"Wie das Geſtirn,
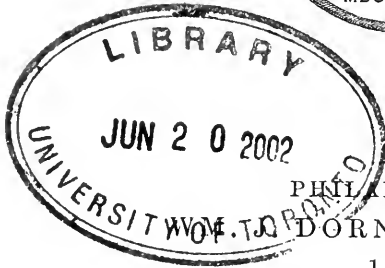Ohne Haſt
Aber ohne Raſt,
Drehe ſich jeder
Um die eigene Laſt."

<div align="right">GOETHE.</div>

TRANSACTIONS OF THE AMERICAN GYNECOLOGICAL SOCIETY

VOLUME 37

FOR THE YEAR 1912

CONTENTS

In Memoriam:

Joseph E. Janvrin, M.D.

Beverly MacMonagle, M.D.

NOTE

The Society does not hold itself responsible for the views
enunciated in the papers read at its meetings.

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Le ROY BROUN, M.D., *Secretary*,
148 W. Seventy-seventh Street, New York.

OFFICERS AND FELLOWS

OF THE

AMERICAN GYNECOLOGICAL SOCIETY

1912

OFFICERS FOR 1912[1]

PRESIDENT

HOWARD A. KELLY, Baltimore.

VICE-PRESIDENTS

RICHARD R. SMITH, Grand Rapids.
JOHN A. SAMPSON, Albany.

SECRETARY

Le ROY BROUN, New York.

TREASURER

J. WESLEY BOVÉE, Washington.

OTHER MEMBERS OF THE COUNCIL

J. MONTGOMERY BALDY, Philadelphia.
[To serve one year.]

J. RIDDLE GOFFE, New York.
[To serve two years.]

EDWARD P. DAVIS, Philadelphia.
[To serve three years.]

REUBEN PETERSON, Ann Arbor.
[To serve four years.]

F. S. NEWELL, Boston.
W. W. CHIPMAN, Montreal.
[To serve one year.]

[1] Officers for the ensuing year may be found in the minutes of the meeting, page xlviii.

LIST OF OFFICERS

FROM THE ORGANIZATION TO THE PRESENT TIME

* Deceased.

	President.	Vice-Presidents.	Secretary.	Treasurer.
1876.	*Fordyce Barker.	*Washington L. Atlee, *William H. Byford.	*James R. Chadwick.	*Paul F. Mundé.
1877.	*Fordyce Barker.	*Washington L. Atlee, *William H. Byford.	*James R. Chadwick.	*Paul F. Mundé.
1878.	*Edmund R. Peaslee.	*William Goodell, *Isaac E. Taylor.	*James R. Chadwick.	*Paul F. Mundé.
1879.	*T. Gaillard Thomas.	*D. Humphreys Storer, *Henry P. C. Wilson.	*James R. Chadwick.	*Paul F. Mundé.
1880.	*J. Marion Sims.	*W. T. Howard, *Robert Battey.	*James R. Chadwick.	*Paul F.Mundé.
1881.	*W. H. Byford.	*T. A. Reamy, *H. F. Campbell.	*James R. Chadwick.	*Paul F. Mundé.
1882.	Thomas Addis Emmet.	*George H. Lyman, *Emil Noeggerath.	*James R. Chadwick.	*Paul F. Mundé.
1883.	*Gilman Kimball.	*Albert H. Smith, *Theophilus Parvin.	Frank P. Foster.	*Paul F. Mundé.
1884.	*Albert H. Smith.	*James R. Chadwick, *Samuel C. Busey.	Frank P. Foster.	Matthew D. Mann.
1885.	*William T. Howard.	Wm. L. Richardson, *Paul F. Mundé.	Frank P. Foster.	Matthew D. Mann.
1886.	*Thaddens A. Reamy.	*Theophilus Parvin, *Geo. J. Engelmann.	Joseph Taber Johnson.	Matthew D. Mann.
1887.	*Alex. J. C. Skene.	John C. Reeve, *Ellwood Wilson.	Joseph Taber Johnson.	Matthew D. Mann.
1888.	*Robert Battey.	*A. Reeves Jackson, *James R. Chadwick.	Joseph Taber Johnson.	Matthew D. Mann.
1889.	*Henry P. C. Wilson.	*William T. Lusk, *Edward W. Jenks.	Joseph Taber Johnson.	Matthew D. Mann.
1890.	John P. Reynolds.	William M. Polk, *Ely Van de Warker.	Joseph Taber Johnson.	Matthew D. Mann.
1891.	*A. Reeves Jackson.	Joseph Taber Johnson, William H. Baker.	Henry Clark Coe.	Matthew D. Mann.
1892.	*John Byrne.	Richard B. Maury, *Cornelius Kollock.	Henry Clark Coe.	Matthew D. Mann.

President.	Vice-Presidents.	Secretary.	Treasurer.
1893. *Theophilus Parvin.	William H. Parish, William H. Baker.	Henry Clark Coe.	Matthew D. Mann.
1894. *William T. Lusk.	*Samuel C. Busey, Bache McE. Emmet.	Henry Clark Coe.	Matthew D. Mann.
1895. Matthew D. Mann.	*Geo. J. Engelmann, Clement Cleveland.	Henry Clark Coe.	J. Montgomery Baldy.
1896. William M. Polk.	*James H. Etheridge, *Fernand Henrotin.	Henry Clark Coe.	J. Montgomery Baldy.
1897. *James R. Chadwick.	*R. Stansbury Sutton, Henry J. Garrigues.	J. Riddle Goffe.	J. Montgomery Baldy.
1898. *Paul F. Mundé.	Emilius C. Dudley, *Arthur W. Johnstone.	J. Riddle Goffe.	J. Montgomery Baldy.
1899. Joseph Taber Johnson.	Howard A. Kelly, A. F. A. King.	J. Riddle Goffe.	J. Montgomery Baldy.
1900. *George J. Engelmann.	Edward L. Duer, Seth C. Gordon.	J. Riddle Goffe.	J. Montgomery Baldy.
1901. *Ely Van de Warker.	Charles Jewett, Richard B. Maury.	J. Riddle Goffe.	J. Montgomery Baldy.
1902. Seth C. Gordon.	*George M. Edebohls, Edward Reynolds.	J. Riddle Goffe.	J. Montgomery Baldy.
1903. Joseph E. Janvrin.	*Edward W. Jenks, *A. Palmer Dudley.	J. Riddle Goffe.	J. Montgomery Baldy.
1904. Edward Reynolds.	J. Whitridge Williams, Edward P. Davis.	J. Riddle Goffe.	J. Montgomery Baldy.
1905. E. Clark Dudley.	Henry D. Fry, Henry C. Coe.	J. Riddle Goffe.	J. Montgomery Baldy.
1906. Richard B. Maury.	Howard A. Kelly, Reuben Peterson.	J. Riddle Goffe.	J. Montgomery Baldy.
1907. Clement Cleveland.	Willis E. Ford, J. Clifton Edgar.	J. Riddle Goffe.	J. Montgomery Baldy.
1908. J. Montgomery Baldy.	I. S. Stone. Eugene Boise.	J. Riddle Goffe.	Charles P. Noble.
1909. J. Riddle Goffe.	Howard A. Kelly. Malcolm McLean.	Le Roy Broun.	J. Wesley Bovée.
1910. Edward P. Davis.	Seth C. Gordon, Edward Reynolds.	Le Roy Broun.	J. Wesley Bovée.
1911. Reuben Peterson.	John F. Thompson, John G. Clark.	Le Roy Broun.	J. Wesley Bovée.
1912. Howard A. Kelly.	Richard R. Smith, John A. Sampson.	Le Roy Broun.	J. Wesley Bovée.

HONORARY FELLOWS

HONORARY FELLOWS

DECEASED

1877. JOHN L. ATLEE, M.D., Lancaster, Pa.

1876. ROBERT BARNES, M.D., London, England.

1892. ROBERT BATTEY, M.D., Rome, Georgia. *Founder.*

1897. SAMUEL C. BUSEY, M.D., LL.D., Washington, D. C. *Founder.*

1910. J. CHALMERS CAMERON, M.D., Montreal, Canada.

1890. HENRY F. CAMPBELL, M.D., Augusta, Georgia. *Founder.*

1905. JAMES R. CHADWICK, A.M, M.D., Boston. *Founder.*

1889. M. CHARPENTIER, M.D., Paris, France.

1893. CHARLES J. CULLINGWORTH, M.D., London, England.

1877. JOHN C. DALTON, M.D., New York.

1877. J. A. H. DEPAUL, M.D., Paris, France.

1878. J. MATTHEWS DUNCAN, M.D., London, England.

1888. ALEXANDER DUNLAP, M.D., Springfield, Ohio.

1876. JOSEPH A. EVE, M.D., Augusta, Georgia.

1889. ROBERT P. HARRIS, M.D., Philadelphia.

1888. GRAILY HEWITT, M.D., London, England.

1881. J. BRAXTON HICKS, M.D., London, England.

1902. WILLIAM T. HOWARD, M.D., Baltimore, Md. *Founder.*

1911. JOSEPH E. JANVRIN, M.D., New York.

1876. THOMAS KEITH, M.D., London, England.

1888. GILMAN KIMBALL, M.D., Lowell, Massachusetts.

1891. CHRISTIAN G. LEOPOLD, M.D., Dresden, Germany.

1876. ALFRED H. M'CLINTOCK, M.D., Dublin, Ireland.

1888. EMIL NOEGGERATH, M.D., Wiesbaden, Germany. *Founder.*

1877. CHARLES PAJOT, M.D., Paris, France.

1908. J. PFANNENSTIEL, M.D., Kiel, Germany.

1885. W. S. PLAYFAIR, M.D., London, England.

1888. Sir WILLIAM O. PRIESTLEY, LL.D., London, England.

1907. THADDEUS A. REAMY, M.D., Cincinnati, Ohio.

1901. M. SAENGER, M.D., Prague.

1877. F. W. VON SCANZONI, M.D., Würzburg, Bavaria.

1876. CARL SCHROEDER, M.D., Berlin, Germany.

1876. GUSTAV SIMON, M.D., Heidelberg, Germany.

1888. D. HUMPHREYS STORER, M.D., Boston. *Founder.*

1905. R. STANSBURY SUTTON, M.D., Pittsburg, Pa.

1882. LAWSON TAIT, Esq., Birmingham, England.

1881. S. TARNIER, M.D., Paris, France.

1888. ISAAC E. TAYLOR, M.D., New York.   *Founder.*

1893. T. GAILLARD THOMAS, M.D., New York.   *Founder.*

1882. J. KNOWSLEY THORNTON, Esq., London, England.

1909. ELY VAN De WARKER, M.D., Syracuse, N.Y.

1886. Sir SPENCER WELLS, Bart., London, England.

1881. FRANZ VON WINCKEL, M.D., Munich, Germany.

1876. MARMADUKE B. WRIGHT, M.D., Cincinnati.

ACTIVE FELLOWS

1906.—ANDREWS, FRANK T., A.M., M.D. Professor of Clinical Gynecology, Northwestern University Medical School; Gynecologist to Mercy and Wesley Hospitals and South Side Dispensary. 32 N. State Street, Chicago.

1909.—ANSPACH, BROOKE M., M.D. Gynecologist and Obstetrician to the Philadelphia and Stetson Hospitals; Associate in Gynecology, University of Pennsylvania; Assistant Gynecologist, University Hospital; Surgeon to the Gynecian Hospital. 119 South Twentieth Street, Philadelphia.

1888.—ASHBY, THOMAS A., M.D. Professor of Diseases of Women, University of Maryland; Honorary Member of Medical Society, District of Columbia, Washington, D.C.; Ex-President of Medical and Chirurgical Society of Maryland. 1125 Madison Avenue, Baltimore, Maryland.

1895.—ASHTON, WILLIAM EASTERLY, M.D. Professor of Gynecology, Medico-Chirurgical College of Philadelphia; Gynecologist to Medico-Chirurgical and Philadelphia Hospitals; First Lieutenant in the Medical Reserve Corps of the United States Army. 2011 Walnut Street, Philadelphia.

1886.—BAER, B. F., M.D. Professor of Gynecology, Philadelphia Polyclinic; Ex-President of Philadelphia Obstetrical Society. *Council*, 1895. 2115 Chestnut Street, Philadelphia.

1889.—BALDY, J. MONTGOMERY, M.D. Professor of Gynecology, Philadelphia Polyclinic; Surgeon to the Gynecean Hospital; Consulting Surgeon to the Jewish and the Frederick Douglas Hospitals. *Treasurer*, 1894–1907. *President*, 1908. *Council*. 2219 De Lancey Place, Philadelphia.

1908.—BISSELL, DOUGAL, M.D. Surgeon to the Woman's Hospital in the State of New York; Consulting Surgeon to the State Hospital (Insane), Central Islip, L. I. 265 West Eighty-first Street, New York.

1896.—BOISE, EUGENE, A.B., M.D.   Consulting Physician to Butterworth Hospital.   Grand Rapids, Michigan.

1888.—BOLDT, HERMANN J., M.D.   Consulting Gynecologist to the German Poliklinik; Consulting Gynecologist to the Beth Israel Hospital, and to the Philanthropic Hospital; Professor of Diseases of Women, New York Post-Graduate Medical School and Hospital; Fellow of the Royal Society of Medicine and International Gynecological Societies, and of the Southern Surgical and Gynecological Society; Consulting Gynecologist to St. Vincent's Hospital; Member of Gynecological Society of Germany; Gynecologist to Post-Graduate Hospital.   39 East Sixty-first Street, New York.

1897.—BOVÉE, J. WESLEY, M.D.   Professor of Gynecology, George Washington University; Gynecologist to Columbia and George Washington University Hospitals, and St. Elizabeth Hospital for the Insane; Consulting Physician to St. Ann's Infant Asylum.   *Treasurer.*   The Rochambeau, 815 Connecticut Avenue, Washington, D. C.

1909.—BRETTAUER, JOSEPH, M.D.   Attending Gynecologist to Mt. Sinai Hospital, New York.   1063 Madison Avenue, New York.

1905.—BROUN, LE ROY, B.S., M.D.   Surgeon to Woman's Hospital in the State of New York; Surgeon to Manhattan State Hospital (Insane Asylum).   *Secretary.*   148 West Seventy-seventh Street, New York.

1898.—BURRAGE, WALTER L., A.M., M.D.   Formerly Gynecologist to St. Elizabeth's and the Carney Hospitals. 282 Newbury Street, Boston, Massachusetts.

1889.—BYFORD, HENRY T., M.D.   Professor of Gynecology and Clinical Gynecology of the University of Illinois. Peoples Gas Building, cor. Michigan Avenue and Adams St., Chicago.

1903.—CHIPMAN, WALTER WILLIAM, M.D.   Professor of Gynecology, McGill University; Assistant Gynecologist to Royal Victoria Hospital.   *Council.*   285 Mountain Street, Montreal, Canada.

1903.—CLARK, JOHN G., M.D.   Professor of Gynecology, University of Pennsylvania; Gynecologist-in-Chief, University Hospital; Consulting Gynecologist to Woman's and Bryn Mawr, Germantown, Chestnut Hill, and other hospitals; Chairman Section Diseases of Women and Obstetrics,

American Medical Association, 1910. *Vice-President*, 1911. 2017 Walnut Street, Philadelphia.

1889.—CLEVELAND, CLEMENT, A.M., M.D. Surgeon to the Woman's Hospital in the State of New York; Consulting Gynecologist to General Memorial Hospital. *Council*, 1894, *Vice-President*, 1895. *President*, 1907. *Council*. Office: 40 East Forty-first Street. Residence: 925 Park Ave., New York.

1888.—COE, HENRY C., A.M., M.D., M.R.C.S. Gynecologist to Bellevue and General Memorial Hospitals; Consulting Gynecologist to the Woman's and New York Foundling Hospitals; Professor of Gynecology in the University and Bellevue Hospital Medical College; Honorary Fellow Edinburgh Obstetrical Society. *Secretary*, 1891–96. *Vice-President*, 1905. 8 West Seventy-sixth Street, New York.

1896.—CRAGIN, EDWIN B., A.B., A.M. (HON.), M.D. Professor of Obstetrics and of Gynecology, College of Physicians and Surgeons, N. Y.; Attending Obstetrician and Gynecologist to the Sloane Hospital for Women; Consulting Gynecologist to the Presbyterian and Lincoln Hospitals, to the New York Infirmary for Women and Children, and to St. Luke's Hospital, Newburg, N. Y.; Consulting Obstetrician to the City Maternity, Italian, New York Nursery, and Child's Hospitals. 10 West Fiftieth Street, New York.

1909.—CROSSEN, HARRY STURGEON, M.D. Professor of Clinical Gynecology in the Medical Department of Washington University, St. Louis; Gynecologist to the Washington University Hospital; Gynecologist to the Mullanphy Hospital; Gynecologist to the Bethesda Hospital. 310 Metropolitan Building, St. Louis, Missouri.

1904.—CULLEN, THOMAS S., M.D. Associate Professor of Gynecology, Johns Hopkins University; Associate Gynecologist, Johns Hopkins Hospital; Consulting Gynecologist, Church Home and Infirmary. 3 West Preston Street, Baltimore, Maryland.

1889.—CURRIER, ANDREW F., A.B., M.D. Consulting Gynecologist to McDonough Memorial Hospital, New York, and Ossining Hospital, Sing Sing, N. Y., and Mt. Vernon Hospital, Mt. Vernon, N. Y.; formerly Gynecologist to Skin and Cancer Hospital, New York City; Associate Surgeon Woman's Hospital, New York City. 173 East Lincoln Avenue, Mount Vernon, New York.

1893.—Cushing, Ernest W., A.B., LL.D., M.D. Professor Abdominal Surgery and Gynecology, Tufts College Medical School; Surgeon to Woman's Charity Club Hospital. 168 Newbury Street, Boston, Massachusetts.

1889.—Davenport, Francis H., A.B., M.D. Consulting Surgeon to the Free Hospital for Women. *Council*, 1891. 419 Boylston Street, Boston, Massachusetts.

1891.—Davis, Edward P., A.M., M.D. Professor of Obstetrics, Jefferson Medical College; Obstetrician to the Jefferson Hospital; Obstetrician and Gynecologist to Philadelphia Hospital; Consultant to the Preston Retreat; Member (Founder) International Congress of Obstetrics and Gynecology; Honorary Member of Chicago Gynecological Society; Academy of Surgery, Bucharest; Medical Society of Virginia; Member College of Physicians of Philadelphia; Philadelphia Obstetrical Society. *Council*, 1896–1899. *Vice-President*, 1904. *President*, 1910. *Council*. 250 South Twenty-first Street, Philadelphia.

1892.—Dickinson, Robert L., M.D. Gynecologist to Brooklyn Hospital; Obstetrician-in-Chief, Methodist Episcopal Hospital; Consulting Gynecologist, St. Mary's Hospital, Jamaica, L. I.; Memorial Hospital, Brattleboro, Vt. 168 Clinton Street, Brooklyn, New York.

1886.—Dudley, Emilius Clark, A.B., M.D. Professor of Gynecology, Northwestern University Medical School; Fellow of the Royal Society of Medicine. *Council*, 1891, 1893, 1906–1909. *Vice-President*, 1898. *President*, 1905. 32 North State Street, Chicago.

1893.—Edgar, James Clifton, Ph.B., A.M., M.D. Professor of Obstetrics and Clinical Midwifery, Cornell University Medical College of New York; Attending Surgeon to the Manhattan Maternity Hospital; Attending Obstetrician to Bellevue Hospital. *Vice-President*, 1907. 28 West Fifty-sixth Street, New York.

1907.—Ehrenfest, Hugo, M.D. Professor of Obstetrics and Gynecology, St. Louis University; Physician-in-Chief, St. Louis Obstetric Dispensary; Obstetrician, Jewish Hospital; Visiting Gynecologist, St. Louis City Hospital. 4619 McPherson Avenue, St. Louis, Missouri.

1904.—Findley, Palmer, B.S., M.D. Professor of Gynecology, College of Medicine, University of Nebraska. 3602 Lincoln Boulevard, Omaha, Nebraska.

1889.—FORD, WILLIS E., A.M., M.D. Medical Director and Gynecologist, St. Luke's Hospital. *Council*, 1893. *Vice-President*, 1907. 266 Genesee Street, Utica, New York.

1912. FRANK, ROBERT TILDEN, B.A., M.A., M.D., Adjunct Gynecologist, Mount Sinai Hospital. 983 Park Avenue, New York.

1890.—FRY, HENRY D., M.D. Professor of Obstetrics, Medical Department of Georgetown University; Obstetrician-in-Chief, Columbia Lying-in Hospital, and Georgetown University Hospital; Gynecologist, Garfield Memorial Hospital. *Vice-President*, 1905. Corner Connecticut Avenue and Q Street, N. W., Washington, D. C.

1909.—GARCEAU, EDGAR, M.D. Consulting Gynecologist to the Quincy Hospital, Quincy, Mass.; Gynecologist to the Boston Dispensary. 397 Marlboro Street, Boston, Massachusetts.

1888.—GEHRUNG, EUGENE C., M.D. Ex-President and Chief of the Gynecological Department of the South Side Dispensary; Consulting Gynecologist of the Missouri Baptist Sanitarium and the St. Louis Female Hospital; Corresponding Member of Société Obstétricale et Gynécologique de Paris; Membre Titulaire de la Société Française d'Electrothérapie; Member International Periodical Congress Obstetricians and Gynecologists; Ex-President (two terms) St. Louis Obstetrical and Gynecological Society. 3857 Westminster Place, St. Louis, Missouri.

1904.—GELLHORN, GEORGE, M.D. Lecturer on Gynecology, Washington University; Gynecologist to St. Luke's Hospital and Barnard Free Skin and Cancer Hospital; St. Louis City Hospital; Fellow of Deutsche Gesellschaft für Gynäkologie, also of Gynecological Society of Berlin, Germany. 713 Metropolitan Building, St. Louis, Missouri.

1911.—GOODALL, JAMES R., B.A., M.D., C.M. Assistant Gynecologist to the Royal Victoria Hospital; Gynecological Pathologist to the Royal Victoria Hospital; Demonstrator in Gynecology, McGill University. 153 Metcalf Street, Montreal, Canada.

1891.—GOFFE, J. RIDDLE, Ph.M., M.D. Professor of Gynecology, New York Polyclinic Medical School and Hospital, and Dartmouth Medical College; Attending Surgeon

to the Woman's Hospital in the State of New York; Consulting Gynecologist to New York City Hospital, to St. Joseph's Hospital, Yonkers, N. Y., to Mt. Vernon Hospital, Mt. Vernon, N. Y., and to the Lawrence Hospital, Bronxville. *Council*, 1896. *Secretary*, 1897–1908. *President*, 1909. *Council*. 616 Madison Avenue, New York.

1888.—GORDON, SETH CHASE, M.D., LL.D.   Former Lecturer to the Portland School for Medical Instruction; Ex-Surgeon to the Maine General Hospital; Consulting Surgeon to the Maine Eye and Ear Infirmary and to the Maine General Hospital; Ex-President of the Maine Medical Association; Ex-President, Section of Obstetrics and Gynecology, American Medical Association; Fellow of the Royal Society of Medicine; Fellow of the Boston Gynecological Society and of the Detroit Academy of Medicine; President Board of Trustees, Maine Insane Asylums and School for Feeble Minded. *Council*, 1892, 1903–1907, and 1910. *President*, 1902. Portland, Maine.

1890.—GRANDIN, EGBERT H., M.D., Consulting Gynecologist to the French Hospital; Attending Gynecologist to Columbus Hospital. 116 West Seventy-sixth Street, New York.

1886.—GREEN, CHARLES M., A.B., M.D. Professor of Obstetrics and Gynecology, Harvard University; Senior Visiting Surgeon for Diseases of Women, Boston City Hospital; Visiting Physician to the Boston Lying-in Hospital; Consulting Physician to the Adams Nervine Asylum, and to the State Hospital at Tewksbury; ex-President of the Obstetrical Society of Boston, and of the Boston Society for Medical Improvement.   *Council*, 1895, 1899.   78 Marlborough Street, Boston, Massachusetts.

1895.—HARRIS, PHILANDER A., M.D. Gynecologist to the Paterson General Hospital and to Passaic General Hospital; Corresponding Member of the Obstetrical and Gynecological Society of Paris, France (1895); Consulting Gynecologist to the New Jersey State Hospital and to the Meriam Barnet Memorial Hospital. 26 Church Street, Paterson, N. J.

1894.—HARRISON, GEORGE TUCKER, M.A., M.D. Formerly Consulting Surgeon to Woman's Hospital; formerly Consulting Obstetrician to Nursery and Child's Hospital; formerly Consulting Gynecologist to the Misericordia Hos-

pital; formerly Surgeon to St. Elizabeth's Hospital; Honorary Fellow, Medical Society of Virginia. *Council.* Charlottesville, Virginia.

1891.—HIRST, BARTON COOKE, M.D. Professor of Obstetrics, University of Pennsylvania; Gynecologist to the Howard and Orthopedic Hospitals; Consulting Obstetrician to the Lying-in Charity, Preston Retreat, and Newport Hospitals. 1821 Spruce Street, Philadelphia.

1891.—INGALLS, PHINEAS H., A.M., M.D. Gynecologist to the Hartford Hospital. 49 Pearl Street, Room 509, Hartford, Connecticut.

1895.—JARMAN, GEORGE W., A.M., M.D. Gynecologist to the General Memorial Hospital. 54 West Seventy-sixth Street, New York.

Founder.—JOHNSON, JOSEPH TABER, A.M., Ph.D., M.D. Professor of Gynecology and Abdominal Surgery, University of Georgetown; Gynecologist to the Providence and Columbia Hospitals; Chief of the Gynecological Service, Georgetown University Hospital; President, Southern Surgical and Gynecological Association, 1899; President of the Medical Society of the District of Columbia, 1887; Member of the British Medical Association; President of the Washington Obstetrical and Gynecological Society. *Secretary*, 1886–90. *Vice-President*, 1891. *Council*, 1881, 1885, 1897. *President*, 1899. 926 Farragut Square, Washington, D. C.

1887.—KELLY, HOWARD A., B.A., M.D., LL.D. Founder of the Kensington Hospital, Philadelphia; Associate Professor of Obstetrics, University of Pennsylvania, 1888–89; Professor of Gynecology and Obstetrics in Johns Hopkins University, 1889–99; Professor of Gynecological Surgery in Johns Hopkins University; Gynecologist to the Johns Hopkins Hospital; Honorary Fellow of Royal College of Surgeons, Edinburgh, 1905; President Southern Surgical and Gynecological Association, 1907; Honorary Member, Royal Medical Society of Edinburgh; the Italian Society of Obstetrics and Gynecology, Rome; Society of Obstetrics and Gynecology, Berlin; Society of Obstetrics, Leipzig; Honorary Fellow of the Edinburgh Obstetrical Society; Royal Academy of Medicine, Ireland; Glasgow Obstetrical and Gynecological Society; Chicago Gynecological Society; Associate Foreign Member, Society of Obstetrics, Gynecology and Pediatrics, and Chi-

rurgical Society, Paris; Corresponding Member, Society of Obstetrics, Leipzig; Royal Society of Physicians, Vienna; Fellow of the Royal Society of Medicine. *Vice-President*, 1899, 1906. *Council*. *President*, 1912. 1418 Eutaw Place, Baltimore, Md.

1886.—KING, ALBERT F. A., A.M., M.D., LL.D. Professor of Obstetrics in the Medical Department of the George Washington University, and in the University of Vermont; Visiting Obstetrician to the George Washington University Hospital; Consulting Physician to the Children's Hospital, Washington; Member of the Royal Society of Medicine; President of the Washington Obstetrical and Gynecological Society (1885–87). *Council*, 1898. *Vice-President*, 1899. 1315 Massachusetts Avenue, N. W., Washington, D. C.

1892.—KIRKLEY, CYRUS A., M.D. Toledo, Ohio.

1891.—KRUG, FLORIAN, M.D. Gynecologist to the Mt. Sinai Hospital; Consulting Gynecologist to the German Hospital. 616 Madison Avenue, New York.

1892.—McLEAN, MALCOLM, M.D. Surgeon to St. Andrew's Infirmary for Women; Consulting Gynecologist to Randall's Island Hospitals; Associate Surgeon to the Woman's Hospital. *Vice-President*, 1908–09. 29 East One Hundred and Twenty-sixth Street, New York.

1901.—MANTON, WALTER PORTER, M.D. Formerly Clinical Professor of Gynecology and Professor of Obstetrics, Detroit College of Medicine; Gynecologist to Harper Hospital and to the Eastern and Northern Michigan Asylums for the Insane; Consulting Gynecologist to St. Joseph's Retreat; Visiting Obstetrician and President of Medical Board, Woman's Hospital and Infants' Home; President, Wayne County Medical Society, 1908–09; Chairman, Section of Obstetrics and Diseases of Women, American Medical Association, 1908–09; Fellow of the Royal Society of Medicine. 32 Adams Avenue, Detroit, Michigan.

1908.—MARTIN, FRANKLIN H., M.D. Professor of Gynecology Post-Graduate Medical School of Chicago; General Secretary Clinical Congress of Surgeons of North America; Editor *Surgery, Gynecology, and Obstetrics*. 103 State Street, Chicago.

1909.—MILLER, GIDEON BROWN, B.Sc., M.D. Attending Gynecologist to the Emergency Hospital and to the Garfield Hospital; Associate Gynecologist to the Columbia Hospital;

Instructor in Gynecology in the George Washington University. 1730 K Street, N. W., Washington, D. C.

1894.—MONTGOMERY, EDWARD E., A.M., M.D., LL.D. Professor of Gynecology, Jefferson Medical College; Gynecologist to Jefferson Medical College and to St. Joseph's Hospitals. 1426 Spruce Street, Philadelphia.

1912. MORLEY, WILLIAM HORACE, PH.B., M.D., Visiting Obstetrician to the House of Providence Hospital; Visiting Obstetrician to the Woman's Hospital and Infants' Home. 202 Fine Arts Building, Detroit, Michigan.

1891.—MOSELEY, WILLIAM E., M.D. Professor Emeritus of Diseases of Women, Baltimore Medical College; Gynecologist to the Maryland General Hospital. *Council*, 1897. 614 North Howard Street, Baltimore, Maryland.

1904.—NEWELL, FRANKLIN SPILMAN, A.B., M.D. Assistant Visiting Physician, Boston Lying-in Hospital; Junior Visiting Surgeon, Department of Diseases of Women, Boston City Hospital; Assistant Professor of Obstetrics and Gynecology, Harvard University. *Council*. 443 Beacon Street, Boston, Mass.

1894.—NEWMAN, HENRY PARKER, A.M., M.D. Professor of Obstetrics and Clinical Gynecology, College of Physicians and Surgeons of Chicago; Professor of Gynecology, Chicago Post-Graduate Medical School; Surgeon (Department of Diseases of Women) to St. Elizabeth, Post-Graduate, and Chicago Hospitals. San Diego, California.

1891.—NOBLE, CHARLES P., M.D., S.D. Surgeon-in-Chief to the Kensington Hospital for Women. *Council*, 1899. *Treasurer*, 1908. 328 South Seventeenth Street, Philadelphia.

1902.—NOBLE, GEORGE HENRY, M.D. Gynecologist to Grady Hospital and Wesley Memorial Hospital; Dean and Professor of Abdominal Surgery, Atlanta School of Medicine. 186 South Pryor Street. Residence, 980 Peachtree Street, Atlanta, Georgia.

1893.—NORRIS, RICHARD C., A.M., M.D. Assistant Professor of Obstetrics, Medical Department, University of Pennsylvania; Surgeon-in-Charge, Preston Retreat; Gynecologist to the Methodist Episcopal Hospital and to the Philadelphia Hospital. 500 North Twentieth Street, Philadelphia.

1897.—PETERSON, REUBEN, A.B., M.D. Professor of Obstetrics and Gynecology, University of Michigan; Obstetrician and Gynecologist to the University of Michigan Hos-

pital. *Vice-President*, 1906. *President*, 1911. *Council*. Ann
Arbor, Michigan.

1908.—POLAK, JOHN OSBORNE, M.D.   Professor of Ob-
stetrics, Dartmouth Medical College; Professor of Obstetrics
and Gynecology, Long Island College Hospital; Consulting
Obstetrician to the Methodist Episcopal Hospital; Gynecolo-
gist to the Jewish Hospital; Consulting Gynecologist to the
Coney Island, Williamsburg, Deaconess', and People's Hos-
pitals; Consulting Obstetrician to Mary Hitchcock Hospital,
Hanover, New Hampshire.   287 Clinton Avenue, Brooklyn,
New York.

1881.—POLK, WILLIAM M., M.D.   Professor of Gyne-
cology, Cornell University Medical College; Gynecologist to
Bellevue Hospital; Consulting Gynecologist to St. Luke's
and St. Vincent's Hospitals, to the New York Lying-in
Hospital, and to the New York Infirmary for Women and
Children; Dean of Cornell University Medical College.
Vice-President, 1890. *Council*, 1891. *President*, 1896. 7 East
Thirty-sixth Street, New York.

1890.—REYNOLDS, EDWARD, M.D.   *Council*, 1894–96,
1905-08. *Vice-President*, 1902 and 1910.   *President*, 1904.
321 Dartmouth Street, Boston, Massachusetts.

1896.—ROBB, HUNTER, M.D.   Professor of Gynecology,
Western Reserve University; Visiting Gynecologist to the
Lakeside Hospital.   702 Rose Building, Cleveland, Ohio.

1906.—SAMPSON, JOHN A., M.D.   Professor of Gynecol-
ogy, Albany Medical College; Gynecologist to the Albany
Hospital and South End Dispensary. *Council*, 1911.   *Vice-
President*, 1912. 180 Washington Avenue, Albany, New York.

1911.—SCHENCK, BENJAMIN R., A.B., M.D.   Junior At-
tending Gynecologist to the Harper Hospital; Consulting
Obstetrician to the Woman's Hospital.   502 Washington
Arcade, Detroit, Michigan.

1907.—SIMPSON, FRANK FARROW, A.B., M.D.   Gynecolo-
gist, Allegheny General Hospital; Consulting Gynecologist,
Columbia Hospital.   Jenkins Arcade Building, Pittsburg, Pa.

1905.—SMITH, RICHARD R., M.D.   Surgeon to Butter-
worth Hospital. *Council*, 1912. *Vice-President*, 1912.   Grand
Rapids, Michigan.

1898.—STONE, ISAAC S., M.D.   Clinical Professor of
Gynecology, University of Georgetown; Gynecologist to
Columbia Hospital for Women; Fellow of the Royal Society

of Medicine, London, England; President Washington Obstetrical and Gynecological Society, 1907–09. *Vice-President*, 1908. Connecticut Avenue and L Street, N. W., Washington, D. C.

1905.—STONE, WILLIAM STEPHEN, A.B., M.D. 113 East Sixty-second Street, New York.

1909.—STUDDIFORD, WILLIAM EMERY, B.A., M.A., M.D. Assistant Professor of Gynecology, New York University; Assistant Gynecologist to the Bellevue and to the General Memorial Hospitals; Attending Obstetrician to the New York Nursery and Child's Hospital; Consulting Surgeon to the Franklin Hospital, New Jersey. 124 East Thirty-sixth Street, New York

1906.—TAUSSIG, FREDERICK JOSEPH, A.B., M.D. Lecturer on Gynecology, Washington University; Gynecologist to Barnard Free Skin and Cancer Hospital; Obstetrician to St. Louis Maternity Hospital; Gynecologist to the St. Louis City Hospital and City Sanitarium. 731 Metropolitan Building, St. Louis, Missouri.

1905.—TAYLOR, HOWARD C., Ph.B., M.D. Attending Gynecologist, Roosevelt Hospital; Instructor in Gynecology, Columbia University; Consulting Gynecologist, Greenwich (Conn.) General Hospital. 32 West Fiftieth Street, New York.

1898.—THOMPSON, JOHN F., A.M., M.D. Professor of Diseases of Women, Medical School of Maine (Bowdoin); Surgeon, Maine General Hospital. *Vice-President*, 1911. 211 State Street, Portland, Maine.

1897.—VINEBERG, HIRAM N., M.D. Associate Gynecologist to Mt. Sinai Hospital; Visiting Gynecologist to St. Mark's and Har Moriah Hospitals; Consulting Gynecologist to the Montefiore Home for Chronic Invalids. 751 Madison Avenue, New York.

1903.—WAKEFIELD, W. FRANCIS B., M.D. 1525 Sutter Street, San Francisco.

1909.—WARD, GEORGE GRAY, JR., M.D. Professor of Diseases of Women and Gynecologist to the New York Post-Graduate Medical School and Hospital; Consulting Gynecologist to the Monmouth Memorial Hospital, Long Branch, New Jersey, and to the Italian Hospital, New York; Associate Surgeon to the Woman's Hospital; Instructor in Gynecology Cornell Medical College. 71 West Fiftieth Street, New York

1891.—WATHEN, WILLIAM H., A.M., M.D., LL.D. Professor of Abdominal Surgery and Gynecology in the Medical Department of the University of Louisville; Abdominal Surgeon and Gynecologist to the Louisville City Hospital and St. Anthony's Hospital; Chairman of the Section on Obstetrics and Gynecology of the American Medical Association, 1891; President of the Kentucky State Medical Society, 1889; Orator on Surgery of the American Medical Association, 1907. The Gaulbert, Louisville, Kentucky.

1896.—WATKINS, THOMAS J., M.D. Professor of Clinical Gynecology, Northwestern University Medical School; Gynecologist to St. Luke's, Wesley, and Mercy Hospitals, Chicago. 3564 Grand Boulevard, Chicago.

1898.—WEBSTER, J. CLARENCE, B.A., M.D. (Edin.), F.R.C.P.E., F.R.S.E. Professor of Obstetrics and Gynecology, Rush Medical College, University of Chicago; Gynecologist, Presbyterian and St. Joseph's Hospitals; Fellow of the Edinburgh Obstetrical Society; Corresponding Member of the Royal Academy of Palermo, Italy, and of the Italian Obstetrical and Gynecological Society. 706 Reliance Building, 32 North State Street, Chicago, Ill.

1902.—WELLS, BROOKS H., M.D. Professor of Gynecology in the New York Polyclinic Medical School and Hospital; Consulting Surgeon to the Brattleboro Memorial Hospital, Brattleboro, Vt.; Consulting Gynecologist to the Beth Israel Hospital, New York; Associate Surgeon to the Woman's Hospital in the State of New York. 523 Madison Avenue, New York.

1892.—WILLIAMS, J. WHITRIDGE, A.B., M.D., B.S.D. Professor of Obstetrics, Johns Hopkins University; Obstetrician-in-Chief to the Johns Hopkins Hospital; Gynecologist to Union Protestant Infirmary; Honorary President Glasgow Gynecological and Obstetrical Society, 1910–12; Corresponding Member of the Gynecological Society of Leipsic and Munich. Council, 1899. Vice-President, 1904. 1128 Cathedral Street, Baltimore, Maryland.

1886.—WYLIE, W. GILL, M.D. Professor Emeritus of Gynecology, New York Polyclinic Medical School and Hospital; Consulting Gynecologist to Bellevue Hospital; Fellow of the Royal Medical Society, England. 28 West Fortieth Street, New York.

Total, 87 Active Fellows.

ACTIVE FELLOWS

CLASSIFIED

CANADA

CHIPMAN, WALTER WILLIAM, 285 Mountain Street, Montreal.
GOODALL, JAMES R., 153 Metcalf Street, Montreal.

CONNECTICUT

INGALLS, PHINEAS, 49 Pearl Street, Room 509, Hartford.

CALIFORNIA

NEWMAN, HENRY PARKER, San Diego.
WAKEFIELD, W. FRANCIS, 1525 Sutter Street, San Francisco.

DISTRICT OF COLUMBIA

BOVÉE, J. WESLEY, The Rochambeau, 815 Connecticut Ave., Washington.
FRY, HENRY D., cor. Connecticut Ave. and Q St., N. W., Washington.
JOHNSON, JOSEPH TABER, 926 Farragut Square, Washington.
KING, ALBERT F. A., 1315 Massachusetts Avenue, N. W., Washington.
MILLER, GIDEON BROWN, 1730 K Street, N. W., Washington.
STONE, ISAAC S., Connecticut Avenue and L Street, N. W., Washington.

GEORGIA

NOBLE, GEORGE HENRY, 980 Peachtree Street, Atlanta.

ILLINOIS

ANDREWS, FRANK T., 100 State Street, Chicago.
BYFORD, HENRY T., Michigan Avenue and Adams Street, Chicago.
DUDLEY, EMILIUS CLARK, 32 North State Street, Chicago.
MARTIN, FRANKLIN H., 103 State Street, Chicago.
WATKINS, THOMAS J., 3564 Grand Boulevard, Chicago.
WEBSTER, J. CLARENCE, 32 North State Street, Chicago.

KENTUCKY

WATHEN, WILLIAM H., The Gaulbert, Louisville.

MAINE

GORDON, SETH CHASE, Portland.
THOMPSON, JOHN F., 211 State Street, Portland.

MARYLAND

ASHBY, THOMAS A., 1125 Madison Avenue, Baltimore.
CULLEN, THOMAS S., 3 West Preston Street, Baltimore.
KELLY, HOWARD A., 1418 Eutaw Place, Baltimore.
MOSELEY, WILLIAM E., 614 North Howard Street, Baltimore.
WILLIAMS, J. WHITRIDGE, 1128 Cathedral Street, Baltimore.

MASSACHUSETTS

BURRAGE, WALTER L., 282 Newbury Street, Boston.
CUSHING, ERNEST W., 168 Newbury Street, Boston.
DAVENPORT, FRANCIS H., 419 Boyleston Street, Boston.
GARCEAU, EDGAR, 397 Marlboro Street, Boston.
GREEN, CHARLES M., 78 Marlborough Street, Boston.
NEWELL, FRANKLIN SPILMAN, 379 Beacon Street, Boston.
REYNOLDS, EDWARD, 321 Dartmouth Street, Boston.

MICHIGAN

BOISE, EUGENE, Grand Rapids.
MANTON, WALTER PORTER, 32 Adams Avenue, Detroit.
MORLEY, WILLIAM HORACE, 202 Fine Arts Building, Detroit.
PETERSON, REUBEN, Ann Arbor.
SCHENCK, BENJAMIN R., 502 Washington Arcade, Detroit.
SMITH, RICHARD R., Grand Rapids.

MISSOURI

CROSSEN, HARRY STURGEON, 310 Metropolitan Building, St. Louis.
EHRENFEST, HUGO, 4619 McPherson Avenue, St. Louis.
GEHRUNG, EUGENE C., 3857 Westminster Place, St. Louis.
GELLHORN, GEORGE, 715 Metropolitan Building, St. Louis.
TAUSSIG, FREDERICK JOSEPH, 713 Metropolitan Building, St. Louis.

NEBRASKA

FINDLEY, PALMER, 3602 Lincoln Boulevard, Omaha

NEW JERSEY

HARRIS, PHILANDER A., 26 Church Street, Paterson.

NEW YORK

BISSELL, DOUGAL, 265 West Eighty-first Street, New York.
BOLDT, HERMANN, J., 39 East Sixty-first Street, New York.
BRETTAUER, JOSEPH, 1063 Madison Avenue, New York.
BROUN, LE ROY, 148 West Seventy-seventh Street, New York.
CLEVELAND, CLEMENT, 40 East Forty-first Street, New York.

COE, HENRY C., 8 West Seventy-sixth Street, New York.
CRAGIN, EDWIN B., 10 West Fiftieth Street, New York.
CURRIER, ANDREW F., 173 East Lincoln Avenue, Mt. Vernon.
DICKINSON, ROBERT L., 168 Clinton Street, Brooklyn.
EDGAR, JAMES CLIFTON, 28 West Fifty-sixth Street, New York.
FORD, WILLIS E., 266 Genesee Street, Utica.
FRANK, ROBERT TILDEN, 983 Park Avenue, New York.
GOFFE, J. RIDDLE, 616 Madison Avenue, New York.
GRANDIN, EGBERT H., 116 West Seventy-sixth Street, New York.
JARMAN, GEORGE W., 54 West Seventy-sixth Street, New York.
KRUG, FLORIAN, 616 Madison Avenue, New York.
MCLEAN, MALCOLM, 29 East 126th Street, New York.
POLAK, JOHN OSBORNE, 287 Clinton Avenue, Brooklyn.
POLK, WILLIAM M., 7 East Thirty-sixth Street, New York.
SAMPSON, JOHN A., 180 Washington Avenue, Albany.
STONE, WILLIAM STEPHEN, 113 E. Sixty-second Street, New York.
STUDDIFORD, WILLIAM EMERY, 124 East Thirty-sixth Street, New
    York.
TAYLOR, HOWARD C., 32 West Fiftieth Street, New York.
VINEBERG, HIRAM N., 751 Madison Avenue, New York.
WARD, GEORGE GRAY, JR., 71 West Fiftieth Street, New York.
WELLS, BROOKS H., 523 Madison Avenue, New York.
WYLIE, W. GILL, 28 West Fortieth Street, New York.

OHIO

KIRKLEY, CYRUS A., Toledo.
ROBB, HUNTER, 702 Rose Building, Cleveland.

PENNSYLVANIA

ANSPACH, BROOKE M., 119 South Twentieth Street, Philadelphia.
ASHTON, WILLIAM EASTERLY, 2011 Walnut Street, Philadelphia.
BAER, B. F., 2115 Chestnut Street, Philadelphia.
BALDY, J. MONTGOMERY, 2219 De Lancey Place, Philadelphia.
CLARK, JOHN G., 2017 Walnut Street, Philadelphia.
DAVIS, EDWARD P., 250 South Twenty-first Street, Philadelphia.
HIRST, BARTON COOKE, 1821 Spruce Street, Philadelphia.
MONTGOMERY, EDWARD E., 1426 Spruce Street, Philadelphia.
NOBLE, CHARLES P., 328 South Seventeenth Street, Philadelphia.
NORRIS, RICHARD C., 500 North Twentieth Street, Philadelphia.
SIMPSON, FRANK FARROW, Jenkins Arcade Building, Pittsburg.

VIRGINIA

HARRISON, GEORGE TUCKER, Charlottesville.

ACTIVE FELLOWS

DECEASED

ELECTED		DIED
FOUNDER.	ATLEE, WASHINGTON L., M.D.	1877
FOUNDER.	BARKER, FORDYCE, M.D., LL.D.	1891
FOUNDER.	†BATTEY, ROBERT, M.D.	1894
FOUNDER.	BUCKINGHAM, CHARLES E., M.D.	1877
FOUNDER.	†BUSEY, SAMUEL C., M.D., LL.D.	1901
FOUNDER.	BYFORD, WILLIAM H., M.D., LL.D.	1890
FOUNDER.	BYRNE, JOHN, M.D., M.R.C.S.E.	1902
FOUNDER.	†CAMPBELL, HENRY F., M. D.	1891
FOUNDER.	†CHADWICK, JAMES R., A.M., M.D.	1905
1888.	COLEMAN, JOHN SCOTT, M.D.	1892
FOUNDER.	DRYSDALE, THOMAS M., A.M., M.D.	1904
1889.	DUDLEY, A. PALMER, M.D.	1905
1891.	EDEBOHLS, GEORGE M., A.M., M.D.	1908
FOUNDER.	ENGELMANN, GEORGE J., A.M., M.D.	1903
1890.	ETHERIDGE, JAMES H., A.M., M.D.	1899
1902.	FREDERICK, CARLTON C., B.S., M.D.	1911
FOUNDER.	GOODELL, WILLIAM, A.M., M.D., LL.D.	1895
1887.	HANKS, HORACE TRACY, M.D., LL.D.	1900
1894.	HENROTIN, FERNAND, M.D.	1906
1892.	HOLMES, HORATIO R., M.D.	1896
FOUNDER.	†HOWARD, WILLIAM T., M.D.	1907
1885.	HUNTER, JAMES B., M.D.	1889
1877.	JACKSON, A. REEVES, A.M., M.D.	1892
1889.	JAGGARD, W. W., M.D.	1896
1886.	†JANVRIN, JOSEPH E., M.D.,	1912
FOUNDER.	JENKS, EDWARD W., M.D., LL.D.	1903
1885.	JEWETT, CHARLES, A.M., M.D., Sc.D.	1911
1886.	JOHNSTONE, ARTHUR W., A.M., M.D.	1905
1892.	KEATING, JOHN M., M.D., LL.D.	1893
1888.	KOLLOCK, CORNELIUS, A.M., M.D.	1897
1881.	LEE, CHARLES C., A.M., M.D., LL.D.	1893
FOUNDER.	LUSK, WILLIAM T., A.M., M.D., LL.D.	1897

Elected		Died
Founder.	LYMAN, GEORGE H., M.D.	1891
1892.	MacMONAGLE, BEVERLY, M.D.	1912
Founder.	MUNDÉ, PAUL F., M.D., LL.D.	1902
1890.	MURRAY, ROBERT A., M.D.	1909
Founder.	†NOEGGERATH, EMIL, M.D.	1895
Founder.	PARVIN, THEOPHILUS, M.D., LL.D.	1898
Founder.	PEASLEY, E. RANDOLPH, M.D., LL.D.	1880
1892.	PRYOR, WILLIAM R., M.D	1904
1877.	†REAMY, THADDEUS A., M.D., LL.D.	1909
1887.	REYNOLDS, JOHN P., M.D.	1896
1879.	SCOTT, JOHN, M.D., M.R.C.S.I.	1886
Founder.	SIMS, J. MARION, M.D., LL.D.	1883
Founder.	SKENE, ALEXANDER J. C., M.D.	1900
Founder.	SMITH, ALBERT H., M.D.	1886
Founder.	†STORER, D. HUMPHREYS, M.D.	1903
1891.	STRONG, CHARLES P., A.B., M.D.	1893
1879.	†SUTTON, R. STRANSBURY, M.D., LL.D.	1906
Founder.	†TAYLOR, ISAAC E., M.D.	1890
Founder.	†THOMAS, T. GAILLARD, M.D.	1903
Founder.	TRASK, JAMES D., M.D.	1883
Founder.	†Van de WARKER, ELY, M.D.	1911
Founder.	WALLACE, ELLERSLIE, M.D.	1885
Founder.	WHITE, JAMES P., M.D.	1881
1887.	WILSON, ELWOOD, M.D.	1889
Founder.	WILSON, HENRY P. C., M.D.	1898

MINUTES OF THE PROCEEDINGS

AT THE

THIRTY-SEVENTH ANNUAL MEETING

OF THE

AMERICAN GYNECOLOGICAL SOCIETY

HELD AT

BALTIMORE, MARYLAND

MAY 28, 29, AND 30, 1912

THIRTY-SEVENTH ANNUAL MEETING

Baltimore, Maryland, May 28, 29, and 30, 1912

The following members were present:

Andrews, Frank T.
Anspach, Brooke M.
Ashton, William Easterly
Baldy, J. Montgomery
Bissell, Dougal
Boldt, Herman J.
Bovée, J. Wesley
Brettauer, Joseph
Broun, Le Roy
Byford, Henry T.
Clark, John G.
Cleveland, Clement
Crossen, Henry Sturgeon
Cullen, Thomas S.
Davis, Edward P.
Dickinson, Robert L.
Ehrenfest, Hugo
Findley, Palmer
Ford, Willis E.
Fry, Henry D.
Garceau, Edgar
Gehrung, Eugene C.
Goffe, J. Riddle
Gordon, Seth C.
Green, Charles M.
Goodall, James R.
Harrison, George Tucker
Hirst, Barton Cooke
Ingalls, Phineas H.

Johnson, Joseph Taber
Kelly, Howard A.
Krug, Florian
McClean, Malcolm
Martin, Franklin H.
Montgomery, Edward E.
Moseley, William E.
Newman, Henry Parker
Noble, Charles P.
Noble, George Henry
Norris, Richard C.
Peterson, Reuben
Polak, John Osborn
Polk, William M.
Robb, Hunter
Sampson, John A.
Smith, Richard R.
Stone, Isaac S.
Stone, William S.
Schenck, Benjamin R.
Taussig, Frederick J.
Taylor, Howard C.
Thompson, John F.
Wakefield, W. F. B.
Ward, George Gray, Jr.
Wathen, William H.
Webster, J. Clarence
Wells, Brooks H.
Williams, J. Whitridge

HONORARY FELLOW

Gardner, William

First Day.—*Tuesday, May* 28, 1912

Morning Session.—The Society met in the Medical and Chirurgical Faculty Building, and was called to order at 10 A.M. by the First Vice-President, Dr. Richard R. Smith, of Grand Rapids, Michigan, in the temporary absence of President Kelly.

The Secretary called the roll.

THE FIRST VICE-PRESIDENT.—We have with us this morning the following guests: Dr. George W. Kosmak, New York City; Dr. Hiram Grad, New York City; Dr. George W. Dobbin, Baltimore; Dr. W. P. Graves, Boston; and Dr. Horace G. Wetherill, Denver, Colorado.

DR. J. RIDDLE GOFFE.—I move the courtesies of the Society be extended to these gentlemen, and that they be invited to participate in the discussions.

Motion seconded and carried.

Dr. William E. Moseley, of Baltimore, was introduced, and delivered the following

ADDRESS OF WELCOME

MR. PRESIDENT AND FELLOW MEMBERS OF THE AMERICAN GYNECOLOGICAL SOCIETY: Through the courtesy of the Baltimore Fellows it becomes my very pleasant duty to welcome you to this, the Thirty-seventh Annual Meeting of our Society and the fourth occasion on which the Association has met in this city. When one remembers that seventeen years have elapsed since the last Baltimore meeting, it would seem almost as though we had been lacking in hospitality, but I can assure you that in any and all of those years our hearts and homes have been open to you, and we feel that we, rather than you, have been the losers by your absence.

Our Society was founded on June 6, 1876, just thirty-six years ago next week, the active membership limited to thirty-nine. Of these thirty-nine "founders" only four are at this time members of the Association: Three, Drs. Thomas Addis Emmet, John C. Reeve, and William L. Richardson, an Honorary Fellow, while the fourth, Dr. Joseph Taber Johnson,

is still an Active Fellow—active not only in name, but in reality.

The fact that Dr. Johnson, now the only living active parent of our Society, had maintained such a vital interest in its work, led me to look up his attendance record, and I found that he had answered to thirty-one roll calls, had been absent four times and possibly a fifth time, the meeting of 1901. The volume of the TRANSACTIONS for that year contained no record of attendance, but as his name does not appear as either reading a paper or entering into any of the discussions, I feel morally certain that he was not present. It requires but a few men of that type to maintain the vitality of a society and make it a living force.

In 1879, when the fourth annual meeting of our Society was held in th s city, Baltimore included a territory of fourteen and a half square miles, and contained a little over three hundred thousand inhabitants. Since then, by the annexation of adjoining territory, it has added seventeen square miles, making its present area thirty-one and a half square miles, and its present population is between five hundred and seventy-five and five hundred and eighty thousand. Its growth in manufacturing and commercial interests has kept pace with its physical increase and, in spite of certain very evident shortcomings, it has developed a very healthy spirit of civic pride.

It seems to me that during the last few years the public conscience has been more keenly alive to the uplifting of the masses; that in spite of the rampant commercialism of the age there is in civil life a strong undercurrent of real endeavor for higher moral and ethical standards. Can we say the same of our own loved profession? The advances in the science and art of medicine have been tremendous. Have the advances on the moral, the ethical side been so great? Is it now and will it continue to be a learned profession, or will commercialism make of it a learned trade?

It has been said, and truly, I believe, that the only permanent remedy for the present troubles in business and political life is the personal application of the golden rule. If this same simple rule be applied by us in our dealings with each other and with our patients, there can be no lowering of ethical standards.

Gentlemen, we are very happy to have you with us as our

guests. We hope you will be glad that you came, and as sorry when the time for your departure arrives as we shall be.

RESPONSE BY DR. BROOKS H. WELLS

MR. PRESIDENT AND GENTLEMEN: It is with great pleasure that I rise to accept in the name of the American Gynecological Society the welcome so cordially extended to us by our Baltimore Fellows through the eloquent lips of Dr. Moseley, and to thank them for the pleasures in store for us.

The open-handed hospitality of the city on the shores of the Chesapeake is as well known as its cuisine. The enticing mint julip, the canvas-back duck, the luscious crab, its oysters, terrapin, and pretty girls have spread the fame of Baltimore far and wide. We, who have known them all, properly appreciate them, and are prepared to do them proper honor.

But there is another element of greatness that in our minds as physicians must overshadow all these, an element whose importance as an example it is difficult to overestimate, that has held up a lamp as a beacon for all of us to see by more clearly, an element that should make our meeting here of more than usual interest, and that element is the spirit of scientific altruism in medical research fostered by the Faculty of the Johns Hopkins University; a Faculty that has done much for the honor of Baltimore. The influence that flows out into the land through its teachings and through the constant stream of the graduates from its university makes surely for the advancement of pure science and higher standards in medicine. Such an influence can only continue to flow from a fountain whose source is from the pellucid waters of truth, and whose outflow is kept clear from the dirt and weeds of commercialism.

Some whom we have admired and revered are gone from those who met in this city when last we accepted its hospitality seventeen years ago, but in the ceaseless moving of the wheel of life others have arisen who now hold our affection and esteem and from whose inspiration and wise counsel we will now profit, to return to our chosen work with a stimulated enthusiasm, with fresh energy, and with ideals placed yet a little higher than those we have known before.

Following the response to the Address of Welcome, the reading of papers was begun.

1. "Acute Torsion of Tubal Enlargements, with Reference Especially to Pyosalpinx," by Dr. Brooke M. Anspach, Philadelphia.

The paper was discussed by Drs. Martin, Byford, Sampson, Polak, Montgomery, and in closing by the essayist.

2. "Menstruation without Ovaries," by Dr. Palmer Findley, Omaha, Nebraska.

Discussed by Drs. Webster, Byford, Baldy, Andrews, Davis, Cleveland, and Gordon.

3. "Chronic Cystitis of the Trigone and Vesical Neck," by Dr. Edgar Garceau, Boston.

Discussed by Drs. Byford, Kelly, and in closing by the essayist.

4. "A Simple Method of Shortening the Uterosacral Ligaments," by Dr. George H. Noble, Atlanta, Georgia.

Discussed by Drs. Bovée, Webster, Goffe, and discussion closed by the author of the paper.

5. "The Use of the Continuous Fixed Sponge," by Dr. W. Francis B. Wakefield, San Francisco, California.

This paper was discussed by Drs. Ward, Stone, Thompson, Bovée, Wells, Noble, Schenck, Thomson, Andrews, Anspach, and in closing by the essayist.

On motion, the Society adjourned until 2.30 P.M.

Afternoon Session.—The Society reassembled at 2.30 P.M. and was called to order by the President.

6. "Gymnastics and Other Mechanical Means in the Treatment of Visceral Prolapse and its Complications," by Dr. Franklin H. Martin, Chicago, Illinois.

Discussed by Drs. Wakefield, Noble (Chas. P.), Cleveland, Smith, Stone (William S.), and in closing by the essayist.

7. "The Influence of Myomas on the Blood Supply of the Uterus, with Special Reference to Uterine Bleeding; Based on a Study of 150 Injected Uteri Containing these Tumors," by Dr. John A. Sampson, Albany, New York.

Discussed by Dr. William S. Stone, and in closing by the essayist.

8. "A Further Report on the Relation of Thyroidism to the Toxemia of Pregnancy," by Dr. George Gray Ward, Jr., New York City.

9. "Treatment of Acute and Fulminant Toxemia," by Dr. Edward P. Davis, Philadelphia.

10. "Treatment of Eclampsia," by Dr. Franklin S. Newell, Boston.   (Read by title in the absence of the author.)

11. "Treatment of Eclampsia," by Dr. George Tucker Harrison, Charlottesville, Virginia.

12. "The Indications for and the Type of Operation to Select in the Toxemia of Pregnancy," by Dr. John O. Polak, Brooklyn, New York.

13. "The Treatment of Eclampsia," by Dr. Cyrus A. Kirkley, Asheville, North Carolina.   (Read by title in the absence of the author.)

The discussion of this symposium was opened by Dr. Reuben Peterson, and continued by Drs. Hirst, Norris, Williams, Green, Fry, Kosmak, Ehrenfest, and the discussion closed by Drs. Ward, Davis, and Harrison.

On motion, the Society adjourned until 9.30 A.M., Thursday.

NOTE.   Wednesday Morning, May 29, operative clinics were held at the Johns Hopkins Hospital.   At noon, the President, Dr. Howard A. Kelly, Baltimore, delivered his address.   He selected for his subject "The History of Vesicovaginal Fistula."

The afternoon was devoted to demonstrations in the amphitheatre of the Johns Hopkins Hospital.

At five o'clock a business meeting of the Society was held.

BUSINESS MEETING

The business meeting of the Society was held on May 28, at 5 P.M. in the Amphitheatre of the Johns Hopkins Hospital, Baltimore.

The meeting being called to order, the Secretary presented the minutes of the preceding meeting, as printed in the TRANSACTIONS.   On motion the minutes were adopted as printed.

The Treasurer's Report was made and was submitted to the Auditing Committee appointed by the Chair.   The Committee having pronounced that all bills and vouchers were correct, the Report was adopted and ordered placed on file.

The Secretary reported the resignation of Dr. Charles B. Penrose, of Philadelphia.   On motion Dr. Penrose's resignation was accepted subject to the payment of the annual dues of 1912.

The requests to be transferred to Honorary Fellowship by

Dr. Edward L. Duer, of Philadelphia, Dr. Bache McE. Emmet, of New York, and Dr. B. Bernard Browne, of Baltimore, were presented.   On motion the requests of these Fellows were granted subject to the payment of the annual dues for 1912.

The Secretary reported the death of Dr. Joseph E. Janvrin, of New York, on December 21, 1911, Dr. J. Chalmers Cameron, of Montreal, on March 16, 1912, Dr. Christian G. Leopold, of Dresden, and Dr. Franz von Winckel, of Munich.

Dr. Garceau reported the death of Dr. Beverly MacMonagle, of San Francisco, Cal., an Active Fellow, who had recently died abroad.

The resignation of Dr. Lapthorn Smith, of Montreal, was submitted to the Society, with the recommendation from the Council that the annual dues be rescinded and the resignation be accepted.   On motion this was unanimously approved.

Dr. Robert Tilden Frank, of New York, and Dr. William Horace Morley, of Detroit, Mich., were recommended by the Council to the Society for Fellowship.   These applicants were unanimously elected.

On ballot, Professor Nagle, of Berlin, and Professor J. M. Munro Kerr, of Glasgow, were elected Honorary Fellows of the Society.

The amendment to Section III, paragraph V, of the Constitution was read and action deferred until the succeeding year. The paragraph as amended would read: The names of any candidates not nominated by the Council or not elected by the Society shall be placed upon a waiting list, and any such candidate in order to be reconsidered must present another thesis to the Council one month before the first day of the annual meeting.   When the name of the candidate is placed upon the waiting list a copy of his paper shall be returned to him for publication if he so desires.   A list of all the candidates, accompanied by all the information sent to the Council, shall be sent to every Fellow with the notification of the annual meeting.

On motion, Dr. Edward P. Davis, of Philadelphia, and Dr. John O. Polak, of New York, were elected delegates to the International Congress of Obstetricians and Gynecologists to convene in Berlin in September, 1912.

Dr. Edward P. Davis, Dr. Reuben Peterson, Dr. Joseph Brettauer, and Dr. Charles M. Green were appointed delegates to the International Medical Congress, to meet in London, 1913.

Dr. Joseph Taber Johnson, of Washington, was elected to represent the Society in the Committee of Arrangements for the meeting of Congress of Physicians and Surgeons to meet in Washington, 1913.

Dr. Baldy moved that the "Nominating Committee shall meet for the purpose of selecting nominees immediately after the afternoon session of the first day of the meeting of the Society, and their report shall be presented to the Society at the morning session of the day of the executive meeting of the Society." The motion being seconded was submitted to the Society for action.   On vote the motion did not prevail.   The meeting therefore will continue as before, immediately after the scientific session the first day.

Dr. J. Riddle Goffe, on behalf of the Nominating Committee, reported the nominations for the ensuing year.   Upon ballot the Society elected Dr. Henry C. Coe, of New York, President; Dr. George H. Noble, of Atlanta, First Vice-President; Dr. George Gellhorn, of St. Louis, Second Vice-President; Dr. J. Wesley Bovée, of Washington, Treasurer; Dr. Le Roy Broun, of New York, Secretary.   Additional Members of the Council: Dr. George Gray Ward, Jr., of New York, and Dr. Palmer Findley, of Omaha, who were elected for one year; Dr. J. Riddle Goffe, Dr. Edward P. Davis, Dr. Reuben Peterson, and Dr. Howard A. Kelly making up the remainder of the Council.   There being no further business the Society adjourned to meet in Scientific Session on the following morning.

<center>THIRD DAY.—*Thursday, May* 30, 1912</center>

Morning Session.—The Society met at 9.30 A.M. and was called to order by the President.

Symposium on the Radical Abdominal Operation for Cancer of the Cervix of the Uterus; Primary Results and End Results (Five Year Limit).

14. "The Radical Abdominal Operation for Cancer of the Cervix of the Uterus, Based upon Forty Operations," by Dr. John G. Clark, Philadelphia.

15. "Primary and End Results of Fifty Radical Abdominal Operations for Cancer of the Uterus," by Dr. Reuben Peterson, Ann Arbor, Michigan.

16. "Report of Twenty-nine Cases of the Radical Abdominal Operation for Cancer of the Uterus," by Dr. Howard C. Taylor, New York.

17. "The Prognosis in Radical Operation for Uterine Cancer," by Dr. Fred. J. Taussig, St. Louis, Missouri.

18. "Remote Results in Abdominal Hysterectomies for Cancer of the Uterus," by Dr. Thomas S. Cullen, Baltimore, Maryland.

The discussion of this symposium was opened by Dr. John A. Sampson, and continued by Drs. Brettauer, Bovée, Broun, Polak, Gordon, Stone, Graves, Ehrenfest, Montgomery, Green, Chalfant, Noble (George H.), and the discussion closed by Drs. Clark, Peterson, Taylor, Taussig, Cullen, and Bovée.

At the conclusion of the discussion of this symposium, Dr Reuben Peterson said: In order that we may profit in a general way by the work of this morning in the symposium upon cancer, I would propose and would make a motion to the effect that the three men who have been doing the most work in regard to the propaganda of cancer, namely, Drs. Le Roy Broun, Howard C. Taylor, and Fred. J. Taussig, be appointed a committee for a specific object in view; that they draw up a plan of action and present it at the next meeting of the council, which will take place in November or December, and that the Council be empowered by the Society, after looking over the plan, to take what action it may see fit.

Dr. J. M. Baldy.—I second the motion. Carried.

The President.—The committee will consist of the gentlemen named in the motion, namely, Drs. Broun, Taylor and Taussig.

On motion, the Society adjourned until 2.30 P.M.

Afternoon Session.—The Society reassembled at 2.30 P.M. and was called to order by the President.

Symposium on the End Results (Two Year Limit) of Operations for Complete Procidentia of the Uterus.

(*a*) In Child-bearing Women.

(*b*) In Women after the Menopause.

19. "A Consideration of the Present Day Methods of Treatment of Prolapsus Uteri with Their Advantages and Disadvantages," by Dr. E. E. Montgomery, Philadelphia.

20. "Prolapse of the Uterus," by Dr. J. M. Baldy, Philadelphia.

21. "The Principle Involved in the Operation for the Relief of Procidentia Uteri with Rectocele and Cystocele; Report of Cases," by Dr. J. Riddle Goffe, New York City.

22. "Report of Twenty-six Cases of Procidentia Uteri Treated by Shortening of the Broad and Uterosacral Ligaments and Plication of the Vagina," by Dr. William M. Polk, New York City.

23. "The End Results with Various Operative Procedures for Procidentia Uteri Prior and Subsequent to the Menopause," by Dr. Hiram N. Vineberg, New York City. (Read by title in the absence of the author.)

The symposium was discussed by Drs. Hirst and Ward.

DR. J. M. BALDY.—Before we adjourn, Mr. President, I desire to move that the thanks of this body be extended to the members of this city who have so delightfully and constantly entertained us during our stay in Baltimore, and not only entertained us in a material way, but also in an intellectual way by the operative clinics and demonstrations given at the Johns Hopkins Hospital yesterday.

Motion seconded by several and carried.

As there was no further business to come before the meeting, on motion the Society adjourned to meet in Washington, D. C., in 1913.

LE ROY BROUN,
Secretary.

CONSTITUTION

I. This Society shall be known as the AMERICAN GYNECO-LOGICAL SOCIETY.

II. The object of this Society shall be the promotion of knowledge in all that relates to the Diseases of Women, to Obstetrics, and to Abdominal Surgery.

FELLOWS

III. The Fellows of this Society shall consist of Fellows and Honorary Fellows.

The Fellows shall not exceed one hundred in number.

The Honorary Fellows shall not exceed ten American (exclusive of those who have been Active Fellows of the Society) and twenty-five foreign.

Candidates shall be proposed to the Council, by two Fellows *only*, at least one month before the first day of the meeting, each nomination being accompanied by a list of the principal publications of the candidate and of the official positions which he holds. Each candidate shall submit *eleven* copies of his original and unpublished thesis to the Secretary of the Society not later than one month before the first day of the meeting, on a subject connected with gynecology, obstetrics, or abdominal surgery; this thesis shall not have been previously read or presented by title before any society. On nomination by the Council, each candidate shall be separately balloted for at the annual meeting. A two-thirds affirmative vote of all the Fellows present shall constitute an election, at least fifteen Fellows being present.

The names of any candidates not nominated by the Council or not elected by the Society shall be placed upon a waiting list and shall be reconsidered by the Council at each succeeding meeting. When the name of the candidate is placed upon the waiting list a copy of his paper shall be returned to him for publication if he so desires, but any such candidate shall have the privilege of submitting another paper to

the Council one month before the first day of the succeeding annual meeting. A list of all the candidates, accompanied by all the information sent to the Council, shall be sent to every Fellow with the notification of the annual meeting.

No one shall be eligible for Active Fellowship until he shall have submitted to the Council a paper on some subject connected with gynecological science.

HONORARY FELLOWS

IV. The power of nominating Honorary Fellows shall be vested in the Council.

No Honorary Fellow shall be voted on at the same Annual Meeting at which his name is recommended by the Council; but at the next succeeding Annual Meeting, except in the case of active Fellows of the Society being transferred to the Honorary List.

The election shall take place in the same manner as that of ordinary Fellows.

They shall enjoy all the privileges of other Fellows, but shall not be required to pay any fee or be allowed to hold any office, or to cast any vote.

Any member of this Society at the end of twenty-five years' active service in the Society, or at any time thereafter, at his own request, shall be placed on the roll of Honorary Fellows, and shall be so classified in the next volume of TRANSACTIONS, provided the request be made during the fiscal year for which the annual dues have been paid by that member.

OFFICERS

V. The officers of the Society shall be a President, two Vice-Presidents, a Secretary, and a Treasurer, and two other Fellows, all to be elected annually, who, with four other Fellows, one to be elected each year for a term of four years, shall constitute the Council of the Society.

The nomination of all officers shall be made in open session at the business meeting, and the same shall be elected by ballot.

The officers shall enter upon their duties immediately before the adjournment of the meeting at which they were elected, and shall hold office for one year.

Any vacancy occurring between the annual meetings shall be filled temporarily by the action of the Council.

All officers shall be eligible for re-election.

ANNUAL MEETING

VI. The annual meeting of the Society shall be held regularly at a date to be determined by the Council, and shall continue for three days, unless otherwise ordered by vote of the Society at any executive session. The sole management of the annual meetings shall be under the control of the Council, subject to any action of the Society at the preceding annual meeting.

AMENDMENTS

VII. This Constitution may be amended by a two-thirds vote of all the Fellows present at an annual meeting, provided that notice of the proposed amendment has been given in writing at the annual meeting next preceding, and that the same has been printed in the notification of the meeting at which the vote is to be taken.

BY-LAWS

PRESIDENT AND VICE-PRESIDENTS

I. The President and Vice-Presidents shall discharge the duties belonging to their respective offices. The President shall be *ex-officio* chairman of the Council.

SECRETARY

II. The Secretary shall attend and keep a record of all the meetings of the Society and of the Council, of which latter he shall be *ex-officio* clerk, and when not in session shall perform its business by correspondence.

At each annual meeting he shall announce the names of all who have ceased to be Fellows since the last report.

He shall superintend the publication of the TRANSACTIONS, under the direction of the Council.

He shall notify candidates of their election to Fellowship.

He shall send notifications of the annual meetings and of the meetings of the Council.

TREASURER

III. The Treasurer shall receive all moneys due and pay all debts. He shall render an account thereof at the annual meeting, when an Auditing Committee shall be appointed to report.

COUNCIL

IV. The Council shall meet as often as the interests of the Society may require.

Five members shall constitute a quorum.

It shall have the management of the affairs of the Society, subject to the action of the Society at its annual meetings.

It shall arrange the order for the reading of papers at the annual meetings.

It shall not have power to make the Society liable for any debts exceeding in total one hundred dollars in the course of any one year, unless specially authorized by a vote of the Society.

It shall have the entire control of the publications of the Society, with the power to reject such papers or discussions as it deems best.

The President, or any three members, may call a meeting, notice of which shall be transmitted to every member two weeks previous to the meeting.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and By-laws, or for conduct unbecoming an honorable physician, and shall have the sole power of moving the expulsion of any Fellow.

ORDER OF BUSINESS

V. The Order of Business at the annual meetings of the Society shall be as follows:

    I. General meetings at 10 A.M. each day.

        1. Reports of the Committees.

        2. Reading of Papers and Discussion of the same.

    II. The Business Meeting, at which only Fellows of the Society shall be present, shall be held on the second day of the session, at an hour determined by the Council and announced on the program of the meeting. The Secretary's Record shall then be read; the Treasurer's accounts be submitted; the reports of Committees or other than scientific subjects be received; and all miscellaneous business be transacted.

PAPERS, ETC.

VI. The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than *two weeks* before the first day of the meeting.

No paper shall be read before the Society which has already been printed or has been read before another body.

All papers that may be read before the Society, and accepted for publication, shall become the property of the Society, and their publication shall be under the control of the Council. Such papers may be published in full in medical journals, provided that they are also printed in the TRANSACTIONS.

QUORUM

VII. A quorum for business purposes shall be fifteen Fellows.

DECORUM

VIII. No remarks reflecting upon the personal or professional character of any Fellow shall be in order at the annual meetings, except when introduced by the Council

ASSESSMENTS

IX. Every Fellow shall pay in advance the sum of twenty dollars annually.

Any Fellow whose subscription shall be more than nine months in arrears shall be reminded of the fact by the Treasurer in writing; in event of payment not being then made, he may, on vote of the Council, be dropped from the Society.

Each Fellow shall pay on admission an initiation fee of twenty-five dollars.

Any Fellow who shall neither attend nor present a paper for three successive years shall, unless he offers an excuse satisfactory to the Society, be dropped from Fellowship.

AMENDMENTS

X. Any of these By-laws may be amended, repealed, or suspended by a two-thirds vote of the Fellows present at any meeting. *Provided,* Previous notice in writing has been given at the annual meeting, immediately preceding the one at which the vote is to be taken.

PAPERS

THIRTY-SEVENTH ANNUAL MEETING

AMERICAN GYNECOLOGICAL SOCIETY

BALTIMORE, MARYLAND

ADDRESS OF THE PRESIDENT

THE HISTORY OF VESICOVAGINAL FISTULA

By Howard A. Kelly, M.D.
Baltimore, Maryland

According as we remember others so those yet to come will remember us. If we live only for the present and for our own age and reject the past because of imperfections, so in turn will we ourselves as surely be forgotten and despised as the centuries roll over our dust.

I do not believe there is any justification in fact for the common notion that in any important sense in an ultimate analysis the present is greatly superior to the past ages. Such a naïve sentiment of superiority has prevailed in every age; were it founded on fact the cumulative inheritances of the age in which we live would constitute such an endowment of superlative virtues that we might well emulate the angels and wing our beatific way into heaven. The student of history finds the past so inextricably interwoven with the present that the two finally become to his discriminating inspection woof and web of the same cloth, and to tear one from the other is to ruin the fabric.

Impressed with these reflections, I have selected for our brief consideration the history of vesicovaginal fistula, that interesting plastic operation which did for the

gynecology of the vagina and the lower pelvis what ovariotomy did in the field of abdominal surgery. On these two legs our biped specialty walks erect—a living, active growing organism—each planted on a grand progenitor, a McDowell and a Sims.

Let me invite your philosophical minds to consider the efforts made to cure vesicovaginal fistula before Sims' time, the work of Sims and his contemporaries, and finally, what has been done since his day to perfect this operation.

In an effort to keep clear the pathway of prior claims, I will follow a chronological order. Permit me to say that I do not know that this work has been done since Sims' death twenty-nine years ago, but the literature is large, and it may well be that I am but duplicating the work of another. However, the attempt will be none the less interesting, and the inspiration which ever comes from a pious reverence for the labors of the illustrious dead no less, even though others have trodden the path bearing their laurel wreaths before us.

I am happy to confess my indebtedness to the following writers who have preceded me in a historical study of our subject, drawing attention above all others to the elaborate and admirable work of Deroubaix, of Brussels, mentioned third in the subjoined list:

Mémoire sur des Moyens Nouveaux de Traitement des Fistules Vésicovaginales, J. Leroy d'Etiolles, Paris, 1842.

Études Historiques sur l'Operation de la Fistule Vésicovaginale, Hergott, Paris, 1864.

Traité des Fistules Urogenitales de la Femme, L. Deroubaix, Bruxelles, 1870.

Einige geschichtliche und technische Bemerkungen zur Lappenperineorrhapie, Centralbl. f. Gynäk., 1888, No. 47.

Einige geschichtliche Bemerkungen zur Lappenspaltungs Methode bei den Blasen-Scheidenfisteln, Centralbl. f. Gynäk., 1897, No. 26, A. Karczweski.

Handbuch der Chirurgie, Blasius, 1841, vol. iii, p. 407.

In addition to these, Sims' first paper begins a brief historical sketch. Emmet, in his *Principles and Practice of Gynecology*, also refers to the subject, and T. G. Thomas, in his practical treatise on *Diseases of Women*, adds some historical notes, among others, referring to Paret as treating fistulas by "retinacula," a reference I cannot verify.

The following references will also be found useful to the student of medical history desirous of tracing the historical evolution of our present methods of treatment:

Plater, 1597, in Spach's Gynecorium. De mulierum partibus generationi dictis, etc.

Van Roonhuyse, 1663. Heelkonstige Aanmerckingen, Amsterdam, p. 181.

Velthem, 1724. De Incontinentia ex Partu Difficili, Fatio, 1752. Helvetisch vernünftige Wehemutter, Basel, p. 282, et fol.

Hirschfeld, 1759. De Incontinentia Urinæ post Partum Difficilem.

Petit, 1790. Traité des maladies chirurgicales.

Desault, 1799. Traité des maladies des voies urinares. An. vii, t. iii, p. 287.

Lewinski, 1802. Thèse de la Faculté de Paris.

Naegele, 1812. Erfahrungen und Abhandlungen uber Krankheiten des weiblichen Geschlechts, Mannheim, p. 389.

Schreger, 1817. Annalen des chirurg. Klinikums auf die Universität zu Erlangen.

L'Allemand, 1825. Archives générales de Médecine, t. vii; 1825, Froge, Dissertation sur la fistule vesicovaginale, Thése de Paris.

Dupuytren, 1829. Journal hebdomadaire, t. v, p. 255.

Dupuytren, 1829. Journal hebdomadaire, t. ii, pp. 65 to 83 (3).

Malagodie, 1829. Raccoglito medico, 6 Juillet, p. 38.

Duges, 1831. Gazette médicale de Paris, Nos. 44 et 367.

Gosset, 1834. Lancet, vol. i, p. 346.

Jobert de Lamballe, 1834. v. Traité des fistules, etc., Paris, 1852.

Jeanselme. L'Expérience, 1837-1838, t. l, p. 257.

Hayward, 1839. Amer. Jour. Med. Sci., August, 1839, and Surgical Reports and Miscellaneous Papers on Medical Subjects, Boston, 1855, p. 196.

Vidal de Cassis, 1841. Traité de Path. Ext., vol. v, p. 572.

Leroy d'Etiolles, 1842. Mémoire sur des Moyens Nouveaux de Traitement des Fistules Vésicovaginales.

Wützer, 1832 and 1843. Heilung der Blasenschiedenfisteln Organon f. v. gesammte Heilkunde, vii.

Diffenbach, 1845.   Die operative Chirurgie, vii, p. 573.

Maisonneuve, 1848.   Clinique chirurgicale, vii, p. 660, et suiv.

Sims, 1852.   Amer. Jour. Med. Sci.,

Simon, 1854 and 1862.   Heilung der Blasenscheidenfisteln. Giessen (1854), p. 2.   Operation der Blasenscheidenfisteln durch die blutige Naht. Rostock (1862).

Bozeman, 1856.   A new mode of suture with seven successful operatiods.   Louisville.   Surgeon-General's Catalogue.   (Quoted as date by Bozeman in Amer. Jour. Med. Sci., 1870, n. s., vol. lx, p. 108.

Colles, 1857 and 1861.   Dublin Quarterly Journal of Medical Sciences (1857), t. xxiii, p. 123.   Dublin Quarterly Journal of Medical Sciences (1861), vol. xxiii and xxxi, pp. 119 and 302.

Schuppert, 1856.   A Treatise on Vesicovaginal Fistula and New Orleans News and Hospital Gazette.

Baker-Brown, 1858.   On Vesicovaginal Fistula and its Successful Treatment, London.

Thorp, 1859.   Dublin Quarterly Journal of Medical Sciences, 1861, p. 302; second edition, 1859, p. 91.

Agnew, 1867.   A Treatise on Vesicovaginal Fistula.

Emmet, 1868.   Vesicovaginal Fistula.

Dudley, 1886.   Chicago Medical Journal and Examiner, May.

Follet, of Lille, 1886.   Bull. de la Soc. de Chir., May 26, p. 445.

Woelfler, 1887.   Centralbl. f. Chir., XVI Kongress, p. 95.

Duncan, 1887.   British Med. Jour., vol. ii, p. 936.

Rydygier, 1887.   Berl. klin. Wochenschr., p. 568.

Saenger, 1888.   Centralbl. f. Gyn., p. 377.

Champneys, 1888.   British Med. Jour., vol. ii, p. 818.

Fritsch, 1888 and 1897.   Centralbl. f. Gyn., 1888, No. 49.   Die Krankheiten der Weiblichen Blase, 1897, p. 124.

Neugebauer, 1889.   St. Petersburger med. Wochenschrift, p. 209.

Walcher, 1889.   Centralbl. f. Gynäk., p. 1.

Johnson, 1889.   Boston Med. and Surg. Jour., Band cxx, p. 309.

Cullingworth, 1889.   British Med. Jour., vol. ii, p. 1099.

McGill, 1890.   An Operation for Vesicovaginal Fistula through a Suprapubic Opening in the Bladder.

Trendelenburg, 1890.   Volkm. Sam. klin. Vort., No. 355.

Strauch, 1891.   Korrespondenzbl. d. allg. Mecklenburg. Aertzte-vereins, p. 137.

Bardenhauer, 1891.   Deutsche med. Wochenschr., Band xvii, p. 1348; Arch. f. klin. Chir., Band xi, u. ii, p. 362.

Schauta, 1893.   Vesicovaginal-fistel. Centrl. f. Gyn., Band viii, p. 1023.

Von Dittel, 1893.   Abdom. Blasenscheidenfistel-Operation.   Wiener klin. Woch., Band vi, p. 449.

Leopold, 1893.   Amer. Jour. Obstet., Mar., vol. xxvii, p. 321.

Frank, 1894. Centralbl. f. Gyn., vol. xviii, p. 493.

Ferguson, 1895. Amer. Jour. Obstet., vol. xxxi, p. 476.

Wertheim, 1895. Ein Fall von Vesicovaginal Fistel, Centralbl. f. Gyn., Band xix, p. 578.

Von Rosthorn, 1895. Zur Heil d. Blasenscheidfist. nach Freund, Präg. med. Woch., Band xx, p. 221.

Freund, 1895 and 1899. Eine neue Operation 2 Schlies gewisse Harnfisteln bein Weibe, Volk. Sam. klin. Vort., N. F., 1895, No. 118. Monat. f. Geburt. u. Gyn., 1899, Band ix, pp. 681 and x, p. 511.

Kelly, 1896. Johns Hopkins Hospital Bulletin.

· Samter, 1897. Volkmann's Samml. klin. Vort. Neue Folge, No. 175.

Mackenrodt, 1897. Monatsschr. f. Geburt. u. Gyn., Band v, p. 446.

Latouche, 1897. Gaz. des Hôp., Tome lxx, p. 968.

Stankiewicz, 1898. Ueber Behand. d. Blasenscheidenfisteln mittelst direkter Blasennaht. Gazette Lek., p. 195.

Braquehaye, 1899. Traitement de la fistule vésicovaginale par un procedé nouveau, Rev. de Chir., Tome xx, p. 604.

Crossen. Amer. Jour. Obstet., vol. xxxix, pp. 178 and 213.

McCann, 1902. British Med. Jour., May, 1902.

Ward, 1910. Surg., Gyn., and Obstet., vol. xi.

Michaux, 1911. Traité de Gynecologie, p. 161, Faure et Siredy, Paris.

I find in looking through my Oribasius (Bussemaker and Daremberg, Paris, 1862, p. 466, vol. iv), under the title "Urinary Fistula, from Heliodorus," the following brief obscure statement:

"A urinary fistula takes place when a thin part of the bladder has been divided or when the neck of that organ has been cut ('periairethentos'), or some similar accident has taken place." This takes place from several causes. The affection is incurable ("esti de to pathos atherapeuton"). It is not clear that Oribasius is speaking of women under this caption, for the preceding subject is hypospadias, and phimosis follows.

To take a long jump down the centuries, Felix Plater, in 1597, in Spach's great work *Gynecorium*, etc., makes the following illuminating statement under title: Uteri et Vesicæ Cervicis cum Adhaerente Recto Intestino in Partu Dilaceratis. "In partu violento fœtu exstincto cuidam

mulieri uteri et vesicæ cervix adeo læsa sunt, ut excrementa confusa stercoris et urinæ invicem redderentur." Again, under title Vesicæ Cervicis alia Ruptura in Partu: "Ex partu difficili et primo cuidam juvenculæ rusticæ orificium vesicæ adeo scissum est, ut longa illic et hiante rima vesicæ aperta cerneretur: sicuti ipse bis intuitus sum stylo abhibito sic se habere deprehendi; ob quam læsionem urina continuo illi involuntariæ profluit et vicinas partes erodit atque inflammat."

Also further, under the caption De Uteri Fistulis, p. 24, he says: "Verum, quia ærumnosam calamitosamque vitam et multis periculis obnoxiam hujusmodi affectiones accersunt; siquidem ad intestina et ad vesicam adeo profunde aliaquando permeant, ut urina et alvi excrementa per fistulam facile instillent; ob id quidem, etc."

We have here the clearest possible picture of the injury, its diagnosis, and its associated serious complications, but no light at all on its treatment.

Pinaeus (+1619) son-in-law of Colat, also a lithotomist, in his "de Virginitatis notis graviditate et partu" Lugd. Bataz., 1650, says: "Among the accidents not rare in difficult labor are a loss of substance of the posterior part of the bladder extending almost to the implantation of the ureters. An ulcer is formed which is rendered callous by the urine running straightway through the laceration into the sinus pudoris (upper vagina) and then escaping outside. This you can recognize by inserting a silver probe through the collum vesicæ (urethra) into the bladder and the index finger or another probe into the vagina, when the two probes are made to touch."

Several other writers, following Pinaeus, mention these fistules without adding to our information.

H. Van Roonhuyse, of Amsterdam, friend of Zulp and Ruysch, first threw a great light upon the subject by discovering a well-defined plan of treatment. His merits are of

such a high order that I quote somewhat fully (*Heel-konftige Aenmerckingen van Hendrick van Roonhuyse*, Amsterdam, 1672, p. 181). He writes:

"The operation is performed as follows: The patient is put on the table opposite a convenient light, as in cutting for stone. When this is done one must dilate the vagina with a speculum as much as needs be. Then freshen and cause the edges of the vagina to bleed at the place where it is ulcerated through, and in contact with the opening into the bladder, touching the bladder, however, as little as possible. The denudation is made by means of little forceps, scissors or a bistoury or what ever instrument suits the operator best. I find, however, nothing better suited than a little pair of cutting forceps which are made as sharp as possible so as not to crush the tissues, in this way the edges of the rupture are denuded by taking off a little tissue, making them bloody and raw, after which they are immediately coapted. This is not done with silver or golden needles as is the custom in cleft palate, but with pins prepared from strong swan's quills cut down fine and sharp. I prefer these not only because they yield but because they bruise the surrounding parts less, when they are properly wrapped with red waxed silk, for when one has bent these needles, they straighten themselves again. One must then coat the parts with a healing salve. Finally, a dressing is applied to the wound, consisting of two or three large flat wicks moistened with a warm balsam oil; one must also fill the parts with suitable sponges moistened with a little oil of sweet almonds; these on swelling exercise some pressure. When the bandages and the compresses are removed, then the patient can urinate carefully; she must lie still in bed on her back with the lower part of the body somewhat elevated keeping this posture until the cure is complete. When the bladder is too seriously and too deeply torn, so that it is impossible to get at it to cure it, the patients

are compelled to care for themselves, using nice compresses made of linen.

"I have also used different instruments of copper or silver to be worn bandaged to the body, to catch the urine on walking or standing; but the women could not sit down with them."

It seems evident from such a positive clear description, and from the deliberateness of the surgeon who selects one or other instrument and describes its special advantages, that Van Roonhuyse without doubt actually operated upon some cases. His method contained the following essentials to success:

The patient put in the position appropriate for lithotomy.

The satisfactory exposure of the fistula by a retracting speculum.

The thorough denudation of the margins of the fistula without including the bladder wall.

The approximation of the denuded edges of the fistula by means of quills thrust through the edges of the wound and held in place by silk threads wrapped around the ends.

The dressing of the wound with balsam and absorbent vaginal dressings.

The patient kept quiet in bed until the parts had healed.

It is with these words, Van Roonhuyse closes a letter to his nephew and completes his valuable work.

Considerable discussion has been aroused about Van Roonhuyse's claims, Killian considering the conception utterly impracticable. Nägele believed it was only applicable to injuries of the urethra. Herrgott (*Études historiques sur l'operation de la fistule vésicovaginale*, Strassbourg, 1864) believes as I do that the writer actually put his methods into successful practice.

H. A. Velthem, writing in the year 1724 (*De Incontinentia Urinæ ex Partu Difficili*), begins with the following interesting introductory: "Admiranda est summi conditoris

nostri sapientia, quâ omnium animalium, maxime vero
hominis, ita fabricavit corpora, ut non solum necessitatibus
singulis rectissime satisfaciant, verum etiam ad elegantiam
hoc plenissime excutere, sed Lectori tantum in memoriam
revocare, quantum sit illud beneficium, quod ea, quae
necessario excerni debent, ab assumtis quotidianis tanquam
feces residua, voluntatis nostræ arbitrio ex parte subiecta
sint, nec invitis nobis exitum, quod sani sumus, inveniant."

The great difficulty and the occasion of many ills in the
matter we are discussing was the fact that men were not
admitted to obstetric practice at that time, as he states on
page 16.

"Quoniam vero ita ferunt corrupti hominum mores,
ut Medicum vix admittant ad ea, quæ in locis, quos pudor
abscondere suadet, occurrunt, nisi prius convicti sint,
privatos anicularum ausus in vacuum exiisse, et interea
mala pleraque ad immedicabilem statum progrediantur."

He appears to know nothing of Van Roonhuyse's work,
for he declares that when the fistula is of recent date it can
be cured by the use of cicatrizing agents, and a catheter
passed through the urethra and retained some days.

Johannes Fatio was another great light (see his *Hel-
vetisch Vernüntige Wehemutter*, Basel, 1752, p. 282). He
speaks of the crushing rupture of the neck of the bladder
in difficult labors, by which it comes to pass that women
cannot hold their urine and must endure this wretched
condition throughout life. He says the chief cause is imbib-
ing fluids, by which the bladder becomes greatly distended,
then when a severe labor follows this, or when the head
sticks in the pelvis, there is a rupture or an inflammation
of the neck of the bladder, producing ulceration and fistula.
An inexperienced, pitiless midwife can cause this injury,
especially when she urges the birth before the bladder is
emptied or relieved by the catheter.

Another cause of accident is a stone at the neck of the

bladder during labor. This misfortune is serious when the
opening lies in the base of the bladder or when the sphincter
of the bladder is destroyed, then it is incurable. When
the opening is small, help may be hoped for.

Fatio goes on to say that all kinds of medication have
been proposed, such as pulverizing of a living toad inside
a new pot, the powdered toad being carried in a little bag
over the pit of the stomach. "I readily grant such cures
their fame and credit the statements of such distinguished
men. I must, however, beg pardon when I declare that
for myself I prefer to resort to surgical procedures, in a
recent fistula at the neck of the bladder, as I did in 1675
in the presence of Professor Johannes Casper Bauhin, in
a case of a daughter of a shoemaker in Basel, Switzerland,
who was fifteen years old and who in consequence of com-
plete retention had punctured the neck of the bladder.
Also in 1684, I operated on a peasant woman, twenty-
eight years old, who suffered at the hands of an unskilled
midwife in her first confinement. I operated successfully,
almost wholly by the method of the skilled physician
Roonhuyse."

Fatio placed his patients in a lithotomy position, and
exposed the fistula with a suitable speculum, and denuded
the margins with delicate, sharp scissors, also instead of a
needle, using a sharpened quill, and bringing the edges
together by means of a twisted suture. The parts were
then dressed with balsam, protected with a pledget, and the
vagina filled with an absorbent dressing. The dressings
were renewed whenever the patient urinated. Both cases
healed within fourteen days. Thus did the brilliant sugges-
tions of the Holland surgeon bear fruit within thirteen
years. These precious observations were, however, lost
sight of for more than a century and a half.

Deroubaix, the historian *par excellence* of vesicovaginal
fistula, expresses his doubts as to Fatio's success. I do not,

myself, hesitate to accept such a convincing circumstantial
account.

From now on until the time of Sims and his contempo-
raries, persistent efforts were made to cure these fistules
by cauterization, by the application of dressings, or by
leaving a catheter in the bladder. Bizarre instruments
were devised, and occasionally well-directed efforts were
made to denude the opening and suture it, with here and
there a rare success, harbinger of a better day.

The causes of vesicovaginal fistula as well as the various
causes of incontinence of the urine were clearly distinguished
by most of the earlier writers, but they learned little or
nothing useful for its relief. J. P. Hirschfeld (*De Inconti-
nentia Urinæ post partum Difficilem. Argentorati,* 1759) says:

"Vel Atoniam sphincteris vesicæ, vel ejusdem ac vaginae,
plenariam rupturam, vi partus contigentem tamquam
causam proximan hujus mali accusavimus."

"Pergit iter sensim parciori progressu, usque tandem
firmiter pelvi infixum hæreat, hujusque adeo cavitatem
exacte repleat, quin acum multo minus digitum inter caput
fœtus atque vaginam in toto ejusdem ambitu intromittere
possibile sit. Id quod tunc sub capitis incuneati nomine,
Gallis, Tête enclavée, obstetricibus nostratibus *der kopff
ist eingenagelt, steckt in der geburt,* venit."

Lévret (*L'Art des Accouchments,* Paris, 1766) traces these
fistules to delayed labor causing a slough, and recommends
lotions and injections as soon as the slough has separated
to secure an abundance of flesh granulations to facilitate
"obturation" of the opening. If seen later, after the forma-
tion of the fistula, first scarify the edges of the ulcer with
a curved bistoury, using a "speculum uteri." To do this,
put the patient on knees and elbows supported by a big
pillow under the stomach and operate from the rear.

J. L. Petit (*Traité des maladies chirurgicales,* Paris, 1790),
the great surgeon of the early part of the eighteenth century

has no suggestions regarding the cure of this malady other than cleanliness, introduction of the catheter, and the use of the urinal, to which he gives the name *trou d'enfer*.

Lewinski (*Thèse de Paris*, 1802) took a step toward the modern method of instrumental treatment by devising a cannula carrying a concealed needle; the cannula was introduced through the urethra and brought into relation with the margin of the fistula, when the needle was thrust through and threaded. On withdrawing the needle the thread was thus placed, and by conducting the needle through the opposite side in the same way and disengaging the thread a suture was passed.

This method, which was not put into practice, serves but to show the extremities to which surgeons were reduced in their efforts to handle this hopeless malady in accordance with the methods of surgical practice in general.

Nägele (*Erfahrungen und Adhandlungen über Krank-heiten des weiblichen Geschlechts*, Mannheim, 1812, p. 389), beginning in the year 1809, entered upon this subject with characteristic German thoroughness. Realizing the hope-lessness of the situation under the palliative methods commonly used, he began by operating upon cadavers; he then devised the plan of freshening the edges of the open-ing with scissors or with bistoury without using any specu-lum, doing the entire work under the guidance of the sense of touch, a method much employed by Lawson Tait. Nägele also tried curved silver or gilt-covered needles and a twisted suture. He worked so earnestly that it is a pity there are no successes to record.

Schreger in 1817 (*Annalen des chir. Klinikums auf die Universität zu Erlangen*) also operated by denuding and suturing the margins of the wound with interrupted silk sutures, and appears to have secured success.

Lallemand, writing from 1825 to 1835, used nitrate of silver to produce a slough and then after the separation of

the slough, tried to draw the lips of the opening together by an instrument called a hook-sound. This useless and dangerous method attained an undue celebrity.

Malagodie, of Bologne (*Raccoglito medico*, 6 juillet, 1829), cured a patient by hooking the fistula down on the finger and then denuding the margins, using first the index of the right hand and then that of the left; he united the edges by braided sutures passed in small needles. Three sutures introduced in this way were tied separately, and cut close to the knot, and the bladder was drained by the urethra. The opening, almost completely closed, was healed later by caustic.

Dugès, of Montpellier (*Gazette médicale de Paris*, 1831), treated a case where Lallemand had failed, as follows:

The fistula was at the neck of the bladder. He introduced a gutter-shaped speculum into the vagina to expose, and a male sound into the bladder to bring the part to be operated on down and into prominence. Then seizing the margin of the upper lip of the fistula with a museaux forceps or a hook, he freshened the edges with scissors strongly curved on the flat. The posterior lip was denuded by catching it with a double hook and transfixing the margins with a bistoury. He then passed a double waxed thread through both fistulous margins in a direction from vesical to vaginal surface and tied them. A sound was inserted and the bladder drained. On the third day he had to remove the threads on account of hemorrhage, so the operation failed.

Jeanselme, with Schuppert, the most caustic critic who has yet arisen, in *L'Experience*, 1837 to 1838, vol. 1, p. 257, declares that none of the methods up to that time devised, accomplished anything where a fistula existed due to the loss of substance from the base of the bladder.

Velpeau's declaration in 1839 says:

"To abrade the borders of an opening when we do not know where to grasp them; to shut it up by means of needle

and thread when we have no point, apparently, to which
to secure them; to act upon a movable partition placed
between two cavities hidden from our sight, and upon
which we can scarcely find any purchase, seems to be calcu-
lated to yield no other result than to cause unnecessary
pain to the patient." See *A System of Gynecology*, edited
by T. C. Allbutt and Playfair, 1896, p. 17.

George Hayward, of Boston, a surgeon to the Massa-
chusetts General Hospital, is one of the greatest pioneers
in this field of vesical surgery (see *American Journal of
the Medical Sciences*, August, 1839, and *Surgical Reports
and Miscellaneous Papers on Medical Subjects*, Boston,
1855, p. 196). He treated his first case May 10, 1839, as
follows: He put the patient in the lithotomy position,
introduced a large bougie into the bladder through the
urethra, and forced the fistula down where it could be
readily seen and handled. He began the operation by
removing a narrow margin (one line in diameter) from the
edge of the fistula, and then "as soon as the bleeding which
was slight, had ceased he dissected up the membrane of
the vagina from the bladder all around the opening to the
extent of about three lines. This was done partly with the
view of increasing the chance of union by presenting a
larger surface, and partly to prevent the necessity of carry-
ing the needles through the bladder. A short silver catheter
was left in the bladder."

In a *résumé* of the subject after the presentation of 9
cases, he says (p. 222): "It is not difficult, therefore, to
dissect up the outer covering from the coat of the bladder
to the distance of two or three lines. The needles are then
to be passed through the outer covering only and as many
stitches must be introduced as may be found necessary
to bring the edges of the fistula in close contact." The
result was a perfect cure.

It is important to note that Hayward detached the bladder

from the vagina. In commenting, in 1855 (see *Surgical Reports*, etc., p. 222), upon a series of 9 cases, after having tried both splitting the margins and simple denudation, he remarks, "It is difficult therefore to dissect off the outer covering from the mucous coat of the bladder."

In a case treated in 1847, Hayward put a woman under the influence of ether and freshened the edges so as to secure bleeding surfaces obliquely from without inward and then passed two silk sutures without including the vesical mucosa. This patient was cured after a second operation. (See *Boston Medical and Surgical Journal*, 1851).

Blasius, in 1841, in the second edition of his *Handbuch der Chirurgie*, 1841, vol. iii, p. 407, gives an excellent outline history of the various methods of treatment. He laments that the successful cases of closure are so few compared with the unsuccessful, and that no well-defined rules of operative procedure can be laid down. He finds it necessary, therefore, simply to give an account of the various methods in use, beginning with an elaborate consideration of six different methods of denudation of the margins of the fistula and union by suture, including a dove-tailing suture somewhat like that recommended by Joseph Pancoast, of Philadelphia.

The whole account is a model of clearness in stating a difficult problem.

Vidal de Cassis sizes up the situation in 1841 when he declares that the treatment by catheter is perhaps good in small recent fistulæ, but the tampon is no real use. "Point de guérison," he says, "par le tampon!"

In his *Traité de Path. Ext.*, published in 1841, vol. v, p. 572, in speaking of the operations of vesicovaginal fistula, he says, "These operations are numerous, which proves their difficulty in succeeding." He divides the plans of treatment into two, direct and indirect, and says that the direct method tries to obliterate the opening by compres-

sion or cauterization or suture, while the indirect method operates on surrounding parts abandoning the opening. He can conceive of a cure by the direct method only in the case of a very small fistula recently formed and without loss of substance. In speaking of the cauterization of the wound he describes a long curved speculum, with a retracting handle, by means of which he is able to expose the whole anterior vaginal wall by retracting the posterior wall strongly. The indirect method is that of the partial obliteration of the vagina, which he performed in the year 1813. This success was the result of the accidental cauterization of the posterior wall of the vagina with a stick of nitrate of silver, which caused an enormous swelling of the vagina and the attachment of the posterior wall to the anterior in such a way as to obliterate the opening. The stoppage lasted fifteen days, when the operator unfortunately inserted his index finger and broke some of the adhesions, spoiling the effect.

Leroy d'Étiolle (*Mémoire sur des Moyens Nouveaux de Traitement des Fistules Vésicovaginales*, Paris, 1842), without adding anything of importance, wrote one of the most interesting memoirs extant describing the various methods of treatment recommended in his time, including numerous figures of instruments designed to pinch or hook, or to hold together by suture, the edges of the fistula. Anyone who desires to appreciate the extremities to which the surgeons were reduced in the days just preceding the epoch introduced by Jobert, Sims, and Simon, cannot do better than consult this little monograph and its twenty-nine figures. He closes with the sad comment: "J'espère qu'ils comprendront mes apprehensions, car le passé n'est pas fait pour me rassurer complètement sur l'avenir."

Wützer, of Bonn, 1843 (*Ueber die Heilung der Blasenscheidenfistel, in Organon für die gesammte Heilkunde*, t. 11), who, as Herrgott states, was after Diffenbach for

a long time the only one who operated upon these fistulæ, succeeded in curing one woman after the thirty-third operation. Her name has been perpetuated by Kilian as a heroine and a martyr to the cause of science (*Die helden-müthige Lucie Stich*).

Up to 1852 Wützer had obtained the signal success of curing 11 out of 35 cases, an enormous gain compared with the work of his predecessors and a prophecy of the new era shortly to dawn. Were he to appear today among us he would justly claim more credit than has ever been accorded him. The growth of his experience and of his technical skill is shown by the fact that between 1838 and 1842 he cured 4 out of 18 cases and between 1842 and 1852 he cured 7 out of 17 cases. He adopted the following method of procedure: The patient was placed upon her stomach and the perineum was forcibly retracted by a crotchet. The vulva was then held open by lateral retractors, then grasping the borders of the fistula with a tenaculum by means of a bistoury he made a denudation from $\frac{1}{4}$ to $\frac{1}{3}$ of an inch in width, taking care to avoid injuring the mucous membrane of the bladder. For sutures, he used insect pins inserted three or four lines apart, held in place by twisted sutures. The threads were removed on the third or fourth day. In order to put the bladder at rest during the healing process, he made a suprapubic puncture and inserted a catheter. The woman was kept in a prone position by straps during the healing.

The name of the great German surgeon Diffenbach (*Operative Chirurgie*, Leipzig, 1845) is associated with the history of vesicovaginal fistula on account of the imperishable classical description he wrote in his despair, picturing the wretched condition of these abandoned sufferers. He tried out all the various methods of treatment: Potential cautery, actual cautery, freshening flaps, transplantation, purse-string sutures. He made a classical denudation and

united the margins of the wound with silk sutures, six to
the inch. The bladder was drained by means of a catheter,
left in until the eighth day.

In spite of his best efforts, Diffenbach was never able
to cure a large fistula. He says: "I operated on one
woman eighteen times without curing her," and closes with
the following lament: "I have filled entire wards with
these wretched women gathered from all countries; I have
exhausted every measure, and I have been able to cure but
few of them."

Metzler, of Prague, in 1846 described an instrument
like the Sims speculum, to be used in retracting the posterior
vaginal wall so as to expose the anterior wall. He put his
patient in the knee-elbow position and lifted up the posterior
wall with the speculum, exposing the freshened edges of the
fistula with curbed scissors, removing a line for one-half of
the vaginal tissue, and half a line of the margins of the
opening. The lips were then brought together with gilded
needles. These were held in place by hooks, little staples
retained in their turn by perforated shot.

John Peter Mettauer, of Virginia (1787-1875), published
(*American Journal of the Medical Sciences*, 1847, vol. xiv)
a series of 6 cases of vesicovaginal fistules treated by
denuding about the margins of the fistulous surface, freshen-
ing them. In his first case in 1830 he united them by means
of eight twisted lead sutures; the fistula, of six months'
duration, was the size of a Spanish milled dollar. The
sutures were removed on the tenth day and the patient
was cured. She passed through two later confinements
without injury.

Mettauer concludes his brief paper with the statement:
"I am decidedly of the opinion that every case of vesico-
vaginal fistula can be cured, and my success justifies the
statement."

Gosset, of London, operated in 1834 (*Lancet*, November,

1834), putting his patient in the knee-elbow posture, and freshening the margins of the fistula, he used fine needles and fine gilded sutures. The bladder was drained by means of a rubber catheter, and the patient kept lying on her stomach.

As we have pursued these interesting references to the literature of our subject from the early centuries down to the middle of the last century, we have gradually passed from the mists of obscurity, vagueness, and uncertainty, until we have emerged into the clear light of the recognition of the exact nature and the site of the fistula, as well as of its causes.

But alas, to recognize it was not to heal it, for we have seen all sorts of bizarre attempts made upon poor suffering women in the vain hope of affording relief to their distressing condition. Here and there a little taper shed a few rays of clear light, as some unusual surgeon, a Van Roonhuyse, a Fatio, a Wützer, a Hayward, or a Mettauer, pursued the right path in his effort to establish the proper methods of treatment; we even seemed now and then to stand in trembling expectation on the very threshold of the solution of the vexed question. But, as seen, no one was able to reply with certainty and assurance to the question, "What is the best way to treat a fistula, one which with some degree of certainty will effect a cure?" How this great question was solved will next occupy our attention.

We now enter upon the second era, namely, that of the treatment of vesicovaginal fistula inaugurated by Marion Sims and T. A. Emmet. We have followed the history of our subject up to the 50's of the last century, until we saw the gray dawn of uncertain and tentative efforts gradually lightening with the promise of success. We have seen Van Roonhuyse and Fatio standing like finger-posts in the latter half of the 1600's pointing toward the one way to

succeed—namely, by denudation and suture. We have seen, following in the train of the Hollander and the Swiss physician, Nägele, Wützer, and Dieffenbach in Germany; Malagodie and Jobert de Lamballe in France; Gosset in London; and Mettauer, of Virginia, and Hayward, of Boston, each struggling with this great question and moving on the same lines in different countries.

The new era about to dawn was ushered in by that brave and patient pioneer Jobert de Lamballe, of Paris, whose work was taken up and perfected by his pupil, Gustave Simon, of Darmstadt, laboring at about the same time and on similar lines with Sims, Emmet, and Bozeman in America. Jobert de Lamballe began in the 30's (1834) with an attempt to make up large vaginal defects by transplanting flaps from the vulva, detached, twisted, and later sutured in place as a stop-gap. These early attempts attracted much attention and a few imitators, but realized few successes. His next publication, eleven years later (1845), embodied a most important principle called "autoplastie par glissement." In this operation he detached the upper border of the fistula from the cervix of the uterus, so as to do away with all tension in bringing together the margins of the fistula. Up to 1849 he had had 13 cures and 2 deaths. His method of operating was as follows: Lithotomy position, cervix caught with museau forceps and pulled down, a catheter inserted into the bladder by which the fistula was forced down, the whole circumference of the fistula cut away, sutures passed from $\frac{1}{2}$ to 1 cm. from the margin of the wound with well-curved needles, and penetrating if needs be the vesical mucosa. Tension relieved by incisions in the vaginal walls. Recovery with a catheter in the bladder.

Jobert's failures were partly due to the highly infected state of the wards of the Paris hospitals.

Maisonneuve, in 1848, following the precepts of Jobert, cured a case in which the whole anterior vaginal wall had

disappeared, using the relaxation incision of Jobert at the vaginal vault, and another, which he called the urethropubic incision, by which the urethra is loosened up from the under surface at the pubis by means of a semicircular incision convex above. In 1880, Maisonneuve made use of the Schuchardt (paravaginal) incision to reach an inaccessible fistule. Failing to cure his case he then did an episioclisis, and established an opening between the rectum and the vagina. When this closed, the bold operator punctured the perineum, hoping to establish a fistulous opening there, but the long-suffering patient died of phlebitis.

Gustav Simon, who visited Paris as a pupil of Jobert, fully appreciated the merits of his master's operation. Simon's own contribution to surgery rests largely in doing away with the lateral incisions, substituting instead the "Doppel-Nähte," or approximation and tension sutures.

Simon's merit lay in the fact that he digested the whole matter, discovered with clear insight wherein lay the essential elements of success, adopted them with important modifications, and became the leader of the great German nation in this branch of surgery. He converted this previously most unsuccessful operation into a success and took away the reproach left by the labors of Dieffenbach and Nägele. His success must also be largely attributed to his skill born of a great experience.

Simon's method as described in *Ueber die Heilung der Blasenscheidenfisteln*, Giessen, 1854, is this: He places his patients in an exaggerated lithotomy posture, with hips raised high and legs strongly flexed on the body called "Steissrückenlage." The uterus is then drawn down and held by sutures passed through the cervix, so as to draw the anterior vaginal wall out between the labia. He uses a retracting speculum with long handles, known by his name, with lateral retractors. Simon makes a high precipitous funnel-shaped denudation and not a broad, flat one like Sims.

He rejects metal and uses fine silk sutures, using lateral incisions in occasional cases. One row unites the edges of the wound accurately (Vereinigungs-nähte), and there is no tension. He uses only these and pays no attention to question whether suture passes through vesical mucosa or not. Simon had 35 cures in 40 cases.

Often a second series of sutures is passed, entering and emerging at greater distances from the edges of the wound than the approximation sutures designed to take off all tension. (Entspannungsnähte.)

In his *Ueber die Operation der Blasenscheidenfisteln durch die blutige Näht*, Rostock, 1862, he critically examines the subject and contributes a number of excellent histories and numerous illustrations, with 13 lithographic plates describing the operation. It is easy to see why Simon is still justly regarded as the master mind in this field throughout Germany. The novel elements in Simon's work, namely, the use of relaxation sutures and a more vertical incision, while not unimportant, do not today look as large as they did fifty years ago: just as ever, that which appears a mountain to one generation is apt to dwindle to a mole hill in the mind of the next.

The work of Jobert and Simon, is evidently passing out of the hazardous uncertainties of their predecessors. We have at last left behind the distressing cauterizations of the generation preceding and pass into the clearer atmosphere of well-directed surgical effort, acting positively upon the margins of the fistula by suitable postural and specular exposure, by tractions to deliver the operative field as nearly as possible on the exterior in order to facilitate more accurate work we find too a careful categorical distinction of the various kinds of fistulæ and their varying appropriate treatments.

MARION SIMS. Sims' first paper was published in 1852 in the *American Journal of the Medical Sciences*, with 22

clear wood cuts. His method here was to denude the margins of the fistula, suitably exposed by a speculum, like the Sims speculum of today, and to approximate the edges of the fistula by interrupted sutures, while the edges were drawn together by means of clamps on either side through which sutures were passed and shotted. Sims' paper, which was twenty-four pages long, is a model of clearness from beginning to end. As to the causes of fistulæ he states, touching the use of forceps:

"I am well satisfied that for one case thus produced, their judicious application has prevented it fifty times."

The difficulties through which he passed may be imagined from his statement on the second page:

"I had three cases on which I operated forty times, but failed in each instance to effect a perfect cure, though succeeding so far as to encourage me to persevere. Now, I think I may say that almost every case of this hitherto intractable affection is rendered curable."

Sims' operation for vesicovaginal fistula was not new in the sense that it was a revelation of any single surgical principle or set of principles by which success hitherto rarely attainable was henceforth guaranteed.

Every individual step had been used before with more or less success by a number of surgeons.

Postural exposure and the gutter speculum were already known and practised by Schreger in 1817, and by Wützer in 1838, who placed the patient on her belly. Dieffenbach pulled the vaginal wall down until the fistula appeared at the vulva. Hayward (1839) put a sound in the bladder through the urethra and so depressed the fistula. Metzler (1846) had used the identical gutter speculum, and actually figured it. The principle of careful denudation of the margins had been enunciated by Van Roonhuyse (1663) and certainly practised successfully by Fatio (1685).

Jobert de Lamballe had realized the necessity of doing

away with all tension on the wound edges during the healing process and had made use of his liberating incisions.

A metallic suture, if that is to be regarded, as Sims deemed it, the chief keystone of his success, had been used by Mettauer (1830) and Gosset (1834). The drainage of the bladder, to put is at rest, after operation, was universally conceded for over the preceding century to be a necessary step.

Note then that while Sims did not invent any single step or procedure, he did devise his successful operation, and put it on a plane never before realized or even anticipated, by utilizing various steps, each one of which had been before employed.

I do not mean to say that Sims' work was not in the highest degree original, but that the various steps did not originate with him. Sims brought success out of failure in a way which did more to demonstrate his genius than if he had made some entirely new discovery. He took the common materials which lay ready at hand and available for all men, and where others had failed he brought good fortune out of the womb of failure. His success was due first of all to his clear recognition of those principles which have since become the basis of all successful plastic surgery —accessibility of the field, a good wide denudation in sound vascular tissues, accurate approximation without strangulation, and the wound placed at rest and kept clean while healing.

My impression of the Sims-Emmet-Bozeman operations is that their marvellous successes depended upon a technique well defined in all its steps, that they worked with great accuracy and most painstaking zeal, slighting no step from the preparation and preliminary treatments through the operation, down to, and including, the after-treatment.

Sims and Emmet developed an insight and an accuracy born of the experience of many failures finally converted into successes.

I am convinced that these older operators succeeded with a regularity and in a class of cases which no operator of today can hope to imitate if limited to the same means.

It is astonishing to note that operations lasting two and three hours and even longer were often done without an anesthetic, with the patient in the knee-elbow posture, taxing the strength and determination of the often feeble patient, as well as the skill, patience, and ingenuity of the operator, who must often have been not a little harassed by the necessity of calming and giving moral support to the weary patient, while executing some difficult maneuver. Sims was too shining a mark to escape Schuppert's criticism. He says:

"Dr. Sims has since made some alterations in his method. He has given up his clamps, using only the interrupted silver wire suture; he also places the patient on the left side when operated upon. These alterations have been made known by Sims in a very curious pamphlet.[1]" In language never heard of since the days of Bombastus Paracelsus, Sims says: "In 1845 I conceived the idea of curing vesicovaginal fistula, and entered upon the field of experiment with all the ardor and enthusiasm of a devotee. After nearly four years of fruitless labor, silver wire was fortunately substituted for silk as a suture, and lo! a new era dawned upon surgery; and I declare it as my honest and heartfelt conviction, that silver as a suture is the great surgical achievement of the nineteenth century."

Bozeman's button, which was so variously modified by Baker, Brown, Simpson, and Agnew, he criticises in the following words:

"What alterations next? The button successfully reverted, cut in pieces and broken through, being now stripped

[1] Silver Sutures in Surgery: an Anniversary Discourse Delivered before the New York Academy of Sciences, by F. Marion Sims, M.D., surgeon to the Women's Hospital in New York, 1858.

of its most essential character, will eventually be so modified
as that nothing will be left but the holes.   Such is the
irresistible power of progress.   Just as Sims had to relin-
quish his clamp, so will Bozeman seal his button to the tomb
of the Capulets, and that, too, with no abatement of his
former success in operating."

Sims' claims are so universally known and conceded
that I do little more here than to record them in their proper
place and to draw attention to the inestimable services
rendered by Dr. T. A. Emmet, who worked with Sims and
with a devotion no whit less, and often I believe in the
unusual cases acting with even greater skill than his master.
Emmet's little book on vesicovaginal fistula is probably
his greatest work.   Sims has left us no similar record of
his own work.

About this time the great operator and caustic critic,
Schuppert, of New Orleans, appeared, whose *Treatise on
Vesicovaginal Fistula* (New Orleans, 1866) is worth reading,
both because of its surgical acumen as well as for its spicy
criticisms of his contemporaries.

It was he who did the first successful episiorrhaphy.
He says in discussing a moot question that he perforates
the vesical mucosa with the sutures, declaring that "fear
of wounding mucous membrane of the bladder is a spectre
not founded on reality."   He criticises Sir J. Y. Simpson's
use of iron wire as not so good as Sims' silver, is very careful
to relieve edges of wound of tension in drawing the sutures
together, and makes incisions to relieve tension.   He moves
the bowels early, and avoids opium, the latter contrary
to Simpson's recommendations.

He even tried letting the patient out of bed, and doing
without the catheter in one case.   He says that the opera-
tion can be done without an anesthetic, but uses it to
spare the feelings of the patient.

Schuppert's pamphlet, with an account of 17 cases, is

enjoyable throughout on account of his quaint quizzical sarcasm. He says of a patient he cured: "The patient did not long enjoy her happiness. About three months later she died of yellow fever, a disease in which silver sutures are unavailing." He also speaks of a case which closed down to a minute opening which he tried to close by silver nitrate, but the patient went to her home in the country. He remarks: "Has the opening closed? I doubt the affirmative, from the experience I have had with the use of nitrate of silver, which seems to favor only French surgeons."

In August, 1859, he followed in a large adherent fistula, the plan of uniting first the middle portion, and then closing the small openings left at the ends at two subsequent operations. As a foil to Diffenbach's classical description of the loathsome character of the disease, Schuppert notes the expressions of satisfaction sometimes heard after a cure: "The joy of the poor woman, after four years of suffering, being besides previously told by several physicians that her case was a hopeless one, is beyond description in seeing herself freed from a loathsome disease."

At a later date I propose to complete my paper by a digest of the more recent work.

THE TORSION OF TUBAL ENLARGEMENTS WITH REFERENCE ESPECIALLY TO PYOSALPINX

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THE patient who drew my attention to the subject of
this paper, was admitted to the University Hospital on
May 16, 1910. She was an unmarried woman, twenty-six
years old. Her history was negative, except that during
the previous year she had suffered three attacks of sharp
pain in the right lower abdomen, which her physician
had attributed to appendicitis. The present attack had
come on acutely, and was accompanied with fever, rapid
pulse, nausea, and constipation. The entire lower abdo-
men was tender and rigid, but particularly so on the right
side about McBurney's point. There was slight distention
and some limitation of peristalsis. Pelvic examination was
unsatisfactory, because no relaxation of the abdominal walls
could be obtained, and the vaginal outlet was very narrow.

A diagnosis of acute appendicitis was made, and im-
mediate operation was advised. After the patient was anes-
thetized, an area of induration could be felt in the right
iliac fossa. When the peritoneal cavity was opened, a small
amount of blood-stained serum escaped, and upon intro-
ducing the finger, a mass could be felt at the brim of the
pelvis on the right side. After isolating the area with gauze,
and exposing it with retractors, an oblong body, purplish-
black in color, could be seen, which at first suggested a

strangulated coil of small intestine. Upon further examination, it proved to be a tube and ovary of the right side which had undergone torsion. The mass was but lightly adherent to the surrounding intestine and omentum. The tube was distended with pus, and formed the bulk of the enlargement; the ovary was closely adherent to the tube, somewhat increased in size, and infiltrated with blood. The tubal mass was twisted upon itself in the direction of the hands of a watch about one and three quarter times. The pedicle was made up of the broad ligament, the utero-ovarian ligament, and the inner extremity of the tube. The appendix was adherent at the tip, but appeared to have been involved secondarily. The right tube and ovary and the appendix were removed. The peritoneal cavity was drained, and the patient made an uncomplicated recovery.[1]

[1] The pathological report of the specimen is as follows:

Macroscopic Description. The specimen consists of the right tube and ovary, and the vermiform appendix.

Right Tube. Measures about 14.5 cm. in length. It is retort-shaped. The diameter at the uterine extremity is 8 mm.; through the middle of the isthmus, 1.5 cm.; from here the tube widens out rapidly, until through the ampulla diameter is 5.5 cm. The abdominal ostium is constricted so that a small probe can be passed only with difficulty. Numerous fimbria are present externally. These are greatly enlarged and are all deeply congested. One of these measures 5 cm. in length. The surface of the tube is free of adhesions, except on the posterior portion of the isthmus. The entire specimen is deeply congested, reddish-black in color, and shows the result of an acute torsion. This has been in the direction of the hands of a watch, and can be easily reproduced. At the area of torsion the tissues are black. The lumen of the tube is much dilated, and contains thin yellow pus streaked with blood. The mesosalpinx is thickened and infiltrated with blood. The pedicle has been formed by the inner third of the tube and the mesosalpinx.

Right Ovary. Is involved to a considerably less extent. It measures 5.5 x 3 x 1.5 cm. The surface is covered with vascular adhesions. The substance of the organ is comparatively normal.

Appendix. Is 4 cm. in length Beyond a few adhesions, it appears normal on the surface. On section the lumen is slightly dilated.

Histological Description. Right Tube. The walls are edematous and infiltrated with free blood and serum. The bloodvessels are

I was greatly interested in the case because I had never seen one like it, nor had I met with much on the subject in the literature. A sactosalpinx containing pus and twisted on its pedicle seemed quite extraordinary, as a pus tube is usually sufficiently adherent to surrounding structures to prevent such an accident as torsion.

There was no history of gonorrhea, and no evidence of a gonorrheal infection. It seemed likely therefore that the tube was a tuberculous one, in which the inflammatory alterations had been subacute in character, and had caused considerable enlargement without much surrounding infiltration or adhesions. Nevertheless, a careful histological examination of the tube wall did not reveal the characteristics of a tuberculous salpingitis. No cultures were made.

The patient went home after the usual period of convalescence, but returned about Januray 1, 1912, nearly two years later, complaining that at each monthly period the incision would open and discharge a slight amount of bloody fluid. I concluded from this history, and from an examination, that there was a fistulous communication between the right uterine cornu and the incision, evidently a remnant of the drainage tract. The left ovary was prolapsed and adherent.

After a median abdominal incision, the string-like fistulous tract was excised from the uterus at one extremity, and ligated immediately beneath the old scar at the other. Attention was then given to the opposite side of the pelvis; to my surprise the tube presented an appearance at once suggesting a tuberculous pyosalpinx, and, in addition, was

engorged, and some contain thrombi. Here and there, areas of small, round-cell infiltration are seen. The epithelial elements of the mucosa have disappeared apparently as the result of a suppurative process and a dense infiltration of blood.

Appendix. Presents the usual appearance of a chronic appendicitis.

Diagnosis. Right purulent salpingitis (acute torsion). Right chronic universal oöphoritis (hemorrhagic infiltration as the result of torsion).

of unusual length and had an abnormally redundant meso-
salpinx. It was perfectly free and floating, so to speak, on
the left side of the pelvis, and had escaped my observation
entirely in the pelvic examination. The tube was removed,
the ovary released from its adhesions, and suspended. His-
tologic examination showed that the enlargement of the
tube was due to tuberculosis.[1]

The specimen, I believe, shows precisely what the condi-
tion of the right tube was before torsion took place, and if so,
exhibits the factors predisposing to torsion on that side, viz.,
an unusual length of the tube, a very considerable enlarge-
ment which was limited almost entirely to the outer third,
and the absence of adhesions. Probably the only difference
in the two sides originally lay in the ovaries; the right ovary,
I believe, was not adherent previous to the torsion, while the
left ovary was fixed to the posterior surface of the broad
ligament.

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[1] *Macroscopic Description.* The specimen consists of the left tube.
This measures 17 cm. in length. The proximal 3.5 cm. is normal in
diameter. From this point it gradually widens out until, through the
ampulla, it attains a thickness of nearly 3 cm. The organ is typically
retort-shaped. The abdominal ostium is closed, but most of the fimbria
project from the outer extremity. The walls of the outer portion of
the tube are thin (average thickness 2.5 to 3 mm.). The lumen is
dilated and contains thick creamy pus. The color in the enlarged por-
tion of the specimen is yellowish-white. The general character of the
tube and the luxuriant fimbria are suggestive of tuberculosis. The
mesosalpinx is thin. The general shape of the specimen is that of a
hydro- rather than a pyosalpinx.

Histological Description. The surface presents adhesions. The
muscularis is thin, fibrous, and infiltrated with small round cells. The
mucosa is flattened out against the muscularis. The plica as such
have been almost totally obliterated. The surface epithelium is des-
quamated A number of small gland-like spaces are present, the epithe-
lium of which is irregular, and for the most part stains deeply. The
stroma is infiltrated with inflammatory products, and here and there
typical tubercles are observed One or two giant cells are present.
Reëxamination of the specimen previously removed (right tube and
ovary) fails to show any evidence of tuberculosis.

Upon searching through the literature, I found that the torsion of tubal enlargements had received a considerable amount of attention. A number of monographs have appeared, notably those of Praeger, Cathelin, and Bell. A considerable number of references to the subject were not accessible, but I was able to find and review 87 cases.

As might be supposed, the reports vary in completeness and exactness, so that an accurate and comparative study of them is not possible in every particular. Nevertheless, there are certain facts of clinical importance to which I ask your attention.

Anatomical Diagnosis. Under the title of this paper have been grouped the torsion of tubal enlargements, whatever their nature; but no instance of a twisted tube (whether diseased or normal), in which it formed but a part of the pedicle of another tumor which had become twisted, has been included. A very large majority or 62 of the tumors were described as hydrosalpinx or hematosalpinx, the latter being secondary, engrafted upon the first, and the result of torsion in most instances. In 2 cases reported by Chaput, the hematosalpinx was primary and associated with gynatresia.

In 5 the tube was the seat of an ectopic pregnancy; in 2 it was enlarged by a newgrowth; in 2 there was a cystic tumor of the outer extremity of the tube (not of the parovarium), and in 12 there was a pyosalpinx, or the blood of an hematosalpinx was mixed with pus. The enormous size to which these tubal accumulations may grow is evidenced by the dimensions, 20 cm. by 6 cm., of one of the tumors, and by the contents (4 liters) of another case; others contained from 80 to 500 gm. of blood-stained fluid.

Clinical Diagnosis. It is not at all surprising that none of the cases were correctly diagnosticated before operation, because the condition is rare and there are no specific indications. The acute nature of the attack with fever, leukocy-

tosis, localized rigidity and tenderness, led to the diagnosis of acute appendicitis in 8. In 25 an abdominal or pelvic enlargement, plus the acute pain and the absence of evident inflammatory symptoms, made an ovarian cyst with a twisted pedicle, the probability. In 4 cases a tubal pregnancy was regarded as the offending cause, and in 20, pelvic inflammatory trouble of some sort was expeccted. In 2 cases, gynatresia, with distention of the vagina and uterus was diagnosticated. The diagnosis in 1 case was acute strangulation of the intestine. In 30 no clinical diagnosis is given.

Period of Observation. Most of this series of cases were operated on after the symptoms had existed for some time. A very common history is that the patient complained for a greater or lesser period of distress in the affected area, or repeated attacks of severe pain, while the particular attack for which they sought hospital or surgical treatment was the most violent.

A majority of them were kept under observation for some time, possibly in view of the doubt as to what they actually represented, and partly in the hope of resorting to operation at a later and more favorable stage of the disease. Fifty-six were operated on after more than two weeks' observation, and in some the painful paroxysms had extended over a much longer time, as long as three months in one instance. In 9 the operations were performed immediately or within thirty-six hours. In 10 within two weeks of the onset of symptoms.

Abdominal Tumor. Although no mention is made in 39 of the cases as to whether an abdominal tumor was present or not, in 22 it is said that an abdominal enlargement was not observed. Undoubtedly most of the 39 cases, in the report of which it was not mentioned, did not exhibit an abdominal enlargement. Nevertheless, in 34 it is definitely stated that an abdominal enlargement was present. Excluding 4 cases in which the tumor was due to an asso-

ciated condition, such as fibroid tumor of the uterus and hematometra, there were 30, or nearly a third, in which the twisted tube was so large, or placed so high, that it could be palpated or observed upon abdominal examination.

Side Affected. There is a great predisposition for torsion to occur on the right side; in 44 cases, or more than one-half, torsion of the right tube alone was present; in 31 the left tube was affected; in 7 both sides were involved. No statement is made in 8. Why torsion more frequently affects right than left tubal enlargements affords interesting ground for speculation. It may be that the greater roominess of the right side, the left side being partly filled up by the sigmoid flexure, may have something to do with it, especially in those cases in which there are no adhesions, the tumor is bulbous in shape and has a long mesosalpinx. Under such circumstances, the force of gravity would have full sway.

In those cases with primary adhesions, and there must, of course, be some, the peristaltic action of an adherent loop of intestine might have some direct influence, as has been suggested by Woolcombe. The peristaltic action of the cecum, or the small intestine to which a hydrosalpinx on the right would likely find attachment, would be greater, possibly, than that of the sigmoid on the left.

As there is a source of infection on the right side of the pelvis, which does not exist on the left, viz., the appendix, the question arises whether that organ may not be responsible for the original infection of the tube in some cases. This also would favor the preponderance of right-sided hydrosalpinx. Unfortunately, the condition of the appendix was not noted in a large majority of the reports.

The Appearance of the Tumor upon Abdominal Section. A great number of the cases, upon exposure through the abdominal incision, presented a purplish-red or bluish-black mass, at once suggesting a strangulated cyst or a coil

of intestine; 66 were of this appearance; the degree of circulatory disturbance being sufficient to cause gangrene in a number of cases. In 5 the contents was clear, and the condition had not advanced to the point of such obstruction to the circulation as to cause hemorrhage or necrosis. In 2 cases of pyosalpinx, the tumor had a yellowish color, one of the cases suggesting a dermoid cyst. Nothing is said, and no inference can be drawn concerning the color or appearance of the tumor in 11 instances.

The Number and the Direction of the Twists. The number of twists varied from one-half to four or more; in a majority of the cases (23) there were two twists; in 25 no information can be gleaned upon the subject. The direction of the twists is not stated in 59 of the cases, and of the remainder it is put down as to the right in 6; to the left in 6, as the hands of a watch move in 12, and against the hands of a watch in 16.

Condition of the Ovary of the Affected Side. Nothing is said of the ovary in 34; it was involved in 27 and uninvolved in 34. The only deduction from this is that the participation of the ovary of the affected side is accidental, and occurred in about 30 of the cases.

Condition of the Opposite Adnexa. The adnexa on the opposite side were healthy in 20 and diseased in 44 instances. In 31 no statement is made. Involvement of the opposite tube and ovary to this extent, *i. e.*, nearly one-half of the cases would correspond to the usual bilateral involvement in pelvic infections.

Age, Social Condition, and Parity. Although the incidence of cases with respect to age, corresponded closely with the periods of the greatest physiological development and function of the generative tract, more than one-third of the patients were under thirty years, and 11 were under twenty. Thirty of the total number, also, were unmarried or virginal; of the remainer, only 44 are clearly said to have

been married, or have been placed among the married ones because of the history of pregnancy. It is definitely stated that 27 of the patients never had been pregnant, while in 38 pregnancy had occurred.

Etiological Factors in Torsion of Tubal Enlargement. The normal Fallopian tube is of such size and structure that strangulation by torsion is almost inconceivable; when, however, the outer part of the tube becomes enlarged or heavy, and at the same time is not adherent to surrounding parts, the mechanical conditions favoring torsion may be said to exist, viz., a freely movable tumor (the enlarged ampulla of the tube) attached to a more or less fixed base (the uterus), by a pedicle (the isthmus of the tube and the mesosalpinx). Under such circumstances the same forces which cause torsion of ovarian or parovarian tumors may come into play with a similar result.

Although several cases are reported in the literature as examples of torsion of normal tubes, a perusal of the articles, describing them, will show that there existed at the time of operation, inflammatory bands or adhesions, or some other evidence of past disease. It would be impossible to deny, therefore, that at the time of torsion, the tube had been the seat of a hydrosalpinx, and that, in the course of years, the fluid had been absorbed, and the thinned-out walls of the tube had undergone atrophy.

In other instances one cannot help wondering why the author has reported the case under such a title, for both the history and the pathologic anatomy of the parts at operation, indicate clearly that the tube was diseased beforehand. In von Graff's case, an illustration of which is here exhibited, there was probably a congenital defect, or it is possible that adhesions may have so compressed the isthmus of the tube as to result in atrophy and atresia. It is unlikely that the normal tube ever undergoes torsion, although a tube may be predisposed to it by reason of an abnormally

long mesosalpinx, or by one or two accessory ostia, or by greater length and thickness than usual.

Given the mechanical conditions favoring torsion, the existing causes are the same as those given for ovarian cysts.[1] In addition, another cause more or less recently developed by Payr ("Ueber die Ursachen der Stieldrehung intraperitoneal gelegener Organe," *Archiv. f. Klin. Chir.*, 1902, lxviii, p. 501; "Weitere experimentelle und Klinische Beiträge zur Frage der Stieldrehung intraperitonealler Organe und Geschwülste," *Deuts. Zeits. f. Chirurg.*, 1906, lxxxv, p. 392) must be given a place.

Payr found that venous stasis in the pedicle of a small, freely movable tumor, led to torsion. The sort of a pedicle to which his experiments would seem especially to apply is just such a one as would be found in enlargements of the tube, the hydrosalpinx, or other tumors being freely movable and largely confined to the outer parts. When the veins in such a pedicle become engorged, having a more spiral course and stretching more than the arteries, they impart a twisting motion to the pedicle, as is well illustrated by Payr. Should the twist become sufficient to cause more obstruction to the circulation, the distention of the veins becomes even greater, and the torsion is increased.

[1] Storer mentions as exciting causes of the torsion of ovarian cysts:

Disturbances in the equilibrium of the tumor itself, by reason of irregular growth.

Pregnancy, from fetal movements, or displacement of the tumor by the growing uterus; contractions of uterus during labor, or the sudden diminution in pelvic contents at the close of labor.

Alternate distention and evacuation of the bladder.

Defecation, descent of feces into rectum, or straining during the act.

Intestinal peristalsis, possibly impotent unless adhesions are present.

Unusual, sudden, or constrained movements of the body as a whole; vomiting, stooping, twist of the body in getting out of bed, etc.

Trauma, tapping, fall, jolting, pressure of wash-tub against abdomen, plus up and down movements, administration of enemata, gynecological examinations.

This may explain the apparent fact that torsion of adnexal tumors, of whatever nature, is often precipitated by pregnancy, or by rapidly growing tumors of the uterus; the pressure of the uterus on the pedicle causing congestion of its veins, and at least starting the twist. Damianos ("Uber die Stieldrehung der Adnexe in Leistenbruchen im fruhen Kindesalter," *Deuts. Zeits. f. Chir.*, 1905, xxx, p. 228) thinks that Payr's theory applies to the torsion so often observed in the adnexal inguinal hernias in children. He reports 15 cases from the literature and 1 of his own.

Hydrosalpinx. It must be true that a great majority of the enlargements of the tube which undergo torsion are of an inflammatory nature. This statement is borne out by the pathological anatomy of the parts, found at operation, and by the condition of the opposite adnexa. The form of the enlargement is that known as hydrosalpinx, and in the course of torsion it almost always becomes converted into an hematosalpinx. Many of these hematosalpinxes have been taken as evidences of tubal pregnancy, as mentioned by Fritsch, Sänger, and others. After microscopical examination of specimens came into vogue, it was demonstrated that some of the supposed tubal pregnancies were strangulated hydrosalpinxes.

In many of the cases of hydrosalpinx which undergo torsion there is no history of an infection of the common sort, viz., that due to gonorrhea and that due to puerperal infection. Thus, in the series of cases which I have collected from the statements of the authors, or the deductions to be drawn from their reports, a hydrosalpinx had formed, with no history of a previous pelvic infection, or any of the possibilities thereof in 32 instances. While in many such a history might have been elicited by careful inquiry, it nevertheless must be true that in some there was no explanation for the tubal disease on the grounds of a primary genital or pelvic infection.

We may ask, therefore, what may be the source of a hydrosalpinx in an unmarried and virginal woman? Findley (*Western Med. Rev.*, April, 1912, p. 186), Currier (*N. Y. and Phila. Med. Jour.*, October 8, 1904), Sänger, quoted by Sarah Welt-Kakels (*N. Y. and Phila. Med. Jour.*, October 8, 1904), Marx (*Gaz. de Gyn.*, November 15, 1895), and others have observed that gonorrheal vulvovaginitis in childhood may persist in a latent form until puberty, and then invade the uterus and tubes without producing symptoms, which lead to a correct diagnosis, the pain, etc., being ascribed to extragenital conditions, and the previous infection forgotten.

It is also possible that a hydrosalpinx may form as the result of a salpingitis, dating from childhood or young womanhood, the lesion taking place in the course of febrile, especially exanthematous diseases, and little note being made of lower abdominal or pelvic symptoms because of the patient's age.

A case of Funke is interesting in this connection. A virgin, aged twenty-eight years, had suffered with "typhus" at twenty. The operation was performed at twenty-eight, when the tube of each side had been converted into a hydrosalpinx, and both were twisted. Hennig (*Zent. f. Gyn.*, 1893, No. 31, p. 729) found in the autopsy of a young girl after "typhus," a hemorrhagic necrosis of the tube, with perforation into the bowel and into the bladder.

It is also possible that tuberculosis may be responsible, in some cases of hydrosalpinx, as it will be shown later, is true for most of the pyosalpinxes which become twisted. Delorè and Alamartine (see abstract of case) have reported a case in which they suspected such an infection. The patient was a virgin, aged thirty-eight years; there was no history of pelvic disease, although the ends of both tubes were closed, and the right, which was a very large hydrosalpinx, contained one-half liter of fluid; it was twisted on its pedicle

two or three times, but strangulation had not occurred; the fluid was clear yellow, and the tubal walls were thin and transparent.   The authors, in reporting this case, bring up the question of tuberculosis being a cause of hydrosalpinx, and say "in view of the frequency of genital tuberculosis apparently increasing from day to day, it seems not illogical to ask if hydrosalpinx is not sometimes symptomatic of an attenuated tuberculous infection, as is the case, for example, with hydrocele." They injected some of the fluid in their case into a guinea-pig, but there is no report of the result.

Pyosalpinx. While the torsion of a hydrosalpinx is not extremely rare, the opposite is true of pyosalpinx, because such prerequisites as free mobility of the tubal enlargement and a mesosalpinx sufficiently long to form a pedicle do not obtain.   Altogether there are only a few cases in the literature of twisted pyosalpinx, and most of them other authors have denied as being primary, believing that they were originally hydrohematosalpinxes which had become infected secondarily.   Nevertheless, there are some undoubted cases in which a primary pyosalpnix became twisted.

The ordinary pyosalpinx is fixed to surrounding parts, and it would be impossible for it to undergo torsion.   As the inflammation subsides, and the pus is absorbed, in a certain proportion of cases, the pyosalpinx becomes converted into a hydrosalpinx.   Undoubtedly, some of the cases of twisted hydrosalpinx have this history.   The point I wish to make, however, is that the primary pyosalpinx which undergoes torsion, must differ from the ordinary gonorrheal or septic form in an absence of adhesions and surrounding inflammatory exudate.

Taking the cases in the literature described as twisted pyosalpinx, and adding my own case, there are 12 altogether. Analyzing them, we find that two (Ross' and Merdervoort's) are definitely stated to have been tuberculous; in one(Lewers')

tuberculosis was thought likely by the author, sepsis and gonorrhea being fairly well excluded; in two (Fraenkel's, Woolcombe's) no bacteriological or histological evidence of tubercle bacillus was found, but from the preceding history and the gross pathology, tuberculosis was at least quite possible.

Of the remaining cases, one (Pierson's) is so incompletely reported, that no conclusion is justifiable; in one (Jacob's) the case was unquestionably an ordinary pyogenic infection, but the tube is merely said to have been twisted, and it is of secondary interest, as it was associated with a fibroid tumor of the uterus and an ovarian abscess, the specimen being recovered after vaginal morcellement of the fibroid, and vaginal hysterectomy.

In one (Rouffart's I) case the existence of torsion is very doubtful, and the number of twists is not stated; it is said that the fimbriated extremity of the tube was carried to the median line, and that the posterior surface of the tube was adherent to the anterior surface of the uterus, the uterus being in retroposition. In one (Pozzi's I) infection probably originated in the appendix. In one (Pozzi's II) there were possibilities of infection (three children, one placenta prævia, and the history of metritis). Six years before admission, pus was evacuated from the left iliac region by a subperitoneal laparotomy. The contents is described as viscid hemorrhagic fluid mixed with pus; the opposite side was not examined at the first operation in this case, but two weeks later, was exposed by operation and removed when its condition resembled that of the other side.

My own case is an interesting example of how easily the cause of the condition may fail of recognition, as would have happened if the patient had not fallen into my hands for the second operation. This case is unquestionably tuberculous, and makes a third (the others being Ross' and v.

Merdervoort's) of undoubted origin, with three other cases
very strongly suggestive of tuberculosis (Lewer's, Fraenkel's,
Woolcombe's). In other words, one-fourth of the cases
reported as twisted pyosalpinx are proved to be tuber-
culous, and one-half are probably so; and, furthermore, it
is quite likely that at least 3 of the remainder were not
pyosalpinxes when the attack began, but became infected
during the period of observation. The age of one of the
undoubted cases is not given; of the other 2 it is twenty-
four and twenty-six respectively; of the presumably tuber-
culous cases, the ages are twenty, thirty-seven, and twenty-
two; of the other reported pyosalpinxes, the ages are given
as thirty-one, thirty-seven, thirty-nine, forty, and fifty-two.

*Miscellaneous Features of the Cases of Twisted Tubal
Enlargement.* There are some interesting features which
have been noted in connection with the cases in the liter-
ature. The severe pain has often followed a *sudden* and
violent movement or trauma, as sitting down hard after miss-
ing the chair (Baldwin), after suddenly rising from a sitting
posture (Clado, Cathelin), after falling on the street (Delbet),
after a long walk (Cosset and Reymond), during a ride in a
tram-car (Hedley), after straining at stool (Ortner), after
cranking an automobile (Ross), after heavy lifting (Stratz).

In some cases (Guicciardi's, Ries, Kauffman's, and Lejar's
II) the torsion either did not produce acute symptoms,
or the case was allowed to go without operation for such a
time that the twisted part had become more or less com-
pletely detached and parasitic. In one case (Chaput's II)
the hydrosalpinx had ruptured, and the abdomen contained
free bloody fluid. In one case (Lejar's IX (in our list VIII),
a large hydrosalpinx of the left side formed an abdominal
tumor on the right.

There were certain interesting complications with preg-
nancy. In one case (Hartman's) the attack occurred in a
patient five or six months pregnant; after removal the patient

went on to term and had a normal delivery. In one (Pinard and Paquay's) the operation followed induction of labor and delivery within a few days; the patient had had numerous severe attacks during pregnancy. Ward's II was four months pregnant; Aulhorn's case was three months pregnant; Martin (Rouen's) thought herself pregnant about four months, and the attack at first was regarded as a threatened miscarriage.

The tumor was situated high in Legueu's I, so that the abdominal enlargement could scarcely be felt per vaginam; the same was true in another case (Warneck's II). In Schirmer's case the appendix was markedly involved; in Pozzi's I its participation was suspected. In my own case it contained pus, but most likely this was secondary to the other infection. In one case (Siredy's) there were said to have been no pelvic symptoms, the patient was being treated for enteritis, and the tumor, which was abdominal, was discovered by accident.

The abdominal enlargement was sometimes of great size; in Voigt's case it reached to within three fingers of the umbilicus; in Waldo's II it reached nearly to the umbilicus, and in Woolcombe's there were two masses, one extending above the umbilicus on the right and the other rising out of the pelvis on the left.

ABSTRACTS OF CASES IN THE LITERATURE

Alburtin. Hydrosalpinx tordu avec metrorrhagies abundantes, *Lyon Méd.*, 1911, cxvii, 29. Reports a specimen of hydrosalpinx, twisted on uterine pedicle, with an ecchymotic color, indicative of necrosis.

Alburtin. A propos des hydrosalpinx et de la torsion du pédicule, *Lyon Méd.*, 1905, cv, 1040. Case I. Aged eighteen years. Clinical diagnosis: bilateral ovarian cyst. Anatomical diagnosis: bilateral hydrosalpinx, right; twisted;

left ovarian cyst. Side affected, right. Size, fist. Opposite side: hydrosalpinx; ovarian cyst. Subjective condition: repeated attacks of abdominal pain. Case II. Aged sixteen years. Side (?). Twists, three. Contents: hemorrhagic; ovary: four times normal size and infiltrated with blood. Color: blackish. Subjective conditions: patient had had painful attacks in abdomen. A few days after admission had a very severe attack, from which diagnosis of twist of the pedicle was made. Diagnosis: hydrosalpinx; twisted.

Amann. Stieltorsion einer Hydrosalpinx. *Monat. f. Geb. u. Gyn.*, Band xv, Heft 2. Aged thirty-three years. Two children. Sudden acute pain. Previous good health. Median abdominal tumor three inches below umbilicus. Operation: ten days after attack began. Clinical diagnosis: ovarian cyst; twisted pedicle; right side affected; left side also hydrosalpinx. Anatomical diagnosis: hydrosalpinx twisted two and one-half to the right; brownish-red color; 20 cm. long and 6 cm. broad. Adhesions to intestine and mesentery. Brownish-red contents.

Arthur. Ueber Axendrehung der Tube, *Deut. Zeits. f. Chir.*, Band xlviii, Heft 2 and 3, p. 198. Aged twenty-one years. Clinical diagnosis: appendicitis, or right adnexal disease. Anatomical diagnosis: hydrosalpinx, twisted. Operation: seven days after acute symptoms began. Seat of tumor: left. Size: ostrich egg. Twists: one, near uterine cornu. Contents: fluid, blackish, much injected, sphacelated. Adhesions: none. Objective symptoms: tumor in iliac fossa, easily outlined above. Subjective condition: pain in lower abdomen, especially left; vomiting; menstruation, regular; pain increased during menstruation; severe pain in left iliac fossa; no fever; operation: laparotomy (lateral). Remarks: diarrhea.

Aulhorn. Spontane Stieltorsion normaler Adnexe in der Schwangerschaft, *Zent. f. Gynäk.*, 1910, Nr. 16, p. 538. Aged nineteen years. Three months pregnant. Pain for

some weeks. Acute exacerbation two days before admission. Clinical diagnosis: pregnancy and pyosalpinx. Anatomical diagnosis: right hematosalpinx, twisted, 180; tumor 9 cm. long, dark-blue color; ovary involved; uterus, gravid.

Baldwin. Hydrosalpinx with Twisted Pedicle, *Amer. Jour. Obstet.*, 1906, liv, p. 654. Aged forty-three years. No children; one miscarriage. Missed chair and sat down heavily; three hours later severe pain. Clinical diagnosis: acute appendix. Emergency operation. Right side affected. Left tube also hydrosalpinx. Ovaries not disturbed and not affected. Tubes contained serum and blood. Diagnosis: hydrosalpinx, twisted and gangrenous.

Baudron. Torsion du pédicule d'un hydrosalpinx droit coincidant avec la rupture d'une grossesse tubaire gauche. Laparotomie, guérison, *Compt. Rend. Soc. d'Obst. de Gyn. et de Ped.*, 1900, ii, 90. Aged thirty-two years. One miscarriage at nineteen years. Clinical diagnosis: tubal pregnancy (ruptured). Anatomical diagnosis: hydrosalpinx, twisted. Side; right. Size; orange. Location; tumor adherent to parietal perineum of pelvis. Form: irregular, nodular, ecchymotic. Size of pedicle: size of little finger. Twists: two. Contents: 300 gm.; black blood. Adhesions recently. Ovary not twisted. Adnexa of opposite side, tubal pregnancy. Objective signs: abdominal tumor; cul-de-sac entirely free. Subjective conditions: menstruated at twelve years; regular; leucorrhea; severe abdominal pains; tendency to syncope. Operation: laparotomy; bilateral castration. Result: cure. Remarks: symptoms of tubal pregnancy had masked the torsion.

Bell. Torsion of the Pedicle in Hydrosalpinx and Other Morbid Conditions of the Fallopian Tube, *Jour. Obstet. and Gyn. of the British Empire*, 1904, No. 5, p. 514. Aged forty-five years. Married at nineteen; child in eighteen months; no other pregnancies. Family history tubercular. Patient had recurrent attacks of bronchitis. Attack of

severe pain in 1899, with faintness and vomiting; lasted two hours; no doctor. In 1901, another. Present attack sharpest. Abdominal tumor found. Clinical diagnosis: twisted pedicle. Left side affected, right also hydrosalpinx. Diagnosis: hydrosalpinx twisted one and three-fourths; reversely to watch. Twisted tube almost black in color.

Bland-Sutton. Salpingitis and Some of its Effects, *Surg. Dis. of the Ovary and Fallopian Tubes*, London, 1891, p. 257. Case of H. Morris. Not acute; ovary uninvolved. Diagnosis: hydrosalpinx twisted three and one-half times. Contents: bloody. Dense adhesions. Separation and parasitic growth of enlargement.

Boursier. De la torsion du pédicule des salpingites hystiques, *Jour. de méd. d. Bordeaux*, 1901, Nr. 30, p. 512. Aged thirty-four years. Para-O. Clinical diagnosis: endometritis; adherent retroflexion, ovariosalpingitis (right). Anatomical diagnosis: hydrosalpinx, twisted. Subjective condition: menstruation at twelve years; regular. In 1899, severe pains right iliac fossa, especially if fatigued, increased at menstrual periods; gradually grew worse, coming on in attacks when fatigued. During month before admission (1901), pains suddenly increased in violence without apparent cause; went to bed; slight fever frequently, and painful micturition. Objective signs: abdomen not distended. Behind and right of uterus a not very hard mass, difficult to outline; tender. Side affected: right. Opposite side: follicular cysts in ovary; congested tube. Number of twists: two and one-half. Twisted tube: adherent to posterior surface of uterus and neighboring organs, forms a rounded mass containing 80 gm., reddish-brown, hemorrhagic, syrupy fluid. Operation: right salpingo-oöphorectomy. Result: cure.

Burrage. Case of Acute Torsion of Fallopian Tube with Hematosalpinx, *Boston Med. and Surg. Jour.*, 1906, cliv, No. 11, p. 295. Aged twenty-six years. Married two years; no pregnancies. Treated for dysmenorrhea, December, 1898.

Dudley operation. Pelvis negative, except prolapse of right ovary. Acute attack November, 1899. Clinical diagnosis: pelvic abscess. Anatomical diagnosis: hydrosalpinx twisted. Right salpingectomy: resection of both ovaries. Right side affected. Left tube normal. No free blood. Both ovaries riddled with cysts. Twisted hydrosalpinx adherent to bladder and surrounding structures. Color: dark reddish-brown. Contents: blood-clot, no villi.

Cathelin. De la torsion des hydrosalpinx, *Revue de Chirurg.*, 1901, xxiii, p. 263. Case I. Aged twenty-six years. One miscarriage of five months, seven years previous. Clinical diagnosis: large salpingitis (left); slight annexitis (right). Anatomical diagnosis: hydrosalpinx, twisted. Seat of tumor: left. Size: hen's egg (6 to 7 cm. long diameter). Tubal localization, external portion. Form: ovoid. Color: blackish. Twists, two and one-half direct. Contents: 200 gm. blood; no clots; adhesions present. Ovary not twisted. Adnexa of opposite side normal. Objective signs: tender mass in posterior cul-de-sac (left). Subjective condition: menstruated at eleven and one-half years; regular; very active pains in left lower abdomen three years before operation, without other symptoms; for three years had uterus discomfort. Evening before operation, violent pains on rising from a chair. Operation: laparotomy; unilateral castration. Result: cure.

Cathelin. Case II. Salpingite gauche à pèdicule tordu, hydrosalpinx droit prolabe, *Bull. et. mém. de la Soc. Anat. de Paris*, 1900, 6 s., t., ii, 75, 673. Aged forty years. Para-II. Sudden seizures; repetition in sixteen days; mobile tumor on right, by pelvis examination. Hydrosalpinx, left, twisted one and one-half times, direction hands of watch. Ovary not involved. Blackish tumor. Right hydrosalpinx adherent in Douglas' pouch.

Chaput. Contribution à l'étude de la torsion des hematosalpinx compliquant les atrésiés vaginales congénitales,

Revue de Gyn., 1906, tome x, p. 963. Case I. Aged twenty years. Subjective condition: never menstruated; at age of seventeen, vague pains in abdomen; recurred following month, then every month, accompanied with increase in size of abdomen. Lasted at first eight days, but on admission this had increased so that patient suffered two weeks every month. Objective signs: abdomen swollen; resembles abdomen of large fibroid. On percussion, dulness; on palpation, uterus very large, hard, tender, reached to about umbilicus. Iliac fossæ filled with masses which seem attached to sides of uterus. Hymen imperforate; not bulging. On rectal examination, whole small pelvis full of tumor mass. Operation: puncture of hymen, followed by discharge (one-half liter) of blackish blood. Paravaginal incision, left; above the point of stricture, vagina much dilated; cervix dilated; uterus empty. Post-operation: large tumor felt in right iliac fossa (hematosalpinx); blood in abdominal cavity. Right tube size of fist; black; perforated at one point. Pedicle twisted six times; left tube (smaller) twisted five times. Both removed. Result: death next day (in coma). Case II. Aged eighteen years. Subjective condition: normal to sixteen years of age, then intellectual disturbance; no menstruation; severe pains in iliac regions each month; nausea; syncope. For two months previous to admission, pains worse and more frequent. Objective findings: tumor in right flank rising to level of umbilicus, per rectum. This mass seems to occupy posterior cul-de-sac. Vaginal examination impossible. Hymen imperforate. Operation: dissected between urethra and rectum. At depth of 6 cm., hematocolpos found; brown fluid, one and one-half liter evacuated. Result: death on second day. Autopsy: both uterine cornua distended, especially right. Right tube long, apoplectic; extremity dilated by hematosalpinx, had been punctured in the colpotomy; twisted once, including mesovarium. Opposite adnexa, tube long, ovary normal; uterus bicornute. Remarks:

outer end of tube had no mesosalpinx, and end was adherent to abdominal wall. Tube seemed to have twisted between the two fixed parts, formed by this adhesion and by the tubo-ovarian ligament.

Clado. Salpingite à pèdicule tordu; guérison, *Bull. et Mém. de la Soc. de Anat. de Paris*, 1900, 6 s., ii, 41. Aged thirty years. Para-O. No miscarriages. Clinical diagnosis: bilateral salpingitis; acute exacerbation, right. Anatomical diagnosis: hydrosalpinx, twisted. Seat of tumor: right, size of child's head. Tubal location: external portion. Formed mass with convexity above base at mid-point of line, from pubes to umbilicus. Size of pedicle: little finger. Twists; three, reversely. Contents: 300 gm.; black blood, no clots. Adhesions, posterior. Opposite adnexa: cystic, sanguineous fluid. Objective signs: abdomen swollen, right; mass in true pelvis, and rising to umbilicus; hard; on left tumor size of mandarin, fluctuating, not adherent, encroaching on left posterior cul-de-sac. Subjective conditions: menstruated at twelve years; irregular. Pains in lower abdomen. Abundant metrorrhagias. Sudden and severe pain on right, when rising from sitting posture. Vomiting; fever. Operation: laparotomy; bilateral castration. Result: cure. Remarks: four to five little hemorrhagic cysts in thickness of the cyst wall.

Delbet. Torsion du pédicule dans un cas de salpingite, *Bull. et Mém. de la Soc. de Anat. de Paris*, 1892, p. 300. Aged thirty-nine years. Clinical diagnosis: intestinal strangulation from bands, or volvulus of sigmoid. Operation within thirty-six hours. Anatomical diagnosis: hydrosalpinx: three twists; left side affected. Size: intestinal loop. Tubal location: external portion. Contents: blood. Right hydrosalpinx. Ovary not twisted. Objective signs: abdomen retracted; palpation very painful; vaginal examination impossible. Subjective conditions: very sudden and severe pain; fainting. Patient fell while walking on street. Con-

tinued vomiting: not fecal, no gas or food. Pulse full,
rapid; temperature, normal. Operation: laparotomy; bilat-
eral castration. Results: cure.

Delore und Alamartine. Volumineux hydrosalpinx en
apparence primitif, *Lyon Méd.*, 1909, Nr. 9, p. 416. Aged
thirty-eight years (virgin). No genital history. Right side
affected; contains one-half liter clear yellow fluid; wall thin
and transparent. Left side also hydrosalpinx. Ends of both
tubes obliterated. No menstrual symptoms. No signs of
infection. Diagnosis: hydrosalpinx, right, twisted two or
three times. Voluminous hydrosalpinx, right, containing
one-half liter fluid, attached by a delicate pedicle which
showed traces of torsion in the form of two or three spiral
turns, slightly lobulated, and shape of bag-pipe; right ovary
left, left tube slightly cystic. In this patient, no preceding
genital infection could be demonstrated; ovaries and uterus
appeared healthy. Author considers attenuated tuberculous
infection as cause of hydrosalpinx. "In view of the frequency
of genital tuberculosis, apparently increasing from day to
day, it seems not illogical to ask if hydrosalpinx is not some-
times symptomatic of an attenuated tuberculous infection,
as is the case, for example, with hydrocele." Some of the
liquid was injected into a guinea-pig. No report of result.

Fraenkel, L. Beiträge zur Pathologie und Therapie der
Salpingitis, *Monats. f. Geb. u. Gyn.*, Band xxxv, Heft 4,
p. 459. Aged twenty years. No children; not married.
Suppurating cervical glands in childhood, and pneumonia
twice. Menstruated regularly from twelve years of age.
Appendicectomy five years ago. Fourteen days previous,
severe pain and vomiting; attack repeated twice; since
then, continuing severe pain. Clinical diagnosis: bilateral
ovarian cyst with twisted pedicle. Operation after fourteen
days' observation. Right side affected. Anatomical diag-
nosis: pyosalpinx, 3 x 180 = 540 twisted. No adhesions.
Yellow color. Resembling dermoid. Wall thin. Tumor

light in weight; size of fist. Abdominal ostium free. Fimbria neither swollen nor reddened. Pus thick, caseous, tolerably dry, and no odor. Left side same as right, but not twisted: 20 cm. long, outer 2 cm., and fimbria entirely normal, size of child's fist. Pus from this tube gave neither tubercle gonococci, pneumococci, nor bacteria coli, but only slender non-acid fast stäbschen in sparse number, and weak stain. The culture showed also a few staphylococcus germs.

Francais. Salpingite avec torsion. Sociéte anatomique, *La Presse Médicale,* October 30, Nr. 89. Cystic salpingitis with torsion of pedicle. Abundant hemorrhage in tubal wall; hemorrhagic fluid in cyst cavity. Other tube normal. (No other data given.)

Fritsch, H. Die Krankheit der Frau. Braunschweig, 1894, p. 469. Simply declares that every hematosalpinx is not a tubal pregnancy, and reports a very movable hematosalpinx with a twisted pedicle, but gives no details. Diagnosis: hydrosalpinx, twisted; size of fist.

Funke. Stieltorsion bei Hydrosalpinx. *Hegar's Beiträg.,* 1904, Band vii, Heft 3, p. 450. Aged twenty-eight years (virgin). Typhoid fever at twenty. Abdominal tumor for one-half year, increasing in size. Clinical diagnosis: inflamed tumor of left adnexa. Anatomical diagnosis: hydrosalpinx, twisted. Left side affected, well hidden by adhesions. Right also hydrosalpinx, not adherent, also twisted. Ovary, all right; left twist one and one-half opposite to watch; right twist one-half with watch: yellow, clear fluid.

Gosset and Reymond. Salpingo-ovarite a pédicule tordu. Laparotomie, guérison, *Ann. de Gyn.,* 1899, p. 21. Aged thirty-one years. Para-III. Seat of tumor: left, size of fist. Tubal localization: external portion. Form: smooth. Pedicle twisted at 2 cm. from uterus. Twists, one; direction contrary to watch. Contents: chocolate-colored fluid. Adhesions: none. Ovary: twisted. Opposite adnexa: healthy. Objective signs: suprapubic mass rising to five fingers

above pubis; slight lateral mobility; posterior cul-de-sac filled by resistant mass corresponding with the suprapubic tumor. Subjective conditions: menstruation, normal. Pain since first pregnancy, especially at periods.   After a long walk, suddenly seized with severe pains in abdomen, maximum in left flank, radiating to lumbar region. Vomiting of food and bile. Operation: laparotomy. Result: cure.

Goullioud. Taken from Cathelin (*Revue de Chirurg.*, 1901, Nos. 2 and 3, p. 263). Aged thirty-seven years. Para-O. Clinical diagnosis: pelvic fibroma, complicated by ovarian cyst.   Anatomical diagnosis: fibroma and hydrosalpinx, twisted. Seat of tumor: right. Size of child's head. Tubal localization: external portion. Form: irregular. Color, bloody. Twists, two. Contents: fluid, hemorrhagic, not viscid. Adhesions easily separated. Ovary twisted. Opposite adnexa: cystic. Objective signs: abdomen distended. Fibroma reaching to umbilicus. In front of this hard tumor, another, more fluctuating, not reaching to symphysis.   In right iliac fossa, another smaller tumor, size of an egg, very hard and tender. Per vaginam, nothing felt but fibroma. Subjective conditions: six years previous menstruation became more painful, more abundant, and lasted longer. Sixteen months previous, intestinal colics, syncopal attacks, vomiting.   Attack again in three months, then several more. For several months all right, then eight days before admission to hospital, acute pain with sudden enlargement of abdomen. Morphine. Pain radiating to right leg. Operation: laparotomy; bilateral castration. Result: cure. Remarks: after operation regression of fibroma, and improvement in pulmonary and pleural tuberculous lesions (right).

Guicciardi, G. (Florenz.) Ueber spontane Tubenresektion, *Ginecologia*, 1905, Nr. 4. Aged forty-nine years. Single. Right side affected. Left adnexa and right ovary adherent. Sactosalpinx confined to ampulla of tube. Cheesy contents. Diagnosis: sactosalpinx (right). Completely separated from

uterine stump of tube; 3 cm. distance between two ends. This author met with 5 cases of tubal torsion in 1041; laparotomies: three actual amputations of the enlarged tube.

Harpöth. Beiträge zur Kasuistic der Sactosalpinx mit Torsion des Stieles, *Zent. f. Gyn.*, 1900, Nr. 52, 1399. Aged twenty-six years. (Seamstress.) No pregnancies, but no hymen; vaginal orifice wide; no stated evidences of infection. Clinical diagnosis: ovarian cyst and torsion; heart and lungs, all right; general health very good. Operation after six weeks' observation. Anatomical diagnosis: hydrosalpinx, twisted. Left side affected. Right tube not twisted, but also sactosalpinx. Although not definitely stated, presumably no tubal, but a few omental adhesions. No bacteria found on microscopic examination, and no cultures. Contents of tube, seropurulent (sterile); twisted two and one-half times, from left to right.

Hartman, H., and Reymond. La torsion du pédicule des Salpingo-ovarites, *Annal. de Gynec.*, September, 1894. Aged thirty years. Subjective conditions: pains in right side of abdomen. Last three years patient noticed tumor. Occasional severe attacks accompanied with vomiting. Right side affected. Hydrosalpinx and cystic ovary. Adhesions to surrounding organs. Contents: one and one-half liters sanguinolent fluid. Diagnosis: hydrosalpinx, two twists in direction of hands of watch.

Hartman, H., and Reymond, E. Contribution à l'étude de l'anat. path. et de la bacteriologie des salpingoovant, *Annal. de Gynec.*, 1898. Para-O. Clinical diagnosis: bilateral salpingitis. Anatomical diagnosis: hydrosalpinx, twisted several times, opposite to hands of watch. Seat of tumor, left. Abdominal enlargement. Form: lobulated. Color: dark red; size of pedicle: finger. Contents: 400 gm. blood. Right side also hydrosalpinx. Adhesions: with all adjacent organs (uterus twisted one-half time.) Ovary twisted

posteriorly and below.   Objective signs: increase in size
of tumor; tension; dulness; signs of peritonitis.   Subjective
conditions: menstruation normal.   Violent pains on right
side of abdomen, radiating down thigh.   Vomiting; fever.
Operation: laparotomy; bilateral castration.   Result: cure.

Hartman.   La torsion des salpingites, *Comptes Rendus de la
Soc. d'Obst. de Gyn. et de Ped. de Paris*, 1900, ii, 28.   Case I.
Aged forty-four years.   Pains in right side of abdomen, coming
on in attacks for two years.   Examination subumbilical tumor;
tender; fluctuating.   Right side.   Pedicle size umbilical cord.
Twisted twice, reversely.   Color: brown.   Contents: 500 gm.
blood.   No mention of just what composed tumor, tube (?),
ovary (?), both (?).   No mention of opposite adnexa.   Result:
cure.   Case II.   Aged twenty years.   When five or six
months pregnant, suddenly seized with pain in right iliac
region; vomiting; distention; fever.   Next day operation.
Right adnexa enlarged, adherent, hemorrhagic.   Pedicle
twisted once, reversely.   Removal.   Cure.   Normal delivery
at term.   Case III.   Aged thirty-three years.   Curetted
several times for metrorrhagia.   December 7, 1899, sudden
violent abdominal pains; in following days, signs of pelveo-
peritonitis gradually subsiding.   Tenderness remained.
Large mass in abdomen, reaching to umbilicus.   Operation:
January 3, 1900.   Large blackish tumor formed by right
salpingitis, with pedicle twisted directly.   Ovary not in-
volved.   Uterus twisted one-half time.   Contents: sterile, fluid.

Hartman, C. R.   Un nouveau cas d'annexite à pédicule
tordu, *Comptes Rendus de la Soc. d'Obst. de Gyn. et de Ped de
Paris*, 1900, ii, 254.   Aged twenty-five years.   Para-I (eight
months previous).   Clinical diagnosis: appendicitis or tubal
disorder.   Anatomical diagnosis: hydrosalpinx, twisted
(right).   Tubal localization: two tumors, one internal supe-
rior other external and inferior.   Color: brownish-black.
Twisted one-half, reversely.   Contents: blood; clots.   Adhe-
sions: numerous.   Ovary: twisted.   Opposite adnexa: adhe-

sions: liberated. Objective signs: abdomen, flaccid; tumor in hypogastrium, reaching to right iliac fossa; irregular; painful. Per vagina, mass posterior to uterus, continuous with abdominal tumor. Subjective conditions: three years previous severe pains on rising, pain radiating to right leg. Attack during pregnancy. Six weeks previous to operation sudden abdominal pain without vomiting; fever. Operation: laparotomy; unilateral castration. Result: cure. Remarks: appendix adherent; removed.

Hedley. Hydrosalpinx with Torsion of the Pedicle, *Proc. Roy. Soc. Med.*, London, 1907-08, p. 95. Aged twenty-three years. Single. Rickets. One brother tuberculous. Under treatment for lateral curvature. Acute symptoms came on in a tram-car. Operation after seventeen days of acute pain in lower abdomen. Removal of affected tube. Left side affected. Diagnosis: hydrosalpinx twisted twice, in direction of hands of watch; size of small orange. Contents: sterile, thin, blood-streaked fluid. Ovary, all right; right appendix, all right. No adhesions mentioned; presumably not many, as tumor was untwisted.

V. Herff. Hematosalpinx mit Torsion, *Verhandlung d. d. Gesell. f. Gyn. Kong.*, 1895, p. 695. Exhibited a specimen as above. (No details.)

Hirst. Torsion of the Fallopian Tube, *American Jour. Obstet.*, xxxiii, 263. Left side affected. Other pelvic organs normal. No other details. Diagnosis: hydrosalpinx twisted three times, in association with fibroid uterus.

Jacobs. Fibromyoma. Pyosalpinx. Vollständige Drehung der linken Tube um ihre Aches, *Zent. f. Gyn.*, 1896, Nr. 50, p. 1283. Vaginal operation: four to six weeks' observation. Morcellement of fibroid. Left side affected. Pyosalpinx of right side; right ovarian abscess; interstitial fibroid of uterus. Diagnosis: pyosalpinx twisted (?), at a distance of 3 cm. from uterus. No gangrene, but great thinning of tube.

Kauffman.   Einen Fall von Selbstamputation der Tube,
Zent. f. Gynäk., 1903, Nr. 11, p. 344.   Age (?).   Three chil-
dren; one miscarriage.   Clinical diagnosis: Retroflexion with
adhesion; much pain; unable to work.   Diffuse adhesions
of both adnexa.   Right side affected; consist of two parts—
a short uterine stump and an outer 3 cm. long, part with
fimbriated extremity closed; size of cherry.   Anatomical
diagnosis: hydrosalpinx detached by torsion and para-
sitic.

Klein.   Isolierte Stieltorsion einer Sactosalpinx, *Monats.
f. Geb. u. Gyn.*, 1912, p. 655.   Aged thirty-five years.   Para-
II.   Clinical diagnosis: ovarian cyst; twisted pedicle.   Three
attacks previously.   Anatomical diagnosis: hydrosalpinx,
twisted 360 degrees; ovary adherent; bluish-black tumor.

Kadygroboff.   Zur Frage über primäre Torsion der
Tubae Fallopiae, *Jour. akusch. i Shensk. boles.*, January and
February, 1906, Ref. *Zent. f. Gyn.*, 1907, Nr. 32, p. 991.
Aged twenty-eight years.   Nullipara.   Right hydrosalpinx;
slow twisting, almost complete separation from inner part
of tube.   String-like connection, 1 cm. long.   Contents:
bloody.   Tumor oblong, disseminated red spots.

Legueu.   La torsion des salpingites.   *Presse Médicale*,
1900, p. 37.   Case I.   Aged thirty-three years.   Para-III.
Clinical diagnosis: cyst of ovary with twisted pedicle or
pyosalpinx.   Anatomical diagnosis: hydrosalpinx, twisted.
Seat of tumor: right.   Twists one-half from right to left,
and from behind forward (region of ampulla turned toward
uterus).   Contents: 400 gm. blood; ovary not twisted.
Opposite adnexa: healthy.   Objective signs: above to right
umbilical tumor with rounded upper margin, whose lower
end reaches into small pelvis.   To palpation: resistant,
tender; hardly to be felt per vaginum.   Subjective condi-
tions: sudden pains at menstrual periods, especially right;
vomiting of food and bile.   Operation: laparotomy; unilat-
eral castration.   Result: cure.   Case II.   Aged twenty-

six years. Anatomical diagnosis: hydrosalpinx. Seat of tumor: right; size of hen's egg. Form: smooth, regular. Twists one and one-half. Adhesions: none; neither pelvic inflammation. Ovary not twisted. Objective signs: mobile tumor, slightly tender, in posterior cul-de-sac, independent of uterus. Subjective conditions: acute pains in abdomen at menstrual periods for last two years, especially right. Leucorrhea only during intervals. Operation: laparotomy; unilateral castration. Result: cure.

Lejars. Des torsions tubaires, *La Gyn.*, January, 1910, p. 70, and *Compt. Rend. de la Soc. d'Obst. et de Gyn. et de Ped. de Paris*, 1909, xi, 342. Case I. Aged twenty-two years. Para-O. Clinical diagnosis: tubal pregnancy in course of aborting. Subjective conditions: last period, November, 1907. In January 1908, sudden severe pains right side; vomiting; fever. Objective examination: cervix soft; corpus above symphysis. Tender mass bulging in posterior cul-de-sac. Operation, January 28, 1908 (ten days after onset of symptoms). Large adnexal mass on right; blackish; pedicle twisted (?) twice. Right side removed. Result: cure. Remarks: uterus size of two month's pregnancy. Opposite adnexa: healthy. (Pregnancy continued to term; normal delivery; no microscopic examination given.) Microscopic diagnoiss (?). Case II. Aged thirty-two years. Clinical diagnosis: fibroma (retroperitoneal). Subjective conditions: three years previous, suddenly taken with pains in abdomen, which lasted several days. Reappeared at menstrual periods and when fatigued. Three months before operation, severe attacks; bed for ten days. Objective finding: mass size of fist, anterior and left uterus. Operation: large blackish tumor anterior and left of uterus, everywhere adherent corresponding to left adnexa, attached to left cornu by pedicle twisted twice, undergoing ulceration. (No microscopic examination.) Case III. Aged thirty-one years. Para-III. No pain until two weeks before opera-

tion; sudden onset. Objective findings: cervix large, hard;
in right cul-de-sac; mass size of two fists, hard, fixed. Clin-
ical diagnosis: intraligamentous fibroid. Operation: mass
consists of large tube twisted (? times); loop of intestines
adherent. Contents: pus. Case IV. Aged thirty-eight
years. Para-O; no miscarriages. Severe pains; sudden
onset six weeks before admission. Examination: nodular,
hard tumor, fixed, reaching to three fingers below umbilicus,
filling left iliac fossa. Operation: fibroid with many intes-
tinal adhesions; left tube large, blackish, external half
twisted, the torsion being maintained by fine, recent adhe-
sions. Opposite adnexa all right. Hysterectomy. Cure.
Case V. Aged fifty years. Para-III. Miscarriage, one.
Still menstruating. For two months metrorrhagia, profuse;
leucorrhea. No severe pains; general feeling of weight in
abdomen. Examination: large adherent mass in pouch
of Douglas, which appeared to be, in large part, constituted
by retroflexed uterus. Operation: uterus retroverted; on
left, a prolapsed blackish tube, filled with hemorrhagic
fluid, twisted several times on its pedicle. Cure. Case VI.
Aged forty-three years. Operated upon for uterine fibroid.
As a chance finding double hydrosalpinx, size of lemons,
each twisted on its pedicle. Case VII. Aged forty years.
History and symptoms, chronic salpingo-oöphoritis. Opera-
tion: right ovary healthy; "the tube in its inner three-
quarter, healthy; the ampulla was transformed into a little
blackish pouch, attached to a twisted pedicle, and in part
detached." Contents (of the little pouch) black, hemorr-
hagic liquid mixed with a little pus. Diagnosis: salpingitis,
torsion, necrosis. The torsion had been eccentric, and had
involved only the ampulla. Opposite adnexa, cystic ovary;
tube, large, closed. Case VIII. Lejars. Un nouveau cas de
torsion de la trompe, *La Gyn.*, 1910, p. 76, and *Compt.
Rend. de la Soc. d'Obst. de Gyn. et de Ped. de Paris*, 1909, xi,
p. 357. Aged twenty years. Pains in right abdomen came

on one month before operation. Painful micturition. Examination: round tumor in suprapubic region (right), size of an orange; consistency of dermoid, which was the clinical diagnosis. Operation: large hydrosalpinx of left side, transposed to right, twisted three times on itself; torsion maintained by adhesions. Ovary healthy, situated above point of torsion. Opposite adnexa, all right; uterus small. Result: cure.

Lewers. Pyosalpinx with Twisted Pedicle, *Trans. Obst. Soc. of London*, xliv, 362. Aged thirty-seven years. Single. First attack of pain and vomiting, December, 1901; second, May, 1902; third, September, 1902. Clinical diagnosis: double ovarian tumor with twists of pedicle. Operation: October, 1902. Both tubes removed; neither ovary. Right side affected. Left pyosalpinx not twisted. Right pyosalpinx adherent to small intestine, omentum, and bladder. No tuberculosis demonstrated, but thought likely. Sepsis and gonorrhea fairly well excluded. Diagnosis: pyosalpinx twisted several times. Right ovary not involved.

McCann. A Case of Hematosalpinx, Due to Tubal Pregnancy, Complicated by Torsion of the Pedicle, *Lancet*, May 9, 1903. Aged thirty-four years. Curettement in 1898 for purulent discharge; no abnormality of adnexa recognized at that time. Sudden seizure October, 1900; recurred March, 1901; recurred April, 1901; third attack May, 1901. Operation: June 15. Right side affected. Diagnosis: ectopic pregnancy; three twists. Bluish-black color, ascitic fluid. Right ovary, all right. Opposite adnexa, all right.

McIllroy. Hydrosalpinx with Torsion of the Tube, *Scottish Med. and Surg. Jour.*, August, 1904, p. 150. Aged forty-three years. Married. Para-V. Last labor eleven months ago. Attack, pain during last pregnancy, and felt as if there was some obstruction to last delivery. Thereafter, pressure symptoms. Left side affected. Anatomical

diagnosis: hydrosalpinx; outer third of tube enormously distended; three twists of tube at different parts; outer third necrotic. This I believe was parovarian cyst, but author has looked into it pretty carefully, and thinks it otherwise. Complete torsion of tube at three distinct points; necrosis of outer cystic part, containing chocolate-colored fluid and flakes of fibrin. Parovarium distinct. Author thinks tumor is definite part of outer tube. Drawing looks as if it were a parovarian cyst; still author regards it as a hydrosalpinx.

Maillard. De la torsion des salpingites, *Thèse de Paris,* 1897 and 1898, quoted by Legueu, *Presse Méd.,* 1900, p. 37, (second case). Aged forty-nine years. Para-II; last seventeen years previous. Clinical diagnosis: pyosalpinx, right, with less severe adnexal disease, left. Anatomical diagnosis: hematosalpinx; twisted pedicle. Seat of tumor: right. Twists, one and one-half in direction of hands of watch. Form: globular. Ovary: normal. Contents: coagulated blood. Opposite adnexa: ovary cystic. Objective signs: uterus three fingers above symphysis. Tumor felt high in right cul-de-sac; size as large as an egg, resistant. Attached to uterus on one side, to pelvic wall on other. In left cul-de-sac a smaller, long tumor, attached to uterus, slightly tender. Subjective conditions: menstruated at age of thirteen. Four years before operation, leucorrhea, pain on urination, tenesmus, diagnosis of gonorrhea. Shortly afterward, began to have abdominal pains, which for last year considerably increased. These came on in attacks, always beginning on right side, radiating to lumbar region, and down thigh to knee; vomiting; distention of abdomen; attacks lasted three days, gradually passing into period of calm, generally lasting about one and one-half months. In year preceding operation, had had seven attacks. Result: cure. Operation: supravaginal hysterectomy with both adnexa. Remarks: fibroid uterus.

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Malcolm. A Twisted Inflamed Fallopian Tube, *Proc. Roy. Soc. Med.*, London, 1907 to 1908, p. 99. Married fifty-two years; eight children. Acute attack after two years of pelvic symptoms, and operation one month after acute attack. Severe pain on two or three occasions. Clinical diagnosis: pyosalpinx. Left side affected. Right side, all right. Left ovary uninvolved. Adhesions about twisted mass in Douglas' pouch. Anatomical diagnosis: pyosalpinx (?) twisted. Says nothing about contents. Deep bluish-black color.

Martin, A. Eine Tubarschwangerschaft mit Stieltorsion, *Zeits. f. Geburtsh. u. Gyn.*, 1893, Band xxvi, 221. Aged thirty-one years. Five children. Pain for two weeks, making patient unfit for work. Mass size of two fists in left side of pelvis. Left side affected; ovary attached. Right side, all right. Diagnosis: ectopic pregnancy (tubal); twisted twice. Adhesions all around. Microscopic examination confirms diagnosis. Bloody ascites.

Martin, Rouen. Torsion du pédicule d'un hydrosalpinx droit, Ref. *Compt. Rend. de la Soc. d'Obst., de Gyn., de Ped. de Paris*, 1906, viii, 147. Aged thirty-four years. Nulliparous. Thought herself four months' pregnant, and threatened with miscarriage. Nine years previous, in bed one month on account of severe pains in lower right quadrant of abdomen. Since then, not seriously ill. Past four or five months, distention of abdomen, accompanied with diminution in menses. Nausea and vomiting in morning. Just before admission, suddenly seized with violent abdominal pains; vomiting. Examination: uterus normal in size. In right cul-de-sac a rounded, fluctuating tumor, tender, distinctly from uterus. Clinical diagnosis: Torsion of pedicle of small ovarian cyst, or more probable of a right salpingitis. Operation: smooth, fluctuating tumor in Douglas'; no adhesions; it was the right tube, internal end forming pedicle, two reverse twists. A hydrosalpinx; ovary not involved. Opposite adnexa, all right. Tumor measured 110 x 90 mm.

v. Merdervoort, Pompe Van.   Een geval van torsie van een pyosalpinx, *Nederl. Tijdsch voor verlosken Gyn.*, p. 175. Abst. *Frommel's Jahresbericht*, 1905, p. 209.   Aged twenty-four years.   Lower abdominal pain for five years.   Left side affected.   Right side also large pyosalpinx.   Diagnosis: pyosalpinx.   Both pyosalpinxes were tuberculous.   Outer part size of egg.   Interstitial part converted in fibrous strand from torsion.

Michel.   Eine Beobachtung doppelseitiger Torsion beider Tuben, *Ann. de Gyn. et d'Obstet.*, 1907, April.   Ref. *Zent. f. Gyn.*, 1909, xxiv, 863.   Aged thirty-five years.   Married. Para-II.   Operation: four weeks after first attack.   Both sides affected.   No pus in tubes, although woman had had fever.   Diagnosis: hydrosalpinx, right; twisted four times, left to right.   Hematosalpinx, left; twisted three times, right to left.

Morel.   Hématosalpinx à pédicule tordu.   *Bull. et Mém. de la Soc. Anat. de Paris*, December, 1903, p. 863.   Aged thirty-two years.   Para-IV.   Clinical diagnosis: ectopic pregnancy.   Subjective conditions: had missed no period. Severe pain one morning in left side, spreading to whole abdomen.   Vomiting; bile.   Examination of abdomen: rigid, tender.   Mobile, tender tumor in posterior cul-de-sac.   Operation (next day): uterus large, appears gravid. Right adnexa normal.   Posterior cul-de-sac occupied by a mobile, violet-colored tumor, developed from left adnexa; size of turkey egg.   Pedicle twisted five or six times reversely.   Wall of tubal sac delicate, and through it can be seen the hemorrhagic contents.   No anatomical diagnosis; ectopic (?); hematosalpinx?

Nanu.   Hematosalpinx torsion du pédicule.   *Bull. et Mém. de la Soc. de Chir. de Bucarest*, 1900, 160.   "M. Nanu presented a specimen, obtained by abdominal hysterectomy, of a uterine fibroid with both tubes.   One of these a right hematosalpinx, has the pedicle twisted twice about its axis;

it occupies the position of the cecum, which it resembles in form. It had also adhesions of the omentum."

Ortner. *Berichte aus Geburtsh. u. Gyn. Gesellsch. in Wien, Zent. f. Gyn.*, 1909, xxix, 1025. Aged thirty years. Evidences of previous infection not discussed. Symptoms acute, followed straining at stool. Chills, vomiting, and pain. Operation after six days' symptoms; mass found a month before. Left side affected. Tube thick as ball of thumb, swollen, and dark blue; mucosa gone, inside tube. Right side: abdominal ostium closed. Omentum adherent to fundus. Diagnosis: hemato and pyosalpinx twisted about 2 cm. from uterus, one and one-quarter times in direction of hands of watch. Left ovary, all right. Hemorrhagic infarcts in tube wall; pus and blood in contents.

Pierson. Reported by Storer. A study of Axis Rotation with Especial Reference to the Torsion of Ovarian Tumors, *Boston Med. and Surg. Jour.*, 1896, cxxxv, No. 19, p. 461. Acute appendicitis. Right side affected. Tube full of pus; lay above pelvic brim with fimbriated extremity looking towards the loin. Diagnosis: pyosalpinx twisted one and one-half before backward, close to uterine end.

Pinard and Paquy. Torsion de pédicule d'un hydrosalpinx droit coincidant avec une grossesse de quatre mois, *Compt. Rend. de la Soc. d'Obst., Gyn., Ped.*, Paris, October, 1901. Aged twenty-six years. One child previously. Numerous severe attacks of pain during the second pregnancy, and for last five years; vomiting in last attack; pain, nausea, frequent micturition, vomiting, diarrhea, meteorism, and icterus. Operation after induction of labor and emptying of uterus, because symptoms continued, especially fever. Right side affected. Right salpingo-oöphorectomy. Pregnant uterus. Diagnosis: hydrosalpinx twisted twice, reversely to hands of watch; size of orange. Ovary, all right. Another reference to the same case, and from which some of the notes were taken is: *Compt. Rend. de la Soc. d'Obst.*

Gyn. et de Ped. de Paris, 1902. The age here is given as thirty-six, but all other details are the same.

Poirier et Cathelin. Salpingite, gauche tordue, *Bull. Soc. Anat. de Paris*, 1900, p. 209. Aged forty-two years. Para-III, last twelve years previous. Clinical diagnosis: retroflexed uterus, or probably adnexal disease. Anatomical diagnosis: hydrosalpinx, twisted. Seat of tumor: left; size of orange. Tubal localization external portion. Form: pear-shaped, nodular. Twists three and one-half directly. Contents: blood. Ovary: twisted. Objective signs: resistant tumor, abdominopelvic (posterior cul-de-sac). Subjective conditions: menstruated at twelve; irregular; active pains; metrorrhagia. Operation: laparotomy; bilateral castration. Result: death next day. Remarks: autopsy did not reveal cause of death.

Pozzi. Note sur quatre nouveaux cas de torsion de la trompe kystique, *Comptes Rend. de la Soc. d'Obst. de Gyn., de Ped. de Paris*, 1900, ii, 95. (This is same as case in *Rev. de Gyn. et Chir. Abd.*, 1900.) Case I. Aged thirty-nine years. Para-II. No miscarriage. Clinical diagnosis: salpingitis cystica, prolapsed in Douglas'. Subjective conditions: pains in lower abdomen two and one-half years. In January, 1899, continuous metrorrhagias, leucorrhea, attacks of pain, relieved by rest. End March, during period, severe pains sub-umbilical region. Nausea, vomiting, constipation; distention of abdomen. Admitted March 14, 1899. Objective findings: uterus forward; tumor size of fist posterior cul-de-sac. Operation: pyosalpinx, right, ruptured during removal; size of mandarin. Pedicle twisted twice. Ovary: necrotic. Opposite adnexa. Microcystic degeneration of ovary; tube normal. Result: cure. Remarks: appendix could not be found; probably had become necrotic and sloughed off in tubal mass. Origin of pyosalpinx, probably from appendix. Case II. Aged thirty-seven years. Para-III. Placenta prævia at first. In 1891, metritis follow-

ing chilling during menstrual period. In 1894, evacuation by "subperitoneal laparotomy," without opening peritoneum, of a quantity of pus, from left iliac region. Regained health. December, 1899, fever, vomiting, pain mid-point twixt umbilicus and anterior superior spine. Tumor size of mandarin at McBurney's point. Vaginal examination negative. Clinical diagnosis: appendicitis. First operation: January 1, 1900; cystic right tube size of orange, twisted once from behind forward. In handling, ruptured. Contents: viscid hemorrhagic fluid mixed with pus. Appendix intact. Opposite adnexa not examined (right ovary also twisted, remained with tube). Convalescence normal until January 11. Pain left iliac region, beneath scar of operation in 1894: fever. Second operation January 14, 1900. Left iliac incision. Pus cavity adherent to scar. Pyosalpinx blackish in color, twisted once, from behind forward. Ovary carried down and forward; tube up and backward. Resembles adnexa of opposite side. Removed tube and ovary. Result: cure.

Case III. Aged thirty-three years. Para-I (forceps). Subjective conditions: metritis at age of twenty-eight; from time to time, thereafter, attacks of pain (tubal colic), lasting two weeks, not at menstrual periods. January, 1900, very severe pains in lower abdomen. From then on, several attacks of abdominal pain, and constant bleeding up until operation. Objective findings: cervix large, soft, patulous. Uterus large; to left and in front of uterus a cyst size of fetal head; on right, slight induration. Clinical diagnosis: ovarian cyst, left; salpingitis, right. Operation: April 2, 1900. Large tumor resembling ovarian cyst found on left side, but pedicle arises from right; enormously dilated tube, weighs 300 gms., twisted once reversely to hands of watch. Ovary sclerocystic. Contents: fetus, $3\frac{1}{4}$ m.; dead, not macerated. Opposite adnexa. Ovary, all right. Tube: hydrosalpinx. Salpingostomy. Result: cure.

Praeger, J. Ueber Stieldrehung der Eileitergeschwülste, *Arch. f. Gynäk.*, 1899, Band lviii, p. 579. Case I. Aged twenty-two years. No pregnancies. Suffered with delayed menses and distress in lower abdomen, July, 1897. In October, 1897, ovarian tumor diagnosticated; acute attack April, 1898, vomiting, constant and severe pain. Operation three months later. Clinical diagnosis: adherent ovarian or tubal mass. Left ovary and tube removed; right ovary resected; right tube opened. Left side affected. Ovary involved. Right side affected involved in hematocele. Adhesions all around. Diagnosis: hydrosalpinx twisted twice, in direction of hands of watch. Dark red color; hemorrhagic infiltration. Case II. Aged thirty-five years. One child. Acute pain in lower abdomen, February, 1898. Tumor in left abdomen found. No pain to February, 1899; thereafter, amenorrhea for twelve weeks; severe pain; constant vomiting; retention of urine. After eight days, all right. Since then, great tenderness over abdomen; tumor reaching to navel on left. Clinical diagnosis: left ovarian cyst with torsion. Operation February 23. Left side affected, ovary not involved. Tumor measures 10 x 10 x 7 cm. Right side, all right. Diagnosis: hydrosalpinx twisted twice in direction of hands of watch. Contents: blood, and bloody masses; hemorrhagic infiltration.

Ries. Spontaneous Amputation of both Fallopian Tubes, *Amer. Gyn. and Obstet. Jour.*, April, 1900, p. 325. Aged thirty-two years. Married. One child eleven years ago; two miscarriages: one twelve and one eight years ago. Ailing since first confinement. Attack of severe pain four years ago; in bed a week. Clinical diagnosis: inflamed right adnexa; vaginal section; both sides of tubal stumps attached to uterus. Remainder of right tube consists of right hematosalpinx, size of goose egg. Universal adhesions. Both ovaries removed, but all right except adherent. Diagnosis: right hematosalpinx. Amputated spontaneously

by torsion. Serous bloody fluid; normal tube amputated on left. No trace of tube beyond twist.

Ross. Twisting of the Fallopian Tube with Gangrene, without Implication of the Ovary, *Amer. Jour. Obstet.*, 1906, liv, p. 653. Age (?). Married. Clinical diagnosis: acute appendicitis. Pain began after cranking automobile. Emergency operation. Right side affected. Left tube tuberculous. Diagnosis: pyosalpinx twisted one and one-half times. Ovary, all right. Right tube proved to be tuberculous.

Rouffart, E. Un cas de pyosalpinx tordu observation. Piece anatomique, *Bull. Soc. Gyn. and Obstet.*, Brussels, 1900, tome x, No. 10, p. 257. Case I. Aged forty years. Para-II (last eighteen months previous). Diagnosis: retroversion of uterus. Seat of tumor: left, size of orange. Tubal localization: external portion. Color: blackish. Size: engorged intestinal loop. Left side affected. Contents: pus. Retroposition of uterus. Adhesions: rectum and lower portion ileum. Ovary not twisted. Opposite adnexa: tube adherent to rectum. Pyosalpinx. Objective signs: cervix patulous; retroversion. Tumor anterior to left of uterus, fluctuating. Subjective conditions: menstruation began at ten years; regular; paroxysmal pains arising on left side. Operation: laparotomy; supravaginal hysterectomy. Result: cure. Remarks: fimbriated extremity of tube was carried to median line, and posterior surface of tube adherent to anterior surface of uterus.

Rouffart, E. Tubentorsion gefolgt von völliger Trennung, *Jour. Med. de Bruxelles*, 1900, Nr. 12. Ref. *Zent. f. Gyn.*, 1900, xxxvii, 975. Case II. Aged twenty-six years. Para-I. Complete separation outer part of right tube, as a consequence of torsion; probably a previous hydrosalpinx; separated part, adherent and parasitic; ovary adherent. Left parovarian cyst.

Sänger. Ueber hämorrhagische Tubennekrose, *Zent. f.*

Gynak., 1893, No. 31, p. 727. Aged thirty-nine years. No children. For some time irregular menorrhagia and metrorrhagia. Acute pain in left adnexa. Operation after two months; no fever; vomiting. Both sides removed. Left side affected. Right side inflamed, small hydrosalpinx. Diagnosis: hydrosalpinx; mass, size of an apple; bilateral adhesions; hemorrhagic infarction from obstructed circulation. Contents: blood, fluid dark. Sänger attributed hematosalpinx and hemorrhagic necrosis in this case to the action of adhesions and torsion.

Siredy. *Compt. Rend. de la Soc. d'Obst., de Gyn. et de Ped. de Paris*, 1906, viii, 150. In discussion of Martin's (Rouen) case, reported following. Patient (age not given) had no symptoms, whatever, from genital tract. Was, at a wateringplace, taken with enteritis; the local physician found, by accident, a tumor size of adult's fist in left side. Patient had no pain or symptoms, whatever, but subsequently decided to be operated on. At operation, a cystic hydrosalpinx with thin walls, twisted twice, was found.

Stark. Acute Torsion of Normal Appendages with Hematosalpinx, *Jour. Obstet. and Gyn. of the British Empire*, 1911, xix, 258. Aged forty-six years. Unmarried. Attacks of pain for nine months. Clinical findings (virgin): to right of uterus, tense firm body, size of ordinary tomato; on left side, marked enlargement of the tube. At operation: blood clots in lower abdomen; on left, hematosalpinx twisted three times. Ovary closely applied to tube. Right dermoid cyst: intraligamentous.

Stolz. Beitrag zu den cystischen Bildungen an der Tube, *Monats. f. Geb. u. Gyn.*, 1899, Band x, Heft 2, p. 175. Aged twenty-three years. Single. Left side affected. Cystic tumor of the tube arising from adherent folds of mucosa; 750 c.c. of clotted blood and reddish-brown fluid. Right side all right. Diagnosis: cyst of tube; diameter about 12 cm.; twist 540 degrees; slow torsion.

Storer. Bilateral Torsion of the Fallopian Tubes, *Boston Med. and Surg, Jour.*, 1906, cliv, No. 11, p. 285. Aged twenty-nine years. Married six years. No pregnancies. No history of gonorrhea. For a year dull pain in left side; recently pain before menstruation. Clinical diagnosis: left salpingitis; right hydrosalpinx. Both sides affected; right side no strangulation; left side decided strangulation. Hemorrhagic infiltration and infarction on left side. Neither ovary involved. Diagnosis: hydrosalpinx (bilateral); right twist 360 degrees follow hands of watch; left hydrosalpinx twisted 180 degrees, opposite to hands of watch.

Stratz. Akute Stiehldrehung einer Hamatosalpinx., *Zent. f. Gynäk.*, 1907, Nr. 31, p. 1444. Aged thirty-six years. Para-III (last twelve years ago). February, 1906, after moving, profuse bleeding and pain in right side. Clinical diagnosis: right tubal enlargement; hydro- or pyosalpinx, or tubal pregnancy. Operation: March 22. Right side affected; left side, all right; from clinical examination, nothing said of it at operation. Diagnosis: hydrosalpinx twisted forward over round ligament, and adherent above bladder. Contents partly pus. Microscopic diagnosis: chronic salpingitis with torsion and formation of hemato-salpinx. Bluish-red tumor. No mention of tuberculosis or other infection.

Stroganoff. *Wratch*, 1893, p. 1095. (From Praeger.) Right side affected. Ovary cystic. Diagnosis: adeno-sarcoma of tube; twisted once, to right.

Taylor. Cyst of Fallopian Tube with Twisted Pedicle, *Trans. Brit. Gyn. Soc., Brit. Gyn. Jour. B.*, 1893–04, ix, 418. Aged thirty years. Married at nineteen; child at twenty. Had retroflexion and sterility for seven years. Dr. Taylor did Alexander operation; and patient shortly after became pregnant, and was confined at term. Two or three months after, had abdominal pain, and tumor found. No record of histological examination. Possibly a cyst of tube, but he says presumably a hydrosalpinx with twisted pedicle.

Veit. Ueber Hematosalpinx, *Verh. d. d. Geb. f. Gyn.*, 1891, iv, p. 216. Aged twenty-seven years. Three children. Suffered since last labor two years previous. Sudden attack, severe pain in abdomen; seven weeks after first attack, another; four weeks later, a tumor, reaching to navel, was found. Right side affected. Clinical diagnosis: torsion; ovarian cyst. Anatomical diagnosis: hydrosalpinx twisted, filled with blood.

Voigt. Stieldrehung einer ungewöhnlich grossen Hydrosalpinx bei einer Sechzig jahrygen. *Der Frauenartz*, 1909. Aged sixty years. Tumor noticed for some time; full feeling in abdomen; acute pain and tenderness. Clinical diagnosis: large, unilocular ovarian cyst; twisted pedicle; size of man's head; marked abdominal enlargement, somewhat more to left side, and within three fingers' breadth of lower border of ribs. Left side affected. Anatomical diagnosis: hydrosalpinx twisted two and one-half times to the left; 4 liters yellow, clear straw-colored fluid; tumor has a dark blue color from hemorrhagic infiltration.

Waldo. Sactosalpinx Hemorrhagica. *Amer. Jour. Obstet.*, August, 1901, p. 179. Case I. Aged seventeen years. Acute attack; previously good health. No illness before, except measles and whooping cough. Operation after two days. Clinical diagnosis: acute appendicitis (?). Fever; rapid pulse; tumor in right iliac fossa; vomiting. Right side affected; left side, all right. Diagnosis: hydrosalpinx twisted three times; completely strangulated; no ligature needed to control bleeding from pedicle; no villi or decidua. Case. II. Aged twenty-six years. Married four years; never pregnant. Well until three months previous. Since then, pain low down on left side. Fever; increased pulse; pain over entire lower abdomen, especially left. Abdominal tumor, immovable, but slight fluctuation, reaching from symphysis nearly to umbilicus. Clinical diagnosis: inflamed ovarian cyst. Operation after two weeks. Left tube affected. Ovary, all right.

Right side, all right. Diagnosis: hydrosalpinx infiltrated with blood, with several distinct and complete twists. Extensive adhesions. No villi or decidua.

Ward. Twisted Pedicles, *Amer. Jour. Obstet.*, 1910, lxii, 639. Case. I. Aged forty-seven years. Married twenty-one years, No children. Sharp attack of pain in left ovarian region eight years before; occasional recurrence. Exciting cause of this attack, cleaning house and sweeping. Acute pain and symptoms of diffuse peritonitis. Clinical diagnosis: twisted pedicle of cyst. Left side affected; left ovary involved; free fluid blood in abdomen. Right hydrosalpinx; right ovary, all right. Diagnosis: hydrosalpinx twisted three times, left to right. Case II. Aged twenty years. Married four months; pregnant four months. Acute pain during pregnancy. Clinical diagnosis: acute appendix. Right side affected. Anatomical diagnosis: hydrosalpinx twisted four times, right to left. Blood-stained fluid.

Warnek. Trois cas de tumeurs des trompes de fallope avec, torsion du pedicule, *Soc. d'Accouch. et de Gyn. de Moscou, Rev. Annal. de Gyn.*, 1894, Nr. 41, 335. Case I. Aged forty-three years. Para-III (last twelve years previous). Clinical diagnosis: cyst of right ovary with torsion of pedicle; left salpingitis. Anatomical diagnosis: hydrosalpinx twisted. Seat of tumor: left. Tubal localization: external portion. Twists one and one-half. Contents: dark red. Adhesions between intestines and the right broad ligament. Ovary twisted. Opposite side: tubo-ovarian cyst twisted one and one-half times. Bilateral carcinomatous degeneration of both tubes on microscopic examination. Case II. Aged thirty years. Para-III (first six years ago, last five months previous). Clinical diagnosis: pyosalpinx. Anatomical diagnosis: hydrosalpinx, twisted. Seat: right. Size: potato. Tubal localization: external portion dilated, adherent to broad ligament and pelvic wall; attached to inner third by a delicate band 4 cm. long, and completely

twisted. Contents: outer two-thirds, clots; inner one-third, serous fluid; small abscess in wall of outer two-thirds. Opposite adnexa: healthy. Case III. Aged forty-years. Para-O. Clinical diagnosis: bilateral ovarian cyst with twisted pedicle. Anatomical diagnosis: hydrosalpinx, twisted. Seat of tumor: right. Size: ox bladder (when tube was dried). Tubal localization: external portion. Form floating kidney. Twists four and one-half, from right to left. Contents: blood: no clots. Ovary not twisted. Opposite adnexa: tubo-ovarian cyst; intraligamentous.

Weir. Torsion of a Hydrosalpinx Resulting in Infarction, *Amer. Jour. Obstet.*, August, 1901, p. 529. Aged forty-six years. Married; two miscarriages. Previously well. Acute attack; severe pain in right lower abdomen; nausea; difficult micturition. Clinical diagnosis: Ovarian cyst. Operation after five days (Dr. Robb). Right side affected. Hydrosalpinx twisted twice. Dark red color; hemorrhagic infiltration; left side tube and ovary adherent. Ovary adherent; otherwise, all right.

Williamson. Torsion of the Pedicle of a Hydrosalpinx, *Trans. Obstet. Soc. London*, 1905. Aged eighteen years. Unmarried. Healthy to December, 1903; from that time to June, 1904, scanty and painful menses. June 7, severe pain in right side; later, diffuse pain; vomiting and distention. Operation after two days. Right side affected. Hydrosalpinx twisted three times, opposite to hands of watch. End of tube closed completely. Contents: blood. Inner surface smooth. Ovary (right): congested, otherwise, all right.

Woolcombe. A Remarkable Case of Double Pyosalpinx with Torsion of both Pedicles, *Lancet.*, December 7, 1901, p. 1584. Aged twenty-two years. Unmarried. First attack two years before, in right lower abdomen. Repeated attacks since, last one week before admission. Abdominal tumor observed for two or three months. Right side abdominal

tumor extends above the umbilicus; left side, also, abdominal tumor rising out of pelvis. Universal adhesions, but very easily separated on right. Very few on left. Diagnosis: pyosalpinx (bilateral); right side with ovary twisted one and one-half times to left. Left side without ovary twisted twice to the right. Right tube, circumference $10\frac{1}{2}$ inches; extreme length 8 inches; dark bluish-red blood inside. Right ovary involved; measures 3 x 3 inches. Left tube, the bulbous part, $7\frac{1}{2}$ inches long. Maximum circumference 11 inches. Contents resemble cream cheese; no odor, no diplococci; no tubercles; no chorion villi or signs of newgrowth.

Summary of Cases

Age.		Social conditions.		Children or pregnancies.	
16 to 20,	11	Single,	13	Nulliparous,	27
20 to 30,	24	Married,	44	I-Para,	13
30 to 40,	30	Not Stated,	38	II-Para,	10
40 to 50,	13			III-Para,	10
50 to 60,	3			IV-Para,	3
Not Stated,	14			V-Para,	1
				VIII-Para,	1
				Not Stated,	30
	95		95		95

Abdominal tumor.		Clinical diagnosis.	
Present,	34	Ovarian cyst with twisted pedicle,	25
Absent,	22	Pelvic inflammatory disease,	20
Not stated,	39	Appendicitis,	8
		Tubal pregnancy,	4
		Other diagnoses,	8
		Not stated,	30
	95		95

Side affected.		Period of observation before operation.	
Right alone	49	Less than forty-eight hours,	9
Left alone,	31	Less than two weeks,	10
Both,	7	Over two weeks,	56
Not stated,	8	Not stated,	20
	95		95

Condition of opposite adnexa.		Ovary of affected side.	
Healthy,	20	Involved,	27
Diseased,	44	Not involved,	34
Not stated,	31	Not stated,	34
	95		95

Number of Twists

Less than one	8
One	20
Two	23
Three	18
Four or more	6
Not stated	20
	95

Color of Tumor

Bluish-black	66
Inflammed and red	10
Yellow	1
Clear and translucent	6
Not stated	12
	95

Pathological Diagnosis

Hydrosalpinx	62
Tubal pregnancy	5
Carcinoma or sarcoma	2
Cystic tumor of tube	2
Pyosalpinx	12
Other diagnoses	12
	95

PERTINENT CASES NOT INCLUDED IN THE SERIES

E. v. Graff. Atresie u. Torsion einer Tube, Archiv f. Gyn., Band xciii, Heft 1. Aged thirty-five years, Para-V. Operation for cancer of cervix. Normal tube broken in its course by a thin, cord-like strand 1 cm. long.

Littauer. Tubenschwangerschaft mit vollkommener Abtrennung des Eileiters, Zent. f. Gynäk., 1902, No. 51, 1407. Tubal pregnancy— tube lying entirely free in Douglas' pouch. Possibly detached by torsion—possibly by roughness on bimanual palpation.

Monod. Double Kyste hématique de l'ovaire et de la trompe du côté droit, avec pédicule plusieurs fois tordu pur lui-meme, ayant simulé', une appendicite à reclintes, Rev. Mems. de Gyn., d'Obs., et

de Ped. de Bordeaux, 1901, iii, 101. Hemorrhagic cyst of ovary with twisted pedicle made up in part by hydrosalpinx.

Napier. Specimen of Axial Rotation of a Right-sided Parovarial Cyst with Attached Right Ovary and Fallopian Tube Distended with Hemorrhage, Trans. Obst. Soc., London, 1892, Band xxxiv, p. 124. Parovarian cyst with torsion and secondary implication of tube.

Peraire. Quintriple torsion du pédicule d'une tumeur para-uterine, Trans. Soc. Anat., November 5, 1909. La Presse Méd., 1909, No. 90. Para-uterine tumor with twisted pedicle, nature of which cannot be determined as no histological examination was made.

Russel. Hemorrhagic Infarction of the Fallopian Tube, Amer. Jour. Obst., 1894, xxx, 192. Hydatid cyst, with twisted pedicle, tube involved secondarily.

Schirmer. Ueber Stieldrehung intra-abdomineller Organe. Medizinische Klinik, 1907, No. 13, p. 347. Cyst at outer extremity of tube— uncertain origin—possibly from broad ligament —possibly from tube.

LITERATURE NOT AVAILABLE

Vanden Berg. Inaug. Dissert., Freiburg, abs. Zent. f. Gyn., 1900, No. 48, p. 1304. No details given of a case of torsion of pyosalpinx.

Basquet. Da la torsion des Salpingites Kystiques, Thése de Bordeaux, 1904, ref. Zent. f. Gyn., 1905, No. 23, p. 733. No details.

Chandelux. Hematosalpinx suppuré avec torsion du pédicule, elimination par sphacéle de la poche, Bull. Soc. Chir. de Lyon, Juillet, 1902, p. 299. Frömmel's Jahresbericht, 1903.

Doua. Bull. et mém. Soc. de Chur. de Bucarest, 1901, iii, 186.

Fasano. Bella torsini ped. Sactosalpingi, Milan, 1909.

Foehier. Bull. Soc. de Chir. de Lyon, 1900, iii, p. 183.

Koehanoff. Zwei Fälle von Torsion der Tuben, Jour. akuseh. i., Shensk bolesnei, December, Frömmel's Jahresbericht, 1910.

Konwer. Grosse Hydrosalp. mit. Stieltors, hurrührend von eines früher gesunden Virgo—warscheinlich durch Stauung verrussache, Med. Tijdschr. v. verl. en gyn., Frömmel's Jahresbericht, 1907.

Rabier, Contribution à l'étude de la torsion des trompes, Thése de Paris, Frömmels' Jahresbericht, 1902.

Sanson. De la torsion du pédicule dans les tumeurs liquides des annexes. (Kystes de l'ovaire Hydrosalpinx.) Thése de Paris, 1904, ref. zent. f. gyn, 1906, xxxiv, 967. No details.

Simount. De la torsion du Pédicule dans les Salpingitis, Thése de Bordeaux, 1908, p. 59.

Thompson. Zur Torsion der Tumeren der Fallopischen Tuben, Jour. akusehers., Shensk. bolesnei, June, Frömmel's Jahresbericht, 1906.

Timmonet. De la torsion du pédicule dans les salpingites. Thése des Bordeaux, 1905, Frömmel's Jahresbericht, 1906.

DISCUSSION

Dr. Franklin H. Martin.—This careful presentation of this subject is very interesting to me. It emphasizes an article that I published within the last few years on the congenital defects in the pelvis. The principal defects were the perpendicular pelvis and the loose mesentery. In that paper I dwelt particularly upon the proneness to displacement of the appendages and the uterus in those particular cases. As we know, there are two reasons why that should occur. In the normal, fully developed individual, the broad ligament planes are forward of the middle line of the pelvis, so that the uterus and appendages naturally are drawn forward of the middle line, and hence fall naturally anteriorly rather than posteriorly in case their mesenteries are blended, in front of the middle line.

Another thing, besides the unblending of the mesenteries there is the usual perpendicular pelvis, with the symphysis above the tip of the coccyx and the sacrum parallel with the long axis of the patient's body. With the uterus and the appendages in the centre of this, lying in the same relative position in the pelvis, the appendages must of necessity go back, and especially if their mesenteries are loose. I mean by the mesenteries, the broad ligaments and the mesosalpinx. In the normal individual we have the pelvis rotated at nearly right angles to the perpendicular plane, and besides that the broad ligaments are blended well forward, so that the uterus with its appendages is drawn in that direction. In well-developed women, furthermore, the mesosalpinx is extremely short. You could not get torsion in the normally developed woman. It is in those that are defective where we have unblending of the other mesenteries, and where the ureter stands out, as in the dog and other lower animals, that we are liable to get this condition of displacement of the appendages and torsion.

I would like to ask the essayist if anything in the cases reported indicated that the other cases had a long mesosalpinx, or whether any notice was taken of the position of the pelvis.

Dr. Henry T. Byford.—One lesson that perhaps might be learned from this case is, that there are cases of pelvic peritonitis in which an immediate operation is the operation of choice the same as in cases of appendicitis. Given a twisted pedicle

of a sactosalpinx, there may be pain and a moderate rise of temperature without sepsis. Pretty soon intestinal adhesions will occur, with possible colon bacillus infection. In such a case an operation in the early, acute stage is safer and more conservative than a deferred one.

In regard to the etiology, the condition may be the result of gonococcus infection. We have all removed adherent ovaries in which the tube apparently had recovered as macroscopically examined, in which there were no adhesions nor occlusion, nor even retraction of the fimbriæ. In other cases we have found no exudate except around the end of the tube. And we know that such exudates are apt to be absorbed, leaving a mobile sactosalpinx. We also know that intestinal adhesions may disappear. When he feels an adherent ovary that causes symptoms, the ordinary practitioner is likely to make a diagnosis of pyosalpinx, and upon operating find a normal looking tube. It is unnecessary to consider these cases as of tubercular origin, or due to congenital deformities.

Dr. JOHN A. SAMPSON.—I have been very much interested in Dr. Anspach's paper because I have had two similar cases. The first patient, aged nineteen years, was operated upon in 1904 for an acute pelvic inflammatory condition, and I found at operation that the right tube had a twisted pedicle. The specimen was similar to the one Dr. Anspach has described except that it was larger, the opposite tube was also enlarged but its pedicle was not twisted. The right tube and ovary were removed, and also the left tube. The operation was done in the Johns Hopkins Hospital in the service of Dr. Kelly. I do not know the microscopic findings in the case and whether or not it was tubercular.

The second case was operated a year and a half ago. The patient, aged twenty-one years, gave a history of a sudden attack of severe abdominal pain on the right side, associated with nausea and vomiting. I made a diagnosis of ovarian cyst with twisted pedicle. At the operation I found an enlarged tube on the right side, which was hemorrhagic as described by the essayist, with a distinct twisting of the pedicle; also an enlarged tube on the opposite side, elongated, and to all appearances a pyosalpinx. Supravaginal hysterectomy was done together with removal of the right tube and ovary and the left tube. The specimen was placed in the position it

occupied in the pelvis, and the arteries were injected with 15 per cent. gelatin containing red lead. The ovary in the side of the tube, with the twisted pedicle, was not involved in the twist. The tube on the opposite side was examined microscopically and proved to be tubercular.

A radiograph of the injected specimen shows that the twisting of the pedicle prevented any of the injection from reaching the tube.

Pain arising from a twisting of a portion of a tube may occur. I desire to show a radiograph of a tube and ovary which were removed with a large myomatous uterus. The patient had a sudden, severe attack of pain, and the pain apparently arose from a twisting of the pedicle of an hydatid of Morgagni. The arterial supply of the specimen was injected with bismuth subcarbonate and may be compared with that of a normal hydatid of Morgagni which was removed from another case and also injected.

DR. JOHN O. POLAK.—I wish to place on record a case of pyosalpinx with a twisted pedicle. This occurred in a girl, aged nineteen years, who was apparently of the type Dr. Martin has described. The operation was done three days after the primary attack of acute abdominal pain. One interesting point about this case was the extreme size of the tube, which measured eighteen by ten centimeters in its diameters, and the fact that the ovary was not involved in the twist, the twist being in the free and isthmic portion of the tube. The tumor was smooth, dark, and free from any adhesions. This was undoubtedly a hematosalpinx which had become infected. On microscopic examination there was no evidence of the tubercle or colon bacillus found in the tube content.

DR. E. E. MONTGOMERY.—Some years ago a young lady, aged twenty-two years, consulted me, who suffered from a severe attack of pain in the pelvis. It came on so suddenly as to lead to the suspicion of ectopic gestation. On opening the abdomen both tubes were found filled with pus, the pedicle of the left tube was twisted, and there were quite extensive hemorrhages into the peritoneal cavity from the surface of the sac produced by interference with the circulation. The environment of the patient led me to believe it was secondary to an acute gonorrheal infection. No microscopic examination, however, was made of the specimens.

Dr. Anspach (closing).—In regard to Dr. Martin's remarks on the predisposition to torsion by the shape or the type of the tube, I think in my case there was a decided abnormality in that direction. The tube was much longer. On the left side it was seventeen centimeters in length. You can see there would be plenty of room for a twist, and with this heavy extremity absolutely free it might occur. It did not occur on this left side because the ovary was adherent; whereas, I believe the right ovary was originally unaffected by adhesions. This elongation of the tube and lax mesosalpinx is mentioned by other authors notably von Berg, although no one has spoken so far as I know of faulty inclination of the pelvis or habit of posture as a predisposing cause.

As Drs. Sampson, Polak, and Montgomery have shown by their cases, the typical history is that the attack comes on in a young woman and the cause of the pelvic trouble is not easy to explain. Possibly that is the reason why many of these cases are kept so long before operation, *i. e.*, because the diagnosis is obscure. I was very much interested in hearing what Dr. Sampson had to say with reference to finding tuberculosis in his specimen. The involvement of the ovary seems to be a secondary thing, and in only six of the reported cases was it twisted with the tube.

MENSTRUATION WITHOUT OVARIES

By Palmer Findley, M.D.
Omaha, Nebraska

Maxillian Neu (*Zent. f. Gyn.*, 1911, No. 10), in writing of so-called "pseudomenstruation," records his observations in 54 cases in which both diseased ovaries were wholly removed. He observed that in every instance in which the ovaries were removed fourteen or more days after the last menstrual period that a menstrual flow occurred shortly after the operation and resembled in duration and amount the regular menstrual flux, but where the operation was performed in less than fourteen days after the last menstrual period there was no loss of blood following the operation. He believes that these hemorrhages were not accidental but were regular menstrual hemorrhages.

The statistics of Straehl, Schmalfuss, Wiedow, Glaveke, Hernes, Liesan, and Pfister show that the menses return for a variable number of times after double ovariotomy in from 2.7 per cent. to 24.4 per cent. of all cases, or an average of 12 per cent. This percentage would be increased were the occurrence of vicarious menstruation included. Pfister, in 116 cases of double castration, had 12 cases in which hemorrhages from the nose and bowel recurred at regular intervals over a period of one to two years. According to Pfister, 30 per cent. and Glaveke, 50 per cent. of all castrated cases experience the menstrual molimina for two or more years. In the above statistics no account is taken of the

occurrence of hemorrhage from the uterus which frequently follow double ovariotomy and persist for one or more days only but do not recur at regular intervals.

My interest in the periodic recurrence of the menstrual flux after the removal of both ovaries was incited by the following case:

Mrs. B., aged thirty years, referred by Dr. Sykes, of Hamburg, Iowa, was first operated September 30, 1909 by Dr. Jolly, of Hamburg, Iowa, who, at that time, removed the left tube and ovary and appendix. On May 9, 1910, he removed the right tube and ovary. In both cases, the ovaries were markedly cystic and not adherent.

My relation to the case began September 14, 1911, when she complained of a constant pain in the back and in the right side of the pelvis which had persisted for two or more years. She ceased to menstruate for three months after the last operation by Dr. Jolly; then proceeded to flow at regular twenty-eight day periods. The flow did not differ from that of previous years.

On examination I found a mass about the size of a hen's egg to the right of the uterus that was tender to pressure and immovable; this I assumed to be an adherent cystic ovary resulting from a retained fragment of an excised ovary. Upon opening the abdomen I discovered that this mass was the omentum firmly adhered to the right horn of the uterus and that there were adhesions distributed throughout the pelvis. In a careful search no trace of ovarian tissue was found. Neither of the ovarian ligaments was in evidence. I amputated the omentum high above the uterus and broke up all pelvic adhesions, leaving no raw surfaces. The uterus was normal but atrophied to about two-thirds its normal size. An exploratory curettage revealed nothing abnormal within the uterus. It is now seven months since the operation and the patient writes me that she is in good general health, but that *her menstrual periods have continued to recur*

at regular intervals and in the usual amount. She says she is very nervous and suffers from hot flashes. She has not taken ovarian or corpus luteum extract.

The findings in this case are almost identical with those in the case reported by Dr. George Gellhorn, of St. Louis, in the *Zent. f. Gyn.* 1907, No. 40. In his case both ovaries were removed, one in 1905, and the other in 1906. She complained of pain in the abdominal scar and groin and hot flashes. She had menstruated at regular monthly intervals for seventeen months following the second operation in which the second ovary was removed. In the operation of Gellhorn, general pelvic adhesions were encountered, the omentum was adhered to the abdominal scar and fundus of the uterus by means of three solid cords which were severed. The uterus was atrophied but otherwise appeared normal. There was no evidence of tubes or ovaries. The case was followed for six months, during which time there was no return of the menses.

It will be noted that Gellhorn's case and mine differed in only one essential detail; the menses recurred at regular monthly intervals after the operation in my case; while in Gellhorn's case they had not recurred during the six months of observation following his operation.

Gellhorn very logically concludes that in his case the persistence of the menstrual periods following the removal of both ovaries was aided by the added blood supply brought to the uterus through the adherent omentum, and that inasmuch as no ovarian tissue was found and could not possibly have been removed by him in the operation, he believes that the cyclic element was the controlling factor in continuing the menstrual periods. In his study of the case he was careful to eliminate such causal factors as endometritis, fibroids, polypi, cancer, and general conditions, such as an incompetent heart which might result in pelvic congestion. He believes that the ovary is not the essential cause but

merely a stimulus to the menstrual cycle and illustrates his point by a recital of another case in which both ovaries had been removed, the menses ceased for six months when ovarian extract was given, and in six weeks from the time ovarian extract was given, the menstrual periods began and continued to recur at regular periods so long as the patient was under observation. In this connection, it is of interest to note that Van de Velde made a number of abservations in women of forty-three to forty-nine years of age in whom the menses ceased for a period of four to eighteen months and returned shortly after the administration of ovarian extract.

In a personal communication from Dr. Gellhorn, he suggests that the probable explanation for the menstrual periods persisting after the removal of both ovaries in my case is found in the formation of adhesions binding the omentum and other pelvic structures to the uterus and that possibly these adhesions recurred after the operation which I performed, thus accounting for the persistence of menstruation after my operation was performed. I do not believe that the amputated omentum could possibly adhere to the uterus, but there were extensive adhesions elsewhere in the pelvis which might readily reform. The point is well taken by Gellhorn that in a woman in the age of sexual maturity and in the absence of ovarian tissue, the menses may recur at regular intervals through the agency of the vascular connections with the uterus as existed in his and in my case. That between the ages of twenty-five and forty a comparatively small stimulus may suffice.

It is of passing interest to note the experiments of Josef Halban (*Zent. f. Gyn.*, November, 1911), who studied the recurrence of rut in frogs after castration. While the rut was diminished in degree it recurred at regular intervals. These observations suggested to the mind of Halban that the genital glands are not essential to rut and he assumes

the existence of some as yet unknown cause for the menstrual phenomena.

The theory that has met with general acceptance is that of the presence of ovarian tissue left behind after the removal of both anatomical ovaries. In the removal of adherent infected ovaries small bits of ovary may be easily left attached to surrounding structures and thus account for the persistence of the menstrual periods. Supernumerary and accessory ovaries form the subject of very able discussions by Dr. Manclaire and Madam Isenberg-Paperin (*Archiv. gen. de chirurgie*, July 25, 1911), and Meriel (*Paris médical*, October 14, 1911). Two varieties of supernumerary ovaries are recognized: (1) Contiguous supernumerary ovaries placed on or close against the anatomical ovary, and (2) aberrant supernumerary ovaries lying at some point in the line of descent of the fetal ovary or more or less removed from that line. Meriel found aberrant ovarian tissue in 4 per cent. of female bodies of all ages. These bodies were usually not larger than a millet seed or pea and rarely attained the size of a cherry. The greater number lie adjacent to the anatomical ovary but may be found in the broad ligament, ovarian ligament, pelvic pouches, under the peritoneum adjacent to the ureter, and adhered to the omentum and intestine. They are prone to develop new cystic growths just as are aberrant thyroid and adrenal bodies.

Meriel explains the occurrence of these supernumerary bodies lying close to the anatomical ovary on the hypothesis of gland division by fetal peritoneal bands. He observes that the ovary and accessory bit are separated by cicatricial tissue. The more remote supernumerary bodies are the result of peritoneal bands formed early in fetal life, before the ovary had made its descent. Or, as Chipman (*Trans. Am. Gyn. Sec.* 1911) suggests, it may be due to the persistence of the type of diffuse ovaries found in birds and reptiles.

Not only may menstruation persist after double ovari-

otomy, but Blair Bell, Doran, Chipman, Hoegh, Gordon, and others have reported instances in which pregnancy followed the removal of both ovaries thereby supplying proof positive of the functioning capacity of the supernumerary ovaries.

Referring again to the cause of the periodic recurrence of the menstrual periods after the removal of both ovaries, I submit that there is no convincing proof that such an event is possible in the absence of ovarian tissue; that when a woman continues to menstruate at regular intervals after complete double ovariotomy, it must be assumed that she is still the carrier of ovarian tissue.

The argument of Dr. Gellhorn for the "habit of menstruating" aided by the added blood supply coming through the omental tissue adhered to the uterus, is well taken in his case but cannot be accepted without qualification without excluding the possible existence of accessory ovarian bits; and this, I believe, to be a physical impossibility on the living subject.

That the ovaries are not the only essential etiological factor in menstruation, we can neither affirm nor deny. The case of Gellhorn and the experiments of Halban suggest the possibility that menstruation can proceed and can recur at regular epochs over periods of months and years after the removal of all ovarian tissue. There is much need for further investigation of this important subject.

DISCUSSION

DR. J. CLARENCE WEBSTER.—I think we have all had experience of hemorrhage occurring from the uterus after the removal of the ovaries. We have even had cases of hemorrhage from the cervix after the removal of the body of the uterus. I believe that a number of these cases—perhaps a considerable percentage—may be explained either by vascular

degenerations in the uterine or ovarian arteries, or in both, or in varicose veins of the broad ligaments. In most instances the bleeding occurs at irregular intervals. I can only recall one case in my experience where a regular flow suggestive of menstruation occurred after castration.

I do not believe that Dr. Gellhorn's suggestion of adhesions will hold for a moment as explaining such cases. I think Dr. Findley's last suggestion is probably the important one, namely, the retention, after the operation, either of a portion of the ovary in the stump, or what is more likely, where good surgery is carried out, the existence of small detached portions in the broad ligaments. I believe that we have aberrant Müllerian tissue in the pelvic viscera. It is certain that aberrant ovarian tissue may be occasionally demonstrated microscopically in the form of portions the size of a millet seed or a pea, especially in the broad ligament. When we consider the course taken by the ovary in its development, it is not surprising that there should be small portions invisible perhaps to the naked eye left along the track, and therefore it is not strange that the menstrual habit may be kept up for years, where both visible ovaries have been removed.

Dr. HENRY T. BYFORD.—There are two points I should like to bring out which vary a little from the paper. First, the testimony of the patient. I recall a patient in whom I amputated the uterus at the internal os and removed the ovaries, who afterward claimed that she was still menstruating. Upon careful investigation I found it was not exactly at the end of every month that she had a discharge of blood. Sometimes the interval was about three and a half weeks, sometimes four weeks, sometimes a little over four weeks. Sometimes there was a little flow between the supposed menstrual periods. In short her flowings were atypical hemorrhages due to a lesion of the stump.

With regard to adhesions, my experience has convinced me that they can produce bloody uterine discharges. I have had many cases of adhesions in which the chief symptom was hemorrhage. In talking to students it is my custom to divide chronic cases of adhesions clinically into two classes of cases, the hemorrhagic ones and the painful ones; and tell them that the hemorrhagic cases often have no pain, and the painful cases seldom bleed much. The flow in most chronic cases is

not profuse, but is merely a prolongation of the menses, with irregular discharges of blood or blood colored mucus between them. The exciting cause of the bloody discharges is the same as the cause of pain in the painful class of cases, viz., overdoing. I have relieved them of the bleeding and thus have symptomatically cured them by having the patient lie down part of each day and avoid active exercise. There is nothing more established in my mind than that adhesions may modify the circulation by increasing it or damming it up, and can, in connection with overexertion, produce irregular bloody discharges from the uterus, or prolong the regular menstrual flow.

Dr. J. M. Baldy.—I should like to emphasize, as Dr. Byford has done, not only the statement of the patient, but the statement of the doctor as to what is menstruation. Dr. Byford has covered very fully the unreliability of the statement of the patient as regards menstruation, and in this connection I would call your attention to a statement, for instance, of a notable New York surgeon, who transplanted ovarian tissue and called the discharge of blood that followed menstruation. It was a mere show of blood which disappeared in a short time. Everybody recognizes that it was not menstruation at all in the sense that we have recognized menstruation.

The far-fetched theories in regard to the causes of this have never appealed to me. Take, for instance, the last one put forward by the essayist, the aberrant ovary; that because a woman menstruates she must have ovarian tissue left; that because a man commits a crime, that therefore he is insane. That is exactly the same line of reasoning.

Dr. Webster's suggestion in the beginning of the discussion has appealed to me always as much more potent than any other as explaining these, oberrant bleedings I will call them I will not dignify them by the name of menstruation, and that is the degenerative changes in the vessels in the pelvis. As a matter of fact, when we talk about these patient's menstruating, who tell us how how long they menstruate, or how soon it has stopped, in most cases if we investigated we would find the discharge had stopped, after a space of time. I have never known a case to go more than a year and a half at the outside; perhaps there may be a few cases that exist in which the discharge has gone on longer; those cases were not adherent cases, and there was no considerable portion of ovarian tissue

left to account for the continued menstruation. As a matter
of fact, they usually universally stop after an indefinite length
of time. It cannot be the aberrant ovarian tissue, because an
aberrant ovary sufficient to start a discharge would continue
throughout the whole life of that woman.

DR. FRANK T. ANDREWS.—I am reminded of a rather in-
teresting case, although all of the details are not sufficiently
clear in my mind. There was a family of four girls, and inci-
dentally there were two sons. One of the sons was a tall man
and deformed by a talipes equino varus. The other son grew
up and became a banker. This is not, of course, gynecological,
but it bears a little on the family history. The four girls were
referred to me by a physician from Wichita, Kansas, who had
operated on one girl after marriage for a large ovarian tumor.
He removed her ovaries. Another girl, after some years, was
likewise operated upon, and he removed her ovaries and she
had a normal change of life. There was a normal result in that
case, resulting in stoppage of the flow. Then the family moved
to Chicago, and here were two girls suffering severely with
dysmenorrhea. After caring for them and striving to avoid
operation for several years, in the meantime getting the best
advice I could from my gynecological and neurological friends,
I decided to operate one of them. Finally, I operated on the
last one, and she made a normal recovery. The first one oper-
ated on improved very much for about nine months, but she
kept on flowing apparently normally. The operation consisted
in removing one ovary, leaving one ovary, and removing both
tubes. After the dysmenorrhea returned, upon examination
I found she had developed an ovarian tumor in the remaining
ovary. This was a year and a half after the first operation
In operating on that and carefully looking over the field I
discovered there was a little stump I had not taken out on one
side for some reason; I had not cut in and taken the whole
tube out from the cornua of the uterus, so I removed that.
The other one was thoroughly removed. I removed the ovarian
tumor and she continued to menstruate. About three or four
years after that I removed the bulk of the uterus, leaving the
cervix. The woman continued to menstruate, and for some-
where in the neighborhood of four years from that time until
now this woman goes through exactly the same nervous dis-
turbances every month that she used to go through while

menstruating, but she has ceased to flow. I have had four neurologists examine this patient at intervals at different times, and there has not been a single symptom discovered of hysteria. That element is cut out of the case entirely.

DR. EDWARD P. DAVIS.—Recent studies to settle the vexed question of the time of labor throw light upon the question under discussion. It is found that the physiological life of woman consists in periods of accumulation of blood terminating in increased pulse tension and in hemorrhage; that this condition is independent of the presence of genital organs; that is, that the genital organs may be removed, and this established physiological habit of woman still continue. In some cases the persistance of this discharge and the increased tension is the result of a disorder of the ductless glands and some cases are improved by the administration of thyroid extract or pituitrin or adrenalin. This would explain some of the cases now under discussion where the absence of genital organs by operation has been followed by continued hemorrhage. The hemorrhage will occur from a physiological standpoint in any organ lined by mucous surface, richly supplied by subjacent capillaries, and in the absence of uterine mucosa hemorrhage is seen which is familiar to us from the nasal cavity, sometimes from the gastric mucosa, and sometimes from the intestine, and rarely in the hemorrhages underneath the skin which, when complicated by hysteria, give rise to those interesting cases of alleged bloody sweats and supernatural manifestations.

DR. CLEMENT CLEVELAND.—I am entirely in sympathy with Dr. Webster and Dr. Baldy about these menstrual discharges of blood. It is not an indication, of course, that this discharge of blood is really menstruation or ovulation. But I am reminded of a case I had some years ago where it was reported that both ovaries had been removed and still the woman menstruated. It was a case at the Woman's Hospital in New York and my confrère, who had done the operation, died in the meantime. The woman came into my service, I looked up the history, and found what I have stated that both ovaries had been entirely removed. She was miscarrying at the fourth month. I have very little faith in the functional activity of supernumerary ovaries, and I came to the conclusion, that I do in most cases, that it was due to a small portion

of the ovary having been left behind. I am very positive it
was so in this case. She recovered completely.

I recall also two typical cases where I removed ovarian
tumors. It was very nearly seven years ago that I had a young
woman under my care, a graduate of Wellesley College, aged
twenty-one years, who presented herself with two ovarian cysts,
both pretty good sized tumors. I opened the abdomen and
removed both cysts and both ovaries. In examining the cysts,
I saw near to the ovarian ligament what seemed to be normal
ovarian tissue, and I was careful in taking out the cyst to
leave small portions of ovary. The woman recovered com-
pletely from the operation, and while it is nearly seven years
ago, as I remember it, she has menstruated regularly since
that time. I have examined her from time to time, but there
has been no decrease in the size of the uterus, and she appears
to be going through the normal function every month. As I
remember, she has not skipped any month. A short time ago
I was consulted as to whether it would be all right for this
young woman to marry. I thought the matter over very care-
fully, and as the young man and the girl were very fond of
each other I gave the young man to understand that possibly
she might not have any children should they marry. They
have married. I have not heard of any pregnancy, and I do
not know that I look for it.

In the next case I removed two ovarian cysts several years
ago about the same size as the one previously described from a
woman, the mother of several children in whom I removed the
right ovary completely. I found I could leave a portion of the
left ovary about the size of a pea, and did so. She has men-
struated regularly, and I think there is one period during the
last two years in which she has skipped menstruation for two
months, but that is all. I have examined her from time to
time; there has been no decrease in the size of the uterus, and
her menstrual functions are apparently perfectly normal. She
has no indication of the menopause.

Dr. Seth C. Gordon.—I believe Dr. Davis has struck the
keynote in this whole matter to which the essayist has referred.
I have reported two cases where pregnancy took place after
as careful a removal of both ovaries as possible. One occurred
in the practice of Dr. Chadwick, of Boston, who assured me
he was certain he removed every particle of the ovary. In

my case I felt equally as certain that I did the same thing, and yet both of these women bore a child each after about a year and a half after the operation. Let me mention another case in point: I removed the ovaries of a young lady and she continued to menstruate. Two years afterward I resorted to supravaginal removal of the uterus, and she still continued to menstruate. Two years later I removed the cervix, and that stopped the menstruation. But menstruation was absolutely regular during the time that the cervix alone remained. So I believe that a physiological congestion actually occurs, and it accounts for the regular menstrual periods.

CHRONIC CYSTITIS OF THE TRIGONE AND THE VESICAL NECK

By Edgar Garceau, M.D.
Boston, Massachusetts

Miss W., aged fifty-eight years, was first seen in October, 1909. A brother, who suffered from insomnia, had committed suicide a year previously. The patient herself was a nervous, high-strung woman, who liked to have her own way. When she was thirty years of age she had suffered from the effects of "strained muscles of the back," which had confined her to bed for a period of fifteen months. She had been troubled with indigestion for a period of forty years and had also had "rheumatism." Following her brother's suicide she had suffered from insomnia. The menopause occurred at the age of fifty-two years. She had never been conscious of uterine disease.

Her bladder had tormented her for ten years. During that time she had consulted many surgeons and specialists in various cities, who had all pronounced her disease a neurosis. The first symptom which was noticed was frequent urgent desire to urinate day and night. The trouble lasted three weeks and then subsided for a whole year, only to reappear at the end of that time, when it again lasted a few weeks with the same symptom. Again it subsided suddenly and did not reappear for another year. The urine at that time was said to be "full of acid." Since the second attack the bladder has troubled her in the same way. She has been well for a few months, during which time there has

been no bladder trouble at all. This has been succeeded by a period of irritability again. For the last ten years she has had no assurance that the trouble was over, for when she thought herself well, the disease would reappear with redoubled intensity.

When the writer first saw her she was complaining of frequent painless micturition. There was a constant desire to urinate, which gave her no rest day and night. She could, when she had to, hold her urine, but as a general rule micturition was required ten or twelve times by day and several times by night. There was no tenesmus and no hematuria, and there was no history of stone.

On examination, the hymen was found intact. By rectal examination the uterus was found retroverted and of small size. The ovaries were not to be felt. On cystoscopic examination, with an electric indirect vision water cysto-scope, the ureteral eminences and orifices were found to be normal. The trigone was of a bright scarlet red color, and had a few spots on it which looked like small ecchymoses. The superior part of the sphincter was normal in appear-ance, but the inferior part was scarlet red, and this scarlet red color ran into the posterior two-thirds of the urethra. The capacity of the bladder was 2 ounces, using no pressure, but could be increased to 6 ounces under pressure.

The analysis of urine gave the following result: Color normal; indoxyl, increased; reaction, slightly acid; specific gravity, 1909; albumin, slight trace; aceton, absent; bile pig-ments, absent; diazo reaction, absent; amount, 1470 c.c.; urea, 2 per cent. (29.4 grams.); uric acid, 0.059 per cent. (0.87 gram.); chlorides, 0.62 per cent. (9.11 grams); sediment slight and consists of a little squamous epithelium, a few small round cells, some abnormal blood, numerous secondary small calcium oxalate crystals. No pus was found.

The treatment at first was vesical irrigations of boric acid solutions, urethral suppositories of subcarbonate of

bismuth and carbonate of lead and dilatation of the bladder
by hydraulic pressure. In a few weeks she was slightly
better and urinated six times a day and three times at night.
Then Knorr's treatment of applications of 5 per cent. nitrate
of silver solution on a cotton-wrapped stick was tried; also
without success. Finally the bladder and urethra were
curetted with a sharp curette and a tooth-brush cut well
down so that the bristles were stiff. This also gave no
relief. Then she drifted to the Christian Scientists.

The curettings were sent to the Harvard Medical School
and were examined by an expert pathologist, who gave the
following interesting report: "Situated immediately beneath
the stratified epithelium of the bladder are numerous lym-
phocytes which are massed together in an area to form an
area similar to lymphoid tissue (Figs. 1 and 2). A few
lymphocytes are seen in the stratified epithelium, but there
are very few. The stratified epithelium is well preserved
in the specimen; it shows an occasional mitotic figure, but
there is *little evidence of inflammation* in the stratified epithe-
lium. In some areas the aggregation of lymphocytes is
situated immediately beneath the bladder stratified epithe-
lium, and this epithelium is intact. This shows chronicity
of the process. The trigone was, on the whole, smooth.
There was abundant evidence of sub-epithelial inflam-
mation."

A bacteriologist was asked to examine the scrapings for
germs, and he reported finding the Bacillus coli and a small
white micrococcus resembling the Micrococcus ureæ.

The diagnosis of this case was, chronic cystitis of the
trigone and vesical neck and urethritis. The etiology was
probably hyperemia of the bladder with secondary infection;
the hyperemia was probably due to old retroversion.

The first one to accurately describe this disease was
Richard Knorr, of Berlin (*Monats. f. Gerburt. u. Gyn.*,
1900, xi, 1047, and *Zts. f. Geburt. u. Gyn.*, 1905, lv, 477).

FIG. 1.—Showing stratified epithelium of bladder intact, and a focus of lymphocytes beneath it.
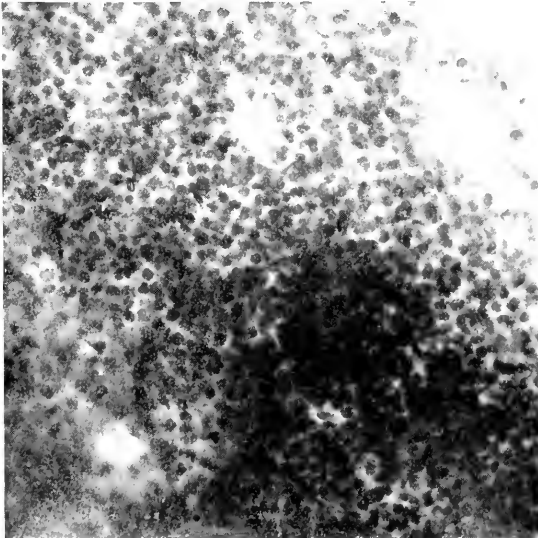
FIG. 2.—Focus of lymphocytes magnified.

His description was so accurate, in symptomatology and pathology, that there is little to add to it.

Winter (*Zeits. f. Geburt. u. Gyn.*, 1897, xxxvii, 497) also spoke in a general way of a cystitis, whose chief characteristics were, "a red trigone and a slight urinary sediment in which there were a few leukocytes, a few blood cells, and some epithelium."

Heymann (*Central. f. d. Krank. d. Harn. u. Sex. Org.*, 1905, xvi, 422), inspired by Knorr, in whose clinic the material was studied, likewise wrote on this subject.

Bierhoff (*Med. News,,* N. Y., 1900, lxxvi, 809) also described some cases of this disease, some of which he had seen in Knorr's clinic.

Zechmeister and Matzenauer (*Centr. f. d. Harn. u. Sex. Org.*, 1901, xii, 4) likewise reported a case in which they drew particular attention to the lesions which may occur about the neck of the bladder in this disease.

Stoeckel (*Cystokopie. u. Urethroskopie,* Berlin, 2d ed., 1910, 183) gave a very accurate cystoscopic picture of the disease.

Finally, the writer has been observing many of these cases during many years, and has arrived independently at practically the same conclusions regarding them as Knorr and others. The writer has long felt that "neuroses" of the bladder, with which this affection is oftenest confounded by the inexperienced, must be exceedingly rare, if they ever occur. The term "irritable bladder in the female," which was a favorite classic expression of the writers of a generation ago, still survives them. It should be abandoned, for it is not a disease; it is a symptom. The writer has never seen a neurosis of the bladder. The term "neurosis" must be distinctly separated from the term psychosis. The writer admits the psychoses. Examples of psychoses are: Hysteria with vesical symptoms; "stammering bladder" (bégaiement urinaire); essential incontinence, etc. These

are not vesical diseases but are merely symptoms of a profoundly disturbed nervous system and are oftenest seen in degenerates or in people who are not perfectly well balanced. In the family history of these individulas there will usually be found some hereditary taint such as alcoholism, gout, rhematism, epilepsy, diabetes, and insanity. The disturbed nervous system in patients with chronic cystitis of the trigone and vesical neck is a result of the disease, and not the principal affection. They are neurasthenics and often hypochondriacs, but not for any other reason than that they are constantly suffering physical pain and distress. This is so with many other organs in the body, notably the intestines, whose disturbed mechanism, in consequence of a ptosis or an unrecognized partial obstruction, so often gives rise to profound toxic consequences, chief among which is derangement of the nervous system. This is a fact just beginning to be recognized by the neurologists, who, from their necessarily limited knowledge of the specialties in medicine, have been so prone to recognize, in a train of symptoms, a primary disease of the nervous system, and to condemn their patients to long, tedious, and futile treatments in sanatoria, etc., when the real condition was a distinct disease of a visceral organ, giving rise to nervous phenomena.

Chronic cystitis of the trigone and vesical neck is always ushered in by frequent micturition. The writer is sure, from long observation of these cases, that the disease often starts as a simple hyperemia of the trigone of the bladder which had taken its origin in consequence of hyperemia of the pelvis, which is due to some pelvic disease, and that the first symptoms are those usually experienced with vesical hyperemia. This will be referred to again in discussing etiology and pathology. Usually, therefore, the early history will be one of frequent painless micturition, especially during the daytime. By night the patient may not,

perhaps, be obliged to urinate at all, or at most not more than once or twice. During the day she may have to empty the bladder every hour or even oftener. Later in the course of the disease pain may accompany urination, and it may be felt before, during, or after the act, its seat being in the bladder. There is sometimes tenesmus. If there is urethral pain it is probably due to the urethritis which the writer believes is always present in this disease. Even late in the course of the disease there may be no pain whatever, and the only symptom may be the frequent urgent desire to urinate. Occasionally there may be a little blood in the urine, which may be visible to the eye; it is never present in great amount and is rather a rare symptom. The urine, even in long-standing cases, may be perfectly clear and the sediment very slight. The urine is sometimes cloudy in cases in which there are marked vesical lesions. Clear urine is found in cases in which there is a smooth mucous membrane over the trigone, and cloudy urine in those in which the membrane has undergone marked pathologic changes. Sometimes, however, there may be considerable trigonal changes and still the urine may be clear and without pus in it. The writer recently had a case of this kind in a woman fifty-five years of age. Her trigone was covered with a bright red elevated mass of tissue resembling granulation tissue and yet her urine was absolutely clear and contained only a few squamous cells; pus was absent. Knorr (*Monats. f. Geburt. u. Gyn.*, 1900, xi, 1051), in 30 cases, found 17 in which the urine was clear, and 13 in which it was cloudy. Examination of the sediment should be done with the greatest care, for it is of great diagnostic importance. A clear urine should be allowed to stand for several hours in a large amount; the whole sediment is then taken up with a pipette and is centrifugalized. It will almost always show an excess of epithelial cells, squamous, small round and medium round, sometimes one variety alone and some-

times all together. There may be a little mucus. There may be a little microscopic blood and a few pus corpuscles. The pus, however, may be entirely absent. In the cloudy specimens we get more mucus, more cells, and more pus. The absence of pus is what has thrown so many physicians off the track on the diagnosis of this disease. Failing to find pus, with a clear urine, they conclude that there could be no inflammation. Hence the diagnosis of a neurosis. The cystoscope alone can diagnose these cases. It will be shown later that in many of these cases the epithelium is intact; hence the absence of pus. The bladder is not the only part of the urinary tract that may be inflamed and yet pus be absent. The writer (*Amer. Jour. Med. Sci.*, 1903, cxxv, 287) has shown that in ureteritis in the female there may be no pus in the ureteral urine sediment collected with an oblique Kelly cystoscope with the patient in the knee-chest position. The writer believes that the presence of pus, even if there are only one or two corpuscles to the slide, is of great diagnostic importance, especially if there are also a few blood corpuscles.

Most curious and hard to explain is the occurrence in this disease of remissions during which all symptoms disappear. Knorr speaks of this, and the writer has seen it occur in a number of cases. If it is a true case of chronic cystitis of the trigone the symptoms will be sure to return, and after this has happened several times the patient loses confidence and feels that she never knows when the disease is coming back. The writer suggests, though he cannot prove it, that these remissions may be due to a lesser degree of congestion of the pelvis in which the bladder participates and that consequently the disease is in abeyance for the time being. This has its analogy in inflammations elsewhere in the body, for instance, otitis media, salpingitis, phthisis pulmonalis, etc. Another explanation is that there has been a new infection of the bladder.

Perhaps the most serious feature of the disease is its long duration, which entails a severe degree of neurasthenia and reduces the patient to a pitiable state. She does not dare to leave her home for long. She suffers from want of sleep, loss of appetite and well-being, and she is irritable, unhappy, and wretched. If unrecognized, the disease may go on for many years—sometimes active, sometimes less so, and sometimes not at all troublesome.

The best cystoscopes for observing the cystoscopic picture are the electrically illuminated water cystoscopes. Most satisfaction will be obtained from the indirect vision instruments.

Both the bladder and the urethra must be examined. In the writer's experience urethral changes are always present, and it is probable that they are responsible for part of the pain, especially that experienced during micturition.

The vesical changes are mainly confined to the trigone. It is most common to find the superior, posterior, and lateral parts of the bladder quite normal in appearance and the trigone, the vesical neck, and the urethra the diseased portions. The trigone is the principal seat of the pathologic changes. In the beginning of the disease we may see nothing more than an intense redness of this part of the bladder, and it is in this stage that it is so difficult to differentiate a true inflammation from simple vesical hyperemia. Occasionally in a chronic case we may find redness of the trigone the only sign of the disease. The redness may be intense and in some cases it may overstep the trigone and appear on the bladder walls as spots of various sizes and shapes. The mucous membrane is often swollen from edema and rises up here and there quite sharply from the remaining surface. This swelling is most pronounced near the sphincter edge. Near this sphincter edge, especially at the base of the bladder, the writer has often noticed a sharp, irregular line of demarcation between the rough-

ened lusterless mucous membrane of the trigone and the edematous sphincter. In some cases flakes of mucus and pus may be seen clinging to the floor of the trigone or attached to the edge of the sphincter. Ulcers are rare. Knorr (*Monats. f. Geburt. u. Gyn.*, 1900, xi, 1051), in 30 cases of the disease, found but one ulcer. This coincides with the writer's experience. Erosions, however, are not so rarely seen. Petechiæ are occasionally observed, which may at times give outlet to blood, and so occasion a mild hematuria, especially after instrumentation. Perhaps the most characteristic sign of the disease is one which occurs rather late in its course. Reference is made to inflammatory thickenings of the epithelium, which rise above the surface of the trigone and appear in the cystoscopic picture as small polypi or villi. Occasionally they cover the whole surface of the trigone. Bierhoff (*Med. News.*, N. Y., 1900, lxxvi, 809) has reported cases of this kind. The villi give a velvety appearance to the trigone. Bierhoff suggests passing a cystoscope armed with a ureteral catheter. The catheter is passed directly into the villi and between them. They separate to give entrance to the catheter and are thus identified. It is most usual to find the excrescences or villi isolated here and there. Varices are occasionally observed, especially in the aged. Knorr has seen them four times. The writer has twice observed them. It is supposed, but not proved, that these epithelial changes may pass into leukoplakia, which may subsequently give rise to carcinoma.

The vesical neck changes are marked. In most cases the sphincter loses its sharp contour and becomes swollen and whitish in appearance. This is especially marked below and laterally, but seldom superiorly. Fissures of the sphincter are occasionally observed. On the sphincter may also be seen the small inflammatory villi and excrescences which have already been mentioned as occurring on

the trigone. They may reach quite a large size. In one of the writer's cases the polyp grew just outside the sphincter at the beginning of the urethra and gave rise to a good deal of pain during the act of micturition and was the cause of long-continued partial incontinence. These polypi may at times be hard to distinguish from villous tumor, which sometimes selects the vesical neck for its origin, growing all around it. Polypi, however, never attain to a large size as villous tumor does, and seldom give rise to hemorrhage. A small bloodvessel may often be seen in the centre of the polyp, just as in villous tumor. The appearance of these polypi, if fairly thin, waving back and forth in the fluid of the bladder is very deceptive, and it may require careful watching before a differential diagnosis can be made.

More rare than the polypi are small vesicles growing on the edge of the sphincter. These are tiny cysts a few millimeters in diameter either isolated or growing among the villi. They have broad bases; in fact, only about half the vesicle can be seen. The cyst wall is transparent and contains a clear liquid. They are purely inflammatory in nature. The writer has never seen these cysts on the trigone with one exception, and that was in a case of general cystitis due to double pyelonephritis. Around the right ureteral orifice was a distinct collection of cysts of very small size. Legueu (*Traité chir. d'urologie*, Paris, 1910, 1056) has called attention to these cysts on the trigone about the ureteral orifice as pathognomonic of suppuration of the kidney around whose ureteral orifice they are found. This latter class of cyst is probably allied to edema bullosum, which is occasionally seen affecting the posterior wall of the bladder.

Urethral changes, in the writer's experience, are invariably present in this disease. They may be observed with a small metal tubular endoscope or with a glass one. The writer has found the latter more serviceable, and he uses one which he (*Surgery, Gynecology, and Obstetrics*, 1912,

xiv, 80) devised. It is nothing but a modification of the old Skene urethroscope, with a new system of illumination and a larger glass tube than the one which Skene used.

Zechmeister and Matzenauer (*Cent. f. d. Krank. d. Harn. u. sex. Org.*, 1901, xii, 4) are the only ones who mention urethral changes. The writer has always found an intense injection of the posterior two-thirds of the urethra, with occasionally areas of greater redness here and there. Once he has seen a polyp growing just in front of the sphincter and pointing into the urethra.

The pathology of this affection has just been outlined in discussing cystoscopic appearances. There is one feature, which the writer wishes to emphasize, and that is the sub-epithelial character of the inflammation in some of the cases, even the chronic ones, as in the cases related at the beginning of this paper. In this case the typical inflammatory changes were not on the surface, which presented only a red appearance not inconsistent with simple vesical hyperemia. The lesions were beneath the epithelium, which on microscopic examination was intact. The clue to the diagnosis was the long duration of the disease. It was not until the curettings were examined that the diagnosis was positively made. The subepithelial changes in this case were: "Small massed collections of lymphocytes forming an area similar to lymphoid tissue; a few lymphocytes in the stratified epithelium, but very few of them; little evidence of inflammation in the stratified epithelium; smooth trigone." The intact stratified epithelium with the subepithelial inflammation the pathologist thought to be evidence of chronicity. It is needless to say that there are always pathogenic organisms present in the tissues.

The etiology of the disease is in some instances obscure. Some believe that abnormal urine may occasionally be responsible for the condition. The writer does not think that this is often a cause. In his experience concentrated

urine may occasion a mild hyperemia, which instantly disappears when the patient takes sufficient liquid.

As for the other causes, they made be divided into two classes: Those in which an infection has become engrafted upon a simple hyperemia of the bladder due to pelvic engorgement, the accompaniment of some pelvic disorder; those in which there has been infection from the first.

Hyperemia of the bladder affects the trigone, the vesical neck, and, in some instances, the urethra. It is one of the commonest affections of the bladder and is seen in many cases of pregnancy as an accompaniment of pelvic inflammatory diseases, especially of the uterus, tubes, and ovaries, as a sequence of operations upon the pelvic organs, particularly hysterectomy, and as an accompaniment of displacements of the uterus. The intimate anastomoses of the arteries and veins of the pelvic organs with those of the bladder speak for an easy engorgement of the bloodvessels of the latter when inflammatory conditions exist in the pelvis, or when there is venous engorgement from any cause. This hyperemia is chronic and may last a long time. It is the writer's belief that this hyperemia offers a favorable soil for the infective bacteria should they gain entrance to the tissues. The reasons for this statement are these: in the first place, vesical affections of a non-gonorrheal nature are far more common in females than in males, which suggests causes for vesical derangement in women which cannot be reckoned with in men; the fact that cure of a pelvic disorder in the female is in many instances instantly followed by a cessation of vesical symptoms suggests an intimate relation between the two.

The entrance of germs into the tissues in these cases is probably the same as in other affections of the bladder. The writer is convinced, however, that the lymphatic channels must be oftener the carriers of the germs than is generally supposed. The female vulva is bathed with noxious

bacteria all the time, yet it is rare that we have an infected bladder from this cause alone. Unclean catheterization when there is hyperemia of the bladder is dangerous and must be often the starting point of the disease.

The sequence of events therefore is frequently some derangement of the pelvic organs, either of an inflammatory or a mechanical nature; congestion of the pelvis, either active or passive; hyperemia of the bladder; and finally, chronic cystitis of the trigone and the vesical neck with urethritis; the whole process possibly extending over a period of many years.

There is not much to say about the class of cases in which there has been infection from the start without a previous hyperemia. The infection takes place as is usual in these cases. Unclean and rough catheterization is probably the most frequent cause. Many of the patients owe their cystitis to an unclean catheterization during the puerperium.

The only two diseases with which we need to concern ourselves in discussing differential diagnosis are hyperemia of the trigone and the vesical neck and ureteritis. In both of these diseases, as in some cases of chronic cystitis of the trigone and vesical neck, nothing may be seen but a scarlet red trigone and vesical neck. The few cases of ureteritis that the writer has seen have all had this red trigone, which is part of the affection and is inflammatory in nature.

In hyperemia, which was first described by Zuckerkandl (*Wien. med. Presse*, 1894, 759) and Jacobs (*Polyclinique*, Brux., 1896, v, 715), the disease is not apt to be so severe as chronic cystitis. Urination is not so frequent, as a rule, and the patient seldom rises as many times at night as in chronic cystitis. In some cases she does not have to rise at all. This is an important feature. Hyperemia is more apt to be transitory in character and with the suppression of the cause instantly disappears. If the symptoms do not disappear with the suppression of the cause we may suspect

a chronic cystitis. The urine findings in hyperemia may be the same as in cystitis of the vesical neck and trigone. On reviewing a large number of cases of hyperemia of the bladder the writer found that in this affection blood was less likely to be found in the urinary sediment than in chronic cystitis. An occasional leukocyte may be found, but they are not so frequent as in cystitis. In hyperemia we find the same scarlet red trigone as in cystitis. There are never any other lesions, such as papillary excrescences, cysts, etc. If we find these we can, of course, exclude hyperemia. In a case, however, in which the cystoscopic picture is nothing more than a smooth red membrane, in which the disease has lasted a long time, with possibly intermissions of repose, in which the sediment shows no pus and blood, we are unable to differentiate between hyperemia and chronic cystitis of the trigone in which the inflammatory changes are wholly confined to the submucous tissue. In such a case we shall be obliged to curette the bladder or remove a piece of it and make the diagnosis with the microscope.

With reference to ureteritis, we must first be sure that it is present. To determine this point there is but one sure method of diagnosis, and that is to examine the uncontaminated urine as it comes from the ureter. To this end the patient is put in the knee-chest position, a Kelly tube with an oblique end is introduced, and the urine from each ureter in turn is collected in a test-tube as it drops from the mouth of the canal. If the ureter is diseased, the urine thus collected will contain only those elements thrown off from the diseased surface. If, on the other hand, a ureteral catheter is used, it will necessarily scratch off a good deal of epithelium and a diagnosis will be impossible. In ureteritis of the chronic form, excluding tuberculosis, an excess of epithelium on the diseased side is, according to the writer (*Amer. Jour. Med. Sci.*, 1903, cxxv, 287), the most important diagnostic point in this disease. Pus and blood may be

absent just as in hyperemia and cystitis of the trigone. If together with the urine findings we get tenderness along the course of the ureter, especially on vaginal examination, the diagnosis is confirmed. Neglect to determine the presence or absence of ureteritis is responsible for many failures in the treatment of chronic cystitis.

The first point to be discussed in the treatment of chronic cystitis of the trigone and the vesical neck is prophylaxis. A physican who sees a woman suffering for the first time from frequent micturition should bear in mind that such a symptom may be the first sign of a long and serious disease. He should, therefore, examine the urine with care and also make sure there is no pelvic disease. If there is undue concentration of urine this should be corrected. The pelvic trouble should likewise be attended to. The whole disturbance may end here. It is true that many physicians are still content to accept the term "irritable bladder in the female" as a disease in the nature of a neurosis, especially if they find no pus in the urine. After consulting two or three physicians and getting no relief the patient accepts her fate and becomes resigned to her years of suffering. It is in the early stages that treatment is most efficacious. The woman under these circumstances is usually young, has vigor, and an abundance of reserve force, and she can be easily cured. If we can get these patients in the stage of hyperemia of the bladder the removal of the cause will be promptly followed by complete relief, and the disease will not recur. Cystitis just beginning will also yield to treatment in the same way if the cause is removed. This done, a few applications to the bladder will usually end the trouble.

From what has already been said it is evident that there are two distinct classes of cases to be considered in deciding as to the proper treatment of chronic cystitis of the trigone and of the vesical neck: the first, which will include the majority of cases, is that in which there are manifest lesions

on top of the mucous membrane, such as polypi cysts, fissures, etc.; the second is that in which the disease is in the submucous tissue. In the latter class it is evident that no local treatment will be of the slightest avail. In fact, it will do harm.

The first class will be first considered. The writer thinks it best in all cases to get the patient's confidence. To this end she is put on a bland diet, is given urotropin, and is told to drink about six or eight glassfuls of unirritating liquid a day, such as milk, water, and weak tea. It is far better that she should be in a good hospital and have a good nurse who will take exclusive care of her. The local treatment for the first few days should be boric acid vesical injections two or three times daily, immediately followed by an injection of ten or twenty cubic centimeters of a 10 per cent. solution of protargol. This treatment will not irritate the bladder and will prepare the patient for more severe measures. If severe treatment is instituted at once, the patient may become discouraged, give up entirely, and return home.

The best treatment for the disease is that recommended by Knorr (*Zeits. f. Geburt. u. Gyn.*, 1905, lv, 482). The bladder is first washed out with boric acid solution and is then anesthetized, with the urethra, by injecting into it and the urethra twenty cubic centimeters of a 2 per cent. solution of eucain. Then a small endoscope is passed into the bladder and the obturator withdrawn. Through the tube is then introduced a cotton-wrapped stick soaked in a 1 or 2 or 5 per cent. solution of nitrate of silver and then the endoscope is withdrawn, allowing the stick to remain in the bladder and urethra for a few moments. The spasm of the vesical neck and urethra which ensues will squeeze out the silver solution so that it is spread over the diseased membrane. The stick is removed at the end of a few moments by a quick jerk. This causes little pain. The treatment is applied daily at first and then every few days according to improvement

noticed. Knorr speaks well of this method, and so does Stoeckel. The writer has found it efficacious.

Polypi should be removed either with a snare or with a cautery. Fissures should be treated by dilating the sphincter and by cutting through them followed by an application of nitrate of silver fused on the end of a probe. Cysts should be punctured with an electric cautery and their contents let out. Ulcers on the trigone are best treated by gently touching them with nitrate of sliver fused on a probe, employing a Kelly cystoscope, so that the ulcer and not the surrounding mucous membrane shall be touched. The bladder is at once washed out with salt solution. Too frequent treatment of this kind for these lesions is not desirable. Once in four or five days is enough, depending on the tolerance of the bladder.

Should these measures fail, as they may, the choice of treatment lies between curetting the trigone, vesical neck, and urethra, and a vaginal cystotomy. The writer's experience with curetting has not been very good. This is owing to the difficulty if not the impossibility of removing all the diseased tissue. The curette slips over the flaccid membrane and does not act as it would over a hard, firm surface. Areas are left and underneath these there may be foci of the disease which serve to propagate it. A cystotomy, on the other hand, puts the bladder, sphincter, and urethra at complete rest and under the most favorable conditions for healing. The writer recommends that the cystotomy incision extend from a point just behind the vesical neck nearly to the cervix uteri. This allows turning out the trigone into the vagina and permits of a thorough curetting of it, or even of a complete dissection of its top layer. A few immediate sutures at the uterine end of the incision closes it enough so as to bring it to the usual size in these cases. The tub bath treatment, with boric acid vesical irrigation and ichthyol applications,

according to Hunner's (*Jour. Amer. Med. Assoc.*, 1907, xl, 2066) suggestions, is of service as after-treatment. When the inflammation has subsided the fistula is closed.

In the cases in which the disease is submucous in character without superficial lesions, local treatment is not only of no avail but harmful. A vaginal cystotomy must be performed and the top layer of the trigone curetted off through the diseased tissue, in the manner just outlined. The after-treatment is the same as that just described.

The prognosis of this disease should in all cases be guarded if the disease has been of long duration. Early cases do well, for the inflammation has probably not gone deeply into the tissues. In the late cases we have not only a diseased bladder to correct but a disorganized nervous system The well-to-do who can afford the time and the expense of a long sojourn in a hospital under competent care will stand a better chance of recovery than the poor woman.

A ureteritis is the worst possible complication. Yet even this, as Fenwick (*Clinical Jour.*, London, 1909, xxxv, 261) has recently pointed out, will, if it depends on a sagging of the pelvic contents, with dragging of the ureter as it passes under the uterine vessels, sometimes cease to annoy the patient if a proper pelvic operation is performed.

DISCUSSION

DR. HENRY T. BYFORD.—The very fact, as pointed out by the essayist, that local treatment does not help would indicate that it is sometimes medical treatment which is needed. I have usually permanently relieved the cases due to faulty conditions of the urine, although I did not always help them materially in a week or two. There is something in their habits and in their diet. There may be hyperacidity, and crystals and other results of faulty metabolism. Persistent medical

treatment is sometimes neglected by gynecologists. We are apt to devote our attention too much to the surgical aspect of our cases. Some of us are in danger of becoming mere surgeons instead of gynecologists.

Dr. H. A. Kelly.—Few subjects interest me as much as that of trigonitis. I was the first to apply this word and believe it to be eminently suitable to the class of cases under conditions which exhibit a group shading all the way from a well defined inflammation to a condition of hyperemia. The common symptom of this class is frequent micturition, varying greatly in its intensity in the different cases. In some it is distressing and transient, in others it continues through months and years. The distressing sensations are located at the neck of the bladder and the patient feels obliged to micturate, often every few minutes. Examination of the urine shows little, if any, pus. I have never found any well defined organism. If pus and organisms are found, then I always catheterize one or both ureters to see if the lower trouble is not merely an expression of a disease whose real focus is up in the kidney.

On making a cystoscopic examination, varying degrees of hyperemia of the trigonum are noted. In some it is extremely red, in others the color is not much more intense than the normal, which is always greater at this point. In thin, nervous women one sometimes finds a marked hyperacidity of which they are relieved if the urine is treated from this standpoint. This was carefully investigated by Dr. T. R. Brown when associated with me in my present hospital work. The hyperemia extends down the urethra. I do not find any fissures in this group of cases, and I am unable to connect them with ulcer of the bladder. Occasionally in this group they get an old gonorrheal inflammation which has subsided, leaving no traces behind by which it can be recognized, but bequeathing this one distressing symptom to the patient.

The treatment of these cases is most interesting. I fully agree with Dr. Garceau that hygienic measures are of the utmost importance and ought to be considered in every case. Many years ago I tried it through curettage, then I tried multiple puncture of the bladder; I also tried scrubbing this little area with a rubber brush to stimulate a little fresh, healthy reaction, hoping to get rid of the symptoms by distracting the attention of the nerves, as it were, for a time.

I have tried injecting novocain into the septum of the bladder and the vagina. I have also made use of electricity and massage. None of these means, however, have done any good that I could discover. I have used distentions of the bladder and do not put any confidence in that treatment of this condition, useful as the method is when there is an old cystitis. In some of the worst cases I have tried draining the bladder, but while this does much good in the true inflammation it does not seem to relieve this class of cases.

A number of these patients come to me who have been operated upon, being women who have borne children, who have had a cystocele or a retrodisplacement and the surgeon has promised that with the cure of the cystocele or of the retro-position, the symptoms would disappear. As a matter of fact, I have never known any patient relieved in this way. On the other hand, it was the custom a little while ago more than it is today, if the patient was a young woman with a normally posed uterus, to tell her that the condition was due to the uterus resting upon the bladder. The next step then was to insert a pessary at once, hoping to hold the fundus up. This, too, did no good.

Let me add, here, a word of earnest caution. I am confident that some of the worst cystitides I have had to deal with have started with simple cases of vesical irritation of the kind about which we are speaking today. A well-meaning physician then makes a diagnosis of cystitis based solely upon the symptoms of frequent urination, and begins a course of treatment by irrigation or injections of medicated solutions into the bladder. A real inflammation then starts up and may continue indefinitely and in unmitigated severity.

What kind of treatment, then, does help this class of patients? Let me repeat once more, put the patient under stimulating, hygienic treatment with alternations of rest. If the case is bad, I not infrequently pass Hagar dilators into the bladder dilating the urethra up to No. 12 (according to my scheme it means 12 mm. in diameter). I then treat the trigonum locally with a 5 per cent. solution of nitrate of silver at the first treatment, and following this at intervals of from five to seven days, I apply a 3 per cent. solution. This is done through an open cystoscope with the patient in the knee-breast posture, and the application made directly to the

reddened areas, placing the saturated pledget of cotton against the spot and holding it there from three to five seconds. Then, if I desire to treat the entire trigonum as well as the opposite side, I rotate the cotton saturated with nitrate of silver over in the bladder, keeping it pressed against the vesical wall. The application to the upper part of the urethra is also often needed. By such means, cases are occasionally cured like magic; others slowly improve, while still others are not much helped and remain a puzzle for only the urologist. Collargol is sometimes beneficial and I think the best way of applying it is, after emptying the bladder, to inject from 3 to 5 c.c. of 10 per cent. solution.

DR. GARCEAU.—I did not quite understand, from Dr. Kelly's remarks, whether he can distinguish, in all cases, between true inflammation of the trigone and hyperemia, judging solely from the cystoscopic appearances.

DR. KELLY.—Inflammation of the trigone is rare, and the cases we are discussing rarely have a demonstrable inflammatory basis. They have hyperemia, and often not even that.

In an inflammation there is a more intense redness and a puffy condition of the trigone; there may be patches elsewhere, and above all, the kidney on the side affected may be the seat of the primary focus. The urine shows leukocytes and sometimes a little blood, and the affected area bleeds easily on being touched. It is not practicable to cut out a piece to make the diagnosis sure.

DR. GARCEAU.—The whole point of my paper lies in this, that we cannot distinguish, by cystoscopic appearances alone, between a true cystitis of the trigone and a simple hyperemia, provided there is nothing but redness of the area affected to serve as a guide. We can diagnosticate these cases only by submitting a piece of the trigone to the microscope. In this way only can we make a diagnosis. An occasional leukocyte is not diagnostic, for we see this sign in both affections.

A SIMPLE METHOD OF SHORTENING THE UTEROSACRAL LIGAMENTS

By George H. Noble, M.D.
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A STUDY of intra-abdominal pressure and its effect upon the pelvic structures and the mechanism of resistance afforded by the latter elucidates the functions of the uterosacral ligaments in maintaining the uterus in its normal position. The intra-abdominal pressure, being equal in all directions, is expended in front and behind the uterus. The difference in the force between those two points vary with the extent of surface to which it is applied. Pressure anterior to the uterus has a tendency to drive the bladder downward upon the vagina. When it is partially filled pressure is transmitted through its fluid contents in the direction of the vaginal orifice, anterior surface of the vagina and uterus, effecting a tendency to hold the cervix and lower border of the broad ligaments upward and backward. The fully distended bladder forces the uterus bodily toward the sacrum. When empty it collapses on the anterior wall of the vagina, the uterus responding to the influence of superimposed pressure, turns forward upon it. In the normal subject the pressure, applied anterior to the uterus, is not equal to that posterior on account of smaller area, but serves to retard the forward slipping of the cervix. This is effected partly by the ball-valve action of the partially filled bladder and anterversion of the uterus above referred to.

Tendency of the force applied in the posterior uterine

cul-de-sac is to dilate Douglas' pouch and put the utero-sacral ligaments on a strain. The result naturally is slipping forward of the cervix uteri and changes in the axis of the uterus as it rotates around the pivotal point where the latter advances to a position anterior to the centre of gravity of the uterus.

With overstretching of uterosacral ligaments Douglas' pouch becomes distended, resulting in an increased area and corresponding increase in pressure behind and reduction in pressure in front of the uterus. The balance in pressure is destroyed. In addition to this the loss of the ball-valve action of the bladder is noticeable, expecially when the retro-displacement has reached the stage of prolapsus. Then, in place of the partially filled bladder acting as a ball-valve over the vaginal orifice and in front of the cervix it lies upon the anterior surface of the retroverted and prolapsed uterus. The resistance in front of the uterus being removed and the pressure behind being increased the tendency to further stretching of the uterosacral ligaments is greater. The enormous burden is expended on the lower border of the broad ligaments and the rectovesical fascia. When the latter gives way the base of the broad ligaments swings forward and the vagina prolapses with the uterus. The process increases step by step until extrusion occurs.

The functions of the uterosacral ligaments, therefore, are to preserve the balance and to equalize the strain in front and behind the uterus, to hold the cervix and vagina upward and backward, maintaining the normal size of Douglas' pouch and to turn the body and fundus of the uterus forward in such a way that intra-abdominal pressure is exerted upon its posterior surface with a tendency to antevert the organ. The mechanical principle is identical with that employed in the use of the pessary. No one now maintains the idea that the upper arm of the pessary holds the uterus in place by making pressure upon the posterior wall of the uterus,
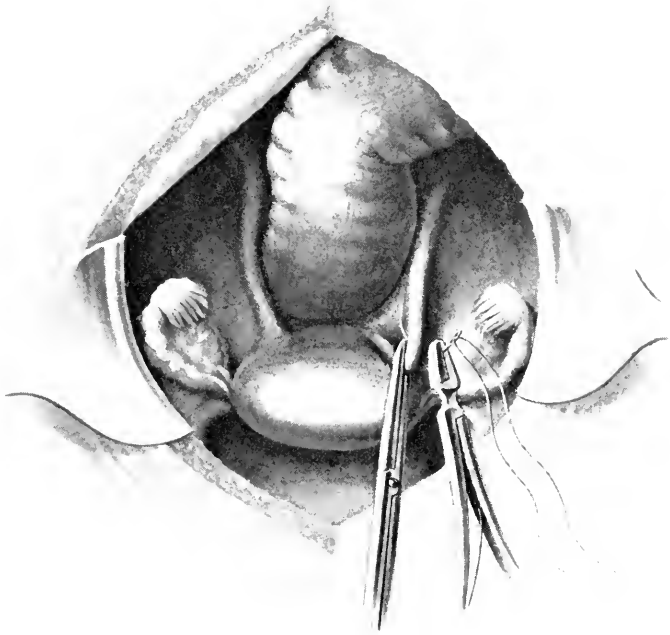
FIG. 1
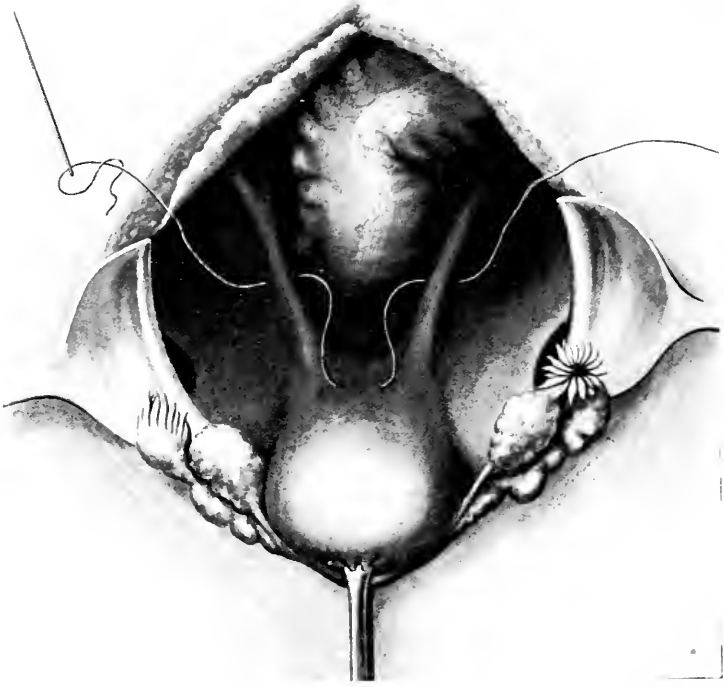
FIG. 2

FIG. 3

but all agree that its mechanical function is the one above mentioned, that is, to hold the vagina and neck of the uterus upward and backward producing the effect above described.

The mechanical principles in surgical repair indicate a reversal of this process in addition to correction of lesions of the cervix, vagina, and floor of the pelvis, that is to say, turn the fundus forward and move the pivotal point posterior to the centre of gravity of the uterus. This is best accomplished by shortening the uterosacral ligaments, reducing the size of Douglas' pouch and ligament suspension of the uterus. The former is done with continuous cat-gut sutures, closing the sides and anterior surface of Douglas' pouch by infolding peritoneum upon itself behind the uterus until the pouch is reduced to normal. The next step, or shortening of the uterosacral ligaments, I have simplified by putting into effect the single suture approximation of three points— one on the posterior surface of the cervix, the other two on either side of Douglas' pouch at the junction of the posterior and middle third of the uterosacral ligaments. If there is much elongation of ligaments division of them into thirds will not place the suture at the proper point. In such instances it may be introduced about the middle of the posterior half of the ligament. In other words, a point should be selected far enough anterior to the sacrum to bring the two ligaments together in front of the rectum in such a way as to produce a normal size retro-uterine pouch. A long pair of forceps picks up the ligament at the point indicated, and brings it upward as near the abdominal incision as it can be turned to facilitate manipulation. A heavy kangaroo suture in a stout curved needle is passed through the ligaments embracing quite a quantity of tissue (Fig. 1). The ligament is then released, and the needle passed through the posterior wall of the cervix a little below the internal os. The other ligament is then picked up and the neddle passed behind it as above described (Fig. 2).

In tieing the suture, the three points are approximated at a common centre (Fig. 3). The effect is to reduce the size of Douglass' pouch and to pull the cervix uteri backward to its normal position. When there is much prolapsus of the uterus or excessive elongation of the uterosacral ligaments, tieing the suture mentioned will cause the anterior part of these ligaments to fall into folds on either side of the cervix at the base of the broad ligament, and if the openings are large enough to admit the finger the folds should be gathered up and one turned over the other (behind the uterus), and each sutured to the opposite uterosacral ligament.

To prevent retroversion the body of the uterus is held forward by shortening the round ligaments. For this purpose I prefer an extraperitoneal operation, embedding the ligaments between the layers of the aponeurosis anterior to the recti muscles.

DISCUSSION

Dr. J. Wesley Bovée.—I think, as we study the literature and the tissues in the human, we become firmly convinced that the uterosacral ligaments have the function attributed to them by Dr. Noble. This plan of suturing the ligaments I have followed myself. I usually adopt the plan of picking up the ligaments, according to the amount of stretching or injury to them. We have to consider injuries of the ligaments, and if we have a ligament that is torn back toward the sacrum, then this is the part that needs more repairing than the part nearer to the uterus, and there is particularly where we want to apply our supporting methods, but if we have stretched ligaments that require shortening, and there is some part of the ligament that needs it more than any other, I have adopted the plan of catching up the uterosacral ligament at two places, one at two-thirds of the distance, and the other one-third of the distance back of the cervix, pulling

the former point forward it is attached to cervix and the other point is attached where the ligament is reflected onto the sacrum. The three folds thus formed are sutured together. That gives us a simple plan of shortening the round ligaments, as we were taught by Mann and Dudley and some others.

About six months ago H. Jellett reported in *Surgery, Gynecology, and Obstetrics* (xiii, 206–8) a method which he had adopted in shortening the ligaments. While the method impressed me at the time, I have had no opportunity to apply it. It embraces severing the ligament from its attachment to the uterus and bringing the two ends together in front of the cervix. The method was nicely illustrated, and I believe it is a good procedure.

DR. J. CLARENCE WEBSTER.—I should be very glad indeed if either of the speakers would tell us what they mean by the uterosacral ligaments and what they mean when they say they sew the uterosacral ligament. I think an anatomical study of these structures will show this condition: there is a fold a short distance back from the upper part of the cervix consisting of peritoneal tissue, containing a little cellular tissue, elastic tissue, but no strong connective tissue. There is no well-defined muscle in the free part of the ligaments. The muscular retractor of Luschka is a flat band which does not extend into the folds. I admit and believe that the uterosacral ligaments are of great importance in helping to keep the uterus anteposed by exercising upward and backward traction on the cervix. I believe it is important in extensive cases of retroversion of the uterus and in some cases of prolapsus to try to get some kind of elevation of the posterior part of the cervix; but I hold that in such cases there is such obliteration of the uterosacral ligaments as that they cannot be isolated and shortened. What we really do, in such cases, when we try to shorten the uterosacral ligaments is merely to pick up the stretched posterior layer of the broad ligaments, running from the cervix toward the posterior part of the pelvis and pucker it from before backward. The muscle is greatly stretched and thinned and it is probably not included in the stitches. It is rather dangerous to go deeply into the broad ligament with a needle on account of the position of the ureters. The new uterosacral ligaments are, therefore, merely artificial creations.

Shortening of the uterosacral ligaments cannot, therefore, be regarded as analogous to shortening of the round ligaments, because the latter never lose their identity as do the stretched uterosacrals.

DR. J. RIDDLE GOFFE.—I think the uterosacral ligaments as a means of maintaining the uterus in proper position and therefore maintaining the plane of reflection of intra-abdominal pressure are extremely important. I utilize them as Dr. Noble has described.

DR. NOBLE.—If Dr. Goffee will permit me a word, I will say that one feature in the technique of operating for prolapse is that of dealing with the posterior uterine supports, taking it for more than the two other supports and giving it attention.

DR. J. RIDDLE GOFFE (resuming).—I quite agree with what has been said with reference to the impinging of the intra-abdominal pressure upon the uterus, and how important its deflection is in maintaining the uterus in normal position. I do not accept the theory of hydrostatic pressure as being the whole solution of intra-abdominal pressure by any means. It can be used as an illustration to a certain extent, but hydrostatic or hydraulic pressure differs very much from intra-abdominal pressure, in that in the latter we have a combination of flaccid walls and solid walls. We have also in the abdomen and pelvis more or less solid organs that deflect the pressure. It takes a longer time to transmit pressure through a solid organ like the uterus than it does the bladder with retained urine in it. It takes a shorter time to transmit pressure through an intestine distended by gas than it does through a bladder distended by urine. So we have these various organs that transmit pressure unequally, and they also deflect the pressure unequally. To my mind one of the great factors in the study of intra-abdominal pressure is the different planes of deflection or reflection.

When we come to the pelvic cavity we have pressure deflected at once at a different angle. The form we present here would be the action of the diaphragm. Of course, when a human makes an effort at heavy lifting or strains at stool, the first thing he or she does is to draw down the diaphragm, *i. e.*, take a long breath. This fixes the upper point of attachment of the abdominal muscles, makes the trunk rigid for the effort and increases intra-abdominal pressure. The diaphragm

acts as a piston rod here and pressure is transmitted in a direct line until it is reflected and deflected in various directions. As it comes down into the pelvis, part of it passes in front of the uterus; most of it impinges upon the posterior face of the uterus and broad ligaments, and by the tilting up of the fundus is deflected back into the axis of the pelvic outlet. No ligament is sufficiently strong to hold the uterus and bladder directly in opposition to this intra-abdominal pressure. My idea of the action of this deflecting plane is as follows: The first effect of the impact of the pressure is to bear down the uterus and bladder before it until it reaches a point when the uterine ligaments, especially the cardinal ligaments, will no longer yield. In some instances it may descend until it rests upon the floor of the pelvis. The fundus can go no further, but the free arm of the lever, the cervix, being more free continues to yield. This tilts up the fundus and thereby presents an acute angle to the impinging force and deflects it back into the axis of the outlet, where it meets with less resistance. In other words, it slips off and passes by. The uterus thus being relieved of pressure is lifted up into normal position by its muscular ligaments and pelvic equilibrium is restored. The uterosacrals and the round ligaments are the important factors in this process and are the tissues to utilize in any operation for the relief of displacement, if permanency of result is to attend it.

DR. NOBLE (closing).—Dr. Webster presented the anatomy of the uterosacral ligaments very clearly, and requires no further comment except to state that we do not depend upon the muscular fibers found in these ligaments. In marked prolapsus they are effaced. We, therefore, have to depend upon a reproduction of them by folding and suturing the peritoneum. The principle is similar to that employed in Kelly's ventro-suspension of the uterus, that is, the making of an artificial support of peritoneum.

One of the features in the technique of the operation is its simplicity and effectiveness. As much can be accomplished with one suture as can be done by many sutures in other methods. If, however, Douglas' pouch is much dilated, it should be turned together below the plain of the uterosacral ligaments with a continuous catgut suture.

I cannot agree with Dr. Goffe concerning his theory of

reflection of pressure. I do not believe that intra-abdominal pressure thrown against the promontory of the sacrum is reflected anteriorly, like rays of light, but to the contrary, it is exerted through the medium of the abdominal and pelvic viscera in the manner of hydrostatic pressure, the force exerting itself in all directions. If there is a weak place in the abdominal walls or a relaxed abdomen, pressure will be less on account of the decreased resistance. Naturally the force travels in the direction of the least resistance, and the pressure contained within the cavity cannot be greater than the weakest point. In the relaxed abdomen the pelvic organs are not forced down solely by superimposed force, but the relaxed condition of the pelvic supports offer less resistance, and yield more rapidly to strain than normal pelvic tissues.

Pressure being equal in all directions, it is exerted behind as well as in front of the uterus, and the space behind the uterus being smaller than the anterior fossa, the area is less; consequently aggregate pressure is less. The forward inclination of the fundus and the anchoring of the lower uterine pole by the uterosacral ligaments and the traction on the corpus by the round ligaments exposes the posterior surface of the fundus to superimposed pressure, which has a tendency to drive the body of the uterus anteriorly. In relaxation of uterosacral ligaments and increase in area of Douglas' pouch this proposition is reversed. Pressure behind the uterus drives the cervix forward and increases the distention of Douglas' pouch with a corresponding increase of pressure at this point, and as the uterus turns backward pressure anteriorly forces the fundus in the direction of the sacrum. This is a natural result of the hydrostatic principle referred to.

In this connection I have made some experimental studies of intra-abdominal pressure, and find that it is the same in different parts of the body when the patient is in recumbent posture, showing that there is no such thing as deflection of pressure referred to by Dr. Goffe. In the recumbent posture in the passive state, intra-abdominal pressure is practically nil. With well developed abdominal muscles in state of contraction there is a negative pressure on inspiration. As the patient assumes the sitting posture the pressure is increased to eighteen or twenty millimeters. On standing it goes higher, showing there is something in the posture assumed by the patient.

In violent coughing there is greater strain than in efforts at stool. The latter represents fifty or sixty millimeters, whereas in violent coughing it goes as high as seventy, and sometimes ninety millimeters. The effect or impulse is the same in all parts of the abdomen. I make this statement by reasoning from the standpoint of physics, and from the fact that I have measured it in the upper and lower abdomen and vagina. When the pressure becomes abnormally increased, pelvic organs suffer more than other parts on account of the inferior resistance of their supports, and because the impulse on the diaphragm and abdominal walls (when these parts are in state of contraction) is expended through a secondary impulse or reaction upon the pelvic diaphragm. If it were not for the fact that the uterine supports are elastic and transmit the pressure to surrounding parts, the pelvic organs would suffer from the effect of the strain very much more. This is demonstrated by the vaginal tests. In the normal subject intra-abdominal pressure is transmitted through the uterus to the air bag which shows a loss of force. The lower down the vagina the test is made less the pressure becomes until the outer surface of the perineum is reached where it is reduced to twenty millimeters. This also proves the positive support given to the uterus by the pelvic floor and tissues lying between this point and the uterus. If the perineum is deeply lacerated the amount of strain it should normally receive will be expended upon the structures immediately above it, namely twenty millimeters (mercury). When there is rectocele and cystocele the superimposed pressure received by these parts in health will be expended upon the uterus and its ligaments. In other words, the full intra-abdominal pressure would be expended on the uterine ligaments because resistance below is lacking. When the uterus is prolapsed to the vaginal outlet, the full extent of abdominal force is measured at that point.

From the foregoing it will be seen that I am presenting this method of shortening the uterosacral ligaments as one step only in the technique of operative relief for prolapsed uteri. In addition, it is necessary to shorten the round ligaments for the purpose of holding the uterus forward, and to correct lesions in the floor of the pelvis for the purpose of restoring resistance to intra-abdominal pressure transmitted through the uterus. For retroversion, I prefer intramural shortening of

the round ligaments drawing them up in front of the recti muscles and embedding them between layers of the aponeurosis making an extraperitoneal operation. For cystocele, I make a diamond shape denudation and close with a kangaroo suture, the technique of which I have described elsewhere. Rectocele when small or medium should be anchored to the rectovesical fascia where it joins the anal segment of the rectum. My technique in perineorrhaphy is well known and needs no explanation here, further than to emphasize the fact that lacerations of the triangular ligament, extending deep enough to sever it from the anal segment of the rectum, causes a rotation of the latter around the tip of the coccyx, and predisposes to rectocele and prolapsus by loss of support the bond in the inverted arch (pelvic floor) should give to the pelvic organs. The neck of the bladder rotates under the pubic arch when the suspensory ligaments and rectovesical fascia (where it is reflected upon the neck of the bladder) are lacerated. These should be repaired also.

THE USE OF THE CONTINUOUS FIXED LAPAROTOMY SPONGE

By W. Francis B. Wakefield, M.D.
San Francisco, California

The adverse criticism to which one of my surgical friends has recently been subjected because a loose sponge was subsequently discovered in the abdomen of a patient on whom he had operated, brought this danger to my mind with unusual emphasis, and prompted me to present this subject.

We have done so much as a profession to improve our work, and to protect the individuals who entrust themselves to our care against errors of technique, that it is to be wondered at that some very definite stand has not been taken by surgeons to prevent the possibility of leaving sponges in the abdominal cavity—a possibility that will always obtain so long as we use loose squares of gauze in our work.

We have all lived in more or less constant dread of this accident. I need but to mention the numerous cases of malpractice suits that it has inspired. We cannot blame the public for believing the accident a preventable one, and yet, as the matter of sponges is usually handled in the average operating room, it is quite remarkable that loose sponges are not closed up in the abdominal cavity oftener than they are.

When Dr. H. S. Crossen, of St. Louis, wrote an article,

which appeared in the *American Journal of Obstetrics* for January, 1909, on "Abdominal Surgery without Detached Pads or Sponges," I was deeply impressed with the practicability of his suggestions, and immediately began to apply them. Since then—that is for the last three years—I have entirely discarded the use of loose sponges from the abdominal work.

I now use long folds of gauze of desirable size which, for convenience and safety, are packed in bags. One end is stitched to the bottom of the bag; the other end is left free at the top. We have, thus, a continuous sponge which is pulled out little by little as required. Two sizes meet all requirements. A detailed description is given at the end of the paper.

It is a little difficult, at first, to become accustomed to the altered technique which the use of any new method involves; but one soon learns to use the continuous sponge rapidly and efficiently.

I use a laparotomy sheet containing three pockets, one on either side and one at the upper end of the opening in the sheet. In the upper pocket we fasten the bag containing the broader strip of gauze which is used for packing back the intestines, or walling off local infective areas. In each side pocket we fasten one of the narrower strips which is used by the operator and his assistant for keeping the field clear of blood or doing any work a sponge may be called upon to do. The pockets in the laparotomy sheet are a good deal wider than the sponge bag, and the used-up part of the sponge is tucked away in the pocket of the sheet, leaving a clean portion of the strip always under the operator's fingers ready for use.

It is very important to keep the used-up part of the strip tucked away in the pocket, otherwise the sponge will be getting tangled up with everything around the field of operation. After using these continuous sponges a few times,

this part of the technique becomes almost automatic.   Dr. Crossen in his article does not suggest the use of pockets for the sponge bags but simply pins the bag to the side of the sheet and allows the used-up part of the sponge to keep dropping to the floor.   I think the use of pockets permits a better technique.

We rarely find it necessary, in an ordinary laparotomy, to use more than the three sponges with which we started. Should the operation be an unusually long one, however, or should hemorrhage be unusually troublesome, we are likely to require two additional sponges which are always in readiness.

Should an abscess be opened or any infective fluid be spilled in the abdomen or pelvis, one of the sponges is used to wipe it clear and then discarded, another pocket with contained sponge being pinned or clamped to the sheet over the original pocket, thus covering up the whole infected area.

When troublesome oozing occurs, which demands the use of a temporary hot sponge pack, a sponge bag is pinned to the laparotomy sheet below the incision, and as much as is required is pulled out, wrung out of hot salt solution, and packed in the pelvis.

I am thoroughly satisfied with the use of these sponges. I find them easy to use, safe, and economical.   They can be used over and over again.   Some of those we are using now are the original ones that were made three years ago.   They are washed out after each operation, bleached, dried, repacked in their respective bags, and resterilized for use again.

A sufficient number of surgeons throughout the country have used the continuous laparotomy sponge a sufficient length of time to prove conclusively that abdominal operations can be efficiently performed without the use of the dangerous loose sponge.   This being so, it follows logically that, as time goes on, and the knowledge of this fact becomes

more widespread, surgeons will find it increasingly difficult to obtain, in courts of law, extenuation for having left a sponge in the abdominal cavity.

Each set of sponges for abdominal section consists of four narrow strips and one wide strip.

Each narrow strip consists of a piece of gauze ten yards long and one-half yard wide, folded lengthwise so as to make six thicknesses. The strip when finished is three inches wide and ten yards long with all the raw edges turned in and the ends stitched to keep it from unfolding. The strip is then ready for the bag which is made of very heavy muslin sewed with French seams (to prevent raveling) and when finished is five inches wide and ten inches deep. The bag is then turned inside out and one end of the strip sewn securely to the seam at the bottom of the bag. It is then turned right side out again and the strip is packed back and forth into the bag a little at a time, so that it will pull out easily when used. The bag is then closed with one strong safety pin, which is used later for fastening the sponge to the pocket of the laparotomy sheet.

The wide strip consists of a piece of gauze, one yard wide and five yards long, folded lengthwise so as to make four thicknesses. When finished it is nine inches wide and five yards long with ends stitched the same as the narrow strips. The bag for the wide strip is ten inches wide and six inches deep, sewed with French seams. The strip is then fastened to the bottom of the bag and packed into it and closed in the same way as the narrow strip.

Each laparotomy sheet is made with three pockets—one at each side twelve by twelve inches—and one at the head of the sheet twelve by eight inches. At the beginning of an operation, one narrow strip is placed in each side pocket and pinned to the pocket with the safety pin which closes the bag containing the strip. The wide strip is placed in the pocket at the head of the sheet in the same way. The

narrow strips are used dry, but the wide strip is dampened with hot salt solution before it is placed in the pocket.

Each set of abdominal section sponges has a separate set of pockets; and when fresh sponges are necessary, the soiled sponges and pockets are covered with a fresh pocket containing a fresh sponge.

DISCUSSION

DR. GEORGE GRAY WARD.—For the last five years at least I have abandoned the use of separate sponges in the abdominal cavity and have been using the continuous sponge in the form of a roller bandage, about three yards long and six inches wide, folded in four or five thicknesses of gauze. I got the idea from Dr. Polk who has used it for a number of years. In my service no loose sponges are used in the abdomen, and this roller bandage is unrolled as it is required, and the ends of it used to tuck underneath the edges of the incision, holding back the intestines and the roll being clamped to the laparotomy sheet. This is very useful and you do not have to sit up at night worrying whether you left a sponge in the abdomen or not.

DR. I. S. STONE.—It seems to me, this ought to carry with it some preventive measure of other troubles besides that of leaving sponges in the abdomen. We have on record quite a number of cases where other bodies than sponges, such as various sorts of instruments, including a finger ring, have been left in the abdominal cavity. I have seen a finger ring that was removed from the abdominal cavity. Is it not time that there should be some security on part of the surgeon and hospital against accidents of all kinds. I would like to bring up this question, Why is it not proper for an individual, who trusts a surgeon to operate upon him or her, to grant that man a carte blanche to do what is best, and the patient accept the responsibility? Is it not about time that we assume a definite attitude about operating upon free patients and doing free work in our hospitals, and then possibly be sued

all the way from twenty to fifty thousand dollars, if we own that much property, as a result? I see very little that the profession has done to protect itself against suits of this character. We seem to be at the mercy of the public, a designing public, and especially of that class who are anxious to make the doctor pay, who is supposed to have a good income. Why can we not in each hospital have patients sign a certificate that they accept responsibility and relieve the surgeon after he has done his duty? When this is done we will have accomplished something for the benefit of the profession.

Dr. John F. Thompson.—I want to say with reference to sponges in the abdominal cavity, that the essential thing is the count of whatever is used in the form of a sponge or sponges. We apply that count at our private hospital in Portland to everything practically which possibly goes through the abdominal incision in the operating room, and the sponges are counted by the nurse, both before and after operation. Sponges the size of this might by accident be left, just as a small one has been. I insist on the count as being essential.

Dr. J. Wesley Bovée.—This count is sometimes a miscount. Many a time I have closed the abdomen with the nurse being very much disturbed over the loss of a sponge. I had counted the sponges when I put them in, and when I removed them, and I knew every sponge was out, and a day or two later, I would find that the nurse had miscounted the sponges. This is not a reliable way. I have not tried the plan outlined by Dr. Wakefield, although it looks very good to me. The plan I follow is to have a tape on each sponge that goes into the abdominal cavity, and it takes up very little space. If one uses five or six in the abdomen, with a tape on each one coming out, having little strands of tape that are clamped with one forceps, one knows how many go in there and knows when they come out. I would rather trust my own count than be responsible for the count of one or two nurses.

Dr. Brooks H. Wells.—Even the tape might go astray. In the only case in which he had left a sponge inside the abdomen, the sponges were carefully counted before and after operation by a nurse, and they were all supposed to have tapes sewed on them with a weight on the end of the tape. The patient, after a supravaginal hysterectomy, made a very

good convalescence, and ten days thereafter she was brought into the clinic room, and shown to the students. He had been talking on this subject and had spoken of Dr. Crossen's method and of other ways of avoiding the possibility of having a sponge sewed up inside the abdomen. He introduced his finger into the patient's vagina and to his surprise found there a bulging cul-de-sac and what felt like a mass of gauze. He held up his hand for silence, asked for scissors, made a slit, and removed a gauze pad. This was a case in which the sponge was left in spite of the fact that the sponges were supposed to have tapes on them, and were counted, and had weights on the tapes. In looking over a bundle of pads prepared by the same nurse, he found two sponges laid together and counted as one, one not having any tape attached to it.

DR. BENJAMIN R. SCHENCK.—The method we have been following at the Harper Hospital, Detroit, is to use large squares or abdominal towels, employing no sponges at all in our abdominal operations. I formerly used gauze in the abdomen, and had the gauze strips numbered with big lead numbers from one to eight; it was the nurse's duty to find each one of the consecutive numbers. This method is open to the same objection that Dr. Wells has referred to, namely, the possibility of two strips of gauze being put together. The only absolutely safe method is the continuous attached sponge that has been described by Dr. Wakefield.

DR. CHARLES E. THOMSON.—This is a very important subject, and I desire to report an extreme case. I have listened very attentively to the various methods that have been mentioned, and I have been impressed with the method that has been outlined by the author of this paper. In our case it was a simple exploration, and according to the record there was no sponge used in the abdomen. In fact, there was no occasion to use one and yet we found a sponge later in the abdomen. It was a case with a very large fibroid of the uterus complicated with pregnancy. The woman was pregnant four months. I made a diagnosis of pregnancy, but having gone a long distance to see the patient in consultation, I said to the doctor, We will make sure and if she is pregnant we will not operate on her. Having made the diagnosis of a fibroid tumor of the uterus complicating pregnancy, we closed the abdomen. To this day it is the greatest mystery as to how

that sponge got in the abdomen. Later on we did a Cesarean section, removed the child and tumor, and the patient is well.

DR. FRANK T. ANDREWS.—We use small sponges which are carefully counted and carefully labeled with a lead mark, and sometimes I have used a six-foot strip of gauze with a nickel ring attached to the end of the two-foot tape.

DR. BROOKE M. ANSPACH.—In all of my work I have followed Dr. Clarke's custom at the University Hospital; that is, to do all isolating by means of a gauze roll twelve inches wide, three feet long and made of three or four thicknesses of gauze. Only one continuous piece was therefore used to pack off the intestines and isolate the operative area. For sponging twelve smaller pads are used, but these are never left in the pelvis. They are, nevertheless, carefully counted before closing the incision.

GYMNASTICS AND OTHER MECHANICAL MEANS IN THE TREATMENT OF VISCERAL PRO-LAPSE AND ITS COMPLICATIONS

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OUTLINE SUMMARY

1. General visceral ptoses is indicated, among other things, by a ptotic figure that is characteristic, by a peculiar attitude of the individual when standing, and by marked muscular insufficiency.

2. General visceral prolapse leads to intestinal stasis, digestive disturbances and neurasthenia, and, in the author's opinion, is one of the important etiological factors of the Lane kinks of the terminal end of the ileum, Jackson's membranes, kinks of the pylorus, the cystic duct of the gall-bladder, the duodenal-jejunal junction, the appendix at the termination of its mesoappendix, the transverse colon and other portions of the large bowel, and to a distinct contraction of the parietes of the upper abdomen.

3. These various intestinal bends, when long continued and when subject to considerable mechanical irritation or to intercurrent inflammation, become fixed by adhesions, and as they are in a disadvantageous position, their bends and fixations must be corrected before the ptotic individual can be successfully treated for his ptoses.

4. In uncomplicated general ptoses or ptoses in which the complications have been corrected by surgery, the treatment herein described gives prompt, and if conscientiously

followed, permanent relief, except in the congenital type. In the congenital type, too, relief is obtained if the subject persists in the treatment.

5. The treatment consists in substituting active muscular exercise for passive exercise and rest, the active exercise being made acceptable and advantageous by directing that it be taken while the patient is in the Trendelenburg position; and by reënforcing the muscular parietes, at the beginning of the treatment, by properly constructed supports to be worn by the patient while in the perpendicular position.

6. Systematic persistence in this treatment strengthens the defective muscles and, by the aid of gravity, replaces the prolapsed viscera.   The temporary supports retain the viscera at their proper level until the fat deposited as a result of better nutrition, and the reconstructed muscular parietes, make a permanent anatomical support.

7. The author's results convince him that this treatment in relieving ptoses will prevent relapse of the complications of ptoses, if they are first relieved by appropriate surgery, and thus make unnecessary the radical surgery of Lane, which involves "short-circuiting" or extirpating the colon, or the operation of Coffey, which has for its object expansion of the upper abdomen.

The alluring subject of the etiology of ptoses will not be discussed in this paper. Neither shall I discuss the many intricacies of ptoses, as the subject is one that is thoroughly understood by the members of this Society and has been handled in its various phases by Richard Smith, Edward Reynolds, Robert W. Lovett, Joseph A. Blake, Maurice Richardson, J. Riddle Goffe, John G. Clark, W. M. Polk, and many others.

My task shall be confined to outlining a treatment for ptoses and accompanying complications, by the employ-

ment of a systematic combination of simple and well-known measures. It will be necessary, however, to point out a few general principles of an incontrovertible character which suggest some of the causes of ptoses, in order to present the scheme of treatment herein proposed.

First, I wish to compare the physique and natural attitude of a normal, healthy individual with one who is known to be suffering with ptoses. Figs. 1, 2, and 3 represent, respectively, a front view of the typical ptotic form, a side view of the same figure, and a typical abdominal ptosis, more particularly of the acquired variety. Figs. 4, 5, 6, and 7 represent side and front views of healthy individuals without ptoses, such as we might easily duplicate anywhere from among the rank and file of healthy individuals.

Without going into a discussion here of the etiological factors, differentiating between congenital and acquired causes, I wish to call attention to a few of the essential differences between the normal group presented, representing healthy individuals, and the group which represents definitely sick individuals.

A profile view (Fig. 2) shows the well-known attitude of body which is characteristic of the individual possessing, or having a tendency to, ptoses. Notice the forward bend of the neck and the forward curve of the body above the waist, with arms hanging forward of the middle line of the trunk. It is the compensatory stoop of this type of ptosis. Note the flatness of the area between the lower end of the sternum and the costal arch, the bulging of the lower abdomen, the straight back, the flat chest, and general muscular flabbiness.

An x-ray picture of this individual's skeleton would show a sacrum nearly perpendicular with the spine, instead of projecting backward at an angle of nearly 40 degrees with the body axis. The lower border of the symphysis pubis would be shown far above the tip of the coccyx instead

of being perceptibly below it as it is in the normal. The cavity of the pelvis, in other words, would be parallel or perpendicular to the abdominal cavity instead of appearing at a decided angle to it (Fig. 8). The same x-ray picture of this individual would show an obliteration of the normal lumbar and dorsal vertebral curves and a flattening of the chest cavity by change in its bony cage.

A schematic drawing of the outline of the abdominal cavity of the ptotic figure in profile, taken in the perpendicular, is quite accurately shown in Fig. 9. It represents a truncated cone resting on its base. Fig. 10 represents the outline in the same type when viewed from the front. Here again we have a truncated cone with the base at the bottom. By comparing this with the outline of the abdominal cavity of the normal individual in profile (Fig. 11) we note that the cone is reversed, with the base between the expanding chest walls above and the apex at the symphysis. The outline in the front view shown in the female is more cylindrical than in the male. The latter represents the cone with its base at the diaphragm, while the former is the typical hour-glass outline.

So far, then, we have no difficulty in recognizing that the general ptotic individual has definite peculiarities of body form and attitude that are characteristic. Briefly they are: (*a*) the compensatory stoop; (*b*) smallness of the upper abdomen due to a flat chest and abnormal flatness of the dorsal vertebra; (*c*) expansion of the lower abdomen by flatness of the lumbar curve with expansion of the abdominal parietes and obliteration of the normal promontory of the sacrum, thus giving the loosely attached viscera no vantage points of support on the flabby, receding walls.

This abdominal cavity, which becomes so distorted in well-advanced ptoses, depends much for its normal contour on the proper development of its muscular walls. Fig. 13 represents the muscles of the normally developed abdomen.

In the ptotic individual, on the other hand, the recti muscles which normally are so strong are usually distinctly weak. The pyramidalis, which should constitute a key to the wedge of the support of the lower abdomen, is flabby and inactive. In comparison with the normal, the external, oblique, and transversalis are thin muscular sheets, frequently predominating in thin aponeurotic layers, rather than well-bellied muscles held together with strong aponeurosis. The whole abdominal group presents an inadequate bulging wall rather than a compact perpendicular bulwark.

Fig. 14 represents the deep back group as shown in the normal individual. This, with its balancing group, especially as represented in Fig. 15, with the sacrospinalis and multifidus spinæ which have so much to do in maintaining a proper balance of the spinal column, is woefully neglected and atrophied in the class of men and women under discussion. The quadratus lumborum is particularly weak and flabby in these individuals.

In examining in detail the muscular insufficiency of one of these individuals, we should also note the external muscles of the pelvis and thigh. These muscles which aid in balancing and maintaining the pelvis at its normal tilt are flat, deficient, and inadequate. Particularly will this be noticed in comparing the defective muscles with a normal group. In the gluteal group and the strong upper thigh muscles (Fig. 16) we can compare the corresponding balancing muscles of the interior of the pelvis, that is, iliacus pyriformis and psoas muscles (Fig. 17).

Again, note the normal muscles in the deep group at the upper portion of the back (Fig. 18). This group will be found woefully inadequate in the ptotic type of individual. The levator and depressor muscles of the ribs must perform their action or the ribs will gradually fall to the spine.

Higher up we note the effect on the relation of the spinal

column to the height of the shoulders and the chest walls,
due to the inadequacy of the pectoralis muscles in front
and the trapezius muscle and latissimus dorsi behind. (The
normal muscles are shown in Fig. 19.) Even the condition
of the deep cervical head and neck muscles must be taken
into consideration in accounting for the improper curve of
the cervical vertebra in the defective figure. (Fig. 20 shows
a cross-section as well as a profile view of the freed muscle
of this group in the normal individual.)

In connection with the chest walls and the upper abdominal
walls we must take into consideration that great series of
muscles which separates the two cavities, the abdomen and
the thorax, and which plays such an important part in
the function of each, viz., the diaphragm (Fig. 21). The
effect of a gradual contraction of the thoracic walls from
which it receives its principal attachments and the gradual
receding of the principal contents of the upper abdomen
gives to the diaphragm a task in which it is destined to fail
even if it is inherently strong, and one in which it will play
a conspicuous part in the general disaster if it is inclined to
be weak.

Why does the bony frame of the trunk of a ptotic indi-
vidual curve forward at its upper and lower extremities
instead of remaining normal? Why should not the powerful
muscles of backward tension succeed in performing their func-
tion as adequately as those of forward tension? Is it because
the anterior group of muscles or flexors are proportionately
more powerful than the extensors for the task they have to
perform? Is it because when the muscles of the whole
trunk are at rest in sitting or lying down, the trunk is slightly
bent forward as the hand is slightly flexed when at rest?
(Fig. 22). Is it the position of relaxation? Is it because the
changed centre of gravity, due to the moving forward and
downward of the movable viscera of the trunk, is more
easily retained by the standing figure by slightly bending

the body forward? Is it because the strong fascia, the aponeurosis and ligaments of the body which stand for internal support, become weakened and stretched coincidentally with muscular insufficiency, causing the connections of the framework of the body to become loose and shift accordingly, and in shifting in the direction of least resistance, make for the deformity? Is it because when the back muscles or body extensors are favored or allowed to remain dormant for a long time by the individual assuming frequently the position of relaxation, these muscles will not only become weakened but will be obliged when they do act, to overcome and take up the slack of the stretched fascia, aponeurosis, and ligaments, and this in time will lead to their exhaustion and to the development of still further deformity while they recuperate, and thus another vicious circle will be established?

A comparison of the normal individual with the defective type which is known to possess multiple visceral ptoses markedly demonstrates that the defective possesses general muscular inadequacy which (a) affects the contour of the abdominal cavity, (b) results in the chest becoming contracted by descent of the ribs, (c) accounts for the defects of attitude in the standing individual, and finally explains many of the skeleton defects which we have learned to observe.

Right here we must not overlook one other fact in studying these interesting individuals, with their peculiar body condition and attitude. An individual may have acquired weak muscles as the result of acute or chronic disease, affecting every group of muscles we have mentioned, and still not possess ptoses. Such an individual, however, will have to be constantly on the alert to avoid gradually adopting unconsciously the forward bend of relaxation. This, if not corrected by prompt return to normal nutrition accompanied by suitable rest and intelligent endeavor to

counteract the muscular tendency, will lead to an acquired ptosis. Too often we observe this same condition among young girls and women even when there has been no acute or chronic crisis to account for the onset. It is gradually acquired by the individual indolently assuming too fre- quently the attitude of rest, without at any time giving the muscles of the body proper exercise. Fortunately in these days of wholesome athletics we do not see so much of this.

These individuals, if not rescued in time, acquire a weakening of the respiratory muscles which inevitably leads to a contracted chest, an inadequate diaphragm action, a contraction of the upper abdomen, a gradual descent of the upper abdominal viscera, digestive and nutritional disturbances, attenuation of the mesentery and ligament attachments from loss of fat, expansion of the lower abdo- men from muscular weakening and visceral pressure, and finally to neurasthenia. This is practically the same picture that is presented in the definite congenital type in which is found the unblended mesenteries, the unfixed ascending and descending colons, the loose duodenum, the unascended kidney and undescended testicles. In fact, the pictures resemble each other so closely that frequently without an exploratory or postmortem examination of the abdominal organs a differentiation cannot be made.

POSTURE, ABDOMINAL SUPPORTS, GYMNASTICS, AND FEEDING SYSTEMATICALLY APPLIED AS A FORM OF TREATMENT

Before any form of treatment of a hygienic character is attempted for general abdominal ptoses, careful analysis of the cases should be made to exclude complicating factors of the ptoses which would require preliminary surgical treatment, or if preliminary surgical treatment is necessary, means should be instituted at once to utilize it. These

complications include partial obstruction due to bends made permanent by adhesions of viscera in disadvantageous positions due to intercurrent inflammation of some part of the abdomen, and complicating tumors and permanent changes in the walls of the trunk.

The treatment that I wish to present and discuss may be divided as follows: (1) Posture; (2) temporary supports; (3) exercise of the muscles and correction of postural habitis; (4) fresh air and feeding.

<div align="center">POSTURE</div>

The effect of posture on the viscera in the opened abdomen is demonstrated every time a patient is placed in the Trendelenburg and the abdomen opened. The same demonstration can be made on unfixed viscera without opening the abdomen by means of the x-ray. Fig. 25 shows the position of the stomach of a patient after the patient has been walking about, taken in the perpendicular position. Fig. 26 shows the position of the same stomach immediately following the taking of the picture just shown after the individual had assumed the Trendelenburg. Fig. 27 shows another case with the picture taken in the standing position, and Fig. 28 shows the same stomach immediately afterward, taken in the Trendelenburg position. By placing a ptotic individual in the Trendelenburg position the prolapsed viscera, if not prevented by adhesions, contracted walls or new growths, will seek to gravitate to their normal level. Placing the patient in the Trendelenburg position, then, is the first act in the treatment under consideration.

<div align="center">TEMPORARY SUPPORTS</div>

The most effectual and satisfactory preliminary abdominal bandage is the Achilles-Rose adhesive moleskin plaster,

placed upon the abdomen while the patient is in the Trendelenburg position, after the viscera have been restored (Fig. 23). If this is found to afford relief and severe symptoms, which reveal adhesions or prolapsed viscera, do not follow its application in a short time, a well-fitting canvas abdominal support or corset can be substituted for wear during the day. These permanent supports in the form of bandages and corsets are shown in Figs. 24, 29, 30, 31, 32, and 33. The essential thing in any abdominal support for the treatment of these cases is to have it uplift rather than compress the contents of the abdomen.

EXERCISE AND CORRECTION OF POSTURAL HABITS

The exercises are of two varieties—those which are practised in connection with postural treatment in the Trendelenburg position and those practised while wearing the abdominal support in the upright position.

The individual with the marked type of ptoses is required to arise from his bed each morning and assume a position on his back upon his extemporized Trendelenburg table, without a bandage (Fig. 33). While in this position, simple active muscular exercises are indulged in.

In order to systematize these exercises and classify them for the purpose of giving instruction to my patients, or nurses who have charge of the cases, I have outlined a few simple maneuvers.

The first movement, which I frequently prescribe to my convalescent patients who have the ptotic habit and have been subjected to surgery because of intercurrent difficulties or complications of ptosis, consists in the slow flexion of the leg on the thigh and the thigh on the abdomen, without unflexing or extending the leg and without lifting the foot from the bed. Fig. 34 depicts this simple act with either limb. Fig. 35 is the same maneuver with both limbs.

As this is one of the simplest exercises and reserved for convalescent patients it is carried out upon a cot at the side of the patient's bed, the end of which is elevated by placing a chair under it to secure the Trendelenburg position.

The regular routine exercises hereinafter described are best carried out on an ordinary ironing board employed as a convenient substitute for the Trendelenburg table (Fig. 36).

Movement two consists in slow, extreme expansion of the chest by deep inspiration and slow expiration. In my opinion this is the most important exercise that can be prescribed for a ptotic patient, and for that reason it is insisted upon as the alternate movement in connection with all the others. To secure the best effect in ptoses, this exercise should be practised in the Trendelenburg position, and should be performed with (*a*) pressing both hands upon the lower abdomen toward the diaphragm; (*b*) elevating the shoulders with arms extended slowly at right angles to the sides (Fig. 37); and (*c*) elevating the arms above the head perpendicular to the body. This movement brings into play the diaphragm, the abdominal muscles, the back muscles, the depressors and levators of the ribs, the shoulder muscles, the strong pectoral, the trapezius, and even the strong cervical group of muscles.

The third movement is the elevation of the lower extremities at right angles to the trunk, with preliminary knee flexion (Fig. 38); then slow flexion at the knees, followed by extreme flexion of the thighs on the abdomen; and finally slow extension to beginning position. This movement may be carried out (*a*) with one limb at a time, or (*b*) with both limbs simultaneously.

These two movements when properly accomplished exercise some muscles that are seldom brought into extreme action by the ordinary use of the extremities; especially is this true of the deep psoas muscles, the deep posterior

sacral and back muscles, and most markedly the recti and pyramidalis muscles of the abdomen.

The fourth movement consists of slowly elevating the lower portion of the trunk on the soles of the feet and back of head and shoulders (Fig. 39). This obviously brings into play the strong extensors of the back, the lumbar, dorsal, and posterior cervical group, the anterior muscles of the thigh and the front and lateral muscles of the abdominal walls.

A fifth movement employed with the stronger patients consists in raising the body to a sitting position with the hands by the side, or if necessary at first, by grasping the edge of the board with the two hands to assist in the movement (Fig. 40).

These movements are the important ones, and rather than add confusion by multiplying them, I modify them slightly. To exercise the adductor and abductor of the thighs, and particularly to reach the little obturator and pyriformis which are both outside and inside the pelvis, in the sixth movement, the patients are instructed to (a) separate the knees widely with the two feet parallel, with the soles flat on the board (Fig. 41); or (b) a more difficult exercise, with the two feet extended at right angles to the body, to slowly separate them to the extent of comfort (Fig. 41).

Patients who are weak and unaccustomed to active exercise are assisted at the beginning by the nurse or a member of the family until such time as they can exercise by themselves.

Frequently it is desirable to employ the influence of posture, more particularly in prolapsed or retroverted uteri, where these organs are not permanently fixed by adhesions. This I have designated as the seventh movement.

There are three influential factors that may be utilized in these cases in the gymnastic and postural treatment: (a) Replacement of the displaced uterus by the knee-chest posture; (b) ballooning the vagina and sometimes the

<div align="center">

Fɪɢ. 1   Fɪɢ. 2

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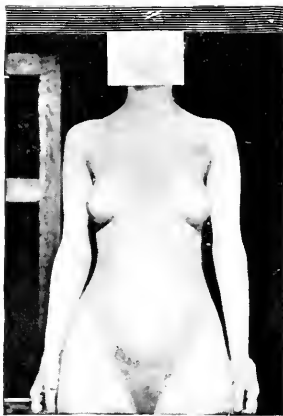
Fɪɢ. 1.—Typical ptotic figure of the congenital type. (Drawing from Richard Smith's collection.)

Fɪɢ. 2.—Typical ptotic figure showing flat chest, straight back; and cannon ball abdomen. (Drawing from Richard Smith's collection.)

<div align="center">

Fɪɢ. 3   Fɪɢ. 4

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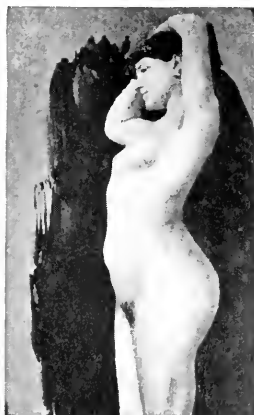
Fɪɢ. 3.—Typical acquired ptoses type representing the exaggerated feminine figure.

Fɪɢ. 4.—Typical normal female. (From a photograph.)

FIG. 5   FIG. 6

FIG. 5.—Typical normal female of the athletic type.   (From Sargent.)
FIG. 6.—Back view of heavier athletic type of normal individual.
(From Sargent.)

FIG. 7.—Typical male athletic type.   (Model from Sylvester
Simon's gymnasium.)
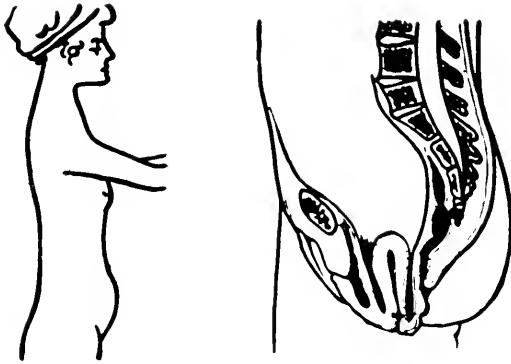
Fig. 8.—Typical ptotic individual of congenital type with reproduction of pelvis showing its perpendicular attitude.
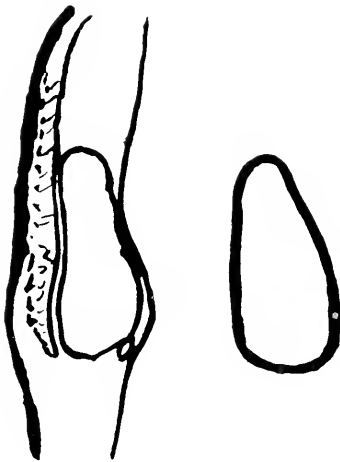
Fig. 9.—Typical ptotic figure showing schematic cone shape of abdomen with base of cone in the pelvis.
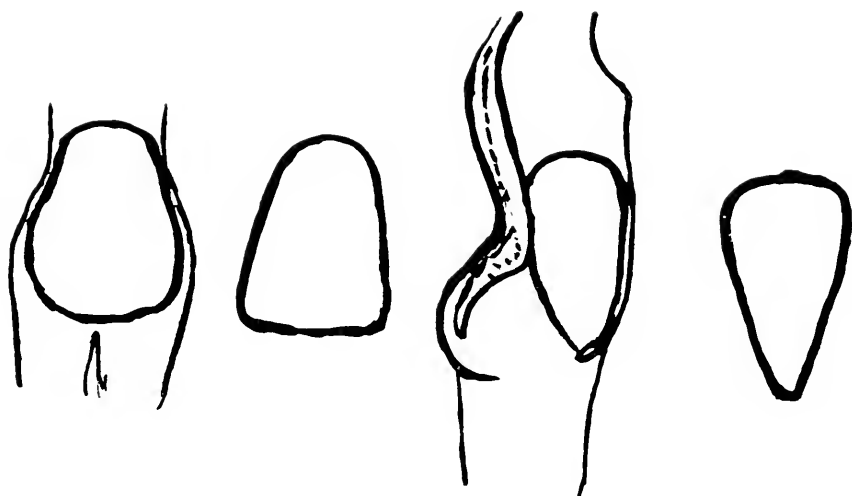
Fig. 10   Fig. 11

Fig. 10.—Same as Fig. 11, front view; showing base of cone in the pelvis.

Fig. 11.—Normal individual showing cone shape of abdomen with cone reversed with its base beneath the diaphragm.
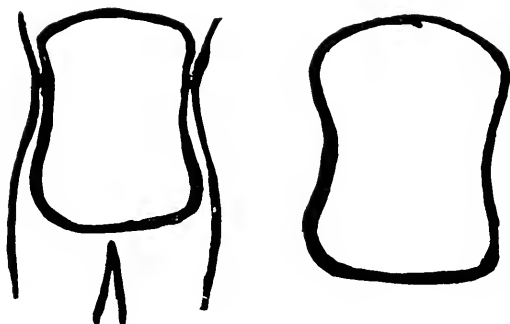
Fig. 12.—Front view of normal female abdominal cavity representing an hour glass, with large portions beneath the diaphragm and the pelvis.

Fig. 13
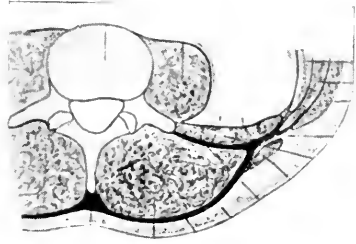
Fig. 14

Fig. 15

Fig. 16

Fig. 17
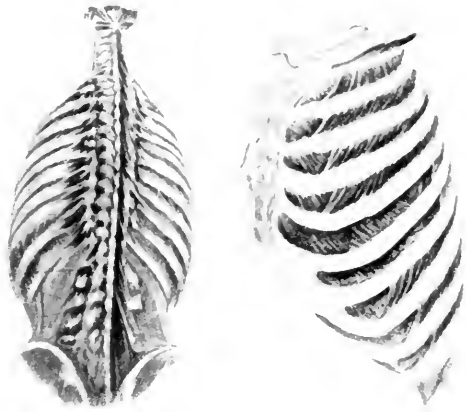
Fig. 18
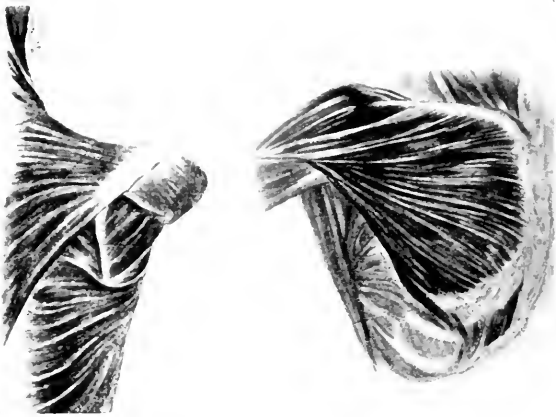
Fig. 19

Fig. 20
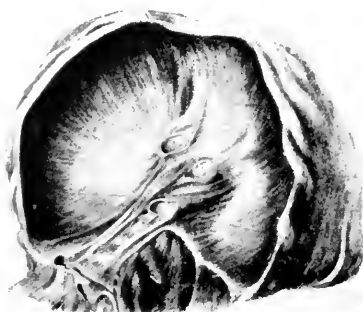
Fig. 21

Fig. 22.—The attitude of rest.

Fig. 23.—Application of the Achilles Rose adhesive plaster. Bandage applied with patient in Trendelenburg position.

Fig. 24.—Well-known binder of desirable construction, supporting abdomen of ptotic individual of exaggerated feminine type.

FIG. 25.—X-ray of ptotic individual taken in perpendicular position after patient has been walking about for some time.

Fig. 26.—Photograph taken immediately following Fig. 25, after the
individual had assumed the Trendelenburg position.

Fig. 27.—X-ray taken of ptotic individual with patient in
perpendicular position.

Fig. 28.—Same stomach after the individual had assumed the
Trendelenburg position.

Fig. 29   Fig. 30

Fig. 29.—Another style of abdominal bandage of a very desirable type for both men and women.

Fig. 30.—A corset abdominal support showing effect of application to an exaggerated feminine type with ptoses.
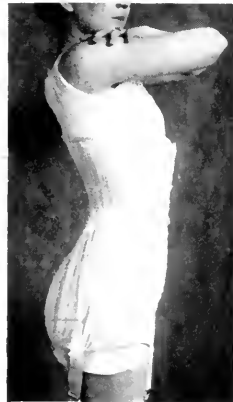
Fig. 31   Fig. 32

Fig. 31.—Same style of support applied to a male patient.
Fig. 32.—Form of corset for ptotic females which is very satisfactory.

Fig. 33.—Position advised for exercises described for ptotic patients.

Fig. 34.—Movement one, consisting of flexing leg upon thigh and thigh upon abdomen.

Fig. 35.—Second act of first movement.
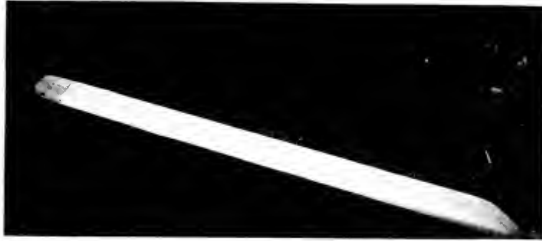
FIG. 36.—Simple and inexpensive means of obtaining Trendelenburg position.

FIG. 37.—Movement two consists of exaggerated expansion of the chest with arms above the head or, as in Fig. 33, with pressure of hands over the lower abdomen.

FIG. 38.—Movement three. After extreme expansion of limbs one at a time and then together, leg is flexed upon thigh and thigh upon abdomen, followed by return to extended horizontal position.

FIG. 39.—Movement four.

FIG. 40.—Movement five.

FIG. 41.—Movement six (a).

Fig. 42.—Movement six (b).

Fig. 43.—Movement seven (a).

Fig. 44.—Movement seven (b).

Fig. 45.—Form of apparatus for securing Trendelenburg position for ptotic patients who have been operated upon for adhesions.

Fig. 46.—After one year treatment. Was extreme ptotic type with narrow upper and projecting lower abdomen. Marked intestinal stasis. Right iliac lower quadrant pain. Extreme anemia and neurasthenia. Operation revealed chronic appendicitis, marked Lane kink, and extreme general ptosis. Treatment: Reconstruction of abdomen, flattening of lower abdomen, and increasing capacity of upper abdomen. Patient completely cured of all former symptoms.

FIG. 47 · FIG. 48 FIG. 49

FIG. 47.—After successful treatment: Case diagnosed: "Lane kink" with intestinal stasis. Symptoms: constant indigestion with extreme exacerbation accompanied with right side pain, nausea, and vomiting. Relieved by rest, abstinence from food and intestinal unloading. Patient had marked ptoses with narrow upper abdomen. Operation revealed Lane kink with acute bend and firm adhesions. Cecum prolapsed into pelvis and appendix clubbed. Kinks relieved, adhesions separated, appendix removed, and, after replacing viscera, treatment described in this article was instituted. Symptoms completely relieved. Upper abdomen had been expanded with marked improvement in the ptoses.

FIG. 48.—Extreme "over-feminine" type with general ptoses, including right kidney descent. Symptoms; intestinal stasis with anemia, and periodic attacks of nausea and vomiting. Pain in right lower quadrant. Occasional severe kidney crises, precipitating coma. Diagnosis: Chronic appendicitis, Lane kink and extreme kidney descent, accompanying general ptoses. Operation: Corrected kink, separated adhesions about head of cecum, removed appendix and anchored kidney. Treatment described herein instituted to prevent relapse and to cure ptoses. The extreme lordosis of spine corrected, lower abdomen flattened, upper abdomen expanded, and general ptoses prevented. Patient is restored to perfect health.

FIG. 49.—Described as "case 10" in article in *Jour. Amer. Med. Assoc.*, November, 1911. Patient had appendix removed five years before I operated on him for Lane kink. Subject of chronic intestinal stasis, anemia, and pronounced neurasthenia with grave mental disturbance. I relieved the Lane kink, surrounded by many adhesions and accompanied by generally ptotic condition of abdominal viscera, and instituted treatment herein described. Patient has been completely reconstructed. From an extreme ptotic type with "cannon-ball" abdomen, contracted chest and upper abdomen, with the compensatory stoop, he has developed a normal contour and a normal attitude. Symptoms are relieved and by a strenuous attention to his exercise, he keeps himself in working form.

rectum by distending them with air; (*c*) aiding these two measures by contracting and relaxing the abdominal muscles and the diaphragm.

The exercise consists of three movements in the hands-and-knees position, either on a level surface or better an inclined plane (Fig. 43). The (*a*) movement is slow, deep inspiration and expiration of the lungs in the knees-and-hands position; (*b*) lowering the upper portion of the body so that the chest and knees will be in contact with the board; (*c*) deep inspiration and expiration while in the last or true knee-chest position; finally returning to the knees-and-hands position (Fig. 44).

These movements may be repeated slowly from knee-hands to knee-chest and back again, with deep breathing interspersed. This maneuver is usually prescribed as the last one of the series of exercises. The patient is then instructed to assume her bed or couch in the Sims position for rest.

The ballooning of the vagina is facilitated and assured if there is any doubt about its being accomplished by instructing the patient to slip a small tube or glass or hard rubber with a vulva protecting flange into the vagina before beginning the maneuver. This insures an inrush of air into the vagina on the patient assuming the knee-chest position, thereby throwing the cervix high and into the hollow of the sacrum and favoring a forward movement of the fundus of the uterus by gravity and by the bellows-like or aspirative action of the abdominal cavity with the contraction of its muscular walls. Where still further action is required on the fundus of an impacted uterus, means should be used to balloon the rectum as well as the vagina.

It is advisable, if exercises of the kind recommended in this paper are to be of any value, to impress upon the patient the importance of them, and to give exact directions in regard to the length of time to be employed with the move-

ments and the exact kind and number of each movement. In order that the patients be well started with the exercise it should be conducted at first under the supervision of a conscientious nurse. Later the exercises should be observed once or twice a week by a nurse or other reliable attendant, who will make a definite report on the progress of the patient. This report should include the weight of the patient and measurements at extreme inspiration and expiration of the chest, waist, and abdomen, also measurements of the abdomen at the tip of the ninth rib with full chest expansion and contraction.

At the beginning it is well to prescribe a few movements carried out slowly, ten to fifteen minutes' time being allowed morning and evening. As the patients develop muscular strength, the movements may be increased from three or four of each of the principal movements properly alternated, to six or eight or even ten of each carried out more rapidly and occupying from fifteen to twenty minutes' time for their execution.

In ptotic cases the bath and rubdown, consisting of a sponge bath in convalescent cases, with a coarse towel friction rub, should be given in the recumbent, or better, the Trendelenburg position. Then after the required rest, a properly supporting abdominal bandage should be applied, with the patient in the Trendelenburg position. The patient should then be allowed to assume the upright position.

The patients should be enjoined to carefully avoid the compensatory stoop while in the standing or walking position. With the abdomen properly supported, and the viscera at their normal height, hugging the posterior parietes instead of dangling forward far from their normal attachments, the desire for the forward bend is partially eliminated and the individual finds that he can more easily maintain his normal position because the normal centre of gravity is restored.

It is but a step now, when the patient finds that he can walk with ease, without the feeling of weakness and insecurity in his abdomen that compels him to adopt the ptotic attitude, to the time when he will gladly walk long distances and adopt other outdoor exercises which will develop muscles naturally and give him an appetite for nourishing food and refreshing sleep.

FRESH AIR AND FEEDING

With the individual restored to such an extent that his digestive organs are functionating normally, with exercise that will send him into the open air, appetite will develop. Nourishing, fat-making food should now be prescribed for the patient and an accumulation of a normal amount of fat encouraged.

COMPLICATIONS OF PTOSIS

Surgeons *who have been looking for them* have found accompanying if not directly depending upon, general or partial ptoses, kinks or bends in the intestines which obviously have produced pathological stasis. These occur particularly at the pylorus, the duodenal-jejunum junction, the terminal end of the ileum, the transverse colon, and the sigmoid. Frequently the condition is made permanent by adhesions due to peritoneal inflammation caused by infection or excessive mechanical irritation of misplaced or overriding viscera.

A low-riding cecum distorts the appendix, causes a kink at the distal mesoappendix attachment and leads to chronic appendicitis. A descending liver produces flexion on the cystic duct and at periods of exacerbation causes gall-bladder symptoms which call for surgical interference, which interference reveals gall-bladder infection, and occasionally extensive adhesions about that region. An intractable

kidney in which severe crises are a frequent symptom and which cannot be relieved by abdominal supports will be found to be one that is not easily replaceable.

These cases all require surgery. The kinks must be relieved from their adhesions and the organs replaced. This, however, in ptotic individuals is not sufficient.

After the surgery has been accomplished, *through a sufficiently large incision to enable the operator to do his work well, and to assure him that he is not overlooking something important in these individuals so prone to multiple complications, the viscera should all be carefully restored to their proper level, by the aid of the steep Trendelenburg position.* Dressings should be placed in such a position on the abdomen that, by the application of a snug adhesive plaster corset, they will retain the hitherto displaced viscera in their normal position.

The patient is then transferred to a bed with a 15 degree Trendelenburg incline (Fig. 45), and kept in that position for forty-eight to seventy-two hours, or until such time as the replaced intestines and other viscera have reformed their adhesions (if they must be reformed) in an *advantageous* rather than the former *disadvantageous* position. The patient is then treated as a chronic ptosis case, along the lines already outlined in this paper.

In another communication[1] I have dwelt upon the management of the adherent kinks at the terminal end of the ileum the properly called Lane kink. At least 40 such cases of my own have been treated by the above routine during convalescence. The success of the treatment has been remarkable in more than 80 per cent. of the cases operated upon, and the disappointments have only been partial, and in direct relation to the failure of the patient to carry out the rather irksome details of the treatment.

I very often find in ptotic cases that mucous colitis promptly

[1] Jour. Amer. Med. Assoc., November 11, 1911.

disappears if the colon is free from adhesions and is replaceable under the treatment I have suggested for general ptoses. The replacement of a non-adherent, prolapsed colon may be encouraged by filling it with water while the patient is in the Trendelenburg or knee-chest position.

Another definite complication of the general ptotic individual, for which surgery has been recommended by Coffey, is the narrow upper abdomen, which contracts and becomes permanently narrowed above the prolapsed viscera, and for which he advocates an operation which has for its object the increasing of the capacity of the narrowed portion. The narrowed upper abdomen is a compensatory atrophy which is inevitable in direct proportion to the sagging and disappearing of its contents.

The treatment I have outlined is particularly applicable to several of the processes leading to that condition. In a series of cases I have seen the upper abdomen and lower chest walls expand rapidly under the practice of the Trendelenburg position accompanied by the exercises outlined in this paper. This gravitates the prolapsed viscera to the neglected upper abdomen, and, combined with forced expansion of the chest walls and exercises of the abdominal and back muscles, directly increases the capacity of that portion of the abdomen. The results of this treatment in this respect are so marked and prompt that I have been led to believe that its thorough trial will make the expanding surgery unnecessary (Figs. 46, 47, 48, and 49).

Figs. 46, 47, 48, and 49 represent extreme types which have been under treatment such as that described in this paper. These individuals are representative of a large number who have been under similar treatment. Their figures have been actually reconstructed. It was with some difficulty that the consent of these patients was obtained to reproduce their figures, and I am under deep obligations to them for the privilege.

DISCUSSION

DR. W. FRANCIS B. WAKEFIELD.—I cannot let this excellent paper go by without a word of commendation. I think that Dr. Martin has given us a very valuable therapeutic agent. I have been using a course of treatment almost identical with that given for the last four years, and the results obtained by it have been extremely satisfactory. It seems to me that, as surgeons, we are shortsighted if we allow those women, who advertise physical culture treatment in the popular lay journals, to cure our patients. I know it is possible to take an intelligent nurse and train her to understand the principles and application of such treatment, and to use it intelligently, and it will be wise for us to take the trouble to do this, and thus keep a useful form of treatment under professional supervision rather than have our patients seek, in desperation, the help of those outside of the profession.

DR. CHARLES P. NOBLE.—It cannot but be of interest to me to see how more and more the general subject, under which Dr. Martin's paper comes, is attracting the attention, not only of gynecologists, but also of physicians generally. This is seen by the greater attention being paid to the ptoses, and to such diathetic conditions as adenoids in the nasopharynx, the broader concept of infantilism, and, finally, the recent concept of the Germans, entitled "*Asthenia Universalis Congenita.*" This last concept recently put forward by the German School corresponds with that of the late Dr. Harrison Allen and myself, when in 1886, after studying the causes of delayed puberty in girls, we decided that it is due to hypoplasia, usually of an environmental origin.

The subject can be discussed from many standpoints. Dr. Martin has not presented it in general, but has simply dwelt upon one phase of it.

As to treatment, I will merely say this: I was interested in Dr. Martin's recommendations, but I am confident that both the patient and the physician can be saved much trouble if it shall be recognized that what is actually the matter with this group of people is that they are in part dead, while yet alive. In other words, their vitality is low. Their potential energy and their capacity to generate energy are below that of the norm or the type of the species—the *genus homo.*

Finally, what does the elaborate tratment recommended by
Dr. Martin bring about? It insures that the patients shall
have exercise, and the exercise makes them eat more, and
thus they can develop more energy, and become "better." In
short, it is all unnecessary, and also is a waste of time, to go into
all the details of exercise so carefully elaborated in this paper.
The patient should be treated as are cases of tuberculosis.
They should be given fresh air, should be well fed, and should
have their bodies washed out with water to rid them of their
retained toxins. If their digestion is good, they gain in nutrition
when fed upon a diet of beefsteak, milk, and water, and fruit
and vegetables; when less good, they do better upon a diet of
milk and raw eggs. They should be given rest, as they are
worn out; because they are all half dead; and because, should
they exercise when half dead, early in the "cure," they accumu-
late additional fatigue toxins, and thus their functions become
more abnormal. The essentials of treatment consist in washing
out the toxins with water and liquid diet, in rest, and in securing
improved nutrition, whereby the capacity for generating energy
is increased. As the patients develop more energy, let them
have general exercise, and they will get along much better—
will recover more rapidly—than by having the trouble and the
annoyance of going through the particular exercises that have
been outlined. The real difficulty is lowered vitality. Improve
this; then the tonicity of the tissues will be restored, and,
once more, the balance between the intra-abdominal forces will
be restored, and the patients will be "well;" but they, for
the most part, are environmental, evolutional degenerates—
instances of arrested development—and to "keep well," each
must be instructed how best to improve and to maintain his
or her vitality; and also to limit the output of energy to a point
within the individual potential for generating nerve force or
energy.

Dr. Clement Cleveland.—I do not propose to enter into
a discussion of this subject, but I want to say a word in the
way of correction of terms. I had been in the habit of using
the term Trendelenburg position or posture, but a few years
ago I met Professor Trendelenburg and he immediately corrected
me with regard to the pronunciation of his name. The posture
Dr. Martin spoke about is not the Trendelenburg posture,
but it is merely an inclined posture with the head downward,

and that is not the Trendelenburg posture. The Trendelenburg posture requires relaxation, not only of the abdominal muscles, but of the psoas muscles. In order to get that, you must flex the thighs upon the pelvis, and the only table which does that is a table that is known by my name, and which has been in existence for years.

Dr. RICHARD R. SMITH.—I wish to express my appreciation of Dr. Martin's paper. It is the best one I have heard on the mechanical treatment of this condition. We are indebted to him for having elaborated a specific way of handling this phase of the problem. I believe, however, that this is not the most imporatant element in the management. We must remember that when these women come to us suffering, they come to us —in the vast majority of cases at least—in a state of nervous and physical fatigue. A woman who is enteroptotic and in equilibrium, who is leading a life within her limitations, has few if any symptoms, but goes about doing her work and taking her part in society with other women. She has a low vitality, as Dr. Noble has said, and gives out more easily. Then she comes to us. The keynote of the situation is that she needs rest, both physical and mental. We need also to improve her nutrition, which means fresh air, better food or whatever other means we may employ. Each case must be worked out individually. These mechanical measures help incidentally, and if we can employ them in conjunction with other things surprising results may be obtained. The most difficult thing in connection with the treatment is to get these women to follow a prescribed course, for it is apt to involve a considerable sacrifice of time and a reconstruction of their habits of living.

I wish to call your attention to the preventive treatment of enteroptosis. If we follow these women back into childhood, we find that they are essentially of the same build when children as they are later in life; that the fundmental defects are there in childhood as we find them in adult life. These fundmental defects are a lack of fat, a laxity of tissue and a backwardness in the vigor of their development. We will find, if we examine the organs of these children, that they are pretty well up in place; that the ptoses themselves are not present in childhood as they are in adult life, although we may find occasionally, especially toward puberty, more or less evidences of this. If we are to handle this problem correctly, we must see to it that

these children do not continue into adult life in this state of nutrition, and in many instances I believe it can be prevented. They should be regarded as a separate class of individuals and handled accordingly. Our schools may well be modified to meet this, as well as other physical problems of childhood, so that not only the mental development of our children may be cured for but the physical as well. If these children are kept in the open air a grest deal, if they are not allowed to become overfatigued, if they are given proper excersie and proper food, it is surprising how well they will develop. It would seem after all that it is not going to remain with us alone as a profession to solve this problem, but rather with the public in the work that is being done to better our school conditions. Through the school home conditions may perhaps be improved for them, and we will hope some time in the future to have less of these nervous enteroptotic women to care for.

DR. WILLIAM S. STONE.—All of us realize, I think, how much success in the treatment of these cases depends upon the attention we give to detailed instruction in carrying out certain therapeutic measures, and from Dr. Martin we have received many helpful suggestions. We have heard also from Dr. Noble's remarks how closely the etiology of these conditions is related to heredity and to bad habits of hygiene that have been acquired in early life. Each of us has undoubtedly some favorite way of treating these cases. For the purposes of carrying out successfully the principle of alternating exercise and rest, I, relying upon walking as the best form of exercise for the majority of these cases, instruct the patients somewhat as follows: To walk each day for a distance a little bit longer than they feel like walking, and to take the walk at such a time in the day that when they reach home, they are able to immediately lie down, on bed or sofa, without attending to any domestic details, for the same length of time as they have spent in their walk. In addition, massage and various hydrotherapeutic measures are found to be of value. Without regard to the specific kind of measures we advise, it is extremely important to impress upon the patients that usually a longer time than they anticipate will be required for their complete recovery.

DR. MARTIN (closing).—Unfortunately my paper was not read in full. I wish to say, that this treatment was developed in the treatment of surgical cases, in the treatment of kink of

the ileum, and the transverse colon, and in the conditions that are operated on by Lane, and for which he has gained considerable reputation. The first of the cases which I observed were operated on by the Mayos. They relieved the Lane kink from its adhesion and made no further treatment. I operated on a considerable number of cases afterward myself. I separated the adhesions, replaced the contents of the abdomen, and sent the patients out. Within a few months they returned with the kink still existing. In other words, the adhesions began to reform, and in most cases there existed relaxation or ptosis.

In regard to these exercises, these individuals will not walk because they cannot walk without pain and distress. The only time they are comfortable is when they are lying on their backs or when in a reversed position. What I do for them, after operating upon them, is to put them in that position. After replacing the organs that are kinked and adherent, instead of removing the colon or transplanting the ileum into the sigmoid, I put them in the Trendelenburg posture, and replace the organs while they are in that position by filling them full with water, as is done by Clark, replacing the organs absolutely, and do not allow them to get out of that position for seventy-two hours. In other words, the viscera are put in an advantageous position and are not allowed to go back into a disadvantageous position until the adhesions that are going to form have formed. These patients will not exercise, they cannot exercise, because their organs are dangling and the individuals are uncomfortable. They are allowed to get up on their feet gradually, and with the organs properly supported they will exercise, and the organs will remain in that position, enabling them to live with some degree of comfort and to rapidly get well. These exercises must be gone through in some way, and the best position to adopt in performing them is one that will maintain the organs in their normal position.

Dr. Goffe.—Dr. Martin says he puts these patients in the inclined posture until adhesions have formed. I would like to know what he means by that. Where do the adhesions come from?

Dr. Martin.—Do you recognize a Lane kink?

Dr. Goffe.—Yes.

Dr. Martin.—You have separated the adhesions. What happens? If you allow the individual to go about, the adhesions reform because the cecum is always down, which is one reason why the individual has a Lane kink. On the other hand, if you put that individual in the Trendelenburg posture and keep the cecum up until adhesions have formed in some other position than in the kink the individual will not have stasis at that point. In other words, the adhesions of the intestines are of no importance if the intestines are not adherent in that disadvantageous position.

THE INFLUENCE OF MYOMATA ON THE BLOOD SUPPLY OF THE UTERUS, WITH SPECIAL REFERENCE TO ABNORMAL UTERINE BLEEDING[1]

BASED ON THE STUDY OF 150 INJECTED UTERI CONTAINING THESE TUMORS

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THE purpose of the present article is to show the blood supply of uteri containing myomata with reference to the changes caused in it by these tumors and especially those which would lead to abnormal bleeding, as found in the clinico-pathological study of 150 injected uteri containing myomata.

At the last meeting of the American Gynecological Society held at Atlantic City in May, 1911, I presented a paper entitled "The Blood Supply of Uterine Myomata, Based on the Study of 80 Injected Uteri Containing these Tumors." This paper, which included a study of twenty more injected specimens, was presented before the Second Annual Session of the Clinical Congress of Surgeons of North America on November 15, 1911, and has appeared in the TRANSACTIONS OF THE AMERICAN GYNECOLOGICAL SOCIETY, 1911, and in *Surgery, Gynecology, and Obstetrics,* March, 1912.

The present study is a continuation of the previous one, and is of greater clinical value because the changes in the

[1] The illustrations for this article can be found in Surgery, Gynecology, and Obstetrics for March, 1913.

circulation of the uterus caused by these tumors contribute more to their symptomatology and interfere more with the health of the individual than the blood supply of the tumors themselves.

The literature of this subject, based on the study of injected specimens, is meagre and has already been referred to in the previous paper.

The material for the present study consists of the 100 injected uteri containing one or more of these tumors which were used in the preparation of the previous paper, and 50 additional ones, all of which were removed at operation and injected soon afterward.

The injection mass used was 15 per cent. gelatin, which contained in suspension either a pigment or some material (usually bismuth subcarbonate) which was impervious to the x-ray. In 52 specimens either the arteries or veins, or both, were injected with a pigment (if both were injected, Venetian red was used for the arteries and ultramarine blue for the veins). In the remaining 98 specimens, one vascular system was injected with a mass impervious to the x-ray, and the other system was usually injected with a colored mass. Stereoscopic radiographs, of the specimens injected with the mass impervious to the x-ray, were found to be of great value in the study of the various phases of this subject. The methods of injecting, preserving, and studying the specimens were described in the previous paper.

The material for this study may be grouped according to the clinical diagnoses made before the operation as follows: myomata, 79; pelvic inflammatory conditions, 20; uterine bleeding of obscure origin, 16; ovarian cysts, 12; carcinoma of the cervix, 8; carcinoma of the body, 5; descensus and retrodisplacements of uterus, 5; ectopic pregnancy, 3; hydatiform mole, 1; sarcoma, 1. This shows how frequently myomata are encountered when operating for other condi-

tions; *i. e.*, over 47 per cent. of the material was obtained at operations which were undertaken for other conditions than myomata.

THE BLOOD SUPPLY OF THE NORMAL UTERUS

The course of each uterine artery along the side of the uterus and its free anastomosis with the ovarian artery of the same side are well known. From each uterine artery branches arise, at intervals, which penetrate the uterus; each one either divides into two branches, one supplying the anterior and the other the posterior uterine wall, or without dividing it supplies either one or the other uterine wall. At the level of the internal os their course within the uterus is at right angles to the long axis of that organ; below this level it is inclined downward, while above it is directed obliquely upward and the arteries themselves are larger. Frequently one intramural artery is much larger than the rest and appears as a terminal branch of the main uterine artery. This is known as the fundal branch. These arteries present many minor variations, but the general plan of their origin and course is the same. These main intramural arteries which I have called "arcuate" lie between the outer and middle third of the uterine wall, and each one supplies a quadrantal segment of the uterus corresponding to a segment of either the anterior or posterior half of the Müllerian duct of that side. They terminate in median peripheral and radial (centripetal) branches. The peripheral terminal branches of some of the arcuate arteries of one side anastomose freely with similar branches of arcuate arteries of the opposite side, thus establishing a free communication between the two main uterine arteries. Along the course of each arcuate artery *radial* (centripetal) and *peripheral* (centrifugal) branches arise. The radial branches are the larger and more numerous. They supply

the myometrium, mesial to the arcuate artery from which they arise, and *terminate in the endometrium.* The peripheral arteries nourish the peripheral portion of the myometrium. There is a free anastomosis of the arterioles of the peripheral branches of neighboring arcuate arteries of the same side, and also of the arterioles of the radial branches near their origin from the arcuate artery, but the distal portion of the radial arteries are apparently end arteries.

The arterial system of the uterus enables us to divide the uterine wall into three zones: (1) The peripheral (the outer third), which is nourished by the peripheral arteries; (2) the arcuate, the narrow zone in which the arcuate vessels lie; (3) the radial (the inner two-thirds), which is nourished by the radial arteries.

In order to distinguish the arteries from the veins an injection mass of sufficient coarseness was used, so that it usually did not escape through the arterial capillaries into the veins, and as a result I may have failed to inject some of the finer capillaries of the endometrium. The fine terminal branches of the radial arteries penetrate the base of the endometrium, and arterial capillaries were found to extend only a short distance in the uterine mucosa. On the other hand the veins of the endometrium (the venous capillaries) are easily injected through the uterine and ovarian veins. Occasionally the arterial injection mass escaped from the terminal branches of the radial arteries into the venous plexus of the endometrium, and these specimens presented a very confusing picture as the arteries and veins contained the same mass, and even if the arterial mass were followed by a venous one of another color the arterial mass remained in the veins of the endometrium.

The arrangement of the venous system of the uterus is as follows: (1) A rich plexus in the endometrium which is fed by the terminal branches of the radial arteries, to which reference has been made; (2) a similar

but larger plexus of the myometrium which communicates with that of the endometrium by venous channels. There is often a narrow zone of the myometrium about the endometrium which is relatively anemic (under normal conditions), and through which the venous channels pass, uniting the two plexuses. This "protection" zone is possibly an important means of regulating physiological as well as pathological uterine bleeding, as will be considered later. About the periphery of the myometrium, especially on the sides, and sometimes accompanying the arcuate arteries, are collecting veins which convey the venous blood of the uterus to the uterine veins situated between the layers of the broad ligament. Since the entire venous system of the uterus is easily injected through the uterine and ovarian veins, the intrinsic uterine veins do not contain valves.

The study of the uterine circulation from the injected specimens, bearing in mind that there are not any valves in the veins and that the uterus is a muscular organ which may relax and contract, suggests that relaxation and contraction of the uterus may be of great importance in aiding its circulation, *i. e.*, the *uterus is essentially a "pelvic heart"* (Theilhaber). This is seen during pregnancy and menstruation, and possibly may occur during the quiescent nonpregnant condition, though I have not been able to obtain any definite proof of the latter. When relaxed the plexuses of the endometrium and myometrium would be filled with venous blood and the arterial blood would easily gain access to the endometrium, and in contracting this blood would be forced out of the uterus into the pelvic veins. My studies support the views of Theilhaber in regard to the importance of the muscular efficiency of the uterus in aiding the uterine circulation and that it is also an important factor in regulating uterine bleeding.

During pregnancy the uterine arteries increase in size, and the arcuate arteries whose radial branches nourish the

placenta become hypertrophied. The venous plexus of the myometrium is distended with blood when the uterus is relaxed. On account of the increased vascularity of the organ as a whole the demand for its "cardiac" function is greater than in the non-pregnant condition, and it is in pregnancy that the intermittent contractions are most noticeable. After labor the process of involution occurs, and Goodall (*Am. Jour. Obs.*, 1909, lx, 921 to 985) believes that the uterus renews all of its arteries, the renewal consisting in the building of a new vessel within the lumen of the old one.

Adler and Hitschmann have divided the menstrual cycle into four periods: the post-menstrual, interval, premenstrual, and menstrual. At the post-menstrual period they describe the endometrium as thin, anemic, and smooth. It gradually increases in thickness as the individual approaches menstruation, and at the premenstrual period it is thicker and more vascular than at any other time. By the process of menstruation the endometrium assumes the post-menstrual condition.

It would also seem that the entire uterus contained more blood in the premenstrual period and that menstruation may be looked upon as a form of labor, followed by a process of involution differing in degree from postpartum involution.

I have *studied all my specimens with a knowledge of the age of the patient and the date of the last menstruation* if operated upon before the menopause, and have injected several specimens from patients who were menstruating at the time of the operation. I have found that the endometrium differs so much in its thickness and vascularity in individual cases that it is impossible to determine the exact stage of the menstrual cycle from the appearance of the endometrium except during the actual flow. I have seen the endometrium thick and very vascular within a

week after the menstrual period and relatively thin in the premenstrual period. It must be borne in mind that the degree of congestion during life cannot be determined from the injected specimen, nevertheless my work in a general way confirms the descriptions of Adler and Hitschmann as to the changes of the endometrium in the various phases of the menstrual cycle. As a woman approaches the menopause the uterus becomes less vascular, both arterial and venous, the endometrium and uterine wall become thinner, and the proportion of the muscle to connective-tissue changes in the wall, the connective tissue predominating. I believe that injected uteri can only be intelligently studied when both the age of the patient is known and the date of the last menstrual period, irrespective of the pathological condition present.

THE FACTORS REGULATING MENSTRUATION

In the present communication we are specially concerned with the vascular changes in the uterus leading up to and associated with menstruation. What causes the onset of the flow? Why does it continue for a certain number of days? Why does it stop? Why irregular or regular, scanty or profuse, of short or of long duration?

OVARIAN FUNCTION AS A FACTOR IN REGULATING MENSTRUATION

We know that ovarian activity or function is responsible for the menstrual cycle. If the ovaries have been entirely removed, the changes in the uterus leading to menstruation do not take place and physiological uterine bleeding will not occur.

On the other hand, ovarian activity may normally exist, and yet the individual may not menstruate as shown by women becoming pregnant before puberty, during the amenorrhea incident to lactation, after the apparent menopause, and in those with suppression or absence of menstruation due to other causes. A non-pregnant woman then with apparently normal ovarian function *as far as ovulation is concerned* may not menstruate. If she does not, its non-appearance is due to some condition within the uterus, or even outside. I have long been impressed with the fact that patients with abnormal menstruation either irregular, scanty, profuse or prolonged may have ovaries which anatomically and histologically appear normal. We also find extensive pathological condition of the ovaries, especially large cysts, in patients with normal menstruation. We must conclude that the influence of the ovaries on menstruation, both as regards its periodicity, the duration of the flow and amount of blood lost, whether scanty or profuse, is not so much dependent upon the anatomical structure of the ovaries which we are able to detect as upon their functional activity and the inter-relation between this and the uterus and the influence of other factors which we have not yet determined. Here again, as will be shown, the functional activity of the uterus plays an important part in regulating the amount of blood lost, and the latter is not dependent entirely upon anatomical changes which we can detect.

THE ENDOMETRIUM

The menstrual flow occurs as an escape of blood from the endometrium into the uterine cavity. A study of the injected specimens shows us that the distal portion of the radial arteries terminate in the endometrium, and that

these branches are very small and the capillaries supplying the uterine mucosa are very difficult to inject with the material I have used On the other hand there is a rich venous plexus in the endometrium whose blood is carried by venous channels to the venous plexus of the myometrium.   If a uterus, removed from a patient who was menstruating at the time of the operation, was injected, the arterial injection mass did not escape into the uterine cavity *but the venous injection mass always did*. This we would expect from the study of injected uteri removed in the inter-menstrual period.   From my studies I would infer that *the normal menstrual flow is entirely a venous hemorrhage from the venous plexus of the endometrium, and it is only possible when there are changes in this venous plexus thus permitting the blood to escape*.   I offer as proof of the latter statement that I have never seen the injection mass escape into uterine cavity unless the patient was flowing (either physiologically or pathologically) at the time of the operation, or else just before or after such a flow.   The venous plexus is very strong during the inter-menstrual period, for I have often purposely used great force, and yet the injection mass did not escape into the uterine cavity.   When the injection mass escaped, it occurred either in the form of oozing from the portion of the venous plexus just beneath the endometrial epithelium or a "hematoma" of the mass formed in the endometrium with subsequent rupture of the portion of the mucosa over it, permitting its escape into the uterine cavity.

Adler and Hitschmann state that the endometrium is thicker just before menstruation than at any other time, and that this thickness is due to actual hypertrophy with marked glandular hypertrophy and increased vascularity. As changes in this plexus are necessary for the escape of the blood, and as there is often a marked glandular hyper-

trophy at this time, suggesting an increased glandular activity, the views expressed by Frankl (*Archiv f. Gyn.*, 1911, vol. xcv, 269, 313) that menstruation is a biochemical process dependent upon a ferment produced by these glands, which ferment alters the plexus or portions of it thus permitting an escape of blood, seems possible. It would be expected that the thicker and the more vascular the endometrium the greater the flow, but this does not necessarily follow. I have seen specimens removed during the interval and premenstrual period with a very thick and vascular endometrium, and yet the patient gave a history of a moderate menstrual flow, and other specimens removed under similar conditions showed a much thinner endometrium, and yet menstruation was very profuse. The type of menstruation is not entirely dependent upon the character of the endometrium—here again functional activity plays an important part and the degree of this activity cannot always be detected from the anatomical structure.

It is generally considered that under normal conditions the menstrual blood will not clot. In other words, the endometrium receives coagulable blood and it escapes in a noncoagulable state. The endometrium is supposed to secrete some substance which inhibits clotting. Sturmdoff believes that this is an important local hematological factor in the causation of uterine bleeding. The discussion of this phase of the subject and references to the literature may be found in his article (*N. Y. State Jour. of Med.*, 1911, vol. ii, 1161 to 1164). I obtained careful menstrual histories in regard to clotting from 100 women who either were not suffering from any pelvic disorder at the time, or the history applied to the character of their menstruation previous to the pelvic trouble. Sixty-five gave a history of no clotting: the flow was scanty in 15, moderate in 44, and profuse in 6. Thirty-five gave a history of clotting, the flow was scanty

in 2, moderate in 8, and profuse in 25. Of the one hundred cases the menstruation was scanty in 17 (no clotting in 15 and clotting in 2), moderate in 52 (no clotting in 44 and clotting in 8), profuse in 31 (no clotting in 6 and clotting in 25). It would seem that patients with a scanty or moderate flow were not apt to have clots (59 out of 69), while those with a profuse flow were apt to (25 out of 31). This is in accord with the findings in the injected specimens; if the flow is profuse the endometrium does not have an opportunity to act upon it and much of it is probably a reflux (no valves in the veins) from the rich plexus of the myometrium. While the action of the endometrium on the blood (inhibiting its power to clot) may be an important factor at the onset of the flow, it would seem to me that it had very little influence in the causation of profuse mentruation.

THE MYOMETRIUM AS A FACTOR IN THE CONTROL OF MENSTRUATION

In considering this we must also include its bloodvessels and especially the rich venous plexus into which the endometrial venous plexus empties. We are all aware of the fact that contraction of the uterus will cause endometrial hemorrhage to cease, and relaxation of the same will make it more profuse. We have the opportunity to observe this not only post partum but when curetting the uterus, especially for an incomplete abortion—the uterus will often dilate, leading to a profuse hemorrhage, and the contraction of the uterus will cause the bleeding to cease.

Following curettement of the uterus, the bleeding soon ceases. The question naturally presents itself, Why is not the usual curettage for sterility, etc., followed by prolonged bleeding simulating the menstrual flow? The endometrium

and its bloodvessels have been injured. I have injected only one uterus in which there had been a curettage as the first step in the operation. In this specimen both the arterial and venous injection masses escaped into the uterine cavity, showing that both the arteries and veins of the endometrium and also possibly some of those of the myometrium had been injured, yet had the uterus not been removed the bleeding would soon have ceased. A study of injected specimens will convince one that contractions of the uterus would easily compress not only the venous channels leading from the endometrium, but also the distal branches of the radial arteries which are very small. The latter after being severed may also retract within the musculature, due to their elasticity, and soon cease to bleed. Contraction of the uterus would also make the uterine cavity smaller. The myometrium is apparently an important factor in the control of physiological uterine bleeding. During contraction the terminal branches of the radial arteries would be compressed as well as the veins uniting the two plexuses, and the amount of arterial and venous blood in the uterine mucosa would be diminished.

We have discussed the influence of ovarian activity on the menstrual cycle as manifested in the changes occurring in the endometrium. The study of this phase of the subject is relatively easy, but the study of the changes occurring in the myometrium is more difficult. It is supposed that the uterus contains more blood just prior to the menstrual flow, *i. e.*, it is "congested." I have endeavored to prove this, but there is so much individual variation in the specimens removed that I have been unable to tell by the appearance of an injected myometrium at what stage in the menstrual cycle the uterus was removed, just as I have been unable always to determine by the appearance of the endometrium (except during the actual flow) what stage of the menstrual cycle it presents. Nevertheless my studies

have led me to believe the venous plexus of the myometrium is capable of containing more blood just before the menstrual flow than at any time, and possibly more blood may be carried by the arteries to the uterus. The greater the relaxation of the uterus, the more blood it will contain. We would naturally suppose that the greater "the uterine congestion" the greater the menstrual flow, but this is not invariably true. The plexus of the myometrium may be very large, and yet the flow is not necessarily profuse as may be seen in some of the uteri containing intramural myomata which are not necessarily associated with profuse menstruation. *It is not the amount* of blood within the uterus or pelvic veins which determines the amount of blood lost at the menstrual flow as much as the control of this blood, *i. e.*, the ability of the uterus to hold back the venous blood. The great factor in preventing the escape of this blood into the uterine cavity is the tonicity of the uterus. It would seem that during relaxation of the uterus at the menstrual period the venous blood escapes into the uterine cavity, and during contraction of the uterus the flow is retarded by occlusion of the cavity and compression of both arteries and veins, but the blood which has escaped into the cavity is forced out through the cervix. If the endometrium is intact bleeding will not occur during relaxation of the myometrium. This may be observed during pregnancy when the uterus is frequently relaxed, and I have observed it during curettage, the dilatation of the cervix may cause uterine relaxation as shown by the length of the uterine cavity and yet bleeding does not occur until the endometrium is injured.

My studies have led me to believe that the myometrium is a very important factor in the regulation of the menstrual flow. It may receive stimuli from many outside sources, the most important of which is probably the ovary.

As women grow older all the pelvic generative organs

become less vascular and less active. The arterial system of the uterus becomes physiologically sclerotic, the venous plexuses atrophy, the endometrium becomes thinner and anemic, the muscles of the myometrium atrophy, and the proportion of fibrous tissue increases and the entire organ becomes smaller. Under normal conditions menstruation becomes gradually less and finally ceases. Under abnormal conditions of uterine inefficiency, and here I believe with Theilhaber that the most important single factor is muscular insufficiency, menstruation may become prolonged and more profuse, and there may be irregular or intermenstrual bleeding.

SUMMARY

As a result of ovarian activity the entire uterus of the sexually active woman becomes periodically hyperemic, the height of hyperemia (congestion) occurring in the premenstrual period. The endometrium undergoes *functional active changes*, often manifesting themselves by hypertrophy, especially glandular, hyperemia and edema. The onset of menstruation is established by changes in the venous plexus of the endometrium, permitting the blood to escape into the uterine cavity. The continuation of the flow is probably made possible by several factors; such as ovarian activity, the continuation of the uterine conditions which established it, and the time necessary for the regressive changes to occur, and repair to take place. Menstruation then is associated with and followed by a process which may be called involution.

The amount of blood lost is determined by many factors and their interrelation, such as ovarian activity, the anatomical and functional changes in the endometrium and myometrium, and influences other than ovarian outside the uterus. Of all these factors, I believe that the

muscular efficiency of the uterine wall must play an important part, for this is the only means of closing the uterine cavity and of controlling the venous channels which unite the plexus of the endometrium with that of the endometrium and also the arterial blood conveyed to the mucosa. The "protective zone" (anemic) through which the terminal portion of the radial arteries and the venous channels pass would be the portion of the uterus most readily compressed by uterine contraction.

THE CLASSIFICATION OF UTERINE MYOMATA

Myomata may arise in the body of the uterus, the usual situation, or in the cervix. They may be grouped topographically into the *intramural*, the *subserous* (including *intraligamentary* and *retroperitoneal*), and the *submucous* (the usual classification). We may also group them according to the source of their main arterial supply into, *peripheral* and *radial*. A *peripheral* myoma is one arising in the peripheral zone of the uterus and receiving its chief or sole arterial supply from a peripheral branch of an arcuate artery. All peripheral tumors are either intramural, subserous, intraligamentary or retroperitoneal. A *radial* myoma arises in the radial zone and receives its chief or sole arterial supply from a radial branch or branches of an arcuate artery. All radial tumors are primarily intramural. They may persist as such, or eventually become subserous or submucous. When they do so they carry their nutrient artery or arteries with them.

These tumors may also differ morphologically. A myoma may be simple, that is, uninodular or compound. In the latter case it may be referred to as conglomerate or multinodular. It may be discrete, with sharply defined limits, or diffuse, merging gradually into the surrounding tissues.

We must also consider a somewhat unusual form, the adeno-myoma, in which areas of uterine mucosa are found.

In studying the influence of myomata on the circulation of the uterus we must consider in each case the variety of myoma or myomata present, their blood supply, the age of the patient, and if before the menopause at what stage of the menstrual cycle the uterus was removed. It is often difficult to study the influence of each variety on the blood supply of the uterus because usually several myomata are present in each specimen, and often repre-senting several varieties.

In the 150 uteri containing myomata, multiple tumors were found in 144. The following classification of this material may be made:

Small peripheral myomata projecting from the surface of the uterus, which may be designated as subserous, were encountered in 83 specimens. In only one specimen was only one myoma found, in all the others intramural tumors were also present.

Large pedunculated myomata 10 cm. in diameter (the largest being 22 cm.) were encountered in only three speci-mens, and these were all associated with intramural myomata.

Small intramural myomata, either peripheral or radial, were found in 146 of the uteri removed, and in only two instances was only one tumor present.

Medium size (2.5 cm. or over) and large intramural myomata were found in 76 specimens, and in three only was a simple tumor present.

Submucous myomata (*i. e.*, over half the circumference of the tumor projecting into the uterine cavity) were found in 16, and all were associated with other varieties of myomata.

Adenomyomata were found in 12, and all were associated with other varieties of myomata.

Only one definite cervical myoma was found, but two others were encountered while I was collecting this material, but were not injected, as the tumors were removed without removing the uterus.

THE BLOOD SUPPLY OF UTERINE MYOMATA

All myomata, except some of the very small ones, have an arterial blood supply which can be easily seen with the naked eye. As they increase in size they become more vascular (arterial), so that the medium size and large ones contain more vessels filled with the arterial injection mass than the myometrium. The vessels filled with the venous injection mass are usually few in numbers, and in some specimens, even large tumors, I have been unable to demonstrate any "veins" in the substance of the tumor. This is in marked contrast to the myometrium, where the venous supply predominates over the arterial.

The arterial blood is carried to these tumors by means of nutrient arteries which are either peripheral or radial branches of an arcuate artery, hence myomata may be grouped as either peripheral or radial. In many only one nutrient artery is found; in others two or three with one predominating. The branches of the nutrient artery extend over the surface of the tumor and penetrate its substance, thus supplying the intrinsic "arteries" of the tumor, which I have stated are often much more abundant than those in the myometrium, and differ in their arrangement, etc. See previous article on "The Blood Supply of Uterine Myomata."[1] Often the only communication found between the arteries of the tumor and those of the myometrium is by the nutrient arteries. In some of the medium-sized and large tumors, in addition to the nutrient

[1] See Transactions of American Gynecological Society, 1911, vol. xxxvi.

arteries, an anastomosis was found between the arterioles of the myometrium about the tumor and similar vessels in the periphery of the myoma. When the tumors change their position their nutrient artery accompanies them. In many of the medium-sized and larger myomata the development of their intrinsic arteries is so great that the injected specimen appears as an arterial angioma rather than a myoma.

The myomata, as already stated, are usually poorly supplied with veins in their substance, and in some specimens I have not been able to demonstrate any. I have proved in some that the arterial blood gains access to veins in the substance of the tumor, *i. e.*, where the latter are present, but where veins cannot be demonstrated we must assume that this occurs about the periphery of the tumor or else the arterial blood leaves the tumor as such and gains access to veins in the surrounding myometrium. The enormous number of arteries in the tumor and their tortuous course, together with the apparent inefficient venous outlet, suggests that the circulation of the blood within the tumor is sluggish. For further description of the blood supply of these tumors, see previous article on the subject.[1] On account of the great vascularity of many of these tumors, we must look for other changes in the circulation of the uterus than those caused by the mechanical influence of the tumor or tumors.

SMALL SUBSEROUS MYOMATA

Changes Caused by Them in the Circulation of the Uterus

I have included in this group all myomata under 2.5 cm. in diameter projecting from the surface of the uterus for over one-half their circumference, and that covered only

[1] See TRANSACTIONS OF AMERICAN GYNECOLOGICAL SOCIETY, 1911, vol. xxxvi.

by peritoneum. As stated, this variety was found in 83
specimens, and in only one specimen was but one myoma
present. In all the others intramural myomata were found.
A study of the injected specimens shows that the branches
of the nutrient artery of the tumor spread over the surface
of the tumor from its base, and thence penetrate the sub-
stance of the tumor. The tumors of this size while con-
taining intrinsic arteries are usually less vascular than the
myometrium. Veins are found over the surface of the
myoma, but it is usually impossible to demonstrate any
within its substance. Aside from a slight increase in size
of the peripheral artery from which the nutrient artery
arises there is not any apparent change in the arteries of
the uterus, and the same is true of the veins. The study
of the injected specimens supports the clinical findings in
these cases, *i. e.*, small subserous myomata do not disturb
the circulation of the uterus and do not alter menstruation.
The same was found to be true of the medium size sub-
serous myomata (2.5 to 10 cm. in diameter), of which 11
were studied.

LARGE SUBSEROUS MYOMATA OVER 10 CM. IN DIAMETER

Changes Caused by Them in the Circulation of the Uterus

Only three such specimens were present in this series,
one was associated with several intramural myomata, small
and large, and a submucous myoma, and, therefore, was
ill adapted to the study of this phase of the subject. The
other two also contained several intramural and subserous
myomata, but fortunately they were of small size. In one
of these two the subserous tumor was 10 cm. in diameter,
very vascular, and derived its chief blood supply from
one uterine artery. This artery was enlarged, and it

could be seen in the radiograph that the excess blood supply over the normal was diverted from the uterus to the tumor. The body of the uterus was not enlarged, the arterial supply was not increased, but rather appeared less than normal, suggesting that the tumor might receive more than its share of arterial blood. Large veins were present in the pedicle of the tumor, and the venous blood was carried from the tumor by means of large venous channels in the peripheral zone of the uterus. From a study of the specimen one would suppose that the tumor would not influence menstruation, and such was the history of the case—menstruation regular, normal, and moderate. The second specimen was larger, the tumor, measuring 22 cm. in diameter, arose from the middle of the posterior wall of the uterus and was therefore nourished by both uterine arteries. Both uterine arteries were greatly enlarged, and what has been said about the previous specimen can also be said about this one. Menstruation in this patient had always been profuse but had not increased in amount or duration. These two cases show that while these tumors alter the arcuate arteries from which their nutrient arteries arise, and give rise to large venous channels in the pedicle of the tumor and in the peripheral zone of the uterus, that the radial zone is unaffected, and we would expect that menstruation would usually not be, and such has been our clinical experience.

Some of the large venous channels in the pedicle of the tumor are very superficial, and similar channels are found about the base of the tumor. One can readily see that these might easily be injured by movements of the tumor and give rise to bleeding into the peritoneal cavity, and such complications have arisen. Such an instance occurred in this series; the injury arose from a bimanual examination of the patient made before the operation.

SMALL INTRAMURAL MYOMATA UNDER 2.5 CM. IN DIAMETER

Changes Caused by Them in the Circulation of the Uterus

As has been stated under the classification of uterine myomata these were found in 146 of the 150 specimens, and in only two instances was only one tumor present. They were present in all but three specimens where medium-sized and large intramural myomata were found, in all specimens containing submucous myomata, adenomyomata, medium-sized, and large subserous myomata. This group alone was found in uteri which were removed for the following conditions: pelvic inflammation 14, including two cases of puerperal infection with portions of retained plancenta; uterine bleeding, 16; ovarian cysts, 7; carcinoma of the cervix, 7; carcinoma of the body, 5; retrodisplacements and prolapse 5 (uterus removed on account) of myomata discovered at operation); ectopic pregnancy, 3; sarcoma and hydatiform mole, each one. These tumors develop either in the peripheral or radial zone of the uterus, and are either peripheral or radial tumors. I have not counted all the tumors found in the 146 specimens, and so cannot state in which zone they occur most frequently, but apparently in the radial zone, and this would be expected as it is much the larger zone. All these tumors apparently have an arterial blood supply, although I have seen a few very small ones in which it could not be detected in the gross specimen; this may have been due to faulty technique or the section through the tumor may not have exposed any of its vessels. Its nutrient artery, a radial or peripheral branch of an arcuate artery surrounds the tumor with its branches, and the latter penetrate the substance of the tumor. Intramural myomata of this size are nearly always less vascular (arterial) than the surrounding myometrium. I have usually been unable to find any vessels

in their substance filled with the venous injection mass. These tumors apparently do not appreciably alter the arterial circulation of the uterus as a whole unless in large numbers when the uterine artery may appear a little larger. Locally the artery supplying its nutrient artery may seem a little larger, and mechanically they displace the arteries in the surrounding myometrium. The venous plexus of the myometrium about the very small tumors is not appreciably changed, but about many of those over 1 cm. in diameter there is often a localized, or even a general dilatation of this plexus, and this increases with the size of the tumor. Sometimes when the larger tumors of this group are present or there are a number of tumors there is an increase in the size of the uterine wall, due in some instances to an actual hypertrophy of the myometrium and in others to a dilatation of the venous plexus of the myometrium, or both factors.

A study of the injected specimens suggest that these tumors usually do not greatly interfere with the circulation of the uterus, and usually do not alter menstruation, and clinically experience confirms this. Even those with a generally hypertrophied venous plexus of the myometrium do not necessarily have menstrual disturbances. On the other hand they may indirectly cause menorrhagia or metrorrhagia. In 18 uteri removed for obscure uterine bleeding small intramural myomata were found in 16. The 2 in which they were not found were nullipara, as were also 2 of the 16. In 4 of the 16 discrete polypi were found in addition to the myomata, in 2 others there was a polypoid condition of the endometrium. In the remaining 10 the myomata were the only apparent pathological condition present. In none of the 16 cases did any of the myomata encroach upon the endometrium. In 2 of the specimens the uterus was soft, flabby, and the plexus of the myometrium hypertrophied, in the others the

uterus was hard, the walls thickened, and the plexus of the myometrium compressed. They represent the two types of uteri associated with abnormal bleeding described by Theilhaber (*Blutungen und Ausflus aus dem Uterus*). Verlag von E. Reinhardt, München, 1909; the one due to muscular weakness, *i. e.*, the musculature is unable to regulate an increased hyperemia due to any cause, *i. e.*, hypoplasia muscularis uteri; the other due to an apparent predominance of fibrous tissue, the myofibrosis uteri found especially in parous women approaching the menopause. It is not my purpose to discuss the cause of bleeding in these cases, as the literature on this subject is voluminous, contributions having been made by several writers in this country, as Findley, Anspach, Smith, Goodall, and others, but to suggest that small intramural myomata may in some way contribute to its development. From the study of the injected specimens, muscular inefficiency seems to me to be the most important factor as it would fail to prevent the reflux of blood from the plexus of the myometrium into that of the endometrium and would fail to occlude the uterine cavity.

MEDIUM SIZE AND LARGE INTRAMURAL MYOMATA

Changes Caused by Them in the Circulation of the Uterus

Medium-sized and large intramural myomata were found in 76 specimens, in 60 of these they were the principal variety present, while in 16 a more important variety or condition was associated with them, as submucous myomata in 11, adenomyoma in 3, sarcoma in 1, and carcinoma of the cervix in another. Sixty of these specimens were used in the study of this phase of the subject. In 3 only one tumor was found, while in 57 multiple intramural myomata were present.

These specimens have been arranged in three groups:

1. Those not encroaching upon the uterine cavity.

2. Where a single tumor encroaches upon the uterine cavity.

3. Where multiple tumors encroach upon the uterine cavity.

MEDIUM-SIZED AND LARGE INTRAMURAL MYOMATA NOT ENCROACHING UPON THE UTERINE CAVITY

These were found in many of the specimens, but only in 6 were they the principal condition present, and in all 6 other smaller myomata were present. They develop in the peripheral zone of the uterus, and are nourished by peripheral arteries which supply the tumor as the smaller tumors are nourished. There is usually one principal nutrient artery and secondary ones may be present which communicate with branches of the principal one; in addition there is sometimes found a communication between arterioles in the periphery of the tumor and those in the surrounding myometrium as has been described in the previous article. The venous supply of these tumors is usually scanty, and in some apparently lacking. Tumors of this size contain a larger number of arteries than the surrounding myometrium, and sometimes are so vascular that they appear as an arterial angioma rather than a myoma.

A study of the injected specimens show that these tumors contain many tortuous vessels filled with arterial blood and that the veins within the tumor are usually scanty; this suggests that the circulation of the tumors is very sluggish. Nevertheless there is a demand for more blood to be carried to and away from the uterus, and therefore the extrinsic uterine arteries and veins are usually increased in size. One uterine artery is sometimes larger than the other—namely, the one nourishing the largest

myomata or the greatest number. The arcuate artery from which the principal nutrient artery arises is also increased in size. As in large subserous myomata the excess arterial supply of the uterus as a whole is diverted to the tumor or tumors. The tumor mechanically causes a displacement of the arteries in the surrounding myometrium. The myometrial venous plexus about the tumor is always dilated. As the latter condition exists about the entire circumference of the tumor, it is principally one of active and not passive venous hyperemia. A study of the six cases shows that the disturbance in circulation is chiefly a local one and in four of the six specimens confined mainly to the peripheral zone of the uterus and the circulation of the radial zone and endometrium was unaltered, and the uteri apart from the tumors were only slightly increased in size. We would expect that in these four cases menstruation would not be affected by the tumor or tumors, and it was not. In two patients menstruation had apparently been altered by the myomata. In one it had become more profuse, many medium size intramural myomata were present in the peripheral zone of the uterus, and these may have mechanically embarrassed the flow of blood from the radial zone; the uterus as a whole was increased in size. Here again muscular inefficiency may have been at fault, *i. e.*, more blood in the radial zone than the musculature of the uterus could handle. The other patient had both menorrhagia and metrorrhagia, and the specimen apart from the myomata was typical of myofibrosis uteri.

SINGLE, MEDIUM-SIZED, OR LARGE INTRAMURAL (RADIAL) MYOMATA WHICH ENCROACH UPON THE UTERINE CAVITY.

These were found in 44 specimens as the principal condition present. They were also found in other specimens,

but were overshadowed by some other condition, as a sub-mucous myoma, sarcoma, carcinoma, etc. In three of the 44 specimens only one myoma was present. In the remaining 41, other but less important myomata were found.

These tumors had all developed in the radial zone, and were all nourished by radial arteries. Their blood supply and circulation is similar to those developing in the peripheral zone. They are intrauterine growths in the true sense of the term. The body of the uterus as a whole is hypertrophied. The degree of uterine hypertrophy apparently varies greatly in different specimens and seems more marked in the relatively young women. In those appraoching or at the menopause it is apparently not as evident. The increased thickness of the wall is due principally to two conditions: first, an actual hypertrophy of their tissues, and secondly a dilatation of the venous plexus of the entire myometrium, most marked where the pressure is least. The arterial supply of the entire uterus is increased, and much of the excess over the normal is diverted to the tumor or tumors. The uterine veins are also enlarged. The tumors cause a local displacement of the arteries in the surrounding myometrium, and the venous plexus of the myometrium immediately about the tumor is often dilated. As these tumors approach the uterine cavity they alter its size and shape and usually make it larger, but may occasionally make it smaller, as when a moderate-sized tumor develops in the fundus or lateral wall of the uterus.

Let us first consider uteri containing tumors which while encroaching upon the uterine cavity are still separated from it by a zone of myometrium. We find in the radiographs that the radial arteries curve around the tumor, and while distorted in their course are still able to reach the endometrium lining the cavity nearest the tumor. The venous plexus of the myometrium between the endometrium and

the tumor is usually dilated. The uterine cavity is usually broadened or lengthened, or both. The endometrium nearest the tumor is sometimes thickened and other times thinned. The latter condition may be due to pressure or interference with its blood supply. Conditions found in some of the injected specimens would support the theory advanced by Clark (*Johns Hopkins Bulletin*, 1899, x, 11–20), viz., that such tumors mechanically compress the veins more readily than the arteries, and therefore cause a local congestion of the portion of the endometrium over the tumor, and hence menorrhagia results, but the history of these cases do not entirely support this view. While menorrhagia occurs in some of them, menstruation in others is normal, and menorrhagia is much less apt to occur in this group than in the one about to be described where the portion of the tumor encroaching upon the uterine cavity is covered only by the endometrium, and that portion of the endometrium is anemic. While the local congestion when it is found present may be a contributory factor in making the menstrual flow more profuse, it is not the chief one, and we are forced to explain the bleeding when it occurs in this group as being due mainly to a condition of uterine inefficiency. The uterus is unable to control the great venous hyperemia which exists and prevent an excessive flow of venous blood at that time. We find identical anatomical conditions in two specimens, *i. e.*, great venous hyperemia of both myometrium and endometrium, and especially marked between the tumor and the uterine cavity, yet in one the menstruation is unaltered and in the other menorrhagia or metrorrhagia exists. In eight specimens where the tumor was separated from the endometrium by a zone of myometrium only three gave a history of menorrhagia.

The next group where the tumor encroaches more upon the uterine cavity represents a later stage of the preceding

one and included 36 specimens. In this group the myoma is separated from the uterine cavity by a thin capsule of myometrium or the endometrium alone. I have included in this group all those in which less than one-half the circumference of the tumor projected into the cavity. When more than this occurred they were included with the submucous tumors. The vascular changes in the myometrium are the same as in the preceding group, except for the thin zone which is sometimes present between the tumor and the endometrium. This zone in the preceding group was richly supplied with venous blood while in the present group it is usually anemic. The endometrium over the tumor is also thin and anemic. The radiographs of specimens when the arteries are injected with bismuth show that the tumor mechanically interferes with the arterial supply of this portion of the endometrium. The radiographs of specimens where the veins are injected show that this portion of the endometrium is also poorly supplied with veins; the rich venous plexus of the endometrium has disappeared and is replaced by a fine network of veins. Here and there a large vein may be present just as we find large veins extending over the surface of a subserous tumor. Histologically (as beautifully shown in the illustrations in Kelly and Cullen's book, *Myomata of the Uterus*, W. B. Saunders & Co., 1909) the glands are few in numbers, atrophied or entirely lacking. In extreme cases the endometrium covering the tumor is similar in its vascularity to the peritoneum covering the subserous variety.

The vascularity of the endometrium of the uterine wall opposite the tumor varies according to the size of the tumor and changes in form of the uterine cavity. When the tumor is small, the opposite wall and its vascularity is very little changed. In large tumors with a corresponding increase in size of the uterine cavity the uterine wall opposite the

tumor is thinned, the course of the radial arteries in this portion of the wall are more oblique than normal, and they are also separated farther from each other. The venous plexus of the myometrium, where pressure is greatest, is compressed. The endometrium covering this portion of the uterine wall is often thinner than usual and anemic. The thinning of this portion of the endometrium I believe is due not only to mechanical pressure and a pulling out of the uterine wall, but also to an interception of its blood supply.

Now let us consider the portions of the endometrium not encroached upon by the tumor. The situation of these portions vary with the situation and size of the tumor. Take as an example a tumor 5 cm. in diameter situated in the centre of the posterior wall of the uterus. We find that the endometrium is thickest above and below the tumor and at the sides. The arterial supply of these portions is not interfered with and the venous plexus is usually greatly hypertrophied. The blood supply of the endometrium covering these portions of the myometrium is not only not diminished but often apparently increased, the radial arteries supplying it are sometimes apparently larger and even more numerous. The endometrium is always thicker than elsewhere in the specimen. In the majority of the cases it is thicker than normal and sometimes there is marked hypertrophy. It was found hypertrophied in 24 of the 36 specimens. In the remaining 12 it was thicker than elsewhere in the specimen, but not actually hypertrophied. Three of these 12 were past the menopause, and the phase of the menstrual cycle when the uterus was removed, and the fact that some of them were operated upon soon after a prolonged flow, may account for the comparative thinness of this portion of the endometrium in these specimens. The venous plexus of these portions of the endometrium is usually also dilated,

and the venous channels uniting the plexus of the endo-
metrium with that of the myometrium are often larger
than normal. The hypertrophy of the endometrium is due
not only to its apparent increased arterial supply and venous
congestion, but I believe it is also due to the fact that there
is not only room for it to grow but there is a necessity for
it to fill in the spaces (depressions) caused by the irregu-
larities in the uterine cavity. This endometrium is rich
in glands.

From a histological study of the injected specimens we
would suppose that when menstruation occurs it would
take place not from the endometrium over the tumor,
which is lacking in glands and a venous plexus so
necessary for the flow, but from the endometrium not
encroached upon by the tumor, which not only contains
glands and a plexus, but both are often hypertophied,
thus suggesting increased functional activity. This plexus
also communicates with a dilated myometrical plexus
containing more blood than normal and united with it by
larger channels. I have studied three specimens which
were removed and injected the first day of menstruation.
In all these the portion of the atrophied endometrium
over the tumor apparently did not take part in menstru-
ation and the most active flow occurred from the places
above described. I have studied other specimens removed
from patients who were flowing irregularly at the time
of the opration and found the same to be true. Unless
the patient is actually flowing, or is about to flow, or has
just ceased flowing, the injection mass will not escape into
the uterine cavity. Changes in the venous plexus of the
endometrium are essential for the flow and these changes
are usually initiated, in this group of cases, by the onset
of menstruation, though the bleeding may continue for
many days or even weeks afterward. From a study of the
injected specimens alone we would assume that the pro-

longed profuse menstruation so often seen in these cases
was due to the hypertrophy of the endometrium, with its
increased venous plexus, which through larger channels
than normal communicated with an hypertrophied venous
plexus of the myometrium.   The clinical study of these
cases showed that 6 of the 36 cases gave a history of normal
menstruation, while in 30 menorrhagia or metrorrhagia
was present. We must also bear in mind that uterine bleed-
ing is the symptom which usually induces these patients
to consult a physician and also influences the physician to
advise an operation.   Therefore, a greater proportion of
those with bleeding are operated upon than those who are
not bleeding, and the ratio of 30 to 6 does not represent
the true ratio. When we study the specimens in these two
groups, *i. e.*, those with and without bleeding, we find the
same anatomical conditions present in both groups.   In
fact, some of the patients with the thinnest endometrium
had the most profuse bleeding. As stated before the thick-
ness of the endometrium varies with the individual, her
age and the period of the menstrual cycle when the uterus
was removed, thickest just before menstruation, thinnest
just after, and especially after a profuse flow.

Some of these cases do not bleed, and this is apparently
because the uterus is able to control the flow, even though
the uterus as a whole contains more blood and has to work
under disadvantages; portions of the endometrium are
hypertrophied, the venous plexuses of those portions and
that of the myometrium are dilated, and the venous chan-
nels uniting the two are larger than normal, and the uterine
cavity on account of its shape is difficult to close. On the
other hand many of these cases have menorrhagia or
metrorrhagia, and this is due to the inability of the uterus
to regulate the flow, which is due to many factors, and chief
among these I believe are functional ones, and especially
muscular inefficiency.

The factors which might increase the flow are:

1. Increased ovarian activity which cannot be detected anatomically, though the ovaries are sometimes enlarged. The myomatous uterus may stimulate the ovaries chemically and also through the increased vascularity of the uterine circulation.

2. More arterial and venous blood for the uterus to handle and the possibilities of venous congestion, due to the greater volume of venous blood in the uterus and in the uterine and ovarian veins, and that the tumors themselves sometimes mechanically interfere with the return flow of blood.

3. Localized hypertrophy of the endometrium, where it is not directly or indirectly encroached upon by the tumor. This hypertrophy carries with it the possibility of increased functional activity, and I refer especially to glandular activity and the production of a ferment which would not only alter the venous plexus of the endometrium at the onset of menstruation *but which might interfere with its subsequent repair*.

4. Dilatation of the venous plexus of the localized hypertrophied portion of the endometrium, and that of the myometrium into which it empties and the dilated venous channels between the two, making the control of the "protective" zone between the two more difficult.

5. Dilated veins sometimes present in the endometrium over the tumor, which may through pressure become eroded or may be acted upon by the products of the glands at the time of menstruation. I have occasionally seen extravasation of the injection mass into the endometrium over the tumor and can see how that bleeding may arise from this situation, but have never found any proof other than that just mentioned in my specimens.

6. In an irregular uterine cavity which is difficult to close.

Any one of the above mentioned factors might prolong or make more profuse the menstrual flow, and yet all these conditions are sometimes apparently present in patients in whom menstruation is unaltered. I believe that while all of the above factors contribute to disturbances in menstruation, we are forced to admit that the failure of the uterus to control the menstrual flow in these cases is in a large measure functional. This functional disturbance might be ovarian, in the endometrium or myometrium, and my studies have led me to support Theilhaber's views that muscular inefficiency is the most important single cause of the abnormal bleeding. Theilhaber has shown that the muscular fibers of the myomatous uterus are smaller in patients with a history of bleeding than in others.

The type of abnormal bleeding caused by intramural myomata encroaching upon the uterine cavity is profuse or prolonged, or both profuse and prolonged. Sometimes intermenstrual bleeding occurs, and I think that it is but a further index of broken compensation. I have not had the opportunity to study a sloughing myoma, but would expect that when such a specimen was injected that the injection mass would escape from the tumor and hence would be arterial rather than venous as occurred in all the specimens studied in this series who were flowing at the time of the operation and where the injection mass escaped from the endometrium.

MULTIPLE, MEDIUM-SIZED, AND LARGE INTRAMURAL MYOMATA ENCROACHING UPON THE UTERINE CAVITY

This group should be a subdivision of the preceding one. The changes are similar to the preceding one. The areas of hypertrophied endometrium are found in the crevices

between the tumors and wherever the nutrition of the endometrium is not interfered with by the tumors intercepting it or from pressure The uterine cavity is often greatly distorted and therefore more difficult to be kept enclosed. Ten such specimens were found. Two gave a history of normal menstruation, 7 of menorrhagia, and 1 of metrorrhagia. In 9 areas of hypertrophied endometrium were found, and in 1 (the one with metrorrhagia) the endometrium was everywhere atrophied (the patient's age was fifty).

SUBMUCOUS MYOMATA

Sixteen specimens were obtained where a submucous myoma was the principal condition present. In addition 3 of the 12 specimens with adenomyomata also had submucous myomata. I have included as submucous myomata all myomata protruding into the uterine cavity for half or more of their circumference. They represent a later stage of the preceding variety. Of these 16 specimens more than one submucous myoma was found in 5, and in all intramural myomata of various sizes were found.

The changes caused by the sessile submucous myomata are similar to those found in the intramural tumors already considered. Pedunculated submucous myomata were found in 8 specimens and only one of these presented at the external os. The vascularity of the endometrial surface of the pedunculated myomata simulates very closely that of the serous surface of the pedunculated subserous variety. The endometrial surface is devoid of true endometrium, and the endometrium covering the uterine cavity in contact with the tumor is usually compressed, while the endometrium lining the cavity and not in contact with the tumor is always comparatively thicker and often hyper-

trophied. We would suppose that menstruation would occur mainly from that portion of the endometrium containing glands and having a good blood supply and not compressed by the tumor, and such is the case. The menstrual history of these cases showed that all but one gave a history of menorrhagia or metrorrhagia as in the menstrual history of intramural variety with menorrhagia. This is not a constant symptom, *i. e.*, it does not occur with every menstruation.

As stated these tumors do not necessarily cause bleeding, but they apparently cause it in a larger percentage of the cases than the preceding. They represent a later stage of the disease. They are more apt to have metrorrhagia, which is also a manifestation of a later stage of the disease. The metrorrhagia in some of these cases may come from rupture of the veins over the surface of the tumor. I was able to demonstrate this in one of my specimens. We know that intraperitoneal hemorrhage may occur from the rupture of dilated veins over a subserous myoma. In a pedunculated submucous tumor the return of the venous blood is often interfered with and the surface of the tumor is exposed to trauma and irritation.

ADENOMYOMATA

Changes Caused by Them in the Circulation of the Uterus

This variety of myoma was found in twelve specimens, and in each specimen other varieties of myomata were also present. In four the patients were operated upon for uterine myomata and adenomyoma was found associated with the other varieties. In three the uterus was removed with ovarian cysts, two bilateral, and one unilateral (the opposite ovary having been previously removed). Three

uteri with adenomyomata were removed for chronic pelvic peritonitis, one for ectopic pregnancy, and another for tuberculosis. In all twelve specimens small ordinary intramural myomata were found. In three of these large ordinary intramural myomata, and in another three, the submucous variety in addition to the small intramural tumors mentioned and adenomyomata were found. The following injection masses were used in these twelve specimens: in one, ultramarine blue for the arteries; in three, Venetian red for arteries and ultramarine blue for the veins; in one, bismuth for arteries and ultramarine blue for the veins, in the remaining seven the veins only were injected, and these with bismuth.

The study of the blood supply of these tumors is difficult because they are not as sharply defined from the myometrium as the other variety. They are apparently more vascular (arterial) than the surrounding myometrium, and are poorly supplied with veins, but not as poorly supplied as the ordinary myoma.

The study of the influence of these tumors on the circulation of the uterus I have found difficult because other varieties were present in the same specimen. In five of the twelve specimens the adenomyoma was the predominating variety present, while in the remaining seven other varieties were more prominent and the adenomyoma was relatively insignificant. These tumors cause an increased vascularity of the uterus and also a dilatation of the venous plexus of the myometrium, as do the intramural myomata of their size. Their relation to the endometrium is interesting. In two of the specimens the adenomyoma was in no place continuous with the endometrium. In the remaining ten it was continuous with it, and in four surrounded nearly the uterine cavity. I recently operated upon a patient (not in this series) in whom an adenomyoma

was present in each tube at its origin from the uterus. Four of the twelve specimens suggested the simultaneous development of the tumor in each cornu. In my specimens the endometrium lining the uterine cavity over these tumors was thinner and less vascular than the endometrium lining other portions of the uterine cavity.

In five menstruation was unaltered by the myomata (including adenomyomata) present. In two of these menstruation was moderate in amount, while in three it was profuse but not excessive. One of these had moderate menstruation, and the other had a similar menstrual history, and contained small discrete intramural myomata, in one of which areas of mucosa were found. Five gave a history of menorrhagia; two of these specimens also contain a discrete ordinary submucous myoma and intramural myomata in addition to the adenomyoma. In the other three the adenomyoma was apparently responsible for the menorrhagia, although bilateral ovarian cysts were present in two of these three, and small ordinary intramural myomata were also present. Two gave a history of metrorrhagia, one profuse the other scanty. In the one which was profuse a polyp and small intramural myomata were present; in the one with occasionally "spotting" an ordinary submucous myoma, small intramural myomata, and tuberculosis of the endometrium were present in addition to the adenomyoma.

Only two of the twelve patients were flowing at the time of the operation, and only one of these lends itself to the study of the source of the bleeding in adenomyomata, as the other contained an ordinary submucous myoma, had tuberculosis of the endometrium, and had been curetted a few days before. The first one showed that the venous flow escaped from the endometrium over a portion of uterus not involved by the tumor.

This subject needs further investigation, but the clinico-pathological study of my twelve injected specimens show that these tumors do not necessarily disturb menstruation, five of the twelve did not; that when menorrhagia or metrorrhagia is present it may be due to an ordinary myoma present, as three of these had ordinary submucous myoma in addition to the adenomyoma or some other well-known possible cause of these symptoms. On the other hand I believe that adenomyomata sometimes give rise to abnormal uterine bleeding. These cases suggest that the etiology of the bleeding is similar to that !n other myomata and apparently does not arise from the tumor, but as in others is due to the uterine insufficiency, *i. e.*, the inability of the uterus to control its increased venous circulation and prevent an excessive flow of venous blood at the menstrual period.

SUMMARY OF CASES CLASSIFIED ACCORDING TO THEIR MENSTRUAL HISTORY AND CONDITIONS PRESENT

Forty-seven of the patients gave a history of not having had any disturbance in menstruation. Of these, 22 had small intramural and some small subserous myomata, 17 medium-sized and large intramural myomata, 5 adenomyomata and small intramural myomata, 2 large subserous and small intramural myomata, and 1 a submucous and small intramural myomata.

Sixty-four gave a history of profuse menstruation, often prolonged, *i. e.*, the so-called menorrhagia as the predominating type of abnormal bleeding. Thirty-nine of these had intramural tumors encroaching upon the uterine cavity as the apparent cause, in 10 a submucous tumor was present, small intramural tumors not encroaching upon the uterine cavity were found in 9, adenomyoma with other

varieties of myomata were found in 5, small intramural tumors with a polyp were found in 2.

Thirty-nine gave a history of irregular bleeding, *i. e.*, metrorrhagia as the predominating symptom, carcinoma of the cervix with intramural myomata was found in 8, carcinoma of the body of the uterus with myomata in 5, polypi and small intramural tumors in 5, small intramural myomata not encroaching upon the uterine cavity 4, large intramural myomata 3, adenomyomata with other forms of myomata 2, tubal pregnancy and myomata 3, incomplete abortion with myomata and infection (one puerperal, other probably gonorrheal) 2, hydatiform mole with myomata 1, sarcoma 2.

This grouping shows that any one variety may or may not alter menstruation and that the bleeding present, especially if of the metrorrhagic type, may be due to some other condition.

THE INFLUENCE OF UTERINE MYOMATA ON THE AGE OF THE MENOPAUSE

Myomata, except very small ones, increase the amount of blood in the uteroövarian circle. The ovarian arteries and veins are hypertrophied as well as the uterine. The excess over the normal amount of blood is apparently, for the most part, diverted to the uterus, and there diverted to the tumor. The usual physiological arterial sclerosis incident to the approaching menopause would probably affect a larger vessel less quickly than a smaller one. We would expect that an efficient blood supply to the ovaries would be maintained at a later age in women with myomata than those without, and, therefore, the functional activity of the ovaries in such women would persist longer, even though the excess over the usual amount of blood is apparently diverted to the uterus. The same would also hold

true for the uterus, especially if it contained intramural myomata, *i. e.*, we would expect that the endometrium or portions of it would maintain its circulation at a later age than in the non-myomatous uterus. The generally accepted view is that the menopause is delayed in women who have myomata, and my studies confirm this. Sixteen of the 150 patients had passed the menopause, the earliest age at which this occurred was forty-five (had two very small intramural myomata), the next earliest forty-eight, and the latest fifty-six. The average age of the menopause in the 16 patients was fifty-one plus years.

SARCOMA AND MYOMA OF THE UTERUS

Sarcoma was found in only two specimens. The first patient, a nullipara, was fifty years of age and had been bleeding for six months. Small intramural myomata were present and the uterine cavity was filled with a growth which protruded partially from the cervix and extended through the uterine walls and invaded the adjacent structures. It was impossible to state if it was primarily sarcoma or sarcoma had developed in a myoma. This specimen was so badly mutiliated in its removal that it could not be satisfactorily injected. The patient died six months later, and at autopsy an extensive local recurrence was found and metastases were present in the lungs.

The second patient, a nullipara, was fifty-seven years of age. Irregular uterine bleeding was of six months' duration, and began two and a half years after the menopause. The uterus contained several small myomata, a large intramural myoma and a submucous myoma. A small area of the submucous tumor showed sarcoma. The blood supply of this area seemed similar to that of the myoma in which it had developed. It contained vessels filled with the arterial injection mass, but did not show any filled with

the venous mass. The *arterial and not the venous mass*
escaped into the uterine cavity, *i. e.*, the bleeding was of
arterial and not venous origin as occurs in uterine bleeding
arising from the endometrium. The patient died six
months after the operation with symptoms of bronchitis
and pleurisy (tapped and fluid removed from pleural cavity),
thus suggesting pulmonary metastases. An autopsy was
not obtained.

CARCINOMA OF THE UTERUS AND MYOMATA

Eleven uteri were removed for carcinoma of the cervix
while collecting this material and injected as a routine
procedure. Myomata were found in eight specimens, in
seven the myomata were small and of the intramural type.
In the eighth small myomata were present, and in addi-
tion a large intramural myoma and a myoma of the cervix;
the latter was of the submucous type and protruded into
the vagina. The youngest patient was thirty-two and the
oldest fifty-seven, the average age of the 11 patients was
forty-three plus years.

Five uteri were removed for carcinoma of the body, and
in all small intramural myomata were found. The youngest
patient was fifty and the oldest sixty-two, the average age
of the 5 patients was fifty-seven years.

It is impossible to draw any conclusions from such a
small number of cases, but they emphasize the frequency
with which myomata are found associated with carcinoma
of the uterus and, especially, with carcinoma of the body,
to which references may be found in the literature.

It is very difficult to obtain a satisfactory injection of
either the arterial or venous supply of the cervix of a uterus
removed at operation because the injection mass escapes
from many small cervical vessels which are injured at the
operation, and the injection of all my specimens on this

account was incomplete. Nevertheless they showed that carcinoma of the cervix has an arterial blood supply, apparently less than the normal cervix, and as in myomata it is difficult to demonstrate any veins. The *arterial injection mass* and *not the venous* escaped from the growth during the injection of the specimen. The necrosis incident to the growth leads to destruction of portion of the cancer and injury to its arteries with subsequent hemorrhage of *arterial, not venous origin.* My studies of the blood supply of carcinoma of the cervix are unfinished and must be reserved for a later publication.

The injection of uteri containing carcinoma of the body is easily accomplished, and my specimens showed that this type of growth has an arterial blood supply but less than the myometrium, and that they are also deficient in veins. In every instance, the injection mass which escaped from the growth was arterial and not venous.

OVARIAN CYSTS AND UTERINE MYOMATA

We are aware that the ovaries are responsible for the changes in the uterus leading up to the menstrual flow, and that it is possible that they are of importance in the regulation of the flow. Therefore, disturbances in the circulation of the uterus may influence the functional activity of the ovaries and lead to changes in the ovaries. The ovaries of patient having myomata often are apparently normal even in those causing marked changes in the circulation of the uterus. At times they are enlarged, the so-called "myomatous ovaries," and at times cysts are present. I have not studied the ovaries of all my specimens histologically, as in many instances they were not removed or only one was removed. In 17 instances ovarian cysts were found, and in 12 of these the operation was undertaken for ovarian cysts and the myomata were of secondary

importance. Carcinomatous ovarian cysts were found in two instances, dermoids in two, bilateral hemorrhagic ovarian cysts in 8, Graafian follicle cysts in 3, bilateral infected ovarian cysts 1, and adenocystoma 1. Of the 150 cases, 17 were associated with ovarian cysts and 8, *i. e.*, nearly half of these were associated with bilateral ovarian cysts containing a thick bloody material in the cavities of the cysts. Of the 17 specimens with ovarian cysts, 5 were associated with adenomyoma. Of 12 cases of adenomyoma of the uterus (also containing other forms of myomata), 5 of them were associated with ovarian cysts as compared with 138 cases of myomatous uteri not containing adenomyomata and associated with ovarian cysts in only 12 instances. The ovarian cysts associated with the adenomyomata were not all of the same kind. In 4 of the 5 the cysts were bilateral, and the one that was unilateral had had a previous operation in which an ovary had been removed for a small cyst. The cysts in two instances were apparently Graafian follicle cysts, in two others the cysts contained the hemorrhagic material mentioned above and in the fifth bilateral infected cysts were present. Of the 17 cases only 6 gave a history of meno- or metrorrhagia, and in all 6 myomata of a type apt to cause uterine bleeding were found.

The patients with demoid, cancerous cysts and cystaadenoma, associated with myoma, were probably accidental associations, and the same may be true of the others. The significance of these findings, especially the apparent frequency of adenomyoma associated with ovarian cysts, is based on too small a number of cases from which to draw any conclusions.

SUMMARY

As a result of ovarian activity, the uterus undergoes periodic changes which manifest themselves clinically by the menstrual flow. The flow is preceded by changes in

the venous plexus of the endometrium, permitting the escape of blood into the tissues of the latter. The duration of the flow and the amount of blood lost is probably depedent upon many factors, such as changes in the endometrium, the time necessary for the repair of the altered endometrium, the degree of venous congestion of the uterus and the ability of the uterus to control its venous circulation. These factors are not entirely evident in anatomical conditions which we can detect, but are probably controlled mainly by the functional activity of the uterus, the ovaries, and, possibly, other structures and the interrelation between them and the ovaries and uterus. I have demonstrated that menstruation is mainly, if not entirely, a venous flow and can occur only when there are changes in the venous plexus of the endometrium, permitting the blood to escape. As there are not any valves in the uterine veins, the duration of the flow and the amount of blood lost is dependent upon several factors, and, especially, the ability of the uterus to control its venous circulation, *i. e.*, to prevent an excessive escape into the uterine cavity when there is a leak in the venous plexus of the endometrium, as occurs at the menstrual flow. An important factor in controlling the venous circulation would be the muscular efficiency of the uterus and the regulation of the same, however it may be accomplished.

Small subserous myomata are relatively anemic and do not have any appreciable influence on the uterine circulation.

Large subserous myomata are very vascular (arterial), and cause a hypertrophy of the uterine artery from which their nutrient artery arises, and thus more blood is carried to the uterus and tumor; the excess over the normal being diverted to the tumor. More venous blood is carried back to the uterine and ovarian veins. The chief arterial and venous changes are in the peripheral zone of the uterus;

the radial zone and endometrium are but very little affected and menstruation is usually not altered.

Small intramural myomata are less vascular than the myometrium and apparently have very little influence on the circulation of the uterus, and usually menstruation is not altered. As cases sometimes occur with a history of meno- or metrorrhagia in which small intramural myomata are found, these cases suggest that those tumors may in some way lead to uterine inefficiency, especially muscular inefficiency with a resulting loss of control of the venous circulation of the uterus.

Intramural myomata over 2.5 cm. in diameter are usually more vascular (arterially) than the myometrium, but less vascular (venously). Some of the large tumors are so very vascular that the injected specimen appears more like an arterial angioma than a myoma. The greater the arterial supply of the tumor, the greater the increase in the arterial supply of the uterus containing it, but as in the subserous variety, at least the greater part of the increase over the normal is diverted from the uterus to the tumor.

The venous plexus of the myometrium is always dilated, and this is most marked about the periphery of the tumor and, specially, in places where the pressure is least. The venous uterine congestion is apparently mainly an active one and the uterine walls are apparently hypertrophied in order to control it. The endometrium if not encroached upon by the tumor, or tumors, is often hypertrophied, and its venous plexus is also dilated. Menstruation may or may not be affected, and when excessive or abnormal bleeding occurs it is apparently due to a loss of uterine efficiency, *i. e.*, the uterus is unable to control its increased venous plexuses, and there not being any valves it is unable to prevent the escape of an excessive amount of blood into the uterine cavity at the menstrual flow. The regenerative changes following menstruation, *i. e.*, menstrual involution,

is also sometimes retarded. This may be due to changes in the endometrium which are possibly dependent upon the disturbance in circulation.

Intramural myomata which encroach upon the uterine cavity alter the shape of the cavity and intercept or push to one side the radial arteries which supply the endometrium over the tumor, and this with the pressure exerted by the myoma causes an atrophy and anemia of this portion of the endometrium. The endometrium directly opposite the tumor may also be thinner and less vascular than normal due to the pressure of the tumor. The endometrium not directly or indirectly encroached upon is always thicker and more vascular, and is often actually hypertrophied and its venous plexus more dilated than normal. The condition of the endometrium in any specimen varies with the age of the patient and the phase of menstrual cycle during which the uterus was removed. The menstrual flow arises mainly from the endometrium not directly or indirrectly encroached upon by the tumor, *i. e.*, the endometrium which has an abundant blood supply, contains glands, and is usually hypertrophied. The atrophied, anemic endometrium over the tumor which has a poor blood supply and in which the glands are few in number or entirely absent, takes a very small part or none at all in the menstrual flow. Disturbances in menstruation may or may not occur. The profuse flow, when it occurs, is only in a measure dependent upon the increased amount of venous blood in the plexuses of the myo- and endometrium, the larger channels uniting the two plexuses, and the hypertrophy of portions of the endometrium, and the distortion of the uterine cavity making it more difficult to close. This disturbance is apparently due more to the failure of the uterus to control the venous blood under these adverse circumstances, and a retardment of the regeneration or repair of the endometrium. Two specimens may appear the same, yet in

one menstruation is normal and in the other excessive; nor can we discern anatomically why both should not give the same menstrual history. Occasionally dilated veins in the endometrium over the surface of the tumor may become eroded and give rise to abnormal bleeding, but the usual and chief source is from the portion of the endometrium described above.

Submucous myomata represent a later stage of the intramural variety, and the veins over the surface of the tumor are more apt to become injured or undergo degeneration than those over the intramural tumors. The source of the profuse menstruation is usually the endometrium not encroached upon by the myoma. Menstruation is more often abnormal, but may be normal.

I have not studied a sufficient number of specimens of adenomyomata to state definitely the source of bleeding when this variety is present. Only 12 uteri were encountered containing these tumors and in all 12 other types of uterine myomata were also present. These cases showed that *disturbances in menstruation are not necessarily present,* and when they occur that they may be due to changes caused by other myomata in the specimen. On the other hand adenomyomata may cause meno- or metrorrhagia just as other intramural myomata encroaching upon the uterine cavity do. When abnormal bleeding is present, it is apparently dependent upon the same factors as other types of myomata and the excessive flow does not arise from the tumor itself. This variety must be reserved for further study.

My studies have led me to believe that when the bleeding arises from the tumor itself, due to sloughing or sarcomatous changes, that it would be arterial (the tumors have a rich arterial supply), and not venous as occurs from the endometrium.

DISCUSSION

Dr. WILLIAM S. STONE.—We must all feel indebted to Dr. Sampsom for his demonstration of the circulatory conditions that he has found to exist in the immediate neighborhood of these uterine tumors, and from an exact interpretation of these findings we may hope to learn that an intimate causal relation exists. I have the clinical records of 24 cases of uterine fibromyomata, which I saw and examined before the tumors were of appreciable size. In a few of these cases I also have the record of the histological examination of both the tumor and the adjacent uterine wall. I am unable yet to make any definite statement, but my study of these cases suggests that the presence and growth of these tumors has some relation to a developmental error of the uterus. I also think, in accordance with Dr. Sampson, that the theory, basing the occurrence of uterine bleeding at the time of the menopause in many cases upon a relatively poor muscular development, is the best one so far proposed—and it also merits further study because it offers a rational explanation for the occurrence of uterine bleeding at the time of puberty. We have certainly reached the time when a more exact knowledge of the conditions under which these tumors appear and grow is demanded, and such work as Dr. Sampson has shown us must be considered a valuable addition.

A FURTHER REPORT ON THE RELATION OF THYROIDISM TO THE TOXEMIA OF PREGNANCY

By George Gray Ward, Jr., M.D.
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In April, 1909, I presented a study of the relation of the thyroid gland and thyroidism to the toxemia of pregnancy[1] as a thesis for Fellowship in this Society, and after reviewing some of the research work that had been done up to that time and the deductions to be drawn therefrom, I reported two cases that had come under my observation which were illustrative of the subject and seemed to bear out clinically some of the conclusions of the laboratory.

The conclusions in my paper were as follows:

1. The thyroid gland is, in all probability, concerned in promoting nitrogenous metabolism.

2. There is considerable evidence that the thyroid gland normally hypertrophies during pregnancy, and plays an important part in the increased nitrogenous metabolic processes incident to that state.

3. It is very probable that the toxemia of pregnancy is largely dependent upon faulty metabolism; at least, insufficient metabolism is an accompaniment which greatly adds to the seriousness of the condition.

4. Failure of the thyroid gland to hypertrophy during pregnancy is probably followed by insufficient metabolism, and may result in the various forms of toxemia of pregnancy.

5. Graves' disease, by materially altering the quantity and quality of the thyroid secretion, has an important influence upon metabolic processes; therefore, if associated with pregnancy, owing to the increased metabolism incident to that state, it becomes a grave complication.

6. When there is a failure of the normal hypertrophy of the thyroid gland during pregnancy, and when there is a diseased thyroid, as in Graves' disease, the adminstration of thyroid substance, by supplying the deficiency of the normal thyroid secretion and by diuretic action, may materially improve a faulty metabolism and thus have a favorable influence upon the manifestations of the toxemia of pregnancy.

7. The use of a saline extract of thyroid proteids made from fresh normal human glands is much more efficient in rapidity and reliability of action than the sheep thyroids as ordinarily prepared; therefore much more satisfactory results may be expected from its use.

8. The hypodermic administration of thyroid proteids is greatly superior to oral administration, especially when used in cases of toxic vomiting of pregnancy or in eclampsia.

9. As the whole subject is yet so very obscure, much further research work along the same lines and many clinical observations are essential to a more definite understanding of the relationship of the thyroid gland to toxemia, but in view of some results already obtained the field is at least a promising one.

10. It is not improbable that further research may show that the parathyroids have an important relation to the manifestations of the toxemia of pregnancy.

Since the above was written, investigations and clinical observations made by different observers along the same line have tended to confirm many of the above conclusions. Several studies adding to our knowledge of the problem have been contributed to the medical journals by both laboratory

workers and clinicians. Among the former, the work of
Carlson and Jacobson,[2] and of MacCallum and Voegtlin[3]
is of interest, while clinical observations have been reported
by Leitz,[4] Stowe,[5] Bonnaire,[6] Goodall and Conn,[7] Porter,[8]
Davis,[9] Rogers,[10] and others.

The value of the nitrogen partition of the urine as a guide
to the state of the metabolism in the toxemias of pregnancy
cannot be overestimated. In no other way can we judge
the degree of the disturbance present, and the limits of safety.
Blood pressure is too variable to be relied upon in these
cases, as has been emphasized by Davis in a recent paper.

An excess of ammonia nitrogen and rest nitrogen is
indicative of marked failure in metabolism.

The work of Williams[11] on the relation of an excess
of ammonia of toxic vomiting of pregnancy is familiar to
all. He has stated that normally in the first half of preg-
nancy the ammonia coefficient varies from 4 to 5 per cent.,
while in toxic vomiting it may rise to 10, 20, 30, or even 40
per cent.; and in one case (death) it reached 48 per cent.
He places 10 per cent. of ammonia nitrogen as suspicious
if not pathognomonic of toxemia.

Folin,[12] and also Ewing and Wolf,[13] however, believe
from their investigations that 10 per cent. of ammonia
nitrogen may be normal when there is a pronounced reduc-
tion in the total nitrogen, as under such circumstances
they have always found a relative increase in the ammonia.

In 1907 Coronedi and Luzzatto[14] finding the tendency
to alkaline reaction in the urine of dogs after complete
thyroidectomy, attributed this to the increased ammonia
content. In 1909 Berkeley and Beebe[15] found both a
relative and an absolute increase in the ammonia in urine
after thyroidparathyroidectomy in dogs.

Recently, MacCallum and Voegtlin have established the
further important fact that under similar thyroid removal
there is a greatly increased ammonia content in the blood,

and Carlson and Jacobson have contributed an important paper on the depression of the ammonia destroying power of the liver after complete thyroidectomy.

Beebe has recently told the writer that some of his unpublished experiments prove beyond a doubt the marked influence the thyroid has on the excretion of ammonia. He has found that under thyroid administration the ammonia excretion was reduced where it had previously been increased after thyroidectomy. These experiments still further add to the accumulating proofs of the importance of the thyroid and parathyroid glands to some of the physiological processes in the liver.

The liver, then, undoubtedly has an ammonia destroying or converting power, and when this power is inhibited and the liver fails in this function ammonia appears in the urine and also in the blood. Thyroidectomy produces a marked depression in this ammonia destroying power of the liver. An excess of ammonia output in the blood and urine means a depressed functional activity of the liver or a failure in the metabolic processes, and produces ammonia intoxication.

In the light of these observations it would appear logical that when there is a high ammonia output shown by the nitrogen partition, as in a disturbed metabolism of the toxemia of pregnancy, thyroid administration is indicated.

Among recent clinical contributions that of Goodall and Conn is especially interesting, as showing the intimate relationship between the thyroid gland and the generative organs. They are of the opinion that the ovaries stand in very close relation with the thyroid, and that the uterus is devoid of any influence upon thyroid activity, except indirectly through the ovarian function; also that ovarian hyperactivity is a frequent cause of the development of exophthalmic goitre and that diminished or absent ovarian activity usually coincides with myxedema.   They cite

cases where hypothyroidism has been associated with disturbance in the functions of the generative organs, especially menstruation, which were greatly benefited by thyroid administration.

Porter reports a case of pregnancy associated with thyroidism and has advocated the treatment of the diseased gland by the injection of boiling water. E. P. Davis has very recently written on thyroid disease complicating pregnancy and parturition, and states that in his experience it is no unusual thing to observe disturbance of the functions of the genital organs in women, associated with various degrees of thyroid disease. He reports 4 cases occurring in his practice in the last few years, in which a diseased thyroid proved an important factor in the outcome. His first case, a II-para, presented herself with no observable thyroid enlargement but was in an unusually neurotic state. Spontaneous labor developed rapidly with great excitement, the patient becoming unmanageable. The labor terminated normally. There was an excessive secretion of milk and she nursed the child, but remained in a highly hysterical condition. Five months later the patient developed exophthalmic goitre and eighteen months after her labor she was operated upon for cystocele by another surgeon and promptly died in delirium. The second case, a II-para, had a narrowed and flattened pelvis which caused a most difficult labor in her first pregnancy. He advised her to have a Cesarean section on account of her previous history and the pelvic deformity. After the early months the patient began to suffer with nausea, exhaustion, and headaches, and there was an enlargement of the thyroid. The urine showed a deficient nitrogenous metabolism. Thyroid extract was administered, with occasional intermissions, throughout the pregnancy in very moderate doses with some benefit. The patient went to term, when labor began with attacks of great nervousness. An immediate Cesarean section was done, with happy

outcome for both mother and child. A partial thyroidectomy was done six months later, and eighteen months after the delivery she was in excellent health. The third case reported was in her seventh pregnancy, with a history of having lost all of her children by abortion, or by their dying a few days postpartum. There was a very much enlarged thyroid and marked nervous disturbances. Patient was suffering with considerable nausea and other symptoms of disturbed metabolism, which was confirmed by the nitrogen partition, the ammonia nitrogen being nearly 24 per cent., and the rest nitrogen nearly 20 per cent. in one specimen. Patient was advised to have a Cesarean section as a living child was greatly desired. Thyroid extract was persistently used throughout the pregnancy with decided success, the urine analysis showing a continuous improvement in the metabolism, and the patient feeling greatly benefited physically. Cesarean section was done just before term, and mother and child left the hospital in excellent condition. Three months later her Graves' disease again developed and she had a partial thyroidectomy done by Dr. Charles Mayo and has been well since. The child is exceptionally vigorous.

The fourth case reported was a II-para who was four months pregnant when first seen and evidently toxemia with insufficient metabolism. Thyroid extract was given, one grain three times daily, with benefit. The labor was spontaneous and a healthy child was delivered. During the puerperium, the mother was able to nurse the child. The child had several attacks of intermittent toxemia which were relieved by the administration of thyroid extract to the mother. There was an immediate improvement in the nitrogenous metabolism following the use of the thyroid extract in this case.

Davis has had the greatest success in giving small doses of the thyroid extract, one grain three times daily, continued for from four to seven months. He advocates elective

Cesarean section as the method of choice where the previous history shows fetal mortality; and thinks that the induction of labor in these cases is seldom indicated, as it is too slow and uncertain. The pressure of elactic bags increases the mother's nervous disturbance, and the delivery of the child through a partially dilated birth canal exposes it to additional risk.

Since 1909 I have had the opportunity to make two further clinical observations on the relation of thyroidism to toxemia. Both were on the same patients whose cases I previously reported.

A summary of the history of Case II as reported in my former paper is as follows:

Mrs. A. T., aged thirty-two years, was delivered by me in November, 1908, by vaginal hysterotomy, her case being complicated by Graves' disease and a most severe toxemia, manifested by a hyperemesis that almost amounted to pernicious vomiting. She had been under the care of Dr. Rogers for the Graves' disease, and when her toxic vomiting began, hypodermic injections of the proteid thyreoglobulin were given, with unquestionable relief of symptoms. Her symptoms were most alarming when the urine output was lowest. Several times the total quantity for twenty-four hours was below 14 ounces, and the nitrogen partition at these times showed serious metabolic disturbance. The child lived thirty-six hours. Five months after this labor the patient became pregnant again, her last menstruation being on March 15, 1909, and I delivered her on December 20, 1909, by a second vaginal Cesarean section. The child was obtained by a version, and is alive today. The state of her Graves' disease was similar to what it was during the previous pregnancy. Dr. Rogers described the condition of her thyroid secretion as being an excess but of very poor quality, such as is observed in cases extending over several years. She had the same nervousness and restlessness,

with a moderate hypertrophy of the thyroid and a pulse running from 90 to 100. Throughout this second pregnancy, the same toxic symptoms manifested themselves, but with a somewhat lessened severity than during the previous gestation. A nitrogen partition made during the third month showed a diminished total nitrogen, 6.43 grams; ammonia nitrogen, 7.55 per cent. instead of 4.5 per cent.; and rest nitrogen 8.6 per cent. instead of 4 per cent. There was no albumin or sugar.

The same relation between the vomiting and the diminished output of urine was present as before. An accurate record was kept of the total daily quantity of urine excreted, and also of the number of times vomiting occurred each day. (See charts I, II, III.) The vomiting first appeared at the sixth week and was irregular and of moderate frequency until the end of the sixth month, when it began to be persistent and continued right up to the termination of labor at term. During the fifth month the daily average of urine was 34.3 ounces, the minimum being 27 ounces and the maximum 45 ounces. Vomiting occurred but seldom. During the sixth month the vomiting began to be more troublesome, occurring from one to three times daily except for two intervals of about ten days each, with a total of eighteen attacks for the month. The urine averaged 32.6 ounces, maximum 45 ounces, and minimum 23 ounces.

Throughtout the seventh month the patient vomited daily, with a total of seventy-five attacks, the attacks varying from one to five each day, with an average of 2.5 per day. The urine averaged 32 ounces, with a minimum of 10 ounces and a maximum of 44 ounces.

During the eighth month, the condition of the patient remained about the same, so far as the urine output and vomiting were concerned, but her general state of health was going down hill. She was becoming more prostrated and her headaches were more troublesome. The urine

average was $31\frac{4}{10}$ ounces, minimum 21 ounces and maximum 43 ounces. The vomiting occurred one to five times

CHART I　MRS A.T

TOXAEMIA OF PREGNANCY. GRAVES DISEASE ——
DAILY TOTAL QUANTITY OF URINE ——
ATTACKS OF VOMITING IN 24 HRS. ——

7th MONTH

SEPTEMBER　OCTOBER

URINE IN 24 HRS. { MAXIMUM 44℥　MINIMUM 10℥　AVERAGE 32℥

NO ALBUMEN　NO SUGAR

TOTAL ATTACKS OF VOMITING 75

daily, with a total of 73 times for the month, and a daily average of 2.3.

CHART II   MRS A. T.

TOXAEMIA OF PREGNANCY. GRAVES DISEASE. DAILY TOTAL QUANTITY OF URINE. ATTACKS OF VOMITING IN 24 HRS.
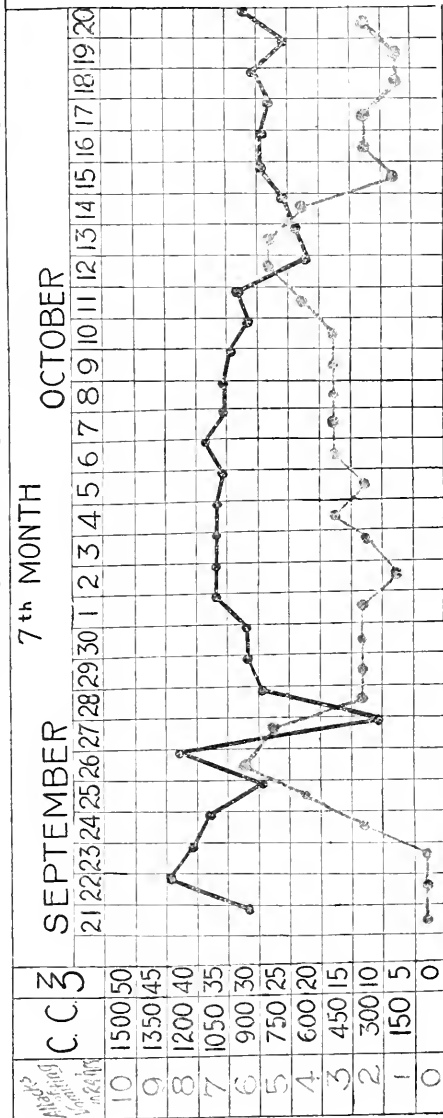
URINE IN 24 HRS { MAXIMUM 433 MINIMUM 213 AVERAGE 31.43

NO ALBUMEN
NO SUGAR

TOTAL ATTACKS OF VOMITING 73

A nitrogen partition made at this time (November **17,** 1909) showed a low total nitrogen, 3.918 grams; ammonia

CHART II

TOXAEMIA OF PREGNANCY GRAVES DISEASE

MRS A T   DAILY TOTAL QUANTITY OF URINE ——
ATTACKS OF VOMITING in 24 HRS

MAXIMUM 413
MINIMUM 153
AVERAGE 273

NO ALBUMEN
NO SUGAR

TOTAL ATTACKS OF VOMITING 91
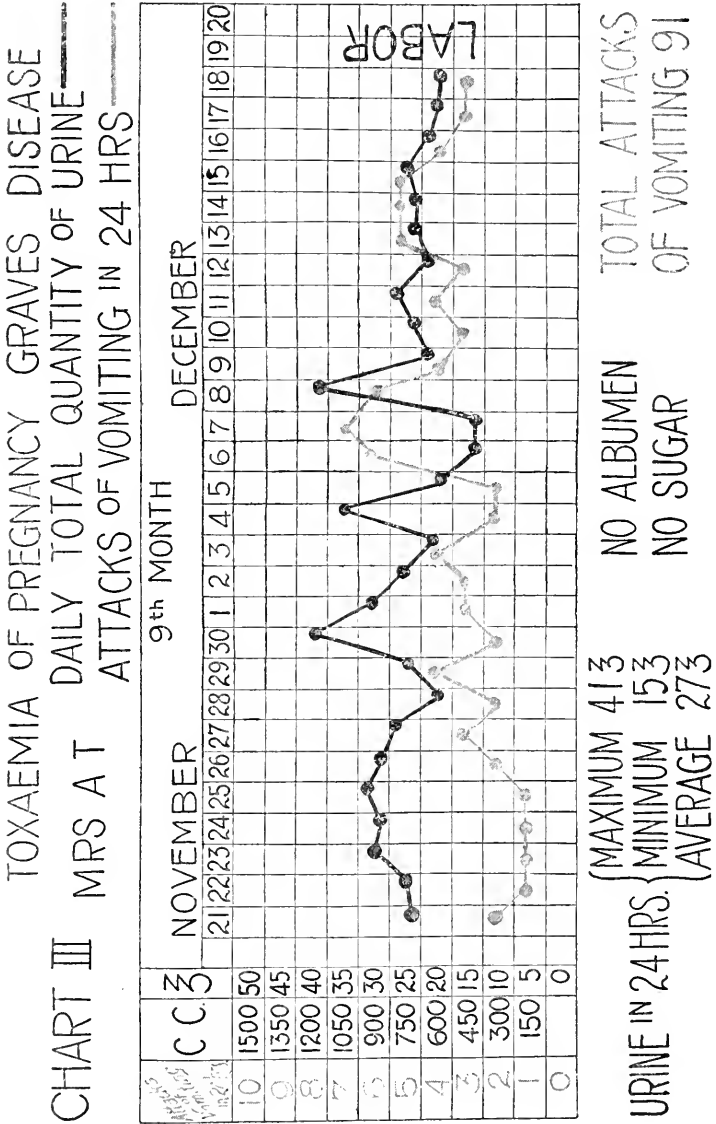
nitrogen, 6.63 per cent; and a very high rest nitrogen, 29.4 per cent. There was evidently a marked disturbance of metabolism.

In the ninth month, all the symptoms increased in severity, and it was doubtful whether the pregnancy might not have to be terminated at any time. The vomiting occurred from one to seven times daily, with an average of 3.2 per day, and a total of 91 attacks for the month. The urine had diminished to 27 ounces average, minimum 15 ounces and maximum 41 ounces. A nitrogen partition (December 7, 1909), showed total nitrogen 6.016 grams; ammonia nitrogen, 6.86 per cent.; and rest nitrogen, 18.9 per cent. A study of the charts will show a direct relation between the output of urine and the number of attacks of vomiting. Whenever the total quantity of urine became diminished, the attacks of vomiting increased, and vice versa. Examples of this are remarkedly shown on Chart III on November 30 and December 6 and 7.

On December 17, 1909, the membranes ruptured spontaneously at 9 P. M., the position of the child being L. O. A., no pains occurring for thirty-six hours. A No. 4 Voorhees bag was inserted. Only feeble pains resulted, and no real progress was made, so after waiting twenty-four hours the highly nervous condition of the mother made it seem best to operate. Traction was made on the bag for ten minutes, until it was delivered. As the cervix still presented a resisting ring, and bearing in mind the lesson of the previous labor, a vaginal hysterotomy was done at once. The anterior uterine wall was very thin at the site of the cicatrix of the previous operation, and it began to tear when dissecting the bladder free from the uterus. A bimanual version was performed without difficulty, but in passing the hand to reach for an extended posterior arm the uterine incision was evidently extended high up on the anterior wall of the uterus, close to or into the peritoneal cavity. The child

was extracted in good condition, and with the exception of a too highly organized nervous system, is well today. The uterus was sutured with catgut and a gauze drain was inserted between it and the bladder. The patient had a stormy convalescence. For six days she ran a temperature up to 103°, with a pulse as high as 148 at times. There was marked tympanites, and evidently a moderate infection, as there was a leucocytosis of 22,000, with a polynuclear count of 91 per cent., and the lochia showed cultures of the colon bacillus. The case was still further complicated by a most severe sciatica, which developed on the second day. In spite of all this, the temperature was normal on the seventh day, and the recovey was otherwise uneventful. All nausea and vomiting ceased with the termination of the labor, as in the previous pregnancy.

Throughout the last four months of the gestation, the patient received daily hypodermic injections of thyreo-globulin made from normal human thyroid glands, as in the previous pregnancy. The dosage and frequency of the injections varied according to the severity of the symptoms. The results obtained paralleled those obtained before. The nausea and vomiting were relieved and controlled to some extent, and the urine output was increased. The pulse rate and tension were so erratic in this case that no reliance could be placed on blood pressure. The nitrogen partition proved a more valuable index as to the degree of the toxemia. Certainly I do not believe the patient could have been carried to term without the use of thyroid extract.

In view of my two experiences with this patient, I am in accord with the views of Davis, that elective Cesarean section gives the best chance for the child, with the least danger to the mother, in this class of cases; and as this patient is very anxious for further offsprings, I should adopt that procedure another time.

The patient reported as Case I in the previous paper,

also became pregnant about nine months later, and I again delivered her at term after a normal labor.

This patient had a typical Graves' disease of an early type, or a condition of *hyperthyroidism*. She received marked benefit from the antiserum of Beebe and Rogers, but was difficult to keep under control, and therefore had occasional relapses. She felt much better and her symptoms were in abeyance while pregnant, and her nervousness and pulse rate promptly increased as soon as the labor was terminated.

In this second pregnancy her condition was similar to that of the previous one, she having about the same degree of hyperthyroidism. Her thyroid showed considerable enlargement and her pulse varied from 95 to 120, and she was troubled with considerable itching of the skin, according to my notes. Her urine showed a trace of albumin, and 4.4 grains per ounce of sugar at one time. However, she stated emphatically that she felt much better than when she was not pregnant, as she always did. There was not so marked a change in the pulse rate during her puerperium as before, but still it averaged an increase. It was 84 to 92 at the time of the labor, and after the second day it averaged from 104 to 108.

The history of this case would seem to support the opinion of Charcot and others, that certain Graves' cases are relieved of some of their symptoms during pregnancy. The increased metabolism made necessary by the growing fetus utilizing the excess of thyroid secretion common to cases of hyperthyroidism, as seen in the earlier stages of Graves' disease.

Beebe personally communicated to me the following two cases which he has recently observed, and has kindly permitted me to report them.

CASE I.—Mrs. S., aged twenty-six years, primipara. No Graves' disease or excessive enlargement of the thyroid. She began to have excessive vomiting at the end of the

fourth month, which continued throughout the gestation. The urine contained no albumin or sugar, but the nitrogen partitions showed faulty metabolism. Hypodermic injections of normal human thyreoglobulin were given according to the severity of the symptoms, and they were sufficient to control the vomiting so that it was possible to carry the patient to term, when she was successfully delivered of a healthy child. The blood pressure in this case was high.

CASE II.—Mrs F., aged thirty years; primipara. Three years previously she had developed exophthalmic goitre, and was treated with Rogers' and Beebe's serum and recovered. When six and a half months pregnant she developed a marked toxemia, which was accompanied by myxedematous manifestations, as dry skin, dull mentality, vomiting, tender liver, and constipation. Her condition was that of *hypothyroidism*. Hypodermic injections of normal human thyreoglobulin were administered, with the result that all myxedematous symptoms were relieved and the toxic vomiting was controlled. She went to term and was delivered of a healthy child. Two months later she developed a state of *hyperthyroidism*, which was corrected by the use of thyroid cytotoxic, or antiserum. The urine showed some albumin, and the nitrogen partitions showed marked disturbance of metabolism. The blood pressure in this case was not high, ranging from 110 to 120.

SUMMARY

In the light of many experiences, the present status of the toxemias of pregnancy of this type may be stated as follows:

1. That these cases may be classified into two groups: (a) Cases having no Graves' disease, but without sufficient

thyroid secretion to promote the increased metabolism in the liver made necessary by the pregnancy, and probably due to the failure of the thyroid to hypertrophy. (*b*) Cases associated with Graves' disease, which condition usually causes serious disturbance in the metabolism.

2. Toxemias of the first group are frequently much benefited by the administration of thyroid substance, in the form of either dry extract or a serum.

3. In toxemia of the second group, it is essential to determine whether the Graves' disease is in a condition of *hyperthyroidism* or *hypothyroidism*. If the former, rest, applications of ice, milk diet, and sedatives should be employed, and if these measures fail, an antiserum such as the cytotoxic serum of Beebe and Rogers should be administered. If the latter (hypothyroidism), thyroid substances should be given in the form of the dry extract, or, what is more efficient if possible to obtain, a saline extract prepared from normal human glands for hypodermic administration.

4. Reliance should be placed upon the nitrogen partition of the urine as a guide to the severity of the toxemia, rather than on the blood pressure.

5. Induction of labor is very slow and uncertain in these cases, and where the history of former labors is that of dystocia, elective Cesarean section is probably the safest method of delivery for both mother and child.

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THE TREATMENT OF ACUTE AND FULMINANT TOXEMIA

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OUR knowledge of the complex condition known as toxemia in parturient women has reached the stage where we may distinguish between the natural history of the disease and abortive or unusual cases.

In the former the patient accumulates toxins in her blood until the nerve centres become so irritated that convulsions, eclamptic in character, develop. The mechanism of these convulsions is such as to produce excessive muscular contraction, in the majority of cases extending to the uterus, and causing expulsion of its contents. This is followed by a gradual diminution in blood pressure, by the reëstablishment of the circulation in the kidneys and abdominal viscera, and, in a considerable number of cases, by the gradual recovery of the mother. In other cases labor fails, the convulsions bring about relaxation of arterioles, secretion and excretion are reëstablished, the patient may recover and subsequently give birth to a living and viable child.

Such, in the light of our present knowledge, is the natural history of the toxemia of pregnancy, culminating in the conservative process known as eclampsia.

Of late, much attention has been drawn to fulminant toxemia, styled by some eclampsia without convulsions. The extensive literature on the subject furnishes abundant evidence that the liver is primarily at fault in these cases,

that the ductless glands share in the loss or perversion of function, and that the involvement of the kidneys is secondary. When toxemia becomes overwhelming, the patient's nervous system is overcome by the poisons and the stage of convulsions is not reached. There is intense cerebral disturbance, profound involvement of the sympathetic nervous system; shown by deadly nausea or violent vomiting, pulse tension abnormally high or excessively low, with failure of secretion and excretion. Where the liver is most dangerously involved hemorrhage is a most significant and alarming symptom. This may be from any glandular organ of the body—from the kidneys, as shown in bloody urine; from the mucous membrane of the stomach, illustrated by vomiting of blood; from the bowel, as demonstrated by bloody stools, and from epithelial surfaces, illustrated by petechial eruptions and multiple hemorrhage into the epithelial organs. So intense is the poison that the fetus rarely, if ever, survives, the placenta sharing as a secretory organ with the hepatic derangement present, and the fetus perishing from overwhelming toxemia.

In attempting to interpret correctly the gravity of the condition present in a given case, one is at once dismayed by the fact that upon no one symptom can one lay predominant weight. The effort to establish a given rate of pulse tension as dangerous has not been successful, in view of the observations of Bailey (*Surgery, Gynecology, and Obstetrics*, November, 1911) and others, who have found great variation in blood pressure in these cases. The examination of the urine fails to give a true picture of the gravity of the situation, as the urine may be comparatively normal to average methods of examination, containing toxins which it is exceedingly difficult to isolate. The temperature of the patient may vary considerably.

One is forced to the conclusion, borne out by experience, that each case of toxemia of pregnancy must be studied by

a thorough physical examination, and that undue importance cannot be assigned to any one symptom.

We may possibly gain light upon this complex question by turning to pathology to explain the fatal issue in some of these cases, and to guide us in our efforts at treatment. One fact stands out preëminently, in all fatal cases of toxemia of pregnancy, and that is the disorganized state of the blood, the minute hemorrhages in the liver and other organs; and, in those patients in whom fulminant toxemia lasts for some time, the occurrence of pulmonary edema and of gangrenous pneumonia. Whatever we can do in the way of treatment must be addressed to avoiding these conditions.

In endeavoring to secure elimination and thus prevent the rapid disorganization of the blood, one must not, on the other hand, go to the extreme of favoring pulmonary edema. Excessive bleedings, followed by the instillation of large quantities of salt solution, distinctly favor pulmonary edema and are exceedingly dangerous. The free use of veratrum viride weakens and depresses the circulation, and cannot fail to do harm. The depressing influence of the hot pack, prolonged at very high temperature, has frequently proved highly injurious. Whatever tends to overwhelm the nervous system, whether large doses of narcotics or profound depressants, cannot fail to do harm. Mechanical violence of the genital tract, especially by vaginal delivery, which tears asunder the veins of the pelvic region, cannot fail to favor the development of thrombosis and embolism.

As the life of the fetus is inevitably lost in severe cases, no risk must be placed upon the mother to save a poisoned child.

In view of these negative statements, what does the present state of our knowledge offer as a more hopeful view? There can be no doubt of the value of prophylaxis. Each pregnant woman must receive skilled attention during her

entire pregnancy. By this, and by this only, can fulminant toxemia be avoided. No problem in medicine is more difficult, but none more important, in the saving of life.

The signs and symptoms of toxemia of pregnancy should be made common knowledge among women of child-bearing age. The proposal, made some years ago in Germany, to instruct women in the signs and symptoms of cancer of the womb, with the hope of bringing them early to their physicians for diagnosis, is a proposal which may properly be made regarding the toxemia of pregnancy. It is customary, in instructing nurses in hospital training schools, to teach them the symptoms of this disease, and to urge them to recognize these symptoms in all pregnant women with whom they may be thrown.

The value of milk as a prophylactic diet must be insisted upon, and the advances made in the modern production of milk and the fact that good milk is now available almost universally, should aid greatly in this important method of treatment. The prevalent taste for fresh air should also be encouraged.

A thorough physical examination should give warning of the approach of fulminant toxemia. Great variations in pulse tension, disturbance of the nervous system, inability to retain nourishment, disordered secretion and excretion, and variation in the nitrogenous output of the body, as demonstrated by the nitrogenous partition of the urine, are all of paramount importance.

In the presence of fulminant toxemia, it is the belief of the writer that conservatism is the wisest course. This belief follows his trial of all forms of treatment which have so far been suggested by competent observers. He feels confident that his mistakes have been in the too radical employment of methods which in themselves seemed logical and wise.

To bring this matter to a concrete statement: the patient

should at once, if possible, be transferred to hospital. She should be placed in bed, between blankets, the skin thoroughly but gently cleaned, and gentle but continuous perspiration encouraged by a gentle heat obtained from hot water bottles placed about the blankets. If the case is not threatening, the electric cabinet may be found most useful. Wet heat is less desirable than dry, as it is less stimulating, more depressing, and cannot be continued for so long a time. However dry heat be applied, it should never be carried to the point of depression, but should be used as continuously as possible.

The stomach and bowels should be emptied as promptly and thoroughly as possible by irrigation with warm salt solution. The conclusion of gastric lavage may be marked by a moderate dose of calomel and soda left within the stomach. Following the copious irrigation of the bowel, salt solution may be continuously administered by the Murphy method during periods of from four to six hours. The bladder should be emptied by catheter. The anesthetic effects of oxygen should be obtained if possible. If it cannot be given by apparatus, the patient's rooms should be as thoroughly aired as possible. To sustain the circulation, moderate doses of digitalis combined with a cerebral sedative have proved of value. If the vasomotor system is greatly depressed, benefit has followed the combination of strychnine and digitalin and codein, by hypodermic injection. As far as possible the patient should be protected from noise, bright light, rapid and abrupt movement, and unnecessary disturbance of every sort. So soon as the stomach is retentive, a mildly alkaline water should be given as freely as possible. Dry cold should be continuously applied to the head. Counterirritation over the epigastrium is useful in some cases.

The important question next arises, "Shall the uterus be emptied, and if so, by what method?"

Again our experience has been that one should wait for Nature to declare herself before interfering. It is a point of great importance, that the obstetrician should ascertain, as promptly as possible, whether the mechanical conditions are such that the disease may take its natural course, terminating in muscular contraction and the expulsion of the uterine contents. For example, if the women has a highly contracted pelvis or pregnancy is complicated by a tumor, or if great disproportion is present, it is useless to wait for spontaneous delivery. The natural course of the disease cannot be expected to develop. If, on the other hand, the conditions are favorable for the expulsion of the fetus, in our experience no interference should be practised until the uterus shows signs of discharging its contents. When the cervix is softened, and the presenting part engaged, the rupture of the membranes often serves a useful purpose. Labor and spontaneous expulsion usually follow, and if the patient's circulation be sustained during this period and she be given moderate doses of sedatives at regular intervals, the results in our experience have been the best which we have seen. Should labor linger after beginning spontaneously it should be terminated in a manner requiring the least anesthesia, and doing the least violence to the mother. Should anesthesia be undertaken, the smallest possible quantity of ether with the greatest amount of oxygen should be selected. Moderate bleeding should be encouraged after the delivery. Prolonged anesthesia is to be carefully avoided.

On the other hand, should the conditions be unfavorable for spontaneous delivery, and the uterus make an effort to expel its contents, we believe that rapid delivery by abdominal section is the operation of choice. We prefer this to vaginal section, because it is free from mechanical difficulty, and does not open the veins above the pelvis and lower portion of the birth canal.

Isolated cases furnish examples of success by various surgical procedures applied to these cases. Thus prolonged anuria has yielded to decapsulation. The balance of toxemia has been successfully thrown in favor of the patient by the amputation of the breasts. Vaginal Cesarean section has its distinguished and able advocates. If statistics may be relied upon, one cannot neglect Stronganoff's maternal mortality of between 6 and 7 per cent., under conservative treatment. It is the statement of his house staff at St. Petersburg that with him conservatism is carried to the furthest extent, and that they rarely witness a surgical procedure in the treatment of fulminant toxemia.

The most recent collection of statistics in the operative treatment of this condition was made by Peterson, whose mortality rate was considerably higher than that of Stroganoff.

THE TREATMENT OF ECLAMPSIA

By George Tucker Harrison, M.A., M.D.
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WHATEVER be the nature and origin of the toxic substance which evokes the phenomena characteristic of eclampsia, two facts stand out in clear light. In the first place the potency of the poison that produces the autointoxication is made manifest by the profound disturbance of tissue metabolism, tissue necrosis, and capillary thrombosis, more particularly by the degenerative changes in the kidneys, the anemic and hemorrhagic necroses of the liver, the hemorrhages into the brain and multiple thrombosis, as demonstrated by Lubarsch and Schmorl, with others. In the second place, the undoubted fact that, as a rule, the evacuation of the contents of the uterus is attended by a speedy relief of the symptoms and a *restitutio ad integrum*. Bearing in mind these facts, it is scientifically correct to maintain that in cases of acute toxemia in pregnancy, whether with or without eclamptic attack, the indication of treatment is to empty the uterus as speedily as may be. In this way the interests of both mother and child are best subserved. I am aware of the excellent results claimed by the prophylactic method of Stroganoff (*Zentralblatt f. Gyn.*, 1910, xxiii) and others, consisting in placing the patient at absolute rest in a room to herself, morphine hypodermically in small doses, chloral hydrate per rectum, and a milk diet. In my hands this method was attended by good results only in mild cases. I am in accord with the views expressed by Fritsch

(*Klinik der geb. op. 5te aufl.*) when he says: "For years nar-
cotics were regarded as the best method of treating eclampsia.
I shall not decide how many cases of eclampsia have fallen
victims to this treatment. But it surely is unreasonable
to add to an already poisoned organism continually new
poisons in excess. I am firmly convinced that many an
eclamptic has fallen a victim to a mixture of uremia, mor-
phine, hydrate of chloral, chloroform poisoning, and anemia.
. . . That therapeutical measure only is rational and
sound that empties the uterus speedily." If the cervix is
dilated or dilatable, either by manual dilatation ignoring
the use of metallic dilators, or by the use of metreurysis,
sufficient dilatation may be effected so that version and
delivery may be accomplished in a short time. Forceps
should be used only when the head is fixed in the pelvis.
As soon as a foot is brought down, the breech of the
child acts as a dilating body and dilatation is soon accom-
plished. In the case of primiparæ, when the cervix is
maintained in its entire length, the indication is the vaginal
Cæsarean section (or hysterotomia, anterior and posterior).
This operation, after having been subjected to severe
criticism on the part of eminent obstetricians, has grown
in favor so that now it is recognized as a more valuable
addition to obstetric surgery. In the February number of
the *Monatsschrift für Geburtshülfe und Gynäkologie*, xxxv,
pp. 125 to 264, W. Beckmann, from St. Petersburg, reports
the excellent results obtained by the employment of the
vaginal Cæsarean section in 43 cases. For the last two
years he declares that he delivered at once by vaginal
Cæsarean section all women brought to the clinic with
eclampsia without having recourse to other measures. As
compared with the conservative treatment, employed in
the previous two years, the mortality was reduced over 40
per cent., none of the children of the multiparæ died and
only four of the primiparæ. "Such a low mortality," he

remarks of the newborn in vaginal Cæsarean section, is
further an argument not to be underestimated in favor
of this operation." If the obstetrician will persist in trying
prophylactic treatment, in the first instance, and call into
play rest in bed, milk diet, hot packs, saline enemas, etc.,
let him take to heart the excellent advice of that master in
obstetrics Bumm (*Grundriss zum studium der Geburtshülfe* 5*te
aufl.*, p. 661): "If no improvement takes place," he observes,
"in spite of the strictly enforced regime, then I advise you
not to wait too long with the introduction of premature
labor; every day increases the danger, and many a one has
regretted, on the outbreak of severe convulsions, that he
neglected the favorable time for the interruption of preg-
nancy." I go farther and maintain that not *every day* but
every hour brings increasing danger. The splendid results
achieved by such careful and trustworthy clinical observers
as Zweifel, Bumm, Liepmann, Veit, Fritsch, Schauta, and
many others have demonstrated unequivocally the ines-
timable value of the vaginal Cæsarean section in saving
human life under the conditions in question. The truth is,
the sooner the fact is recognized by obstetricians that
in vaginal Cæsarean section they have at their command
a scientifically exact surgical method of opening the vagina
and uterus to such a degree as to permit delivery of the child
without loss of time, and this at any moment of pregnancy
and birth, the better for them and their patients when
confronted with toxemia of pregnancy. I do not believe
that the extraperitoneal Cæsarean section as devised by
Sellheim will come into competition with the operation of
vaginal Cæsarean section—possibly in very rare cases. The
classical Cæsarean section should be reserved for such cases
in which there is contraction of the pelvis. With reference to
decapsulation of the kidneys, as was practised by Edebohls,
it is only necessary to say that recent investigations have
invalidated its claims.

THE INDICATIONS FOR AND THE TYPE OF OPERATION TO SELECT IN THE TOXEMIA OF PREGNANCY

By John Osborn Polak, M.D.
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During pregnancy the emunctories are called upon to do increased work as the result of fetal metabolism, and unless the eliminative organs are functionating perfectly some toxic retention obtains. The bulk of oxidation falls upon the liver. The toxins in the maternal blood are first conveyed to the liver, and it oxidizes and converts this toxic material into substances fit for elimination by the kidneys. If the liver fails in its function or breaks down under the strain imposed upon it, incomplete oxidation of the fetal metabolic products occurs, and as a result the maternal blood will contain toxic material, which is irritating to the kidneys, the central nervous system, and to the capillaries everywhere.

Actual pathological changes take place in the liver in the toxemia of pregnancy. These changes differ, dependent upon whether it is a toxemia of the early months, characterized by the pernicious vomiting or a toxemia of the later months, producing eclampsia.

In the toxemia which produces hyperemesis, the changes within the liver lobule are degenerative and begin in the centre and extend toward the periphery. They are progressive and the clinical symptoms are the result of the fatty degeneration within the lobule, which has been shown to be the constant lesion in pernicious vomiting.

In eclampsia the lesion most frequently found is a peri-lobular thrombosis and a hemorrhagic necrosis in the portal spaces. These changes invade the hepatic cells from the periphery toward the centre, and tissue destruction follows in their wake. From these two pathological facts, which are admitted by most observers, it will be seen that both pernicious vomiting and eclampsia are dependent upon progressive hepatic lesions, with more or less destruction of liver tissue, the cause of which, the gestation, must be checked, or the other eliminative organs must assume the function of the diseased liver, before the toxemia can cease·

In the toxemia of pregnancy, not only are these changes taking place in the liver, but when no food is taken starvation becomes an important factor. The carbohydrates are withdrawn and the fat and tissue proteins are utilized and acetone bodies develop, producing further tissue destruction, as shown by the acetonuria.

In eclampsia we have two clinical types, the hepatic, the pathology of which has been already referred to, producing a hepato-toxemia, the symptoms of which may or may not be convulsions, slight edema, vomiting, jaundice, hepatic tenderness, renal casts, high blood pressure, etc., and the second or nephritic type with its headache, visual disturbance, edema, marked albuminuria, and tube casts. Here the burden of elimination has fallen on a kidney which was incompetent. It is in the latter type that dietetic and eliminative treatment will frequently carry the woman to term, or allay the convulsions, should they have occurred interpartum; for, as a rule, the actual liver lesion in this type is very slight and reparation is likely, while in the hepatic type, where actual interlobular degenerative changes have taken place in the liver cells, it stands to reason that the removal of the source from which these toxins are generated can alone control further advance of the lesion.

The termination of pregnancy will not repair interlobular

necrosis, which has already taken place, and at best there will always be some morbidity, but delivery will in a large proportion of cases produce such general improvement that the patient may recover. What are the indications, therefore, to terminate gestation in the presence of a toxemia?

In the hyperemesis cases observation has taught us, that in the presence of a high ammonia ratio, which continues in spite of the use of a dextrose solution by the bowel, or subcutaneously, the pregnancy should be terminated. The glycogenic power of the liver is the most reliable index of the hepatic function, for when the liver is unable to assimilate cane sugar, it shows that destructive changes have taken place. Ordinarily, the power of assimilation should be from 1 to 3 grams for every kilogram of body weight.

The high ammonia ratio in toxemia indicates that the patient is incapable of digesting and absorbing, and probably of burning up the proteins, fats, and carbohydrates consumed.

The persistence of this high ammonia coefficient must be considered a danger signal, and the pregnancy would better be terminated. Another observation which has some clinical significance is the persistence of a pulse of 100 or more, when the patient is at rest and in bed. Acetone in the urine is also significant, and a persistent acetonuria calls for prompt action. We are far too apt to permit these hyperemesis cases to go too far before induction. Every day of delay after the toxic symptoms have appeared and are not improved by rest, lavage, proctoclysis, dextrose enemata and other dietetic measures, allows a further hepatic change to take place, and makes the problem of emptying the uterus a more serious one.

In the toxemia of the later months, which terminates in eclampsia, the presence of the danger signals—namely, a diminished urinary output, a persistent albuminuria, a constant blood pressure of over 150, the detection of tube

casts in the urine, an albuminuric retinitis, amaurosis, or persistent frontal headache, which do not yield to rest, dietetic and eliminative measures, and show a lowering of the blood pressure and an increase in the urinary output, or the occurrence of an eclamptic seizure in the course of the treatment, indicate that the pregnancy should be terminated.

Having determined upon the interruption of the pregnancy, the question arises: By what method shall we proceed? This is determined by certain factors: (1) The period of pregnancy; (2) the condition of the cervix; (3) the general condition of the woman.

What I am about to say relative to surgical evacuation presupposes that the operator is skilled in gynecological technique, and has at hand the facilities of a modern and well-equipped operating room.   ·

Evacuation in hypermesis cases may be made with the curette after careful dilatation of the cervix, when the pregnancy is *eight weeks or under;* after this period, owing to the bulk of the placental mass and the presence of an embryo of some size, the pregnancy is best terminated by anterior hysterotomy, and removal of the ovum with the Ward placental forceps.

Experience has taught us that toxic patients are more susceptible to infection than their more fortunate sisters. This possible complication can be minimized by the strict observation of an aseptic technique, complete evacuation of the uterus and the avoidance of trauma.   It is usual in this class of patients to find a long, rigid, hyperplastic cervix, which is more apt to tear than to dilate, and thus to introduce the dangers from trauma.   Time is another element which influences the prognosis.   Prolonged anesthesia is detrimental and not well borne.   These difficulties are met by anterior hysterotomy and the employment of ether-oxygen vapor anesthesia for the narcosis.   Chloroform

should never be used in the presence of a pregnancy toxæmia on account of the liver destruction following its use.

The above statements also apply to the toxemias in primipara of mid-pregnancy. When, however, we are dealing with eclampsia in the last month or at term, in woman other than primipara, less radical procedures should receive consideration.

Vaginal Cesarean section is not well adapted to the delivery of the full-term child, especially in the presence of a small vagina and a rigid vulvovaginal orifice, unless sufficient room is gained by deep lateral incisions through the introitus.

THE CONDITION OF THE CERVIX. In the presence of the rigid cervix of the undeveloped uterus, pregnant for the first time, or the hyperplastic cervix which has been the seat of a chronic endocervicitis for years, dilatation with the pack, the small balloon, or the graded dilatating bougies, is tedious and unsatisfactory. Dilatation may be accomplished by the steel branched dilator, but such dilatation is always obtained by some degree of laceration which may extend into the broad ligaments, producing trauma of the cellular structures, reducing their resistance, and opening avenues for infection, while anterior incision in equally skilled hands has none of these objections.

The toxic patient of early pregnancy has very little resistance. The blood pressure is low, the urine scanty, the white blood count low or moderately increased. She must be considered as a poor operative risk. So also is the eclamptic, though, as a rule, her cardiomuscular resistance is better; nevertheless, both deserve the speediest evacuation of the uterus, consistent with the principle of minimum trauma, asepsis, and thoroughness.

An analysis of 27 consecutive cases without maternal mortality, from the service of the writer, may elucidate some points of clinical significance. 20 were pregnant for

the first time; of this number, 8 were hyperemesis cases. Twelve were latter month toxemias or eclamptics. Of the remaining 7, all multipara, only 1 belonged to the hyperemesis class, while 6 had had eclamptic seizures.

Of the early toxemias, only one woman presented symptoms so grave as to require evacuation before the tenth week; all were emptied before the end of the fourth month, every palliative method having been used before resorting to interruption.

Among the 18 making up the toxemias from five and a half months to term, there were three women whose cervices were unusually long and rigid, upon which repeated packing had made no impression. These women were about six months pregnant, were in the pre-eclamptic state, with very high blood pressures. Convulsions had occurred in all of the remaining 15. One had had two seizures, another eleven, the average being five before delivery was attempted.

Hysterotomy was selected because it afforded the safest, quickest, and surest method of securing sufficient dilatation of the cervix to deliver through. The average length of operation including the delivery was twenty-three minutes, the shortest nineteen, the longest thirty-seven. No vesical injury was sustained. Lateral incision of the pelvic floor was required twice, owing to the small size of the vulva outlet. None were complicated with pelvic contraction sufficient to interfere with bringing down the uterus.

A longitudinal incision of the anterior vaginal wall, from the meatus to the cervix, was used; not the T-incision, as recommended by Peterson. The anterior uterine incision alone was employed in this series, as we have found little gain from the anterior and posterior division of the cervix and lower uterine segment. The cul-de-sac is frequently entered and the repair by suture is much prolonged, not to speak of the final result in the woman, which is far from satisfactory.

The hemorrhage has been inconsiderable, which we believe to be due to the manual removal of the placenta and the firm tamponade of the uterus with gauze, until the sutures have been placed in the upper angle of the incision. The convalescence has been smooth, and without complication. Primary union has been the result in both the vaginal and uterine incisions. One other technical point is the use of interrupted sutures in both wounds. This maintains the length of the anterior vaginal wall, and keeps the cervix pointing backward and by straightening the canal secures better drainage.

In the hyperemesis cases the effect of evacuation by section has been most striking; vomiting ceased almost from the moment the patient recovered from her light anesthesia.

In this series of eclamptics all the children were premature. Fifteen were born alive; only two, however, were sufficiently viable to live.

In summarizing we draw these conclusions:

That toxic vomiting which resists rest, lavage, dextrose, enemas, enteroclysis, and presents a high ammonia ratio or persistent acetonuria and a maternal pulse of 100 or more should have the pregnancy interrupted.

That before the placental formation the curette is the method of choice; after this period anterior hysterotomy offers decided advantages.

That the pre-eclamptic state, characterized by its high blood pressure, diminished urinary output, the persistent albuminuria, etc., not yielding to dietetic, eliminative, and medicinal measures, justifies evacuation, and that surgical methods in skilled hands do less injury, have a lower mortality, and have less morbidity than the less radical procedures.

That when the convulsions and coma have occurred, the termination of pregnancy improves the chance of the

patient's recovery, and that the method of delivery depends
on the condition of the cervix, which determines whether
it be by incision, bag, or nature, supplemented by version
or forceps.

Finally, that anterior hysterotomy should always be the
choice over manual dilatation where no effacement of the
cervix has taken place.

THE TREATMENT OF ECLAMPSIA

By Franklin S. Newell, M.D.
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ALTHOUGH the etiology of eclampsia is as yet undetermined, and in all probability will remain unknown until the physiological chemist succeeds in isolating the toxin or ferment which produces it, there are certain well-recognized facts which give some foundation for the formulation of a rational method of treatment. At the present time two theories seem to be generally accepted as explaining the lesions and symptoms which are usually present in the course of the disease. The first and to me the most probable theory is that under certain conditions which we do not understand, but which are closely associated with a sluggish action of the maternal organs of excretion, a toxin of an extremely irritating nature is produced in the placenta during the development of the ovum. This toxin is then absorbed by the maternal circulation and carried to the various organs in which it produces the lesions, which are recognized as pathognomonic of the eclamptic state, and the symptoms which depend upon them. The second, but to my mind the less logical theory, is that owing to some deficiency in the maternal metabolism, as for instance a lack of proper action by the ductless glands, certain products of normal fetal growth which are ordinarily neutralized in the maternal blood produce the various pathological changes in the maternal organs when the normal process of neutralization is diminished or absent.

At the present time we are unable to determine with which of those two processes we have to deal, and, therefore, our treatment must be symptomatic and more or less empirical. It seems evident, however, that eclampsia is a disease characterized by the circulation of some substance in the mother's blood which produces certain definite organic lesions attended by definite symptoms, which, however, may vary in degree in different patients.

The most common (and, according to some observers, the pathognomonic) lesion found in eclampsia is a necrosis of the liver resulting from the direct action of the toxin on the liver cells, associated with less definite and constant changes in the other organs. Convulsions usually occur, as a result of irritation of the central nervous system by this poison, and the action of the excretory organs is diminished or even temporarily abolished, either by the inflammation caused directly by the poison, or by the spasm of vasomotor system, which is induced by the irritation of the central nervous system. A marked rise in blood pressure necessarily accompanies this vasomotor stimulation, and, therefore, we have a disease whose dominant symptoms are convulsions, high blood pressure and lack of excretion, while the autopsy findings show the results of an irritant poison circulating in the system.

The causes of death in eclampsia correspond very closely to the symptoms. They are: acute dilatation of the heart induced by the high blood tension, together with the increased strain brought to bear on the heart by the convulsions, the cardiac muscle in most cases showing some degeneration as the result of the irritant effects of the absorbed toxin; edema of the lungs, due to inability of the heart to properly perform its work; cerebral hemorrhage, due to the giving way of a weakened bloodvessel under the strain induced by the high blood pressure; necrosis of the internal organs, particularly the liver, produced probably by the direct

action of the absorbed poison, which is circulating in the blood to such a degree that regeneration is impossible, and shock as the result of a severe operative delivery on a patient whose weakened condition renders the burden of operation too heavy to be borne.

If we accept this as a fair statement of the symptoms and of the causes of death in eclampsia it seems evident that our treatment of a case of eclampsia must be directed to certain definite objects: first, the prevention of further absorption of the toxins; second, limitation of the damage by the toxins already in the system; third, promotion of the excretion of the toxins; fourth, treatment of the patient independently of the disease.

PREVENTION OF FURTHER ABSORPTION OF TOXINS

Whether eclampsia is due to the development of a new substance in the placenta, which when absorbed by the maternal circulation produces the widespread changes which we find at autopsy, or whether, owing to a lack of certain elements in the maternal blood, normal products of conception, ordinarily innocuous, become violently toxic in their action, is a question which we are unable to answer at the present time. Inasmuch as we do not understand the nature of the poison with which we have to deal, and, therefore, cannot neutralize its action by appropriate measures, there can be only one rational method of treating this condition when we find that the symptoms of the disease cannot be controlled by prophylactic treatment, and that is, the prevention of any further absorption of the toxins. This can only be accomplished in one way, and that is, by ending the pregnancy and thus removing the cause of the disease. The question immediately arises as to what is the best method to adopt to empty the uterus so as to cause the least injury to the patient. This question can only

be answered by determining what will subject the patient to the least operative shock, other conditions being equal. No method can be considered applicable to all cases, as the choice of operation must depend on whether the patient is a multipara or a primipara, the stage of pregnancy which has been reached, the condition of the soft parts, and the general condition of the patient.

Since eclampsia is a disease of the latter half of pregnancy, the emptying of the uterus may be, and usually is, a serious procedure from an operative standpoint. Since the majority of patients who suffer from eclampsia are primiparæ, any method of dilating the cervix may involve so prolonged and difficult an operation that the shock of operation may be too great for the patient. Furthermore, the condition of the maternal tissues in eclampsia, particularly in a patient who has reached the convulsive stage, is apt to be one of rigidity, often rendering cervical dilatation, by manual or instrumental means, an operation of marked severity, which in the patient's weakened condition may of itself prove fatal. If the patient is a primipara in whom labor has not begun, with a baby not out of proportion to the pelvic canal, and whose cervix is rigid and not taken up, undoubtedly the most conservative operation for a skilled surgeon is vaginal Cesarean section, followed by forceps delivery or version, since this operation can be performed quickly and with a minimum of shock in the great majority of cases. This is not, however, an operation for the general practitioner who is untrained in surgical technique, since it offers marked technical difficulties in many cases. In a multipara, whose soft parts are not unduly rigid, and in a primipara in whom obliteration of the cervical canal has taken place, and perhaps some dilatation of the cervix has occurred, either as a result of beginning labor or of the uterine contractions induced by the convulsions, manual dilatation perhaps preceded by instrumental dilatation to overcome the initial

cervical rigidity and followed by extraction with forceps or by version, is a legitimate and in most cases a conservative procedure. Induction of labor by the use of bougies or the dilating bag is too slow a method to employ in a seriously sick patient, and the local irritation produced by such methods of induction often determines the onset of the convulsive attacks or increases their severity. In patients in whom a disproportion exists between the size of the baby and the pelvic canal, abdominal Cesarean section offers the only chance of delivery with just attention to both maternal and fetal interests. I do not believe, however, that abdominal Cesarean section is an operation of election for an eclamptic patient, when it can be avoided, since I believe that for abdominal surgery to be safe, normal excretory powers on the part of the patient are a *sine qua non*. We recognize in abdominal surgery as apart from eclampsia that suppression of urine following operation is a condition that we always fear and watch for, and I do not consider it logical to perform an unnecessary laparotomy on a patient who is already suffering from a greater or less degree of urinary suppression. Future experience may possibly prove this view to be incorrect, but at the present time I cannot believe that the abdominal Cesarean section has any place in the treatment of eclampsia, except when the pelvic indications are present.

THE LIMITATION OF DAMAGE BY THE TOXINS ALREADY ABSORBED

Having met the first indication of preventing further absorption of toxins by emptying the uterus, the next question is how to limit the damage by the toxins which have already entered the maternal circulation. We cannot control the amount of damage done directly to the internal organs, as for instance the liver, except by ending the pregnancy at the earliest possible moment, and then by pro-

moting the excretion of toxins as rapidly as possible, but we can do much to limit the strain on the heart and other organs induced by the high blood pressure and by the convulsions, and these two symptoms are the ones which will require the most active treatment. The high blood pressure is in my opinion largely due to the condition of vasomotor spasm induced by the irritation of the central nervous system by the absorbed toxins, and the first step in treatment is to limit or remove this irritability, and the use of drugs which will accomplish this object is the next step in treatment. Large doses of bromide and chloral by mouth or by rectum will in many cases give satisfactory results, but I believe that absorption from either stomach or rectum is extremely uncertain during the eclamptic attack, and, therefore, that the absorption of bromides and chloral so given cannot be relied upon in the majority of cases, and we must depend on hypodermic medication as of greater value. Of the drugs which can be given hypodermically, those which seem to have done the most good are morphine and veratrum viride. My own experience, and, therefore, my own preference, lies with morphine. What dosage of any drug shall be used under these circumstances cannot be arbitrarily laid down, but the effect which it produces on the given patient must be watched in order to determine the proper dosage. My own rule is to give $\frac{1}{4}$ grain of morphine and repeat in one hour or sooner, dependent on whether the patient shows any reaction to the first dose, and following this to give $\frac{1}{8}$ grain doses every hour until slowing of the respiration shows that the drug is effective, my object being to lower the respiration to about twelve per minute and to hold it there for at least twenty-four hours, repeating the morphine whenever the respiration shows a tendency to rise to normal, on the hypothesis that convulsions will seldom or never occur in a patient who is kept under the influence of morphine. In one of my cases the respiration dropped to seven, which was

so marked a reaction that it caused considerable anxiety, but the patient made a perfectly satisfactory recovery.

Many authorities believe morphine to be an improper drug to use under these circumstances, claiming that it tends to decrease the excretions, and, therefore, that it is definitely contraindicated in a disease of lessened excretions such as eclampsia. There is no doubt about such an action occurring in the use of morphine on normal patients, but in eclampsia I believe that the lessened excretions are due not so much to the local lesions of the disease as to the vasomotor contraction induced by the irritation of the central nervous system, and my personal experience seems to show that as soon as the patient is sufficiently under the action of morphine to show a diminution in the rate of respiration there is a vasomotor relaxation which results in a lowering of the blood tension and a prompt increase in the excretions, and the only patients in whom we failed to get this sequence were patients who showed no reaction to the morphine.

The blood pressure can be directly lowered by bleeding, and I believe that a moderate postpartum hemorrhage should be hoped for and favored at the time of delivery. My experience has been, however, the eclamptic patients seldom lose enough blood at the time of delivery to lower the blood pressure more than temporarily, and I believe that in most patients venesection and the withdrawal of 20 to 30 ounces of blood is necessary in order to accomplish the best results. The indication for venesection should be taken from the blood pressure. If at the time of delivery the blood pressure drops to 120, or below, venesection should be deferred until a rising pressure shows a return of the symptoms of central irritation; but if the blood pressure does not drop with the emptying of the uterus venesection should be promptly performed and a sufficient amount of blood extracted to lower the blood pressure to approximately a normal level.

The use of nitroglycerine and the use of a hot pack will also tend to diminish the blood pressure temporarily. Vene-section, aside from lowering the blood pressure, removes a portion of the toxins from the circulation, and the remainder may be diluted by the administration of normal salt solu-tion given under the skin. In patients who are not edema-tous this use of the salt solution will be found of great value, but if any marked degree of edema is present the use of salt solution is contraindicated, since the patient is unable to take care of the fluid already in the system and any addition to this burden will do harm instead of good.

PROMOTION OF THE EXCRETION OF THE TOXINS

As a general rule, as soon as the blood pressure is lowered to approximately normal an increase in the excretions of the skin and kidneys will be noted. I believe, however, that the most important channel of excretion in this condi-tion is the intestinal tract, and that free perspiration and an increase in the amount of urine simply denote the much to be desired relaxation of the vasomotor spasm and not necessarily the excretion of the toxins in the system. I have seen several patients who apparently recovered from the primary attack of eclampsia and did well for three or four days only to have a recurrence of convulsions, one case ending fatally. A study of the records of those cases shows that in none was the intestinal tract thoroughly emptied. I, therefore, believe that free catharsis is the most important element in eliminative treatment, since otherwise a reabsorp-tion of the toxins may take place from the intestinal tract and give rise to a return of the symptoms. For this reason before the patient is removed from the operating table the stomach should be washed out and from 1 to 2 ounces of a saturated solution of Epsom salt left in the stomach to be repeated at intervals when the patient can swallow.

High colonic flushing is systematically carried out to empty
the lower bowel, and the action of the salts is aided by the
exhibition of drop doses of croton oil, to be repeated at hourly
intervals, for several doses, or until the bowels move freely.
It has been my experience that, if free watery catharsis
can be established so that the patient has six to eight
copious watery movements in the first forty-eight hours
after delivery, recovery can be confidently predicted in the
absence of cardiac dilatation or cerebral hemorrhage, and
that a recurrence of the attack is practically never seen.

TREATMENT OF THE PATIENT

There will be certain cases in which the above methods
of treatment are not applicable on account of the patient's
poor general condition at the time when she comes under
observation, and delivery by any method seems sure to be
fatal, and in which we are, therefore, forced to treat the
patient and not the disease. In an occasional case the
use of bromides and chloral, or the use of morphine combined
with venesection, will restore the failing heart compensation
and render operation at a somewhat later date possible,
but the prognosis in these cases is exceedingly bad.   In
certain cases after delivery the condition may be such that
active treatment is contraindicated and free stimulation is
necessary, and in rare cases direct transfusion of blood may
be necessary to restore the patient's failing powers.

These cases simply tend to demonstrate still further
the fact that the treatment of any serious condition must
be the treatment of the individual as reacted on by the
disease and not the treatment of the disease according to
a fixed rule.

The choice of the anesthetic to be used at the operation
is of considerable importance, and a word in regard to it
cannot be out of place in any paper on eclampsia.   Chloro-

form is contraindicated on account of the fact that it tends to produce lesions in the liver of the healthy patient similar to those found in eclampsia, a fact which has been repeatedly demonstrated in patients who have died of chloroform poisoning. I have tried gas and oxygen as an anesthetic in one case and the result was such that, although the patient eventually recovered, I consider the use of gas-oxygen anesthesia unjustifiable in these cases on account of the increase in blood pressure which it produces. In my patient an acute dilatation of the heart promptly developed before we had a chance to empty the uterus and operation had to be deferred some hours until the patient's condition became more satisfactory. Ether, while not ideal, seems to be unquestionably the safest anesthetic which we have at present for these cases, and I have yet to see any serious effects from its use.

TREATMENT OF THE TOXEMIA OF PREGNANCY
(ECLAMPSIA)

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THE treatment of the toxemia of pregnancy should be mainly prophylactic. While the etiology remains obscure the treatment will be undetermined and indefinite, and in the present state of our knowledge the best results will follow treatment of the toxemic patient rather than treatment of the toxemia. So far as is known the toxemia is not an infection but an auto-intoxication, mainly resulting from renal and hepatic insufficiency, though the spleen, nervous system, and thyroid gland are supposed to be contributing factors. Derangement of protein metabolism and waste products from fetal metabolism probably add to the blood dyscrasia.

In the pre-eclamptic stage (Edgar) there is continuous headache, usually due to increased blood pressure, impairment of vision, dizziness, hebetude, gastro-intestinal disorder, lassitude, precordial oppression, anorexia, edema, and scanty urine. Scanty secretion of urine, whether albuminous or not, is usually of serious import, and means non-elimination of urea from impaired kidney function. Eclampsia is not so apt to occur in pregnant women who secrete nearly the normal quantity of urine, though it may be albuminous, especially if she has been under the observation of her physician since or soon after pregnancy began. Urinalysis should be made two or three times a month, or more fre-

quently if necessary. The quantity of urea excreted should be the guide in treatment, for, as is well known, serious convulsions may occur without the presence of albumin at all.

Impairment, and suspension of function in the eliminative organs in some cases, points to the presence of an unknown toxin or toxins in the blood, and to relieve the system of those toxins is the object of all treatment. Animal food should be allowed sparingly or not at all. An exclusive milk diet (Edgar) is an important reliance. Calomel and soda (10 grains of the former and 20 to 30 grains of the latter) given at night, followed by a saline the next morning, will often give prompt relief. Sodium sulphate or the potassio-tartrate of soda are the preferable salines, and may afterward be given daily if necessary. The hot pack or hot air bath is a great aid to elimination by the skin. If stimulation of the kidneys is not contraindicated, either the potassium acetate or potassium citrate in 30-grain doses may be of great advantage. Either diuretic is useless unless given in full doses with abundance of water. Should the stomach become irritable after two or three days the dose should be diminished. Should diaphoresis be desirable the liq. ammon. acet. may be added. To maintain the action of the bowels and kidneys the potassium-bitartrate has given excellent results. Glonoin is highly recommended as an anti-eclamptic and diuretic (Edgar). Experience is not in accord with the suggestion that alkalies should not be given in the toxemia of pregnancy. Massage, when exercise is inadvisable, pure air, and an abundance of pure water should not be lost sight of.

An eclamptic seizure calls for prompt and energetic treatment. May not its terror grow less, and may not hope for its more successful management be entertained, now that the era of venesection is apparently being "born again?" Until within a few years it has been mentioned only to be

condemned, and is yet in disfavor with some eminent and excellent authorities. It is not easy to understand why venesection was ever abandoned. It was the main reliance when all that was guessed at as to the etiology of eclampsia was the non-elimination of urea. While it may have been abused, it was then, and is now in suitable cases, the most efficient means at our command for the prompt relief of eclampsia. Fortunately many, if not most, eclamptics will bear the abstraction of blood well.

Given a plethoric primipara, when in either an ante-, intra-, or postpartum seizure, with a history of persistent headache, dizziness, mental depression, impairment of vision, precordial oppression, and diminished or arrested secretions, with probably dilated pupils, face flushed or cyanosed, stertorous breathing, and a full, strong, bounding and rapid pulse, to say nothing of the horribly contorted features, venesection will give more prompt relief than any other means, and recovery, therefore, made more hopeful. Blood should be allowed to flow until cyanosis diminishes or disappears, and the breathing and pulse improve. Fortunately, eclampsia is less frequent in the debilitated and anemic. If venesection is impracticable during the seizure, it is as well to do nothing except to prevent wounding of the tongue, by placing a cork or soft piece of wood between the upper and lower maxillæ, and to prevent as far as possible the patient injuring herself. Venesection is equally efficient as a prophylactic.

It is not easy to understand why some excellent authorities advise the administration of chloroform during the seizure. The disturbed breathing prevents inhalation of enough to have any influence in shortening the attack, and were inhalation of enough possible, its effect upon the liver and kidneys could only be deletereous, and, besides, another toxin is added to the blood. Oxygen, even that contained in the atmosphere, is of vastly greater importance. Ether is preferable whenever anesthesia is necessary.

Morphine has no place in the treatment of eclampsia. It not only retards or entirely arrests elimination, but deepens and prolongs coma. Hypodermoclysis and proctoclysis are valuable aids, especially the former after venesection. Toxins are not only diluted, but the bloodvessels are filled, and elimination is encouraged if not actually induced. Transfusion of normal salt solution may be preferable to either.

Veratrum viride stands next to venesection as an anti-eclamptic. It diminishes blood pressure, and promotes elimination by the kidneys and skin, and frequently the rigid os and cervix uteri will become relaxed. It should be given in full doses hypodermically, and repeated every half hour or hour until the pulse rate falls to 60 or 64 per minute. It should be the principal reliance in cases in which venesection is contraindicated, but should not be given as a substitute. Chloral hydrate per rectum, or sodium or potassium bromide, will often prevent a recurrence of convulsions and promote quiet and refreshing sleep.

The bowels should be evacuated as soon as possible. Calomel followed by sodium or magnesium sulphate will usually prove efficient. Croton oil may also be employed.

Though hardly enough is known of the "thyroid treatment" of eclampsia to correctly estimate its value, certain conditions might be an indication for its use, especially as a prophylactic. Could the prodromal symptoms of eclampsia even in part be accounted for from athyroidism, administration of thyroid would certainly be rational treatment.

Decapsulation of kidneys has been suggested in cases of persistent postpartum anuria, but the mortality is too high to be very often considered. In the treatment of eclampsia the best results will follow a correct interpretation of the symptoms, and a rational application of those means the value of which has been proved by experience.

The uterus should be evacuated as soon as possible,

without increasing the risk to the mother. Fortunately labor will often begin with the first convulsion if she be near the end of uterogestation. Should it not follow soon after, and if the internal os uteri is obliterated, dilatation may be undertaken, either manual, instrumental, or by means of the rubber bags. When the cervix is fully dilated or dilatable, and the vaginal and perineal structures are in proper condition, delivery may be easily and rapidly accomplished by forceps or podalic version. A more irrational and it may be said a more senseless undertaking can hardly be conceived of than the attempt to dilate an undilatable cervix.

When, unfortunately, a seizure comes on before the end of uterogestation, or when labor does not follow, and the cervix is not obliterated but hard and undilatable, and the vaginal and perineal structures are rigid and unyielding, and when in addition the pelvis may be deformed, abdominal Cesarean section affords both mother and child the best chance for life, especally if the mother is a primipara.

When obstruction to delivery cannot be overcome by artificial means, and labor has not commenced, or the first stage of labor is incomplete, and the pelvis normal, and especially if the mother is a multipara, vaginal Cesarean section should be the operation of choice.

Discrimination should be made between a too conservative and too radical treatment of eclampsia, either of which may result disastrously. The high mortality in Cesarean section should be a warning against haste, for it is not absolutely certain that the convulsions will cease even after the uterus is emptied—Lichtenstein says "in nearly two-thirds of the cases." He believes that the reason why the convulsions so often cease after delivery is because sufficient toxin carrying blood has been lost instead of emptying the uterus. While this emphasizes the value of venesection, the fact remains that the prognosis is more promising after the

uterus is emptied. While Cesarean section should not be the *dernier ressort*, still it should be absolutely certain that delivery by other means is impossible. Nothing can ever be gained by operating upon the dying.

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DISCUSSION ON THE SYMPOSIUM OF THE TOXEMIA OF PREGNANCY.

DR. REUBEN PETERSON.—Judging from these most excellent papers, we need spend no time discussing the value of prophylactic treatment. Such treatment is always in order and should be persisted in so long as the patient is improving. If, however, the patient is progressively growing worse under such treatment, I believe with Drs. Polak and Harrison, that the rational treatment is to empty the uterus as quickly as possible, and with the least possible trauma. If the cervix be soft and easily dilatable, or if it be nearly dilated, then manual dilatation undoubtedly is the operation of choice. If, on the other hand, the cervix be rigid so that manual dilatation would be time-consuming and productive of trauma, vaginal Cesarean section should be selected. The statistics, maternal and fetal, of this operation will always be high until the profession has learned to employ it under certain conditions, and have given up its use as an operation of last resort. My statistics on this operation, given before the Society last year, show that the maternal mortality of vaginal Cesarean section in the hands of many operators is very high; not high because the uterus was emptied or because this particular operation was performed, but because it was not performed soon enough after the beginning of the

convulsive seizures or because other operative precedures were first employed. When vaginal Cesarean section is performed soon after the first convulsion or the first few convulsions, the mortality statistics were very good, much better than when the operation was postponed until the patient had had many convulsions.

Since my paper of last year, I have collected from the literature and from operators all over the world cases of eclampsia treated by abdominal Cesarean section. While I am not prepared to give my conclusions, arrived at from a study of these 421 cases, I may say that the maternal mortality of this operation in eclampsia has been reduced from over 50 to 36 per cent. Just as in vaginal Cesarean section, the mortality figures suffer from the fact that in many cases the operation was performed as a last resort after the puerperal tract has been infected by many attempts at extraction from below. So this operation was postponed until the patient had had many convulsions and was overwhelmed by the eclamptic poison.

From the standpoint of the fetus there is every reason to choose the abdominal route, since while the fetal mortality after vaginal Cesarean section was 21 per cent., it was only 6 per cent. after abdominal Cesarean section on the eclamptic woman. Hence, while I do not mean to imply that abdominal Cesarean section should be the operation of choice for emptying the uterus for eclampsia, I do say that we should consider this question in the light of modern obstetrical methods and not condemn any operative treatment of the condition from statistics compiled from cases where the particular operation under consideration was performed under unfavorable conditions.

DR. BARTON COOKE HIRST.—I have listened with great interest and pleasure to the papers that have been read on this subject, but there must be some difference of views on the subject.

With reference to the paper of Dr Ward, I think he has given us a valuable suggestion, but I should like to ask him as well as the other members if they have considered the greater efficacy of the parathyroid extract which the Italian school of obstetricians have demonstrated to be of greater benefit in the toxemia of pregnancy than the secretion of the thyroid gland itself. I have used the parathyroid extract for five or six years, and believe that in rare types of toxemia I get better

results than from the thyroid extract itself; but these toxemias requiring the parathyroid treatment are distinctly rare; they constitute only a small minority of the cases of toxemia which we see in practice.

As to the next two papers, the papers of Drs. Davis and Harrison, Dr. Davis calls our attention to the treatment that is applicable to those cases seen by the specialist from the beginning. We all know they are easily dealt with, and that by the modern means advocated or advised, success is best assured, but the majority of our cases are seen in consultation and in hospital practice. We do not often see the severe cases of toxemia, and we almost never see a case of eclampsia in our own practice. The preventive treatment we carry out makes that disease one of the rarest in our private patients. I believe the treatment outlined by Dr. Davis, while good in the class of cases he was describing, does not suffice in the majority of cases we encounter. There would have to be more energetic means taken for the elimination, especially in regard to sweating, than Dr. Davis advocates, in order to get the best results.

Dr. Harrison's unqualified advocation of the operative treatment I feel strongly opposed to, and I think this Society ought to carefully consider its responsibilities to the general profession. We have in the United States approximately 7500 cass of eclampsia every year. Of that number, the vast majority are attended by general physicians, and if we allow the doctrine to go forth from the Society that the only treatment of toxemia and eclampsia is the operative treatment, it will do a vast deal of harm. I am convinced that out of the 2500 women who die from eclampsia in the United States yearly, a large number of them are slaughtered by attempts on the part of the general physician without the necessary surgical skill to deliver them by operative means. One incident that occurred in my consultation work in the last two months illustrates this point. I saw a woman who had had what I am confident was a simple hysterical outbreak at the third month of pregnancy. A general physician, a man of twelve years' experience, thought he was dealing with a case of eclampsia. He called in two consultants from the neighborhood; both exclaimed, as soon as they entered the house, that it was a case of eclampsia and that the uterus should be emptied at once. One of them put a placental forceps in the man's hand. When I reached

the patient's room I found he had extracted about twenty feet of the patient's small intestine, which was lying in a bucket under the table. It is a dangerous doctrine to promulgate that we should treat all cases of toxemia or eclampsia by operative means.

Personally, from my experience in the University Maternity Hospital, Philadelphia, where we have had 210 cases of eclampsia, I find I can get the best results by non-operative treatment. Although I am provided with a good clinic, have had training in gynecological surgery, and operate under the best conditions, yet after three distinct attempts in a series of cases in dealing with extreme toxemias and eclampsias by operative means, I have been compelled by the results of that treatment to return to more conservative meaures. But as in all medical conditions, we cannot be bound by hard and fast rules. When a patient does not respond to the eliminative treatment, does not progress spontaneously in labor, as she ought, I have no hesitation in resorting to the active operative treatment. In exceptional cases I believe it to be recommended, but as a universal rule it is to be deplored, and, in my judgment, should not be unreservedly recommended by this Society.

DR. RICHARD C. NORRIS.—I did not expect to open this discussion. I think Dr. Polak struck the keynote of the situation when he discussed the condition of the maternal soft parts and the condition in which he finds the mother whether extremely grave or otherwise. I am quite sure that under most circumstances there are those of us who are persuaded that vaginal Cesarean section is not the only operative method in treating these cases. I have employed it but very, very rarely.

Yesterday I had my assistant look up the last 34 cases of toxemia at the Preston Retreat, so that I might refer to them in this discussion. The last 34 cases have occurred during the period when vaginal Cesarean section has been discussed by the profession. Of this number, there were 14 actually eclamptic women, who had forty-two convulsions; there were 20 pre-eclamptic cases past the seventh month of pregnancy. That group of cases was treated by the consevative plan. They were what I would term the average cases—the cases that in my judgment do not require the aggressive operative methods, and of these cases only one women died, without convulsions, from a widespread accumulation of fluid in the serous cavities,

due to chronic Bright's disease. Twelve of the infants died,
most of them being premature. Of the pre-eclamptic cases,
twenty in number, sixteen infants left the hospital in grave
condition, four were stillborn or died within a few hours. Of the
eclamptic cases, eight infants were stillborn or died within the
first week, six survived and left the hospital in good condi-
tion. I am sure if I had subjected every one of these women to
vaginal Cesarean section I would not have had better results.

I believe the time has come for us to study these cases individ-
ually and to attempt to properly classify them. There are
unquestionably some cases of eclampsia so fulminating in
character, so serious, and accordingly dangerous, with the soft
parts in such a rigid and undilatable condition that men of
experience can decide that a particular case is best treated by
vaginal Cesarean section. It has not been proved that immedi-
ate evacuation of the uterus can save a large proportion of
these desperate case. It is utter folly to my mind to advocate
that every toxic woman, if she has eclampsia or is threatened
with eclampsia, should have the soft parts cut open in order to
immediately extract the fetus without any attempt being made
to employ the reliable methods of elimination. To me it is the
height of surgical folly. We may as well treat every septic
case by immediate removal of the uterus. We would save
some women from fatal sepsis perhaps, but we would do much
unnecessary surgery. The future may clarify this subject,
we must wait for the physiological chemist; we must have
clinical methods at our disposal which will differentiate the
type of cases that require immediate emptying of the uterus.
At the present time we can say only this, that in the fulminating
hepatic or placental types of toxemia in primiparous women,
with rigid hypoplastic birth canals, we should seriously think
of vaginal Cesarean section and use it, not routinely, but in
the exceptional class of cases just referred to, believing that
it offers, at the present time, an efficient surgical method of
rapidly terminating pregnancy. To what extent terminating
pregnancy within fifteen or thirty minutes, is life saving in the
gravest cases of toxemia, has certainly not been proved.

DR. J. WHITRIDGE WILLIAMS.—I have been much interested
in Dr. Polak's remarks because what he has said concerning
the operative technique represents exactly my own views, and
is much better and more succinctly expressed than I could hope

to do. I agree with him when we have to empty the uterus for the relief of vomiting of pregnancy, that vaginal hysterotomy or vaginal Cesarean section is the method of choice. I have employed it for years with the greatest satisfaction.

There is one point, however, to which I feel obliged to take exception, and that is with reference to testing the glycogenic power. If, in order to make the test, it is necessary to give 2 grams of glucose for each kilo of body weight, we must give 120 grams or 4 ounces to a woman weighing 60 kilograms (130 pounds). I believe that the administration of such quantities is practically out of the question in a woman suffering from serious vomiting, as I have tried a corresponding dose myself and found it nauseous, and upon attempting to give it to normal pregnant women I have found that they nearly always vomited it. Accordingly, I do not believe that the test can be utilized in women who are suffering from serious pernicious vomiting; and to any one who has doubts concerning the correctness of my statement, I would recommend that he try the dose upon himself.

As to the method of emptying the uterus in eclampsia, it is necessary to individualize; but whenever the cervix is rigid I believe that vaginal Cesarean section is the operation of choice if prompt delivery seems advisable. I have employed the operation in a large number of cases with great technical satisfaction; but at the present moment I cannot speak as strongly in favor of routine rapid delivery as I did in the past for the reason that I am extremely dubious concerning the whole question of the treatment of eclampsia.

Up to a few months ago I was a pronounced advocate and a rigid believer in the efficacy of prompt delivery, and carried it out rigorously in my service. A few months ago, however, I analyzed my material and found in a series of 120 cases which had been so treated that the mortality had been 22 per cent. This is a very unsatisfactory showing, but it is modified to some extent by remembering that most of the patients had been sent to us from the outside on account of the eclampsia, and in many instances were so ill upon admission that there was but little hope for their recovery. For this reason we must always expect a relatively high mortality in this type of cases.

On the other hand, upon tabulating the cases of postpartum eclampsia, in which the convulsions did not come on for a vary-

ing length of time after delivery, I found that the mortality
was quite as high as in the ante- and intrapartum cases which
had been delivered as soon as possible after the onset of con-
vulsions.   Such a result was a great surprise, and caused me
to inquire whether rapid delivery had played any part in the
cases which recovered.

If rapid delivery is the treatment *par excellence*, we should
expect almost ideal results in postpartum eclampsia; as in
it Nature has effected spontaneous delivery before the occur-
rence of the first convulsion, and consequently such cases should
be regarded as examples of the earliest possible delivery.   But,
as the results in the two series of cases were practically identical,
it makes one skeptical as to the curative effects of rapid delivery
in general.   With this in mind, I have started certain investi-
gations in my own clinic, concerning which I am not prepared
to speak at this time.   The results have been such that I have
become very doubtful as to whether it is advisable or not to
deliver an eclamptic woman immediately as a matter of routine.
Next year I hope to be able to talk more definitely upon the
subject, and if what I have in mind is borne out I think it will
prove a very interesting addition to our obstetrical knoweldge.

Another point which I should like to emphasize is that when
we attempt to dilate a rigid cervix, either manually or instru-
mentally, we expose the woman to almost as much risk of death
as does the disease itself.   Accordingly, when we feel that
immediate delivery is imperative in such cases, a cutting opera-
tion becomes the method of choice, otherwise the patient had
better be treated purely symptomatically.

DR. CHARLES M. GREEN.—It seems to me that this subject
has been very well presented in the several papers and in the
subsequent discussion.   Opinions will perhaps always differ,
on this as well as on other important subjects in medicine;
and we shall each base our opinion on our individual experience
with this most serious complication of pregnancy.   It has
seemed to me from my own experience that I have had better
results from the more conservative methods so well portrayed
by Dr. Davis, than by the more active operative measures.
I believe that the shock and trauma of hasty accouchment
force have been the cause of many maternal deaths, which
might have been avoided by more conserative measures; and
I am not yet prepared to believe that so-called vaginal Cesarean

section will improve our ultimate results. I am quite ready to believe that in some cases of primigravidæ near full term, but with unsoftened cervix and vaginal tract, when there have been but few convulsions, and the fetus is still apparently in good condition, abdominal hysterotomy will prove to give better maternal and fetal results than the slower eliminative treatment in conjunction with hydrostatic bags and manual dilatation. But when the fetus is non-viable, or too immature to give a reasonable expectation of independent survival— when, in other words, the fetus is a negligible consideration— I believe the best maternal results may be expected from active medicinal treatment to promote the elimination of toxins and the lowering of blood pressure, which so often result in the onset of labor, or in the subsidence of symptoms with the later spontaneous expulsion of the fetus which, of course, is sometimes dead and perhaps macerated.

But if we are to be of greatest service to womankind in the prevention and treatment of pregnancy toxemia, we must take such steps as we can to promote the care and observation of pregnancy from the early months. I need not, perhaps, in this presence, plead for the proper care of pregnant women. The members of this Society well know that prevention is greater than the attempts to alleviate or cure disease. At the Boston Lying-in Hospital we maintain a clinic for pregnant women, in which we supervise the women who will later enter the hospital. We see many women with toxemic symptoms, and a visting nurse discovers others. These women, if they do not improve on ambulatory service, are admitted to hospital: under treatment and hospital regimen many women recover from untoward symptoms, and under supervision go to full term. But if improvement does not ensue under hospital care and hygiene, premature induction is resorted to. We do not allow a toxemic pregnant woman under care to reach the stage of actual eclampsia. While some, with medical and dietetic treatment recover and go to full term, others have an amelioration of symptoms, but with death of an immature fetus and subsequent spontaneous premature delivery; actual eclampsia and maternal death are seldom seen under this method of pregnancy care.

Dr. HENRY D. FRY.—I have been much interested in the papers and discussion on this subject, and we must recognize

that these toxemias affect the pregnant woman differently in the early months than in the later months, not only in a pathological way, as Dr. Polak has pointed out, but that we have in the early stages of pregnancy usually hematemesis and in the latter part eclampsia. Just when we ought to cease treating these cases and trying to get them over the toxemia, and when we should empty the uterus, it is difficult to decide, and I had hoped, when Dr. Williams brought out his ammonia coefficient idea, we had ground to stand on, but that did not work out. I have seen cases that would have died when the ammonia coefficient did not get above 6 per cent., and I have seen other cases get well when it was 40 per cent., and no operation was done.

I am never satisfied to empty the uterus until I have tried one remedy which has served a good purpose in the treatment of the early stage of eclampsia when all others have failed. After putting the woman to bed and taking off all food by the stomach, giving nutrient enemas, I use inhalations of oxygen, and if I cannot stop pernicious vomiting and the symptoms continue, I am satisfied I have a right to empty the uterus.

The paper of Dr. Ward regarding the use of the thyroid extract was interesting to me. I have made it a routine practice in the later months of pregnancy to examine the thyroid glands of all women, and if they do not show a physiological enlargement of the thyroid at that time; if I find they have symptoms of insomnia or restlessness, sleeplessness, indigestion, I put them on the thyroid extract, and have seen the symptoms disappear. I have seen the nitrogen output increase, and this does possibly considerable good in a certain class of cases.

The principal question is whether or not we should empty the uterus in cases where we have a severe preëclamptic condition, or where the woman has had one convulsion. I was glad to hear Dr. Hirst remark that the opinion for immediate operation is getting so prevalent that doctors will go in and say empty the uterus at once. We cannot use as an argument against this method that men cannot tell an hysterical convulsion from an eclamptic convulsion, or they cannot tell the difference between gut and placental tissue. That is no argument against vaginal Cesarean section. I believe if we would take the preëclamptic and find we cannot relieve the symptoms and feel that we are getting into deep water, we should empty the uterus at once.

If the woman has had one convulsion, do not wait for two. We have these liver lesions occurring from absorption of the toxins, and we have not way of telling the degree of hepatic disease. We do not know how far the pathological conditions or lesions have advanced. The woman may have no convulsions, and yet the pathologic lesion in the liver is so far advanced that it is beyond repair. A woman may have forty convulsions, and if the pregnancy is terminated at once she may recover. In the postpartum cases of eclampsia, the liver lesions had progressed so far that the eclampsia proved fatal, although the woman was delivered. That is the reason these women die after the birth of their children.

With reference to vaginal Cesarean section, no one recommends it, as Dr. Peterson has said, in every case. If you have a multipara, with a dilated cervix, no one would think of vaginal Cesarean section in that kind of case. If you rupture the membranes and can apply forceps, no one would recommend that vaginal Cesarean section should be done, but we should recommend that the woman be delivered at once, whether by vaginal Cesarean section or not. If you have a rigid cervix and the woman is a primipara, I believe every time in doing a vaginal Cesarean section, and not an abdominal Cesarean section. The statistics of the maternal death rate of abdominal Cesarean section in toxemic women is different from the mortality in the cases of contracted pelvis, and the statistics which I have seen before, and which Dr. Peterson gave show a maternal death rate of 45 per cent. But if we take his figures we will find that they represent cases that have been badly treated, and treated by everybody, and finally subjected to abdominal Cesarean section, giving a mortality of 46 per cent. The mortality from vaginal Cesarean section in the same class of cases is 23 per cent., one-half less than that from abdominal Cesarean section. If you take the better class of cases, where they operate early, the mortality in 26 per cent., and the mortality by vaginal Cesarean section is 12 or 13 per cent. No matter how you look at it, you canot compare abdominal Cesarean section with vaginal Cesarean section in cases in which it is indicated in eclampsia.

Dr. Davis has said, and I agree with him, that we must not pay much attention to the toxemic child. Very few of them live, anyhow. I would not use that as an argument, however,

for doing abdominal Cesarean section in the eclamptic woman, to give her more danger of her life to save the problematical life of the baby. So I would advise in a case of eclampsia, if the woman has one convulsion, do not let her have two, but immediately empty the uterus, whether by dilatation, version, forceps, vaginal Cesarean section, or whichever is indicated, to empty it at once.

DR. GEORGE W. KOSMAK (by invitation).—It is very fortunate that criticisms of medical methods should come from within the profession rather than outside of it, because the only way in which we can arrive at sane views on the suject is to have criticism come from people who know. Therefore, it is a pleasure to listen at a meeting of this kind to such a free discussion on both sides of this important question.

To begin with, the term "eclampsia" must be regarded as a misnomer in the class of cases to which we have generally applied it. We have accustomed ourselves to call a disease entity, the toxemia of pregnancy, by one of its prominent symptoms. In a great many instances this prominent symptom does not appear. There are numerous cases of toxemia in the late months of pregnancy that do not have convulsions. Some recover from the toxemia and some end fatally. A reference has been made to the postpartum cases. We usually find in these lesions exactly similar to those met with in the cases that went into convulsions before labor or during labor, and we also find them in certain cases where no convulsions occurred.

At a meeting of the American Medical Association, held at Altantic City several years ago, Dr. J. E. Welch, the pathologist of the Lying-in Hospital, showed a series of autopsy specimens, including the brains and livers from each of four women, two of whom had, but the other did not have any convulsions. Therefore, it is not fair in the consideration of these cases to assume that convulsions are the deciding factor, and that is why I personally object to basing a series of therapeutic statistics on the occurrence of convulsions. It has been stated here today that any woman who has had one eclamptic convulsion should not be allowed to have another. What are we going to do with those cases that have no convulsions? Many women get well who have had numerous convulsions, in whom no operative delivery was resorted to, but who delivered themselves spontaneously. If these cases had had a vaginal or abdominal

Cesarean section done after the first convulsion, they would have been included in that column in which the operation was credited with a favorable outcome. It seems to me that this is not a fair basis by which to estimate the effect of treatment in a disease which has so many manifestations as the so-called "puerperal eclampsia."

Dr. Hugo Ehrenfest.—There is one important point, not mentioned in the discussion so far, namely, the possible effect of the amount of blood lost during labor on an existing eclampsia or on the development of postpartum eclampsia. Studying this problem Lichtenstein found that women, in whom convulsions stopped immediately after delivery, had lost about double the amount of blood as compared with those in whom convulsions continued, and about four times the amount as compared with those in whom the first convulsion appeared after delivery. He concludes that the apparently very good results of early forced delivery are probably due to the loss of blood incident to the more or less severe surgical procedures. Fully in harmony with this observation stands the undeniable fact that of late, by many writers, favorable views have been expressed concerning the value of very copious bleeding by means of venesection. The better results are possibly due to the tendency not to resort to saline transfusion, the possible harmful effect of the latter counteracting the beneficial effect of the former.

Dr. Polak has gone over the ground very systematically, but like all the other speakers has discussed the treatment of eclampsia only from the standpoint of the hospital man, forgetting that the overwhelming majority of all cases are handled by the practitioner. A useful treatment of eclampsia must properly consider this fact. Any interference in a case of eclampsia, from simple proctoclysis to Cesarean section, can to better advantage be executed in a hospital. It, therefore, should be accepted as the most important teaching that, whenever possible, a patient suffering from eclampsia or even only exhibiting the symptoms of a severe toxemia should at once be removed to a hospital. For the patients who, especially in country practice, are excluded from the undeniable advantage of hospital accommodation any sort of surgical interference under unfavorable surroundings will involve undue and dangerous risks. For this class of patients, a large one in actual

practice, a conservative treatment along the lines of the Stroganoff method would seem distinctly preferable. This method certainly has yielded splendid results in the hands of many good obstetricians.

Dr. Ward (closing the discussion on his part).—As far as Dr. Hirst's question as to the use of parathyroid preparations in these cases is concerned, all I can say is, I have had no experiences with that preparation, although I am familiar with it. My paper dealt with a rare type of toxemia. It is not the every-day type we see, and the opportunities for observation are not frequent. The men who have done the most work with parathyroid extracts, as Dr. Hirst has mentioned, are those who belong to the Italian school of obstetricians. Beebe has studied parathyroid extract and has done some experimental work in removing the parathyroids in dogs, producing a form of tetany. Beebe has obtained results with the dogs in relieving tetany by the injection of fresh parathyroid nucleoproteid substance. He has, however, told me that he has had no experience with it that was satisfactory on the human being. The point brought out by Dr. Fry in connection with these cases is simply this, that there is a form of toxemia that possibly is dependent upon hypofunction of the thyroid gland. While it is true it is a rare condition, still it occurs sometimes when we least expect it, and I think, therefore, it is wise that all cases of pregnancy coming under the care of the obstetrician should have the thyroid gland observed and watched. Normally we should get a physiological enlargement of the gland, and in cases where that does not occur and they have toxic symptoms developing, it is certainly worthy of trial to see what can be accomplished by the thyroid extract.

Dr. Davis (closing the discussion on his part).—A full account of my cases of thyroid toxemia will shortly appear in the *American Journal of the Medical Sciences*. Those of us who see these cases may be interested in such a patient at operation. Both these women, who came to full term having thyroid toxemia, had a section done. They took their ether very badly, although they showed no dangerous symptoms during the operation. The first twenty-four hours after delivery they were unusually restless, but did not suffer much pain. There was a high degree of excitability, but this was readily controlled with mild sedative drugs. Neither of these women

was allowed to nurse her child, for obvious reasons, and both children did well. I do not believe any obstetrician should deal with these cases without using every endeavor to send the patient to a general surgeon after her recovery from childbirth. Both of these woman went to general surgeons, and both surgeons did thyroidectomy. One operation was done by Dr. Gibbon, and one by Dr. Mayo, of Rochester, and both women today are in excellent health.

A curious coincidence is the action of the mammary gland and the thyroid gland, and sometimes we can promote the secretion of milk by the administration of thyroid extract, and sometimes the effort to use the thyroid extract in nursing women is followed by disturbances of lactation which are very distressing.

I am very much interested in the discussion of the question of toxemia. I agree with Dr. Kosmak that our terminology of the subject must be rewritten, as too much attention has been given to the old idea of convulsions, for I think every one of us who has studied the question long and carefully knows that women will not die oftentimes because they have convulsions. The real history of the cases in whom death occurs after convulsions, or in whom convulsions begin after delivery, show they are critical, and the physiologist will be required to put us on the right track. It is for that reason I took the stand in the paper which I did, that of ultra-conservatism toward every discussion, and I put that side of the question strongly, for I am satisfied that no method of treatment which I have seen tried is adapted to all cases.

DR. HARRISON (closing).—I do not know that I have anything further to say except that I still hold to my views regarding the active intervention in the cases I spoke of, and I was very glad to hear Dr. Kosmak make the criticism as to our terminology. In my paper I spoke of the fact that such cases ought to be dealt with by emptying the uterus, whether there are eclamptic seizures or not; that they had nothing to do with the case. The question was one of toxemia. I still hold to the view that active intervention is absolutely indicated. I am sure, those gentlemen who are so conservative, if they will study the question further, with their minds open to the reception of truth, will come to the same view as such men as Olshausen and Veit. Several years ago they brought out an admirable

work and took strong grounds against this method of Dührssen, which they denounced in unmeasured terms. Not long afterward Veit published his cases and successes with vaginal Cesarean section. His results were magnificent. He had better success than any other man in the same number of cases. As I recall, he published 50 cases with uniform success. Olshausen came out and like a man expressed his regret at havine taken the position he did, which was extremely conservativg ground. I hope these gentelmen who are so conservative will follow the excellent example set by two such men as Olshausen and Veit.

THE RADICAL ABDOMINAL OPERATION FOR CANCER OF THE UTERUS

By John G. Clark, M.D.
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Since the inauguration of a more radical operation for cancer of the uterus, surgical critics have been ranged on one or the other side of the question as energetic antagonists or ardent sponsors. With such an extensive operation it is inevitable that the primary mortality must be high, the surgical accidents and sequelæ numerous and more or less distressing, and even among the most optimistic advocates the consensus of opinion has been that unless the permanent percentage of cures is to be considerably increased, it must be abandoned in favor of less hazardous procedures. To Wertheim belongs the credit of having actively carried forward and simplified the technical details of a more radical operation suggested by Riess, Rumpf, and myself. From the first report of his smaller series of cases until the recent appearance of his monograph, covering 500 completed histories, his efforts have been persistent even in the face of a very high primary mortality. His final conclusions are incontrovertibly in favor of the operation as executed in his own hands and those of Zweifel, Krönig, Bumm, Fratz, and others. While these results have been obtained by a few specialists with a very abundant clinical material, they are not likely to be duplicated, because of technical

difficulties, by those of lesser opportunities. Even in Wertheim's series of 500 cases the primary mortality is shockingly high, being followed in his first hundred by a 30 per cent. death rate; in his second hundred by 22 per cent., while even in his fifth hundred, it was still as high as 15 per cent. Certainly this is not an encouraging outlook for men of lesser opportunities to contemplate. It matters not for what an operation is performed, there are but few surgeons in America so temperamentally constituted that they can work ahead with great enthusiasm in the face of primary mortality of 1 in 4, or 25 per cent.; and further, to see the survivors pass through the trying ordeals of a stormy convalescence attended with many grave postoperative sequelæ. In the radical operation, it is only through the development of a most perfect technique that the hazards of death and serious surgical accidents may be diminished to even a moderate degree.

It is particularly opportune that this question has been brought before the American Gynecological Society for discussion; for it is now more than a decade and a half since the radical operation was first proposed, and statistics, sufficiently comprehensive, should be available to help us in deciding whether it offers a sufficient increase in permanent cures to justify its adoption by the great rank and file of surgeons of this country. The universal benefit of any medical or surgical measure cannot be great if its execution is so difficult as to render it highly hazardous, except in the hands of a very few specialists.

My experience, so far as permanent cures are concerned, has not thus far sustained my hopes for greatly improved results, yet the criticism to my efforts may possibly be the same as that offered by Wertheim in commenting upon von Rosthorn's first series of cases, which was attended with a comparatively small primary death rate, but a high percentage of recurrences, namely, that this indicated a failure

to really effect a widely extended excision of parametrium and vagina. With increasing enthusiasm for the principles underlying this operation, von Rosthorn became still more radical, and his mortality quickly increased to a much higher rate, and although he believed that the survivors would show a proportionally greater freedom from recurrences, Schottlaender's and Kermauner's recent review of his cases do not brilliantly sustain this anticipation.

In Cullen's comprehensive monograph[1] the cases of cancer of the uterus operated upon in the Johns Hopkins Hospital by various methods were reviewed, and, so far as possible, the postoperative results were accurately determined. My first case was operated upon in the Johns Hopkins Hospital by a more radical method in June, 1895, and during the next year and a half 12 cases were subjected to this measure with more or less technical variations. Through Dr. Kelly's generous desire to give me every opportunity to elaborate this plan, several cases were turned over to me for operation.

In all, there were 12; in some the glands were removed; in others there was only a wide excision of a vaginal cuff and as much parametrium as possible. There was one operative death. Among the survivors, 4 could not be traced, 1 died in three months, 1 in nine months, 1 in ten months, 1 in thirteen months, and 1 in four years after operation. Two were alive at the time of publication of Cullen's book, without evidence of recurrence, three and a half years after operation.

Of this series, therefore, we can only assume that the last two cases may be cured. According to continental statisticians, the cases that cannot be traced must be counted among the failures. This rule makes it impossible to reach any definite conclusions as to accurate final results in our

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[1] Cancer of the Uterus, 1900.

larger American cities; for the perfect system of police registration in the continental municipalities does not obtain with us, and it is rarely possible to follow patients after they have changed their address twice. This has been noted in the futile attempts to trace several of my cases operated upon in the Hospital of the University of Pennsylvania.

The failure to obtain better results in this first series of cases and others subsequently operated upon in Philadelphia cast doubt upon the efficiency of this more extensive procedure, and, while I still adhered to the principle, I felt that I had either applied the operation to too far advanced cases or that there had been a failure to really effect the widest possible excision of locally involved tissue. With increasing experience, the difficulty and even the impossibility of really executing a truly extensive glandular dissection caused me to abandon this attempt; for it unduly lengthened the time of the operation with a coincident increase in primary mortality, as well as an increase in operative mishaps and postoperative complications, hence, I confined my efforts to the widest possible excision of the parametrium, with as large a vaginal cuff as possible, contenting myself with the removal of one or more glands if palpably enlarged, for prognostic purposes. My conviction was based upon the following points:

1. The absence, as yet, of any known law concerning metastasis; for, as already demonstrated, the glands of the side of greatest local involvement may be free, while the parametrium, or higher glands of the opposite side, may show microscopic foci.

2. The unreliability of the macroscopic appearance of a gland in determining metastasis; for a large palpable gland may be removed painstakingly from the bifurcation of the iliacs and prove to be of an inflammatory character only; while an invisible lymph radicle, or a microscopic focus,

immediately adjacent, may be the lodgement place for cancer cells.

3. The absence of any law as to what type of cases give metastasis. A very limited local process may show wide glandular metastasis, whereas the opposite may be true in the extensive involvement.

4. The peculiar distribution of metastasis, in that occasionally a lower group of glands may escape metastasis, whereas those above are involved.

Concerning the question of glandular extirpation, it now appears evident that if the higher pelvic lymphatic system is the seat of metastasis, it is scarcely possible for the widest and most painstaking dissection completely to eradicate it. That this forecast has been sustained is shown in Wertheim's report, for in his large series of cases that had passed over the five-year period, there were only 5 survivors in whom the lymphatic glands were involved at the time of the operation. All of the rest are dead. I am aware of the earnest contention in favor of this part of the operation by Aulhorn, Mackenrodt, Riess, and others, but, in view of the objections just noted, and in the face of the failure of the advocates to sustain their position by a much higher percentage of cures in the cases of glandular metastasis, it is self-evident that at the worst we are making but a slight error in this limitation, which will be offset by a lesser primary death rate.

In a monograph of nearly 800 pages[1] by Schottlaender and Kermauner are detailed *in extenso* the cases of von Rosthorn in his clinics at Graz, Heidelberg, and Vienna, comprising in all, 256 abdominal operations, distributed as follows: Graz, 85; Heidelberg, 77; Vienna, 94. In the first series of 27 cases that came under the five-year period there were 20 per cent. cured. Of the remaining 58, 24.1

[1] Zur Kenntnis des Uterus Carzinoms, 1912.

per cent. died from the primary effects of the operation, 1 died of intercurrent disease, 8 could not be located, leaving 18 alive over two and one-half years after operation. Von Rosthorn's experience with the radical operation in the Graz Clinic was very unsatisfactory. In his laudable desire to give the fairest trial to this operation he attributed his failure to effect more cures to the fact that he had not excised a sufficient cuff of the vagina.

Upon assuming the Directorship of the Heidelberg Clinic, he endeavored to correct this defect, and at once noted a very decided increase in primary mortality, and, although there was a larger percentage of permanent cures among the survivors, the final results reckoned from the stand-points of primary mortality, plus subsequent deaths from recurrence, were only slightly better than with the less extensive operation in Graz.

After von Rosthorn was called to the University Clinic in Vienna, 94 cases were operated upon. Ten died from the primary effects of the operation, leaving 84 for final study. At the time of publication of Schottlaender's and Ker-mauner's monograph there had already been noted 24 recurrences. The remainder cannot be utilized in consider-ing permanent cures because of the short time since the operation.

In such a radical procedure very serious surgical accidents occur, which may so far militate against it as to raise the question as to whether the game is really worth the candle. The study of cases of cancer, therefore, should not be based alone upon mortality statistics, for the prolongation of life with some wretched operative complication hardly justifies the salvage.

Thus, in von Rosthorn's entire series of 256 operations, the bladder was more or less seriously injured in 41 cases (16.41 per cent.). The majority of these fistulæ were repaired at the time of the operation, but several remained more or

less permanent for some time. Four required subsequent operation, and 11 remained permanently patulous. In 6.25 per cent. there were injuries to the ureters. In 3 per cent. there were lacerations of the rectum, and in one case, the obturator nerve was cut, causing permanent crippling of the leg. Secondary necrosis of the bladder occurred during the convalescence in 6.25 per cent. of cases. Secondary ureteral fistulæ were noted in 7.03 per cent. of cases. Other complications, such as intestinal fistulæ, etc., are recorded in a small percentage of cases.

In concluding this review of von Rosthorn's cases, Schottlaender and Kermauner do not reach a positive conclusion as to the final value of the radical operation, reiterating the conservative opinion expressed by von Rosthorn in one of his earlier papers published in 1906, as follows: "We do not wish to overvalue, nor yet to undervalue the radical abdominal operation, for we are still in the beginning of its development." Von Rosthorn further stated that theoretically this procedure offered the most effective possible way thus far suggested of reaching the best results, but it would still require a long time to arrive at final conclusions as to whether these principles when carried into effect will be justified by better results than the less hazardous methods hitherto in vogue. The latest results and the most favorable of all so far as permanent cures are concerned, are those of Krönig, reported by Bussee.[1] He gives in more or less detail the results of 59 operations by Krönig, in Jena, with 25.3 per cent. ultimate cures after the five year period reckoned according to Waldstein's formula. Krönig has been very radical in advanced cases with a very high primary mortality, but the increased percentage of cures may justify his query as to whether we may not hope to reach the best

[1] Uber Dauerresultate bei der Operation des Uterus Carzinomes nach den abdominalen Methoden, Monats. f. Geburts. u. Gynäk., January, 1912.

ultimate results by the most radical operation in even the
very far-advanced cases. Before taking this view, however,
we should weigh other considerations, which I shall men-
tion later. His experience in Jena causes him to advance
his standard to the very extreme of operability, and he
believes that even Wertheim is too conservative in this
particular.

In attempting to reach a final estimate of the value of
the radical operation, one must compare carefully all reports
from authoritative sources on other operations. Thus von
Ott,[1] who is recognized as a very skilful technician, com-
pares the radical abdominal, the radical vaginal, and the
simple vaginal hysterectomy. He believes that an estimate
of the value of the three methods should be founded not
alone upon the number of the patients, which are per-
manently cured, but also upon the immediate danger which
is associated with each method. The crux of any ideal
operation is a small primary mortality, freedom from
operative accidents, and postoperative sequelæ, and the
highest percentage of permanent cures.

In weighing statistics, he compares Wertheim's radical
abdominal operation, Staude's and Schauta's radical vaginal
method (Schuchart's operation) and his own, the simple
vaginal method, as follows:

	Radical abdominal method, Wertheim.	Radical vaginal method, Staude.	Radical vaginal method, Schauta.	Simple vaginal method, v. Ott.
Cases operated upon for five or more years	116	58	47	191
Deaths following operation	27	9	9	4
Mortality	23.3%	15.5%	19.1%	2.1%
Absolute percentage of cures (Winter's computation method)	24.7	23.0	16.7	15.5
Absolute percentage of cures according to Waldstein	19.16		13.5	15.1

[1] Zentral. f. Gyn., 1909, No. 19.

From this table it is quite evident that although the abdominal radical operation carries an exaggeratedly higher mortality, in the final casting up of accounts, the permanent cures, although very decidedly better, exact a very high primary death toll.

In comparing the Schuchart method as executed by its exponent Schauta, with the radical method of Wertheim, we may say with great certainty that its value, as demonstrated in Schauta's hands, has fallen short of the standard set by the latter. The cures reported by Wertheim are 57.6 per cent., while Schauta's were only 38.2 per cent. From a comparison of these statistics, it is evident that the Schuchardt method will never have many exponents; for it requires quite as much skill, is attended with a high primary mortality, and is followed by a very large percentage of postoperative accidents.

Further, it bears the serious disadvantages, which all extensive vaginal hysterectomies bear, that the most critical part of the work is done under touch. Even in the hands of the average skilled operator, it would be attended by wretched consequences.

The primary mortality among German and Austrian operators varies widely, and there are wide divergencies in ultimate results. Thus the primary mortality among the leading exponents of the radical operation is as follows: Wertheim, 18 per cent.; Zweifel, 8.5 per cent.; Doderlein, 18.2 per cent.; Bumm, 21 per cent.; and Krönig, 25.4 per cent. Both Krönig and Wertheim claim that the high primary rate of mortality indicates the thoroughness of extirpation of the uterus, parametrium, and vagina, and criticise von Rosthorn's first series of cases because his death rate was only 6 per cent., and yet, as already pointed out, even von Rosthorn's later and more radical efforts did not bring a compensatory return. Now comes the discrepancies, which statistics so frequently show—Zweifel,

who has a higher rate of operability than Wertheim, a ratio of 45 per cent. by one as against 43 per cent. by the other, had only 8.5 per cent. primary mortality with a permanent salvage after five years of 20.46 per cent., as against 18.4 per cent. by Wertheim.

These statistics confuse us, and we are naturally puzzled over these wide differences in the hands of men presumably of equal ability. Certainly neither Wertheim nor Krönig are justified in criticising von Rosthorn's bad results, because his primary mortality was only 6 per cent., when Zweifel, who operates upon 45 per cent. of all cases applying to his clinic with only an 8.5 per cent. primary mortality, claims a percentage of permanent cures decidedly better than Wertheim.

I have quoted rather extensively from the statistics of these leading gynecologists in Germany and Austria, for the radical operation has been more extensively carried out in those countries than in America.

If an operation or other therapeutic procedure is to have a permanent place in our armamentarium, it must be sufficiently easy to make it available, not for a few skilled specialists, but for the great body of surgeons working in every quarter of this and other countries. In these days of low primary percentages attending nearly all the major operations, no operation can possibly gain extensive headway which carries with it a shockingly high mortality, and a large number of distressing and disabling sequelæ. Further, while the continental surgeon, with his large and overcrowded clinics, may ignore the question of mortality in working out a principle, the American surgeon as well as the American layman is so temperamentally constituted that the one cannot and the other will not disregard a high primary death rate except in operations of direst emergency. The effect upon the lay mind, therefore, must be taken

into consideration, for while one may have over 50 per cent. ultimate cures, the effect upon the average intelligent citizen is abhorrent, if for this number of survivors there have been 25 deaths, and for the other 25 a wretched existence, attended by repulsive postoperative sequelæ, followed by a torturing and lingering death. We must remember that these cases are not rushed to our hospitals *in extremis*, but walk in apparently in perfect health. The very nature of their disease makes these women secretive, and their friends and neighbors seldom know of their illness until they hear that they have been operated upon. Even the survivors leave the hospital, and do not talk of their ills; indeed, they are usually kept in ignorance of its true nature. If they die, however, all know about the surgical tragedy. In other words, as I have paraphrased in another paper two lines in Mark Anthony's funeral oration—"The evils of cancer operations live after them, the good is interred with their bodies." We have all seen the widespread prejudicial effects of a fistula among the circle of a patient's criticising friends. After all, the layman only counts as the final test of surgery, successful results, as represented by a restoration to health with a maximum percentage of surgical safety. The specialist, therefore, who may even save the largest number of cases may drive away many others through his unavoidable high death rate and surgical accidents incident to this salvage. With this view of the situation, no one should be censured who regards with favor von Ott's opinion—that an operation, such as a simple vaginal hysterectomy with a very small primary mortality, and almost no complications, is preferable when one casts aside the purely surgical consideration, and takes into account the layman's estimate of results. The population with which we deal is quite different from the great stream of humanity flowing into the German and Austrian clinics, for there the peasant popu-

lation is usually ignorant and poorly informed, and stoically
accept their fate whether it be good or bad. It is possible
that when we make a final summary of our combined
experience we may have to accept the conclusion that a
less radical operation, even though it ultimately saves
fewer cases, may be preferable when attended by a low
surgical mortality and few or no operative sequelæ. What
will be infinitely better and what we ardently hope for, is
that the present operation, which embodies correct princi-
ples, may be further improved and thus eliminate the high
mortality now generally attending it. The gradual lowering
of the death rate in many hands offers the forecast that
we may yet achieve better results. If this follows, every
argument will then be in favor of the radical operation until
some other more effective means of combating this disease
supplants it.

SUMMARY OF CASES OF CANCER OPERATED UPON BY ABDOMI-
NAL HYSTERECTOMY OF A MORE RADICAL TYPE
IN THE GYNECOLOGICAL CLINIC OF THE
UNIVERSITY HOSPITAL

In the study of my cases, I have included only those
patients operated upon in the University Hospital, because
the records of these cases are much more complete than
those in other hospitals with which I am associated. Even
here, it has been impossible to trace all of these patients,
thus leaving a considerable hiatus in the final summary of
results.

In this review it will be seen that the operative accidents,
such as fistulæ, suppuration of the abdominal incision, etc.,
have been about the same as those noted by other operators.
Briefly summarized, my results are as follows:

CARCINOMA OF CERVIX

Operative deaths (peritonitis)	3
Died from recurrence in three months	1
Died from recurrence in six months	3
Died from recurrence in ten months	1
Died from recurrence in twelve months	2
Died from recurrence in fifteen months	1
Died from recurrence in eighteen months	3
Died from recurrence in two years	5
Unable to trace	6
Alive and no sign of recurrence:	
One year	1
One and one-half years	2
Three years	1
Four years	1
Four and one-half years	2
Six years	4
Total	36

POSTOPERATIVE SEQUELÆ

Suppuration of abdominal incision	5
Cystitis	4
Peritonitis (recovery)	2
Ureteral fistulæ	2
Vesical fistulæ	5
Phlebitis	1
Laceration of rectum (fistula)	1
Pleurisy	1
Rectovaginal fistula	1

These accidents largely occurred in the advanced cases in which the bladder or rectum were so closely involved as to render them almost unavoidable. Unfortunately, one frequently cannot determine before the operation has advanced beyond a point where it is impossible to abandon it, the degree of cancerous extension, consequently all operations for cancer of the cervix must inevitably be attended with greater risks than in any other gynecological disease requiring hysterectomy.

However, in every series of cases thus far reported, in which the radical operation has been employed, the surgical mishaps and postoperative sequelæ of greater or lesser extent have been relatively much larger than in the reports of simple hysterectomy cases.

CANCER OF FUNDUS

Merely for the sake of comparison, I include a series of 13 cases of cancer of the fundus operated upon by a simple hysterectomy. As a rule, we have made no attempt to effect a wide dissection of the parametrium, and have not removed the iliac glands. The difference in results between cancer of the fundus and of the cervix is so startling as almost to persuade us that they are of an entirely different nature, for one, even when quite extensive, may be permanently cured by a simple hysterectomy, whereas the other may quickly recur, even when it but lightly involves the cervix, even after the most radical removal. We, therefore, expect good results from comparatively simple operative measures with the one, while the other gives us our worst surgical records.

CANCER OF FUNDUS

Operative death. (This patient died one week after operation from a general metastasis of chorio-epithelioma. Death occurred from wide-spread involvement of the lungs with the malignant process.)	1
Well over six years	5
Well over four years	1
Died after five years from recurrence	2
Died from continuance of disease in seven months	1
Died from recurrence in three years	1
Died from recurrence in one year	1
Died in two and one-half years from mastoid abscess (complete autopsy revealed no microscopic trace of cancer either in pelvis or in the abdominal lymph glands)	1
Total number of cases	13

As my cases stand, they prove little or nothing. Certainly, they do not offer substantial argument for a radical operation, as I have performed it; for, in my list of cases only four are alive after the five-year period. One might favor the proposition that of the six lost sight of, a proportion at least may have survived. This would be mere guesswork, and I accept the standard set by our German

confrères that the cases not accounted for cannot be utilized for statistical study. To count all lost cases against the operation is, however, hardly fair; for it is impossible in this country to trace a more or less nomadic population, which has no police or other permanent registration.

There has been a primary mortality of a fraction over 8 per cent., which argues in favor of a less radical operation than that of Wertheim, whose mortality has been much higher, and yet Zweifel, whose experience I have already quoted, had in his series of cases only 8.5 per cent. mortality, but claims, nevertheless, a greater percentage of cures than Wertheim. I willingly grant that Wertheim has been more consistently radical than I, for I have varied the details of my technique, always with a hope of keeping the primary mortality within reasonable limits, and yet affecting a sufficiently wide extirpation of vagina and parametrium.

These cases at least prove conclusively one point, and that is, there is no middle-of-the-road policy. Either the operation must be extremely radical with a considerable primary mortality and many distressing sequelæ with a larger number of ultimate cures among the survivors, or, on the other hand, it must be a much simpler technique with a minimum primary mortality, few sequelæ, and a much smaller curative basis.

So far as my own experience is concerned, I may say, as did von Rosthorn, that I am neither elated nor yet depressed in my failure to achieve better results. Certainly, the modern American surgeon has no reason to grant that his continental colleagues possess superior skill or a better technique than is in vogue here. Possibly a greater concentration of material in a smaller number of large University clinics may give a wider experience among a few skilled operators, and the earnest educational propaganda among the laity in Germany and Austria concerning the early signs of cancer may cause a larger number of patients to consult the surgeon in

the earlier stage of the disease. As the matter now stands, the combined statistics favor the further trial and perfection of this principle among those who are well prepared to carry it out in the most skilful manner.

From a review of the literature and from personal experience, I would offer the following summary concerning the radical operation:

1. The operation in expert hands, notwithstanding its high primary mortality, has given the greatest percentage of permanent cures of any therapeutic procedure thus far suggested for cancer of the cervix.

2. While the above conclusion is true, the general adoption of the operation in view of its dangers and difficulties is not to be generally advised until the primary mortality can be reduced to a much lower percentage by a simplification or perfection of details.

3. The abandonment of the extensive glandular dissection is justified, because this detail adds to the hazards and does not sufficiently raise the percentage of permanent cures.

4. The cardinal advantage of the operation lies first and above all in the excision of an extensive cuff of vagina and the widest possible removal of the parametrial tissue.

5. There is no middle-of-the-road policy in cancer of the cervix. The surgeon would better perform a simple vaginal hysterectomy or a high amputation of the cervix with extensive cauterization than to attempt the radical operation if he is not prepared effectively to execute its details.

6. The earnest endeavor by many specialists with the improved ultimate cures in a few hands offers the hope that a further simplification and perfection of details in this operation may yet make it more generally available.

TABLE OF CASES OF CANCER OF THE CERVIX OPERATED UPON BY THE MORE
RADICAL ABDOMINAL HYSTERECTOMY IN THE GYNECOLOGICAL
CLINIC OF THE UNIVERSITY OF PENNSYLVANIA

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
34 Dec. 13, 1899 I	32 years; married 7 years; no para; one miscarriage. Uterine colic with metrorrhagia.	Epithelioma of cervix.	Curettage and cauterization of cervix followed by panhysterectomy six days later.	Abdominal incision opened and began to discharge and remained open for one month. Wound then closed with silkworm gut. Later passed small gauze pad by rectum. Following this, rapid convalescence.	Discharged April 14, 1900. Died two years later from local recurrence.
125 June 6, 1900 II	35 years; married 17 years; I-para. Irregular flow for last two years, excessive for last year. For last month or more had profuse hemorrhage with excessive malodorous discharge.	Cauliflower carcinoma, limited to the cervix on the right side but has extended into the vaginal fornix on the left. Uterus freely movable.	Hysterectomy, combined abdominal operation following radical plan of Wertheim and Werder; cuff of vagina removed; glands not palpable.	Severe cystitis following operation.	Patient lived until June 29, 1902, more than 2 years, dying of exhaustion. Suffered intense pain. Severe cystitis and suppression of urine.
199 Oct. 29, 1900 III	63 years; married.	Carcinoma of uterus; outlet senile and greatly relaxed. Cervix patulous, cauliflower growth. Fundus of uterus normal in size and position.	Panhysterectomy.	Peritonitis.	Died October 31, 1900.
334 June, 5 1901 IV	45 years; married (history incomplete).	Carcinoma of cervix extendinto broad ligaments.	Hysterectomy. Too far advanced for any hope of cure.	June 20, 1901, embolic pneumonia. June 27,1901,breakdown in entire incision; stitch abscess and malodorous vaginal discharge.	July 25, 1901, discharged. Abdominal wound entirely healed. Apparently in good shape. Not traced.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
384 Sept. 19, 1901 V	39 years; married 19 years; III-para. Profuse bleeding with malodorous discharge.	Early carcinoma of cervix, cauliflower type.	Radical hysterectomy.	Stormy convalescence; peritonitis. Recovery.	Patient alive over six years from time of operation.
420 Oct. 27, 1901 VI	36 years; married 15 years; II-para; 1 miscarriage. Malodorous discharge and menstrual periods have been profuse and too frequent for six months.	Cauliflower growth of cervix.	Radical hysterectomy.	Following operation, pain in right side of abdomen and right kidney greatly enlarged and easily palpable	Dec. 14, 1901, discharged with a urinary fistula; gives her a burning sensation. Unable to locate patient.
632 June 23, 1902 VII	40 years; no history.	Extensive ulcerative growth of cervix. Parametrial involvement.	Hysterectomy. Large lymph gland removed.	. . . .	Could not be traced.
671 Aug. 20, 1902 VIII	54 years; widow; married 20 years. No para; no miscarriages. General pain in lower abdomen. Painful micturition.	Adenocarcinoma of cervix.	Panhysterectomy.	. . . .	Death on second day after operation from general peritonitis. (Aug. 27, 1902.)
706 Sept. 29, 1902 IX	44 years; married 19 years; III-para. Bleeding constantly for a month. Feels weak and had fainting spells.	Carcinoma of cervix with hydrosalpinx. Early case.	Cauterization of cervix, and panhysterectomy, Oct. 11, 1902.	Uneventful.	Discharged Nov. 7, 1902, perfectly well. June 24, 1904, hard mass in right iliac region. Patient died two years after operation from general metastasis.
731 Oct. 29, 1902 X	37 years; married 5 years; I-para. Flow became irregular 6 months ago. Later profuse hemorrhage. Malodorous.	Cauliflower cancer of cervix.	Hysterectomy. Glands palpable in left iliac region.	Stormy; suppuration of abdominal wound. Establishment of ureterovaginal fistula; closed after patient returned home	Patient died Dec. 23, 1903; extension of cancer into bladder.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
907 May 11, 1903 XI	41 years; married 20 years; IV-para. Pelvic pain for 3 years, very severe on walking. Pains down left thigh and leg; diagnosticated as rheumatism. Recently hemorrhage from uterus, light red in color.	Cervix large and soft with friable mass. Tenderness and induration along left broad ligament.	Panhysterectomy.	Uneventful.	Discharged June 11, 1903. Jan. 2, 1904, all symptoms have disappeared and she feels much better. No recurrence after six years.
1060 Oct. 20, 1903 XII	47 years; married 28 years; VI-para. No symptoms up to 3 months ago, when patient began to have free bleeding.	Carcinoma of cervix.	Hysterectomy. Removal of considerable area of parametrium. One pelvic lymph gland removed from the right iliac region.	. . . .	Patient died in six months from internal metastasis; no local recurrence.
1167 Feb. 29, 1904 XIII	26 years; married 9 years; I-para. Offensive discharge for last seven years. No significant change in periods.	Preliminary excision of cervical lip. Microscopic examination shows carcinoma of cervix.	Panhysterectomy 10 days later. No evidence of metastasis; glands not palpable.	. . . .	Patient died in three days of fulminating peritonitis.
1247 June 26, 1906 XIV	45 years; married 25 years; III-para. For last 10 months constant irregular bleeding. Great weakness from loss of blood.	Very early carcinoma of the cervix, which had not extended to surrounded area. Uterus enlarged to size of 2 months' pregnancy, seat of fibroid.	Hysterectomy. Extensive area of vaginal involvement but no extension into broad ligaments. Pelvic glands not palpable.	Normal.	Present date, patient alive and well since the operation.
1379 Dec. 13, 1904 XV	42 years; married 10 years; For 6 months periods have occurred every two weeks.	Large cauliflower mass springing from lip of cervix. No induration of parametrium.	Preliminary cauterization, followed immediately by abdominal hysterectomy. Right angle clamps of Wertheim employed in this operation.	Infection of stump following operation. Vesical fistula for a short time, healed before leaving hospital.	Patient could not be located. Traced to two addresses and then lost sight of.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
1700 Jan. 11, 1906 XVI	53 years; married 33 years; VII-para. Blood-tinged leucorrhea of two months' duration.	Cervical carcinoma.	Panhysterectomy.	Tympanites; intestinal paresis; vomiting with marked leukocytosis. Suppuration of wound.	Discharged Feb. 18, 1906, general condition excellent. Apr. 17, 1910 (note), patient died from general metastasis 18 months later.
1908 Aug. 31, 1906 XVII	47 years; married; II-para. Excessive uterine bleeding.	Carcinoma of cervix, completely destroying cervix.	Hysterectomy. Apparent metastasis to sigmoid flexure, possibly may be inflammatory.	Very stormy. Severe peritonitis. Intense cystitis. Patient in hospital 40 days.	Her physician writes that she left his care, and he has been unable to trace her since.
1976 Nov. 4, 1906 XVIII	49 years; married 23 years; I-para. Failing health for 2 years. Vaginal discharge constantly for 5 months. Lost 40 pounds in weight.	Carcinoma of uterus. Bleeding on examination, from extensive crater of cervix.	Panhysterectomy.	Uneventful.	Discharged Dec. 27, 1906, perfectly well. Patient died 15 months later from internal metastasis.
2059 Feb. 2, 1907 XIX	49 years; married 30 years; III-para. Constant pain in the lower left quadrant of the abdomen extending to knee. Leucorrhea constant. Scanty bleeding spells in last 4 years.	Cervical carcinoma.	Panhysterectomy. Rectum punctured during operation. Immediately repaired.	Phlebitis.	Discharged Mar. 23, 1907. Physician reports patient alive and well.
2267 Feb. 16, 1907 XX	42 years; married 9 years; No para; one miscarriage. Treated with tampons for 3 months. Always bleeds after removal.	Localized cauliflower carcinoma of cervix. Extension into broad ligaments.	Panhysterectomy.	Rapid and uneventful.	Discharged Oct. 11, 1907. Died 2 years later of local recurrence.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
2390 Jan. 27, 1908 XXI	37 years; married 18 years; II-para. Profuse bleeding 8 weeks ago. Since then continuous discharge with trace of blood.	Part of cervix has sloughed away. Uterus movable; broad ligaments free.	Extensive cervical cauterization, followed immediately by radical hysterectomy.	. . . .	May 1, 1912, patient alive and well; physician's report.
2755 Dec. 4, 1908 XXII	41 years; married 18 years; II-para. Excessive leucorrhea for last 6 months, varying from white serous to coffee-colored discharge.	Early carcinoma of cervix. No extension to vaginal wall or parametrium.	Radical hysterectomy. No palpable glands.	. . . .	May 25, 1912. No recurrence Patient in excellent health.
2758 Dec. 9, 1908 XXIII	45 years; married 25 years; VIII-para. 6 mos. watery discharge.	Extensive cauliflower carcinoma, involving entire cervix.	Hysterectomy.	Infection of severe grade around vaginal wound.	Died one year later from local extension.
2835 Feb. 12, 1909 XXIV	50 years; married 20 years, No para. Hemorrhage 2 months, yellowish malodorous leucorrhea for 3 months.	Cervix extensively ulcerated, bleeds freely on touch. Large cauliflower mass filling vaginal fornix. Two fibroid tumors of fundus uteri.	Preliminary curettage and application of formalin, followed immediately by hysterectomy. Extensive intestinal adhesions. Cancer extended too far for radical operation.	Intense suffering from cystitis and rectovaginal fistula. Extensive suppuration of abdominal incision.	Died six months later.
2952 May 24, 1909 XXV	52 years; married 21 years; III-para. Irregular hemorrhage 2 yrs; very profuse for last three months.	Preliminary curettage, excision of cervical tissue for diagnosis— adenocarcinoma of cervix.	Complete abdominal hysterectomy. One enlarged pelvic lymph gland removed	. . . .	May 1, 1912, in excellent health. No evidence of recurrence.
3074 Oct. 9, 1909 XXVI	48 years; married 31 years; V-para. Yellowish malodorous discharge for 3 months.	Cancerous ulceration of cervix. Uterus enlarged and slightly fixed in pelvis.	Abdominal hysterectomy. Extension of cancer along uterosacral ligaments; glands not palpable. Adrenalin and formalin packing around vaginal wound	. . . .	Patient died Aug. 28, 1910. internal metastasis. Severe pain. Vesical fistula developed some time before death.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
3081 Oct. 17, 1909 XXVII	43 years; married 21 years; II-para. Losing weight for 2 years. Almost continuous bleeding for 4 months.	Cauliflower mass filling vagina, and extensively involving cervix.	Abdominal hysterectomy. Wide extirpation of uterus. Adrenalin-formalin packing in vaginal vault. Glands not palpable.	. . . .	Could not be traced.
3133 Dec. 5, 1909 XXVIII	48 years; married 26 years; II-para. Profuse discharge with bloody tinge.	Carcinoma of cervix.	Panhysterectomy.	Bladder irritability. Malodorous discharge from vesicovaginal fistula.	Jan. 3, 1910, discharged. Fistula persisted for six months, late intestinal fistula developed through abdominal scar. Died from general peritoneal metastasis 18 months after operation.
3191 Feb. 6, 1910 XXIX	50 yrs.; widow; II-para; no miscarriages. Malodorous discharge of 2 or 3 months' duration. Frequency of urination. Loss of weight and strength.	Carcinoma of cervix.	Panhysterectomy.	Pleurisy.	Discharged Mar. 19, 1910. No bladder irritation, but complained of severe backache. Died one year later of internal metastasis.
3392 Aug. 3, 1910 XXX	24 years; married 8 years; IV-para. Whitish, thick discharge for 1 year. Hemorrhage daily for 7 weeks.	Carcinoma of cervix (interstitial).	Complete hysterectomy.	Uneventful.	Apr. 20, 1912, physician reports patient alive. "She is fat, feels well and does all of her own housework." No evidence of recurrence.
3566 Jan. 27, 1910 XXXI	36 years; married 18 years; VII-para. For six months, hemorrhagic discharge with yellowish leucorrhea.	Extensive cancerous involvement of cervix. Parametrial involvement.	Hysterectomy, extension to bladder. Several iliac glands removed.	Extensive lymphatic metastasis.	May 19, 1912, extensive recurrence; intense pain, requires morphine in large doses.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
3596 Jan. 17, 1911 XXXII	40 years; I-para. Yellowish discharge and profuse irregular flow for 6 months.	Cauliflower carcinoma, involving both cervical lips; parametrium slightly involved.	Preliminary cauterization. Hysterectomy.	. . . .	May 1, 1912, well; no symptoms of recurrence.
3603 Jan. 23, 1911 XXXIII	44 years; married 15 years; IV-para. Severe pain in lower abdomen. Continuous oozing of blood. Pain in rectal area. Marked loss in weight and strength.	Carcinoma of cervix. Extensive involvement of cervix and broad ligaments.	Panhysterectomy.	Uneventful. Cystoscopic examination showed vesico-ureterovaginal fistula.	Discharged Mar. 6, 1911, Vesico-uretero-vaginal fistula persisted. Repaired 1 year later. 18 mos. later extensive recurrence; death from large vesical hemorrhage.
3611 Jan. 30, 1911 XXXIV	52 years; married 27 years; IV-para. Since menopause, 8 years ago, vaginal discharge; profuse hemorrhage 8 weeks ago.	Early carcinoma of cervix. No palpable parametrial involvement.	Preliminary cauterization. Hysterectomy. Glands not palpable.	. . . .	Apr. 26, 1912, well; no evidence of local recurrence.
3753 May 22, 1911 XXXV	40 years; married 13 years; II-para. For 6 mos. periods have been much more profuse and more prolonged.	Ulcerative crater, involving both lips of cervix, not extensive. No palpable extension to parametrium.	Preliminary cauterization. Hysterectomy. Extension to lymph glands and both iliac fossæ. One or two glands removed; showed metastasis.	. . . .	Died Nov. 11, 1911. Cancer recurred, invaded bladder and rectum. Intense pain in iliac region.
3818 Aug. 24, 1911 XXXVI	40 years; married 6 years; III-para. Symptoms for 8 weeks.	Early carcinoma of cervix, not extending to vagina or into broad ligaments.	Complete abdominal hysterectomy.	Uneventful.	Well with no sign of recurrence, Apr. 27. 1912.

CARCINOMA OF FUNDUS: SIMPLE ABDOMINAL HYSTERECTOMY

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
3279 Apr. 13, 1901 I	42 years; married 20 years; IV-para. Periods every two weeks, very profuse. Time of bleeding increased from 7 to 10 days; passed many clots.	Myoma uteri with carcinoma of fundus.	Supravaginal myomectomy and bilateral salpingectomy; left oöphorectomy and appendectomy.	Uneventful.	Discharged May 4, 1901, with a low-grade phlebitis of left leg. Patient well over six years after operation.
522 Mar. 4, 1902 II	40 years; married 22 years; III-para. 9 mos. ago began to have severe uterine bleeding, which continued up to present time.	Uterus enlarged. On curettage, large amount of brain-like tissue removed. Carcinoma of fundus.	Simple hysterectomy.	Satisfactory.	Present date, patient alive and in good health.
924 May 26, 1903 III	50 years; single. Symptoms not given.	Carcinoma of fundus.	Abdominal hysterectomy.	Uninterrupted.	Patient living and well.
1072 Nov. 9, 1903 IV	55 years; married 31 years; I-para. No abnormal menstrual symptoms up to 55 years. Large ovarian cyst indication for operation.	Cancer of the fundus was found on pathological examination.	Simple hysterectomy. Removal of ovarian cyst.	Normal.	Present date, patient well; no recurrence.
1131 Jan. 25, 1904 V	56 years (history incomplete). Bilateral pain in lumbar region. Frequency of urination.	Carcinoma of fundus.	Complete hysterectomy.	Abdominal distention; nausea; vomiting.	Discharged Feb. 22, 1904, in good condition. Died 3 years later of local recurrence.
1524 May 17, 1905 VI	43 years; married 23 years; No para. Last 2 months has had profuse hemorrhage. Has lost greatly in weight. Severe degree of anemia.	Uterus enlarged; cervix normal Curettage shows friable material, undoubtedly cancer. Interstitial cancer.	Hysterectomy.	Normal.	June 1, 1912, patient alive and well.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
1609 Oct. 3, 1905 VII	55 years; married. Slight leucorrhea and dribbling of blood for one year.	Carcinoma of fundus extending to sigmoid flexure.	Panhysterectomy.	. . . .	Well up to Oct. 3, 1911, when she noticed hemorrhage from bowels. Died from general carcinomatous metastasis. Had passed five year period when recurrence occurred.
1954 Oct. 8, 1906 VIII	52 years; married 12 years; III-para. Irregular bleeding for 9 mos. Vaginal discharge for one year. Prolonged periods.	Cervix intact; uterus enlarged; freely movable. Curettage shows carcinoma of fundus.	Panhysterectomy. No involvement of lymph glands.	. . . .	Patient well and doing heavy work Oct. 1, 1911, when there was a recurrence. Died from suppression of urine. Had just passed five-year limit.
1433 Sept. 11, 1905 IX	31 years; married 14 years; VII-para. Vaginal bleeding for 3 weeks with chills.	Chorio-epithelioma of uterus Relaxed vaginal outlet. Cervix soft; uterus enlarged.	Panhysterectomy.	Dyspnea, pain in chest with cough. Physical signs in chest negative. Rusty sputum; cardiac murmur over apex.	Died within a week after operation. Postmortem exam. showed general metastasis.
2189 July 3, 1907 X	40 years; single.	Myoma uteri with cancer of fundus.	Partial hysterectomy. Impossible to remove cancerous metastasis.	. . . .	Died 7 months later from continuation of disease.
2983 June 15, 1909 XI	55 years; married 14 years; III-para. More or less constant bleeding for one year.	Extensive cancer of fundus. Metastasis to broad ligaments.	Abdominal hysterectomy. Wide excision of parametrium but cancerous tissue appeared to have passed beyond border lines of operation.	. . . .	Patient died Oct. 26, 1910. General metastasis. Extensive local recurrence. Severe pain. Cystitis. Suppression of urine.
3121 Nov. 23, 1909 XII	40 years; married 20 years; I-para. Irregular hemorrhage for 1 yr. Cramp-like pains referable to gallstones.	Carcinoma of fundus with slight cancerous involvement of vagina.	Hysterectomy. Only slight area of cancer in fundus.	. . . .	Apr. 25, 1912, well. Examination shows no evidence of recurrence.

Gynec. No. Date. Serial No.	Age. Children. Symptoms.	Examination.	Operation.	Convalescence.	Result.
3144 Dec. 16, 1909 XIII	56 years; single. Yellow leucorrhea with profuse uterine hemorrhage. Marked loss in weight in last year; constant backache; epigastric pain.	Carcinoma of fundus.	Panhysterectomy; dilatation and curettage showed large piece of friable material.	Uneventful.	Discharged Jan. 13, 1910. May 1, 1912, patient died of acute cerebrospinal meningitis. Autopsy revealed no microscopic trace of cancer.

PRIMARY AND END RESULTS OF FIFTY–ONE RADICAL ABDOMINAL OPERATIONS FOR CANCER OF THE UTERUS

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Since the publication in the January, 1911, number of *Surgery, Gynecology, and Obstetrics* of my results with 40 radical abdominal operations for cancer of the uterus, my belief in this operation has only become stronger. However, the added experience afforded by 11 additional cases has not made me any more confident that the next patient I operate upon will survive either the primary operation or will ultimately be cured. On the contrary, in contrast with other abdominal operations, the more I perform this operation the more I respect, and, possibly, dread it. Yet I adhere to it for the simple reason that in my hands all other operations for cancer of the uterus have been disappointing in their uniformly bad ultimate results, while with the radical abdominal technique I have been able to save a fairly good percentage of my patients. And that, after all is said, is what the surgeon is after. If he be not content to set at naught his surgical reputation as far as primary results are concerned for the sake of ultimately curing more patients, he would best not meddle with this operation which, in apparently favorable cases, is only too apt to turn out to be grave.

The subject of the cure of cancer of the uterus by the radical abdominal operation is such a large one that it seems

to me those having the program in charge were wise in selecting for discussion the most interesting and important phases of the question—the primary and end results of the operation. I will try to confine myself to the discussion of these divisions of the subject, only adding what seems absolutely necessary to explain such results.

PRIMARY RESULTS

In each of the 51 patients operated upon, the diagnosis of carcinoma of the uterus was confirmed by the microscope. Cases of cancer of the cervix and of the fundus have been grouped together and also considered separately as far as primary and end results are concerned. While it is undoubtedly true that cancer of the fundus is much more amenable to cure by the radical operation than cancer situated in the cervix, since the latter extends much more rapidly through the parametria and lymphatics, I believe that each fundus case should be subjected to as thorough an operation as if the cervix were diseased. Notwithstanding the fact that the radical operation is apt to be easier in carcinoma of the fundus owing to the greater movability of the uterus, there will always be a higher mortality when this technique is employed than after the ordinary panhysterectomy.

It will be seen by Table I that there were 10 deaths in the 51 cases, or a primary mortality of 19.6 per cent. My operative experience with the radical abdominal operation began some ten years ago and, until I had acquired some familiarity with the technique, the results were very discouraging. This is shown by a primary mortality of 42.8 per cent. in the first 14 cases. However, in the last 37 cases there were but 4 primary deaths, a mortality of 10.8 per cent.

That the technical difficulties of the radical operation are much greater in cancer of the cervix than where the

fundus is affected is shown by the great difference in primary mortality in the two types of cases. In 40 cases of carcinoma of the cervix there were 9 deaths, or a primary mortality of 22.5 per cent, while there was only one primary death in 11 cases of cancer of the fundus, or a mortality of 9 per cent.

The high primary mortality in the first 14 cases were due to a prolongation of the operations together with an unnecessary loss of blood due to a failure to appreciate how venous oozing could be avoided. I find it exceedingly difficult to differentiate clinically between shock by itself, usually due to a prolonged operation and shock due to the same cause plus hemorrhage or persistent oozing. But whether one calls it shock or shock plus hemorrhage makes very little difference, since in each case the patient is reduced to such a point that all efforts at stimulation fail and the patient rapidly succumbs. Four of the 6 deaths could be ascribed to shock, 1 to peritonitis and 1 to embolus. Since each of these causes has a direct bearing upon primary mortality in any series of radical abdominal operations, it would be best to consider them separately.

Shock. Prolongation of the operation beyond the limit of safety in an operation where the work is being performed in close proximity to large vessels and important nerve plexuses is a potent cause of shock, especially, as has been stated, if to this be added a considerable loss of blood from venous oozing deep down in the pelvis. Patients with carcinoma of the uterus are usually beyond forty years of age and subject to the degenerative changes present at that time of life. Hearts, arteries, and kidneys which under ordinary circumstances would permit of rather prolonged operations give out when the disease is cancer of the uterus and the patients are subjected to the radical abdominal operation.

Again, women over forty or forty-five are apt to be fat. This is disadvantageous in three ways: excessive adipose tissue lowers the resistance of the patient, a fact well known and dreaded by every abdominal surgeon; in very fleshy women the fat is deposited most frequently and in the largest quantities in the abdominal wall and in the pelvis, thus adding greatly to the technical difficulties of the operation; the immense deposits of fat in the omentum and mesentery pushed down toward the diaphragm in the exaggerated Trendelenburg position make this operative posture distinctly disadvantageous, and not infrequently menace the life of the patient by interfering with respiration and the function of the kidneys. Thus excessive fat, at least for the operation under discussion may be a distinct contraindication for its performance. At least, that is the conclusion at which I have arrived, from my experience with the radical abdominal operation for uterine cancer in excessively fleshy women. While I would not have the decision for or against operation depend on how much the patient tipped the scales, for other factors enumerated above must also be taken into consideration, I reserve the same right to reject this particular operation in the case of excessively fat women that I have to refuse to operate upon certain patients with diabetes, advanced kidney changes, high blood pressure or with marked symptoms of exophthalmic goitre. I do not think the argument that patients with cancer of the uterus are doomed unless the disease be radically removed, hence any operative procedure holding out hope of cure is justifiable, no matter what the condition of the patient, holds good in these cases we have been discussing. With certain excessively fat women, the radical abdominal operation holds out so little chance of primary recovery that I prefer to remove the uterus through the vagina. I do this knowing that in all probability the disease will return; on the other hand, I believe

the sum total gained in women of this class is greater when the very radical operation is not performed. As my experience with the operation increases and I am able to avoid long operations in very fleshy women I may change my position on this question, but that time has not yet arrived.

That celerity in the performance of the operation comes from increased experience with the technique is shown by the marked lowering of the primary mortality in the last 37 cases of the series. These cases were of the same type as the first 14, where the mortality was so high, yet there were only 4 primary deaths in the series, or a primary mortality of 10.8 per cent. While shortening the time of operation from two and a half to one and a half hours, or even less in some cases, probably has much to do with lowering the primary mortality, it was by no means the only factor. For shortening of the time of the operation went hand in hand with the ability to control hemorrhage better, not arterial but venous oozing. Long experience with bloody operations, so common in certain types of fibroid and other pelvic tumors, and the ease with which such hemorrhage is controlled are apt to develop in the surgeon an overconfidence in his ability to control hemorrhage, no matter where situated. But venous hemorrhage in the pelvis, as everybody with experience knows, may be difficult to stop and would better be avoided. As fear of wounding the ureters has stood in the way of wide excision of the parametria in the vaginal operation for cancer, so in the radical abdominal operation, fear of injuring this important duct prevents clamping of the bleeding vein. This results in considerable loss of blood, prolongation of the operation, and resulting shock.

In my experience venous hemorrhage is most frequent in three places: from the transverse vesical veins which run across the ureter, the veins which lie in close proximity to the uterus and the ureter, and finally the veins posterior

to the uterus lying in close connection with the rectum. Hemorrhage from the last source is rather easily controlled and needs no further discussion. Hemorrhage from the vesical vein can be controlled by separating the bladder from the uterus and vagina in the median line only, never trying to separate it at the sides until after the vesical veins have been secured by forceps on either side of the ureter. They can then be tied, cut, and the ureter dissected out of its bed without hemorrhage. Bleeding from the remaining veins can be controlled by pushing the ureter away from and down in the pelvis and clamping toward the uterus without fear of injuring the ureter.

Although the removal of the pelvic glands as a part of the technique of the radical abdominal operation for cancer of the uterus more properly belongs to the second portion of the discussion, the end results of the operation, the question of the extirpation of these glands has such an important bearing upon the primary mortality that it is best to refer to it here. (1) It can hardly be claimed by the most enthusiastic advocate of a complete glandular dissection of the pelvis that it is as possible in this operation to make as complete a lymphatic removal as where the glands are more favorably located; for example, in the axilla in connection with cancer of the breast. In other words, there is greater chance of leaving behind cancerous glands or portions of glands where the dissection is made in the pelvis. (2) Such dissection undoubtedly greatly prolongs the operation and adds to the danger of shock. (3) The best statistics at the present time show that probably in the class of cases suitable for the radical operation not more than one-third have any glandular involvement. (4) The results of Wertheim and others who make only a partial glandular dissection show that, after all, the good results of the radical operation come from a wide excision of the parametrial tissue, not from removal of the glands.

If the above be true, it certainly follows that the removal of the pelvic lymphatics should be left for the last step of the operation, only to be performed if the strength of the patient warrants it. At any rate, such are my conclusions and practice. I admit that theoretically it is logical to make a clean dissection of the pelvis and I would like to do it in every case. In practice I do as much as I can at the completion of, not at the beginning of, the operation. For I can see nothing gained by long and complete dissection of the pelvis with a patient dead of shock as a result. If I were convinced, which I am not, that every patient leaving the table without glandular removal was bound to have a recurrence, no other proceduere would be left me but a removal of the lymphatics in every case. Since I am convinced that only in a certain proportion of cases are the glands invaded by cancer, the logic is all the other way, and I am compelled to save my patient primarily if I can with the expectation, at least, that in a fair proportion of the cases the glands left behind are not the seat of cancer.

Peritonitis. In the radical operation it is easier to guard against peritonitis than against shock. This is best accomplished by rendering the vaginal canal, including the cancerous cervix, as aseptic as possible and shutting off the septic portion of the uterus from the abdominal cavity by the use of the right-angled clamps. In both the patients dying from peritonitis the pelvic cavity was contaminated by tearing through the necrotic cervix during its removal. However, this accident occurred a number of times without resulting sepsis. Infection is favored by drainage, yet I am obliged to use gauze for persistent oozing in a certain proportion of the cases. However, I restrict its use as much as possible and shut it off from the general peritoneal cavity, always draining through the vagina.

Embolus. Two patients died from pulmonary emboli, one a few hours after the operation, the other on the twenty-

third day, the latter embolus orginating from a septic thrombus. Rough handling of the large pelvic veins should be avoided. Such veins may be exposed to unnecessary trauma from retractors in the hands of assistants unfavorably placed to accurately observe where the ends of the retractors press or how much force is being employed.

END RESULTS

While in some instances cancer of the uterus may recur, five years or more subsequent to the operation, these cases are so rare that by common agreement a patient is pronounced cured if she be free from the disease for five years after the radical treatment of the condition. However, it must be borne in mind that in determining the number of patients permanently cured by the radical abdominal operation, it will not do to ascertain that such patients have passed the five-year period and without further investigation pronounce them in subsequent reports cured. They must be continually kept track of and their condition accurately determined before each report be made. If they be lost sight of each case must be deducted from the total number of radical operations. In the same way must be deducted the primary deaths and those patients where it can be proved beyond dispute that death resulted from some intercurrent disease in no way connected with cancer; otherwise such patients must be counted among the recurrences.

I am fortunately situated as regards my material, since it has been possible accurately to keep track of and account for each of the 41 patients surviving the operations. However, such a task would have been impossible without a great and persistent correspondence and generous aid from the physicians referring the patients.

As will be seen from Table III, only 14 cases were operated upon more than five years ago, two more than at the time of my last report. The same statement holds good now as then, that in such a small series of cases percentages count for little and are only given for the sake of comparison with subsequent reports.

Out of the 14 cases there were 6 primary deaths and of the 8 surviving 3 had recurrences, the remaining 5 patients being in good health and free from recurrence five years or more after the operation. Six patients with carcinoma of the cervix survived the operation. Of these 3 are alive and free from recurrence, while the 2 patients with carcinoma of the fundus have had no recurrence.

In Table IV, I have made a summary of the 51 cases. This shows that 8 patients with carcinoma of the cervix have died from recurrence of the disease, while 1 died of tuberculosis. Two patients with carcinoma of the cervix have had recurrences but are still living. One patient had a recurrence in the vaginal vault five months after the operation. Indurated tissue about the size of the end of the thumb was removed at a second laparotomy. Although the tissue was shown to be cancerous by a microscopic examination, the patient has been perfectly well and free from recurrence in the two and a half years elasping since the second operation.

I have arranged the 11 cases with recurrences in Table V with the approximate time of each recurrence. This table is of great interest to me in connection with the next table (Table VI), since it holds out hope that many of the cases in the latter series will escape a recurrence. For the disease has always recurred within two years from the time of the operations. This may indicate that quite a number of patients are passing beyond the extreme danger period.

Site of Recurrence. Since no autopsies have been performed upon any of the 8 patients who have died of recur-

rences, it is impossible to make any authoritative statement as to the exact location of the recurrence in any case. Thus it is impossible to state whether the disease first recurred in the vaginal cicatrix or in the glands. Still, from personal examinations of 7 patients out of the 11 with recurrences, I am able to state that in these the disease undoubtedly returned in the vaginal cicatrix. It is my opinion that in spite of all precautions to prevent contamination of the field of operation, gauze packing and the use of the right-angle clamps below the diseased cervix and the removal of a wide margin of vaginal wall, there is still great danger of implantation metastases during the operation. In support of this opinion it may be mentioned that in 2 of the 5 cases where there was accidental perforation of the necrotic cervix during the operation the disease returned in the vaginal scar. Reference has already been made to one of these cases, the disease appearing in the cicatrix five months after the operation with no recurrence for two years after the removal of the indurated tissue proved microscopically to be carcinoma.

There were 10 recurrences among the 31 cases of carcinoma of the cervix surviving the operations, while there was only one recurrence in the 11 cases of carcinoma of the fundus.

Still, evidence to be presented shortly, shows that while all precautions should be taken against local recurrence, because in a way this is more or less avoidable, some recurrences do take place in the glands. Perhaps a better way to state this would be that where the glands are the seat of metastases the disease is almost sure to return or to progress, no matter how extensive the operation may be.

The Pelvic Lymph Glands. In the discussion of primary mortality, reasons have already beeen given for not removing the pelvic lymph glands in every case of cancer of the uterus subjected to the radical abdominal operation. It now remains to discuss the relation which the removal or non-

removal of the pelvic glands bear to the end results of the operation. Keeping in mind what has been said about the inadvisability of removing lymph glands from a patient where this procedure may be enough to turn the scale so that death will be the result, it will not be surprising to find that only in a certain porportion of the 51 cases have the glands been removed. This is shown in Table VII.

It is inappropriate in a discussion of this kind to present an exhaustive review of the literature relating to pelvic lymph glands in carcinoma of the uterus. More to the point is the presentation of my individual experience with the pelvic lymph glands in the 51 cases operated upon.

Glands were removed in 29 and not removed in 22 cases. The removed glands were all subjected to microscopic examination. In 5 cases only were metastases found. Of these 5 cases 1 patient died from the operation, there was recurrence in 3 and 1 patient is still living, free from recurrence, three years after the operation. As has been stated, glands were only removed if it were judged that the life of the patient was not too much jeopardized by the additional time required for their removal. Where the condition of the patient warranted prolongation of the operation, attempts were made to remove the lymph nodes, the efforts being directed not so much toward the greatly enlarged glands, which are not so apt to be cancerous, as to the smaller, harder lymph glands. However, not much time has of late been spent in looking for glands, since the microscopic researches of other operators show that only the exceptional case is ultimately cured if the glands be affected, whether attempts be made to remove the latter or not. No doubt when isolated lymph nodes, affected by cancer, are removed, permanent cure may result, but this is exceptional. I have removed the glands more for the purpose of microscopic study than in the hope of saving the patient by this means, in case the glands are cancerous.

Percentage of Operability of Cancer Cases.   This has to do directly with both primary and end results, hence is germane to this discussion.   Jacobson has shown conclusively by his statistics that the percentage of operability of cancer of the uterus by the radical abdominal operation is more than twice as high abroad as it is in this country.   This means a number of things.   It signifies that we have not educated the profession or patients as to the necessity of early examinations for the detection of the disease.   It also means that the American surgeon must operate upon a larger proportion of advanced cases; at least, he will not have as many early cases as foreign operators.   Primary and end results will be correspondingly worse the more advanced the cases subjected to operation.   During the ten years I have been employing the radical abdominal operation, I have examined in my university and private clinic 218 cases of carcinoma of the uterus.   Of these 51, or 23.4 per cent., were judged to be sutiable for the radical operation. Greater experience leads me to the conclusion that some of the early cases were too far advanced for this operation. On the other hand, I think I missed some cases which could have been so operated by not making the decision rest upon an exploratory laparotomy rather than upon bimanual examination.

In conclusion, let me say that I am neither elated nor discouraged over the results set forth above.   That I have saved patients who, had they been operated upon by older methods, would now be dead, I am quite certain.   That I shall save the next patient I operate upon I am not so certain, for its primary and end results are the most doubtful of any operation with which I have been concerned.

TABLE. I.—Radical Abdominal Operation for Cancer of Uterus—Primary Mortality in 51 cases—40 cases Cancer of the Cervix—11 cases Cancer of the Fundus. July, 1902, to January, 1912.

Total number of cases	51
Total number of deaths	10
Total primary mortality	19.6%
Primary mortality first 14 cases (6 deaths)	42.8%
Primary mortality last 37 cases (4 deaths)	10.8%
Primary mortality 40 (cervix) (9 deaths)	22.5%
Primary mortality 11 (fundus) (1 death)	9%

TABLE II.—Primary Deaths—10 Cases.

Causes.

Shock	4
Shock and hemorrhage	2
Peritonitis	2
Embolus	2
	—
	10

TABLE III.—End Results of Radical Abdominal Operation—Cases Operated on at least Five Years Ago.

Number of cases	14
Primary deaths	6
Number surviving operation	8
Number of recurrences	3
Number alive and well at least five years after operation . .	5
Percentage of permanent cures	62.5
Number of cases cancer of cervix	6
Number alive	3
Number cases cancer of fundus	2
Number alive	2

TABLE IV.—Summary of Primary and Secondary Results of 51 Cases of Cancer of the Uterus Treated by the Radical Abdominal Operation.

Primary deaths	10
Secondary deaths (due to cancer)	8
Secondary death (due to tuberculosis)	1
Patients alive with inoperable recurrence	2
Patient operated for recurrence	1
Patients alive with no recurrence	29
	—
	51

TABLE V.—Number of Patients with Recurrence and Time of Recurrence.

Time of recurrence.		Location of	No. of cases.
4 months	cervix	1
5 months	cervix	1
1 year	cervix	1
1 year	fundus	1
1½ years	cervix	3
2 years	cervix	4
			—
			11

TABLE VI.—Patients Alive at the Present Time (January, 1912) with and without Recurrences.

Length of time since operation.	Cervix.	Recurrence.	Fundus.	Recurrence.	Total.
9 years	1	. .	. .	. .	1
8 years	. .	. .	1	. .	1
7 years	1	. .	. .	. .	1
6 years	. .	. .	1	. .	1
5 years	1	. .	. .	. .	1
4 years	1	. .	2	. .	3
3 years	5	. .	. .	. .	5
2 years	6	3*	4	. .	10
1 year	5	. .	4	. .	9
					—
					32

Total number alive without recurrence 29
Total number alive with inoperable recurrence 2
* Patient alive two years since operation or recurrence with no
  further recurrence 1
                                                        —
                                                        32

TABLE VII.—Summary of Pelvic Glands in 51 Cases.

Number of cases where glands were not removed 22
Number of cases where glands were removed 29
Number of glands showing metastases 5
Five cases with metastases:

Primary death 1
Died year later 1
Died one and one-half years later 1
Died two years later 1
Alive with no recurrence three years later 1

THE RADICAL ABDOMINAL OPERATION FOR CARCINOMA OF THE CERVIX UTERI, WITH A REPORT OF TWENTY-EIGHT CASES

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THERE is no problem of greater importance before the medical profession today than that of cancer. The real cause of the disease still evades us. Many laboratories in this country and abroad, with workers of the highest intelligence, are searching for the cause, but as yet without success. We have accumulated many facts in regard to the disease, about its greater prevalence in certain localities, the nature of the growth, its occurrence in different animals, about its general and local symptoms, but the causative element still evades the most careful investigation. There is, however, one clinical fact about which we seem to have positive knowledge. It is that theoretically there is a stage at which the cancer is a local process, and if it can be reached surgically, can be cured by an operation. We also know that practically few cases are seen sufficiently early to get that cure in more than a small percentage of cases. Certain organs that may be the seat of a cancerous growth are so located that no examination that we are able to make with our present appliances and skill will reveal the disease until it is so far advanced that it is beyond the hope of any operation. Some organs are so located that even if we could detect the cancerous growth at an early stage, its removal would be, at the present time, surgically impossible. Neither of these conditions, however, obtains with that organ, the diseases of which make up an important part of our specialty,

and the carcinoma of which forms the subject of our consideration today. The examination for a possible carcinoma of the uterus is one which a woman naturally shrinks from, and, unfortunately, postpones as long as possible. It is, however, easily made in a few moments without special pain or discomfort to the patient, and is positive in its findings.

We all know the large number of deaths that occur annually from carcinoma of the uterus, either without or in spite of an operation; we know the relatively small number of cases that are at the present time cured, even by the most extensive operations. Yet I think that we will all agree that any individual patient could be so carefully watched that she would be in little danger from the disease. If the disease were to appear, repeated examinations would reveal it at such an early stage that a radical operation would almost surely save the patient. Practically almost every case of carcinoma of the cervix in this country dies either of the original disease without an operation, or of a recurrence following an operation. Theoretically, almost every case could be saved. The part of the cancer problem for which this society should be responsible is to narrow the gap between the practical and the theoretical. We should do for the community at large what it is possible for us to do theoretically for the individual.

While the laboratory worker is continuing his search for the active cause of the condition, the community, as a whole, should have the full benefit of such knowledge as we have up to the present time. While I do not belittle for a moment the value of the laboratory work, it is a pity that more attention is not given to informing the country at large on the subject of cancer, as has been done during the past ten years on the subject of tuberculosis. We should teach them that in the early stages the disease is curable, but that it must be taken with the first symptoms, or even

before, and that the one treatment that offers this hope is a surgical operation. They should know at the present time there is known to the medical profession no serum or vaccine or application, either medicinal or electrical, that will cure a carcinoma of the uterus. This is being done abroad, and there is not the slightest doubt that it will ultimately be done here.

<center>OPERABILITY</center>

Under operability, I wish to consider three things:
1. My percentage of operability.
2. A comparison of duration of symptoms.
3. The community operability.

<center>MY OWN PERCENTAGE OF OPERABILITY</center>

There is no way which is really accurate by which we can compare the class of cases considered operable by one man with the cases of another.

In 1910 I operated on 70 per cent. of the cases of carcinoma of the cervix which came under my observation; in 1911, I operated on 68 per cent. These percentages, however, do not really carry a great deal of information. Cases that are obviously inoperable when first seen by the general practitioner are not sent to the specialist for operation.

In the same way, a certain number of patients may enter the Out-Patient Department without ever coming under my personal observation. I have tried, however, to see all the cases of carcinoma of the cervix which apply to any part of the Roosevelt Hospital. If there is the slightest chance of operation, or if I am not absolutely sure that the case is inoperable she is always given the benefit of an examination under an anesthetic. If a hysterectomy is found impossible, then the growth is curetted and cauterized,

and some of the unpleasant symptoms of the condition are relieved. A number of cases have been subjected to an exploratory laparotomy in order to determine to a certainty whether an operation is possible. I regret that I am unable to give the percentage of operability of my cases for the years previous to the year 1910. There is no doubt at all that since 1910, at which time I began to do the radical abdominal operation on most of my cases, the range of operability has increased very materially. Formerly if there was any induration in the broad ligament outside the uterus, or if the growth had extended down at all on the vagina, the case was looked upon as one that was no longer operable. This, however, is entirely different since I have been doing the radical abdominal operation. If induration has not extended to the pelvic wall, and the uterus is at all movable, the patient is at least given the benefit of an exploratory operation.

The increased percentage of operability of my cases is well represented by the fact that during the two years, 1910 and 1911, I operated on 40 per cent. more cases than during any two previous consecutive years, although the amount of material that has passed under my observation has probably not materially changed for a number of years. This increase of 40 per cent. in my cases well represents the increased possibility of the radical abdominal operation in my hands.

A COMPARISON OF THE DURATION OF SYMPTOMS

It is, of course, not easy to determine the time at which the disease first began by a consideration of the first symptoms of a given case, but there are some interesting points to be gained by a consideration of the duration of symptoms in a series of cases. In looking up as far as possible the symptoms of all the cases of carcinoma of the cervix on which I

have done a hysterectomy, I find, if we consider those cases on which an ordinary abdominal hysterectomy or a vaginal hysterectomy was done, that in 50 per cent. of the cases the symptoms lasted less than three months, in 40 per cent. of the cases between three and six months, and in only 10 per cent. had the symptoms lasted for more than six months. Of the cases on which I did a radical abdominal operation, the first symptoms had existed for less than three months in 18 per cent. of the cases, between three and six months in 42 per cent., and over six months in 40 per cent. of the cases; that is, the percentage of cases operated upon, the duration of whose symptoms had existed for six months, has been quadrupled by the radical abdominal operation over those of all other hysterectomies.

In this connection, too, it would be well to compare the duration of symptoms in my experience of 28 cases with the series published by Aulhorn in the *Archiv f. Gynäkologie*, vol. xcii, 242, a series of cases in which he reports 40 per cent. of cures at the end of five years. In 54 per cent. of his cases, the symptoms lasted less than three months, and in 28 per cent. the symptoms lasted between three and six months, and in only 18 per cent. was the duration of the symptoms more than six months. Consider the difference in the duration of symptoms in this series of cases reported by Aulhorn, a series which is representative of operable cases in Germany, with my series of cases, which is, I believe, representative of the class of cases operated upon in this country, and we will understand that one reason for the great superiority of their statistics over ours is in getting their cases early. The difference between 54 and 18 as the percentage of cases with symptoms less than three months will make a great difference in the number of absolute cures, and until we get our cases earlier than we do now, we have absolutely no chance to get statistics that compare at all favorably with those reported from abroad.

THE COMMUNITY OPERABILITY

While these comparisons of the type of cases operated on by different individuals are interesting and of value, in the broader sense, carcinoma of the cervix uteri is a matter of the community and not of the individual. The question should not be, what percentage of the cases that fall in the hands of an individual are suitable for any operation, but what percentage of the cases of carcinoma of the cervix uteri in the community are seen early enough to warrant an operation with the hope of curing the patient. With this in mind I asked Dr. Guilfoy, the Registrar of the Board of Health in the City of New York, if he could find out for me the percentage of cases that died of carcinoma of the uterus that had had a hysterectomy. Dr. Guilfoy sent about one hundred and twenty-five letters to the doctors who signed the death certificates of cases of carcinoma of the uterus, and turned over to me something over one hundred replies. A number of these had to be discarded for various and sufficient reasons, leaving 83 cases that I could use for my purpose. These 83 cases included both carcinoma of the fundus and carcinoma of the cervix, as the Board of Health of New York does not require a more exact diagnosis. Of these 83 cases, 62, or 75 per cent., had never had any operation whatsoever other than a cauterization, and only 21, or 25 per cent., of the cases had a hysterectomy of any kind whatsoever been performed. A number of these cases on which a hysterectomy had been performed were obviously so far advanced that they should not have been operated upon at all, but should have been considered inoperable cases. For example, one case operated upon had a portion of the bladder and rectum removed, and died shortly after the operation from shock. This case was doubtless an inoperable case, and the operator made an error in judgment that we have all made in our desire to help a case

otherwise hopeless. In another case, the operation was to control hemorrhage and not with any hope of curing.

This certainly is not a good showing for New York, nor the medical profession here. The real test for our work should not be the percentage of cures of a given operator, or from a certain type of operation, but the broader one of what proportion of all the cases in a given community are cured or given the benefit of the best surgical advice and skill.

I am sure that the experience of each one of us is, that of the cases on which we operate, only a very few are seen sufficiently early to give us hope of a permanent cure. If only 25 per cent. of all the cases have an operation, and in only a small portion of these is it done with the hope of curing the patient, but to add to the comfort and duration of life, it would seem that it would be necessary to devise some plan by which we can get these cases before the growth has become so extensive. The probabilities are that any hysterectomy with symptoms leasting less than six months will have a better ultimate result than the most radical operation on the same case after the symptoms have lasted over six months.

While I firmly believe in the radical abdominal operation for carcinomia of the cervix, I believe that there are greater opportunities in the further education of the medical profession and the people at large, so that they may understand the early symptoms of the disease, and will send the patients to us before they have reached the stage of inoperability.

PRIMARY MORTALITY

In my series of 28 cases, I have had 3 deaths, that is, a primary mortality of 10.7 per cent. This is low for the first cases in the hands of any operator. The number of cases in all (28) is so small that the element of chance has

undoubtedly played an important part in my low mortality. One or two additional deaths in such a small number of cases would, of course, make a material difference in the percentage of deaths. The low percentage was certainly not due to the cases being early or favorable cases, as has been shown in a comparison of the duration of symptoms in my cases, as many of my cases would have been considered inoperable at the time when I did not do the radical operation.

Of the 3 deaths, 1 died eighteen hours after the operation from shock; the second case from peritonitis and infection, on the fifth day after the operation; the third case, one of my easiest, died suddenly from some cardiac condition, having run a smooth course up to that time.

The fact that I lost only 1 case from infection warrants a short description of my technique. The growth in the vagina is first curetted and cauterized in order to make it as aseptic as possible. This, I think, is an important point, as it greatly lessens the chance of infecting the wound area when the vagina is opened from above. I have not in any of my cases used a clamp for clamping the vagina, as recommended by Wertheim, but after the vagina is opened, any fluid there is carefully sponged out and the vagina made as clean as possible before the uterus is entirely removed.

In regard to drainage, I have not drained the general peritoneal cavity in my cases. I suture the bladder fold of peritoneum to the anterior wall of the vagina, and the rectal fold of the peritoneum to the posterior wall of the vagina, leaving a space of each side to which no peritoneum is attached. I then suture the anterior and posterior layers of the broad ligament with a line of sutures from one infundibulo-pelvic ligament to the other, including the anterior and posterior walls of the vagina in the middle line. A small gauze drain is placed under each broad ligament, leading into the vigina at the point where it is not sutured to

the peritoneum. The amount of drainage which I have used has always been very small, merely enough to keep a small opening so that if there is any oozing it would have a chance to come out, or if there is any accumulation of pus, it will have a chance to escape. I believe that there is no need in the ordinary case to drain the general peritoneal cavity, and that there is less danger of a secondary infection if it is entirely closed off at the time of operation. By closing the top of the vagina and draining each broad ligament space separately on either side, we have two cavities with separate drainage, instead of one large one. This is an advantage, for if one side escapes infection at the time of operation, it is not infected later from a septic process on the other side. The abdominal wound, of course, is closed without drainage.

TO OBTAIN END RESULTS

The end results of my operations have been very discouraging, and they are given in Table B. I have had the same difficulty that all men in this country have in keeping track of these patients. It is our custom to keep the names of the patients' friends, and also, when possible, the name of the physician who sent the patient to the hospital. Many of these cases are from the poorer classes; they move frequently, and are soon lost sight of. Only 3 cases were operated on previous to five years ago. Of these 3 cases, 1 died of recurrence; the other 2 could not be located. Of the 12 cases which were operated on previous to two years ago, 6 are known to have died, 1 from the operation and 5 from recurrences, and 6 cases could not be found. Of the 9 operated on between one and two years ago, 5 cases have died, 1 from the operation and 4 of recurrences, 3 cases remain well today and free from recurrence and 1 case not located. Of the 9 cases operated on during the last year, 2 cases

have died, 1 from the operation and 1 from recurrence, 3 remain well and free from recurrence, and 3 cases have not been located. This is not an encouraging showing.

The question might well be asked, if we are justified in operating on these advanced cases, doing an extensive operation, when the ultimate results are no more promising It seems to me beyond question that we are, because we accomplish a great deal, even if we do not premanently cure the patient. Every case has the hope that she is one of the cases who will be cured. There is a great difference in the comfort of a patient with a hope of cure, and one with the knowledge that there is no hope. The bleeding, the foul discharge, and the local inflammation are done away with. If a liberal portion of the vagina is removed with the growth, and there is a recurrence, it will be high up and in the abdomen, and there will be no return of the discharge or bleeding, even late in many cases. It has been claimed that there is less pain with a recurrence after the radical operation with the free removal of the pelvic connective tissue, than after the ordinary hysterectomy. It is my impression, from the cases of recurrence which I have followed, that this claim is well founded. It would seem, therefore, that the operation is justifiable even in the extensive cases where the chance of a permanent cure is small, as the mortality rate is not high, and it renders the period of life which the patient has far more pleasant to her, both mentally and physically, than if she had no operation whatsoever.

In response to a request from our Secretary, Dr. Broun, to find out the result of cancer operation in the States of New York and Pennsylvania, I sent circular letters to about one hundred and seventy-five operators in Philadelphia, New York, and Brooklyn. The replies which I received did not give me any information along the line that I wished, and I have not been able to deduct from them anything of value as to the ultimate result of cancer operations in

these two States. Two things, however, were very apparent
to me from these replies, and which have a very distinct
bearing on this subject of carcinoma of the uterus. The
first was the entire absence of reliable statistics among the
operators. For one reason or another, nearly every man
did not have his statistics at hand, and could give me no
reliable information as to the number of operations for
cancer of the uterus which he had done, the nature of any
of the operations, nor the ultimate result. This, I think,
is most unfortunate. We all appreciate how difficult it
is to follow our cases and get the end result, but there is
no excuse, or should be no excuse, for not knowing the
number of operations of a different kind that a man has
done for carcinoma of the uterus, and there is no excuse
for not knowing his percentage of operability for the dif-
ferent years. It is unfortunate that men who have large
operative opportunities should not have had their records
kept in such a way that they can deduct some idea of the
amount of work along the different lines that they have
done. There is no doubt that there has been great improve-
ment in all of our hospitals within the last few years along
these lines, and I have no doubt that in the future we will
be able to get better statistics.

The other point that impressed itself on me from the
replies which I received was the universal feeling that we
do not get our cases early enough to be of very great benefit
to them. Man after man stated that he saw only a very
few cases on which he could operate. A number of men
stated that the cases on which they did operate were so
far advanced at the time that the operation was palli-
ative and to relieve symptoms rather than with any real
hope of curing the case.

The conclusion which I have drawn as a result of a study of
my own cases and replies to the circular letter which I sent
out are as follows:

1. The primary mortality of the radical abdominal operation is not such that it should deter us from doing the operation.

2. The percentage of operability of the cases which come under observation of an operator, by the use of this operation, will be greatly increased over that of those where the simple hysterectomy is done, as was formally the case.

3. That the end results will never compare favorably with the end results reported from abroad, until we are able to get our cases at an earlier stage of the disease, and that our justification for doing such a radical operation is in its moderate mortality and in the relief of symptoms, in a disease otherwise hopeless.

4. That our most promising field of endeavor on the subject of carcinoma of the uterus should be: (1) More reliable and more complete statistics, including: The percentage of operability, the community operability primary mortality, and, also, end results. (2) A well-regulated organized plan of campaign, in order to get our cases earlier than we do at the present time. This I believe to be along the three well-known paths, the further and more exact education of the medical profession, a more detailed education of the public at large, and the routine examination of all women after a certain age. It is my belief that until we do these things, our statistics will never compare with those that are reported from abroad, where they have been working along these lines for some years past.

TABLE A

Duration of symptoms.	Vaginal and ordinary abdominal hysterectomies. Per cent.	Radical abdominal hysterectomies. Per cent.	Aulhorn's statistics. Per cent.
1 to 3 months	50	18	54
3 to 6 months	40	42	23
Over 6 months	10	40	18

TABLE B

Time since operation.	Number.	Died from operation.	Died from re-currence.	Well.	Not located.
Over 5 years	3	0	1	0	2
4 to 5 years	2	0	1	0	1
3 to 4 years	3	1	1	0	1
2 to 3 years	4	0	2	0	2
1 to 2 years	8	1	4	3	0
Under 1 year	8	1	1	4	2

THE PROGNOSIS IN RADICAL ABDOMINAL
OPERATION FOR UTERINE CANCER

By Fred. J. Taussig, M.D.
St. Louis, Missouri

In accordance with the plan of this symposium, I have limited my report to the work of surgeons west of the Mississippi. The majority of these, it must be said, have been employing either simple abdominal or vaginal hysterectomy without removal of the parametrium, selecting only for this work the very favorable cases where the cancer was limited to the cervix. One or two have taken up the extended vaginal hysterectomy with or without cautery.

From the Mayo clinic I received a report of twenty-two cases of cervical cancer operated on and free of recurrence at the present time. About one-half of these were operated upon vaginally. Owing to the absence of certain data, I have preferred to report the cases from this clinic separately. From Dr. R. G. Coffey, of Portland, Oregon, I received a reply stating that within the last year and a half he had done five radical abdominal operations for cervical cancer without any immediate mortality, but he did give any further details.

There remained then replies from seven surgeons with a total of thirty-seven operations in which all the necessary data were at hand. Adding to this my own twenty-three cases made a total of sixty radical abdominal operations for cervical cancer. I wish here to thank Drs. Gellhorn, Crossen, W. H. Vogt, H. A. Hanser, Ernst Jonas, A. E.

Hertzler, and Howard Hill for their kindness in allowing me to include their cases in my report.

In the absence of previous reports upon this important subject from this particular group of surgeons it would hardly seem wise to jump at once to a consideration of the end results of the operation. Moreover, the total number of patients to whom the five year limit since operation applies is too small to be in itself of special value. So I shall consider briefly some correlated matters.

The question of prognosis in cancer of the cervix can be considered under these heads:

1. The prognosis before operation, or percentage of operability.

2. The prognosis of the operation itself, or operative mortality.

3. The final prognosis after operation, or percentage of recurrence.

The prognosis before operation resolves itself into the question: What patients are, in the absence of other curative methods, hopelessly doomed and what ones have still a chance to be helped by operative removal of the growth? It is suprising how meagre are the statistics as to the operability of cervical cancer in American literature. Sampson's figures of 39 per cent. operability in 412 patients admitted to Johns Hopkins Hospital is higher than the average, for many hopeless cases come only to the dispensary and are hence never entered on the hospital records. My personal tabulation based on the experience of the last seven years in dispensary and hospital work showed 23 cases subjected to radical operation out of 115 cases examined. Only one operable case refused consent to surgical intervention, making a percentage of operability of a little over 20 per cent. I have not been unduly conservative in setting the indications; on the contrary, I plead guilty to having subjected a number of patients to operation that I would now with

riper experience put in the class of inoperables. From my
colleagues in the West I hear of similar experience. They
say: "We see very few operable cases."

The prognosis of the operation itself depends largely
upon the general condition of the patient, the amount of
the involvement, and to no inconsiderable extent, upon
the experience and skill of the operator. Women with
fatty abdominal walls are particularly bad risks for an
operation such as this, requiring a prolonged Trendelenberg
position. Where cachexia is an early symptom, the opera-
tive shock is very great and the mortality high. As to
involvement, cases in which the ureter is compressed or
the bladder wall infiltrated are very serious operative risks.
The worst class in my experience, however, are the patients
with an ulcerating crater which in spite of preliminary
treatment tears open on the slightest pull from above and
allows the highly infectious mush to enter the abdominal
wound. Only through bitter experience did I learn not to
attempt cases in which such a complication was likely to
ensue. When the radical operation first came into use and
extensive glandular dissections were carried out in every
case, the operation itself was held to be extremely dangerous.
With the present technique, however, it is only the com-
plications of advanced cases that are greatly to be feared.
For purpose of analysis the cases had best be grouped under
four heads:

(A) Cases in which the positive diagnosis of cancer could
only be made by microscopic diagnosis.

(B) Cases with a well-defined ulcer involving a greater or
lesser part of the cervix but without parametrial involvement.

(C) Cases with cervix involved and extension into the
parametrium or the upper part of the vagina, but still
partly movable.

(D) Cases with involvement of parametrium almost
to the pelvic brim or beginning bladder infiltration but still
not hopelessly inoperable.

The total of 60 cases were divided as follows: Group A (very early cases) 3, mortality nil; Group B (moderately early cases) 16, deaths 2, mortality 12 per cent.; Group C (advanced cases) 26, deaths 6, mortality 23 per cent.; Group D (very advanced cases) 15, deaths 10, mortality 66 per cent. The mortality of all but the most advanced cases was 17 per cent, the total mortality 30 per cent. Of my own 23 cases, 12 belonged to the first 3 groups and only one was lost by the operation, 8 per cent, whereas of the very advanced cases only 3 out of 11 survived, mortality 72 per cent. This clearly shows that it is not the operation itself that is so dangerous but the unwise extension of operative indications.

The cause of the 18 operative deaths could only in four instances be attributed to shock. In the remaining cases the patients recovered from the immediate effects of the operation. In 11 of them, death was ascribed to septic infection and occurred from the third to the fourteenth day. One patient each died from cerebral embolism, nephritis, and myocarditis.

Deducting these 18 deaths from the total of 60 operations, we have left 42 patients to be studied as to the number and time of recurrences. In 2 instances the recurrence was noticed as early as the second month, and was probably due to an incomplete operative removal of the primary growth. Of the total number, of 15 recurrences, 12 recurrences became manifest within twelve months after operation, one developed during the second year, one during the third year and one patient in my own series did not develop a recurrence until four and a half years after the primary operation.

Deducting these 15 recurrences, there are left 27 patients. Unfortunately 6 of this number could not be traced longer than a year or two after operations, and while some of these doubtless remained free of recurrence, particularly the 4 in

whom the disease was limited to the cervix, we cannot class them as cures. We must also deduct 2 who died of intercurrent diseases, 1 of pneumonia, and 1 of syphilis. This leaves 19 at present free of recurrence out of 42 who survived the operations.

Taking into consideration only the operations that were done over five years ago, we have a total of 14. By a strange coincidence there was not a single operative mortality among these first 14 patients. Apparently each operator was particularly careful in the selection of his first cases. Of these 14, 1 could not be traced, and 1 died of an intercurrent disease. Deducting these, gives us 12 patients, and of this number 5 are still free of recurrence (41.6 per cent.).

To approximate the absolute percentage of cures, we multiply the percentage of operability by the per cent. of recurrence and this by the percentage of those who recovered from the operation. Taking an approximation of 25 per cent. operability, we have

$$\frac{25 \times 41.6 \times 100}{10,000} = 10.4 \text{ per cent.}$$

In other words, as far as these rather meagre statistics go, we cure by means of the radical operation about 10 out of every 100 women who come to the clinic or hospital.

Considering only operations done four years ago, we have a total of 25 with a mortality of 6, or 24 per cent., and 8 free of recurrence. Three were either not traced or died of intercurrent disease. Hence we have 50 per cent. free of recurrence.

$$\frac{25 \times 50 \times 76}{10,000}$$

gives 9.5 per cent. absolute cures.

From the Mayo clinic I obtained through the courtesy of Dr. W. J. Mayo and Dr. L. J. Stacy the following data. Of the patients operated for cervical cancer by the radical

abdominal method from 1902 to 1912, 12 remain free of recurrence. Of this number 5 have passed beyond the five-year period. In only 3 of the 12 was there parametrial involvement.

In collecting statistics regarding cervical cancer, I took occasion also to inquire about cases of cancer of the body. The Mayos have apparently seen an unusually large number of such cases, 40 in all, 10 of which were associated with fibroids. From other sources I learned of the outcome of 14 additional cases. In none of these 54 cases had there been thus far any recurrences. Even considering the fact that about half this number are too recent to be classed as cured, it is sufficient evidence of the unusually benign prognosis of cancer of the uterine body. The majority of these corpus carcinomas were removed by simple vaginal hysterectomy.

If we are justified in drawing any conclusions from the foregoing reports, they would be as follows:

The radical abdominal operation for cervical cancer is not in itself a dangerous operation. It becomes dangerous only in advanced cases owing to the attendant complications, septic infiltration, injury to bladder or ureter, bleeding, prolonged narcosis.

The percentage of recurrences is distinctly less after this operation than after simple vaginal hysterectomy. It should therefore be employed in every case of cervical cancer in which there is no special contraindication to a more extensive operative procedure.

In very advanced cases the immediate operative risk is so great and the likelihood of recurrence such that these patients had better be classed as inoperable. Out of 15 patients in this group not a single one is alive today.

The fact that our percentage of absolute cures is small as compared with German or Austrian statistics is not due to greater operative mortality or to narrowing the limits

of operability. It is not due to lack of boldness or skill on the part of the surgeons but to the character of the material that comes to him for operation. The women are negligent of early symptoms and the average practitioner careless of diagnosis or inclined to try palliative measures until the disease is too far advanced. It is a sad reflection on the intelligence of American women and the American practitioner of medicine that in spite of the fact that many really inoperable cases were attempted, the percentage of operability was less than one-half that of the average German clinic. Only by improving the medical training of the men who go into general practice, by the extermination of quacks and most of all by the persistent systemic education of the laity can we ever hope for better results.

TABLE I.—Report of 60 Radical Abdominal Operations for Cervical Cancer by 8 Western Surgeons, 1903 to 1912.

	Total cases.	Group A, beginning cervix.	Group B, limited to cervix.	Group C, cervix and parametrium.	Group D, extensive parametrial involvement.
Number	60	3	16	26	15
Died from operations	18	0	2	6	10
Percentage mortality	30%	0%	12%	23%	66%
Recurrence	15	0	0	10	5
Possibly saved by operation	27	3	14	10	0
Percentage possibly saved	45%	100%	87.5%	38%	0%

TABLE II.—Report of Late Results of Radical Abdominal Operation for Cervical Cancer

	Five-year limit.	Four-year limit.
Number of cases	14	25
Died from operation	0	6
Recurrence	7	8
No report	1	2
Died from other causes	1	1
Free of recurrence	5	8
Percentage free of recurrence	41.6%	50%
Estimate percentage of operability	25%	25%
Percentage of absolute cure	10.4%	9.5%

THE RADICAL OPERATION FOR CANCER OF THE UTERUS

By Thomas S. Cullen, M.D.
Baltimore, Maryland

The early recognition of cancer of the body of the uterus in recent years and as a consequence the complete removal of the uterus, have led to such excellent temporary as well as permanent results that a consideration of this variety of cancer of the uterus is at this time entirely unnecessary. Some operators claim that nearly all of these patients are permanently cured of their cancer and a most conservative estimate would be that fully two-thirds of all cases of cancer of the body of the uterus operated upon never show any further manifestation of the disease. This fact is often lost sight of in the gloomy reports frequently published on the final results in cancer of the uterus. The diagnosis in the majority of the cases of cancer of the body of the uterus has been made from scrapings and from them the diagnosis is rendered certain in the incipient stage of the disease. In no other branch of surgery has the value of the microscope as an aid to the surgeon been more signally demonstrated. In the present address, therefore, I shall limit myself to a consideration of cancer affecting the cervix.

CANCER OF THE CERVIX. Before considering the immediate and end results in the radical operation for cancer of the cervix, permit me to briefly outline the salient points in our operative treatment of these cases.

Operability. It is very difficult to ascertain the percentage of cases that are suitable for operation. Many patients never see a physician until the disease is too far advanced for any radical operation, and often it happens that the surgeon is not even called upon to see the patient. Again, as pointed out very clearly by Taylor, numerous far-advanced cases of cancer of the cervix are seen in the dispensaries, and only a minority of these reach the operating room.

When the cervix is freely movable we consider the case operable; and although the growth may have extended to the vaginal wall, and even if the broad ligament on one side shows diminished mobility, provided the patient is in a fair physical condition, the abdominal operation is considered justifiable.

Before declining to operate it is, as a rule, advisable to examine the patient under an anesthetic, as one is occasionally able to detect that the lateral thickening is due not to an extension of the cancer, but to a coincident inflammation of the tube and ovary. This we have noted on several occasions, and Taylor has recently drawn attention to this point.

TECHNIQUE OF THE OPERATION. I have never performed a vaginal hysterectomy for cancer of the cervix, but would not hesitate to do so were I dealing with a very stout patient suffering from a carcinoma of the cervix, associated with marked prolapsus.

PREPARATORY TREATMENT OF THE CERVIX. In some of the cases we have cauterized the cervix thoroughly and then abstained from all local treatment for a week, thus giving the raw area a chance to contract down. In some instances this procedure has been followed by a marked "loosening up" of the cervix, and the uterus, which prior to the cauterization had apparently been somewhat fixed, in the course of a few days had become freely movable. On the other hand, I have noted that some patients take a

second anesthetic within seven or eight days very badly, and so much have I been impressed with this fact that for several years I have, whenever possible, done the cauterization only just prior to opening the abdomen.

My colleagues at the Johns Hopkins Hospital at the present time after cauterizing the cervix and washing out the vagina, flush it out with an iodine and alcohol solution (iodine 3.5 per cent.). When this is removed the vagina is filled with alcohol. After this in turn has been removed, the vagina is thoroughly dry, and is then filled with gauze. This method has proved to be most satisfactory.

ABDOMINAL HYSTERECTOMY. The operation performed is patterned after that described by Wertheim. Good exposure of the field of operation is absolutely necessary to secure a thorough removal of the diseased structures. When the patient is very stout a transverse wedge of skin and fat down to the fascia may be removed and the abdomen then entered through a longitudinal incision. This procedure greatly reduces the depth from the surface to the floor of the pelvis and materially cuts down the time consumed in the operation. In quite a number of the cases we have employed an electrically heated table throughout the operation, and it has seemed to me that these patients left the table in a much better condition than the average patient after hysterectomy for cancer.

Proper illumination is of great importance in this operation, and we have found the Krönig light of much value in flooding the field of operation with a steady and most satisfactory flow of artificial sunshine. This light is a great adjunct to any operating room.

As many of the patients are weakened by the long-standing hemorrhage and discharge, I try to save the strength as much as possible by not placing the woman in the Trendelenburg posture until the pelvis has been carefully walled off and the operator is ready to expose the ureters.

As a rule, I have found no difficulty in locating and isolating the ureters except in very stout persons. Here the peritoneum appears to be excessively thin, while the underlying fat is correspondingly thick, and the small bloodvessels in the fat tear on the slightest traction. When the patient is thin I rarely encounter much trouble until the vaginal veins to the outer side of and below the ureter are reached. These are usually readily controlled with the long Wertheim forceps, but now and then give rise to alarming bleeding.

Occasionally prior to cutting across the vagina I apply the right-angle Wertheim clamps, but usually after doubly walling off the uterus from the pelvic wall and having had an assistant wipe out the vagina until the pledgets come away free from stain, I cut across the vagina, picking up the vaginal margins with Ochsner clamps.

After all oozing from the vaginal margins has been controlled the bladder peritoneum is tacked to the edge of the mucosa of the anterior vaginal wall. Thus, as the bladder distends it is the peritoneally covered area that ascends and no raw surface is left to ride over any drain that may be left.

In some of the cases I have removed the pelvic glands, in others I have not disturbed them. Many of my patients were much exhausted by the operation, and I felt that any further time expended in manipulations in the abdomen would seriously jeopardize the patient's life. In 1900, in my book on cancer of the uterus, I drew attention to the fact that an enlarged gland did not necessarily indicate cancer, inasmuch as the enlargement might be due to septic absorption from the cervix. Peterson, in his series, removed the glands in 29 cases, and in 5 of these found metastases. Of the 5 patients, 1 died after operation, 3 had a recurrence, and 1 was well after three years. Whether the glands are to be removed or not must depend on the condition of the patient, and must be left to the judgment of the individual operator.

CLOSURE OF THE PELVIS. After the bladder has been attached to the anterior vaginal wall, and the posterior vaginal wall to the rectum, the broad ligaments are closed. If all oozing has been completely checked, a small cigarette drain is laid in the pelvis and brought out through the vaginal opening, which is now not over 1.5 cm. in diameter. Where there is a little oozing in one or both broad ligaments I have occasionally placed a cigarette drain in the lower angle of each broad ligament, bringing the ends out into the vagina.

DURATION OF THE OPERATION. When the carcinoma of the cervix is in an early stage, the patient is not likely to have lost much blood, and as little sloughing has occurred, there has been a minimal amount of septic absorption. In such cases the operation is a relatively easy one. In the far-advanced cases the patient is frequently cachectic as a result of the anemia and the absorption of septic products. In these cases the growth often extends alarmingly close to the ureter, and as a result the dissection is slow. This prolongation of the operation in a patient already greatly weakened by the disease often leads to an alarming collapse before the operation is completed. Such a patient will stand the operation relatively well for from one to one and a half hours, and then suddenly collapse. A Wertheim operation, at best, is one of the most difficult of all the abdominal procedures, consequently the operator needs to be in the best possible physical condition. He should make it his first operation of the day, and preferably perform it early in the morning when he is fresh. Stimulation of the patient should be undertaken even before there are the slightest signs of collapse.

When the cervix has been torn across during removal of the uterus, thus materially increasing the danger of peritonitis, I occasionally place an abdominal drain in the lower angle of the incision, in addition to the one emerging from

the vagina. In these cases we place the patient in the Fowler position immediately after the operation if the pulse will permit.

RESULTS IN THE RADICAL ABDOMINAL OPERATION FOR CANCER OF THE CERVIX. When the Committee of the American Gynecological Society met in Baltimore to arrange the program for its annual meeting which was held in May of this year, it was unanimously agreed that the time had arrived when we should take stock of the results of abdominal hysterectomies for cancer of the cervix in America. The results of some of these labors are to be found in *Surgery, Gynecology, and Obstetrics* for August, 1912. This number of the journal includes interesting articles by Peterson, Taylor, and Taussig.[1] At the meeting Graves reported the results of his work in Boston, and Peterson gave his statistics from Ann Arbor. Taylor sent out circular letters to about 175 operators in New York, Brooklyn, and Philadelphia. In his paper he says: "The replies which I received did not give me any information along the line that I wished, and I have not been able to deduct from them anything of value as to the ultimate result of cancer operations in these two states." He learned, however, two things: (1) the entire absence of reliable statistics among the operators, (2) the universal feeling among the surgeons that the patients were not seen early enough to be permanently relieved.

Taylor then reports his own results. His immediate mortality was only 3 in 28 cases. Unfortunately many of his patients were lost track of, so that he could not determine the relative percentage of permanent recovery.

Taussig communicated with surgeons west of the Mississippi river. In all he collected records of 60 patients; only 14 of these operations dated beyond the five-year limit. He

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[1] Dr. John G. Clark, of Philadelphia, Dr. J. Sampson, of Albany, and several others also briefly reported their results in the radical operation.

says: "By a strange coincidence there was not a single operative mortality among these first 14 patients. Apparently each operator was particularly careful in the selection of his first case." Of the 14 patients one could not be traced and one had died of an intercurrent disease. Of the remaining 12 patients 5, or 41.6 per cent. of them, were still free from recurrence. This is an exceptionally good showing even though the numbers be small.

Neel, after much labor, was able to trace the records of the cancer cases operated on by the radical method at the Johns Hopkins Hospital. These operations were performed by Dr. Kelly and his associates, and by the residents during the various years. Neel[1] reported in all 70 cases in which over five years had elapsed since the radical operation had been performed. There was an immediate mortality of 20 or 28.6 per cent. Of the 50 patients leaving the hospital, 9 had been lost track of, 1 had died two years later of pneumonia, 14 or 20 per cent. of the total number of patients are today free from recurrence and the remainder had died with unmistakable evidence of return of the growth. Neel draws attention to the fact that if we deduct the 20 that died immediately, and discard the patient dying of an intercurrent affection, and also substract the 9 cases that were lost track of, he still has 40 patients that survived the operation and concerning whom he has definite data. Fourteen or 35 per cent. of the 40 patients are still alive.

At the request of the Committee of the American Gynecological Society I was asked to find out to what extent the radical abdominal operation was employed for carcinoma of the cervix in the southern States. Letters were sent out to most of the surgeons in the South, and I take this opportunity of thanking the many who took the time and trouble

[1] Dr. Neel's paper will appear in a forthcoming number of *Surgery, Gynecology, and Obstetrics.*

to reply. The majority had never done a Wertheim opera-
tion, a few had performed it two or three times, and had
lost sight of the patient. Only in a few instances were the
statistics of any value to us either because the operation
was of such recent date, or because the patient could not be
traced.

Under date of April 6, 1912, Dr. George Tully Vaughan,
of Washington, writes: "In reply to your letter asking for
data of Wertheim or other abdominal hysterectomies for
cancer of the cervix, I should say that I have not had a
large experience in gynecological work. About 5 complete
abdominal operations for cancer are all I can muster—one
death and the others still living so far as I know. One
at least was heard from recently, three years after the
operation."

Dr. H. H. Grant, of Louisville, Ky., replying under date
of April 9, 1912, says: "I have done but 7 panhysterec-
tomies for carcinoma, and but 2 of these included explora-
tion for intra-abdominal glands, none claiming to be Wer-
theim. There was no immediate mortality. Two of these
patients were subjected to amputation of the cervix, because
of doubt, and in 1, Mrs. L., aged thirty-seven years, re-
operation was done after three months for a threatening
recurrence in 1900. She died of recurrence ten months after
the second operation. The other, aged forty-one years, was
re-operated upon in three weeks. She died in five months
of recurrence. The other 5 cases are still living. Mrs. W.,
aged fifty-four years, operated on November, 1909, well;
Mrs. B., aged forty-seven years, operated upon in February,
1910, well; Mrs. M., aged fifty-one years, operated upon in
April, 1911; well; Mrs. C., aged forty-two years, operated
upon in March, 1910, suspicious; Mrs. M., aged forty-eight
years, operated upon in December, 1911, well."

Dr. J. Mason Hundley, of the University of Maryland,
had quite a number of permanent cures, and is a most

enthusiastic advocate of the radical operation. Dr. Hundley, under date of November 1, 1912, writes: "I find we have records of 21 radical operations for cancer of the cervix done by me since 1905. Of that number 2 died as result of the operation and 1 died after reaching home. Four are living and apparently well — 1 operated upon about six years ago, 3 between seven and eight years, and 1 is now dying, operated upon three years ago. Three are living after two years. The remainder have been lost track of."

At the meeting of the American Gynecological Society I reported my results in 49 cases, in which a complete abdominal hysterectomy was attempted. As noted from the accompanying table brought up to June 1, 1912, there were 11 immediate deaths, a mortality of 23 per cent.; 3 patients were lost track of, and are accordingly included among the dead; 21 died at periods varying from a few months to six years; 14 were living and apparently well at the time of the meeting.

Some of the deaths were due to uncontrollable venous oozing, others to shock due to hemorrhage or to the greatly weakened condition of the patient, others to renal complications and to a few instances to a localized purulent peritonitis. In the tabulation of remote deaths, it will be noted that in some it was clearly evident at the time of operation that the entire growth had not been removed. The death in nearly all of these cases was due to a continued progress of the disease.

FIVE-YEAR LIMIT. Twenty-six of my cases were operated upon over five years ago. Of this number 7 died while still in the hospital. One of the patients was lost track of; 11 died at periods varying from a few years to six years, and 7, or 26.9 per cent., are well today.

One is well six and one-half years after operation.

One is well eight years after operation.

One is well eight years and four months after operation.

One is well eight years and six months after operation.

One is well nine years and eight months after operation.

One is well nine years and ten months after operation.

One is well thirteen years after operation.

In 3 of these cases the ureters were catheterized prior to opening the abdomen.

The cancer in 4 of these successful cases was apparently confined to the cervix, the uterus being freely movable. In 1 case the growth had extended into the right broad ligament and encroached alarmingly on the ureter.

In 1 case the carcinoma had made such extensive inroads on the anterior wall of the cervix that the bladder had become densely adherent to it and was opened during the dissection.

In the remaining case the cervix was so extensively involved that during the operation the body was almost completely torn away from the cervix, and on examination of the specimen after removal the carcinoma was found to have extended almost to the cut surface. In this case a most guarded prognosis was given. It is now over eight years and six months since this uterus was removed. I need hardly add that in every case a histological examination was made.

RESULTS OF ABDOMINAL OPERATIONS FOR CANCER OF THE CERVIX[1]

Immediate Death, 11 Cases.

Richardson	April,	1902.
Tate	July,	1902 (H).
Kyle	October,	1902 (H).
Compton	April,	1903.
Rogers	March,	1905.
Hayward	February,	1906.
Vogelsang	November, 1906 (H).	
Havistick	August,	1909.
King	December, 1909 (H).	
Pfaff	January,	1910.
Harris	November, 1910 (H).	

[1] Those marked with (H) I performed at the Johns Hopkins Hospital, the others were done at the other hospitals with which I am connected.

Not Located, 3 Cases.

Collins	January,	1905.
Welch	January,	1908 (H).
Owens	February,	1908 (H).

Patients Living, 14 Cases.

Ryan . . June, 1911, eleven months (H).
Carroll . May, 1911, twelve months (H).
Griffith . October, 1910, eighteen months.
Lucas . . November, 1909, two years, five months (H).
Heilman . December, 1908, three years, five months (H).
Sangwin . May, 1909, three years, six months.
Conklin . June, 1908, three years, eight months (H).
Humphreys December, 1905.
Herzen . April, 1904, eight years.
Yerkes . January, 1904.
Brown . August, 1903, eight years, six months.
Wotten . August, 1902, nine years, eight months.
Mrs. M., patient of Dr. Geo. H. Carveth, Toronto, December, 1902, nine years, ten months.
Ketler . . June, 1899, thirteen years.

Remote Death, 21 Cases.

White . . April, 1903, partially removed.
Tolley . . April, 1903, partially removed.
Bowen . November, 1911, two months, uremia, blindness.
Olfers . . April, 1908, recurrence, three months (H).
Jones, . . 1910, died six months (H).
Bozeman . December, 1910, incomplete removal, died six months.
Snively . June, 1910, died six months.
Finkle . . April, 1903, died eight months.
Porter . . January, 1905, not entirely removed, died eleven months.
Karr . . July, 1906, died fourteen months (H).
Franklin . February, 1908, died sixteen months (H).
Willis . . October, 1905, died eighteen months (H).
Mack . . February, 1908, died in nineteen months (H).
Raymond . January, 1908, died twenty-one months (H).
Ferguson . September, 1906, died twenty-one months (H).
Tregoe . January, 1900, lived two years.
Baldwin . May, 1907, lived two years.
Ardinger . July, 1908, lived two years, ten months (H).
Stehle . . May, 1904, lived four years.
Riggins . January, 1905, lived five years.
Mengel . May, 1904, lived nearly six years.

Operated on Over Five Years Ago, 26 Cases.

Immediate death	7 cases.
Not located	1 case.
Remote deaths at periods varying from a few	
months to five years	11 cases.
Living	7 cases, or
	26.9 per cent.

PROGNOSIS. Even after removal of the uterus, it is very
difficult to give a satisfactory forecast as to the ultimate
result. Sometimes a case that seems most favorable shows
an early recurrence, while a borderline case that looks most
unfavorable may remain free of the disease. When the
growth of the cervix is of a glandular type, however, we
may look for a speedy return.

An early local return, while most disconcerting, need not
necessarily prove fatal. Nearly two years ago a very com-
petent surgeon in a Southern State did a radical operation,
and within a few months a carcinomatous nodule was
detected in the vault. In this case, on account of the prox-
imity of the carcinoma to the ureter, I opened the abdomen
and isolated the ureters and removed a long cuff of the
vagina. This patient up to the present time, sixteen months
later, has had no further manifestation of the disease.

TEMPORARY RELIEF. Some surgeons are of the opinion
that if the entire growth has not been removed the patients
suffer much more than if no radical operation has been
performed. In my experience the patient in the late stages
is no more prone to pressure symptoms than is the woman
who has not been operated upon. On the other hand, fre-
quently the growth spreads in such a manner that the
vaginal mucosa is not again involved, and the patient is
accordingly spared the frequent hemorrhages and the foul
smelling discharge. I am frank to admit that in some cases
I would have refrained from operating had I been aware
of the widespread extension of the disease, but sometimes

when the growth is not very dense the extent is only ascertainable when the operator has partially completed his dissection and complete removal of the uterus cannot then be avoided.

DEDUCTIONS. It is difficult to lay down hard and fast rules as to what cases should and what cases should not be operated upon. All familiar with the course of this dread disease know that in time the hemorrhages become very severe, and that later on in the intervals between hemorrhages the patient has a most foul and loathsome discharge, and that in some cases rectovaginal or vesicovaginal fistulæ or both may develop. They also know that the patient become a burden to herself and a source of the greatest anxiety to her family, who are powerless to do anything, and finally that most painful pressure symptoms may develop. With such an outlook I feel sure that there is not a man in this audience, who, if brought face to face with such a problem in his own family, but would gladly take the chance of an operation, if there were only one or two chances in a hundred. As a matter of fact, the chances are infinitely better.

Over a decade ago, when speaking before the Academy of Medicine in this city on the early diagnosis of cancer of the uterus, one of the most distinguished gynecologists of New York in the discussion said, if I remember correctly, that he had operated on over 120 cases of carcinoma of the uterus, and that at the time of the meeting not one of them was living.

The splendid results obtained by Wertheim and others in Europe leave no doubt that great strides have been made in the cure of cancer of the uterus, and, even from the limited observations in America, it is clear that considerable progress has been made, and there is no reason why we should not materially increase our percentage of permanent cures. The Germans certainly have one advan-

tage over the American surgeons. Many of their patients have had large numbers of children and, owing to their manner of work, have not accumulated the large amount of adipose tissue that is so prevalent with us. Consequently the continental operator can at once secure a much better exposure, and is not troubled with the abundance of adipose tissue around the ureter and in the broad ligaments.

The oftener the surgeon performs this operation the more expert he becomes, the length of the operation is shortened, and consequently the death rate is lowered. The German surgeons apparently see many more of these cases than surgeons in this country. During my last trip to Germany I was making rounds with Professor Zweifel in Leipzig, and he told me that in one month he had performed 15 Wertheim operations for cancer of the cervix. It is, therefore, only natural that the German surgeon should have a lower operative mortality.

Again, the continental surgeon has materially profited by the widespread publicity which the cancer problem has received both in the profession and among the laity. From time to time attempts have been made in America to start an education of the women of this country to the necessity of reporting any suspicious symptoms at once to her physician, but apart from some spasmodic efforts nothing has really been accomplished. It would be most fitting if this splendid Society should here and now start a cancer campaign that would extend from coast to coast. It can and should be undertaken at once. Publications that have done much to enlighten the laity on medical matters could be of invaluable service in the dissemination of this knowledge.

The laity now have a clear idea of the subject of appendicitis, and whereas a decade ago it was often necessary for the family physician, after making the diagnosis, to spend hours in urging the necessity for immediate opera-

tion, at the present day, after he has given his verdict, the first question asked by the family is to what hospital the patient should be sent.

The splendid crusade against tuberculosis is another example of the immense amount that has been accomplished by the education of the rank and file of the community.

Two or three well-illustrated articles explaining in simple words just what cancer is, how it spreads, and what may be accomplished by early operative interference will be all that is necessary to put women on their guard. Many of them have an innate fear that they will sometime develop cancer of the uterus, and are fully aware of the distressing train of symptoms in the advanced stages of this dread disease. What we want to do is to impress upon them the fact that any abnormal bleeding, no matter how slight, should be immediately investigated by their physician to ascertain if cancer be present. If no malignancy be found, they are relieved of their unnecessary anxiety. If cancer be present it can be combated in the early stages. The fact that early cancer may be successfully eradicated by operation and that it is in the beginning a strictly local process instead of a "general blood disease," as it is so often referred to by the laity, should be most forcibly impressed upon the community.

The sooner this subject is launched the sooner will our percentage of permanent cures increase. I feel sure that after women in general are thoroughly familiar with the necessity of an examination just as soon as they present any symptoms, the surgeon will be able to save at a conservative estimate, from 20 to 25 per cent. of these cases.

Among the most important surgical papers that emanate from the larger clinics are those which deal with the after-results in various operative procedures, and it is well worth the while of every surgeon to "take stock" at regular intervals. Having a vivid recollection of the numerous

immediate deaths I had encountered following the Wertheim operation, I hesitated long before I could make up my mind to attempt to locate the patients that had left the hospital. But, when finally the work was commenced, and it was found that some patients had enjoyed comparative comfort for one, two, three, or even six years, I felt that the operation had been worth while. And when seven letters came back saying that the patients were well at periods varying from six to thirteen years, and expressing the most profound thanks for what had been done for them, I could not help feeling that the radical abdominal operation is the one destined to yield the best results.

This is an operation, however, that cannot be lightly undertaken, as it requires the very best efforts of the surgeon. My friend, Reuben Peterson, has expressed my sentiments so well that in conclusion I will quote what he has recently said on the subject:

"My belief in this operation has only become stronger. However, the experience afforded by 11 additional cases has not made me any more confident that the next patient I operate upon will survive either the primary operation or will ultimately be cured. On the contrary, in contrast with other abdominal operations, the more I perform this operation, the more I respect and, possibly, dread it. Yet I adhere to it for the simple reason that in my hands all other operations for cancer of the uterus have been disappointing in their uniformly bad ultimate results, while with the radical abdominal technique I have been able to save a fairly good percentage of my patients, and that, after all, is said, is what the surgeon is after. If he be not content to set at naught his surgical reputation as far as primary results are concerned for the sake of ultimately curing more patients, he would best not meddle with this operation which, in apparently favorable cases, is only too apt to turn out to be grave."

RESULTS AFTER THE WERTHEIM OPERATION FOR CARCINOMA OF THE CERVIX OF THE UTERUS

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(A Preliminary Report from the Gynecological Clinic of Dr. Howard A. Kelly
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Although the radical abdominal operation for patients suffering from carcinoma of the cervix of the uterus had been advocated as early as 1895 by Clark and Ries and in 1898 by Wertheim, before 1900 very few cases had been treated by this method in this clinic. Since 1900, however, in practically all the operative cases the abdominal route has been employed, and the results here given are based upon such cases from January 1900 to January 1912.

TYPE OF OPERATION

Although the original operation still remains the same in its fundamental principles, the wide excision of the uterus with the parametria, and the removal of the surrounding lymph structures *en masse*, from time to time various modifications have been adopted in order to render the technique more perfect. It does not come within the limits of this paper to discuss these modifications; suffice it to say here that the operation as done in Dr. Kelly's clinic corresponds to that described and practised by Wertheim.

PERCENTAGE OF OPERABILITY

Inasmuch as we possess no means of determining the absolute progress of the disease, in the majority of cases the decision as to suitability for the radical operation must depend upon the degree of direct extension of the local lesion. Judged by this standard in the series of cases reported by Cullen from 1893 to 1899, the percentage of operability was 51.7. During the last five years, 125 cases of carcinoma of the cervix of the uterus have been admitted to this clinic. One patient refused operation. Of this number the radical abdominal operation was done in 67 cases, thus giving a percentage of operability of 54.

It is somewhat discouraging to note that although more than a decade has passed, the percentage of operability has remained practically the same. Great efforts are being devoted to the working out of the operative technique, but unfortunately its successful employment is tremendously handicapped by the failure to recognize the early symptoms. The usual history given by these patients is that they have suffered from irregular bleeding for from seven to nine months, and have been submitted to various treatments.

Nevertheless the incessant campaign, waged more especially by Winter, is bringing forth encouraging results. Is it not time that concerted devotion and earnestness similar to that used in fighting tuberculosis so successfully be organized to save these patients, who are otherwise irretrievably lost?

STATISTICS

From January 1900 until January 1912, the radical abdominal operation has been performed in 136 cases; of this number primary death occurred in 28 cases, giving a total primary mortality of 20.5 per cent. During the last five

years, 125 cases have been admitted; out of this number the radical abdominal operation has been done in 67 cases. Primary death occurred in 8 cases, giving a primary mortality of nearly 12 per cent.

In 70 cases a period of five or more years has elapsed; of these patients 61 have been traced and 9 lost track of; one patient died two years later from pneumonia; 14 are alive and well; while the remainder gave practically unmistakable evidence of recurrence. The percentage of permanent cures, based upon the number of cases in which the complete operation was done, excluding those lost track of, is $\frac{14}{70-(1+9)} = 23.3$ per cent. While granting that those 9 patients lost track of died from a recurrence, the percentage of permanent cures is $\frac{14}{70-1} = 20.3$ per cent. Of these 70 cases, primary death occurred in 20. Hence if we deduct from the total number of cases operated on, the number of primary deaths (20), the number dying from other causes (1), and the number lost track of (9), we get a percentage of cures in 35 per cent. of the cases.

PROCEDURES TENDING TO LOWER PRIMARY MORTALITY AND MORBIDITY

The primary mortality, comparatively speaking, has been universally high; chiefly because, owing to their general weakened condition, the patients were unable to stand such an extensive operation. Primarily, as in all operations, the first duty of the surgeon should be directed to the immediate results to the patient, since there can be no consolation in the much quoted remark, "The operation was successful but the patient died." Hence any procedure which will lessen the time required for the operation, the immediate shock, and yet guarantee the same thoroughness, should be employed in every case.

1. *Disinfection of the Growth.* Although it is doubtless impossible to render the carcinomatous area aseptic, there is much to be gained from proper measures along these lines. For several months the following technique has been employed here:

(*a*) The usual perineal and vaginal cleansing—soap and water, bichloride of mercury (1 to 1000), and alcohol 70 per cent.

(*b*) Thorough cauterization of the primary growth with "soldering irons" or the Paquelin cautery.

(*c*) The application of benzine-iodine solution (1 to 1000 iodine) to thoroughly dehydrate the field.

(*d*) The application of tincture of iodine (3.5 per cent.).

(*e*) An iodoform gauze pack placed in the vagina.

After a thorough cauterization of the growth, the cervical canal should always be dilated. Occasionally this procedure brings to light the existence of a pyometra which is an absolute indication for postponement of the operation.

As yet the series of cases treated in this manner is too small to warrant conclusions, but it is of interest to note that none of these patients have subsequently developed peritonitis.

2. *The Incision.* In all these cases a long midline incision has been employed. In very fat patients, the resection of an ovoid area of skin with the subcutaneous fat in the midline (horizontal lipectomy) has been found to be of great advantage. By this method the depth of the field of operation is reduced by from 5 to 7 cm. and the ultimate result adds greatly to the general personal comfort of the patient.

3. *The Catheterization of the Ureters.* Although the use of ureteral catheters has not been followed uniformly there has been no hesitancy in their employment. With the greater facility of catheterization incident to the improvement of cystoscopic technique, this procedure can be carried

out within a few minutes before the general anesthetic is given and will prove to be of the greatest possible assistance during the course of the operation. It is especially satisfactory in obese patients, where the exposure is difficult, since it lessens the time necessary for the isolation of the ureters and renders comparatively easy the control of hemorrhage from the vaginal plexus of veins which in many cases is the most troublesome part of the entire operation.

From a study of our cases we are led to conclude that the liability to ureterovaginal fistulæ or secondary infection of the urinary system is not increased by this procedure. However, the following cautions should be observed:

(*a*) The minimal amount of manipulation with the least possible trauma is to be exercised.

(*b*) The ureteral sheath should not be disturbed at any point.

(*c*) The catheters should be removed when the ureters are completely isolated and further manipulations should consist in rolling the ureters over, with the least possible disturbance to their blood supply.

4. *The Lymphatic Glands.* As it is generally conceded that the lymphatic glands are implicated in from one-third to one-half of all operable cases, and since we have no means of determining that involvement except by microscopic examination, theoretically speaking the ideal operation would include their resection in all cases. However, the present operative facilities and technique do not justify such an extensive operation on account of the great increase in the primary mortality following such a procedure. Hence, for many years no attempt at removal of the lymph structures other than those of the parametria has been made.

5. *The Resection of the Vagina.* After the thorough dissection of the parametrial and vaginal tissues to a point well below the extent of the growth, they are resected after the vaginal canal has been swabbed out to remove any

infected accumulation. With a thorough preliminary cauterization, the widest possible resection with probably the least risk of immediate danger to the patient is obtained by the use of sharp dissection.

6. *Pelvic Closure.* As in all abdominal operations, denuded areas should be closed over as completely as is permissible. By this step of the operation the liability of post-operative intestinal obstruction is reduced and the injury to the ureters greatly lessened.

On account of the possible infection present in all cases, some form of pelvic drainage is to be advised. In this clinic the most satisfactory drainage has been obtained by a small cigarette drain composed of gauze surrounded by rubber protective, placed through the vaginal opening.

7. *The Post-operative Treatment.* Aside from the general measures for combating shock there are many procedures which may contribute to a smooth convalescence. The excessive trauma to the bladder walls almost invariably causes temporary vesical paralysis and formerly it was not unusual to catheterize a patient from thirty to forty times. For the last eight months the preoperative treatment has been varied so that all patients have water forced until they go to the operating room. This, together with the forcing of liquids practically as soon as the patient becomes conscious and the administration of salt solution by the rectum and by infusion, has reduced the number of necessary catheterizations very markedly. Patients who have been submitted to a definite injury to the bladder are, however, catheterized more frequently to prevent overdistention, and occasionally a retention catheter is left in the bladder for a few days.

As far as possible the immediate comfort of the patient is to be sought. Probably no one factor contributes more to this end than the employment of the Fowler position.

For several years in the care of these patients the Gatch bed has been employed by means of which they can occupy the sitting posture. The following advantages are to be gained by such a position:

1. Pelvic drainage is facilitated with limitation of the infection to the pelvic peritoneum.

2. Nausea and vomiting are decreased.

3. Respirations are performed more easily, since the pressure from the distended abdominal viscera upon the diaphragm is greatly lessened.

4. The liability of post-operative pneumonia is greatly decreased by frequent modification of this posture.

CONCLUSIONS

From a study of the cases treated at the Johns Hopkins Hospital the following conclusions are drawn:

1. The extensive abdominal removal of all uterine cervical carcinomata is justified where there is any hope of complete excision.

2. An exploratory laparotomy is often necessary to determine whether or not a case is operable.

3. The preliminary catheterization of the ureters is a valuable aid, especially in fat patients, and does not necessarily increase the probability of fistulæ or secondary infection of the urinary tract.

4. Preliminary cauterization and disinfection of the primary growth is advisable in all cases.

5. A horizontal lipectomy in obese patients decreases the depth of the field of operation and shortens the time necessary for its completion.

6. All patients should be kept in the Fowler position for several days unless this is otherwise contraindicated by symptoms of surgical shock.

7. By improvements in the technique of the operation the primary mortality has been decreased from 28.5 per cent. for the first seven years to 11.7 per cent. for the last five years.

8. Aside from the discovery of the etiological factor of carcinoma of the cervix of the uterus and its successful elimination, the greatest hope lies in the early recognition of the primary growth.

DISCUSSION OF THE SYMPOSIUM ON THE RADICAL ABDOMINAL OPERATION FOR CANCER OF THE CERVIX UTERI.

DR. JOHN A. SAMPSON.—My early experience with this operation was while resident gynecologist at the Johns Hopkins Hospital in the clinic of Dr. Howard A. Kelly, and the cases which I operated upon there through Dr. Kelly's courtesy belong to the records of his clinic and are not included in this report.

Since leaving Baltimore in the Spring of 1905 I have operated upon 25 patients for cancer of the cervix, by the radical abdominal operation. Some of the pelvic lymph nodes were removed at twelve operations, and these were examined microscopically in all but one instance; unfortunately a node from one case, which in the gross apparently contained cancer, was lost. Metastases were found in one or more nodes in 7 of the 12 cases (8 if the one lost is counted as positive). We, therefore, know that at least 7 of the 25 patients had metastases in one or more of the pelvic lymph nodes at the time of operation.

Five died as the result of the operation, and four of these were advanced cases: in one the trigonum of the bladder and lower ends of both ureters (double ureter on one side) were resected; in another a portion of the right external iliac vein was excised for the extension of cancer about it from a metastasis in an iliac lymph node; in another several large cancerous lymph nodes, including a large lumbar node, were removed; in another

a portion of the bladder was excised. The fifth was less extensive than the above, but the patient was in feeble condition. One of the 5 patients died a few hours after the operation and the other 4 did from four to seven days afterward. All five apparently never completely rallied from the shock of the operation. In my experience the operation in the favorable cases is attended with a very low primary mortality (in fact, I have not yet had a fatality in this group). The high primary mortality has occurred in the "borderline" and the advanced cases. The growth is more extensive, requiring a more difficult operation, and the resistence of the patient is lower than in the early cases. This would emphasize the importance of not operating in the latter were it not for the fact that some of them do survive the operation and my be relieved for a time, and even occasionally be cured. With experience we will learn to discriminate what patients should not be operated upon. It is very hard for me to refuse to operate on an unfavorable case if I believe I can remove the entire growth, and it is also difficult to stop during the operation until I think I have. Only one instance of ureteral fistula occurred from interference with the blood supply of the ureter in the 20 patients surviving the operation, and this closed spontaneously. By leaving the ureter attached to the peritoneum above the base of the broad ligament and freeing the parametrial portion carefully from its sheath, the dangers of necrosis are slight. (For discussion of this phase of the subject, see *Johns Hopkins Hospital Bulletin*, April, 1904, and *Jour. Amer. Med. Assoc.*, September 10, 1904).

The end results (five years limit). Eight of the 25 patients were operated upon over five years ago. Two of these died as the result of the operation, and 2 died later from recurrence. Four are clinically free from cancer at the present time; *i. e.*, 4 of 8 cases operated upon and of 6 surviving the operation. The 2 cases dying from recurrence. Both were young women, aged thirty years and thirty-two years, who had never had children. Both presented the same type of growth, namely, the inverting type arising from the portio vaginalis. Both appeared favorable before the operation, the uterus was freely movable, and the parametrium was apparently free. Pelvic lymph nodes were not removed in the first one. In the second, small parametrial lymph nodes were removed and found to contain cancer. (For discussion of this phase of the subject

see previous article by author, "The Participation of the Tissues Adjacent to the Uterus and of the Pelvic Lymphatics in Uterine Cancer," *Journal of the American Medical Association*, January 14, 1911.) The iliac nodes were not removed. The first one was apparently free from cancer for two years, and died from recurrence a year later. The second died within a year of the operation. The cause of death in each was the same, *i. e.*, renal insufficiency from compression of the ureters by cancer. The symptoms were persistent nausea and vomiting with great loss in weight and strength, *i. e.*, they literally straved to death. An autopsy was obtained in both cases. In the first there was not any evidence of cancer found in the field of operation but the uretrs were compressed by cancer, just below the place where they cross the iliac vessels, from the extension of metastases in the iliac lymph nodes. Metastases were also found in two of the abdominal lymph nodes. *The patient died from cancer, inaccessible iliac lymph nodes not removed at operation.* In the second a similar condition was found, and in addition a small recurrence in the field of operation between the bladder and vagina.

The 4 cases who are apparently cured.

No. 1. Para, aged forty-six years, operated upon in August, 1905. The patient had been curetted a month before I saw her, and her condition had later been diagnosticated as "inoperable" by another surgeon. Before operation the primary growth appeared extensive and the parametrium felt indurated. Some of the pelvic lymph nodes were removed and cancer was found in one. The type of growth was inverting, arising from the portio vaginalis, and locally more advanced than in the previous two who died from recurrence. In spite of a previous curettage, an extensive primary growth with a diagnosis of "inoperability" and metastasis found in an iliac lymph node, the patient is clinically free from cancer at the present time, *i. e.*, nearly seven years since the operation.

No. 2. Nullipara, aged forty years, also operated upon in 1905. Before operation the primary growth appeared extensive the cervix having been converted into a thin shell, and its movements were restricted. At operation the cervix was found to be adherent to the bladder and in attempting to free the bladder the cervix was torn, the field of operation infected with the necrotic cancerous material, and the specimen removed

in fragments. The case was considered unfavorable, and no attempt was made to remove the pelvic lymphatics. The type of growth was inverting, arising within the cervix. In spite of an extensive primary growth, its removal in fragments and the infection of the field of operation with cancer, her physician, Dr. C. G. McMullen, of Schenectady, informs me that she is apparently cured.

No. 3. Para, aged forty-three years, operated upon in 1906. Before operation the primary growth appeared extensive though confined to the cervix. Pelvic lymph nodes were not removed. The type of growth was inverting, apparently arising just within the cervical canal.

No. 4. Para, aged fifty-three years, both tubes and ovaries had been removed five years before for pelvic inflammatory conditions; operated upon by me in April, 1907. Before operation the growth was apparently restricted to the cervix, the uterus was fixed (due to adhesions), causing a diagnosis of "inoperability" to be made by the surgeon who had first operated upon her. Pelvic lymph nodes were not removed. The type of growth was inverting, arising within the cervix.

The two patients dying from recurrence were both young women with an average age of thirty-one years, who had never had children. The type of growth was inverting, arising from the portio vaginalis, and the cases appeared favorable before the operation, and both died from extension of metastasis in accessible iliac lymph nodes (a small recurrence in field of operation was present in one). The four apparently free from cancer five years or more since the operation (two nearly seven years) were older women, average aged forty-five plus years, three had born children, the other had not. The type of growth in three was inverting, arising within the cervix, and in one, inverting, arising from the portio vaginalis. Three of the four appeared unfavorable before the operation. In only one were the accessible pelvic lymph nodes removed and cancer was found in one of these.

These cases are too few in number from which to draw any definite conclusion, but they show that what appear to be unfavorable cases may sometimes be cured and that it is not safe to give a favorable prognosis in an apparently early case. With further experience, we will learn on what to base our prognosis, such as the origin of the growth whether from the

portio vaginalis or within the cervix, its type inverting or everting, its histological structure, the age of patient, whether para or nullipara, etc.

I have had the opportunity to obtain autopsies on five patients dying from recurrence (including the two just reported). In three the immediate cause of death arose from the compression of the ureters by cancer extending from metastases in accessible iliac lymph nodes. In the fourth there was an extensive local recurrence in the field of operation from cancer not removed at operation (an advanced case). In the fifth there was an extensive local recurrence filling the pelvis with metastases to the lungs, heart, one kidney, and skin.

I believe that metastases are present in from one-third to one-half of the operable cases, and that while lymph nodes which are not readily accessible may be involved as well as accessible ones, that the latter are the ones which are most frequently involved, and sometimes the only ones, and I refer especially to the iliac lymph nodes near the origin of the internal iliac vessels. I therefore believe that these nodes should be removed when the condition of the patient will permit, and especially in the early cases where the operative technique is easy and the resistence of the patients is usually good.

Dr. Joseph Brettauer.—The results of the radical operation for carcinoma of the cervix as given by the readers of the papers, are certainly not very encouraging. My own experience has been even worse. I did my first Wertheim operation in September, 1902, and the patient lived until 1907, being the only one of my cases to come within the five year limit. Of the other nineteen patients three are still living after a period of two and one-half years; the others all died between two and three years after operation. These cases were all more or less advanced, but there were no special surgical difficulties. The ureter was resected once, the bladder was partially resected once.

I should like to mention one patient who is still alive and apparently very well, when I saw her only one week ago. This young woman was operated upon by one of my assistants during the summer. When I examined her in the fall (following my usual practice of examining these patients every three to six months) I found a recurrence in the fornix in the vaginal scar. This was about the size of a walnut and I removed it easily

per abdomen, by excising the free adherent part of the bladder and uniting the bladder edges and then the bladder. This was about four months after the primary operation and the patient is perfectly well now, three years after operation. This is about the most satisfaction I have had in connection with my abdominal work for cancer. Two patients died of primary sepsis, one of secondary hemorrhage.

I must express my surprise at the small number of cases of cervical carcinomas that have come under observation. During the last ten years I have observed over 15,000 exclusively gynecological cases, and have seen twenty inoperable cases of carcinoma of the cervix and nineteen operable ones.

With the kind permission of the Health Board authorities, I am at present trying to find a basis for comparison, by tracing back as far as the statistics will allow the entire number reported as having died from carcinoma of the uterus.

I want to say that so far as the end result is concerned, in my experience it is not a question of how far the carcinoma has advanced when you operate, but what biological dignity that carcinoma cell possesses.

DR. J. WESLEY BOVÉE.—Before reading what I have written on this subject, I desire to say that I am surprised that the gentlemen who have spoken have told us that they have such a large percentage of operable cases among those of cancer of the cervix. I am certain, I do not see 10 per cent. in my cases of cancer of the cervix which I consider operable, that is, that may reasonably be subjected to a radical surgical operation.

On March 31, 1898, I began the employment of radical surgical treatment of cancer of the uterus under the stimulation of Werder's paper that had appeared the month before in the *American Journal of Obstetrics* (vol. xxxvii, pp. 289 to 293). The operation I then began using was a conbination of Werder's and the one proposed by Ries (*Chicago Medical Recorder*, 1895, vol. ix, pp. 284 to 289), and was described with a report of my first fifteen cases in the *American Gynecological and Obstetrical Journal*, 1901, vol. xvii, pp. 312 to 322. This plan was modified February 22, 1912, by ligating the trunks or the anterior branch of the internal iliac arteries. Occasionally I have modified it by severing the vagina from above through a ribbon compressed and cooked by the Downes electrothermic angiotribe.

My statistics of the employment of broad radical excision for cancer of the cervix down to three years ago are as follows:

Number of cases operated on, 36; mortality of operation was as follows: shock, 5; peritonitis, 2; fecal fistula-asthenia (fourteenth day), 1; renal insufficiency, 1. Total, 9.

Died from recurrence of cancer at the end of one year, 1; at the end of eighteen months, 1; at the end of twenty-one months, 1; at the end of two years, 2; at the end of three years, 1. Total 6.

Died from other diseases, of uremia after ureterocystotomy at the time of operation (lived eleven years), 1; unknown intercurrent disease, (lived two years,) 1; of tuberculosis (lived six months), 1. Total 3.

Number living for more than three years without recurrence, 8; total after recovery from operation and not traceable, 10.

From this table it will appear that 27 patients (75 per cent.) recovered from operation, and that of these 8, or practically 30 per cent., have remained well for more than three years. The exact amount of time they have lived, apparently well, after operation, is for one, fourteen years and two months; 1, twelve years and three months; for 2, twelve years; for 1, nine years and eight months; for 1, nine years and one month; for 1, seven years and four months; and for 1, four years and nine months.

My second patient operated on April 4, 1898, was unique. A cancerous mass was found surrounding (in the broad ligament) and dilating the left ureter. The mass and its contained portion of the ureter were removed and the ureter implanted into the bladder. The late Dr. James Carroll, U. S. A., examined microscopically the specimen and reported that while the duct was not involved in the malignant process, the surrounding mass was cancerous. This case was reported in my article of 1901. The patient was readmitted to the hospital in September, 1909, and as I was absent from home my associate, Dr. G. Brown Miller, treated her. She died a few hours after admission, and no autopsy was made. Dr. Miller believed her fatal illness was uremia, and I have wondered if the defect in the unnatural ureterovesical junction had not been an etiological factor, or if cancer had not recurred in the kidney or kidneys. But assuming the three patients dying from intercurrent disease and the 10 that were not traceable all died of recurrences,

we have left 8 patients that have lived a total of eighty-one years and three months, an average of ten years and two months since operation without recurrence.

The practical question we desire answered is whether such radical surgical procedures as we are now considering for the treatment of cancer of the cervix uteri are advisable. While my experience is small, I am greatly influenced by it and believe the saving of 22 per cent. of cases for an average of more than ten years is strong supportive argument. No doubt each of us has several cases of non-recurrence for years following vaginal hysterectomy for cancer of the cervix. I frequently see two ladies who are in splendid health, whose carcinomatous uteri I thus removed more than seven years ago. But I would reserve that operation for only those patients whose conditions prohibit the employment of the broad dissection by the abdominal route. I believe that improvement in results may be secured not alone by an educational propaganda calculated to bring women suffering from this disease to operation early, but by changing the technique in two ways, to wit: to lessen the primary mortality, and to lessen contamintion during the operation. For the latter, I would recommend the use of the cautery in some form. In my work I have, since 1903, employed for this purpose Downes' electrothermic angiotribe which I have found to be a very serviceable instrument. Ligation of the trunks of both internal arteries or of their anterior branches, if large, greatly assist in controlling hemorrhage, an important matter. I am less an advocate of removing the pelvic glands than formerly, as I think it markedly increases our primary mortality rate from shock. The time of the operation should come within the hour, and will do so if not much time is used in dissecting out glands.

DR. LEROY BROUN.—It seems to me, gentlemen, that the lesson we are to learn from these papers and discussions is, we are not getting our cancer cases early enough. Our percentage of operability is not as high as it is in foreign clinics. Our percentage of immunity after five years is not as high as it is in foreign clinics, and the key to the situation is that we do not get our patients early enough, and it is necessary that we should attempt to educate them in our respective communities.

I was impressed with the reference to the clinic here in Balti-

more. The report brought out yesterday afternoon that the percentage of operability obtained here was 61 per cent. I am sure we have nothing of that kind in New York; we have nothing of that kind in Ann Arbor or in any locality that I know of in this country. The reason evidently must be one of education.

In reviewing the recent literature, we find that of all the uterine cancer cases applying to von Franque's clinic, 33.8 per cent., were operable; of those applying to Zweifel's clinic, 65.7 per cent. were operable; Hofmeier's clinic, 52.2 per cent. were operable; Bumm's (Halle) clinic, 80 per cent. were operable; Bumm's (Berlin) clinic, 65 per cent. were operable; Sellheim's clinic, 72 per cent. were operable; Henkel's clinic, 75 per cent. were operable; Schauta's clinic, 59.5 per cent. were operable; and Wertheim's clinic, 50 per cent. were operable, an average of 60 per cent.

No clinic in America can show such a high percentage of operable cases. Peterson states that his own is 31.7 per cent.

Polosson has a record of 211 radical operations for uterine cancer, and gives only percentages by series, as follows:

	Operability.	Mortality.	Radical cure.
1st series	56.0 per cent.	18.0 per cent.	35 per cent.
2d series	86.8 per cent.	13.7 per cent.	61 per cent.
3d series	77.2 per cent.	11.3 per cent.	69 per cent.
4th series	75.0 per cent.	20.6 per cent.	Too recent

What a difference between the operability that we have in this country. There is only one explanation, and that is education of the lay people, impressing upon general physicians the importance that these cases should be brought early. I believe that each one of us, when we leave here, should make an effort to focus our attention on one thing in our respective communities, and that is, education of the laity and general physicians. If we do this, we can accomplish more toward getting these cases earlier for operation than by any other one means.

I have 6 cases to report, with 1 death. The patient died after six days from a colon bacillus infection of the kidneys after a prolonged operation of some two hours and a half. The other five patients are not far enough along to be of any value in the five-year limit.

DR. JOHN O. POLAK.—This symposium is most instructive to those of us who have worked with the late Dr. Byrne and

have seen the results of his work. I have been doing the radical operation in selected cases for about ten years, and I am frank to say to you that as far as any statistics that I can gather, I have not a single patient living on whom the radical operation was done. This may be due to a defect in my procedure, or it may be due to a bad selection of cases, but my results stand that of the radical hysterectomies I have done, there is not a single one of my patients alive that I can trace. Against this discouraging record, however, I have 4 patients alive, who were operated on by Dr. Byrne's method, 1 was operated nearly nineteen years ago, 1 twelve, 1 ten and another eight years ago. These were all cases that I considered practically inoperable by any radical procedure, and that is the reason I adopted the method of Dr. Byrne. I followed out his technique which all of you, who are Fellows of this Society, will remember was different from what is understood by cauterization at the present time, *i. e.*, the uterus is drawn down, with his spreading tenaculum and the cervix is cut away with a heavy cautery knife; the cold cautery dome is then placed against the tissues the current turned on, and they are slowly cooked, not for minutes, but practically for hours. We get as a result a simple shell, and if the patient has passed the menopause the vagina falls in over the granulating surface and isolates it.

Another interesting feature in the discussion is the fact that we are not getting our cases early enough. In my own clinic at the Long Island College Hospital, where we have nearly 4000 patients a year, in this last year there has not been a single operable case of cancer, operable in the sense that I consider operable, such as the 2 or 3 cases Dr. Cullen has mentioned this morning who have lived a number of years.

There is one other point I wish to mention, it was brought out by Dr. Brettauer, namely, that there is something in the particular type of growth which we have no means of determining, and which certainly determines the longevity of the patient. Take these 4 cases I report in which I used Dr. Byrne's method, and there was a case that was operated upon while I was with Dr. Byrne, twenty-one years ago, the patient is alive today. If these cases were of this peculiarly active type, they probably would have been dead now, and yet they were all cases that I would consider now absolutely inoperable from the standpoint of any of our modern procedures.

DR. SETH C. GORDON.—I was saying to Dr. Sampson while the discussion was going on, that I have watched carefully through twenty-five years of my connection with this Society that at each meeting we have had more or less talk on cancer, and that I believe taking the very best reports we have had made, the gentlemen making them have not shown as good results as Dr. Byrne showed during his lifetime. As Dr. Polak has said, it was really cooking the disease. If you get the disease early, you can cook it very much more thoroughly and radically than if you get it late. In other words, you stop absolutely the infection from spreading any farther. In the very worst cases you get absolutely the best that can be done, in my opinion, under any circumstances. These extremely advanced cases, no matter what you do for them, die. If they do not die primarily, they die very soon afterward, or, at any rate, they wish they could die. I believe, as has been said here, the only hope lies in education of the laity and early removal of the disease. There is no question in my mind but that we can cure cancer of the uterus, the same as we can cure cancer of the lip, if you see it as early as you do cancer of the lip, and know as much about it as you do cancer of the lip. I believe it is absolutely true that 75 per cent. of the operations for cancer of the lip show that the disease never returns, so that the whole thing lies in education of the people to the extent that we may get at the disease early and make a thorough radical removal. But if we wait until the disease is thoroughly established, I believe there is nothing as yet that will approach the record of Dr. Byrne, and I believe he was a good honest old Irishman.

DR. I. S. STONE.—I am really one of those that deserves the prodding that Dr. Cullen mentioned, and I want to say right here, I think perhaps my modesty prevented me from answering his circular letter. However, I thought it was hardly worth while for one in a small clinic to report 2 or perhaps 4 cases, not having exceeded the five year limit, and I decided that it was not worth while to answer the letter unless I could point to cases of five years' standing or more, and so I did not answer it. I want to make a statement and a confession. I knew nothing about the anatomy of the pelvis until I performed the Wertheim operation. I have learned something about it since that time. In the first place, I have learned the difference

between a lymphatic gland which you all understand and a lymph node. Another thing, you occasionally get a lymphatic gland enlarged at the brim of the pelvis, and that patient, if operated on, probably gets well, and you may find perhaps that the case was not carcinoma at all; that the gland was not carcinomatous. You go a little farther down in the anatomy of the pelvis, and I have found one case of anomaly of the uterine artery, or its absence on the right side. Pursuing the dissection along the area below the uterine artery, where it crosses the ureter, and section of the pelvis between that and the obturator foramen down to the vagina is the part which is yet somewhat interesting to myself. The recurrence is usually, first, in the vaginal wall. If we are careless and do not freely excise the vagina, that is the first place where we get a recurrence of the disease. I am not discouraged in operating on these patients. I have some few cases to report, and as Dr. Bovée has pointed out, we know that after the average operation our patients die of recurrence in from six months to two years. No matter whether we pursue the vaginal or the radical abdominal method, we have that experience in the aggregate. I know that my patients after a radical operation live many years longer than they would have lived without operation, and to that extent I am encouraged to go on doing these extensive operations. At the same time, I am not unmindful of the fact that the cautery in the delayed cases is far more desirable than any other method.

Dr. William P. Graves (by invitation).—If I may be permitted, Mr. President, I should like to present my personal statistics on cancer of the cervix, inasmuch as in the absence of Dr. Newell nothing has been heard from my part of the country.

I have performed the Wertheim operation for cancer of the cervix in 18 cases covering a period of nearly four years. I have followed the Wertheim method very closely, having had the good fortune to have as an assistant Dr. Hutchins, a former resident in Dr. Kelly's department at Johns Hopkins Hospital. Dr. Hutchins had learned the technique from Wertheim himself. The only modification I have made in Wertheim's method is in the matter of preliminary curettage. Wertheim curetted at the time of the operation without ether. I have found it more advisable in my cases to curette first under ether and then

treat the patient for about a week with weak formalin douches. The vagina is treated with tincture of iodine immediately before the main operation. I feel quite sure that the fact that my cases have been entirely free from sepsis is due to this method of preparation.

I have followed all my cases very closely. I always tell my patients that I have operated on them for cancer, and I admonish them to report to me either personally or by letter every two or three months.

I have seen all the living cases within two months. Of the 18 cases I have had a primary mortality of 2, or 11 per cent. One death was due to the fact that the case was an inoperable one and the patient died in thirty-six hours after the operation. The second operation was due to carelessness in technique. A deep metallic retractor tore the iliac vein. This rent in the vein was sewed up but gave way later and the patient died from secondary hemorrhage six hours after the operation. Wertheim does not use metallic retractors. His assistant retracts entirely with the hand. This is an excellent method, but requires an extremely skilful assistant.

Of all the 18 cases that I have operated on 10 are living without recurrence, while 8 of them are dead. Two died soon after the operation as described, and 6 have died from recurrence. The recurrence in these cases followed very severe cases of carcimona, and in all instances the carcinoma had invaded the anterior wall of the vagina and implicated the bladder. These are the most unfavorable cases as regards recurrence. The ten living cases without recurrence range from nearly four years down to six months.

As regards post-operative complications I have had 1 case of fecal fistula which is now nearly healed at the end of a year. This woman was immensely fat and had severe pelvic inflammatory disease of long standing, so that it was impossible to avoid injuring the rectum. I have had 1 case of permanent urinary fistula in a patient who died later from recurrence. In no case has the ureter been permanently injured. In some of the cases the bladder was injured or resected during the operation, but after sewing it up carefully there was no leakage later. There has been no sepsis in any of the cases. The convalescence as a rule has been very good, and has simulated closely that of supravaginal hysterectomy.

Dr. Hugo Ehrenfest.—May I be permitted, Mr. President, to point out a fallacy in the explanations offered for the strong difference in the percentage of still operable cases reaching German and American operators. Early diagnosis, of course, is the crucial point, and education of the public undeniably leads to early diagnosis. I wish to emphasize the well-known fact that the public at large in European countries is far below the standard of intelligence in this country, illiteracy is much more prevalent. And, therefore, the striking fact that the sufferers of cancer reach the European operators so much earlier cannot be explained by the statement that this is solely due to the better information, to the better education of the European public. In my belief, this striking fact is also dependent upon the existence of "Frauenkliniken," an institution well known, well advertised to the public, where women know they can find true gynecologists interested in all their ills, whether surgical or not. Does the fact, in your opinion, that Johns Hopkins has such a strikingly high percentage of operable cases, comparing well with Europe, prove that the people of Maryland or Baltimore are better educated, or are you willing to accept my explanation that the frequency with which early cancers appear in the Johns Hopkins Hospital has a great deal to do with the fame of the institution and with the fact that men like Kelly or Cullen, etc., are the men who can be consulted there. If in this country gynecology shall be eliminated as a specialty, and if every woman should be forced to consult a general surgeon for every symptom, however unimportant in her own belief, I am afraid, then, the time is not far distant when the percentage of operability will be lower than it is at the present time.

Dr. E. E. Montgomery.—My experience in the treatment of cancer assures me that much is yet to be learned for the pathologist and as to the best methods of its treatment. I have seen numbers of cases in whom the progress of the disease was such that I had little or no hope of freedom from recurrence, and yet I have operated on such patients, by either a vaginal or abdominal operation, as the condition seemed to warrant, and have found that many have lived for a number of years, and some of them are still living after ten years without subsequent indication of the disease. I have seen other cases where the disease occupied either the body of the uterus or

the vaginal portion of the cervix, in which it was apparently
slight, justifying the hope for a radical cure, and yet within
a few months thereafter a recurrence of the disease and death
of the patient would follow.

There is no question as to the advisability of doing as
radical an operation as possible, of operating in healthy tissue,
getting beyond the diseased areas, or those in which the disease
usually manifests its tendency to recurrence. In carcinoma of
the cervix, as in carcinoma of the mammary gland, it is not an
unusual thing to find a blocking of the lymphatics, which leads
to regurgitation of the lymphatic fluid, and carrying back of
the disease, so that we may have secondary involvement and
recurrence in the vagina at a point rather remote from that in
which the disease was originally found. For this reason it is
important that as much as possible of the vagina should be
removed. I do not believe there is much advantage in the
removal or dissection of the lymphatic glands of the pelvis
in carcinoma. The investigations of Schauta and others have
demonstrated the fact that the lymphatic glands remote from
the uterus, those which are not readily removable, are quite
as frequently involved as those which are close to the organs,
and where we find there is lymphatic involvement it is likely
that the disease will recur there very shortly, and it makes no
difference how radical the operation may be. Again, it has
been demonstrated by what has been said here and by the
experience of many men, that the apparent involvement of
the lymphatic glands is not always necessarily an indication
of the disease being carcinoma, for in the secondary conditions
which are associated with the carcinoma the glands may be
infected from other conditions rather than from the carcinoma.
I have seen cases in which there has been apparent involvement
of the glands of the abdomen, and yet these patients have gone
on for a number of years without recurrence. I remember
very well a patient on whom I operated in 1900. The physician
with whom I saw this patient was rather inclined to resent the
fact that I had advised a hysterectomy. She was a single
woman, and had extensive carcinoma of the cervix. We oper-
ated upon her, and some three years afterward there was a
recurrence of the disease in the abdominal scar, without any
involvement of the vagina or other portions of the pelvis struc-
tures. This abdominal recurrence was excised with a consider-

able portion of the abdominal wall, and it was found that the mass of disease had extended to a coil of intestine beneath. The mesenteric glands in the immediate vicinity were involved. A portion of the involved intestine was excised, and an anastomosis made, the abdominal wound closed, and the woman again lived three years before recurrence occurred now in the vagina. Although there had evidently been lymphatic involvement in the immediate vicinity of the carcinoma, there was no recurrence or sign of recurrence in the mesenteric glands, but when the disease did recur it was in the vagina from which six years before the disease had been removed. So that I say we have much yet to learn as to the characteristics of cancer, and we do know why it remains latent for long periods of time and subsequently develops at points remote from those where it apparently originated.

Dr. Charles M. Green.—I would like to refer to a case which well illustrates the insidious invasion of cancer of the cervix, and then to say a word in the way of suggestion as to how women may be brought to medical observation in the absence of symptoms, or in the face of perhaps trivial symptoms which may be the first indication of uterine cancer—this in the line of civic righteousness, if you please, to which our President has invoked our efforts.

Sixteen years ago a lady came to my office with the statement that she was about to be married and would like to be examined to have it ascertained whether there was any physical reason to forbid it: she was a widow and had had one child. Inquiry as to symptoms evoked the statement that as far as she knew she was in perfect health, the only unusual occurrence being that she had flowed a little more than usual at the last two preceding menstrual periods. Examination revealed an undoubted case of cervical cancer. Since I was to leave town for the summer on the following day, I referred the patient to a colleague, who removed the uterus by the vaginal route. The lady subsequently married; but I lost sight of her until recently, when I saw her in consultation with her family physician with a view to diagnosis of an abdominal tumor. It appeared that she had been in good health for sixteen years, and only recently had sought advice on account of rapid abdominal enlargement. There was no evidence of cancer in the pelvis; but there was found to be a general abdominal carci-

nosis, from which condition the patient died shortly afterward. I suppose it is fair to presume that the abdominal cancer was in no way a recurrence from the cervical cancer removed six- teen years earlier; but the case is of interest from the fact that the only warning subjective symptom of the cervical cancer was the occurrence of a somewhat increased menstrual flow on the two months prior to seeking advice as to a second marriage.

What can we do, what ought we to do, in the way of early diagnosis of uterine cancer? We all know that successful treatment of this dread disease, as well as of the toxemias of pregnancy, depends largely on early diagnosis. We know that cancer of the corpus uteri develops slowly and metastasizes late: there is time for the diagnostic curettage and microscopic examination of scrapings; but we also know that carcinoma of the cervix metastasizes rapidly, and that unless treated early surgical results are at least doubtful.

In a recent popular lecture, in the course given each year by the Harvard Medical School for the instruction of the lay public, I advised that every woman who had borne a child, whose cervix had not been repaired by trachelorrhaphy or removed by amputation, should present herself to a competent physician for examination as often as once in six months. To some minds this advice will doubtless seem absurd; and yet doctors of dental medicine advise that we should all report for the inspection of our teeth at least at six months' intervals. The well-to-do can surely afford the expense of two examina- tions a year; for the poor there is ample provision in numerous out-patient clinics. If all women with torn and unrepaired cervices would present themselves for inspection once in six months, early diagnosis could easily be made and timely sur- gical treatment instituted. I shall be glad if this Society can suggest some better plan for the early detection of cervical cancer.

DR. SIDNEY A. CHALFANT (by invitation).—In Dr. Simpson's clinic in Pittsburg it has not been his custom to do the radical Wertheim operation. In the cases embracing the five-year period we have had 30 cases admitted. Of these only 9 were suitable for the radical operation. Of these 9, 3 died as a result of the operation. One died of pneumonia at one year; 1 died in five years from recurrence; 1 died at the end of five and a half years. This is the sixth-year period rather than the five. Of the 9, there are 3 living and well at the end of six years.

In regard to the discussion of the Byrne operation, of the 30 cases, 4 that were considered inoperable, so far as the radical operation was concerned, had high amputation of the cervix with the cautery. Of these 4, 1 is living and well at the end of seven years; another is living and well at the end of six years. This case was rather interesting. She came in at the end of four years, during Dr. Simpson's absence from the city, complaining of an inguinal hernia. We operated for the hernia and had the opportunity of examining the pelvis and found no evidences of cancer at the time, and she is still living and well.

The technique of the operation is very similar to Dr. Werder's technique that he described recently, except we do not use the Downes' clamp on the uterine artery. The cervix is curetted and cauterized and closed and circumcised with the cautery, and the operation completed from above, as in the ordinary complete hysterectomy. In certain cases, where the patient does not seem to be a good risk for the combined operation, the vaginal operation has been done, but the exact percentage of those I cannot give you at this time.

DR. GEORGE H. NOBLE.—I will give briefly the result of a little work I have been doing. It was my intention to send an account of it to Dr. Cullen, but I did not receive my reports early enough. For this reason he did not include it in his paper.

Of late I have not been doing as much work in carcinoma of the cervix as formerly because of discouragement from reported recurrences and because the operation I have been doing is very radical and was performed with a feeling of protest. In looking up the statistics a short time ago I was much surprised to find they were much better than expected. The cases operated upon over five years ago for carcinoma of the cervix were 38 in number. Of these, 13 are living, 6 were untraceable and are recorded with those that are dead. This is fair perhaps because if they are untraceable they are very likely in another world. There was 1 death due to operation. It may be a matter of some interest to state that in 2 the external iliac artery was resected on one side; in 3 ureters were resected; and in 6 cases I resected the bladder.

These cases were in my private practice, having made no effort to trace those seen at the college clinic or city hospital. In Atlanta we have a large floating population, and there were

so many negroes who change their names every time they move, we cannot tell where they are and what has become of them.

Years ago it was my practice to scrape off the necrotic tissue and cauterize, but it required time and caused bleeding. Now I cauterize deeply with Downes' apparatus. The abdomen is then opened and a thorough eradication of the disease is done. The round ligaments are tied off close to the internal ring; the ovarian arteries ligated well out to the side of the pelvis; and anterior branches of the internal iliac are tied. Then the leaflets of peritoneum are turned up, and the pelvis cleared laterally to its side walls and downward to the levator muscle. Iliac glands are removed when necessary, the dissection extending above the brim of the pelvis.

I think in a great many cases recurrence of the disease is due to the fact that we do not sufficiently clear out the lymphatics and the vessels in the lower border of the broad ligaments deep down by the side of the vagina nor remove enough of the vagina and bladder. When this feature of the technique was properly executed the results were better. Upon the other hand, recurrence in the scar at the edge of the vagina and the bladder were not uncommon observations.

At the meeting of the Southern Surgical and Gynecological Association two years ago the question of ligating the internal iliac artery was freely discussed. It was suggested then that it endangered sloughing of the bladder. I raised the point that it was not due to ligation of the artery so much as it was to the fact that the muscularis is often separated from the bladder mucosa, interfering with its circulation to such an extent that the blood supply is not sufficient to sustain life and sloughing occurs as a natural result.

DR. CLARK (closing the discussion on his part).—I have very little to say in conclusion further than this, that the statistics that have been brought out point in my mind to the fact that we may use at the present time more discretion in the type of operation we select than we have done heretofore. In the earlier cases perhaps we may do a very radical type of operation, but in the more advanced cases, where before we have ventured to operate radically, we should resort to the method of the cautery. In other words, my opinion today, after this discussion and after my review of the literature, is that

I can be a little more liberal in my choice of what operation I do. If you compare von Ott's 15 per cent. from simple vaginal operations with Wertheim's absolute cures of 19 per cent. there is not such a wide difference as one might expect. Therefore, I shall not be as unjustly radical as I have been in former years.

Dr. Peterson (closing the discussion on his part). As far as I am concerned, von Ott's statistics of 15 per cent. permanent recoveries after vaginal hysterectomy for cancer of the cervix is of no value to me, since I am able to save permanently only the exceptional patient by this method.

As I stated in my paper, I do not like the radical abdominal operation for cancer of the uterus on account of its high primary mortality. The only reason for my persisting with the operation is that through it I have saved far more lives than I can by any other method.

This discussion has been very interesting to me, and has given me much encouragement. It will lead me to further extend the operation to apparently hopeless cases, for my own experience and the testimony presented here today show that one cannot tell which cases are going to permanently recover, for as much depends upon the type of carcinoma present as upon the extent of the disease.

Dr. Howard C. Taylor (closing the discussion on his part).— I have enjoyed this discussion very much this morning, and I have received a great deal of help along certain lines, as I felt discouraged with regard to the end-results of the operation.

Those of my friends in New York, whom I see frequently will excuse me if I go back to an old subject that I have talked about many times; that is, the necessity of education of the public at large as well as the medical profession in order to get these cases early. It does not make any difference what operation we so, if we do not get the cases early we cannot cure them. Take the statistics I reported today from the Board of Health of New York: 75 per cent. of the cases had no operation whatever; 25 per cent. having had a hysterectomy only. As these 25 per cent. include the cases of carcinoma of the fundus as well as of the cervix, also a certain number of cases were operated on purely to relieve symptoms. They show the small percentage of cases of carcinoma of the cervix that are seen early enough to be considered operable. The problem is

not merely to get a few cases early enough to operate but to so handle the subject that the entire community will have the benefit of such knowledge as we have on carcinoma of the cervix, and this I believe is only by further education on the subject directly to the women themselves. Dr. Green used the same argument I have often used, namely, we consider it necessary to go to a dentist once every six months, in order to have our teeth examined, merely to avoid a cavity or the losing of a tooth. Think what it means to a woman to know early if she has a carcinoma of the uterus. It is a question of life, and not one of losing an organ. It is a thing that can be determined easily, and if the woman knew how much it meant to her she would be willing to submit to interval examinations.

Dr. Taussig (closing the discussion on his part).—My report was presented as the work of Western surgeons. Perhaps that term is a misnomer in so far as all but 5 out of the 60 operations included in this tabulation were done by St. Louis gynecologists. Most of these men are well known to you. They did the typical operation; I have witnessed their work, and know that the cases included in this list are actually the radical abdominal operations. The subject received a great deal of discussion in St. Louis, particularly in 1902 and 1903 at several of our meetings, so that there is no question as regards the character of the operation that has been done by these men.

In the second place, I want to tell you something about the educational work that we are doing in St. Louis. We are in a particularly fortunate position in having at St. Louis a hospital which is devoted primarily to the treatment of cancer cases, and it is also a free hospital, the Barnard Skin and Cancer Hospital. Dr. Gellhorn and I have been particularly interested in this educational problem, and we have had the permission of the Board of Directors to institute a systematic education of the public and of the medical profession of Missouri. We are at present confining our efforts to Missouri, but we have, or hope to have, some comparative results in five years from now which will show the result of this educational movement. The manner in which our education is carried on is three-fold. In the first place, the various county societies are interested in the subject, and members of the staff go to the county societies and deliver talks, usually not merely upon the subject of cancer of the uterus, because that is only one of the

many forms of cancer concerning which education is necessary, but upon the subject of cancer in general. The second form of education we have employed is that of educating nurses. I have given two talks in St. Louis, one before the Graduate Nurses' Association, and the other before the Visiting Nurses' Association, impressing upon these bodies the early symptoms, particularly of those forms of cancer which appear in women, breast, and uterine cancer. Concerning uterine cancer I have had printed a small leaflet which is so worded that it can be safely distributed by them among such women a they may have occasion to visit for other purposes. The visiting nurses particularly are distributing among the women of the city literature concerning tuberculosis, and, at the same time, leaflets concerning cancer may be distributed with propriety. In the third place, we have been bold enough in St. Louis to have lectures given by members of the medical profession before the laity. I feel that we have heretofore been very remiss in our duty. We have been afraid of what our confrères would think of us. Much good can be accomplished in getting cancer cases early by such systematic public instruction.

DR. CULLEN (closing the discussion on his part).—When Dr. Neel undertook to find out the after-results in cases where a Wertheim operation had been performed my colleagues were very pessimistic, but as the reports came in their pessimism gradually disappeared and when the results were tabulated all felt that the operation was well worth while.

I agree with Dr. Peterson that this is not an operation that we are eager to perform.

In answer to Dr. Peterson's query as to the kind of letter I sent to the general surgeons I may say that some months ago the Secretary of the Society assigned to me the task of finding out as far as possible how many of the surgeons of the South had been performing the Wertheim operation in cases of cancer of the cervix and what results they had obtained. It was impossible to cover the ground completely, but I wrote most of those men in the South belonging to the American Gynecological Society and to those of the Southern Surgical and Gynecological Society. A large number replied. The majority of the general surgeons said that few of these cases come to them.

I think you will agree with me that an extensive Wertheim

operation for the removal of cancer of the cervix is the most difficult operation in the realm of abdominal surgery and that surgery in the upper abdomen by comparison is child's play. We have listened to the report of some most excellent results by means of the thorough use of the cautery, and I think it might be advisable for those who have obtained such good results in this manner to continue to use the cautery, while those who feel that the Wertheim operation offers the best chance continue to employ the abdominal operation. A comparing of the results each year at our Society will soon determine absolutely which is the better procedure, and then the better of the two methods could be adopted, or it might be found that for one group of cases the cautery was preferable while in another group the Wertheim would yield the better results.

There is absolutely no reason why the majority of the women in the United States should not be made aware of the dangers of allowing cancer to advance to the inoperable stage. True we can accomplish some good by talking before small societies, but why not go in for the wholesale education of the masses. We have in this country weekly magazines that have tremendous circulations, magazines whose editors are aiming to do all they can for the welfare of the country. I need only mention such publications as the *Ladies' Home Journal, Collier's Weekly,* that has done so much to educate the masses along medical lines, and the *Saturday Evening Post.* Carefully written and well illustrated articles dealing with cancer of the uterus and worded in such a way that the reader could thoroughly understand what was meant without the article being too technical or creating alarm would do far more good than any number of resolutions or medical addresses that might be delivered. There is no doubt that it is through this avenue that the education of the laity must be carried on.

Dr. Bovée (closing).—I want to emphasize again the very small percentage of operable cases among those that are seen; also the necessity for studying the characteristics and the life history of cancer of the uterus. These are two important points.

I should like to say with reference to getting patients to report after operation, that my experience has not been very optimistic. Patients will come back frequently and regularly for one or two years in such a matter, and you tell them each

time they are all right; that there is no trouble; that they must come to see you again at such and such a time, and the fact of the matter is they tire of coming. Nevertheless, it is very essential to go after these patients if you wish your information. I have patients from whom I get information by meeting them on the street and asking them questions, and they say to me, " I am felling perfectly well; I guess there is no trouble going to occur there." I think we would do very well to occupy a whole day's discussion in going over this subject, have it all worked out systematically, and different men detailed to bring out certain phases of the subject and get statistics from the members of the Society, and let each member of the Society be stimulated from now on to keep accurate statistics, and the man who is detailed by the Council to bring out the statistics of a certain feature of the subject should get the data promptly contributed by each member of this Society.

A CONSIDERATION OF THE MODERN METHODS OF TREATMENT OF PROLAPSUS UTERI WITH THEIR ADVANTAGES AND DISADVANTAGES

By E. E. Montgomery, M.D.
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THE organs of the pelvic cavity are retained by a combination of suspension and support, nicely adjusted to meet the normal conditions, but abnormalities in size, position, and pressure are prone to disturb the finely balanced relation and result in prolapsus or hernias. The importance of these deviations from the normal depends upon the form of protrusion. Thus it may affect the anterior portion of the vagina, producing a preuterine hernia or cystocele, a protrusion of the uterus into or through the vagina; the uterine hernia, prolapse or procidentia according to its extent; the post-uterine hernia, the rectocele, which is to some degree associated with more or less diastasis of the levator ani muscles. These various conditions may occur in the nullipara or the multipara, though more frequently in the latter. As age advances, should the woman become thin, the loss of adipose in the parametrial structures favors prolapsus.

The changes which result from traumatism, from age, and from progressive changes incident to prolonged prolapsus, produce conditions incapable of being restored to the normal, and the best that can be done is to so utilize

the structures in order that the organs may be replaced and maintained in position with as little disturbance and sacrifice of function as possible.

The problems involved in assuming proper support are not always dependent upon the extent of the lesion. A protrusion, or sagging, of the anterior segment of the pelvic floor may demand a much more extended operative procedure than a more severe lesion confined to the posterior. Displacement of the latter, indeed of the entire pelvic organs, as Wylie has indicated, may be less marked when the posterior segment is torn through the sphincter than when that muscle remains intact. The unapposed and increased intra-abdominal pressure necessary to overcome the sphincter necessarily results in eversion of the vaginal walls, and, unless fixed, of the uterus. Increased weight, and deviation of the uterus from its normal position, especially retrodisplacements, aggravated additions to the intra-abdominal pressure, whether due to manner of dress, increasing adipose in omentum and mesentery, abdominal growths, severe constipation and loss of support of the posterior pelvic floor, whether from laceration or muscular relaxation and atrophy are all important factors in the production of the displacement under consideration. It becomes evident that this field affords excellent opportunities for the exercise of the ingenuity of the surgeon in the adoption of the proper means to secure the desired end. In some cases he need only to lessen the external pressure, regulate the diet, secure regular action of the bowels, and employ a mechanical support until a large uterus has undergone complete involution.

Many cases will come under observation in which it will be necessary to secure reduction in the size of a heavy uterus by rest, curetting, a trachelorraphy, or amputation of the cervix, and to give it support by restoration of the posterior segment of the pelvic floor. Our fathers, it has

been thought, overestimated the value of the perineum as
the keystone of the arch in the maintenance of the integrity
of the pelvic support, but the question with some of us
today is, whether they did not confine their operations too
exclusively to the outlet. The more or less complete isola-
tion and special suturing of the levator ani muscles, as
emphasized by Latzka, Tandler and Halban, and practised
for many years by Channing E. Barrett and myself, is, in
my judgment, of extreme importance as the principal
measure in the less marked displacements, and as a supple-
mentary procedure in all severe cases, whether hysterectomy
is done, or the uterus retained. The operation is a recto-
vaginal interposition of the levator ani muscles and may be
accomplished by raising a flap of the posterior vaginal
segment which in some cases should be bluntly dissected
to the level of the ischiatic spines. This dissection must
not infrequently mean the pushing back of the peritoneum
from the retrouterine pouch. In three instances I have
seen a hernia develop above the interposition which in two
instances protruded at the vaginal outlet and led the patient
to believe that she was having a reproduction of the rectocele.

The more rapid convalescence, the decreased discomfort
associated therewith, and the absence of necessity for ex-
ternal excision has rendered the vaginal procedures, where
they give promise of accomplishing results, the elective
method in women who still desire to retain the reproductive
function. In some cases the disposition to sagging of the
anterior vaginal wall or cystocele may be overcome by the
plan of exposing the fascia and suturing the structures in
the lateral surfaces of the anterior wall, as suggested by
Hirst, in others a central resection of the protruding anterior
wall with separation of the bladder from the cervix and the
former anchored higher, thus preventing its continued
pressure on the contracted anterior vaginal wall. In such
cases the Stoltz or purse-string suture should be rarely,

if ever, used. The interrupted sutures are preferable and should be first secured near the cervix so that the tying of each successive suture should push back and upward the cervix.

Goffe and Watkins have devised procedures to greatly extend the efficacy of vaginal procedures, but in the latter particularly, special measures should be instituted to insure sterility. In Goffe's operation the extensive separation necessary to shorten the ligaments for anchoring forward the uterus is not free from danger in the possibility of injuring ureters, opening up extensive venous plexuses, and the possibilities of pelvic infection. The extensive inflammation and adhesions will not infrequently prevent the fecundity it is designed to preserve. Where there is much disposition to prolapse, the uterus, unless the vagina is lengthened and braced by a pessary, will drag upon its anchorage, and sooner or later result in a reproduction of the displacement.

The Watkins operation brings the uterine body through a transverse and vertical incision in the anterior fornix of the vagina when it is secured beneath the bladder in the incision made by dissecting the flaps of the vagina which subsequently cover it.

The Schauta-Wertheim operation, also called vesico-vaginal interposition of the uterine body, is a modification of this operation. Watkins advised sufficient separation of the bladder to permit the uterus to be brought through and covered by the vaginal flaps, but Stoeckel, discussing the Schauta-Wertheim procedure, says this is incomplete, and that unless the cystocele sac is completely shoved up from the broad ligament as well, a spacious recess will remain *in situ* on either side of the uterus, and such patients are doomed to a relapse. The separation by blunt dissection is often impossible, and when it can be accomplished may be inadvisable because of the hemorrhage from lesions of

the paravesical and uterine veins. Stoeckel advised that injury of the ureters should be avoided by cutting with scissors the vesical pillars, after which the separation can be readily completed. The procedure is of limited application. It should be limited to the senile uterus, or to women with small uteri in whom production is undesirable. Not every uterus can be readily interposed, especially where the cervix is long or where the ligaments are shrivelled and unyielding. The uterus which is forcibly brought into ante-version has an inclination to resume its former altitude and a portion of the bladder becomes displaced in front of the uterus, which becomes a cause for dribbling of urine when the patient is on her feet, or during coughing, sneezing, or laughing. Similar action may occur when the fundus is not brought sufficiently close to the base of the urethra, while on the other hand Watkins urges that it be not brought too close for fear of pressure on the canal and obstruction to the flow. In large uteri both Watkins and Stoeckel advise the removal of the fundus and part of the body. Pfannenstiel employed the kiel-shaped excision of the fundus. Watkins says the twisting of the broad ligament incident to its interposition raises the organ and lessens the inclination to protrusion, but the uterus is sometimes so small as to exert no influence in supporting the cystocele, and in others prolapsus of the uterus, vagina, and bladder recurs. The procedure should always be supplemented by the recto-vaginal interposition of the levator ani muscles. In 68 cases in which this operation or a modification of it was done, Watkins reports that an examination was had in 49, of which in 42 a satisfactory result was obtained.

In many cases the operation suggested by Dudley would seem the simpler procedure. After amputation of the cervix, the base of each broad ligament is cut close to the cervix through the incision and dissection for colporrhaphy, and is secured in front of the cervix and covered with the retracted

vagina. The broad ligament thus placed pulls backward and upward on the cervix, and as a consequence the other end of the lever, the fundus, falls forward. Despite our efforts to use the muscles and structures of the pelvic floor, it is evident that there are many cases in which the position of the uterus and the relaxed condition of the structures of the outlet allow the intra-abdominal pressure to become misdirected. The uterus in retroposition permits the pressure against its anterior surface and thus promotes the downward displacement. The round ligaments, where utilized to bring the uterus forward, permits the intra-abdominal pressure to be reflected from the posterior uterine surface to the bottom of the pelvis, which is supported by the tendinous structures of the perineum. If there is sagging of the bladder from loss of power of the cardinal ligaments, or dragging by the uterus because of its weight, or from relaxation of the uterosacral structures, shortening of the ligaments will be of little value. Shortening of the uterosacral ligaments in such cases as a supplemental procedure to the round ligament shortening would seem indicated, but in my experience the uterosacral ligaments when most needed are the slightest in evidence, and the process is little more than a peritoneal folding.

In the great majority of cases of prolapsus the condition will be found complicated by more or less elongation of the mesosigmoid and mesorectum, so that a considerable part of the large intestine will be situated behind the uterus adding to the pressure and promoting the extrusion of the viscera through the increased straining required to accomplish defecation. It has been my custom in the more marked cases of this character to plicate the peritoneum between the sacral promontory and the posterior surface of the cervix, securing these folds to the sides and front of the rectum when a shelf is formed on which the intra-abdominal force is directed toward the symphysis and anterior abdomen. Care

must be exercised in the conduct of this procedure that the ureters are not injured or constricted.

The operation devised by Polk, which consists in a median incision through the vesico-uterine fold of peritoneum and exposure of the surface of the vagina by blunt dissection, after which it is plicated by three or four transverse sutures is a promising procedure for sliding of the anterior segment of the pelvic floor. It throws the cervix backward and affords additional support for the bladder when supplemented by shortening of the round ligaments and plication of the uterosacral ligaments as he suggested, or perhaps better, of the posterior peritoneum, it leaves but little to be desired. In large uteri, following or near the menopause, Polk advocates to follow the plication of the vaginal with supravaginal hysterectomy and to close the stump by transverse sutures, after which the uterosacral ligaments are secured to it, the right to its left side, and the left to the right side.

M. Brenner (*Monatssch. f. Geb. u. Gyn.*, xxxiii, 1911, 464) describes an operative procedure which embodies the principles laid down by Polk. After a pointed oval incision of the anterior wall, the plication of the bladder by a subvaginal circular suture he closes the vaginal resection by transverse sutures, exposes the belly of the levator ani muscles, uses several buried sutures in the muscles without isolation of their fibers, removes a triangular section of the posterior vaginal wall, and unites the vaginal and peritoneal surfaces with transverse sutures. He then opens the abdomen with a Pfannenstiel incision, makes a transverse peritoneal incision and separates the parts by blunt dissection, thus reaching the diverticulum of the bladder sutured from below and over the median suture in the vagina, he bluntly separates and raises the vesical ends of the ureters from their inner layer. A needle armed with a catgut suture is passed from within, taking up as much as possible of the infra-ureteral structures and passed back from without,

beneath the ureter taking up the structure near the uterus. The same course is pursued with the other end of the suture on the opposite side. The tissues are thus brought together and tied without compressing the ureters.

Various efforts have been made to overcome the tendency to prolapsus by ventral fixation of the fundus or of the stump after supravaginal hysterectomy, but when the pelvic floor is relaxed, or the uterosacral ligaments out of commission, the uterus drags upon its anchorage and the procedure proves ineffective. Fixation of the stump makes undue traction, and unless the relaxation is marked interferes with the distention of the bladder, and without plastic surgery on the vagina finally will prove ineffective. A woman suffering from severe prolapsus whom I subjected to such an operation many years ago returned two years later with a hernia from the vagina which had occurred behind the still firmly secured stump. The same objections hold to the operation in which the round ligaments are severed near their exit from the abdomen and with the uterus raised in the abdomen, the proximal portions of the ligaments brought through stab wounds of the muscle wall while the uterus is held against the anterior abdominal wall by the sutures closing the peritoneum, or the intramural sequestration and abdominal fixation of the uterus as suggested and performed by Philander A. Harris, and also practised in a modified form by Soliero. If the prolapsus is marked, the uterus large, or cervix or vagina edematous and their mucous covering broken by gravity sores, hysterectomy would seem the wiser procedure, and the vaginal route the obvious course. The excision should be so planned as to include the redundant vaginal wall and may be made while dragging upon the cervix with fixation forceps by carrying the knife around the cervix posteriorly at the cervicovaginal junction and forward to just beneath the base of the urethra. The intervening vaginal wall is removed by blunt dissection,

and the bladder loosened and pushed back from the cervix. The uterine arteries are exposed, ligated, and the base of the broad ligaments cut. The vesico-uterine fold of the peritoneum is opened, and the fundus brought forward and each broad ligament ligated external to the tube and ovary, seized with hemostat above the ligature and cut between the ligature and the uterus. With the section of the peritoneum posterior, the removal of the uterus is completed.

The peritoneal surfaces beginning in front are now united by a continuous suture on a vertical line, keeping well above the ligatures on the broad ligaments. The stumps of the broad ligaments are made to overlap each other in the median line, and the anterior and posterior sutures so inserted as to take up the slack in the vesical and rectal walls. The suturing is completed by closing the fundus of the vagina on a transverse line and the anterior vaginal wound from above downward by either continuous or interrupted suture. The operation should be supplemented by rectovaginal interposition of the levator ani muscles and colpoperineorrhaphy.

PROLAPSE OF THE UTERUS

BY JOHN M. BALDY, M.D.
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DURING the recent Congress of Surgeons held in Phila-
delphia I had occasion to demonstrate the surgical cure of
several cases of prolapsus uteri, and was somewhat surprised
during subsequent discussion to find more than passing
interest manifested in the methods to which I had resorted
in order to secure a cure. The interest seemed so great
that it determined me to put together in a brief article
the several methods I am at present using and which have
been the outcome of some years of evolution in my work
on prolapsus of the womb.

Somers, of San Francisco, in a recent article, calls atten-
tion to the universal complaint of operators of recurrence
after operation, and, after dicsussing the matter from the
standpoint of operations which retain the uterus, asks,
"Why then remove the uterus when good results are obtained
by preserving it?" We were told by Emmet, and the early
operators, this same thing; in fact these men opposed
opening the abdomen at all, contending they could and did
cure these cases with plastic operations on the vaginal walls
alone. Almost the entire surgical world soon discovered
the fallacy of this teaching, and just as certainly is it true
today that even where the abdomen is opened there are
certain cases of recurrence in procedures which do not
include a removal of the uterus. A large number of cases
may readily be cured by the old Emmet methods of plastic
vaginal work; equally true is it that a certain number also

may be cured by operations involving the opening of the
abdomen, but which retain the uterus. It is for the remain-
ing cases, which recur in spite of these two procedures, in
which we wish to find an operation of certainty and pre-
cision, one which involves no more risk to the patient than
does the lesser one. The trouble here is that no one is able
beforehand to say whether or not a given case will recur,
and, consequently, there is the tendency, having found
one operation of comparatively sure result, to resort to this
operation continually; and this is proper. The answer to
the question of Somers and others of his way of thinking is,
in cases requiring the removal of the womb, that this organ
has ceased to be of further use and advantage to the woman.
By its removal not only is a better and surer result obtained,
but an organ is removed, which later on, in many instances,
causes not only annoying symptoms but also endangers
the woman's life from the possible development of cancer.
Its removal, therefore, is a distinct and positive advantage,
and if, in addition, a comparatively sure cure of the pro-
lapsed bladder, rectum, and vagina may be facilitated,
no amount of sentiment should be allowed to enter into
consideration.

The various degrees of prolapsus as well as the age of
the patient is constantly to be considered in deciding upon
the steps to be taken for its surgical cure, but whatever the
method chosen, thorough vaginal plastic work must be an
essential accompaniment to insure permanent success.
At this particular time I am not especially interested in
the discussion of this phase of the subject; suffice it to say
that I still remain a convert to the Sims and Emmet methods
of plastic work. The abdominal side of the subject is the
one which interested my audiences during the Congress,
and it is to this phase that I desire to devote the present
communication. I shall simply add that, in spite of all the
argument and discussion to the contrary, *I am personally*

unable in every case to assure all my complete prolapse patients of a resonably sure cure without the aid of an intra-abdominal operation. This being true in my own case, I have no cause to further discuss the matter with my more fortunate or more skilful colleagues. I have consequently sought for more certain methods and have only arrived at my present practice through a series of trials and failures. Exposition of the successive steps of this evolution is the excuse for this paper.

In 1895 I published a method of dealing with prolapse of the uterus,[1] with which I had been experimenting for some years, the essenital parts of which were a vaginal hysterectomy and fixation of the stumps in the vaginal vault. Concerning this, in 1898, I said, "The operation should be performed with ligatures and the stumps fastened into the vaginal opening so as to draw the vagina upward during the process of contraction and repair and give that organ a permanent support from above, which can be obtained in no other way." This operation in a few (very few) picked cases may even today have a place (Fig. 1).

Not getting as good final results, as a whole, as I desired, in 1898, after a few years of experimenting from the abdominal side, I published[2] a second method.

The procedure is in all essentials an abdominal hysterectomy by amputation at, or below, the internal os. The points to be observed are:

1. To include both the ovarian arteries and the round ligament in the first ligature on each side of the uterus.

2. To place this ligature as near the pelvic wall as possible so as to leave but a small amount of broad ligament behind with the stump.

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[1] American Text-book of Gynecology, 1895. W. B. Saunders, Philadelphia.

[2] Ibid., 2d edition.

3. To place but one other ligature on each side of the uterus, this ligature to include the uterine artery with as little other tissue as possible. This leaves both broad ligaments open.

4. To amputate the uterus as low on the cervix as possible.

Fig. 2 shows this part of the operation completed, together with the second step, namely, the placing of the sutures. A glance at this illustration shows the suture *in situ*, while a glance at Fig. 3 shows the suture tied with the parts drawn into place.

It will be noted (1) that the suture is composed of silk; (2) that in the course of its application it includes both the ovarian and uterine stumps *deeply* placed well *back* of the ligatures. These points are important, as considerable traction occurs when the sutures are tied, and unless these precautions are taken, the suture might tear out or the ligature on the stump become displaced.

It will be further noted that the sutures include the sides of the cervical stump.

It can readily be seen that the effect of tying these sutures is to lift up the stump of the cervix (together with the vagina) and to bring it in close approximation with the ovarian stumps, doubling the opened broad ligaments together as shown in Fig. 4. Of course, the portion of the broad ligament at the point of the ovarian stump will be drawn down somewhat, but the main effect is to lift to a high point the cervical stump and at the same time to drag up the vagina. Adhesion takes place throughout the full extent of the doubled broad ligament and most surprisingly firm support is given from above to the vagina.

Fig. 4 shows the peritoneum drawn together by a catgut suture over that portion of the cervical stump which remains uncovered after the two sutures are tied.

The result of the operation is as near perfect as is possible by any operative procedure.

The results accomplished are:

The weight of the heavy uterus is removed.

The overstretched vagina is lifted high up and held firmly in place.

The supports utilized are the natural supports of the uterus and the upper portion of the vagina, the broad ligaments.

The cervix remains a pelvic organ as is natural.

The immediate and remote result, as regards fixation of the upper part of the vagina, is perfect.

In cancerous or tubercular disease of the uterus the operation may be varied by performing a pan-hysterectomy. The vaginal mucous membrane is to be sutured together, closing off the vagina. The vagina can then be brought up and fastened to the stumps in a similar manner to the procedure in which the cervix was not removed.

This procedure is an excellent one in a large number of cases in which the vaginal procedure might not succeed, and it has the advantage, in that the parts can be the more accurately and snugly adjusted. And yet, in spite of all this, cases occur in which the relaxation is so great that with this operation the rectocele and cystocele are not drawn back into the vagina sufficiently far to insure a permanent result.

The same year and in the same work I published a further effort in the direction of permanent efficiency, and in connection with this operation stated, "Another and excellent modification of this operation is, after the uterus has been removed by amputation at or below the internal os, to fix the cervical stump to the abdominal wall at the lower angle of the abdominal incision by means of two silkworm-gut sutures passed through the full width of the cervix from side to side, and the free ends brought through the

peritoneum muscles and deep fascia of the abdominal wall, where they are securely tied together, cut off short and the knots buried when the incision is closed (Fig. 5). The open broad ligament should be closed by a continuous catgut suture on each side, preferably before the cervix is anchored by its fixation sutures." After the cervix is drawn up against the abdominal wall, there remains an exposed surface on its posterior aspect which is closed by suturing the cervical peritoneum to the peritoneum of the abdominal wall (Fig. 6). In cancerous or tubercular disease of the uterus a panhysterectomy may be performed, the vaginal vault closed and the vagina itself sutured to the abdominal wall in exactly the same manner. The abdominal wound is then closed in the usual way.

This operation is to be chosen when a very large amount of relaxation exists and the vaginal vault would not otherwise be lifted sufficiently high to give the requisite support. At about the time I published this operation, Polk published one quite similar, but I am, at this time, unable to find his original publication.

Experience with this operation taught me this fact, that it is possible to attach the cervix so far away from the pubis as to defeat the object desired. In the early days one case returned to me with the vagina again prolapsed and I assumed that the attached cervix had been torn from its anchorage. A second operation demonstrated the fact that the cervix was perfectly attached at the point of fixation, but that this point was so far away from the pubic bone as to allow the abdominal wall to be pulled in by the traction below and a repetition of the descent of the upper vagina. Since that time I have made the attachment as *near the pubic bone as it is possible to approach*, and no further failure has been recorded. I was asked during the Congress as to the danger of infection from the cervical canal at the point of contact with the abdominal wall, as this

canal was not closed, only cleansed with a pledget of cotton, wet with bichloride of mercury solution. In no case have I ever known of infection. Should such occur the open canal would give accesss into the vagina for any resulting suppuration.

It will be observed that any and all of these methods are only applicable to cases occurring in women past or near the child-bearing period of life or where it is desirable or necessary to sterilize the patient. The earlier procedures are adapted only to cases of moderate prolapsus. In the extreme cases, I have come to utilize the last procedure routinely, it makes little difference how advanced the age, and I have been enabled by its aid to practically guarantee a permanent result.

Prolapsus occurs in women in whom it is desirable to retain the child-bearing function, and in these cases, in the past, I have depended largely on plastic work with indifferent results. The operation I have been performing for some years to restore a retrodisplaced uterus by bringing the round ligaments posterior to the uterus (Figs. 7, 8, 9, and 10) was at first extended to those cases of retrodisplacement accompanied, to a moderate degree, by a prolapse of the vaginal vault. This operation is clearly demonstrated by the accompanying illustrations.

It will be noted by reference to the illustrations (Fig. 7) that the forceps perforate the broad ligament *close to the uterus and directly under the ovarian ligament.* This is essential to the best results. A too low perforation in the broad ligament will give an unsatisfactory result. When the round ligaments are adjusted and brought snugly together posteriorly the ovarian ligament rests on each round ligament and without so much as touching the ovary or Fallopian tube, always, and with absolute certainty, insures the proper and safe elevation of those organs. When the uterus is thrown forward by almost any other operation the ovaries

will usually rise in the pelvis with it and the displacement
of both organs will be corrected at one and the same time.
But every operator will recognize the fact that there is a
certain large group in which the ovarian ligaments are
relatively more stretched than those of the uterus, and in
spite of the fundus being brought up and held forward the
ovaries are still prolapsed.

The elevation of the ovaries is not accomplished alone
by the general elevation of the uterus, but is materially
aided by the rolling forward a quarter of a circle or more of
the top of the broad ligament, due to the pull backward
of the round ligament as it passes through the hole in the
broad ligament, and, the more the posterior pull of the round
ligament the greater the tendency to the rolling forward
of the top of the broad ligament and the consequent eleva-
tion of the ovary and Fallopian tube. I have in no case
seen this occur to such an extent as to in any way endanger
the patency of the tube. This whole mechanism is per-
fectly plain when seen in the living subject and is perfectly
compatible with every known mechanical law.

The second fact accomplished is that of the elevation of
the uterus and everything connected with it. This is brought
about, of course, on princples somewhat similar to those
which would be involved in grasping a boy in one's arms
and lifting him up. This requires fixed points from which
to act. In the operation, these points are the attachment
of the round ligaments to the abdominal wall, their attach-
ments to the fundus uteri, their attachment throughout
the whole course through the broad ligaments and finally
the artificial attachments made by the operator as they
are brought together behind the uterus and stitched to that
organ.

During the Congress, in one case, I further extended the
application to this operation to a case of complete prolapsus
of the uterus and vagina and found the result so satisfac-
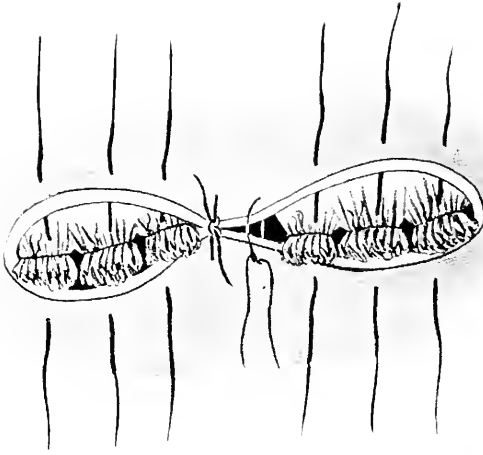
Fig. 1.—Stumps after vaginal hysterectomy, drawn down into vagina, while vaginal vault is pushed up. Suture in place for tying. Amer. Text-book of Gyn., 1895.

Fig 2.—Uterus amputated. Ligatures in place ready for tying. Amer. Text-book of Gyn., 1898.
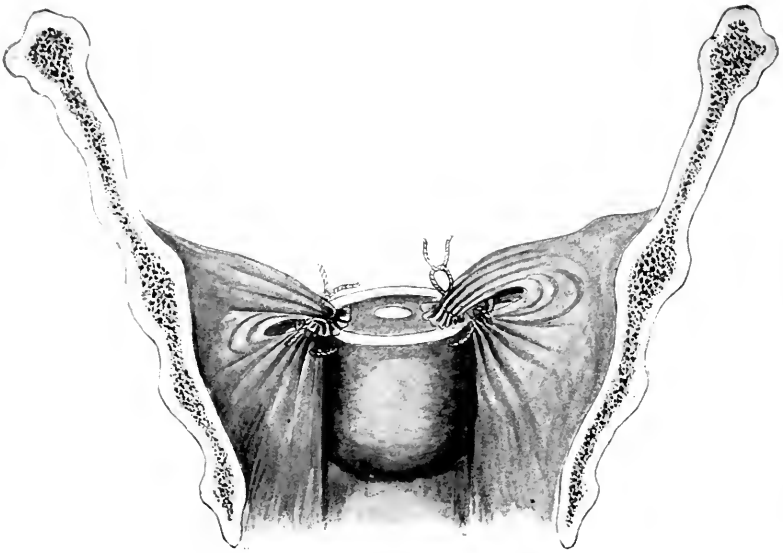
Fig. 3.—Ligatures tied; lifting up cervical stump; approximating
cervical stump and ovarian stumps. Broad ligament doubled upon
itself, burying uterine stumps. Amer. Text-book of Gyn., 1898.
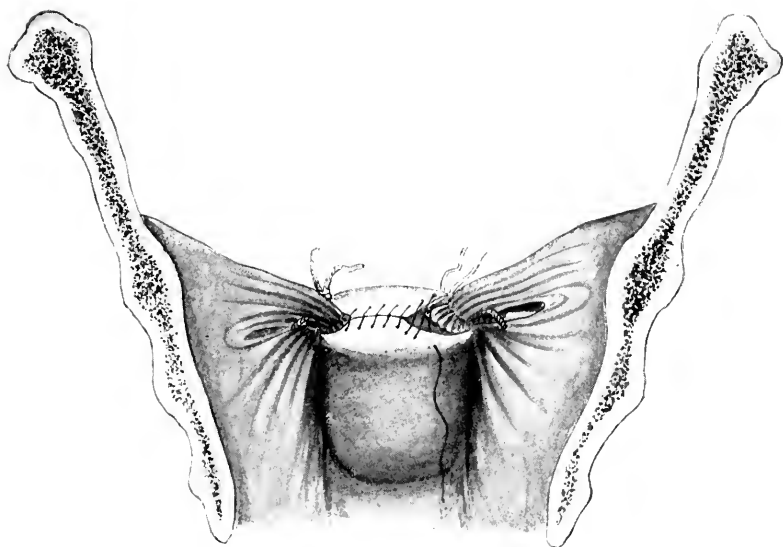
FIG. 4.—Peritoneum whipped over all, closing the wounds outside
the peritoneal cavity. Amer. Text-book of Gyn., 1889.
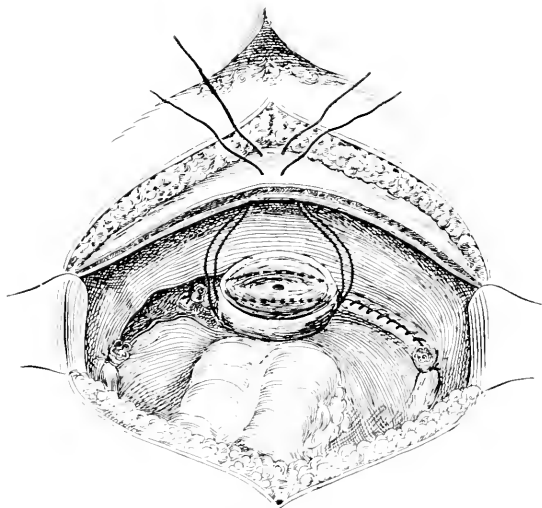
Fig. 5.—Uterus amputated at cervix. Sutures in place ready for drawing the stump up to the abdominal wall. Sutures (silkworm gut protruding through peritoneum, muscle and fascia ready to tie One broad ligament closed by a running catgut suture; the other broad ligament open.
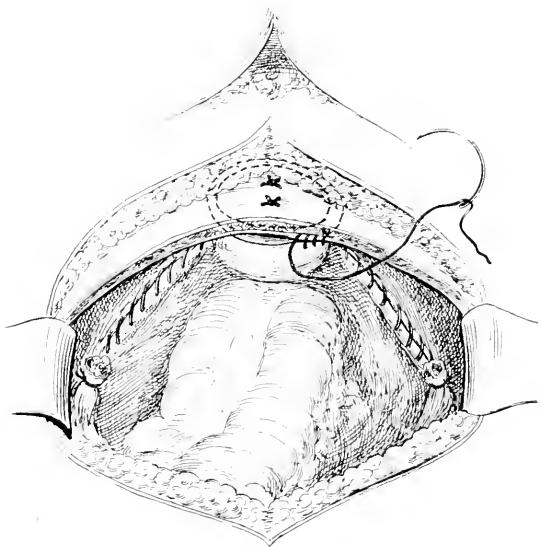
Fig. 6.—Cervix drawn into place and sutures tied; the knots resting on the abdominal fascia. Both broad ligaments closed. The exposed surface of the cervical stump in process of closure by a running catgut suture, uniting the peritoneum of the cervix with the peritoneum of the abdominal wall.
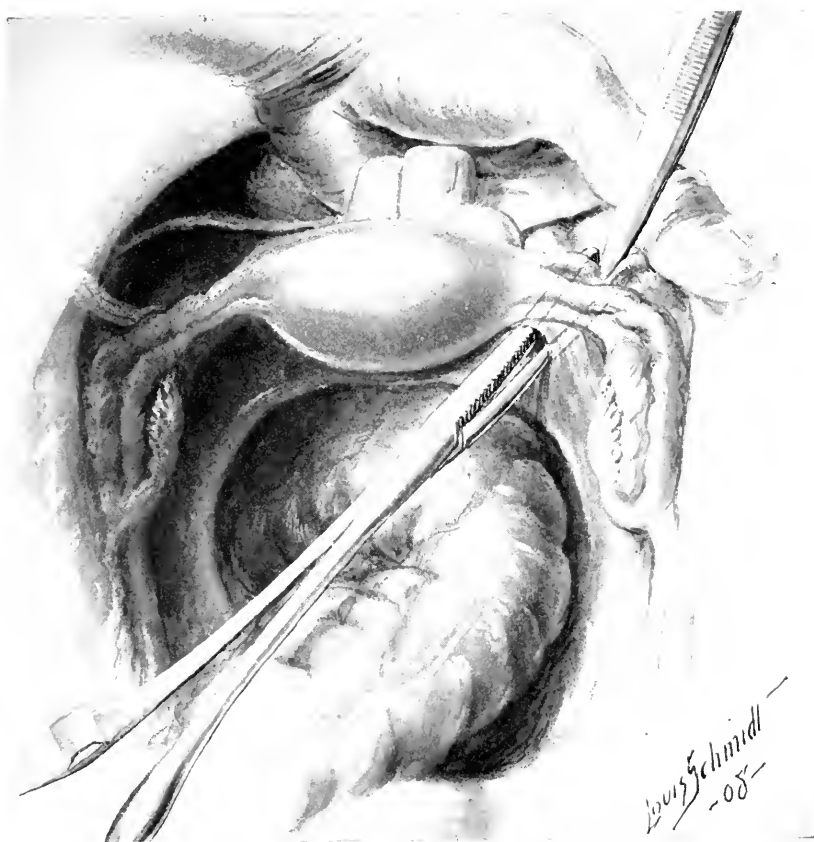
FIG. 7.—Here is seen the hemostatic forceps perforating the broad ligament from behind to its anterior aspect on which lies the round ligament. A pair of tissue forceps are grasping the round ligament and carrying it into the bite of the perforating hemostatic forceps.
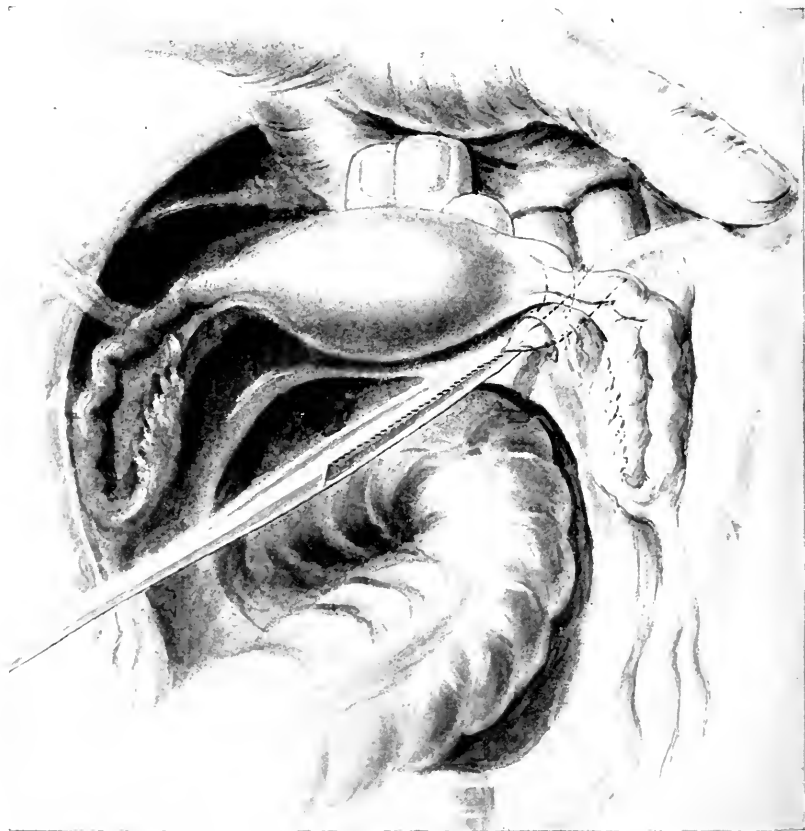
Fig. 8.—Shows the round ligament in the grasp of the hemostatic forceps and in process of being drawn through the broad ligament to its posterior aspect.

FIG. 9.—Shows both round ligaments drawn to the posterior portion of the broad ligament and approaching each other.
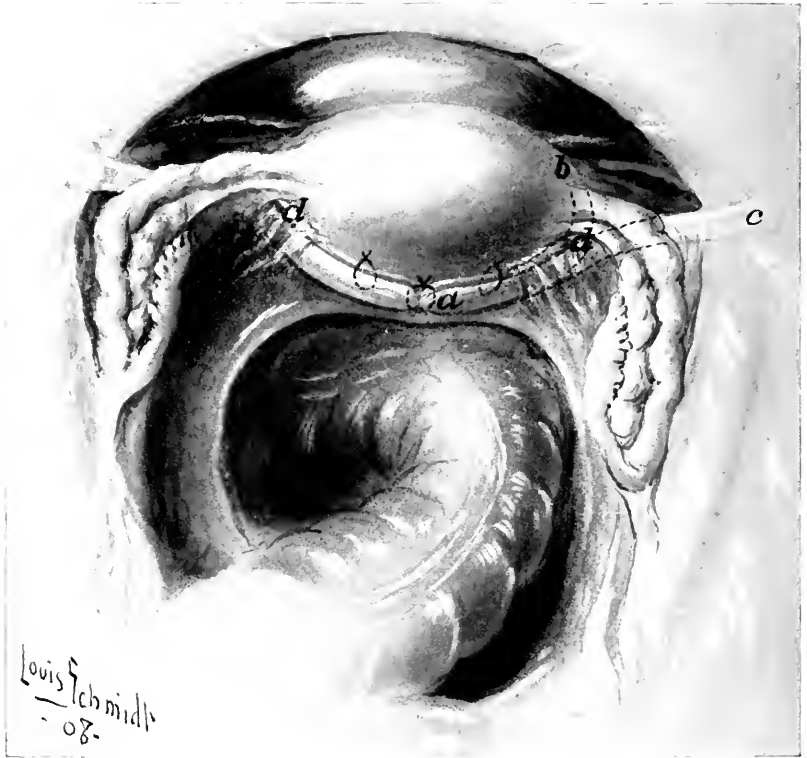
FIG. 10.—Shows both round ligaments united to each other, and at two points to the uterus itself, and the operation is completed.

tory that in future, in such cases, I shall use it extensively. Anyone who is in the habit of performing this operation for displacements will readily realize how thoroughly it elevates the pelvic organs and retains them in place in such a firm manner as is possible by no other operation performed for displacement. It gives exactly the support above to supplement the plastic work, which has been sought so long; a support perfect in its accomplishment and perfectly safe to the child-bearing woman.

Incidentally I wish to call attention to one other point which has hitherto remained unnoted in connection with this operation for retrodisplacement.

Recently in several cases in which the operation has been performed there has existed an inguinal hernia. When the round ligaments had been adjusted to the posterior part of the uterus it was found that the opening into the inguinal canal had practically disappeared. The pull on the ends of the ligament had brought the borders of the ring nearest the pelvis backward, closing the canal so completely, by overlapping, that the opening could only be demonstrated by the examining finger with difficulty. A stitch or two was in each instance introduced, supplementing the closure and overlapping of the ring and nothing further done for the hernia. The idea is to follow the subsequent history of each case and see what the permanent result will be. If it be proved that this operation will cure inguinal hernia, an additional feature of value will have been added to it which will make it an operation difficult to duplicate.

AN OPERATION FOR EXTREME CASES OF PROCIDENTIA, WITH RECTOCELE AND CYSTOCELE, BASED ON ANATOMIC, PHYSIOLOGIC, AND DYNAMIC PRINCIPLES, WITH RE- PORT OF CASES

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No more interesting subject nor one more heavily fraught with promise of far-reaching and most beneficial results has attracted the attention of abdominal and pelvic surgeons during recent years than the dynamics of the closed cavities of the body. Through these investigations we are beginning to get some light on the causes of ptoses and methods of cure. A knowledge of the cause, the etiology, of pathologic conditions is the first step in the solution of the problem. This holds throughout the whole realm of medicine and surgery, but nowhere does it apply more conspicuously than in the treatment and cure of organic displacements.

Immediately there looms up before us the subject of intra-abdominal pressure, and therein has lurked a great mystery.

The laws of hydrostatic pressure have been accepted by some as the key to the problem, and upon these laws have been constructed complete and elaborate theories which, at first blush, seem to be quite convincing. In the elaboration of the details of intra-abdominal pressure, however, they fail to answer satisfactorily many important questions, and we are driven to the conclusion that fluids, either in equi-

librium or under active pressure do not tell the whole story. Careful investigation reveals many reasons for this. In studying this subject we must take into consideration the following facts: (1) The abdominal and pelvic cavities, whether considered individually or as one continuous chamber, have both elastic and inelastic walls; (2) that the interior conformation is most irregular and made up of reflecting planes of pressure at various and varying angles to each other; (3) that within these cavities are many organs of various shapes and density which transmit and reflect pressure with varying degrees of facility and speed; (4) that some of these identical organs at successive and alternating periods contain solids, liquids, and gases; (5) that these tissues are all vital tissues acting under physiologic laws.

The dynamics, therefore, of the abdominal cavities are not restricted to hydrolics, and we must follow the ramifications of pressure when applied upon any part of the surface of the cavities guided by the laws of reflection and deflection, of transmission through vital tissue, and all constantly modified by physiologic action.

Without dwelling upon pressure as relating to the abdominal cavity our interest is more directly concerned in this discussion with conditions in the pelvis. In this cavity the application of pressure is physiologically directed toward expulsion of the contents either of the uterus, the bladder, or the bowel. Here is where we have the most striking illustration of the importance of deflecting planes in directing expulsive force into the axis of the pelvic outlet. This mechanism of deflection and the importance of understanding the action of the deflecting planes is pronouncedly exemplified in the corkscrew progress of the fetal head through the various straits of the pelvis. In this the bony planes play the most conspicuous part. In the evacuation of the bowels, however, we have the intra-abdominal pressure coming down into the pelvis, which to accomplish its desired result must likewise be deflected into the axis of

the pelvic outlet. Under these circumstances the resultant of these forces which finally determines their ultimate effect and which we must follow if we wish to determine their action exerts itself most directly upon the posterior face of the uterus and its broad ligaments. This plane of tissue is thereby forced down to a lower level in the pelvis until its progress is interrupted by the resistance of its ligaments, more especially the cardinal ligaments, and in extreme instances by the crest of the perineum. At this stage the longer arm of the uterine lever (*i. e.*, fundus) is arrested by this resistance while the posterior freepole of the uterus (*i. e.*, the cervix) is forced further down, thus tilting up the fundus, thereby deflecting the pressure backward and downward upon the rectum in the axis of the outlet. As Sturndorf says: "Were this pressure to continue without deflection, this upward tilt of the anterior arm of the uterus must continue and, extending beyond the perpendicular, would retrovert the uterus and force its long axis into line with that of the vaginal outlet." The uterus in this position would fall into the direct axis of the expulsive planes, where it is subjected to such irresistible pressure that the ligaments give way and prolapsus uteri ensues, with its accompanying complications of rectocele and cystocele.

To my mind the importance of this deflecting plane of tissue represented by the uterus and its broad ligaments, in deflecting intra-abdominal pressure, cannot be overestimated. It is undoubtedly true that the ligaments of the uterus would be incapable of resisting normal intra-abdominal pressure were it continuously applied in the direction in which it first impinges upon it. By the resilience of its ligaments and their muscular contractions this force is deflected and the uterus when relieved of this pressure is elevated to its normal topographical position by the uterosacral and round ligaments. "It is a gross misconception of function," says Sturndorf, "to attribute visceral support to textural strength of ligament or muscle; the

muscle or ligament is not created that can permanently withstand the continuous force of intra-abdominal pressure. These muscular and ligamentous elements serve to support the pelvic contents not by virtue of their *textural resistance* to displacement but by *deflecting* the displacing force of intra-abdominal pressure."[1]

The failure of procedures for displacements of the uterus which involve fixation of that organ to the abdominal wall tends to confirm this principle and is a pertinent demonstration of the fallacy of substituting artificial for normal physiologic support. The normal physiologic support of the uterus resides in its ligaments. They are, therefore, the proper tissue to utilize in any operation for the restoration of the uterus to its normal position and physiologic function as a deflecting plane.

In the determination of the kind of operation that shall be employed for the relief of procidentia and its accompanying lesions, it is the universal custom to divide all cases into two classes, namely, cases in which the patients are in the child-bearing period, and those which are at or have passed the menopause.

In my operation the underlying motive is to restore not only anatomic structures, but also physiologic function. In the first class of cases, after attending to any minor lesions, the uterus is restored to its normal position by shortening the round ligaments through the vagina, and in extreme cases the uterosacrals as well. This is done with the prominent idea in view of reconstructing the normal anatomic arrangement, and thereby reëstablish the important function of the uterus and broad ligaments as a deflecting plane of intra-abdominal pressure.

In dealing with the cystocele the effort has been made to observe with scrupulous care also the anatomy, function, and topographic position of the bladder. Kelly has

[1] Medical Record, April 1, 1905.

graphically described the physiologic action of the bladder
in its function of receiving and discharging the urine.
Incidentally he speaks of the anatomic fixation of the
trigone. I cannot give a clearer picture of this process
than by quoting Kelly's own words: "As the bladder
empties, the upper, more movable portion, covered with
peritoneum, settles down into the lower and relatively more
fixed portion, which lies in close relation to the vagina
until it comes to lie within it as one saucer rests in another.
During respiration the free upper half may be seen (through
the cystoscope) moving on the lower half, as if hinged, and
the line of demarcation between them may be distinctly
made out. At the edges where the two saucers meet three
folds are formed—the right, left, and posterior. The
posterior fold stretches from side to side in front of the
uterus; it is gently convex forward, following the contour of
the uterus and ends in front of each broad ligament, where
each lateral fold begins and extends horizontally around
toward the urethra. These folds represent the physio-
logic hinges on which the bladder moves in expanding
and collapsing. The apices, where the posterior fold joins
the lateral folds in front of the broad ligaments, are called
the right and left vesical cornua."

My operation restores with accuracy this anatomic
arrangement. The trigone of the bladder is spread out
and made fast to the anterior face of the uterus and broad
ligaments, by carrying the base of the bladder up and
stitching it at three points; one stitch at each cornu, and
one in the median line at the centre of the anterior face of
the uterus. The uterovesical peritoneal fold is restored as
well as the hinges on which the dome of the bladder moves
in its function of receiving and discharging the urine. I
take it that nature is not working without a purpose in
giving fixation to the trigone. This gives a fixed point
of exit for the urine and a rigid canal in the passage of the
ureters through the wall of the bladder.

In the restoration of the floor of the pelvis I use the method of distinct isolation of the levator ani muscles and stitch them together with buried sutures. It is my conviction that this is the surest and most effective way to restore proper function to the floor of the pelvis. The muscles are thereby freed from cicatricial attachments which distort and limit their function and seems to make a new clean sheath for themselves in which they contract and slide easily and normally. I got my inspiration for adopting this procedure through an article by Dr. Arnold Sturndorf, of New York (*Medical Record*, April 1, 1905), and which is the fullest and most satisfactory explanation that I have ever read of intra-abdominal pressure, and the physiologic action of deflecting planes of tissue both as retention and expulsive planes.

In the second class of cases, that is, in patients at or beyond the menopause, my effort has been, and I think successfully, to retain as nearly as possible all these physiologic functions following the plan as already described. Unless there is positive objection on the part of the patient the uterus is removed per vaginam. In order to restore the deflecting plane of tissue the broad ligaments are stitched together across the pelvis from the infundibulo pelvic and round ligaments down to cardinal ligaments. In this procedure a plane of tissue is restored in exactly the same situation and under control of the same ligaments as under normal conditions. This deflects from its posterior surface back into the pelvic outlet, the intra-abdominal pressure, and thus physiologically takes place of the original structures. On its anterior face it also affords a surface on which to spread out and fix the trigone of the bladder, restoring its hinges and all its physiologic functions. The floor of the pelvis is restored in the usual manner.

Occasionally there is such an extreme prolapse of the rectum that something more than the restoration of the levator ani muscle becomes necessary. In these cases I

have obtained most satisfactory results by stripping the vaginal mucous membrane off from the anterior wall of the rectum, from the line of the peritoneal covering down to the fourchette and then plicating the wall of the rectum with buried catgut sutures. The sutures are passed up and down in the direction of its longitudinal axis; sometimes one line of sutures will suffice, but in ultra conditions two and even three lines of suture running across the rectum have been necessary to comfortably take in all the slack. These sutures, of course, do not enter the lumen of the gut.

In estimating the indications and the value of this operation many things must be taken into consideration. (1) The permanency of results; (2) the age of the patient, with reference to shock; (3) the character of the convalescence, whether stormy or smooth and comfortable; (4) the restoration of physiologic functions.

For the purpose of this investigation I have written letters during the last month to forty-six patients. This list included all those upon whom I had performed this operation previous to two years ago, and whose addresses I have. Owing to the removal of the Polyclinic Hospital to its new quarters, and the confusion attending it, I was unable to secure access to the records there. I regret this exceedingly, for I have quite a series of cases in which this operation was done, and whose histories are there.

Of the 29 patients who reported, 24 came to the office for examination, the balance reported by letter. Of the 24 who presented themselves for examination there was not one that showed the slightest tendency to recurrence, and all gave most favorable reports of improvement not only in their local condition but in their general health. Of 5 who reported by letter, all gave most favorable accounts of the benefit received, with one exception. She wrote as follows: "My operation was not a success; my bladder dropped the last of May. I was operated on in December. I am going out dressmaking and I am very comfortable at

present." This was a poorly nourished widow, aged fifty-seven years, who was suffering from an extreme procidentia and an irritating kraurosis vulvæ. To relieve this she was subjected, at the same sitting, to circumcision of the pudendum. I wrote at once to her family physician asking him to call and make an examination, but to date have received no response.

I cannot tell you how gratified I have been by these tested results. Some of the cases are of seven years' standing, others of four, and three, and the balance of over two years' standing. Two of the patients who came to my office had each borne a child two years after the operation. Both had normal labors, and in neither one was there the slightest lesion of any kind. All the different procedures in the operation had held perfectly.

In regard to the bladder, 3 who had had annoying incontinence previous to operation reported a cure; 5 reported slight irritability of the bladder, lasting from three to five months after the operation, but not present since.

In making my examinations I tested in all instances the contracting power of the levator ani muscles. It was most interesting, and I must say somewhat surprising to me to discover these muscles responded readily and powerfully under voluntary control.

In reference to the age of the patients, although my previous experience had demonstrated to me that elderly women bore vaginal operations surprisingly well, I was not prepared for such sturdy resistance as the elderly women exhibited in this somewhat extreme operation. Among my cases are 11 patients between fifty and sixty years of age, 4 between sixty and seventy, and 1 at the rare old age of seventy-five years at the time of operation. In not one of them was there sufficient reaction to demand any departure from the regular routine after-treatment. The old lady of seventy-five years is now seventy-nine years of age, and last week walked across the city from 10th Avenue to my

office, fully a mile, on the hottest day we have had this year. When I asked her how she felt, she replied, "You have made a new woman of me." Another patient, aged sixty-three years, replied, "I feel as good as new."

Convalescence is surprisingly smooth. In not a single case has infection occurred. Catheterization, as a rule, is not continued beyond the second day. If prolonged, I have the patient out of bed and on the commode by the fifth day.

In response to the question regarding the action of the bowels, all expressed gratification at the ease with which defecation was accomplished. While much of this can be attributed to the restoration of the levator ani muscles, I am inclined to attribute no small part of it to the deflecting power of the broad ligaments.

I have been greatly interested in the reports of Dr. Osgood, the cystoscopist at the Woman's Hospital. He has kindly interested himself during the last year in cysto-scoping the bladders of all patients subjected to this operation, both before and after operation. He reports complete restoration of normal conditions in the interior of the bladder. The mouths of the ureters are in normal position and relation and the interureteral ridge is readily distinguished and followed from side to side. As none of these cases come into this report on account of the time limit, I shall hope to report more in detail at some future time the result of this feature of the investigation.

I have had a somewhat unique experience in three cases. They were patients who had hysterectomies done two, three, and four years previously, one of them a case of my own, in which, however, I did not apply my procedure of stitching together the broad ligaments. In all of them there was marked rectocele and cystocele. In these three cases I had the satisfaction of opening the head of the vagina through the original scar, picking up the broad ligaments, stitching them together across the pelvis, and

then utilizing them as a plane upon which to spread out the bladder. These operations have all been done within the last six months, and so do not fall within the time limit prescribed for the report of cases at this time. In all these cases I was able to secure the infundibulo pelvic ligament and cardinal ligaments, and in two of them the round ligaments as well. In the third case the round ligament had retracted so far that I was unable to recognize them. In this case there were many resisting cobweb adhesions to deal with in all directions.

In all operations upon the human subject it must be borne in mind that we are dealing with vitalized tissue. And the nearer the operation comes to restoring each and every physiologic function is the measure of success in reaching for the ideal. It is not sufficient to say that the result accomplishes a reasonable purpose as long as something more perfect is within our grasp. In the language of one of our distinguished colleagues, Dr. Polk: "The basis of our art being in reality science, and this branch of science dealing with life and its efficiency as developed chiefly in the human race, the sacredness of our trust compels at our hands the highest conceptions and the most skilful execution of such conceptions that human effort is capable of."

The detailed report of cases follows:

Mrs. M. J. G. (Elmira, N. Y.), aged thirty-four years; married twelve years; four children. Previous operation for trachelorrhaphy and perineorrhaphy, both operations failures. Diagnosis: procidentia of second degree; rectocele and cystocele; umbilical hernia; hemorrhoids. Operation January 30, 1905. All lesions repaired; Goffe operation for cystocele. Last seen, 1907. Result: cure.

Mrs. J. S. W. (Mt. Vernon, N. Y.), aged forty-six years; married twenty-five years; four children; last child six years ago; since birth of last child, menses excessive and too frequent. Diagnosis: large retroflexed uterus; large diseased cervix; lacerated perineum; marked cystocele and rectocele.

Operation, March 10, 1905. Divulsion and curettage; amputation of cervix; interposition of fundus; perineorrhaphy. Result: convalescence uneventful; she gradually recovered strength and nerve, but complained of constant discomfort in the pelvis; uterus failed to involute; sensitive on pressure; slight leucorrhea. Operation, February 15, 1906. Abdominal hysterectomy; bladder stitched to broad ligaments; health restored. Last seen May 20, 1912. Has not had such good health since marriage as since the operation. Examination: satisfactory. Levator works well.

Mrs. A. W. (433 East 71st Street, N. Y.), aged thirty-eight years; married seventeen years; seven children. Diagnosis: lacerated perineum; extensive cystocele and rectocele. Operation, December 19, 1906. Goffe operation for cystocele. Last seen May 23, 1912. "No more drag." Examination: uterus in normal position; everything satisfactory; levators strong under voluntary control.

Mrs. J. A. D. (Mt. Vernon, N. Y.), aged fifty-one years; married twenty-one years; three children; menopause one year; lacerated cervix and perineum; rectocele and cystocele. Operation, February 13, 1907. Hysterectomy; Goffe operation for cystocele. Last seen May 17, 1912. No unpleasant symptoms. Examination: satisfactory. Result: perfect.

Mrs. C. D. (1044 Mott Avenue, N. Y.), aged thirty-six years; married seventeen years; eight children. Diagnosis: complete rupture of perineum through spincter; cystocele. Operation, March 12, 1907. Anterior colpotomy; perineorrhaphy. Last seen May 20, 1912. Had baby January, 1909; had postpartum hemorrhage and nearly lost her life; has slight leakage of the rectum occasionally. Examination: uterus and bladder satisfactory; levator strong; sphincter not quite tight enough.

Mrs. M. E. P. (209 West 106th Street, New York), aged forty-eight years; married twenty-seven years; five children. Diagnosis: no control of bladder; extensive cystocele; lacerated perineum. Operation, July 1, 1907. Goffe

operation for cystocele; uterus retained. Last seen May 18, 1912. Reports she has perfect control. Examination: perfect result.

Mrs. M. H. C. (Mount Vernon, New York), aged fifty-seven years; married thirty-nine years; three children. Diagnosis: prolapsus; lacerated cervix and perineum; rectocele and cystocele. Operation, October 7, 1907. All lesions repaired. Goffe operation for cystocele; uterus retained. Last heard from in letters from daughter; report all satisfactory until time of death, December, 1911, from Bright's disease.

Mrs. M. E. S. (Long Branch, N. J.), aged fifty years; married twenty years; one child; menopause at thirty-five years. Diagnosis: procidentia, rectocele, and cystocele. Operation, October, 1907. Last seen May 14, 1912. Satisfactory, except slight hernia of bladder through vaginal sheath; upper end of vagina fast to broad ligaments; vagina proper length; perineum satisfactory; symptoms of return of bearing down feeling.

Mrs. K. W. (813 St. Nicholas Avenue, New York), aged forty-four years; married twenty-four years; four children. Diagnosis: lacerated perineum; rectocele. Operation, November 4,, 1907. Plastic urethra; perineorrhaphy. Died March, 1908, from Bright's disease of kidney.

Mrs. E. H. C. (White Plains, N. Y.), aged fifty-seven years; married thirty-six years; four children. Menopause nine years ago. Diagnosis: prolapsus uteri; cystocele. Operation, December 20, 1907. Hysterectomy; Goffe's improved operation. Circumcision of pudendæ for kraurosis vulvæ. Result by letter, May 15, 1912: "My operation was not a success; my bladder dropped the last of May. I was operated on in December.

1908.—Mrs. G. M. (Chester, N. Y,), aged sixty-two years; married forty-two years; eight children. Diagnosis: procidentia; rectocele and cystocele; urethral caruncle. Operation, January 2, 1908. Hysterectomy; Goffe operation;

caruncle destroyed by actual cautery. Last heard from by letter from Passedena, California, May 20, 1912: "Never was an operation more successful, and I see no reason why it should not remain permanent."

Mrs. L. P. (New York City), aged thirty-three years; married twelve years; three children. Diagnosis: lacerated perineum and cervix; prolapsus uteri; rectocele and cystocele. Operation, January 15, 1908. All lesions repaired; Goffe operation for cystocele; uterus retained. Last seen May 15, 1912. Had a baby two years after operation weighing eleven pounds at birth; all parts in perfect condition, not even a nick in the perineum; surprisingly good in every particular.

Mrs. J. K. B. (Mt. Vernon, New York), aged thirty-seven years; married thirteen years; three children. Diagnosis: complete procidentia; rectocele and cystocele; lacerated cervix and perineum. Operation, January 29, 1908. All lesions repaired; Goffe operation for cystocele; uterus retained. Last seen May 18, 1912. Reports great improvement in general health and local relief perfect. "Rolls sixteen pound ball down bowling alley every Tuesday night." Examination, result perfect.

Mrs. E. D. (34 Boone Avenue, Bronx), aged fifty-one years; married; four children. Diagnosis: procidentia; cystocele. Operation, March 10, 1908. Perineorrhaphy; Goffe method; Watkins operation for cystocele. Writes, May 19, 1912. "Your operation made a new woman of me —a great success."

Mrs. M. B. Y. (Glenridge, N. J.), aged thirty-four years; married; one child stillborn ten years ago. Seven years ago applied for relief of prolapsus; had only escaped with her life after terrible forceps case three years previously; was told she could never be delivered. After measurements I reassured her and advised repair and try again. Operation: trachelorrhaphy; shortening of round ligaments vaginally and colporrhaphy; she conceived, and four years ago I delivered her of living child with high

forceps; extensive laceration of cervix; immediate repair. Diagnosis: procidentia complete; rectocele and cystocele. Operation, April, 1908. Hysterectomy; Goffe operation for cystocele. Last seen May, 1910, satisfactory. Letter from Evanston, Ill., May 20, 1912: "I am glad to speak for the wonderful effect of your operation. I have been perfectly well ever since."

1909.—Mrs. Van V. (Brooklyn, New York), aged seventy-five years; married. Diagnosis: procidentia, rectocele and cystocele. Operation, February 13, 1909. Hysterectomy; Goffe operation for cystocele. Last seen May 24, 1912. Result: "You made a new woman of me." Examination: nothing better to be desired.

Mrs. M. J. H. (Brooklyn, New York), aged sixty-three years; married forty-six years; two children. Diagnosis: extreme procidentia; rectocele and cystocele. Operation, February, 1909. Hysterectomy; Goffe operation for cystocele and rectocele. Last seen October, 1911: "Entirely relieved." Examination entirely satisfactory.

Mrs. S. B. (New York City), aged fifty-seven years; married thirty-four years; fourteen children. Diagnosis: complete procidentia uteri. Operation, March 20, 1909. Vaginal hysterectomy; plastic for cystocele and rectocele; perineorrhaphy; Goffe's method. Returned to hospital February 3, 1910. Diagnosis: rectocele; Goffe operation for rectocele; plication. Last seen December, 1912, satisfactory.

Mrs. A. S. (New York City), aged forty-eight years; married; four children. Diagnosis: procidentia uteri, cystocele. Operation, April 21, 1909. Plastic for cystocele; perineorrhaphy; Goffe operation. Last seen May 20, 1912. Says she feels all right. Examination: large stout woman; runs lunch counter and works in garden. Result: satisfactory; levator works perfectly.

Mrs. M. A. W. (New York City), aged fifty years; married thirty-two years; two children. Diagnosis: procidentia;

rectocele and cystocele. Operation, May 10, 1909. Hyster-
ectomy; all lesions repaired; Goffe operation for cysto-
cele. Last seen May, 1912. Result: perfect; health
restored.

Mrs. T. D. R. (Mt. Vernon, New York), aged sixty-three
years; married thirty-five years; three children. Diagnosis:
procidentia; cystocele and rectocele. Operation, June 5,
1909. All lesions repaired; hysterectomy. Last seen May,
16, 1912. Result: perfect. "Feels as good as new."

Mrs. A. L. C. (New York City), aged fifty-three years;
married thirty-three years; two children. Diagnosis: pro-
cidentia, rectocele, and cystocele. Operation, October 19,
1909. Hysterectomy; Goffe operation for cystocele. Last
seen May 23, 1912. Result: "Entirely relieved." Examina-
tion: satisfactory; levators strong and under voluntary
control. Satisfactory in every particular.

Mrs. J. J. F. (Newburg, N. Y.), aged thirty-two years;
married six years; one child. Diagnosis: cystocele and
rectocele; relaxed urethra. Operation, December, 1909.
Goffe operation for cystocele; uterus retained. Last seen
May 20, 1912. Feels all right; has slight leakage from
urethra on exertion, but usually under good control.

1910.—Mrs. K. R. (New York City), aged forty-nine
years; married; six children. Diagnosis: procidentia, recto-
cele, and cystocele. Operation, February 16, 1910. Vaginal
hysterectomy; perineorrhaphy; Goffe operation for cystocele.
Last seen May 20, 1912. Has frequent micturition, other-
wise satisfactory. Nothing to be desired.

Mrs. L. W. (New York City), aged fifty-one years;
married; nine children. Diagnosis: rectocele and cystocele
following vaginal hysterectomy three years ago. Operation,
March 10, 1910. Colpotomy; picked up the broad ligaments,
stitched them together, and completed Goffe operation for
cystocele; rectal wall plicated and perineorrhaphy, stitching
separately the levators. Last heard from May 21, 1912, by
letter: "Operation a decided success."

Mrs. P. C. (New York City), aged thirty-nine years; married seven years; one child. One year ago had operation in Cleveland Ohio, for falling of the womb, which at that time came outside the vulva. Diagnosis: recurrent cystocele; erosion of cervix, uterus in normal position, and well restored perineum. Operation, March 15, 1910. Goffe operation for cystocele; uterus retained. Last seen May 18, 1912. Result: satisfactory.

Mrs. D. J. D. (New York City), aged thirty-four years; married fifteen years; four children. Diagnosis: lacerated cervix and perineum; retroversion; rectocele and cystocele. Operation, October 14, 1910. All lesions repaired; round ligaments shortened; Goffe operation for cystocele; uterus retained. Last seen May 20, 1912. Menstruates from rectum clots. Examination: nothing to be desired.

Mrs. P. F. G. (New York City), aged thirty-six years; married twelve years; three children. Diagnosis: procidentia; rectocele, and cystocele; Operation, November 4, 1910. All lesions repaired; Goffe operation for cystocele. Last seen May 12, 1912. Result: satisfactory; uterus in good position; also bladder and perineum.[1]

[1] For illustrations of steps of operation see TRANSACTIONS OF AMERICAN GYNECOLOGICAL SOCIETY, 1910, vol. xxxv.—Editor.

PROCIDENTIA UTERI: SUPRAPUBIC PLICATION OF VAGINA AND CONJOINED SHORTENING OF UTEROSACRAL AND BROAD LIGAMENTS

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THE conclusions formulated by the operation for pro-
cidentia uteri suggested at the close of this paper are based
upon the inadequacy in my hands of other forms of opera-
tion which I have employed from time to time. Convinced
of the insufficiency of the lower supports I began with the
introduction of the Alexander operation to employ the
upper supports. The Alexander operation, associated
with high amputation of the cervix uteri as a means of
diminishing the weight of the organ, was employed for a
time; then ventral suspension of the uterus by the fundus;
then amputation of the uterus at the cervix and ventral
suspension of the stump; then amputation of the uterus
with the bringing together over the stump of all the uterine
ligaments — broad, round, uterosacral and uterovesical —
holding them by a kind of purse-string arrangement of the
ligatures or by a process of overlapping. The last procedure
was reported to this Society at its meeting in May, 1909.
The others are to be found in New York Obstetrical Society
reports. In addition to these I employed the other methods
which have from time to time been suggested by other
operators during the last thirty years.

Convinced that the preservation of the circulation and
nerve supply, belonging to the uterus, is an essential to the

success of any operation for procidentia, I finally concentrated my attention upon the procedure which I will explain. The essential element is the utilization of all the direct supports of the uterus and vagina; the broad and uterosacral supports being shortened conjointly, which process may or may not include the round ligament and must be executed so as to spare the blood and nerve supply to the uterus. The utilization of the vaginal supports through plication of its anterior surface (taking in the slack) as far down as the urethra, in fact pulling the sides of the vagina to the centre by the plicating sutures; then dealing from below with the inverted vaginal wall, so as to give the utmost possible support to the base of the bladder. The support thus offered to the base of the bladder, together with the utilization of the direct supports of the vagina and uterus, constitute the cardinal features of the operation.

Before submitting to you the details of the operation, I desire to say that the extensive separation of the bladder and ureters from the vagina, which is necessary, causes far less hemorrhage and shock than I anticipate; so little, in fact, that in but one case was it a feature of the procedure. I have found also that the more complete the prolapse the easier this separation can be made. I have been unable to complete the procedure in less than one hour and thirty minutes. More facile operators, however, would find no difficulty in shortening this time materially. Breaches in the perineum and rectoceles may be corrected later, if condition of the patient should forbid it at the time of this procedure.

The operation is as follows: When you have cleansed the vagina paint it over with strong tincture of iodine. Opening the abdomen the pelvis is freed and kept free of all movable coils of intestine. The uterus is now firmly grasped at vaginal junction with a bullet forceps, and the structures put on the stretch forward and upward. Grasp the broad ligament and the uterosacral fold between the

thumb and forefinger; locate the uterine artery where it leaves the uterus and curves outward toward the main trunk. The thumb being in front and against the uterus, you will have the ureters just at its outer side, behind the artery and extending outward and backward; pass a suture from before backward through the structures held in grasp entering about half an inch above the artery and about one-third of an inch from the uterus, emerging beneath the uterosacral fold about one inch from uterus, according to the amount of elongation of this fold. The outline of this suture can be detected by touch, insuring its avoidance of the ureter which is to its outside. Doubling it back above the uterosacral fold and through the broad ligament below the ovarian ligament it is passed deep into the anterior aspect of the uterovaginal junction; the loose ends are then temporarily held with a pair of forceps. A suture is passed and secured in similar manner on the opposite side. If these sutures are drawn tight and tied now, the subsequent manipulation upon the vagina may disarrange them. The peritoneal covering is now slit from the uterus to the bladder, the vagina being held taut upward. Through this opening (it may be enlarged by lateral incisions if necessary) the bladder is separated from the entire anterior face of the vagina as far as the urethra in extreme cases. This separation is made best with the gloved finger covered with gauze, or with gauze in a sponge holder, the grip of the gauze displacing the tissue with the least risk of injury to important structures. In this separation if one keeps to the vaginal wall, which is recognizable by its smooth and yellowish white structure, the ureters are pushed up and away from this canal, especially opposite the line which the first plicating suture must transfix. This line is as far down as possible upon the anterior surface of the vagina (about opposite the trigone). Seize the side of the vagina with a bullet forceps, taking a generous bite, draw it up and pass the suture from without in, repeat this on the opposite side from within

out. In this fashion the vagina is plicated from below upward. The number of sutures required depends on the length of the vagina, rarely more than four are necessary; the arteries and veins are tied when necessary. Hemorrhage is rarely a troublesome feature and always easily controlled; rents in the cavity of the bladder are easily corrected, but need not occur.

The next step is shortening the lateral and posterior attachments of the uterus—the base of the broad ligament and the utero-sacral fold. To this end the sutures already in position are drawn taut and tied. This brings all of the attachments included well forward, and shortens them up effectively on each side. The next step is to bring the peritoneum together along the line of your incision, taking in any slack that may exist therein. In this connection the round ligaments and peritoneum may be utilized. That is, the round ligaments can be caught up about an inch and a half from the uterus, brought together and fastened down at the uterovaginal junction. This may be done separately or by means of the same suture which encircles the uterosacral folds and base line of broad ligament. If the fundus then needs to be brought forward you may seize the round ligaments an inch farther out and attach that point to the uterus where the ligaments originate. It is now necessary to get the peritoneum which belongs to the anterior face of the broad ligament well down into the uterovesical space, so as to make the fossa as shallow as possible between the uterus and the bladder. In this way you check the first effects of abdominal pressure; you meet it at the highest point in the field. The abdominal wound is now closed and the vagina becomes the field of operation.

More or less of a ridge will be found upon the central line of the anterior vaginal surface. Seizing this fold at the lowest point with a pair of artery forceps you cut directly into it; the introduction of the director will then enable

you to slit it from below upward quite to the uterus without danger of interfering with the sutures that you used in the suprapubic plication. The two folds of the vagina may now be treated as conditions require. You can remove as much or as little as the judgment of the operator may suggest. My own feeling is that little or perhaps none of this fold need be cut away. The surface exposed may be brought together by chromicized gut, which may be put in either separately or continuously, as the exigencies of the case require. If preferred this fold may be left intact and its opposite surfaces stitched together by through and through sutures. If the condition of the patient is good and the perineal body needs repair, as it usually does, this may now be done. This closes the operation

It is quite evident that should we remove the entire anterior wall of the vagina as far down as the urethra, instead of plicating it, the operation would be shortened and simplified. Then one need only bring the cut edges at the sides together at the middle line to bring into play all lateral supports, but the result would be no better than plication gives; in fact inferior, because the column secured by plication gives direct support to the bladder where it is most needed; moreover, if, through any untoward accident or influence, the base of the bladder again descends, it would find adequate covering in the one case, with the other it might not. It is entirely feasible, however, to remove the anterior wall in lieu of plication.

In two of my cases I found the uterosacral folds so well developed and elongated that I drew them forward along with the base line of the broad ligaments and joined them together in front of the uterus, but it is well to realize that the uterosacral fold is sometimes a very disappointing structure. Clearly outlined both as regards location and direction, and well developed, it is readily found, but in some cases it may lack distinctness, and instead of passing directly back toward the sacrum as we hope for, we find

it branching off to the right and left and presenting indistinct lines of attachment to the lateral posterior pelvic walls on the two sides. In these cases I have found that the lateral attachments of the uterus as represented in the base lines of the broad ligaments are stronger and more developed than in cases in which the utero-sacral folds have the expected growth. In all of my cases I have met with evidences of shock in but one instance and this was a case that required more manipulation behind the uterus than I have used in my later cases. Such hemorrhages as occur are easily controlled. Most of it is venous, which as rule has ceased by the time the operation is over. The arterial hemorrhage, if any, is readily controlled. Of course the vital points in the situation are the ureters, but by keeping close to the vagina in separating the bladder, especially as you approach the lower part of the field, and by carefully inspecting the portion of the vagina at which you pass your sutures, this danger is readily avoided. All sutures except those used for vessels and for closing the peritoneum ought to be of good-sized kangaroo tendon.

A sharp lookout must also be kept as to the ureters when you pass sutures through the broad ligaments and utero-sacral folds, especially in cases in which the latter are ill-defined and incline to lateral rather than sacral attachments. These lateral folds usually run quite close to the ureter as it reaches out toward the pelvic wall.

The conjoined shortening of the broad and utero-sacral ligaments is easier and more satisfactory than shortening each separately. The fact that the essential fibres of each are continuous at the sides of the uterus, justify this step anatomically.[1]

I submit eighteen cases as examples, eight within time limit, two years. In every case the uterus rested entirely

[1] My thanks are due Mr. A. G. Crawford and Mr. J. Miller, students at Cornell Medical College, for the dissections and to Mr. Murayama for the drawings showing the dissections and operation.

without the body, or as far out as midway of the cervix. One case reported is a prolapse of the vagina and bladder following removal of the uterus years before for procidentia. Treatment by pessary had been tried in all these cases, with failure in each one.

CASE I.—P. E., aged thirty-three years. Born in United States. Occupation nurse. Admitted to hospital October 2, 1911. Discharged December 11, 1911. Diagnosis: displacement of uterus. Complication: relaxation of pelvic floor. Prolapse second degree. Uterus half out.

Family history negative. Previous history good.

Present illness: Onset several years ago, with sudden cramp-like pains in lower part of abdomen. Patient thinks it was caused by a sudden strain on lifting a patient. Next day pain was still present but less severe. Relief followed rest in bed. Since that time patient has been troubled by weight and dragging in pelvis; a feeling of falling out in perineum; occasional nausea and a tendency to tire easily. After a time patient noticed that her cervix was pressing down into vagina and it has at last gotten so low that it protrudes between the labia after standing for some time. Difficulty in voiding urine, sometimes not being able to void without pushing up the uterus. Tendency to constipation. Discomfort greater with constipation. No leucorrhea. Slight loss of weight. Medium height and stout. Organs normal. Sexual organs: External genitals normal. Perineum relaxed. Vaginal walls prolapsed. Cervix conical. Os closed; soft. Uterus low down in vagina; can be drawn down and brought completely outside of vagina through vulva. Adnexa: Negative, except for general relaxation of all ligaments.

October 11, 1911. Operated October 10. Slept little during night. Considerable pain in bladder region. General condition good. Bladder draining well through retention catheter.

October 12. Doing well. Slight pain. Appetite good. Catheter removed. Has had a few red blood corpuscles
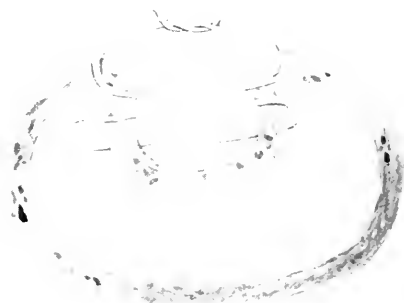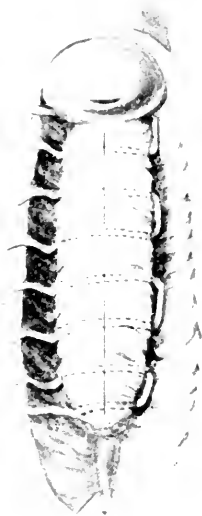
REAR VIEW
Suture thrown around
sacral fold after
penetrating Broad
Ligament.

Fig. 1

FRONT VIEW
Bladder separated
from vagina;
plicating sutures
in place

Fig. 2

Cross section.

INNER VIEW.
Anterior vaginal wall.

Diagrams showing plication of vagina.

FIG. 3

in urine and many white blood corpuscles. Slight pain on voiding.

October 17. Sutures removed. Wound clean and healed. Abdomen strapped.

October 23. Dressing removed from wound. Urine showed some increase in pus. Bladder irrigated with boric acid, 4 per cent., every second day, beginning October 21. Irrigation followed by argyrol, 10 per cent., oz. 2. Up in bed.

October 25. Abdomen restrapped. Bladder irrigations discontinued October 25. Up in chair two hours.

November 6. Ordered up about ward. Condition fine.

November 10. Operation on perineum, November 9. Very little pain.

November 12. Vaginal douche with boric acid, 4 per cent., every second day. Irrigate perineum with boric acid, 4 per cent., twice a day.

November 14. No complaints. No pain. Slight vaginal discharge with slight odor.

December 11, discharged. Patient examined standing. Uterus in excellent position. No vaginal prolapse.

Operation. Prepared in usual manner. Incision 5 inches long in mid-line above pubis opening abdomen. Trendelenburg position. No adhesion. Intestines pushed up and packed with gauze roll in keeping intestines free from operating field. Uterus low down in pelvis. Fibroma large as a chestnut on posterior surface of uterus near right cornu. Peritoneum incised transversely between bladder and uterus. Bladder inclusive of trigone separated from anterior surface of uterus and vagina by blunt dissection. Ureters identified and kept free from field of suture by upward and outward traction. Sutures of strong kangaroo tendon passed through lateral wall of vagina on one side, then emerging and passing anterior to anterior vaginal wall to take a similar bite on opposite side, plicating this anterior wall from below upward, from region of trigone to uterovaginal junction. Five

such sutures passed and tied. Round ligaments drawn together in front of uterus and sutured together with Pagenstecher. Peritoneum sutured together over field of operation. Utero-sacral ligaments caught with bullet forceps drawn together and sutured behind uterus with Pagenstecher suture. Small fibroid enucleated and site covered with peritoneum. Abdomen closed as usual. Retention catheter in bladder. Bloody urine, 4 ounces. Sterile dressing. To bed in good condition. No drain.

April 1, 1912. Reported as doing well.

Case II.—M. Ph. This patient duplicated in all essentials the preceding case, similar in height, both maidens, and stout, this one of the leisure class, however. Operation the same in all particulars except that here conjoined shortening of uterosacral and broad ligaments was done and the rectocele and perineum were treated at time of main operation. March 5 was the date of this operation with a result at this date, April 1, as good as the best.

Case III.—D. M., aged thirty-eight years. Born in United States. Occupation, housework. Admitted to hospital October 24, 1911. Discharged December 21, 1911. Diagnosis: prolapse of uterus. Complication: double salpingitis. Laceration of pelvic floor.

Family history, good. Previous history, good. Present illness: During delivery, seventeen years ago, patient's perineum was badly torn and symptoms of the present condition began shortly after that time. The first symptoms noticed were a sagging sensation in the perineum and a feeling of weight in the pelvis. She next began to have lumbar backache, pain radiating from the backs of the thighs, and a feeling of something dropping out below. At first this feeling amounted to only a sense of fulness in the vagina, but gradually it grew more pronounced and soon the patient noticed that the vaginal wall seemed to protrude between the labia. This condition progressed until the cervix and finally the whole uterus would protrude from

the vaginal orifice whenever the patient would stand for any length of time or strain at stool. During this time the headaches, backaches, and pains in the limbs have been growing steadily worse. Four months ago the patient began to have a profuse brown vaginal discharge after each menstrual period, lasting for about a week. Since onset of the present condition patient has had slight frequency of urination. Sex organs: external genitals, normal. Perineum: extensive old laceration, extending to left side of body of perineum. Vagina: outlet large, gaping; very roomy; walls lax and prolapsed; cystocele and rectocele. Cervix: fairly large and long in vagina. Uterus: prolapsed; can be made to descend through vulvular orifice. Adnexa: relaxation of all ligaments.

Operation. Suprapubic repair of pelvic floor. October 30, 1911. Prepared as usual. Incision 5 inches long in midline above pubis. Trendelenburg position. Both Fallopian tubes distended to one and one-half inches in diameter, angulated, somewhat adherent. Tied off at infundibulopelvic ligament and at uterine end of tubes and both tubes and ovaries cut away. Vesico-uterine peritoneum divided transversely; bladder separated from anterior uterine and anterior vaginal wall well down. Ureters identified and pushed outward from vagina and upward with the trigone of bladder. Sutures of kangaroo tendon passed through lateral columns of vagina from below upward, brought out and tied in front of anterior vaginal wall, thus taking in a reef. Uterosacral ligaments caught up; threaded with a suture; suture passed through base of broad ligament with Cleveland carrier on either side. The ligament sutured to anterior surface of vagina at level of cervix. Divided peritoneum closed. Round ligaments caught up and shortened by suturing to anterior surface of uterus with Pagenstecher linen. Wound closed in usual manner. Sterile dressings. To ward in good condition. Convalescence uneventful.

November 20. Perineum repaired.

December 21. Discharged; uterus in good position. Cervix still too long; not involuted.

April 20. Examined standing as before. Uterovaginal junction in normal position. Cervix still too large but not protruding. Should have been amputated.

CASE IV.—M. W., aged forty-two years. English. Occupation, housework. Admitted to hospital May 17, 1910. Discharged June 23, 1910. Diagnosis: prolapse of uterus. Family history, negative. Present history: ever since birth of first child twenty-six years ago patient had been complaining of sensations of prolapse of pelvic viscera. She has always been of the opinion it was the uterus came down but never came outside. Associated with this she has had backaches of a dragging, bearing down nature but no other pains. Never was treated except once, ten years ago, when she received no relief from pessary, tampons, and douches. Condition has become progressively worse, and for the last six months has been feeling weak and run down. Has been troubled with headaches, whitish discharge, and occasional vomiting. Comes to hospital on account of prolapse.

General appearance. Rather elderly woman. Poorly developed and nourished. Does not appear acutely ill. Heart normal size, shape and position. Apex beat in fifth space, three and one-half inches from mid-sternum. Sounds of good quality. Not roughened or accentuated. No murmur or thrills. Action good. Arteries rather large but soft. Pulse regular in rate and force; good force and tension. Lungs, chest, fairly developed. Expansion good and equal. No impairment at resonance or changes in breath, sounds, voice or tactile fremitus. No rales heard. Abdomen, soft and relaxed. No tenderness, rigidity or muscular spasm. No masses. Liver, spleen, kidneys not palpable. Muscles, bones, joints negative. Lymph nodes not large. Skin negative. Reflexes normal.

Pelvic examination, external genitals, negative.

May 21. Patient's general condition is improved. Constipation has been very stubborn.

May 25. General condition much improved. Intestinal condition better. Locally less congestion. Patient stronger, pulse fuller and better quality.

May 27. Operated. Dr. Polk's operation on pelvic floor. Patient recovered from ether well, with some vomiting.

May 28. Patient has experienced no excessive postoperative pain. Had some cramp-like pains, general in region of colon. Passes urine well. Cathartic given.

May 30. No complications. Patient is very comfortable. Bowels move well.

June 3. General steady improvement. Sutures removed. Wound clean.

June 6. General condition shows steady improvement.

June 10. Some temperature. Patient feels well. Wound clean and no tenderness.

June 12. As before. Wound clean but some slight tenderness about upper part of wound and sense of induration deep down. Small opening made in scar but no pocket found. Strip of gauze to keep opening.

June 14. Gauze taken out and scissors pushed down to induration, which is softer. Pus obtained. Finger and scissors enlarge opening and cavity irrigated and packed with gauze.

June 15. Comfortable. Dressed. Wound shows very little discharge.

June 16. Examined by Dr. Polk. Good position. Some induration. No pain. No prolapse.

June 23. Discharged. Condition excellent generally and locally. Good position. No pain. no prolapse. To return for observation.

Operation. Patient and field of operation prepared in the usual manner. Incision median about four inches long ending 1 inch above symphysis. Abdomen opened and

patient placed in Trendelenburg position. Uterus found abnormally movable and all pelvic ligaments stretched. Uterus grasped at cervico-uterine junction by bullet forceps and drawn upward. Peritoneum incised and widely reflected. Bladder with ureters separated from vaginal and uterine walls and retracted. Kangaroo tendon sutures placed transversely across vagina. Whole venus system in region congested and varicosed and bleeding is excessive; controlled by the sutures put in, one or two perforating into vagina.

Peritoneum closed by plain gut sutures running up on to face of uterus and approximating round ligaments at fundus. Sacro-uterine ligaments identified and shortened by kangaroo tendon sutures. Peritoneum and fascial planes closed by catgut and skin by silkworm gut. Last report: uterus in good position.

CASE V.—B. R., aged twenty-six years. Occupation, housework. Admitted to hospital May 26, 1910. Discharged June 24, 1910. Diagnosis: prolapse of uterus. Complication: laceration of perineum.

Family history, negative. Present illness: began eight days after child was born, as a pain followed by a prolapse of the uterus. Patient came to Bellevue clinic in December and was treated by pessary which supported uterus until March, when some inflammation set in. Rings were removed and patient put on douches. Since March she has had a yellowish leucorrheal discharge. Uterus has been down since that time.

June 6. Operated upon as follows:

Operation. Patient and field of operation prepared in the usual manner. Incision median about 4 inches long ending 1 inch above symphysis. Abdomen opened and patient in Trendelenburg position. Uterus grasped at cervical junction by bullet forceps and drawn upward. Incision into peritoneum over uterovaginal junction and peritoneum reflected widely. Uterus and vagina separated from bladder and ureters, which are retracted from

the operative field. Plicating sutures of kangaroo tendon placed laterally drawing together the vaginal wall anteriorly. Peritoneum closed well up on to face of uterus with catgut, the upper two stitches approximating the round ligaments in front. Uterus held well forward and the utero-sacral ligaments identified. Each shortened with kangaroo tendon. Perineum closed with catgut as were fascial planes. Skin with silkworm gut. Dressed.

Patient placed in lithotomy position. Incision between rectum and vagina running up to site of old fourchette. Vaginal wall dissected free from rectum and lateral walls of space so left closed with catgut. Skin closed with deep sutures of silkworm gut. Dressed and returned to ward in good condition.

CASE VI.—L. L., aged thirty-five years. Russia. Occupation, housework. Admitted to hospital November 10, 1909. Discharged January 13, 1910. Married eleven years; 3 children; 1 miscarriage.

Pelvic Examination. External genitals: normal. Bony pelvis: normal. Pelvic floor: second degree laceration. Cervix: median, central, bilateral laceration, bands of scar tissue binding lip of cervix to anterior wall of vagina and to right lateral wall. Uterus: prolapse in first degree, with cystocele. Adnexa: normal. Vagina: roomy. Operation, November 15.

January 13, 1910. *Vaginal examination* shows little or no discharge. No pain or tenderness except in perineum. Uterus and cervix very high up in vagina. Movable and not tender. Cervix somewhat soft and not patulous. Body of uterus not palpated. Ovaries not palpated; fairly firm bands felt stretching across both fornices laterally, but not making the cervix immobile. Complains of dull, not constant pain over lower abdomen and bladder and in lumbar region of back. No pain on urination. No incontinence. No urgency. Sometimes pain at end of urination. Urination always relieves her pains.

January 8. Complains of dull constant pain in right and left flank. On examination condition is as last noted. Urinary condition improving.

January 10. No change.

January 25. Returned for examination. Cervical stenosis followed second operation and was later broken up. Examined today by Dr. Polk. Conditions noted, uterus returned to normal position. Some induration at base of broad ligament on both sides; most marked on left. Patient just complained of pain at menstruation two weeks ago.

April 5. Examined by Dr. Polk as follows: Uterus in good position. Still complains of pains in region of broad ligaments. Tenderness insignificant.

Operation. Laparotomy and plastic for support of uterus. Patient and field prepared in usual manner. Median incision four inches long made through skin and subcutaneous tissue. Muscle fibres divided. Peritoneum divided. vagina separated from posterior wall of bladder by blunt dissection, then plicated. Infundibulo pelvic ligaments shortened. Uterosacral ligaments shortened; wall of vagina sutured and slack taken up from within abdominal cavity. Peritoneum sutured with catgut; muscle and fascia with plain catgut. Skin sutured with silk. Patient returned to ward in good condition.

Operation on perineum and cervix done December 15, 1909.

April 5, 1910. Position good.

April 20, 1912. Pregnant six months. Uterus and vagina has remained in good position.

Case VII.—P. D., aged forty-three years. German. Occupation, housework. Admitted to hospital, January 15, 1909. Discharged March 15, 1909. Diagnosis: prolapse of uterus.

Family history negative. Present history: One year before admission patient says she fell down stairs while carrying a hod of coal and the next day noticed a mass like a ball

protruding from the vagina. The mass was not particularly sore or tender but would not remain when replaced in the vagina and has continued to get larger and larger up to the present time. Patient has lost thirty-one pounds in the last four years, since husband's death, but attributes it somewhat to hard and unusual work, as she was forced to support herself. Has had a good appetite all the time and states positively that she has had no discharge or pain.

General appearance: Poorly nourished woman of forty-three years of age, of medium frame, mentality of rather low order. Eyes: pupils equal, react sluggishly to light and accommodation. Mucous membranes fair condition. Tongue: slightly coated. Throat and neck: slightly hyperemic and considerable enlargement of thyroid gland, especially right lobe is noticeable. Heart: normal in size and position; no abnormal pulsations seen or murmurs heard. Arteries somewhat thickened. Pulse regular in rhythm and size; small; rate 80. Lungs, negative. Abdomen, wall very relaxed. Striæ prominent. No tenderness except on deep pressure on right lower quadrant, where small mass about the size of a lead pencil was felt. Liver, spleen, kidneys, negative. Skin harsh and dry. Bones, joints, muscles, negative. Lymph nodes, negative. Reflexes, slightly exaggerated. Sexual organs, see pelvic examination. Uterus: about normal in size and when patient lies down is situated low in vagina, but standing or straining, completely prolapses outside vulva.

Operation. Patient and field of operation prepared in usual manner. Incision made in midline between umbilicus and symphysis four inches long and peritoneum opened. Intestines walled off with gauze rolls. Uterus drawn up into abdominal wound. Peritoneum reflection from bladder incised and ureters on each side identified. Sutures of No. 6 plain catgut were then put from the pelvic fascia of each side outside the ureters, then drawing the fascia from each side together under the trigone of the bladder. About four

of these sutures were introduced. The uterine arteries on each side and each infundibulo pelvic ligament were then ligated with No. 6 catgut and uterus cut free from vagina and broad ligaments. Opening in vagina was then closed with No. 4 plain catgut. Then uterosacral ligament from right side was sutured to stump of broad ligament of left side and uterosacral ligament of left side was sutured to base of broad ligament of right side, all uniting in one centre over stump of vagina and under base of bladder. Peritoneum closed with No. 4 plain catgut, muscle sheath with same and skin with continuous silk suture. Dressing applied and patient returned to ward in fairly good condition.

Case VIII.—C. S., aged thirty-nine years. American. Occupation, housework. Admitted to hospital April 20, 1912. Discharged May 14, 1912. Diagnosis: displacement of uterus. Complication.

Family history negative. Past history: Operated on at home in November, 1908, for laceration and prolapse of uterus. Personal history: Menstrual: Started at fifteen years of age; always regular; lasts four to five days. Moderate daily flow; no pains. Last regular period April 1, 1912, to April 6, 1912. Marital: married June 28, 1906. Two children, twins, born May 28, 1907. No miscarriages.

Present illness: Patient delivered of twins on May 28, 1907. Instruments used and patient badly torn. She was in bed for about a month. She was up only about three weeks when she noticed that her uterus began to come down and she began to have a discharge. This got gradually worse and she was operated on in November, 1908, and was all right until about July, 1909, when she noticed it coming down again; her discarge began to get troublesome again and it has been very troublesome ever since. Patient's uterus comes out immediately on getting on her feet or soon after and often swells so that she can hardly replace it. She has had irregular bladder symptoms since onset of present trouble. Bowels constipated. Very little

backache or headaches. The vagina, base of bladder, and uterus cannot be kept inside the pelvis unless the patient is recumbent. Uterus and vagina are greatly hypertrophied, and drop wholly out when standing.

Operation, April 23, 1912. The vagina was plicated from uterus to urethra. The greatly elongated uterosacral folds and broad ligaments were shortened by bringing forward the lower half of the latter and the sacral fold of each conjointly, uniting them in front of uterus at vaginal junction, and fastening them there. This was accomplished by encircling the folds and the section of broad ligament with a suture, one for each side, tying them together in front, then stitching them down to underlying surface. The plicated fold in vagina was then opened from below, trimmed off, and surfaces coapted with catgut. Rectocele and perineum repaired at same time.

CASE IX.—F. F., aged fifty-three years. Canadian. Occupation nurse. Admitted to hospital, November 14, 1911. Discharged December 18, 1911. Diagnosis: prolapse of uterus.

General history: Patient is fifty-three years old; works as a professional nurse. Family history, negative. Previous history: habits good; no alcohol; appetite good; bowels constipated. Usual diseases of childhood. Venereal denied. Always healthy in adult life. Was operated on for alveolar abscess and antrum disease about one year ago. Menstrual history: menopause at age of fifty years. Previous menstrual history negative. Obstetrical history negative.

Present illness: Had a rather acute onset. In April, 1911, patient walked the floor for about twenty minutes carrying a heavy, struggling child. The same evening she had lumbar backache and a bloody vaginal discharge. This discharge lasted for about a day, but the backache grew progressively worse. In addition she has had severe occipital headache, pain in the back of her thighs, and a sensation of something dropping out below. After standing for a long time or

straining at stool patient says that something protrudes from vulval orifice.

Since onset patient has had frequency of urination, especially during the day, and burning after the act. There is an intermittent, scant, thin, white, vaginal discharge.

Examination shows prolapse of uterus and vagina, the uterus can be drawn outside the vulva but when released about half of it returns.

General appearance: Thin, poorly developed, and poorly nourished female of fifty-three years. Does not appear acutely ill. Abdomen: soft; symmetrical; permits of deep palpation everywhere. No masses nor tendernesses made out. Liver, spleen, kidneys not palpable. Skin: somewhat dry; no eruption; no edema. Bones, joints, muscles, negative. Lymph nodes not enlarged. Reflexes present. Breasts poorly developed; firm; no secretions present. Uterus prolapsed second degree.

Operation. Patient prepared in usual manner. Incision four inches long in midline above pubis, abdomen opened. Trendelenburg position. Incision through vesico-uterine peritoneum transversely. Bladder separated from anterior uterine and anterior vaginal wall by blunt dissection with periosteal elevator. Anterior vaginal wall plicated by transverse sutures catching one side of vagina, passing anteriorly, and then taking in a bite of other lateral wall. Sutures tied. Clamp passed through broad ligaments grasping uterosacral ligaments, drawing them anteriorly and fastening them to anterior surface of lower portion of uterus in region of cervix with kangaroo tendons. Round ligaments caught, drawn down, and sutured to anterior surface of fundus of uterus with kangaroo tendons. Peritoneum not sutured over wound but allowed to drop in place. Abdominal wall closed in usual manner. Anterior vaginal fold slit up from cervix to urethral orifice and surfaces stitched together formed by sutures introduced in vaginal wall through laparotomy incision. Vagina packed with gauze. Retention

catheter in bladder. Sterile dressing. To ward in good condition.

CASE X.—M. D., aged forty-two years. Irish. Occupation, housework. Admitted to hospital September 22, 1910. Discharged November 19, 1910. Diagnosis: prolapse of uterus. Complication: old ventral hernia. Lacerated pelvic floor.

General history: Married. Five pregnancies. Venereal denied.

Present illness: Duration about one and one-half years. About one week after leaving Presbyterian Hospital patient felt burning sensation and a feeling as if something had given way in the left lower quadrant. Burning sensation was continuous. Three weeks later patient noticed small lump appearing between labia and this has gradually increased in size. Interferes with walking and makes urination difficult. Has increased frequency of urination. No burning or pain. Has to exert great force to start stream and cannot stop after she has once started. Bowels are always constipated.

Menstruation comes at intervals of six weeks; not painful; flow scant. Has constant sensation of something dragging or falling down about pelvis. No gastric disturbance; slight headache occasionally. No chills, fever or leucorrhea. Uterus prolapsed. Operation same as preceding case.

CASE XI.—E. G., aged forty-six years. American. Occupation, chambermaid. Admitted to hospital October 10, 1910. Discharged December 3, 1910. Diagnosis: Prolapse of uterus. Complication: Lacerated perineum.

General history: Married. Four pregnancies.

Present illness: Duration about seven years. Patient says that off and on for seven years her womb would come down. She had a peculiar sensation by which she could feel that it was down, and sometimes it would protrude outside vulval orifice and would go back into position itself without patient laying or sitting down or any manipulation.

Had no pain but interfered with walking. While womb was prolapsed patient would have severe pain on urination. For last three weeks she says her womb has been down and protruding continuously, and patient could not sit down, and urination and defecation were extremely difficult and painful. Uterus prolapsed. Operation same as preceding case.

CASE XII.—M. M., aged fifty years. German. Occupation, laundress. Admitted November 18, 1909. Discharged February 10, 1910. Diagnosis: prolapse. Complication: cystocele rectocele.

Family history negative.

Present history: For the last year patient has noticed that whenever she walked or went to stool her anterior vaginal wall would bulge down into the vulva. This is accompanied by severe pain along the sides of her abdomen and in her back. She has frequency of urination but no pain. She is troubled with almost constant frontal and occipital headache. Her bowels are very constipated and she becomes nauseated at the slightest cause; she does not vomit however. Patient feels very week. Uterus prolapsed. Operation same as preceding case. Result, April 14, 1912, excellent.

CASE XIII.—E. H., age forty-eight years. Irish. Occupation, housework. Admitted to hospital April 22, 1910. Discharged July 25, 1910. Diagnosis: prolapse of uterus. Complication: rectocele cystocele.

Family history negative.

Present history: Patient was operated on in this hospital and ward eight months ago, and about six weeks after leaving hospital, while at work, she says her womb came down and was put back with some difficulty. Whenever it is prolapsed she suffers from great pains in back, bearing down sensations, considerable pain, and difficulty in urination. She has to wear a perineal support, but gets little relief, and as condition interferes with her work she came to hospital for cure. General health has been fairly good. Uterus prolapsed. Operation same as preceding case.

Case XIV.—M. D., aged thirty-eight years. German. Occupation, housework. Admitted to hospital April 25, 1910. Discharged May 6, 1910. Diagnosis: prolapse of uterus.

Family history negative.

Present history: About three months after patient's last labor eighteen months ago, which terminated in an embryotomy, she began complaining of general ill health and dragging sensations in pelvis as if her insides were falling out. Consulted a doctor, who inserted a pessary and put her on douches. She expelled the pessary shortly after, but continued to treat herself with douches. Had no symptomatic disturbances and felt pretty well except for sensations of prolapse. About one month ago had cough and began to complain of severe dragging pains in back which have persisted. No vesical or rectal disturbances. No discharge.

Pelvic examination: External genitals: very relaxed, otherwise negative. On coughing or straining vaginal walls roll our markedly and cervix presents at vaginal orifice. Perineum: very relaxed, support poor; shows old laceration. Vagina: ostium gapes, relaxed and roomy with marked degree of rectocele and cystocele; fornices negative. Cervix: soft, movable, very low down and somewhat anterior. Os patulous. No tenderness. Uterus: enlarged slightly, well back in pelvis; retroverted and prolapsed about second degree; consistency soft; symmetrical; no tenderness. Adnexa: negative.

Operation. Polk's suprapubic operation on pelvic floor. Perineorrhaphy. Patient and field of operation prepared in the usual manner. Incision about four inches long median and ending one inch above symphysis. Abdomen opened and patient put in Trendelenburg position. Pelvis found to contain considerable adhesions about uterus and tubes. Uterus somewhat enlarged and softened and tubes the seat of recent inflammatory changes. Ahdesions released. Incision through peritoneum over uterovaginal junction and peritoneum retracted. Vaginal wall plicated by four

kangaroo tendon sutures. Peritoneum closed by catgut sutures extending well up and including the approximation of the round ligaments in front of the uterus. Closed ends of the tubes incised and opened. Peritoneum and fascial planes closed by catgut and skin by silkworm gut. Patient put in lithotomy position. Skin between anus and vagina incised and vagina dissected free. Incision goes to site of old fourchette. Lateral walls approximated by catgut suture. Skin closed by deep catgut sutures in anteroposterior line. Patient dressed and returned to ward in good condition.

Last report, December, 1911, good result maintained.

CASE XV.—F. M., aged forty years. American. Occupation, midwife. Admitted April 26, 1912. Discharged May 22, 1912. Diagnosis: laceration of pelvic floor. Prolapse of uterus. Family history negative. Venereal denied.

Present illness: Patient comes to the hospital on account of the prolapse of her uterus. She says she was told that she was torn with her first child twenty-seven years ago, but nothing was done, and she had no trouble afterward or after her second child was born, which was twenty-one years ago. Five years after her second child (1896) she again became pregnant and then began to have such severe pains in her lower abdomen and felt so weak that she consulted a doctor, who told her that she had womb trouble from an old laceration and that she would abort. Patient carried the child for four months by taking very good care of herself and then aborted. Since that time if patient was on her feet much she would have severe pains in her sides and she would go to a doctor and have a tampon put in and rest up and would then be all right for six months or a year. At that time patient could feel the uterus at the opening of the vagina.

Patient has always been constipated and has been troubled with increased frequency of micturition for about ten years.

Patient has been taking a course in midwifery for last

six months and had to be on her feet a great deal, and all her symptoms have become exaggerated, so she comes in for an operation. No pulmonary or cardiac symptoms. Has to get up once or twice a night to pass her water, as a rule, and has severe headaches at times. Sees spots before her eyes and feels dizzy at times. Chief complaints: (1) Prolapse of uterus; (2) constipation and increased frequency of micturition; (3) headaches and dizziness. Uterus prolapsed. Can be drawn two-thirds outside pelvis.

Operation. Repair upper pelvic floor. General anesthesia Dorsal position. Soap and water preparation. Bullet forceps attached to cervix per vagina. After opening the abdomen the vaginal and supervaginal supports put on stretch by traction on this forceps. Uterosacral ligaments clearly outlined thereby were then shortened thus: Each seized, successively one inch from uterus, drawn through opening in broad ligament and attached to anterior lateral aspect of uterovaginal junction. Opening in broad ligament made at inner lower angle of this structure; attachment made several loops of suture. Seizing anterior vaginal wall at uterovaginal junction this structure put on stretch upward. Bladder separated from anterior face of vagina to trigone. Anterior vaginal wall slit open from uterovaginal junction to trigone. Lateral walls of vagina approximated along midline covering in the incision. Round ligaments drawn inward and attached to sides of uterus at utero-vaginal junction. Abdomen then closed. Gauze dressing. From below the apposed surfaces of anterior vaginal wall below line of sutures put in from above were then apposed from above downward from uterus to tongue. Repairs of perineum left for future operation. Patient left hospital without repair of perineum.

Case XVI.—A. F., aged forty years. British West. Occupation, housework. Admitted February 16, 1912. Discharged March 10, 1912. Diagnosis: complete procidentia. Complication: Prolapse of uterus.

Family history negative.

Present illness: Patient's trouble dates back to the birth of her last child in June, 1907. She was delivered with instruments and she thinks she was torn. No operation was done. Patient was in bed only about ten days and then got up and did her work as usual. Patient was apparently all right for about two years, when she began to have a discharge and not long after she noticed that her "womb was falling." This has slowly and progressively gotten worse until now her uterus comes all the way out. The discharge has gotten worse until at present it is profuse in amount and very foul smelling and is yellow in color. Patient has never had much pain until last year, when she noticed that if she was on her feet much she would have heavy dragging pain in her back and sides and also headaches. When she gets tired this way it becomes very painful to pass her water. When she pushes her uterus back there is no more pain and she can pass her water easily.

Bowels always constipated. Patient has noticed a little blood in her vaginal discharge for last three or four months and it is increasing in amount. Patient does not think she has lost any weight. Appetite always good. No cardiac, renal or pulmonary symptoms. Chief complaints: (1) "Falling of her womb;" (2) headaches and backaches if on her feet for any time; (3) vaginal discharge. Sexual organs: uterus can be drawn outside pelvis.

Operation. Repair upper pelvic floor. General anesthesia. Dorsal position. Soap and water preparation. Bullet forceps attached to cervix per vagina. After opening the abdomen the vaginal and infravaginal supports put on stretch by traction on this forceps. Uterosacral ligaments clearly outlined thereby were then shortened thus: Each seized successively, one inch from uterus, drawn through opening in broad ligament and attached to anterior lateral aspect of uterovaginal junction. Opening in broad ligament made at inner lower angle of this structure. Attachment made several loops of suture.

Seizing anterior vaginal wall at utero-vaginal junction this structure put on a stretch upward. Bladder separated from anterior face of vagina to trigone. Anterior vaginal wall slit open from uterovaginal junction to trigone. Lateral walls of vagina approximated along midline covering in incision. Round ligaments drawn inward and attached to sides of uterus at uterovaginal junction. Abdomen then closed. Gauze dressing. From below: The apposed surfaces of anterior vaginal wall below line of sutures put in from above were then apposed from above downward from uterus to trigone. Repair of perineum left for future operation.

CASE XVII.—M. O'B., aged forty-eight years. Irish. Occupation, waitress. Admitted March 25, 1912. Discharged April 17, 1912. Diagnosis: displacement of uterus; retroversion.

Family history: Mother, father, and one brother dead. Causes unknown.

Present illness: Patient went to the dispensary because she had "falling of womb." Patient first noticed her womb coming out about three years ago. It did not come all the way out then, but it has gradually come farther out until it comes out two or three inches now. It goes back when she lies down. Patient denies any discharge or any bladder symptoms. She has had bearing down pains in her back since she first noticed that her womb was falling. These are worse now than ever before and are worse when she is walking or working on her feet, being relieved by lying down. Bowels constipated. Chief complaints: (1) Falling of womb; (2) dragging pain in back.

General appearance: Sparely nourished; medium stature; dorsal posture; no pain. External movements, eyes normal, pupils equal, and react normally. Mucous membranes good color; no patches; tongue clean; throat clear. Heart: no abnormal neck or pericardial pulsation or thrills. Area of cardiac dulness not enlarged. Sounds at apex and base

clear.   Pulse: regular in force and rhythm; volume full; tension moderate.   Lungs: chest fairly well formed, symmetrical, expansion poor.   Fremitus normal, percussion and auscultation negative.   Abdomen: rather sunken but natural contour.   No local tenderness or rigidity.   No masses. Liver, spleen, kidneys not enlarged; not palpable.   Skin: scars on face and right knee of old accident.   Bones, joints, etc., normal.   Lymph nodes not enlarged.   Reflexes normal. Sexual organs not examined.

April 1, patient operated on by Barrows.   The operation sheet.   She took ether well and made a good recovery. April 2, patient in fair condition.   She is getting saline per rectum every four hours; has had some vomiting.   Pulse fair.   April 3, patient is suffering some pain in abdomen. General condition fairly good.   Vaginal packing removed. Patient has no complaints.   Pulse good.   Tongue clean and moist. Quite comfortable.   April 4, condition good.   No complaints.

Operation.   General anesthesia.   Dorsal position.   Soap and water preparation.   Abdomen opened by usual median incision.   A ventral fixation had been done at a previous operation.   The uterus had elongated at about eight inches and was about the diameter of a thumb of medium size. The broad ligament was thinned out and the tubes and ovaries were in a position almost parallel to body of uterus. The uterus was cut free and the bladder separated from the anterior surface of the uterus.   The uterosacral ligaments were brought to the uterovaginal juncture and attached there and the broad ligaments shortened with kangaroo tendon sutures.   Abdomen closed.   Patient put in dorsal lithotomy position and cystocele repaired.   Gauze dressings.

In ending this paper I cannot forbear calling your attention to the advantages to be derived in cases of retroversion of the uterus which cannot be cured in any other manner except by operation.   It is well known that a large number

of these cases are without symptoms and, therefore, need no operation. Others can be cured by simply reducing the size of the uterus through curettage and packing; in other words, bringing about involution and supporting the organ temporarily with a pessary. There are other cases, however, which even though treated by the Alexander operation, or any of its modifications, or by ventral fixation, relapse, carrying with them their symptoms of discomfort and even incapacitate nervous and susceptible women. These relapsing cases I believe fail largely through defects in the peritoneal surface of the pelvic floor. Coffey, of Portland, has suggested an operation which to my mind comes nearer meeting this defect than any other I know. The transference of the traction about the base line of the uterus to the front, as suggested in this operation for procidentia, has in it, I believe, elements which meet the basic principles required to correct this defect. Separation of the bladder has no place here, but narrowing plication of the vagina opposite the cervix, with or without conjoined shortening of the uterosacral, broad, and round ligaments, has something in it worthy of further inquiry.

THE END RESULTS WITH VARIOUS OPERATIVE PROCEDURES FOR PROCIDENTIA AND EXTENSIVE CYSTOCELES PRIOR AND SUBSEQUENT TO THE MENOPAUSE

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VAGINOFIXATION OR TRANSPOSITION OF THE UTERUS AND BLADDER

THE writer will first take up vaginal operations for procidentia with cystocele in women approaching or past the menopause. The operation *par excellence* for this condition at that time of life is vaginofixation, or what has been described within recent years as transposition or interposition of the uterus and bladder. It may be of interest and perhaps of corrective value in the light of certain recent publications to give a brief sketch of the history of vaginal operations in this country for backward and downward displacements of the uterus. This is done in the interest of historical accuracy with no desire to raise the spectre of priority.

The first description of vaginofixation or the Dührssen-Mackenrodt operation in this country was that given by the writer in an article in the *Amer. Jour. of Gyn. and Obst.*, January, 1894. A fuller description was published by him in the *New York Med. Jour.*, October, 1894.[1] The technique

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[1] A suture is passed through the left vaginal flap at the extreme upper end of the incision, that is, from 1 to 2 cm. below the urethral opening and about $\frac{1}{2}$ cm. from the edge of the flap. The suture is

corresponded in all essentials to the procedure recently described by Watkins as "Transposition of the Uterus and Bladder."

From the outset the writer recognized the value of the operation in large cystoceles and in uterine prolapse of various degrees. In fact, on every occasion when the opportunity presented itself he extolled the operation for cystocele and uterine prolapse in women after the menopause.

The first case of complete procidentia, in which he performed the operation, was in 1895, in a patient who in 1908 (thirteen years later) became pregnant, the pregnancy being artificially terminated in the seventh month by another operator on account of morphinism. There had been no recurrence of the prolapse up to that time.

In a paper[1] published in the *Medical Record* for September 6, 1902, the writer took occasion to state that vaginal fixation is "the *ideal* operation for cases of retroversion in women approaching the menopause, in which the retroversion is associated with a marked degree of prolapse and a marked rectocystocele." He had considered the operation so well established for these conditions that he took no further pains to bring it before the profession. He is, therefore, much gratified with the renewed interest it has excited under a new garb.

then carried through the anterior wall of the uterus, as near the fundus as it is possible, and out through the right flap at a corresponding point to that of the opposite side ("The Technique and Indications of Vaginofixation," New York Med. Jour., October 27, 1894). Then, again, the first fixation suture is carried through the anterior aspect of the uterus about 1 cm. below the insertion of the tubes, and is passed through the vaginal flaps near the urethral opening (Trans. Medical Society of the State of New York at its annual meeting, 1896). Compare Fig. 8, "Transposition of the Uterus and Bladder," Thos. J. Watkins, Amer. Jour. of Obst., February, 1912, page 233.

[1] Vaginal Operations for Retroversion and Reflexion, etc., The Medical Record, September 6, 1902.

It is but fair that due credit be given to Drs. Thos. J. Watkins and I. Stone for emphasizing the value of the method in cystocele and prolapse after the menopause.

In his first paper in 1899 Watkins[1] described a technique of suturing the vaginal wall to the broad ligaments, and to the fundus, thus leaving the lower part of the body of the uterus exposed in the vaginal canal, and reported 3 cases. This was a technique Freund had introduced and which soon met the fate it deserved, for a more unsurgical procedure could scarcely be conceived. In 1906 a second paper appeared by Watkins ("Treatment of Cases of Extensive Cystocele and Uterine Prolapse," *Surg., Gyn., and Obs.*, vol. ii, 659), in which the technique described resembled in the main features that of vaginofixation as practised by the writer, with the exception that he did not carry the incision so far up in the anterior vaginal wall. In Watkins' latest and most fully illustrated article ("Transposition of the Uterus and Bladder," *Amer. Jour. of Obst.*, February, 1912) the incision in the anterior vaginal wall and the placing of the sutures in the uterine wall correspond closely to that described by the writer in 1894 ("The Technique and Indications of Vaginofixation," *New York Med. Jour.*, October 27, 1894), as already stated.

The technique of the operation has been so often fully described and illustrated by the writer and others that to describe it now would merely take up unnecessary time and space.

There are a few points, however, in the technique to which the writer would wish to draw attention. In extensive cystoceles he deems it essential, in order to obtain a good permanent result, to separate the bladder freely, centrally, and laterally from the cervix and base of the broad ligaments. To accomplish this the "bladder pillars" have to be severed

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[1] The treatment of Cystocele and Uterine Prolapse after the Menopause, Amer. Gyn. and Obst. Jour., 1899, p. 258.

between two ligatures. To merely separate the bladder in the median line, as advised by Watkins and others, invites a recurrence of the cystocele at the outset, for it leaves pockets of the prolapsed bladder at either side of the cervix, which, in a short time, increase in size and form what might be called a double cystocele. The writer deems it important, also, with a very few exceptions, to perform a high amputation of the cervix, for when this is not done the cervix acts like a wedge and a recurrence of the prolapse is very prone to occur. The omission of this procedure by Watkins in most of his cases would, no doubt, explain the large percentage (5 to 10 per cent.) of recurrence of the uterine prolapse he has encountered. In a few cases where the uterus was very large and thick the writer has excised a wedge-shaped piece from the body as has been done by Pfannenstiel, Landau, Stoeckl, Lowit, and others, but the procedure did not appeal to him. In such conditions he prefers to do a subtotal excision of the uterus, leaving as much of the lower segment of the uterus as possible, together with the cervix, and employing this residue of the uterus as a *pelotte* for the bladder by suturing it to the vaginal wall, as near to the urethral meatus as possible. During the past year he has carried out this procedure in 3 cases, with very gratifying results. They are not included in the series given below, as sufficient time has not yet elapsed to judge of the permanency of the results. In all of the cases a posterior colporrhaphy was done with the purpose of suturing the levator ani together between the rectal and vaginal walls and remedying the existing rectocele and laceration of the perineum. A minor detail which the writer deems of value is the insertion of a narrow gauze packing, pushed up on either side of the cervix, at about the level of the os internum. There is usually considerable oozing from these areas and the gauze checks it. Very disturbing hematoma between the vaginal wall and uterus with fever and breaking down of the suture line have been known to occur when this preventive measure

was not taken. The gauze is removed at the end of twenty-four or forty-eight hours, and as it occupied only the small space between two sutures the healing of the wound is not interfered thereby.

The operation should not be done in the child-bearing period on account of the risk of dystocia in case of pregnancy. Should occasion arise for some good reason to perform it during that period, the patient should be rendered sterile, with consent of husband and wife, by proper ligation and excision of the tubes.

To comply with the condition of this symposium, to state only results of cases observed for two years or more, the writer has had to draw his material almost entirely from his private practice, as it has been nigh impossible to trace the hospital cases for so long a period. The number of cases he has been able to trace is 45. In not a single instance has there been a recurrence of the prolapse or of the cystocele. In three cases there was a recurrence of the rectocele about one and one-half inches above the posterior commissure, showing either a faulty technique in the posterior colporrhaphy, in that the denudation was not sufficiently wide at the upper part, or a too early absorption of the deep catgut sutures. Latterly, the writer has employed chromicized catgut for these sutures.

VAGINAL OPERATIONS DURING THE CHILD-BEARING PERIOD. VAGINAL SUTURING OF THE ROUND LIGAMENTS

In 1895, one or two years after vaginofixation had been introduced, several cases of serious dystocia were reported in the German medical journals, due to the operation. Although the writer had not observed any such difficulties in the 2 cases of labor, in the cases of vaginofixation he had performed, he did not feel himself justified in continuing with the procedure in women during the child-bearing period. Accordingly, he turned his thoughts to devising a technique

which would offer no obstacles, in the event of pregnancy and labor. Having had considerable experience with the method of suturing the round ligaments to the abdominal wall, and knowing its freedom from complications, either during pregnancy and labor, he argued the same freedom should obtain with a similar technique through the vagina, substituting the vaginal for the abdominal wall.

This technique he first carried out on February 4, 1896, and described it in a short paper read before the Obstetric Section of the New York Academy of Medicine, on February 27, 1896 (*Medical News*, March 14, 1896).

Wertheim, following the same line of reasoning, drew a similar inference, and at the end of a long article on dystocia in vaginofixation in the *Centbl. f. Gyn.*, January 11, 1896, made the following statement: "Perhaps these facts (the absence of dystocia following Olshausen's method of ventral suspension, that is, suturing the round ligament to the abdominal wall) would argue in favor of a corresponding modification in vaginofixation." It was not until March 7, 1896, that an article by Wertheim appeared in the *Centbl. f. Gyn.*, describing the technique and reporting two cases in which it had been carried out. Five other cases were reported, but a different technique was followed.

Bode, in an article in the *Centbl. f. Gyn.*, March 26, 1896, described a vaginal operation for folding and suturing the round ligaments upon themselves. Thereafter the various procedures for the employment of the round ligaments by the vaginal route for correction of uterine displacements were known in Germany as the Wertheim-Bode operation.

Shortly after the appearance of the writer's article, Byford[1] and Goffe[2] each presented a paper describing a vaginal operation whereby the round ligaments were sutured either by folding them upon themselves or suturing them to

[1] American Gyn. Jour., June, 1896.
[2] Trans. Amer. Gyn. Soc., 1897.

one another or suturing them to the uterine cornua. As not infrequently happens, the work done in this country in devising and perfecting the technique of employing the round ligaments through the vaginal route was totally ignored in Germany.

Attention is drawn anew to these facts, as it would seem from recent publications that even our own Fellows have either overlooked or forgotten what their Fellow members have done in this line of work.

Although the operation under consideration was originally devised chiefly for the correction of backward displacements, it was soon recognized that it had a field as well in downward displacements associated with large cystocele. Accordingly in a paper presented by the writer to this society at Washington, D. C., May 2, 1900,[1] we find in the 50 tabulated cases, 5 cases with marked prolapsus uteri and large cystoceles. In a number of other cases it is stated there was prolapse of the uterus of the first degree. These are excluded from the present discussion.

The writer has made the following indications for himself in the performance of this operation. Apart from backward displacements he resorts to the operation in patients during the child-bearing period, when there is a marked cystocele accompanying the downward displacement and when for some reason an abdominal operation is ruled out. The ruling out of the abdominal operation may be on account of the marked obesity of the patient or on account of great fear on the part of the patient of a ventral incision. It is with him, therefore, an operation of selection and not of perference. In view of the time that has elapsed since the last paper it may be well to briefly redescribe the technique with the aid of fresh illustrations.

1. *Incision Same as for Vaginofixation.* Blunt dissection of vaginal flaps from the underlying bladder. The manner

[1] Amer. Jour. Obst., 1900, vol. xlii, No. 2.

of doing this is immaterial whether one makes a small transverse incision over the cervix and inserts the point of the scissors and with them effects the separation, or uses the scalpel for the vertical incision from near the urethral meatus down to the vaginal portion and separates the flaps on either side with short strokes of the scalpel aided every now and then with the gauze-covered finger.

2. *Separation of the Bladder from the Anterior Surface of the Cervix and Lower Uterine Segment.* This, as a rule, can be done with gauze and the finger, using the scissors here and there to sever the connecting tissues. As at this period of life the prolapse of the bladder, as a rule, is not as extensive laterally as after the menopause, the separation need only be done in the median line and the "bladder pillars" may be left intact.

3. *Opening the Peritoneum.* This is easily accomplished by catching hold of the loose peritoneum some distance beyond the level of the os internum and with scissors making the incision the necessary width. The writer has witnessed many operators create for themselves unnecessary difficulties just in this step. They would mistake the layer of loose cellular tissue between the bladder and cervix for the peritoneum, begin cutting into this causing troublesome bleeding and continue excavating in this plane and sometimes fail entirely to enter the peritoneal cavity. All this can easily be avoided by not making any attempt to enter the peritoneum until the bladder has been fully separated from the uterus. Then a retractor is placed in the space between the bladder and uterus and the thin peritoneal layer covering this anterior wall of this uterus is freely exposed and easily seen. The remainder is very simple. A suture is carried through the peritoneum above the line of incision and left long in the bite of artery forceps. Its purpose is to locate the distal edge of the peritoneum and to draw it down toward the cervix when it becomes necessary later to close the peritoneal incision.

4. *Delivery of the Fundus through the Vaginal Incision.*
An endeavor should be made to do this by hooking the index
finger over the fundus and drawing it into the vaginal wound,
while at the same time the cervix is pushed forcibly back-
ward with the volsella toward the posterior fornix. This
may fail if the body of the uterus be large and if the separa-
tion of the bladder has not been carried to the full extent.
Care is necessary in this step not to create any raw surface
on the anterior aspect of the uterus. Therefore, if the
above maneuver fails, one should make use of traction
sutures, each carried higher up on the uterine wall until
the fundus presents and is delivered. The adnexa are now
visually inspected by the proper application of retractors
and can, if necessary, be readily brought into the vaginal
wound for any surgical procedure indicated.

5. *Round Ligament Sutures.* Before the uterine body is
returned into the peritoneal cavity, two silk sutures are
passed on either side, the inner one at the point of insertion
of the ligaments into the uterus, and embracing some uterine
tissue, the outer one penetrating the ligament about 2 cm.
further out. To prevent confusion afterward, the ends
of the sutures, in accordance with a preconceived plan, are
attached by artery forceps to the surrounding drapery.
The body of the uterus is then returned into the peritoneal
cavity. A strip is now excised from each vaginal flap corre-
sponding in width to the extent of the redundant vaginal
wall and the round ligament sutures carried through the
vaginal wall on either side at proper distance from the edge
of the incision. The bladder peritoneum is then drawn
down by means of the guy suture and the peritoneal slit
closed by a continuous catgut suture.

6. *Deep Facial Suture of Chromic Catgut.* This is an
important suture and is passed as follows: The needle enters
the fascia at the upper angle of the vaginal incision, where
it is quite thick and plainly visible underneath the mucosa,
it emerges, in the same plane, about 2 cm. lower down and

is then carried through the anterior aspect of the uterus, a short distance above the os internum and is passed in a reverse direction on the opposite side, emerging at a corresponding point. When this suture is tied the entire uterus is elevated and a shelf created by the deep fascia and the lower uterine segment, which prevents a recurrence of the cystocele. When operating for cystocele alone, in the child-bearing period, that is, when there is no downward or backward displacement of the uterus, the writer does not open the peritoneal cavity and merely makes use of this suture. The two vaginal flaps are now coaptated either by interrupted or continuous chromic catgut suture, the last couple of sutures being made to catch up the cervical tissue, thus reproducing the condition that normally obtains.

Then the round ligament sutures are tied, not too tightly, and left long so as to be easily removed in the course of ten or twelve days.

The cervix is now amputated and sutured in the proper manner. The writer deems this an essential feature of all operative procedures for prolapse as stated above.

Finally a posterior colporrhaphy is performed, and, if there be a marked rectocele the parts are sutured so as to bring the levator ani together between the rectum and the vaginal septum.

Seven cases of marked prolapse associated with retroflexion have been traced, on whom the operation had been done, two or more years before. In one of the very early cases (June 27, 1897) the convalescence was complicated by a severe bronchitis, union of the vaginal wound was not good, and, although the uterus remained in good forward position, there was a recurrence of the cystorectocele. In a second case there was a slight protrusion of the anterior vaginal wall when the patient was requested to bear down. In the remaining cases the results were excellent, one patient went through a pregnancy and had a normal labor without any recurrence of the prolapse or cystocele.

ABDOMINAL OPERATION FOR PROCIDENTIA DURING THE CHILD-BEARING PERIOD

The results the writer has obtained with a modification of Olshausen's method of suturing the round ligaments to the abdominal wall for backward and downward displacement of the uterus, have been so uniformly good that he has been content to employ it for the last fifteen years, to the exclusion of all other methods of round ligament operations through an abdominal incision.

As the writer has recently fully described and illustrated the technique[1] he deems it superfluous to repeat it here. It is simple in its technique and is free from the infliction of any traumatism to the organs and structures concerned, and, as already stated, its results are uniformly good. Why anyone should think of employing another method when the round ligaments are called into requisition, has always been a source of surprise to the writer. It is the operation of preference with him in young women, who have only a few children or who are desirous of having more, independent of what number they possess at the time. If the uterine prolapse be associated with a cystorectocele, as is usually the case, the abdominal operation is preceded by a suitable plastic on the vaginal walls. In the presence of a marked cystocele, the same steps are followed as were described in the operation of suturing the round ligaments to the vaginal wall, with the exception that the peritoneal cavity is not entered and the uterus is not delivered through the vaginal incision. After pushing up the bladder above the fundus and excising the redundant vaginal wall, the buried purse-string suture, described above, through the thick fascia at the upper angle of the wound, and, below, through

[1] Ventrosuspension by the Round Ligaments for Backward and Downward Displacement of the Uterus, Surg., Gyn., and Obst., April, 1911.

the anterior uterine wall just above the internal os, is applied. This technique corresponds to the modern one for hernia, which a cystocele virtually is. The contents of the hernial sac are pushed back, and a suture or sutures are employed to bring structures together, which will act as a barrier to prevent the recurrence of the hernial protrusion.

Seventeen cases in private practice have been under observation for two years or longer. There have been three deliveries at full term, one patient had two and another had one. The pregnancies, labors, and puerpera were normal in every respect. The women were examined afterward. In none of the 17 cases has there been a recurrence of the prolapse, or of the cystocele.

DISCUSSION ON THE PAPERS OF DRS. MONT-GOMERY, BALDY, GOFFE, POLK.

DR. BARTON COOKE HIRST.—There is only one way to solve the question of treatment of prolapse of the uterus, and it is always astonishing to me that that one method is persistently dodged in these medical meetings. The only way to devise a satisfactory operation for prolapsus uteri is, in the first place, to understand the anatomy of the supports of the structures involved, and in the second, to understand the injuries which are inflicted upon those structures in labor. Not one word was said in any of the papers as to the injuries which result in prolapsus of the uterus, and yet in 99 cases out of 100 the condition is due to injuries received during labor. As I understood the statement made by Dr. Goffe with regard to the supports of the uterus, he is, if he will pardon me for saying so, incorrect. The uterus does not support the bladder. The bladder is supported by well-known structures, the pubo-vesical and uterovesical ligaments, and by the urogenital muscle and fascia of the trigonum. These are the structures which support the bladder. I do not pretend to be an anatomist, but there are books written by anatomists that are accessible

to everyone. Waldeyer's book and all recent atlases will instruct anybody as to the anatomy of these structures.

I think, however, that I am competent to speak of the injuries in labor which result in prolapsus. They are: an elongation of the cardinal ligaments at the base of the broad ligaments, with subsequent elongation of the lower uterine segment; lateral displacement of the fascial plate, which extends from the base of the broad ligament and from the cervix to the vesicovaginal septum behind the bladder, and lacerations of the urogenital muscle and fascia of the trigonum. The effect of these injuries is: lack of support in the bases of the broad liaments; elongation of the elastic lower uterine segment; a dropping downward and outward of the anterior vaginal wall due to injury to the muscle and fascia of the urogenital trigonum, and finally protrusion of the bladder through the gap in the fascia. Indirectly there is further deprivation of support by injury to the levator ani muscle posteriorly, but complete cystocele may develop with an intact pelvic floor. It is necessary to devise an operation which will correct every one of these injuries and correct them on anatomical principles, and until we correct them on that basis, we will never cease disputing the merits of various procedures for prolapsus uteri, and we will not have arrived at a correct solution of the problem. For eight or ten years I have been utilizing an operation, based on the anatomy of and the injuries to these structures, and so far as I can tell the operation I have been doing has been uniformly successful. My hospital services with the ambulatory dispensary service and out-patient department, amounts to about 4000 new cases a year. Everybody knows what hospital patients are; we know how many cases of prolapse occur in that number of poor women every year. While I cannot present correct figures the number of operations for prolapsus uteri in ten years amounts to several hundred. Not one of these patients has returned for a recurrence of the prolapse. I have had two women with falling of the bladder after the operation, and in them I carried out a suggestion of Dr. Dickinson; suspending the bladder to the anterior wall as high as I could get it. But in each of these cases the uterus did not prolapse and the posterior vaginal wall was normal. I utilize the strong structures at the bases of the broad ligaments, and the fascial plate derived from them and also unite the muscle and fascia of the urogenital trigonum. Finally, by doing an

extensive Hegar operation on the posterior vaginal wall, and bringing the outer edges of the levator ani muscle between the vagina and rectum, the result is satisfatory. I can truthfully state that in the last ten years not a single woman has come back to my hospital clinics with a recurrence of prolapse of the uterus. There may, of course, have been some failures, but I do not know of them. If the proportion were large I surely would have seen some of them in that length of time.

DR. GEORGE GRAY WARD.—I have been much interested in this subject for a number of years, and eight or nine years ago I had the good fortune to assist Dr. Goffe himself in a case of hernia of the bladder or cystocele. The operation, as he has described it here, I have done a great many times for that condition, and I think the proof of the pudding is in the eating. The results have been satisfactory. The whole idea of cystocele is to bear in mind that it is a true hernia; that you have an actual increase in the floor of the bladder brought about by years of stretching, so that you have considerably more bladder than you should have at the situation of the trigone. In the operation one should recognize the principle, which was first elucidated by Hadra, of Texas, as mentioned in Kelly and Noble's work on operative gynecology. You must separate the bladder from the vagina, so that it will slip high up on the anterior surface of the uterus, above the position it was in, and thus get rid of the sagging bladder wall which has come about by years of stretching. The method described by Dr. Goffe suffices certainly in cases of large cystocele, as large as the first sometimes, and it does hold the bladder very satisfactorily I believe. Perineorrhaphy is an essential part of the operation. Some have spoken of using methods which recognize that a relaxation of the pelvic floor should be corrected by taking up the excess of levator ani muscle which has become overstretched, and such an operation as putting the fibers of the levator ani between the rectum and posterior vagina is of the type which should be adopted. The operation for prolapsus uteri is simply a further extension of the method for cystocele, and it seems logical to make a plane at the bases of the broad ligaments; sewing them togther in the median line you have a structure to fasten the bladder upon just as you would if you had the uterus there. I have adopted this procedure in the last two years with success in every case so far as I am aware, but I have not reported results, as I am waiting to see what the alternate outcome will be.

PAPERS

CANDIDATES ELECTED TO FELLOWSHIP

AT THE

THIRTY-SEVENTH ANNUAL MEETING

AN EXPERIMENTAL STUDY OF THE PLACENTA UNDER PHYSIOLOGICAL AND PATHOLOGICAL CONDITIONS (FERMENTS: "VITAL" STAINING)

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In the higher mammals the material needed to supply the growing fetus reaches the ovum through the medium of the placenta, or before this special organ is formed by way of the diffuse chorion, which is its precursor. The fetal waste products traverse this same route in a reverse direction. Certain evidence obtains, moreover, that some part of this exchange continues to take place through the rest of the fetal coverings, the amnion, even after the placenta is fully developed.[1]

The literature bearing upon fetal metabolism and exchange is so voluminous that no effort at completeness can be attempted in this paper. Only such articles as bear directly upon questions under discussion will be referred to.

Although the placenta of human species is of chief importance in this connection, experimental researches have necessarily been most frequently conducted upon animals, and as great and fundamental differences in structure, probably accompanied by variation in function, exist in

different species, certain anatomical peculiarities must be kept in mind.

ANATOMICAL VARIATIONS OF THE PLACENTA. As a representative of the lowest type of placenta that of the torpedo may be instanced. In this the fetal structures are separated from the maternal by a layer of fluid.[2] A closer relationship is noted in the diffuse placenta of the pig in which the epithelial covering of the uterus persists, and the placental villi are in part separated from the uterine mucosa by extravasation of blood and secretions of the uterus, in part are in direct contact with the uterine mucous membrane. In the placentæ of herbivora the villi merely dip downward into the uterine glands as in the preceding type and more intimate fusion between fetal and maternal structures is limited to the apices of the uterine rugæ (caruncles), where the uterine surface epithelium has disappeared. In rodents this fusion is still more accentuated by complete absorption of the uterine surface epithelium and the elaboration of a placental labyrinth, which consists of innumerable blood channels in which the maternal blood comes into intimate contact with the covering of the fetal villi. In primates and the human species the barrier between fetal and maternal blood is still less developed. The villi may be said to project into large vascular channels through which the mother's blood freely circulates. The roof of the placenta is formed by fetal villi covered with syncytium; the floor mainly by fetal cells which replace the endothelial lining of the maternal blood channels (Grosser[3]). In no species does a direct interchange of maternal and fetal blood take place. In the lower forms material has to traverse not only the wall of the maternal vessel, but also the circumvascular connective tissue and uterine epithelium pass through the intervening hiatus filled with extravasated material (uterine milk) and then penetrate the fetal syncytium, connective tissue, and vessel

wall. In the higher forms, in which the villus is directly
bathed by maternal blood, material for exchange need only
penetrate the various layers of the villus until it reaches
its central vessel.

MEANS BY WHICH EXCHANGE MAY BE EFFECTED THROUGH
THE PLACENTA. In the lower forms the nourishment needed
by the embryo is absorbed from blood extravasations and
uterine secretion. In the higher types nutrition is derived
from the rapidly circulating blood. The mechanism, by
means of which this exchange is effected, is but partly
understood, and the present research deals with certain
phases of this problem.

No direct means are at our disposal to analyze the intake
and output of the fetus, or to apply the methods usually
employed in the study of metabolism as practised on the
adult. Variations in the metabolism of the mother as
influenced by pregnancy are of no assistance. Moreover,
our chemical methods are as yet too crude to permit of
analysis of the changes noted, for example, the differences
between that of the afferent blood of the uterine and ovarian
arteries and of the efferent blood of the accompanying
veins.[4]

Consequently investigators have been forced to approach
the problem by other and less direct means. The absorption
by the fetus of substances—gases, fluids, and solids in solu-
tion—has been repeatedly demonstrated. The substances
studied include many of those needed for the growth of
the fetus, also indifferent or harmful chemicals, dyestuffs,
etc. In a like manner the reverse process, passage from
fetus to mother, has been conclusively proved.[5]

Before physiological and physical chemistry has made the
surprising and rapid strides, which have occurred during
the last two decades, investigators focussed their attention
upon the determination of which substances traversed,
and which were excluded by the placental wall. Today

the form in which exchange takes place and the means of transmission are of more immediate interest.

It was at first conceded that filtration sufficiently accounted for the necessary exchange. Later the phenomena were ascribed to osmosis. Today selective secretion and a specific ferment activity of the placenta has more supporters.

FERMENT ACTIVITY OF THE PLACENTA. The discovery of intestinal ferments, which were found to perform the chemical alterations which precede absorption of food, and the finding of similar or other ferments in all the chief organs of the body has revolutionized physiological chemistry. It soon became apparent that all anabolic and catabolic processes in the body are intimately associated with ferment action, and it followed almost automatically that the ferment action of the placenta was subjected to close scrutiny.

Before proceeding with a description of the work done along these lines, it may prove of service to give a few of the salient features, relating to ferments and their mode of action.

As ferments have never been isolated or obtained in a pure condition we do not know their composition, and can classify them solely by means of their action upon a given medium (substrat). The action of ferments consists in accelerating a chemical reaction, without in themselves taking part in the change. Ferments differ from inorganic accelorators (or catalyzer) such as sponge, platinum, etc., by their instability, sensitiveness to heat, antiseptics, or poisons. "*By means of ferments the plant or animal economy is able to perform at a low temperature changes which in the laboratory require high degrees of heat, or the use of strong acids or alkalies.*"

The ferments found in the body may be divided into two groups—*extracellular* ferments secreted by special glands, and *intracellular* ferments which are found in every

cell.[6] In order to study the latter, it is necessary to liberate the enzymes either by the slow process of autolysis or supplementing this by the more rapid methods of mechanical cell disintegration (crushing and rubbing with sand, crushing in the Buchner press at 250 to 300 atmospheres pressure, etc.). It is still a debatable question whether the phenomena of autolysis actually play a role in intermediate metabolism or whether they merely represent post mortem changes.

FERMENTS FOUND IN THE PLACENTA. The placenta has been thoroughly investigated in regard to its ferment contents. Representatives of every class of ferment have been reported. For the sake of brevity a table showing some of the ferments found in the placenta by different investigators is appended.

On critical examination of these reports two facts become strikingly apparent. In the first place nearly all examinations were purely qualitative. In the second place either no precautions were taken to remove the maternal or fetal blood from the placenta, in which case the ferment content of the blood is added to that of the placenta, or the blood was removed by such crude methods as that of repeated washing after the placenta had been reduced to a pulp, in which case an undeterminable amount of liberated intracellular ferment is washed away. If human placenta is employed, and this was the material used in most investigations, coagulation takes place before the afterbirth is expelled and no amount of perfusion through the umbilical vessels will remove all the fetal blood. Even if the perfusion liquid returns clear, colorless fibrin, which has the property of absorbing large quantities of ferment, will adhere within the smaller vessels. From previous work, in which I attempted to free human placentæ of their blood,[20] I am forced to conclude that it is impossible to make this organ blood-free by any method.

TABLE I.—Ferments of Placenta

Author.	Amylase.	Lipase.	Protease.	Other ferments.	Method.
Mathes[7]			Protease +		Human. Pro-longed autolysis.
Merletti[5]			Protease +		Human.
Bergell and Liepmann[9]	Diastase + Glycolytic, weak Invertase —	Lipase —	Protease + (Pepton to tyrosin)		Human, minced and washed.
Hofbauer[10]		Esterase + (Salol)		Oxydase +	Perfused through vessels. Human.
Basso[11]			Protease +		Human. Super-ficial washing.
Charrin et Goupil[12]	Amylase +		Protease + (from blood)	Oxydase	Human and dog; perfused through vessels.
Savaré[13]	Amylase +	Esterase +	Fibrin coagu-lating +. De-samidase + Ereptic + Glycoxalic splitting +	Direct and indirect Oxydase +	Human perfused through vessels.
Nattan-Lar-rier et Ficai[14]	Amylase +	Esterase +	Protease —		Human and animal quantitative (?)
Bergell and Falk[15]			Protease + + heterolysis		Human, minced and washed.
Löb and Higuchi[16]	Diastase + Glycogen-ase + Inulase + Invertase + Lactase — Invertase —	Lipase —	Pepsin + Trypsin + Erepsin — Urease — Desamidase +	Katalase + Oxydase +	Human, minced and washed.
Higuchi[17]		Esterase +		Selective glucoside splitting +	Human.
Higuchi[18]			Lab + Fibrin fer-ment +		Human.
Graefenberg[19]			Up to 4th M Trypsin + +		Human.

Based upon observations, of which a resumé is given in Table I, and upon certain other investigations, which will be referred to, numerous authors have concluded that the placenta subserves a function similar to that of the liver (chiefly a metabolistic organ) and of the intestine (an

absorptive organ). A few (notably Savaré, loc. cit.), more cautious, have stated that perhaps these ferments were used purely in the intracellular domestic economy of the placenta and had no general value or significance to the fetus.

FUNCTIONAL TESTS. A few investigations, in which physiological methods were employed, are on record. Merletti (loc. cit.) perfused placentæ through the vessels of the cord, using a solution containing equal parts of glycogen and ammonium sulphate. He recovered the sulphate in unchanged amount, but the glycogen was diminished. The author, therefore, concludes that a glycogen splitting ferment must be present. Charrin et Goupil (loc. cit.) performed similar experiments. Santi and Acconci[21] repeated this work with negative results. In all these experiments, as human placentæ were used, the sources of error previously mentioned obtain.

Chiage[22] performed a series of experiments under more normal conditions. He removed a portion of placenta and of the fetal liver in bitches, then injected glucose into the mother, and at intervals took further specimens of both organs, which he tested for glycogen. He then found that both placental and liver glycogen increased after injection, but that as time elapsed the placenta lost part of its glycogen and the liver increased its store. These results, however, do not supply proof, as deduced from them by the author, that the placenta contains both an amylolytic and amylogenic (synthetic) ferment. They merely show that glycogen can pass through the placenta.

The ready passage of some substances, and the impermeable barrier interposed by the placenta to others, is well illustrated by the following table, which contains a few of the important chemical compounds studied.

TABLE II.—The Passage of Substances between Mother and Fetus

	Substance.	Present or absent.	Author.
Gases	Oxygen	+	Zweifel
	Carbon monoxide	+	Fehling
	Chloroform	+	Zweifel
	Ether	+	Nicloux
Halogen salts .	Potassium iodide	+	Schauenstein and Spaeth
	Potassium bromide	+	Porak
	Sodium chloride	+	Cohnstein and Zuntz
	Strontium bromide	—	Plottier
Salts, heavy metals	Copper	+	Porak
	Lead	?	Paul
	Mercury	+	Porak, Cathelinau
	Colloidal silver	—	Hofbauer
Benzol compounds	Carbolic acid	+	Plottier
	Sodium benzoate	+	Gusserow
	Salicylic acid	+	Benicke
Alkaloids .	Morphine	+	Plottier
	Atropine	+	Preyer
	Quinine	+	Porak
	Curare	—	Wolter, Fehling
	Ergotin	—	Beatty, Wolter
	Hydrastinin	+	Von Bunge
	Phloridzin	+	Schaller
Glucoside dyes, etc.	Anilin	—	Wertheimer and Meyer
	Adrenalin	—	
	Alizarine	+	Flourens
	Methylene blue	+	Reusing
	Indigo	+	J. C. Mayer
	Indigo carmine	—	Zuntz
	Trypanblau	—	Goldmann (found in liquor)
	Sudan III	+	Hofbauer
Proteins .	Pepton	—	Wertheimer and Delzenne
	Egg albumen	—	Ascoli
	Methemoglobin	—	Wertheimer and Meyer
Miscellaneous .	Bile	—	Kehrer
	Bile acids	—	Kehrer
	Antitoxin	+	Ehrlich
	Agglutinins	+	Jurewitsch
	Glucose	+	Cohnstein and Zuntz
	Leech extract	—	Wertheimer and Meyer

NOTE.—Most of the references found in this table are taken from Kehrer: ''Der platzentare Stoffaustausch in seiner physiologischen und pathologischen Bedeutung,'' Würzburger Abhandlungen aus dem Gesamtgebiet der prakt. Med., 1907, vii, 17, and from Nicloux: ''Passages des Substances Chimiques de la Mére au Fœtus,'' L'Obstetrique, 1909, xiv, 840.

The selective action of the placenta as shown by these investigations might be due to differences in osmotic pressure, to selective secretion (as found in the kidney) or to the decomposing and synthesizing action of placental ferments.

It would carry us too far to enter into a detailed discussion and analysis of these data, as practically all the newer theories of physical and physiological chemistry are concerned. (Lipoid theory, osmosis versus secretion, "Verteilungsatz," etc.). As much of the subject as concerns us will be referred to later.

ACTIVITY OF FETUS. Another complicating factor, requiring to be considered, is the independent activity of the fetus, which in its blood and organs harbors, even at an early stage, practically all the ferments found in the mother. Numerous investigations bearing upon this point have been made. Of these the following are most important.

TABLE III.—Ferments in Embryo

Author.	Ferment.	Present or absent.	Species, size or age.
Mendel and Leavenworth[23]	Autolytic	+	Liver of pig.
Cohnheim[24]	Invertase	+	Earliest digestive ferment, dogs, cats.
Mendel[25]	Invertase	—	Absent in pig.
Mendel[25]	Maltase	+	Pig, 50 mm.
Mendel[25]	Lactase	+	Pig, 50 mm.
Plimmer[26]	Lactase	—	None till twelve hours after birth.
Stauber[27]	Diastase	+	Cattle embryo in pancreas, parotid, 230 mm.
Langendorff[28]	Diastase	+	Pig pancreas, 90 mm. Human absent.
Mendel and Saiki[29]	Glycogenase	+	Pig liver, blood, muscle.
Mendel and Leavenworth[30]	Lipase (esterase)	+	Early in pig liver and intestine.
Langendorff	Pepsin	+	Pig's stomach, 135 mm. Human, fourth month.
Langendorff	Trypsin	+	Pig's pancreas, 135 mm. Human, fifth month.
Ibrahim[31]	Pepsin and trypsin	+	Human, fourth month.
Ibrahim[31]	Erepsin and enterokinase	+	Human, fifth month.
Jaeggy[32]	Erepsin	+	Human intestine, fifth month, pancreas negative.
Vernon (*loc. cit.*)	Erepsin	+	Guinea-pig's kidney, liver.
Durham[33]	Tyrosinase	+	Skin of rat, guinea-pig, rabbit.
Jones and Austrian[34]	Adenase	+	Pig's liver.
Jacoby[35]	Aldehydase	+	Pig, 90 mm.
Lochemann and Thies[36]	Katalase	+	Rabbit, but less than in maternal.

It is, therefore, apparent that the fetus can, and perhaps does, utilize and work up for its own use pabulum supplied by the mother, even if it is supplied in a form not exactly suited to the immediate needs of the embryo.

To recapitulate: The gap between mother and fetus is bridged by the placenta. The foodstuffs carried to the placenta are contained in the blood. Certain substances are accepted, others rejected. The excretory products elaborated by the embryo also reach the maternal blood through the placenta. The presence of ferments, though suggestive, does not necessarily imply that these ferments perform the work; they may be present merely as an integral part of the placental cell, and the placenta may act purely as a delicately adjusted filter (using this term broadly to include osmosis, diffusion, and even selective secretion).

On the other hand, the placenta may prove to be a complex organ of metabolism, which during its short term of existence fulfils the functions similar to those ascribed to the liver, though differing in anatomical structure from this organ, in order to meet the different conditions imposed upon it.

POSSIBLE FUNCTIONS OF THE PLACENTA. If the placenta acts mainly as an organ of exchange we are justified in comparing its function, roughly speaking, to that of the capillary endothelium or to that of the kidney.[37] It would then serve to remove by selective action certain substances, essentially unchanged, from the circulating blood, and transmit them to the fetal circulation. In the fetus the nutritive substances would then undergo further metabolic changes as the result of purely fetal processes.

On the other hand, it is conceivable that the placenta is a true glandular organ, combining in its activity functions corresponding to those of the small intestine and liver. If this were the case the nutritive substances contained in the blood would undergo an intermediate digestive process during their transit through the placenta and reach the

fetus in a "predigested state." For it is hardly conceivable that a complicated mechanism has been elaborated for the sole purpose of changing the foodstuffs circulating in the blood in order to facilitate their absorption through the placenta, followed by a reverse metamorphosis (synthesis) which brought them back to their original chemical state when they reached the fetal vessels (Hofbauer, loc. cit.).

It is true that a somewhat analogous mechanism exists in the small intestine. The analogy is, however, more apparent than real, because the mucosa of the gut absorbs foreign ("artfremdes") protein, breaks this down into indifferent radicals ("Bausteine"—chiefly amino-acids), which are then resynthesized into products homologous to the organism. The placenta is supplied with foodstuffs which are already homologous and which therefore require no such molecular rearrangement.

It should prove of interest to study the placenta, from various aspects, after all demands upon its functional activity have been removed. This can be brought about, experimentally, by causing the death of the fetus, whereupon not only the call for nutritive substances ceases, but the presumable stimulus exerted by the fetal waste substances also stops.

Under these conditions we might expect changes in the ferment values to occur, although our knowledge of the effect of functional changes on ferments is almost nil.[38] In the various glands of the body it is impossible to produce similar conditions. For instance, ligation of the pancreatic duct causes an enormous though transitory increase of diastase, followed by gradual diminution far below the normal in consequence of atrophy of the secreting cells.

To put glands, which have no excretory duct, out of function, it would be necessary to cut off their nutritive blood supply (even an Eck fistula would not produce the proper conditions).

PLACENTA AFTER DEATH OF THE FETUS. Anatomical studies (Merttens[39]) have shown that the placenta undergoes few morphological changes after death of the fetus, remains well nourished for long periods of time, and may even continue to increase in size under these conditions. In most of the observed cases, however, fetal death has probably been due to changes taking place primarily in the placenta. I have had the opportunity to study a human placenta in a case in which fetal death was due to a tight knot of the cord.[40] This placenta was retained at least twenty-four hours after fetal death, but showed no changes in its microscopic structure, though the fetus had undergone maceration.

AIM OF THE INVESTIGATION. The present investigation was undertaken *to determine whether any differences existed in the ferment content of the functionating as compared with that of the non-functionating placenta.* The technique devised by Zuntz (loc. cit.) and lately revived by Wohlgemuth and Massone (loc. cit.) (in their studies of the source of the amniotic fluid) was used. This technique permits of killing the fetus *in utero* without injury to the placenta, and permits of direct comparison, in the same mother animal, of placentæ which are performing their function, and of placentæ, whose nutrition is not disturbed, but upon which no functional call is made. The former I shall speak of, throughout, as "*functionating placentæ*" the latter as "*vegetative placentæ.*" In addition, in five experiments placentæ were found, the fetus of which had either been entirely absorbed, or had died at an early stage of development. These placentæ will be spoken of as "*old placentæ.*"

PLAN OF EXPERIMENTS. 1. It was first necessary to determine whether the ferment content of different functionating placentæ from the same mother animal was equal weight for weight.

2. The effect of the partial or nearly complete removal of the maternal blood upon the ferment values was next studied, for if perfusion could be performed without disturbing the qualitative relations, the ferments of the maternal blood could then be eliminated, at least to some degree.

3. Finally, the effect upon the ferment values of stopping the fetal circulation and with it removing the functional demands normally made upon the placenta was investigated.

Source of Material. Animals, which carry several young during pregnancy were chosen, in order to compare functionating with vegetative placentæ under identical conditions. Several different species were used (rabbits, guinea-pigs, cats, and one bitch) in order to exclude the possibility that individual species idiosyncrasy, or differences in structural connection with the uterus (*vide ante*) might influence the results.

Ferments Studied. Of the many possible ferments but three were investigated—amylase, lipase (esterase), and erepsin. They were chosen partly for reasons of expediency, as comparatively simple tests can be applied, partly because of their special significance.

Amylase, or starch hydrolyzing ferment, is a representative of the important group of carbohydrate splitting enzymes. It is present in all tissues which contain glycogen and also in the blood.[41] Lipase (esterase) is supposed by many to be due chiefly to the blood contained in organs. It was, therefore, selected as an index of the amount of blood present and the quantity removed by perfusion.

Erepsin is the ferment which hydrolyzes peptone into lower products. It of all enzymes has been most thoroughly investigated in reference to changes of values due to changes in function (*vide* Bibliography 38).

Standards of Comparison. In each case the ferment content of the maternal blood serum was used as a standard. In most instances the uterine muscle was also used as a

control. No direct comparison of ferment strengths obtained from different experiments was attempted, as even slight variations of time, temperature, concentration of solution, etc., invalidate the use of such data.

TECHNIQUE, MATERIAL, AND METHODS. Pregnant animals, the date of impregnation known, were anesthetized with ether, and either bled to death from the carotid or when mentioned in the protocols, bled until nearly exsanguinated, and then washed out through the jugular vein until the return flow was nearly colorless and the heart had ceased to beat. In animals whose vascular system was irrigated, one or more fetal sacs were removed before the bleeding and irrigation were begun, in order to collect data on the amount of ferment accounted for by the maternal blood. The last wash-water obtained from the carotid artery was tested for its ferment strength in order to compare it with the full maternal blood.

To obtain "vegetative" placentæ aseptic laparotomy was performed twelve to forty-eight hours before the animal was killed. The head of the fetus to be killed was pressed against the uterine wall, a fine hypodermic needle introduced through the uterine wall into the cranial cavity of the fetus, and 0.5 to 1 c.c. of sterile olive oil forcibly injected. Injections with salt solution did not have the desired effect, and sodium hydrate or sublimate solution, as used by Zuntz and Wohlgemuth and Massone, was not employed, as they could not prove indifferent to the ferments.

Material. The fetal sacs were punctured, and whenever liquor amnii uncontaminated by fetal blood could be obtained it was tested for ferments. Small fetuses were used entire. In large fetuses individual organs were tested. The placentæ were freed from cord, decidua, and membranes. The uterine wall was used as a control, usually comparing the horn removed before and that removed after irrigation. The maternal blood was defibrinated and at once centrifuged,

clear serum only being used in the tests. Several determinations with whole blood were also made. All solid material was weighed to milligrams, ground up thoroughly with quartz sand, and diluted with 0.9 per cent. salt solution (usually 10 c.c. for 1 gram of wet material). (The same salt solution was used throughout the course of a given experiment for every dilution employed, in order that no variations in concentration might occur.) The extracts were then placed in the ice-box for two hours and centrifuged for six minutes at the same speed. All figures are based upon one gram of wet material as the unit for solids, and on cubic centimeter for liquids.

METHOD OF FERMENT DETERMINATION. *Amylase.* Wohlgemuth's method,[42] which is based upon the property of starch to turn blue when iodine is added, but to remain colorless after a certain degree of digestion has occurred (change to achrodextrin) was used. In a series of test-tubes (six to seven) diminishing quantities of extract were placed. To each tube, 5 c.c. of clear, freshly prepared 1 per cent. solution of Kahlbaum's soluble starch was added. Enough salt solution to bring the contents of each tube to 6 c.c. and 0.2 c.c. of toluol to prevent putrefaction were added. The tubes were then incubated for from twelve to nineteen hours at 38° C. When the readings were to be made each tube was diluted with iced water and one drop of $\frac{1}{12}$ normal iodine solution dropped in. The last tube in which no blue or pink color appeared showed the smallest quantity of extract capable of digesting 5 c.c. of starch to the achromic stage. After correcting for the dilution of the extract, values based upon the complete digestion of 1 c.c. of 1 per cent. starch were calculated. (When the starch solution is allowed to drop into the test-tube without touching its wall, no disturbing color reactions occur, and the graded shades of blue to pink of the partly digested mixtures in the lower tubes of the series also show close

correspondence, thus greatly enhancing the accuracy of the method).   The quantities of extract used were part of a geometric series of 1, 0.64, 0.4, 0.25, 0.16, 0.1, 0.064, 0.004.[43]

Lipase (Esterase). This test is based upon the property of lipase to split the esters of fatty acids, thus setting free the fatty acid with resulting increase in acidity. The amount of acid set free was determined by titrating with one-twentieth normal sodium hydrate using phenolphthalein as indicator. Calculations were based upon 1 gram of solid.

The tests were made as follows. 1 c.c. of extract; 5 c.c. of salt solution; 0.3 c.c. of absolute ethyl butyrate and 0.2 c.c. of toluol were used for each experiment. A "blank" in which the extract was first boiled before adding the butyrate, etc., was used for each individual extract. The mixtures were then incubated for twelve to eighteen hours and titrated. Readings were corrected by first subtracting the amount of acidity found in the blanks and then correcting for dilution.

Erepsin and Alkaline Protease. Considerable trouble was encountered in devising an applicable method. Fermi tubes,[44] Gross' casein method,[45] and Vernon's colorimeter method[46] had to be discarded. Finally a modification of Vernon's method was devised, which gives accurate readings for the small values obtained.

The method is based upon the property of proteins of certain composition to give the biuret test (pink to blue color when added to an alkaline solution of copper sulphate). When digested to a certain stage the coloration does not occur (abiuret stage). The depth of color depends upon the amount of biuret producing protein in the fluid. The tests were performed as follows. To 1 c.c. of extract were added 5 c.c. of salt solution; 5 c.c. of 2.5 per cent. solution of Witte's peptone, 0.1 c.c. of 0.5 per cent. solution of sodium carbonate and 0.2 c.c. of toluol. A boiled "blank" similar to that used for lipase was prepared for each extract. The

mixtures were incubated twenty-four hours. Then 0.3 c.c. of the incubated mixture was added to a tube containing 9 c.c. of 4 per cent. sodium hydrate and 1 c.c. of one-fiftieth normal copper sulphate. The "blank" was treated in the same way. After ten minutes, by which time the maximum color change has been reached, the solutions are placed in the chambers of a Duboscq colorimeter. The blank is put at 20, 25, or 30, as the case may be, and the scale on the ferment side is moved up and down until the colors correspond. The mean of three readings were taken; the differences between standard (blank) and active ferment mixture determined, and figures corrected for dilution. Unless the ereptic activity is slight the colors cannot be made to correspond. This method appears accurate and is simple.[47]

Using these methods 12 experiments were performed. amylase determinations were made in all 12, lipase determined in 11, and erepsin in 5. In 5 animals the mother's vascular system was irrigated. In 3 animals vegetative placentæ were prepared by killing fetuses *in utero*, and in 5 animals old placentæ were encountered. In 3 experiments functionating, vegetative and old placentæ could be tested in the same animal. For details see summarized protocols.

RESULTS OF FERMENT DETERMINATION. 1. Functionating, unperfused placentæ of the same animal were found to contain similar amounts of amylase (see Experiments I, II, V, and IX). The ereptic content was less constant.

2. Functionating, perfused placentæ showed greater variations, proving that removal of maternal blood, even by means of perfusion of the living animal, cannot be relied upon to give quantitative results.

3. Vegetative placentæ showed no variations from functionating placentæ, in some instances containing slightly greater, in others the same or slightly less ferment (see Experiments IV, V, and XI).

4. Old placentæ (not functionating for long periods, but containing large numbers of normal cells, as shown by their reaction to the ordinary stains, except in one case, where chiefly coagulated material remained) had approximately the same ferment strength as functionating and vegetative placentæ.

5. The amylase content of all placentæ, with exception of Experiment V, was the same or less than that of the maternal blood. The lipase content of the maternal blood, however, was always less than that of the placenta and the ereptic content much less.[48]

6. The uterus (either parts taken from the unimpregnated horn or distant from the placental site) contained almost as much ferment as the placenta, although the amount of blood in the uterine extracts was much less than in the placental extracts, as could be noted in every instance by the relative amount of hemoglobin present.

7. The fetal blood or liquor always contained less amylase than the maternal blood; the lipase value usually less, though equal in two cases (Experiments VII and IX).

8. In the six rabbits examined, neither placentæ nor maternal blood showed any regular increase or decrease of ferment strength corresponding to the progress of pregnancy (fifteenth to thirtieth day).

CONCLUSIONS TO BE DRAWN FROM THE INVESTIGATION OF FERMENTS. 1. A large part of the ferment found in the placenta is accounted for by the contained maternal and fetal blood. The ferment values of the placenta approach those of the uterus approximately, but fall far below those of the liver.

2. Changes in function are not accompanied by any change in the ferment content, sufficient to be demonstrated by the methods used.

3. Even small fetuses contain an appreciable amount of ferment. The organs of large fetuses have high ferment

values, which sometimes exceed those of similar organs in the mother.

The result of the foregoing investigation of the placental ferments affords no support to the views that the placenta acts as an accessory organ of metabolism to the fetus; on the other hand it supplies no conclusive proof to the contrary.

To some degree the criticism is justified that the methods employed were not sufficiently delicate to record small variations—variations which might, neverthelesss, suffice to satisfy the modest requirements of the fetus; and that the study of other ferments, for example of the oxydases, might have given positive results. The same criticism applies, however, to a far greater degree to the sweeping theories and deduction, drawn by various authors from work based upon similar methods (see Table I), and accepted more or less generally by physiologists and the medical profession.

In order to supplement and check the ferment investigation, another method of study was pursued—that of " vital" staining. In contrast to the preceding, this method is extremely delicate and reacts to minutest variations.

"VITAL" STAINING. A number of dyestuffs have been discovered, which when injected during life, are avidly taken up by certain cells of the body. A clearly marked selective affinity between the dye and particular cells can be noted. Moreover, not the entire cell, but only definite granula within the protoplasm accept the stain. At present the opinion prevails that these granula are intimately connected with the cellular metabolism (Ribbert[49]); that in consequence of pathological changes the granula diminish or disappear (Schlecht, Pari, Masuda[50]), and that in conditions of hyperfunction they increase in number. As the result of severe injury, some cells, which ordinarily do not accept the stain, have been found to stain diffusely,

and under these conditions even the nucleus, which in a healthy cell is uncolored, may show some coloration.

Dyestuffs. Basic dyes, which possess the property of dissolving lipoids, almost without exception, stain *intra vitam.* Recently a number of acid dyes have been found which appear to possess the same qualities. In consequence the theory of "vital" staining is even more unsettled than before, and it is considered unadvisable to enter into any discussion of this doubtful subject (Hoeber[51]).

The dye used in the present study was trypanblau. Trypanblau, as shown by Goldmann,[52] possesses the property of staining the granula of the liver endothelial cells, the Kupffer (star) cells of the liver, the epithelial cells of the kidney, tubules, and certain wandering connective-tissue cells (pyrrol cells) throughout the body. Of special interest is Goldmann's careful study of the behavior of the placenta to vital stains. As Goldmann's work is the only one, with the exception of a short paragraph by Schlecht (loc. cit.), and Hofbauer's[53] microchemical study which deals with the placenta, it will be discussed in some detail.

Goldmann (loc. cit.) found that in pregnant animals injected with trypanblau or similar dyes, the uterus early took on a deep coloration, the intensity increasing in proportion to the duration of pregnancy. The yolk entoderm cells, the placenta, and the liquor amnii also became deep blue. *The fetus, however, never showed coloration of any of its organs.* Microscopically, he noted that in the uterus the so-called pyrrol (wandering connective-tissue cells) alone accepted the stain. In the placenta the giant cells, which erode the maternal vessels, took up the color avidly, and many of the fetal cells which bound the maternal blood channels, and in part constitute their wall, do likewise. The yolk entoderm cells also show intensely stained granula. The author agrees with Haidenhein[54] that the acceptance

of a vital stain is dependent upon the life activity of the cell and is consequently lost or changed by death or subsequent decomposition. The author's second paper[55] embraces a detailed account of the investigation of the glycogen, fat, iron, and hemoglobin absorption, through the placenta, by means of microchemical methods. Although of importance, this paper requires no discussion in this connection.

As the result of these studies it is known that certain cells normally show deeply stained granula; that these granula increase in size and number in conditions of hyperactivity, and that they diminish or disappear when the cell is injured or its function disturbed.

The aim of the second portion of this investigation was to determine how death of the fetus affected the "vital" staining properties of the placenta.

Material. A number of pregnant guinea-pigs and rabbits were operated upon, by the same method used in the previous series, and after the lapse of one to two days injected subcutaneously or intravenously with a 1 per cent. solution of trypanblau. On account of uncontrollable accidents but seven proved of use for the investigation. The impression seems warranted that the exhibition of the dyestuff is not completely indifferent to the organism, and that it hastens the absorption of the dead fetuses and the disintegration of their placenta.

Methods. The uterus was removed from the anesthetized animal. In each case the mother's serum was deep blue. The fetal sacs were at once opened, the color of the liquor amnii noted, and the condition of the fetuses recorded.

All material was fixed in 10 per cent. formalin solution. Part were cut as frozen sections, part rapidly embedded in paraffin (six hours by the vacuum method). Sections were studied unstained, counterstained with alum carmine, hematoxylin eosin, and Sudan III.

SUMMARIZED PROTOCOLS (SERIES II)

Experiment.	Species.	Duration of pregnancy.	Amount injected.	Injected days after operation.	Condition of fetuses at autopsy.			Killed days after operation.	Liquor.
					L.	D.	Abs.*		
1	Guinea-pig	25	20 c.c.	Subcutaneous; 1	2	1	..	2	Colorless.
2	Guinea-pig	15	20 c.c.	Subcutaneous; 1	2	1	..	2½	Slightly blue.
3	Rabbit	20	65 c.c.	Subcutaneous; 1	5	1	..	7	Blue.
4	Rabbit	15	40 c.c.	Subcutaneous; 2	..	..	4	4	
5	Rabbit	15	20 c.c.	Intravenous; 2	1	4	2	7	Blue.
6	Rabbit	15	40 c.c.	Subcutaneous; 1	..	..	5	6	
7	Rabbit	18	30 c.c.	Intravenous; 2	..	..	6	10	

RESULTS OF THE "VITAL" STAINING. 1. Macroscopically the uterus was found to take the stain first; next in order was the yolk membrane, and last the placenta.

2. Macroscopically no difference in the depth of staining could be noted in the placentæ of live and recently killed fetuses. Those placentæ which were well on the way to absorption (old) accepted less color.

3. Microscopically the yolk entoderm cells of functionating, vegetative, and old placentæ could not be distinguished. All showed numerous and equally distributed granula.

4. In the vegetative placentæ the granular structure was almost entirely lost. The stain was diffuse. The loss of granulæ occurred first in the placental labyrinth, next in the cell mantles surrounding the maternal bloodvessels (see figure). Of similar types of cells those farthest removed from the maternal bloodvessels showed degenerative changes first. Stained with hematoxylin eosin many of these placentæ appeared normal.

5. The Sudan stain showed that in vegetative placentæ the fat accumulated chiefly in the cells about the intraplacental maternal bloodvessels, the placental labyrinth containing less fat than that of functionating placentæ.

* L. = live; D. = dead; Abs. = Absorbed.
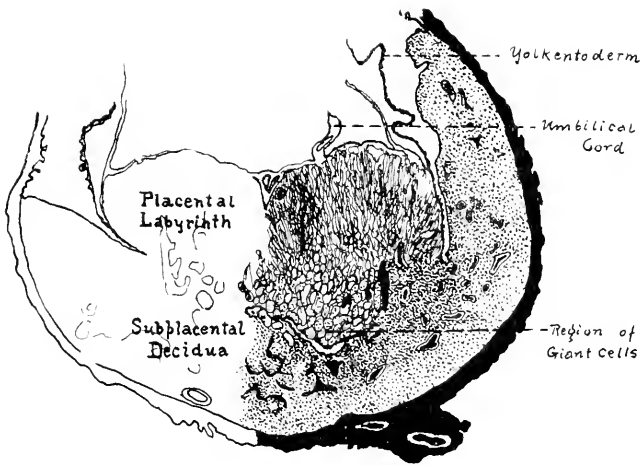
Transverse section of rabbit's uterus at placental site. (Redrawn from Grosser.)

6. In Experiment III the kidneys of the five live fetuses were macroscopically blue. Microscopically they showed the same selective distribution of granules as in the maternal kidney.[56] The cervical lymph glands of one of these fetuses were also blue.

GENERAL CONCLUSIONS. 1. The placenta does not show any parallelism between its ferment values and its functional condition.

2. Changes in the minute structure of the placenta, as shown by "vital" staining, are dependent upon the nutrient supply of blood, furnished by the mother.

3. The fetal membranes possess a considerable degree of independence and maintain their function unchanged much longer than the placenta.

4. The fetal membranes are more rapidly traversed by certain substances than is the placenta. Whether exchange, effected by this route, is of importance to the fetal metabolism was not determined.

5. The evidence obtained in this investigation favors the view that the placenta is a passive organ for exchange, rather than an active organ of metabolism.

The final answer to the problem must, however, await the time when refinement in chemical methods will permit of reliable analysis of the difference in constitution between the maternal blood and that of the fetal blood which enters and leaves the placenta.

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38. Very little is known about the relations of ferment and function. Vernon, loc. cit., p. 37, has attempted to correlate these factors by studying the ereptic power under varying functional conditions. He concludes "that given similar conditions the average ereptic value of a tissue may be roughly constant. . . . . Though the average amount of erepsin in a tissue is nearly constant, yet it varies very greatly with the functional activity of the tissue." It increases rapidly as the embryo develops; is moderately affected by diet in adult animals; is greater in the active than in the hibernating hedge-hog; and decreases in disease.

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during incubation, a not inconsiderable source of error, when dealing with weak enzymes.

47. This modification permits of making fifteen to twenty determinations in half an hour. A very small amount of alkali (0.1 c.c. of 0.5 per cent. sodium carbonate) was added to the incubated extracts sufficient only to counteract the acidity developed during autolysis. This low alkalinity serves to maintain the ereptic activity at a maximum and reduces the disturbing influence of other proteases (trypsin-like ferments) which act best in a more alkaline medium.

The following experiment illustrates the accuracy of the method.

A very weak solution of pancreatin was prepared, diminishing quantities were arranged in series, incubated for fifteen minutes, and treated as above described.

Quantities.	Readings.	Reading value.	Corrected value.
1. 1.0 solution	$21.5 - 22 \quad - 21.9 = 21.8$	1.8×1.6	1.8
1.0 solution boiled	20.0		
2. 0.64 solution	$21.3 - 21.0 - 21.0 = 21.1$	1.1×1.5	1.65
0.64 solution boiled	20.0		
3. 0.4 solution	$30.7 - 30.7 - 30.8 = 30.73$	0.7×2.5	1.75
0.4 solution boiled	30.0		
4. 0.25 solution	$25.5 - 25.2 - 25.5 = 25.4$	0.4×4.0	1.5
0.25 solution boiled	25.00		

Here an extract of which 1 c.c. gave a difference of only 1.8 on the Duboscq was used, yet the values obtained show a maximum difference of only two divisions of the Vernier. When extracts 1 and 2 were compared with simple incubated peptone (corresponding to Vernon's method) the corrected values were 4.8 and 4.6, a much higher reading, accounted for by the protein contained in the pancreatic extract. The organ extracts used in the placental experiments contained much more protein and would, therefore, have greatly increased this error.

48. Possibly the antitryptic action of the serum accounts for this.

49. H. Ribbert. Zeitsch. f. allg. Pathol., 1904, iv, 201, showed that the injured cells in kidney infarcts stained diffusely after intravenous injection of lithion carmine.

50. H. Schlecht. Ziegler's Beiträge d. pathol. Anat., 1907, xl, 312, confirmed Ribbert's results. He adds that dead cells do not take up the dye. G. A. Pari, Frankfurter Zeitsch. f. Pathol., 1910, iv, 1, produced different cell injuries (trauma, freezing, icterus, phosphorous poisoning, hydronephrosis, etc.), and noted that in response to slight injuries the granula disappeared, after severe disturbances diffuse staining occurred. In unilateral hydronephrosis the other kidney, which underwent compensatory hypertrophy, showed an increase of the granula. N. Masuda, Zeitschr. f. exp. Pathol., 1911, ix, 250, a pupil of Ribbert's, carried the work further. He studied various dyes and found trypanblau and lithion carmin best. He used drugs, animal extracts, etc., to produce cellular lesions. He also concludes

that vital staining supplies a method to study the cell function, and enables us to recognize conditions of hyperactivity and degrees of injury varying from functional depression to cell death.

51. R. Hoeber. Biochem. Zeitsch., 1909, xx, 56, gives a concise review of the theory of vital staining. He strongly favors Overton's views. For further details see Hoeber's "Physikalische Chemie de Zelle und der Gewebe," Leipzig, 1911.

52. E. E. Goldmann. Beiträge z. klin. Chir. (v. Brun's), 1909, lxiv, Supplement, used pyrrolblau, isanaminblau, and trypanblau, all acid dyestuffs. His work bridges the gap between vital stains as such, and the epoch-making work of Ehrlich, who uses dyes as chemotherapeutic agents.

53. Hofbauer (loc. cit.) fed pregnant guinea-pigs with fat stained with Sudan, but was unable to recover the stained fat in the fetus. His work with Neutralrot was not "vital." Both this author and Goldman draw too sweeping conclusions from results obtained solely by special staining.

54. M. Haidenhein. Plasma und Zelle, Jena, 1907, li, 446, gives an excellent outline of the literature to the year 1907. He accepts Ehrlich's view that drugs and dyes do not enter into synthetic combination with living protoplasm, but unite with the foodstuffs or other non-living material imprisoned within the cell. He defines a vital stain as one which is dependent more or less closely upon the activities of life, and which fails to act if the normal physiological activity of the plasma does not continue. But dead tissue may stain "vitally" if its interior milieu has not yet been altered.

55. E. E. Goldman. Beiträge z. klin. Chir., March, 1912, lxxviii, p. 1.

56. Goldman (loc. cit.) found the fetal kidneys unstained. He therefore concluded that as the liquor amnii is blue, the source of the fluid must be purely maternal. This view evidently cannot be accepted in the light of the findings in Experiment 3.

SUMMARIZED PROTOCOLS

AMYLASE

DIASTASE (1 c.c. of 1% starch, 38°)

Experiment	Species	Day of pregnancy	Maternal blood	Uterus, not perfused	Uterus, perfused	Maternal liver	Func. Not perfused	Func. Perfused	Veget. Not perfused	Veget. Perfused	Old	Liquor, alive	Liquor, dead	Fetal blood	Entire fetus	Fetus liver, alive	Fetus liver, dead	Fetus kidney, alive	Fetus kidney, dead
I	Rabbit	15	60				68 62 60												
II	Rabbit	16	62	60	35		60 60 60	40				20			20 25				
III	Rabbit	19	75	45	37	150	75	57 45				10			12 32				
IV	Rabbit	24	65	45	40			65	45	55	70						50	30	
V	Rabbit	28	60	110	50		150 150		175	150	150			150			120	100	120 100
VI	Rabbit	30	45	20		130	50 30				35			35 35			30 20	140	
VII	Guinea-pig	33	200	50		80	45					25		30					
VIII	Guinea-pig	36	156	37			125			135		10				75			
IX	Guinea-pig	60	156				62 62 55 55							10 10					
X	Cat	60	780	65	50		175	50 50 55				40 90				300 110			40
XI	Cat	60	250	40		90	65		55	70	65	16					105	105 65	35 40
XII	Bitch	?	78				10 10							50 50					

SUMMARIZED PROTOCOLS. (Continued.)

LIPASE (c.cm. of 1/20 Normal NaOH)

Experiment	Species	Mother — Day of pregnancy	Mother — Maternal blood	Mother — Uterus, not perfused	Mother — Uterus, perfused	Mother — Maternal liver	Placentæ — Function, Not perfused	Placentæ — Function, Perfused	Placentæ — Vegetation, Not perfused	Placentæ — Vegetation, Perfused	Placentæ — Old	Fetus — Liquor, alive	Fetus — Liquor, dead	Fetus — Fetal blood	Fetus — Entire fetus	Fetus — Fetus liver, alive	Fetus — Fetus liver, dead	Fetus — Fetus kidney, alive	Fetus — Fetus kidney, dead
II	Rabbit	16	1.9	5		5	2 3 2	3				0.5			3.4 2.0				
III	Rabbit	19	1.5	2.2		11	1.5	0.5 1.5				0 0.7			0.3 1.0				
IV	Rabbit	24	1.7	1.9	1.7			2.1	1.9	2.0	1.5	0.7	0.5				4.2	2.2	
V	Rabbit	28	0.7	1.5	1.2		1.5 2.2		1.7		1.5 1.0			0.1			6.2	4.2 2.0	1
VI	Rabbit	30	1.5			105	2.5 2.4										5.2 7.0	4.0	6
VII	Guinea-pig	33	0.6			22	4					0.6			5.0				
VIII	Guinea-pig	36	4.6	7.5			7.0			7.5		0.8					7.8		
IX	Guinea-pig	60	1.6				4.0 4.0 3.5 3.5							1.1 1.6					
X	Cat	60	1.0	2.0	1.0		3.0	2.0 1.5 3.5					0.0				3.5 3.5		
XI	Cat	60	1.3	1.7		18	3.5	3.0 4.5		4.5		0.4				8.7	9.2 2.7	10.2	45
XII	Bitch	?	0.6				8.0 7.8												

SUMMARIZED PROTOCOLS.   (Continued).

Experiment	Species	Mother					Placentæ					Fetus							
		Day of pregnancy	Maternal blood	Uterus, not perfused	Uterus, perfused	Maternal liver	Function. Not perfused	Perfused	Vegetation. Not perfused	Perfused	Old	Liquor, alive	Liquor, dead	Fetal blood	Entire fetus	Fetus liver, alive	Fetus liver, dead	Fetus kidney, alive	Fetus kidney, dead

EREPSIN. (Colorimetric)

Experiment	Species	Day of pregnancy	Maternal blood	Uterus, not perfused	Uterus, perfused	Maternal liver	Not perfused	Perfused	Not perfused	Perfused	Old	Liquor, alive	Liquor, dead	Fetal blood	Entire fetus	Fetus liver, alive	Fetus liver, dead	Fetus kidney, alive	Fetus kidney, dead
IV	Rabbit	24	1.9		2.5				7.5	2.9		20							
V	Rabbit	28		11			12	12	6.5	13.5	12						19	26	27
VI	Rabbit	30	2	14		17	9	16			15					145	18	100	
X	Cat	60	1.0				37	18											
XI	Cat	60	0.2	15		61			30	28	23					40	14 12	82	20

SOME OBSERVATIONS WITH PANTOPON, BASED UPON ITS USE IN FORTY CASES OF LABOR

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THE question of anesthesia in obstetrics is an important, interesting, and extensive one. Ever since the discovery of chloroform and ether, about the middle of the last century, and their immediate application in controlling the pains of childbirth, or in producing surgical anesthesia during labor, obstetricians have been seeking a less dangerous substitute for these two inhalation anesthetics. Cases of late chloroform poisoning have been reported in the literature, and ether has been substituted as the ideal obstetrical anesthetic. Then the pendulum has swung the other way, and chloroform, administered with all the proper precautions, has been heralded as the only safe method of easing the pains of childbirth, while others believe that chloroform should be used to ease the pains and that ether should be administered to produce surgical anesthesia when operative interference becomes necessary.

Within the last few years the literature has been filled with monographs upon the use of certain drugs, injected hypodermically during the first or second stage of labor to promote obstetrical analgesia. In order to work out the efficiency of one of these hypodermic narcotics, as a means of making the process of childbirth easier for both mother and child, the writer has made observations upon 40 cases of childbirth with a new opium preparation, called pantopon, in the clinic of the Woman's Hospital at Detroit.[1]

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[1] These obeservations were made in connection with the Grace Whitney Hoff Research Laboratory.

Before taking up in detail the method employed in the administration of this new preparation, a few words of explanation upon the chemistry, morphology, and therapeutic action of this substitute for morphine and the various forms of opium will not be out of place.

Sahli, after working for a number of years, produced a new compound, to which he gave the name of pantopon. The word is formed from two Greek words: pan = all, opos = juice; hence, pantopon means all the juice. This new preparation, freed of all its extraneous and inert substances, such as waxes, resins, gutta-percha, etc., is freely soluble in water and contains all the alkaloids of opium in the form of their hydrochloric acid salts. Pantopon contains about 90 per cent. (89.77) of all the alkaloids of opium. Opium itself has about 14 per cent. to 15 per cent. of all the alkaloids. Hence, 1 gram of pantopon is equal to about 5 grams of opium. This new drug and its solutions are colored a light brown. The aqueous solution reacts weakly acid to litmus, which reaction is due to the weak basicity of the opium alkaloids in contrast to the strong hydrochloric acid. Since pantopon does not contain free hydrochloric acid, and since it is used in dilute solutions only, the subcutaneous injections have not been found to be painful. From the fact that the solution is an aqueous one, and this is the form most often used for hypodermic injection, the precipitation of the salts is prevented in the presence of the body fluids, which precipitation occurs almost immediately when the alcoholic tincture of opium is injected, while the aqueous extract of opium does not keep all the alkaloids of opium in solution.

The therapeutic action of pantopon, used when either morphine or opium was indicated, has been found by Sahli, after a long series of investigations, to be the same as that of morphine and opium. Pantopon was found, however, to possess these advantages over opium and its derivatives,

that no complications, such as nausea and vomiting, constipation, excitation, and depression followed its use. The combination of the alkaloids in pantopon was discovered to be a fixed one, hence it permitted a fixed and accurate dosage. The drug may be given in a number of ways, viz., hypodermically, per os, or per clysma. For hypodermic application, a 2 per cent. solution of pantopon is generally used. This solution, which contains 2 per cent. of pantopon, is usually made up with 75 per cent. water and 25 per cent. glycerin. While such a solution does not require sterilization, as the glycerin acts as an antiseptic, still it may be subjected to boiling without any alteration of its efficiency. The dose hypodermically, is 1 c.c. of a 2 per cent. solution. Internally, it may be given in the form of pills, tablets, or powders, each containing 1 to 2 centigrams of pantopon.

The method employed by the writer in administering pantopon to lessen the sensitiveness of the uterine contractions during labor was as follows: A 2 per cent. solution of pantopon was made up in the following manner:

Pantopon	.	.	.	.	.	.	.	.	.	.	.	.	2.0
Aqua destill.		.	.	.	.	.	.	.	.	.	.	78.0
Spir. vini. optimi.			.	.	.	.	.	.	.	.	5.0
Glycerin pur. neut.			.	.	.	.	.	.	.	.	15.0—M.

 Sig. for a hypo., 1.0 c.c.

This solution was placed in glass ampoules, each containing 1 c.c. of the above solution (= pantopon $\frac{1}{3}$ grain), under strictly sterile conditions. When dilatation of the cervix was complete, or rather when the second stage had commenced, as determined by vaginal examination or by the commencement of the bearing-down pains, 1 c.c. of the above 2 per cent. solution of pantopon was injected. From twenty minutes to one-half hour afterward the action was felt and the patients stated the uterine contractions were much more easily borne. The force and duration of the

pains were easily controlled by placing the hand upon the fundus uteri during a contraction. The action of the abdominal muscles and the force of the expulsive pains remained undisturbed. The patients all bore down with vigor. The third stage showed no change, and whenever it was interrupted the action of the pantopon was not at fault. These were the general results that were observed in the 40 cases with a few possible exceptions to be considered later.

The patients were all primiparæ except two, and these were secundaparæ (Cases 22 and 38), and the average duration of the labor was:

First stage equals	$14\frac{3}{4}$ hours
Second stage equals	$3\frac{1}{2}$ hours
Third stage equals	25 minutes
Total length equals	$18\frac{3}{4}$ hours

The injection of 1 c.c. of the 2 per cent. solution was made during the second stage in each case, with the exception of Case 30, where the pantopon was given during the first stage. The result in this case was that the labor progressed slowly and the cervix was slow in dilating. The contractions of the uterus were, however, not painful. With the exception of a few hours' prolongation, the labor was not interrupted. The second and third stages were undisturbed. The injection was made during the second stage, because, in the opinion of the writer, other investigators, especially those who used pantopon alone, made their injections too early in the course of the labor, usually during the first stage, as soon as the pains had become regular and followed each other at intervals of not less than five minutes. Their results were either unsuccessful in allaying the sensitiveness of the labor pains, or were so slight that the method of injecting pantopon alone was either abandoned or it was given in combination with scopolamine. Jaeger reported 20 cases in which he used pantopon alone. He made the injection during the first stage, and while the

effect lasted the sensitiveness of the pains was much reduced, but the first stage was at the same time prolonged. Very often he got no effect whatever and the dose had to be repeated, usually in an hour. His inequality of results caused him to abandon the method.

Aulhorn, another investigator, used pantopon alone in only 10 cases and found a partial effect in only 3 cases. He injected 0.5 c.c. pantopon and repeated the dose in one hour. There was only a slight amelioration of the sensitiveness of the uterine contractions in 3 cases, and in all 10 cases the labor was prolonged either because the pains became weaker, or because they stopped completely. Aulhorn, for these reasons, gave up the method of using pantopon alone and substituted pantopon in connection with scopolamine.

This last investigator has also explained the difference between the pharmacological action of morphine and pantopon. As was stated at the beginning of this paper, pantopon contains all the alkaloids of opium in a chemically pure form. It contains morphine as well. The action of morphine upon the uterine contractions is so well known as to need no further discussion, except that it lessens the sensitiveness of the contrations, but also diminishes their force, and even in small doses it has been known to produce fatal asphyxia in the child. Pantopon contains, in addition to the alkaloids with a hypnotic action, alkaloids that produce a slight hypnotic action as well as a strong reflex stimulating one, *i. e.*, the alkaloids of the codeine group.

These reflex stimulating components cause a partial paralysis of the hypnotic producing ones, so that during labor the paralyzing action upon the pain centre is increased by this reflex-stimulating action. This explanation, expressed in another way, for this is by far the most important fact in the consideration of the difference between pantopon and morphine, means that the alkaloids of pantopon, acting as a whole, paralyze the sensory centres and have little or

no effect upon the motor centres. Morphine, on the other
hand, produces a paralysis of both sensory and motor
centres. This difference between morphine and pantopon
explains the deleterious effect of morphine upon the child
in the scopolamine-morphine "twilight sleep," because
morphine lowers the frequency and volume of the respira-
tion by its paralyzing action upon the respiratory centres.
The action of pantopon upon the respiratory centres is
either absent or present to a very small degree, and if the
action of pantopon does exist, it is only temporary, while
the action of morphine may last for several hours.

These deductions applied to labor explain the beneficial
action of pantopon in this way. During labor, the lying-in
patient makes use of her entire respiratory efficiency, first
for herself, because she is carrying out strong body work,
and second for the child, whose supply of oxygen suffers
in a normal way during each contraction of the uterus.
If the frequency and volume of the respiration are lowered
for a longer time by morphine, great harm may result to
both mother and child. This will not be the case from panto-
pon, which does not affect the respiratory centres, or at
least only for a short time and never to a marked degree.
This difference would seem to recommend pantopon as
a good substitute for morphine whenever it or opium is
indicated. Another recommendation for pantopon is that
it can be safely used in private practice among domestic
cases, as a second injection, when necessary, can be safely
left with the nurse for administration.

A glance at the list of cases in the appended table will
show that the second stage was not prolonged by the action
of the pantopon. In 2 cases (Nos. 7 and 14) the first stage
was longer than usual, forty-seven and a half and forty-
seven hours respectively, due to uterine inertia of unknown
etiology. The second stage in the first of these 2 cases
(No. 7) was disturbed by a severe uterine hemorrhage, which
necessitated the performance of internal podalic version.

The hemorrhage was due in all probability to the placenta being at or near the internal os plus an inertia of the uterus. The action of the pantopon only lasted about one-half hour. It is possible that the dose should have been repeated, because while the action lasted, the sensitiveness of the contractions was markedly less.

A disturbance of the second stage was not noted in Case No. 14, but the third stage was interrupted by an adherent placenta, for which the pantopon was not at fault.

Operative interference was necessary in 3 cases (Nos. 6, 13, and 38). Low forceps was applied in the first two and medium forceps in the third. The contractions, although they were less painful after the injection of pantopon, grew weaker, and little or no progress of the presenting part made the use of instruments imperative. The third stage in these three cases was uneventful.

In Case No. 5 the pains ceased for several hours after the injection, but there was no change in their frequency and duration when they commenced again. Beyond a prolongation of the second stage, this labor was undisturbed.

In one case (No. 32) a breech presentation was experienced. Pantopon (1 c.c. of a 2 per cent. solution) was injected ten minutes before delivery, which took place without any untoward results. The effect of the pantopon upon the labor was doubtful, although the third stage was undisturbed. It was unfortunate that an earlier injection was not made. There was a slight hemorrhage in Case No. 37, which yielded readily to the usual treatment. An adherent placenta in Case No. 39 necessitated its manual removal and complicated an otherwise uneventful and uninterrupted labor.

Complications among the 40 cases existed in 9 cases, which complications were slight and could in no way be traced to the action of pantopon. Jaeger, Aulhorn, Kolde, and others, in speaking of the complications following the use of pantopon in labor, have reported that in their cases all

children were born alive and that none were asphyxiated.
Some few children had a slight degree of oligopnea, as is
often experienced after the scopolamine-morphine "twilight sleep." Kolde especially reported that the labor was
in no instance prolonged. The pains after injection came
with the same frequency and were of the same duration
and force.

The pause between the pains was perhaps somewhat
greater in some cases and in others the pains were stronger
and came more often.   In one case the contractions stopped
for several hours, due to a too early injection before the
pains became regular.

RESULTS: The results of the observations of the use
of pantopon in controlling the pains of childbirth in these
40 cases have been made after every possible subjective
factor has been ruled out.   The results are more or less
dependent upon the statements of the patients.   Hence,
they must be taken with extreme care.   Until an accurate
and dependable measure of the uterine contractions has
been devised, there will be no exact way to determine whether
a certain drug has any effect whatsoever upon the sensitiveness of the contractions of the uterus or not.   The contraction itself can be measured to a certain extent as to its
length, its force, and its frequency by placing the hand of
the observer upon the fundus during a contraction.   Whether
its sensitiveness has been greater or less must be left to
the statement of the patient.   Therefore, results obtained
in this way cannot help but be somewhat inexact.   The
exactness of the results varies indirectly with the enthusiasm of the observer.   In tabulating the results of the 40
cases, the following results are made with these facts constantly in mind:

	Cases.	Per cent.
No results	2	5
Doubtful results	4	10
Fair results	9	24
Good results	25	61

The above results compare favorably with those of other investigators who have used pantopon to lessen the sensitiveness of the uterine contractions during labor. It is nevertheless true that most of them used pantopon in a few cases only before they abandoned the method, but their only criticism was that the labor was unnecessarily prolonged. Other complications did not occur. They all report that the sensitiveness of the uterine contractions was less after pantopon was injected. A possible source of error was that they made the injection too early in the course of the labor and by this means their results may have been vitiated.

The results obtained with pantopon in the writer's 40 cases, as well as those of other observers, would seem to justify the following conclusions:

1. Pantopon administered during the second stage of labor has a tendency to lessen the sensitiveness of the uterine contraction without changing the force and frequency of the pains.

2. Should one of the inhalation anesthetics become necessary, when operative interference is imperative, pantopon aids rather than hinders the administration of the anesthetic.

3. In moderate doses, pantopon is harmless for the child.

4. Abnormal positions and contracted pelves contraindicate its use.

5. The simplicity of its administration makes pantopon an admirable agent in domestic as well as in hospital cases.

6. Complications following its use are so infrequent, that it is justifiable to give this drug a thorough trial in obstetrics.

7. Further investigations will no doubt determine whether the best results follow the use of pantopon alone or in combination with some other drug.

Case	Para	Duration of labor (hours).				Injection during.	Complications.	Results.
		Stage 1.	Stage 2.	Stage 3.	Total.			
1	I	$19\frac{1}{2}$	$2\frac{1}{2}$	$\frac{1}{4}$	$22\frac{1}{2}$	Stage 2	None.	Good; patient felt less pain after injection. Pupils were contracted.
2	I	$8\frac{1}{2}$	$2\frac{1}{2}$	$\frac{1}{2}$	$11\frac{1}{2}$	Stage 2	None.	Good. Force and frequency of pains same. Suffering diminished. Baby in good condition.
3	I	8	$1\frac{1}{2}$	$\frac{3}{4}$	$10\frac{1}{4}$	Stage 2	None.	Injection was given too late. Third stage prolonged.
4	I	15	1	$\frac{1}{3}$	$16\frac{1}{3}$	Stage 2	None.	Injection eased the pains.
5	I	7	9	$\frac{1}{2}$	$16\frac{1}{2}$	Stage 2	Pains ceased for several hours.	No change when pains started again.
6	I	6	4	$\frac{1}{4}$	$10\frac{1}{4}$	Stage 2	Low forceps applied.	Contractions less painful.
7	I	$47\frac{1}{2}$	5	1	$53\frac{1}{2}$	Stage 2	Severe hemorrhage. Internal podalic version.	Effect of drug lost after one-half hour. Dose should have been repeated.
8	I	8	3	$\frac{1}{12}$	$11\frac{1}{12}$	Stage 2	None.	Pains weaker for a time after injection. On return of strength patient stood them better.
9	I	13	3	8 min.	$16+$	Stage 2	None.	Injection eased the pains.
10	I	$2\frac{3}{4}$	$4\frac{1}{12}$	$\frac{5}{12}$	$7\frac{1}{4}$	Stage 2	None.	Injection eased the pain.
11	I & II	17	$2\frac{2}{12}$	$\frac{10}{12}$	20	Stage 2	None.	Fine result; no pain felt and patient bore down well.
12	I	12	$1\frac{1}{4}$	$\frac{1}{2}$	$13\frac{3}{4}$	Stage 2	None.	Pantopon had no effect.
13	I	25	$9\frac{1}{4}$	$\frac{1}{4}$	$34\frac{1}{2}$	Stage 2, 1, Stage 2, 2.	Low forceps.	Pains stopped for one hour after dose one; dose two given three hours after the first one.
14	I	47	$3\frac{1}{6}$	$5\frac{3}{6}$	$55\frac{1}{2}$	Stage 2	Adherent placenta.	Pains easier. Patient bore down well; pains of good force and frequency.
15	I	$9\frac{1}{2}$	$9\frac{1}{4}$	$\frac{1}{2}$	$19\frac{1}{4}$	Stage 2	None.	Pains easier and of good force. Patient bore down well.
16	I	9	$3\frac{3}{4}$	$\frac{1}{2}$	$13\frac{1}{4}$	Stage 2	None.	No effect from the injection.
17	I	?	$\frac{1}{6}$	$\frac{1}{3}$	$?\frac{1}{2}$	Stage 2	None.	Pains stronger and longer, but less sensitive.
18	I	?	?	$\frac{1}{4}$	$?\frac{1}{4}$	Stage 2	None.	do.　　　do.
19	I	$13\frac{1}{2}$	$3\frac{1}{6}$	$\frac{2}{3}$	$19\frac{1}{3}$	Stage 2	None.	do.　　　do.
20	I	$12\frac{3}{4}$	3	$\frac{1}{2}$	$16\frac{1}{4}$	Stage 2	None.	do.　　　do.
21	I	$10\frac{1}{3}$	$3\frac{1}{2}$	$\frac{1}{4}$	$14\frac{1}{4}$	Stage 2	None.	do.　　　do.
22	II	$4\frac{1}{3}$	$1\frac{1}{3}$	$\frac{2}{3}$	$6\frac{1}{3}$	Stage 2	None.	do.　　　do.
23	I	7	$2\frac{3}{4}$	$\frac{1}{4}$	10	Stage 2	None.	do.　　　do.
24	I	$21\frac{1}{2}$	3	$\frac{1}{2}$	25	Stage 2	None.	Contractions harder and longer; patient said they were easier.

Case.	Para.	Duration of labor (hours).				Injection during.	Complications.	Results.
		Stage 1.	Stage 2.	Stage 3.	Total.			
25	I	?	?	1/2	?1/2	Stage 2	None.	Contractions harder and longer; patient said they were easier.
26	I	18	5 1/3	1/6	23 1/2	Stage 2	None.	do. do.
27	I	?25 1/2	?	1/4	25 3/4	Stage 2	None.	do. do.
28	I	12	3 1/2	1/2	16	Stage 2	None.	do. do.
29	I	16 1/2	2 2/3	1/3	19 1/2	Stage 2	None.	do. do.
30	I	18 1/2	2 3/4	1/2	21 3/4	Stage 1, 1; stage 2, 2.	None.	Labor progressed slowly, cervix slow in dilating. Patient did not seem to suffer from contractions.
31	I	17	2 1/2	1/3	19 5/6	Stage 2	None.	Fair result.
32	I	6 1/2	3	1/2	10	Stage 2	Breech presentation.	Doubtful.
33	I	12 1/2	1	1/2	14	Stage 2	None	Good. Patient a Grecian woman, and it was difficult to get an account of the effect.
34	I	17	2 1/2	1/3	20	Stage 2	None.	Patient said the drug produced no effect.
35	I	?	3 1/4	1/4	?3 1/2	Stage 2	None.	Patient said the pains were easier after injection.
36	I	?	1 6/12	1/2	?2	Stage 2	None.	do. do.
37	I	?	1	2/3	?1 2/3	Stage 2	Slight hemorrhage.	Good; uterine relaxation only slight.
38	II	?	4 1/2	1/4	4 3/4 ?	Stage 2	Medium forceps.	Patient received scopolamine, gr. 0.01 +, morphine, gr. 1/8, four hours after pantopon.
39	I	?	?	1 3/4	?1 3/4	Stage 2	Adherent placenta.	Good; pains much easier.
40	I	?	?	1/6	? 1/6	Stage 2	None.	Good; contractions less sensitive.

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