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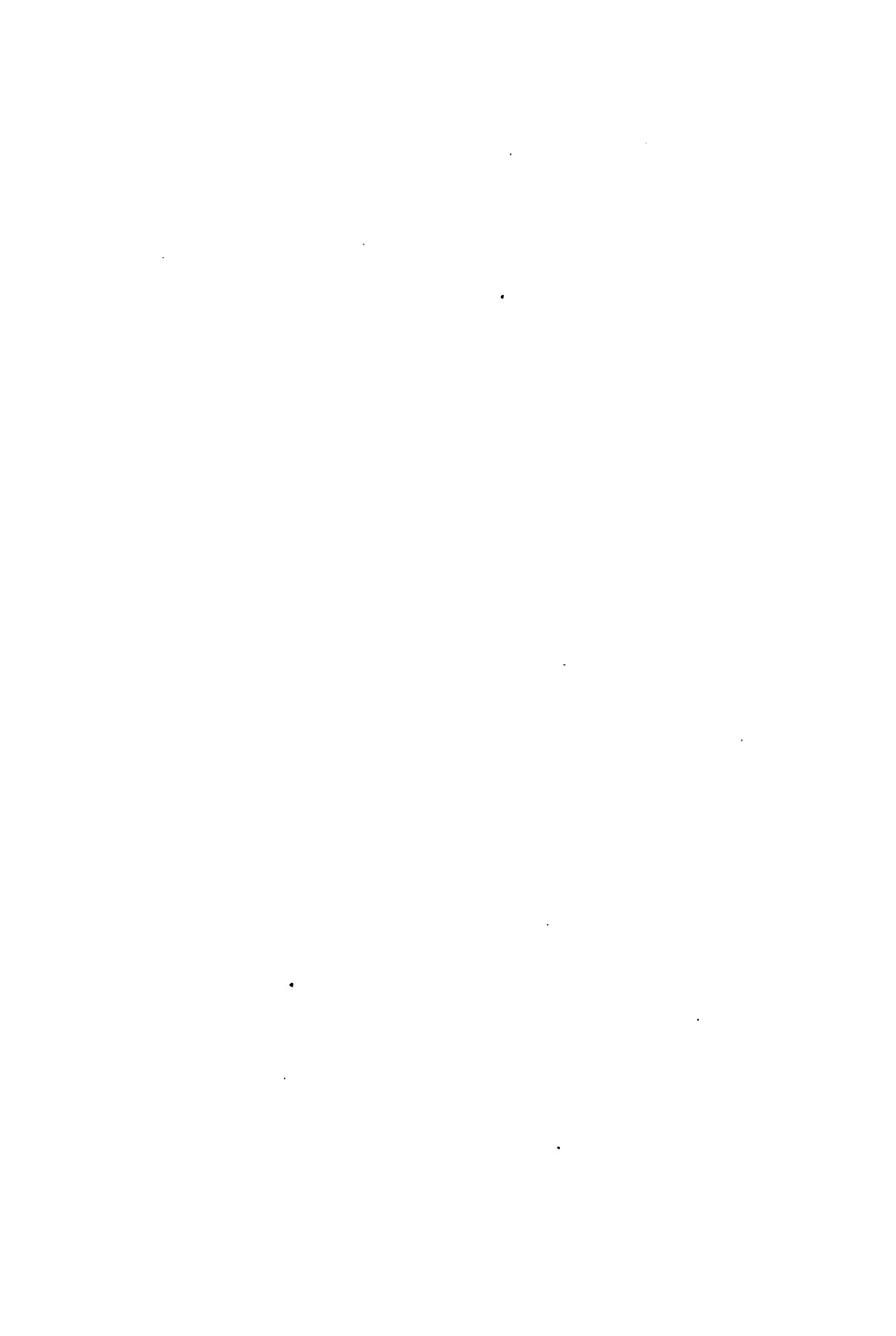
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DISORDERS OF THE BLADDER



PLATE I.

DIRECT CYSTOSCOPIC VIEW OF NORMAL BLADDER AND URETERAL
OPENING, WITH CATHETER IN PLACE. (SEE PAGE 89.)

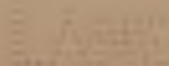
THE PATHOLOGY AND
TREATMENT OF
DISEASES OF THE
BLADDER
AND
THE URETHRA
AND
THE UTERUS AND VAGINA

BY
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CLINICAL DIAGNOSIS AND
TREATMENT OF
**DISORDERS OF
THE BLADDER**
WITH
TECHNIQUE OF CYSTOSCOPY

BY
FOLLEN CABOT, M. D.
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and Post-Graduate Hospitals, New York*

ILLUSTRATED

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1909

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To

HOWARD LILIENTHAL, M. D.

*In appreciation of his many important contributions to
the Science of Surgery.*

85274

PREFACE

THE chief object of this book is to teach general practitioners the principal methods of diagnosing and treating disorders of the urinary bladder. While the cystoscope and its uses have been carefully considered, particular effort has been made to give each method of diagnosis its just value. The various disorders of the bladder are to-day better understood and more satisfactorily treated than they were a few years ago, due to electric illumination of the vesical cavity which has made many formerly obscure diseases recognizable and their successful treatment possible.

In teaching many graduates in medicine from all parts of the world, I have found the need of a book which will help the student in understanding various problems in connection with diseases of the bladder. The present volume is largely a record of personal experience and not an attempt to cover the whole subject under discussion. As a teacher I have endeavored to convey to the student ideas which have been of value to me in practice.

I wish to thank Dr. George W. Warren for the chapter on Anatomy and also to him and Prof. H. T. Brooks, I am largely indebted for the chapter on Urinalysis.

FOLLEN CABOT.

JANUARY, 1909



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CHAPTER I

CASE RECORDING. MANAGEMENT OF THE GENITO-URINARY PATIENT

**HISTORY BLANKS—PHYSICAL EXAMINATION—PREVALENCE
OF SYPHILIS AND GONORRHEA—VENEREAL PROPHY-
LAXIS—LEAFLETS ON GONORRHEA, SYPHILIS, AND
SEXUAL HYGIENE.**

History Taking.—In both private and hospital practice systematic and accurate recording of cases is of the greatest importance. Without some definite and simple method of taking a patient's history and making notes from time to time, we are seriously handicapped. This is particularly so in the treatment of genito-urinary diseases. In this class of cases the treatment is often continued for long periods, and if notes are not taken from time to time we quickly lose track of small changes in the condition. The recording of the treatment given is of value because we are enabled to look back and see what has been used internally and locally, and the effect of such treatment on the patient's disease.

In order to obtain the most satisfactory results from history taking we should have a special form which is easily and quickly filled in. Diagrams are of distinct value for quickly noting the patient's particular disease in a very practical and accurate manner. The

following history blank* is one I have adopted for use in private practice, and also in my clinic at the Post-Graduate Hospital. It is composed, as will be seen, of four pages. On the first two are printed headings of the various parts to be considered and diagrams of the genito-urinary organs. The last two pages are blank and are left for recording treatment and any additional notes. These blanks can be easily filed alphabetically or by number in suitable boxes.

When a patient is first seen I always ask him of what he comes complaining. After he has told me I request him to tell me about the trouble from the beginning. It is well to let him do this without interruption. Of course in hospital practice this may be a difficult matter, as our time is more limited. After the patient has told his story we ask any questions we may have in mind and enter the main points on the history chart.

Physical Examination.—We should now ask the patient to expose his body. The general appearance of the skin and external genitals is noted, and then they are examined for any evidence of disease. If there be a urethral discharge a specimen is taken on a cover glass or slide for microscopical examination. The patient is next requested to pass urine in three glasses and each should be noted. These specimens are particularly inspected for presence of pus, blood and shreds. The third glass is of much value in cases of prostatitis. The last few drops of urine which are squeezed out in this condition are usually cloudy. In

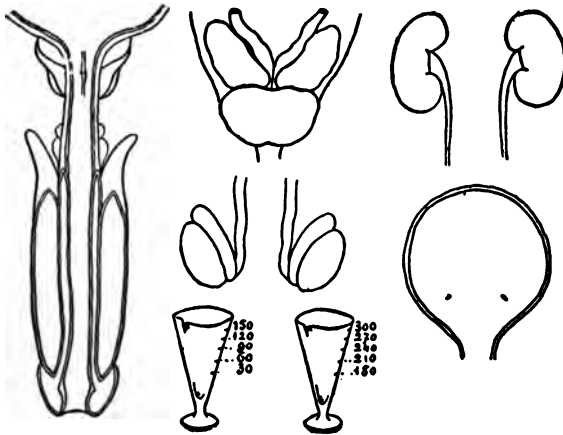
* Courtesy of Dr. W. G. Eckstein. See pages 19 and 20.

Name
Address
Age Occup
Hereditary
Personal

Date
Nativ.

Urological

Chief complaints



Diagnosis

FIRST PAGE OF HISTORY BLANK.

| | | |
|------------------------|---------------|--------------------|
| Urethra. | Secr. | filam |
| Palp | | |
| Exp. gland pen. | | bulb. cowp. |
| Scopy. | | |
| Histo-bact. | | |
| Prostate. | Vol. | cons. |
| Exp | | cont. |
| Ves. sem. | R. | L. |
| Testicles. | R. | L. |
| Bladder | Palp. | Musc. |
| Cap. | resid. | exp. |
| Scopy | | |
| Ureters. | Palp. | cath. |
| Pelvis. | Res. | |
| Kidney. | R | L. |
| Palp. | | |
| Pain. | | |
| Mict. | freq. | pain |
| | quant. | night |
| Haematuria. | } | |
| Pyuria. | | |
| Urine. | 1st | 2d. |

Treatment.

SECOND PAGE OF HISTORY BLANK.

instances of blood in urine something may be told by the appearance of the blood and in which glass it appears most markedly.

After the patient has passed his urine our next step is to carefully examine the rectum. This is done with one index finger on which we have placed a thin rubber cot and plenty of vaseline. The finger is very gently inserted by a slight rotary motion, the patient standing with body bent at a right angle. The prostate and seminal vesicals are now carefully palpated for abnormalities. The sensitiveness, size, consistency, contour, and mobility of these organs should all be considered. The space about them palpated for evidence of inflammation, acute or chronic, and notes on the conditions found are to be carefully recorded. If we wish to examine the secretion from these organs after the urine has been passed, a solution of boric acid should be placed in the bladder by aid of a soft rubber catheter and the suspected parts massaged. The resulting secretion is then collected and examined microscopically. The urethra, except in acute urethritis, in certain instances of tuberculosis, in enlarged prostate and suspected new growths of bladder, should now be explored by a medium size blunt steel sound. This sound, of about twenty-four of the French scale, is first warmed and then lubricated. It is then gently introduced into the urethra. We search for strictures, and granulation areas. This instrument may not be admitted and smaller ones must be tried. It is a mistake to begin with small, sharp-pointed instruments,

as they are apt to produce pain and often are misleading as to the condition present.

It must always be remembered that the urethral canal is normally of unequal caliber, the narrowest parts being at the meatus and membranous regions. We should always in passing sounds endeavor to follow the roof of the canal, for there it is smoother.

After we have passed a sound, a soft rubber or lisle thread catheter is introduced into the bladder and the amount and character of urine thus drawn off noted, the patient just before this having endeavored to empty his bladder. If there be residual urine the fact and its amount is noted. A stone searcher when indicated should be used, and where the condition of the bladder is open to doubt a cystoscopic examination is often of advantage. In suspected diseases of the kidneys a bimanual examination of them will be of value. In addition the urethral catheter will alone tell us of the presence and enable us to determine the relative functioning power of the two kidneys.

The whole examination need not be made at one time. In fact, this is often undesirable, but whenever it is done cleanliness of the physician's hands and instruments should be the first thought. Washing of the parts before and after examination is of prime importance, in order to prevent chills, which may be the result of an infection of a serious nature.

While this book deals mainly with urinary diseases, it will, I think, not be considered out of place to speak

of the importance of instructing our patients in matters relating to venereal infections.

Those afflicted with disorders usually contracted by sexual congress should be told the dangers of such diseases and of their prevention and proper care.

The following paper has been incorporated in this chapter because it was written by me with the idea of bringing this plan of educating the public directly to the attention of everyone interested in the improvement of the human race. To Prince A. Morrow and L. Duncan Bulkley we owe a debt of gratitude for their pioneer work in this field. To my assistant, Dr. Eckstein, I am indebted for some of these figures.

Some Facts in Regard to the Prevalence of Syphilis and Gonorrhoea in the Innocent.— Statistics show that these diseases are more prevalent and a worse scourge to-day than is tuberculosis. Their awful effects may be considered under six broad headings:

1. Mortality.
2. Chronic Invalidism.
3. Degeneration of Race.
4. Race Suicide.
5. Suffering of Innocents.
6. Social and Economic.

A few facts relative to each heading:

1. **MORTALITY.**—Of all deaths from pelvic diseases in women probably eighty per cent. are due to gonorrhoea. One-half of these deaths are among women

who have innocently acquired the disease (married state). Over ninety per cent. of deaths from paresis and other forms of insanity are probably due to syphilis. Over eighty per cent. of deaths from locomotor ataxia and all other brain and chronic spinal disease are due to the same cause. In one hospital during ten years 2000 syphilitic children were born, with mortality of over seventy per cent. Of deaths from apoplexy, chronic diseases of the lungs, blood vessels, heart, kidneys, and tumors other than cancer, it is estimated that more than fifty per cent. are due directly or indirectly to gonorrhoea or syphilis. In a large proportion of these cases the disease was contracted innocently.

2. CHRONIC INVALIDS.—Twenty per cent. of all blindness is due to gonorrhoea contracted by chance at birth or soon after.

More chronic invalids are to be found among married women than among any other class of women as a result of the ravages of gonorrhoea innocently acquired.

3-4. DEGENERATION OF RACE AND RACE SUICIDE.—Tarnowsky reports a total of twenty-two births in three syphilitic families. Of these but one became a healthy adult. Of thirteen who survived some years, eight were incapable of self-support as the result of physical and mental defects. The remaining five were nervous weaklings. He also reports a syphilitic father of nine children, of whom one died in infancy, one was deaf and dumb and two

were idiots. These facts are by no means exceptional. In France it is estimated that 20,000 children are born dead each year as a result of syphilis. This disease is frequently acquired by chance contact by people in all walks of life. Of all the involuntary childless marriages more than fifty per cent. are due to gonorrhoea. In other cases one child is born and disease prevents more: the so-called one-child sterility.

5. SUFFERING OF INNOCENTS.—It is authoritatively stated that among all women who acquire syphilis, from twenty-five to fifty per cent. contract it innocently. Among married women the innocent ones amount to seventy-five to eighty per cent. Add to this the hereditary cases and the rapidly increasing number of infections not of the genitals, but which are contracted from nurses, barbers, in restaurants, cigar factories, hotels, bathing places, from drinking cups, dentists, etc., and it will be seen that of every ten cases of syphilis one or two are innocent sufferers. In this list children form a large percentage. Many married women have to submit to unsexing operations as the result of the ravages of gonorrhoea. In many cases the husband is ignorant of the presence of the disease in himself.

6. SOCIAL AND ECONOMIC.—From a consideration of the few sparse facts set down under the previous headings, some idea may be obtained of the undermining effect of all this on the social structure. It is almost inconceivable that the few men who realize these facts have been unable to enlist the support

necessary to combat the increasing danger. If the cost to the world in suffering and lives could be estimated, it would be found far greater than that caused by tuberculosis.

People, as a rule, have mistaken ideas about these diseases and think the guilty alone suffer, but the facts as stated above show how erroneous is this view. Well-directed measures of a permanent nature in the way of education will save many lives.

Educational Measures to Diminish the Ravages of Syphilis and Gonorrhoea Among the Innocent.—

For ten years the writer of these lines has been laboring through educational methods to interest the medical profession, and to teach them and the laymen their duty with regard to the above described diseases. During the past four years some little interest has begun to manifest itself among medical men; but while many suggestions have been made, the need of a permanent bureau to carry on the work has become apparent. The writer has introduced a system of leaflets of instruction to patients at the Presbyterian Hospital, the Post-Graduate and City Hospitals. Other hospitals have followed the system. The writer has no wish to put his name to the front in this work, but he feels justified in presenting the following suggestions:

1. The need of a Bureau in connection with some educational institution, to provide literature to be sent to hospitals and private physicians, explaining the need of educating patients suffering from these disorders.

In this Bureau letters would be answered, and all business pertaining to the study and spread of knowledge carried on by those qualified to do it.

2. At the Post-Graduate Hospital about 600 graduates matriculate each year. They come from all over this country and Canada. By appropriate lectures, these men could be educated to the needs of the patients. They would be supplied with literature on the subject and kept so supplied from time to time by the Bureau. All hospitals and dispensaries would be given a supply of leaflets and kept so supplied in the same way.

3. Boards of Health in the different States and other bodies interested in the health of the people would be communicated with and supplied with all necessary information. In one State the Board of Health is now sending to the people information regarding these diseases the same as it does in questions of tuberculosis, diphtheria, etc. An attempt would gradually be made to induce other Health Boards to do the same. The system could gradually be extended to include colleges and other lay bodies.

4. In the women's clinics and at the children's clinics in the various hospitals in which patients were suffering from one of these diseases, a nurse could be sent to the patient's house to explain the necessity of care to protect from contagion the other children in the family. This need be done only in exceptional cases, for the leaflets of instruction would, as a rule, be sufficient.

5. To establish a small magazine or make use of a part of an established medical journal to keep the profession of the country informed on this subject.

6. The establishment of beds or a ward for the care of those unfortunates who have acquired the disease innocently, and who need medical treatment. There is hardly a bed to-day in New York, outside of the City Hospital, where a person with syphilis or gonorrhoea can go. It is a great need. In such a ward physicians might be taught in regard to conditions not seen in out-door departments.

7. To carry on the work in a systematic manner, a director and two assistants would be necessary. Men familiar with the needs of these sufferers would be required. For the routine office work two paid assistants would at first be sufficient. It will be important to keep all individual names in the background, and this is another reason for placing the Bureau under the supervision of the largest and first educational institution for the training of medical graduates—the Post-Graduate Medical School of the University of the State of New York. The literature carefully prepared and sent out by those skilled in this field, would, among other things, do great good in counteracting the injurious effects of quacks who prey upon this unfortunate class of sufferers.

The leaflet for those suffering from gonorrhoea is as follows:

LEAFLET I

INSTRUCTIONS TO THOSE HAVING GONORRHEA OR "CLAP"

Gonorrhoea or "clap" is a local contagious disease which requires treatment until the physician pronounces you cured.

To avoid infecting others and to prevent complications, as bubo, stricture, swollen testicles, etc., the following rules should be observed:

1. During the first week walking should be limited. When the discharge is profuse you should keep off your feet as much as possible.

2. Do not use alcohol in any form, as it always prolongs the disease. Drink milk or tea, and from six to eight glasses of water during the day.

3. Avoid all sexual relations until you have been pronounced cured by your physician, as the disease may be given to a woman even after the discharge has apparently ceased. When it is present you should avoid sexual excitement, as erections always aggravate the disease.

4. Always wash the hands after handling the parts. The discharge if carried to the eyes will cause blindness.

5. Sleep alone and be sure that no one uses any of your toilet articles, particularly towels and wash cloths.

6. Never lend your syringe to anyone and as soon as you are well destroy it.

7. Be sure that the bowels move every day. If they are inclined to be constipated take a dose of Rochelle salts before breakfast.

8. Do not use mustard, pepper, horseradish or stimulating sauces on your food.

The leaflet for those afflicted with syphilis is as follows:

LEAFLET II

INSTRUCTIONS TO THOSE SUFFERING FROM SYPHILIS

Syphilis is a constitutional disease. It is "in the blood." Local remedies and taking medicines for a few months will not cure you.

You must be treated for three years.

The effects of this disease are far-reaching, and if treatment is neglected much trouble and suffering may be caused, not only to yourself, but to others.

The following rules must be observed during the first year:

1. Sexual intercourse should not be indulged in.
2. Alcohol in all forms should be avoided, as it always aggravates the disease.
3. Do not smoke or chew tobacco.
4. Sleep alone.
5. Under no circumstances should anyone be allowed to use your toilet articles, such as towels, brushes, combs, razors, shaving brushes, etc.
6. No article that has been in your mouth should be used by others, such as tooth brushes, pencils, pipes, cigarettes, forks, spoons, drinking cups, etc.
7. You must not kiss anyone, especially children.
8. Brush your teeth night and morning and keep your mouth clean.
9. If you have bad teeth, have them attended to by a dentist, and be sure to tell him that you have syphilis, so that he can take necessary precautions, and avoid the possibility of infecting others.
10. Be sure and tell your physician you have syphilis.

The leaflet on questions of sex is as follows :

LEAFLET III

DANGERS OF IGNORANCE

SOME AXIOMS OF HEALTH

1. Sexual relations are not necessary to keep healthy manhood.
 2. If not made use of the power does not become less.
 3. In boys and young men growth of mind and body progresses better without this relation.
 4. The danger of serious disease is always great and cannot be avoided outside of marriage.
 5. If disease be contracted it often does permanent harm, not only to the man, but to his future wife and children.
 6. A man or woman may be badly diseased and not know it.
 7. To avoid these dangers physical exercise in gymnasiums and out of doors gives healthy relief.
 8. In men not living an active sexual life seminal emissions (wet dreams) each week or two are natural and can do no harm.
 9. To avoid sexual thoughts, train the mind by reading and studying clean books.
 10. Avoid drinking, obscene pictures and vulgar stories. Smoking in moderation after meals is beneficial. Choose companions who respect womanhood.
- N. B. By following the preceding common-sense rules, a man will remain strong sexually, keep his body clean and promote his own and others' happiness.

CHAPTER II

ANATOMY OF THE KIDNEYS, URETERS, BLADDER, PROSTATE AND URETHRA

The Kidneys, two in number, are deeply situated in the loins, lying on each side of the vertebral column, at the back of the abdominal cavity, and behind the peritoneum. The upper part of each kidney is in the hypochondriac and epigastric regions; the lower pole extends into the adjacent portions of the lumbar and umbilical regions. The right kidney lies nearly three-quarters of an inch lower than does the left, the lower pole of right kidney reaching to a level of the umbilicus. The upper pole of left kidney is on a level with the eleventh dorsal spine.

They measure about four inches in length, two and a half inches in breadth, and weigh about four and a half ounces. They are bean shaped and have a smooth surface, of a deep red color. The anterior surface of right kidney is covered on the upper and outer part by peritoneum, which lies between the kidney and liver. This surface is also crossed by the commencement of the transverse colon. This portion of the kidney is devoid of peritoneum, while the lower pole is covered. The anterior surface of the left kidney is crossed just above the hilum, by the pancreas and splenic vessels; above this lies the stomach, the peritoneum intervening; below the pancreas are small

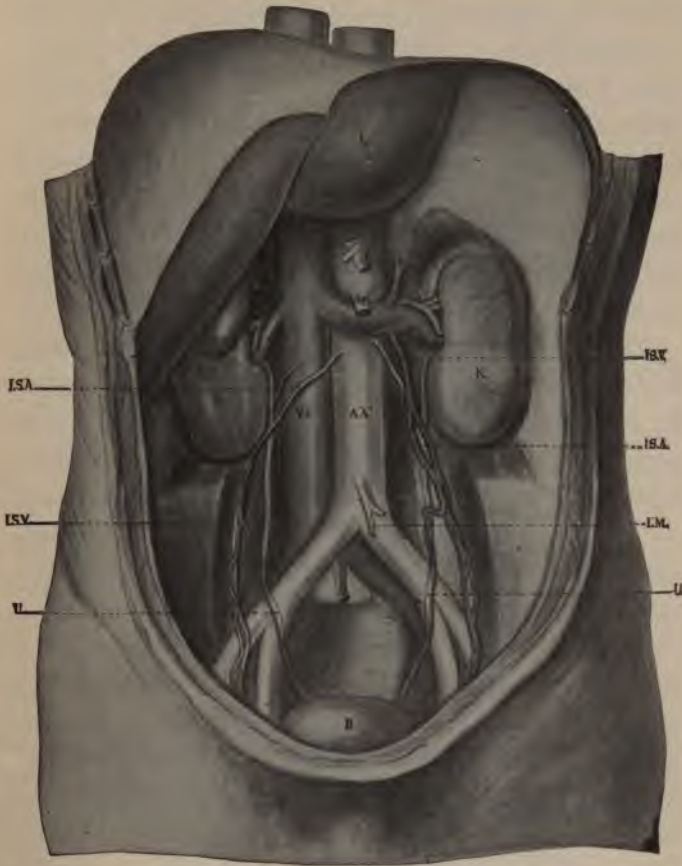


FIG. I. ABDOMINAL CAVITY SHOWING POSITION OF KIDNEYS AND URETERS. L., Liver. K., Kidney. B., Bladder. U., Ureter. A. A., Abdominal Aorta. V. C., Vena Cava (Inferior). I. S. A., Internal Spermatic Artery. I. S. V., Internal Spermatic Vein. S. M., Superior Mesenteric. I. M., Inferior Mesenteric. S. V., Sacral Vein (Mid).

intestines, separated from the kidney by peritoneum. The upper poles of the kidney are capped by the suprarenal glands; above these are the liver and spleen respectively. The ascending colon on the right, splenic flexure and descending colon on the left side are found at the outer edges of the right and left kidneys respectively. These few landmarks are of importance in determining the presence of tumors, abscesses, and other pathological lesions of the kidneys.

The kidney is covered by a proper fibrous coat, which forms a thin, smooth, but tough investment. In longitudinal section, a fissure named the hilum extends some distance into the kidney substance, forming a cavity, called the sinus. This sinus is enclosed on all sides, except at the hilum, by the solid kidney substance. The cavity thus formed, together with the cavity formed by the beginning of the ureter, is the pelvis of the kidney. The solid parts of the kidney are composed of cortical and medullary tissue, the medullary portion being arranged in separate conical masses called pyramids of Malpighi. The apices (papillæ) point toward the sinus, the broad bases toward the surface of the kidney. These pyramids are embedded in cortical substance, except at the sinus, and are thus separated one from another. The cortical part lies directly under the capsule and, as above stated, between the pyramids. This cortical portion contains the glomeruli and collecting tubules. These tubules, anastomosing, gather the secretion from the before-mentioned glomerular bodies and tu-

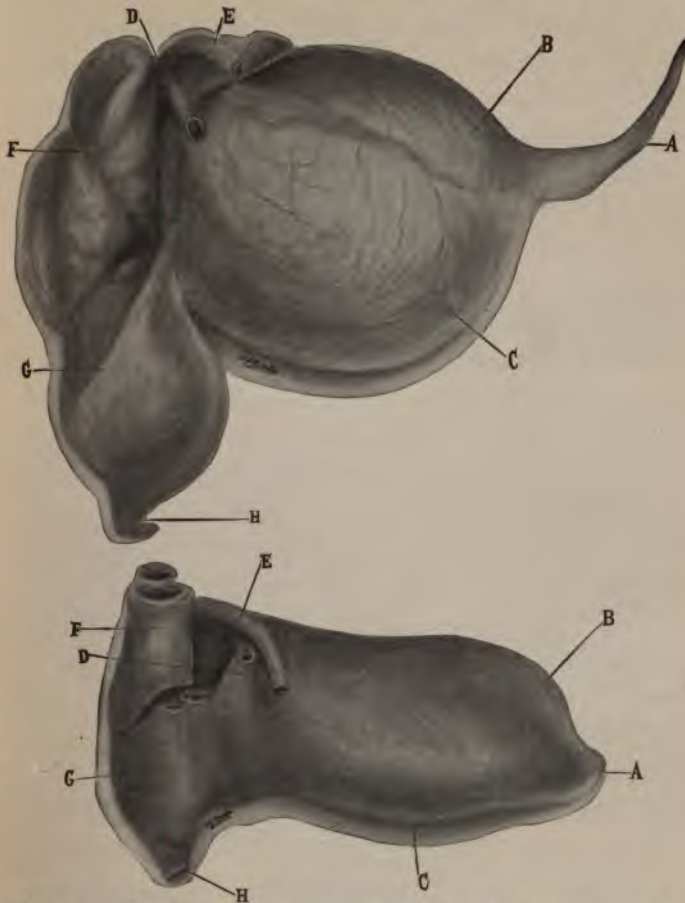


FIG. 2. BORDER OF RIGHT KIDNEY, VIEWED FROM THE INNER SIDE. The hilum on the inner border of the kidney is bounded by two convex margins irregular in outline and variable as regards their relative size and leads into a slit called the renal sinus in which lies the pelvis of the kidney. As not infrequently happens, in this specimen there are several renal arteries each accompanied by a vein. The letters indicate: A, Suprarenal capsule. B, Principal renal vein. C, A renal artery. D, Ureter accompanied by an artery. E, Anterior lip of hilum. F, Posterior lip of hilum. (After Edinburgh Atlas of Anatomy.)

bules, and drain it into the pelvis, where it is carried to the bladder by the ureters.

The Ureters, two in number, one for each kidney, are strong canals about fifteen inches long, with thick muscular walls situated entirely behind the peritoneum, their average caliber being that of a goose quill. They are placed from above downwards, first on the psoas muscle and genito-crural nerve, second on the common iliac vessels on the left and external iliac, on the right side. They enter the posterior false ligament of the bladder and thus reach the vesical wall. Their caliber varies in different portions, the smallest being in the bladder wall, the largest in the kidney, where it comes down from a funnel shape to that of a tube.

The Bladder is a pouch to hold the urine, its average capacity being eight to ten ounces. It lies against the anterior wall of the pelvis and when emptied is flattened and triangular in outline. When partially distended it is rounded in contour, and when completely distended assumes an oval shape. The anterior surface is partly devoid of peritoneum, while the superior surface is entirely covered by that membrane. The sides are not covered by peritoneum in front of or below the obliterated hypogastric artery; while at the back the serous membrane extends down as far as a transverse line uniting the upper parts of the two seminal vesicles. Thus the upper ends of the seminal vesicles and the ureters, where the latter enter the bladder, are covered by peritoneum.



FIGS. 3 and 4. TWO SPECIMENS OF BLADDER, PROSTATE AND SEMINAL VESICLES, VIEWED FROM THE SIDE. In the upper specimen the peritoneum has been left, covering the upper surface. The apex of the prostate points downwards and is in contact with the deep layer of the triangular ligament. The posterior surface is flattened, while the lateral surfaces are rounded. A, Apex of the bladder. B, Upper surface of bladder. C, Inferior. D, Ureter. E, Vas deferens. F, Seminal Vesicle. G, Prostate gland. H, Apex of prostate and urethra issuing from it. (After Edinburgh Atlas of Anatomy.)

The bladder is freely movable in all directions except in the region of the urethral orifice, where its mucous and muscular coats are continuous with those of the urethra (prostatic portion), while the fibrous investment is connected with the pelvic wall by bands of fibrous tissue called the true ligaments of the bladder, the false ligaments being simply reflections of the peritoneum from the bladder. The organ is supported by areola tissue connections to the rectum, prostate, or uterus and vagina, according to sex. The bladder from without inward is composed of a serous, muscular, submucous and a mucous coat. The mucous coat is a smooth membrane comparatively loosely attached to the underlying coats, so that when the bladder is empty, or only partially filled, it is thrown into folds or rugæ. At the base or lower part is seen the orifice leading into the urethra. Just behind the urethral opening, at the lower part of the base, is a smooth triangular surface with its apex forward. This portion, owing to firmer adhesions of the mucous membrane to the subjacent tissue, presents no rugæ. This area is termed the trigonum. At its posterior-superior outer angles are the orifices of the two ureters. These orifices present the appearance of oval slits and are directed forward and inward.

The Prostate is partly glandular, partly muscular, and lies in front of the bladder about the prostatic urethra. It has the shape of an irregular truncated cone and lies between the bladder and triangular ligament. When examined by the rectum, a sulcus is



FIG. 5. SMALL PORTION OF THE INTERIOR OF THE BLADDER which shows at G the urethral orifice and the papilla which projects into the bladder behind it. (After Edinburgh Stereoscopic Atlas of Anatomy.)



FIG. 6. THE BLADDER, PROSTATE AND SEMINAL VESICLES, SEEN FROM BEHIND. A, Urethra. B, Posterior surface of the prostate. C, Seminal vesicle. D, Vas deferens. E, Ureter. F, Upper surface of bladder covered by peritoneum. (After Edinburgh Atlas of Anatomy.)

usually felt dividing the organ into a right and left lobe. It is, as above stated, pierced by the urethra from apex to base, and at the lower portion the ejaculatory ducts pass through it. These two lobes develop independently in fetal life and are united later behind the urethra by the posterior commissure, and at the same time a thin layer covers over the urethra anteriorly (anterior commissure).

The Male Urethra is eight to nine inches in length. The canal is divided into a fixed and movable part. The fixed portion extends from the neck of the bladder to the urethra at the attachment of the suspensory ligament. This portion of the canal describes an even curve similar to that of a short metal sound and lies about one inch below the pubic arch. The movable portion of the urethra while the penis is flaccid, forms another curve in the opposite direction, so the whole canal forms somewhat the outline of the letter S. When a flexible catheter is introduced into the movable urethra the canal accommodates itself to the catheter, but when in the fixed portion the instrument is made to accommodate itself to the urethra.

The canal, when the penis is at rest, is not open; the walls lie in apposition, except when an instrument is introduced or when urine is being passed. The prostatic portion of the canal has the largest caliber and is the most dilatable. Here the ejaculatory ducts open, and inflammation in this portion may spread back along these ducts to the seminal vesicles, and from these through the vas deferens to the epididymis.

Stricture seldom occurs in this portion of the urethra. The membranous urethra, excepting the meatus, is the narrowest part of the canal and at the same time the most muscular. It is fixed between the muscular layers and the triangular ligament. This muscular development explains why at this portion we are likely to get spasmodic obstruction. The penile urethra has a dilatation at both ends, namely, the portion occupying the bulb and the portion occupying the region of the glans. It is in the bulbous urethra we most often meet organic stricture. The lining of the whole canal is composed of mucous membrane. It has many mucous glands and several lacunæ, the latter more numerous in the bulbous urethra. These are often infected and occasionally form small abscesses in gonorrhœal infections.

CHAPTER III

URINALYSIS

CONDITIONS AFFECTING AMOUNT OF URINE PASSED IN TWENTY-FOUR HOURS—SOLIDS IN URINE—SEDIMENTS —BLOOD—ALBUMIN-PUS—RENAL CASTS—EPITHELIAL CELLS.

Normal Urine, freshly voided, is usually a perfectly transparent, watery fluid of a straw or amber color and acid reaction. When allowed to stand (one-half to four hours) a slight cloud appears, which consists of mucous shreds, epithelia, leucocytes, etc., in smaller or larger number, though not in sufficient amount to cause marked turbidity. A perfectly normal, freshly voided urine may, however, be cloudy, owing to precipitation of earthy phosphates or urates. This is seen after meals, during cold weather, and in acid, neutral, or faintly alkaline urines.

As urine contains products of katabolism, examination of it will reveal the general condition of body metabolism and the functional activity of the kidneys, as well as the condition of the several channels through which it must pass to leave the body.

The amount of urine passed by the average adult in twenty-four hours is about 1500 cubic centimeters (forty-five to fifty ounces), but this varies according to the season of the year, amount of fluid ingested, and the quantity of water eliminated through other channels, such as the sweat-glands, intestines, the stomach in vomiting, etc. To measure the twenty-

four-hour amount of urine, it is necessary to begin and end with an empty bladder. For example, the patient should empty his bladder at 7 A. M., then all urine passed after this should be collected, together with that voided the next morning at 7.

Deficient excretion of urine, that is, the amount less than 1500 cubic centimeters (forty-five to fifty ounces) in twenty-four hours, is usually due to:

1. Small quantity of fluid ingested.
2. Sweating.
3. Diarrhea.
4. Vomiting.
5. Renal changes, such as passive hyperemia and the early stages of acute diffuse nephritis.
6. Surgical shock, intoxication (poisoning).

The twenty-four-hour amount is increased by:

1. Large amount of fluid ingested.
2. Cold.
3. Diuretics.
4. Nervous excitement (diabetes insipidus and mellitus).

The reaction of normal urine is acid when the twenty-four-hour amount is tested, but, as seen above, the reaction may vary according to the nature of the food ingested, work and variations in temperature.

The average specific gravity for the twenty-four-hour amount is 1.020. The ordinary variation is from 1.018 to 1.025.

The solids of the urine are the normal constituents present in solution, such as urea, uric acid, phosphates, chlorides, sulphates, etc. The term relative

solids applies to the proportion of solids to water. For example, the relative quantity of urea is two per cent. The absolute solids is the total amount of solids passed in twenty-four hours. For example, the total amount of urea is about twenty-three grams. Under normal conditions the amount of total solids is from seventy to seventy-three grams in twenty-four hours. This amount varies according to weight, age, diet and habits of the individual.

Conditions which decrease the amount of total solids are deficient metabolism and defective excretion. In advanced chronic disease of the kidney, where the function of this organ is greatly interfered with, there is a notable decrease in the amount of total solids eliminated. This decrease in elimination of solids may be the forerunner of uremic conditions, although uremia may occur with no diminution in total solids.

To estimate approximately the total solids in the urine:

Multiply the last two figures of the specific gravity by Haeser's coefficient, 2.33. This will give the number of grams per 1000 cubic centimeters (one liter or one quart) of urine.

For example: The quantity of urine passed in twenty-four hours is 1200 c. c., specific gravity 1.024.

$24 \times 2.33 = 55.92$ grams per 1000 c. c. The quantity passed in twenty-four hours is 1200 c. c. Hence, $\frac{1200 \times 55.92}{1000} = 67.1$ grams of total solids in twenty-four hours.

To determine the number of grains of urea per

ounce of urine from the percentage, the following table may be employed:

| | | | | | | | | |
|-----|-----|-------|-------|-------|--------|----|-----|--------|
| 0.3 | per | cent. | ..... | 1.44 | grains | to | the | ounce. |
| 0.4 | " | " | ..... | 1.92 | " | " | " | " |
| 0.5 | " | " | ..... | 2.4 | " | " | " | " |
| 0.6 | " | " | ..... | 2.88 | " | " | " | " |
| 0.7 | " | " | ..... | 3.36 | " | " | " | " |
| 0.8 | " | " | ..... | 3.84 | " | " | " | " |
| 0.9 | " | " | ..... | 4.32 | " | " | " | " |
| 1.0 | " | " | ..... | 4.8 | " | " | " | " |
| 1.1 | " | " | ..... | 5.28 | " | " | " | " |
| 1.2 | " | " | ..... | 5.76 | " | " | " | " |
| 1.3 | " | " | ..... | 6.24 | " | " | " | " |
| 1.4 | " | " | ..... | 6.72 | " | " | " | " |
| 1.5 | " | " | ..... | 7.2 | " | " | " | " |
| 1.6 | " | " | ..... | 7.68 | " | " | " | " |
| 1.7 | " | " | ..... | 8.16 | " | " | " | " |
| 1.8 | " | " | ..... | 8.64 | " | " | " | " |
| 1.9 | " | " | ..... | 9.12 | " | " | " | " |
| 2.0 | " | " | ..... | 9.6 | " | " | " | " |
| 2.1 | " | " | ..... | 10.08 | " | " | " | " |
| 2.2 | " | " | ..... | 10.56 | " | " | " | " |
| 2.3 | " | " | ..... | 11.04 | " | " | " | " |
| 2.4 | " | " | ..... | 11.52 | " | " | " | " |
| 2.5 | " | " | ..... | 12.0 | " | " | " | " |
| 2.6 | " | " | ..... | 12.48 | " | " | " | " |
| 2.7 | " | " | ..... | 12.96 | " | " | " | " |
| 2.8 | " | " | ..... | 13.44 | " | " | " | " |
| 2.9 | " | " | ..... | 13.92 | " | " | " | " |
| 3.0 | " | " | ..... | 14.4 | " | " | " | " |
| 3.1 | " | " | ..... | 14.88 | " | " | " | " |
| 3.2 | " | " | ..... | 15.36 | " | " | " | " |
| 3.3 | " | " | ..... | 15.84 | " | " | " | " |
| 3.4 | " | " | ..... | 16.32 | " | " | " | " |
| 3.5 | " | " | ..... | 16.8 | " | " | " | " |
| 3.6 | " | " | ..... | 17.28 | " | " | " | " |
| 3.7 | " | " | ..... | 17.76 | " | " | " | " |
| 3.8 | " | " | ..... | 18.24 | " | " | " | " |
| 3.9 | " | " | ..... | 18.72 | " | " | " | " |
| 4.0 | " | " | ..... | 19.2 | " | " | " | " |

A urine which was clear when voided usually becomes cloudy by the formation of a sediment. This sediment can be obtained by two methods: by gravity in a conical glass or by centrifugation. The latter is

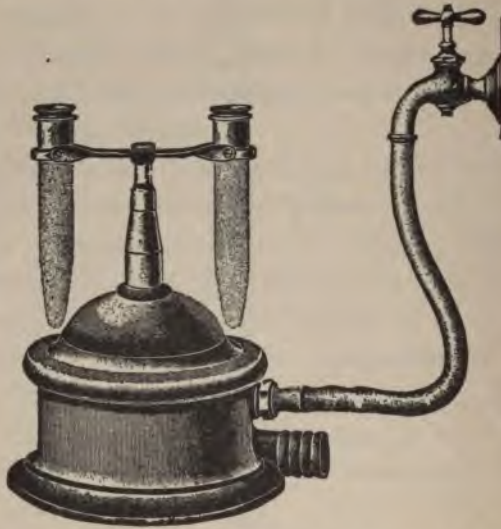


FIG. 7. WATER MOTOR CENTRIFUGE, with aluminum tube holders.

the more trustworthy, as the specific gravity of the urine does not affect the result.

SEDIMENTS may be divided into nonorganized and organized. The nonorganized consist of crystalline and amorphous bodies, such as uric acid, calcium oxalate, calcium phosphate, ammonio-magnesium-phosphate, calcium carbonate, cystin, cholesterin, leucin, tyrosin, bilirubin, xanthin and indigo, phosphates, urates, etc. This group is of little interest from a sur-

gical standpoint, except as they may be confused with the organized sediments, which consist of epithelia, blood, pus, renal casts, spermatozoa, fat, fibrin, tissue, fragments, mucus, parasites and bacteria. In all cases of turbidity the urine should be examined microscopically. This examination should be made of the sediment obtained by the centrifuge.

Blood may appear either in the form of unaltered red corpuscles—when these have been in the urine but a short time—or as blood shadows, when the hemoglobin has been extracted by the action of the fluid. When blood is derived from the kidney, the corpuscles are usually mere shadows. The pigment in solution gives to the urine the characteristic smoky appearance of methemoglobin. In cases of marked hemorrhage from the pelvis of the kidney, the blood corpuscles may be unaltered and clots may even be formed in the bladder. When red corpuscles have the slightest yellowish tint they can be considered unaltered blood corpuscles. In a few hours after blood has entered the urine the corpuscles begin to swell and lose their color and density; they are then considered “abnormal” blood corpuscles. This classification is not infrequently of use in stating the length of time the blood has been in contact with the urine. A corpuscle which enters the urine from the kidney is more likely to be “abnormal” than one which enters from the urethra. The fact that the corpuscle holds its color, gives to the urine a more or less reddish tinge, depending upon the amount of blood present. When an abundance of unaltered

red blood corpuscles is present they impart to the urine a distinctly red color. An abundance of leached red blood corpuscles impart to the urine a smoky color, due to the presence of methemoglobin and hematin.

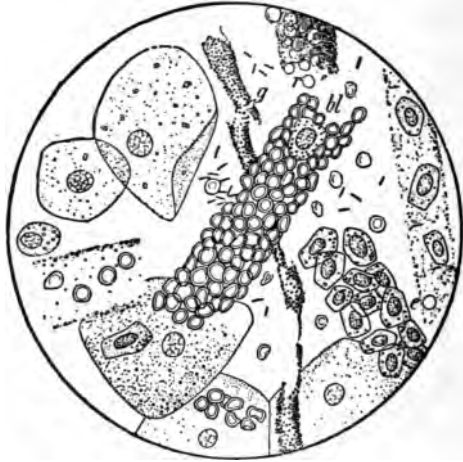


FIG. 8. ACUTE HEMORRHAGIC NEPHRITIS. X 350. Small and large squamous epithelium, hyaline casts (at the margin). G, Finely granular cast. Bl, Red blood-corpuscle cast. E, Tubular epithelium (arranged in cast form). Here and there are blood-corpuscle rings ("shadow" ghosts). (Lenhartz-Brooks.)

If the blood is small in amount, no color may be imparted to the urine.

Albumin can always be found in urine containing blood, even when there is no macroscopic evidence of hemorrhage.

When suppuration is believed to be associated with hematuria, it is important to remember that white corpuscles are present in all urines containing blood. If

the white corpuscles are abundant, suppuration exists somewhere in the urinary tract. In females the possible existence of leucorrhœa must not be lost sight of.

In another chapter the methods of determining the seat of hemorrhage have been discussed.

Blood from the kidney in freshly passed urine is generally altered, the corpuscles isolated, and the se-



FIG. 9. HEMOGLOBINURIA. (Lenhartz-Brooks.)

cretion has a more or less smoky appearance. When abundant or from the straight tubules, the corpuscles may be unaltered. Therefore, in order to differentiate a renal from a vesical hemorrhage, the ureteral catheter and cystoscope must be employed. The only positive evidence of renal hemorrhage is the microscopic finding of blood casts.

LANE LUBER

The most frequent causes of hemorrhage from the kidney are: Acute diseases and circulatory disturbances of the organ, as in active hyperemia (little blood); severe active hyperemia (much blood); acute nephritis (large amount of blood). As a rule this blood is "abnormal."

Hematuria is not uncommon in chronic interstitial and chronic diffuse nephritis (Weigert's mottled kidney), and is not rare in amyloid infiltration of the kidney. It occurs also in tuberculosis of the kidney, in which hemorrhage is a common symptom. This occurs, as a rule, intermittently and is associated with constant pyuria, which sometimes is slight. Neoplasms of the kidney cause repeated hemorrhages, which may be profuse. Degenerated tumor cells are usually present. A calculus in the renal pelvis or embedded in the renal tissue is at times accompanied by hemorrhage. The amount of blood varies greatly and often is associated with pus (pyelitis). Caudate cells of the kidney pelvis may be seen in the urine, but these are difficult to recognize. In these cases the sediment should be searched for crystalline deposits.

The ingestion of certain drugs, such as cantharides, chlorate of potash, etc., may cause hemorrhage from the kidney. Trauma also causes hematuria. In contradistinction to renal hemorrhage, in hemorrhage from the bladder the cellular elements are generally unaltered. Blood coagula are more common in vesical than in renal hemorrhage. When blood coagulates in the ureter, long, worm-like clots may be observed in the

GUIDE TO THE ORIGIN OF BLOOD IN HEMATURIA (After Oertel)

| ORIGIN | QUANTITY | DIFFERENTIAL POINTS | MAY OCCUR IN |
|-------------------------------|------------------------------|---|---|
| Kidney. | Usually comparatively small. | Clots usually absent. Associated with blood-casts, epithelial and hyaline casts, renal epithelium. Intimately mixed with urine. Many swollen (loss of hemoglobin) phantom corpuscles. Sediment slight (or abundant). | Acute and chronic nephritis. Malignant growths. Renal calculus, tuberculosis, embolism, abscess, acute febrile processes, hemophilia, and in filariasis (malaria) and distomiasis (?). Frequently in poisoning from turpentine, carbolic acid, etc. |
| Pelvis of kidney and ureters. | Variable. | Absence of casts of any kind or renal epithelium. Fibrinous molds of ureters may be present. Pus-cells in calculus. | Disease of pelvis, calculus, etc. |
| Bladder. | Frequently large. | Blood-cells well preserved—unless urine is ammoniacal. Clots frequent. Heavy sediment (often scanty). Pus in cystitis. In papilloma and malignant growths may be shreds of such tissue. If from neck of bladder, appears at end of micturition. | Stone, cystitis, tumors, varicose veins of vesical neck (distomum hæmatobium), etc. |
| Urethra. | Small. | May be expressed, first part of micturition. | Urethritis, trauma, etc. |

voided specimen. The above mentioned differential diagnostic points are very reliable.

Pus.—The urine contains occasional isolated leucocytes in health. Morphologically they correspond to pus corpuscles, having a round, well-defined granular body. In size they are quite constant, being a little less than twice that of a red blood cell. They usually contain two or three nuclei (polymorphonuclear leucocyte); although the mononuclear type met



FIG. 10. MUCUS AND PUS-CORPUSCLES, before and after the addition of acetic acid. (Tyson).

with it is far less common. Upon the addition of acetic acid the leucocyte swells and the granules disappear, thus causing

the nuclei to become more

distinct. The leucocyte takes a deep mahogany brown stain when treated with potassic iodide.

It is only when these leucocytes occur in greatly increased number or associated with other cellular elements of a pathological nature, that they attain importance. They are one of the most common elements found in the urinary sediment, and may be derived from any portion of the urinary tract.

When pus comes from the kidney substance there is usually present in the urine *albumin* and renal casts; the casts may be few or many in number and of all types. The percentage of albumin is over fifteen per cent., varying according to the degree of kidney change. The amount of albumin does not depend upon

the quantity of sediment in the urine, but, as already stated, upon the kidney changes. A sediment consisting mostly of pus may be very large in cases of cystitis, with a small amount of albumin, while a small sediment in cases of kidney involvement, will be accompanied by a large amount of albumin. This fact is well shown in the following table compiled by Prof. H. T. Brooks.

| | CYSTITIS Albumin (percentage) | PYELITIS Albumin (percentage) |
|--|-------------------------------------|-------------------------------------|
| I. Maximum degree: Numerous pus-cells in liter glass. | 0.1 | 0.3 |
| II. Moderate degree: Pus-sediment about $\frac{1}{2}$ centimeter high. | 0.06 | 0.2 |
| III. Slight degree: Pus-sediment 1 to 2 millimeters high. | Just distinctly recognizable. | 0.1 |
| IV. Minimum degree: Recognizable almost only by microscope. | Not recogniz- able. | Distinctly rec- ognizable. |

An abscess of the kidney cannot be diagnosed from urinary findings until its contents have been evacuated into the urinary tract.

In uncomplicated cases of chronic pyelitis the urine is acid, the pus is clumped and caudate cells of the kidney pelvis are present.

Pus as the result of cystitis may be very abundant.

The urine may be acid or alkaline. The amount of albumin, in the absence of blood, is always small.

In cases of urethritis the pus may be free or clumped. Shreds may or may not be present, the diagnostic point being a clear urine upon catheterization.

Pyuria in women may be due to a vaginitis or an

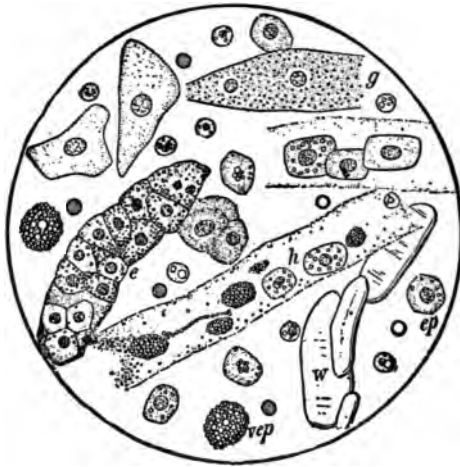


FIG. II. CHRONIC BRIGHT'S DISEASE (Chronic Parenchymatous and Interstitial Nephritis) X 350. H, G, E, W, Hyaline, granular and waxy casts. Ep, Renal epithelium. Vep, Quite uniformly fatty renal epithelium. (Lenhartz-Brooks.)

inflammatory process in the uterus. In either case the urine will contain many large epithelial cells either from the vaginal or uteral epithelium.

Renal Casts.—These are molds of the uriniferous tubules of the kidneys and are found in the urine in various pathological changes in which the function of the kidneys is altered. The origin of casts is unknown, but the theory usually accepted is that they are com-

posed of exuded coagulable elements of the blood which enter the renal tubuli as the result of pathological changes in the latter and there solidify, forming molds (casts) of the tubules.

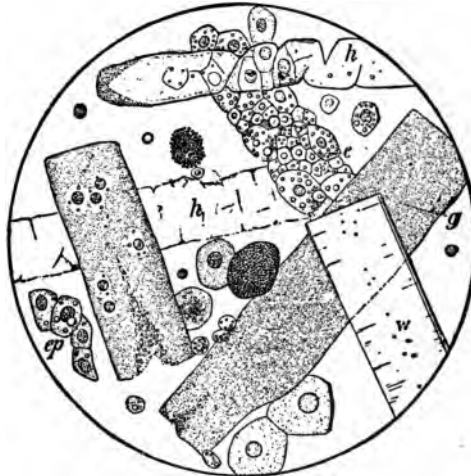


FIG. 12. SEVERE ACUTE NEPHRITIS (at first decidedly hemorrhagic) which ended fatally in four weeks. X 350. H, Hyaline cast. G, Granular cast. W, Waxy cast. E, Epithelial cast. Ep, Free renal epithelia. Also two finely granular, uniformly fatty renal epithelia. (Lenhartz-Brooks.)

A simple division according to their microscopical appearance is:

- I. Hyaline (transparent) casts
- II. Granular casts (coarse, fine)
- III. Epithelial casts
- IV. Pus casts
- V. Blood casts
- VI. Fatty casts
- VII. Mixed casts
- VIII. Waxy casts
- IX. Cylindroid casts

Pure hyaline casts are pale, transparent, homogeneous cylinders generally with rounded ends. They occur in variable length and breadth.

The granular casts consist of a hyaline basis on which granules are embedded. These granules probably come from the renal tubules. They may be composed of degenerated renal epithelium, leucocytes or blood corpuscles; the latter are generally designated blood casts; or be due to certain salts, as sodium urate deposited upon the hyaline basis.

Casts which are studded with renal epithelium are epithelial casts, while those covered with or composed of red blood cells are called blood casts. When the cast is covered with leucocytes they are designated pus casts.

Renal casts are always secondary products of epithelial and granular casts.

Renal casts with few exceptions point to the existence of a renal inflammation.

As a general rule the severity (degree) of the pathological process is indicated by the quantity of anatomical elements and granular matter composing the cast.

As an example, a urine containing only pure hyaline casts of small diameter is found in simple circulatory changes or toxemia.

In more marked disturbances epithelial elements will be found adherent to the cast. Blood casts are indicative of a hemorrhage into the kidney.

Epithelial cells of the squamous type, the large su-

perificial epithelia of the urethra and external genitals, are always present in the urine, while epithelia of the glandular type from the prostate and deep urethra, together with the caudate type from the ureter, are occasionally found.

Epithelial cells of the kidney can be differentiated

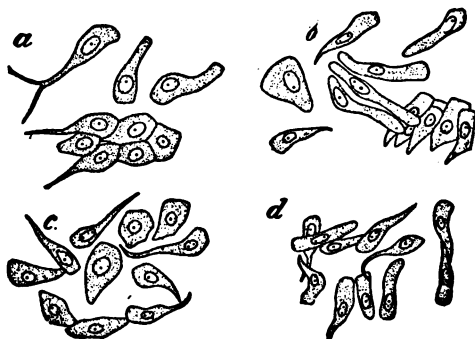


FIG. 13. EPITHELIUM FROM THE URINARY TRACT (obtained by scraping the mucosa). X 350. A, Renal pelvis. B, Ureter. C, Bladder. D, Excretory duct of prostate. (Lenhartz-Brooks.)

from those of the bladder and ureter and also from the cells having their origin in the external genitals.

The epithelial cells of the kidney pelvis cannot be distinguished from those of the kidney tubules, while the urethral and ureteral epithelia resemble each other so closely that they cannot be differentiated.

In cases of new growths in the genito-urinary system there are numerous epithelial cells in the urine. These are atypical (bizarre) forms and show a marked fatty degeneration. The cells occur in masses and are accompanied by slight or marked hemorrhage. We

should always endeavor to examine freshly voided urine obtained before instrumentation of the urinary organs.

Prostatic fluid is commonly found in the urine of patients suffering from inflammation of the prostate.



FIG. 14. SPERMATORRHEA AND PROSTATORRHEA. X 350. S, Spermatozoa. K, Botcher's crystals. P, Prostatic corpuscles. (Latter after Bizzzero.) (Lenhartz-Brooks.)

This fluid is usually found in greater quantity in the last few drops of the voided urine.

Spermatozoids are usually found in the urine after an ejaculation or stripping of the seminal vesicles.

The following notes are from a case with interesting changes in the urine before and after operation.

Joseph M. M., age thirty-two, referred by Dr. Merrick, of Boston, came February, 1905, complaining of

great pain on left side. He says that when he was a child of two years old, he had an abscess of the kidney which discharged into the bladder. Recovered apparently from this, and was in good health, with the exception of an operation for appendicitis, until January, 1905.

In that year he had a mild attack of renal colic. Pain ran down region of ureter into left testicle. The pain was entirely on the left side. At this time he passed some gravel and pus was found in the urine. There was no more pain for ten months, when he had several attacks of the same nature, and in the intervals had a feeling of heaviness and pain in left kidney region.

There was a point of tenderness over the region of the ureter, just above the pelvic brim. This seemed to point to a stone in the ureter. X-ray was, however, negative. Mixed urine; large amount of pus; no blood, no casts; trace of albumin.

Cystoscopic examination showed a mild cystitis. There was a stricture of the left ureter two to three inches from the orifice which was smaller than normal and difficult to locate.

When the catheter was passed beyond this stricture there was no gush of urine as is generally noted in cases of hydronephrosis. The renal attacks became more severe, and the patient ran a septic temperature, which at one time was 105°. Pus was seen to be coming from the left side.

On operation a large pus sac, containing over a

pint of fluid, occupied the region of the left kidney. This fluid consisted mostly of pus with a small amount of urea. The sac was removed, and as there were dense adhesions, the ureter was not disturbed. The sac was tied off just below the pelvis, and the wound drained.

Everything was healed tightly at the end of two months. Patient regained his normal weight and for some months was well and at work. The right kidney at this time was apparently normal.

At the end of six months the patient began to have pain similar to that mentioned before. This became worse and the attacks became more frequent. At the end of a month's time he had constant pain over the region of the left ureter and in the wound in back. Soon the patient had to be given occasional doses of morphine and later he returned to the hospital.

He was at once cystoscoped. No ureteral opening could be seen on the left side. The bladder was apparently normal. This examination was made under general anesthesia. Through the relaxed abdominal walls, a mass could be felt. This occupied the position of the left ureter, and, upon palpation, seemed shaped like a large sausage, three or four inches in circumference.

The urine at this time contained a large amount of albumin, granular casts, slight amount of pus, and squamous epithelia, reaction acid; sp. gr. 1.014, showing disturbance in the remaining kidney.

Dr. Warren assisting, the ureter was operated

upon by the extra-peritoneal route and the mass exposed. It was found to be the left ureter dilated by fluid, and the size of the large gut. It was so bound to the peritoneum and surrounding tissue by adhesions, that it was impossible to remove it, so it was brought up and sutured into the wound, and opened after thirty-six hours. Over two quarts of a purulent fluid were drawn off. This consisted largely of pus, but no urea. A rubber drainage tube was inserted and after three weeks the patient was discharged, still wearing the drainage tube. General condition greatly improved; no pain.

The urine was at this time again examined and found free of albumin and casts.

The patient reports himself in good condition, at the end of three months, but still wearing tube. The plan is to gradually shorten the tube, washing out meantime with bichloride of mercury and silver nitrate alternately. Discharge gradually decreasing. No tubercle bacilli can be found.

CHAPTER IV

METHODS OF EXAMINING THE BLADDER. SEPARATION OF THE URINE

SEPARATORS OR SEGREGATORS—TYPES OF CYSTOSCOPES—
DIRECT AND INDIRECT INSTRUMENTS—METHODS OF
CATHETERIZING URETERS—NECESSARY INSTRUMENTS
FOR GENITO-URINARY PRACTICE—VARIOUS URETHRO-
SCOPES.

Several instruments other than cystoscopes have been devised with the idea of temporarily dividing the bladder into two lateral halves and in this way attempting to keep urine separate as it comes from each kidney. These so-called *separators* or *segregators* are occasionally useful when we are dealing with a healthy bladder. But this reservation begs the whole question because we are never sure that a given bladder is perfectly normal. We may be right in ninety-eight per cent. of cases, but in the remaining two per cent. we may be mistaken, and so this possible source of error even in a small percentage of instances makes the method an unsafe one. In contrast to the cystoscope and the ureteral catheter this method of artificially dividing the bladder may be called a blind one. The only use for an instrument of this character in my opinion is in cases where we have an infected bladder, in consequence of which condition we do not wish to

run any chance of contaminating a healthy ureter and kidney by the introduction of a ureteral catheter. In a case of this type we would, however, have to use the cystoscope first in order to determine the condition of the bladder. But with a diseased bladder it would be difficult to exclude it as the origin of pus or blood found in either of the separate urines as collected by one of these segregators. In the presence, however, of elements in the urine necessarily of kidney origin and found on one side it is of some value. In another class of cases it has been used, that is, where a ureteral opening cannot be found by aid of the cystoscope. However, these cases are so rare and there are so many methods in common use for locating an obscure ureteral opening that in the hands of one with moderate experience the cystoscope and ureteral catheter are the instruments of choice.

Harris, of Chicago, some years ago devised an instrument he called a segregator. With this segregator the bladder is divided into two parts by placing one arm of the instrument in the rectum or vagina and thus forming a watershed between the two ureters. The other arm of the instrument is then introduced into the urethra as we would a sound in the male. This arm is divided into two parts which swing on joints, and after it is in position in the bladder it is opened, one-half the beak going into one cul-de-sac or depression made by the watershed and the other half going into the opposite side. These two halves are provided with eyes which connect with the lumen of each half

of the shaft of the instrument and drain off urine as it is emptied into the bladder from each kidney. It is certainly an ingenious instrument and easily manipulated. I, however, do not use it for the reasons I have already given. Downs, of Philadelphia, has devised an instrument on somewhat similar lines taken from the original model of Harris' with some modifications.

The Luys and Cathélin *séparateurs* are made for the same purpose as the Harris and Downs segregators, but in these instruments a rubber dam is so arranged that a division is made of the bladder after the instrument has been introduced. Certainly ingenious, but to my mind even of less use than our American surgeons' models. Several hundred cases where these instruments have been used successfully have been reported and they no doubt have a limited use. They require in their manipulation less experience than does the ureter cystoscope and in normal bladders are fairly reliable. Of course in using them if we do not also use the cystoscope we lose a most important part of the examination, to wit, a view of the bladder and ureteral openings. It can also readily be seen if the segregator or separator is alone used, unsuspected bladder disease, new growths, ulcerations and other abnormal conditions, may be overlooked and hemorrhage from them wrongly attributed to some disease of the kidney or ureter.

In 1887, the late Max Nitze of Berlin, Germany, brought before the medical world the electric cysto-

scope. For many years before that time, however, many other workers in the same field had been experimenting with methods to view the interior of the bladder. Nitze and Leiter were, however, the first to devise a cystoscope of practical value. It is not necessary here to go into the history of cystoscopy, its great advances and constant improvements as shown from year to year in new models. I shall, therefore, describe only such parts of this history as seem necessary in order to make the subject clear.

Types of Cystoscopes.—In the first place I shall describe the *direct vision cystoscope*, the type originally brought before the medical world by Brenner; then the *prismatic* or *indirect vision instrument*, which is made on the principles of the one devised by Nitze and Leiter. In both of these instruments we have to do with systems of lenses and different kinds of lamps for lighting the bladder. Mr. Reinhold Wappler has done much in this country to advance the art of cystoscopy by his mechanical skill and great ingenuity.

THE DIRECT VIEW CATHETERIZING CYSTOSCOPE as devised by Brenner was arranged with a separate telescope and sheath. The curve of the beak in this instrument was at almost a right angle to the sheath. This method of catheterizing the ureter was well nigh impossible, owing to the fact that the catheter emerged from above the field of vision. Later it was changed and the catheter chamber was placed on the under surface of the sheath. The catheter then emerged at the lower part of the field of vision and made direct-

view catheterization possible. The telescope, which was a separate piece, as already stated, came only

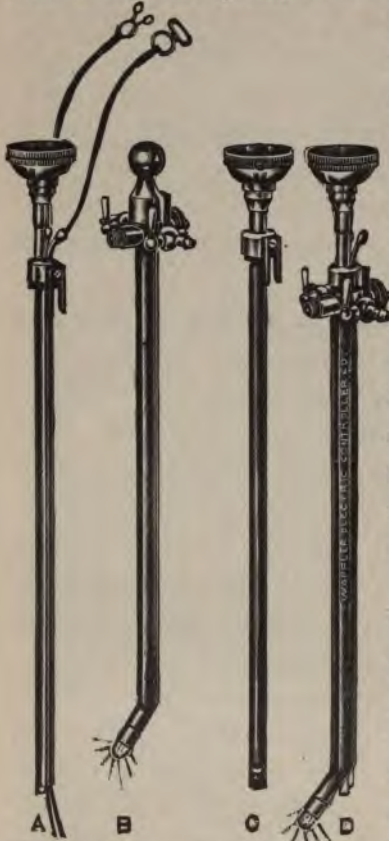


FIG. 15. BRENNER-BROWN DIRECT-VISION CATHETERIZING AND IRRIGATING CYSTOSCOPE. A, Catheterizing telescope. B, Sheath and obturator. C, Observation telescope (indirect). D, Telescope and catheters in sheath.

to the end of the sheath. On this rather cumbersome and painful instrument there was also, in addition to the one chamber on the lower part of the sheath, one irrigating cock for filling and washing the bladder. Difficulties in the way of using this instrument successfully were many, and it was considered of little value.

F. Tilden Brown, who is the leading exponent of *direct vision cystoscopy*, has done more than anyone else to develop the direct method of examining the bladder, and catheterizing the ureters. His ingenuity in the field has been truly marvelous and his instruments have so de-

veloped cystoscopy that I have no doubt the direct-view method of catheterizing ureters will eventually become the one of choice. It is without question when once understood the most satisfactory method.

Dr. Brown has devised what he calls his composite irrigating cystoscope. First he placed two closed catheter chambers on the movable telescope of Brenner and on the sheath placed two irrigating openings controlled by cocks. The lamp was placed on the end of the beak. In order to obtain a good light in the region of the ureter, close to the points where the catheters emerged from the telescope, the latter protruded about one-third inch beyond the sheath into the bladder. In addition to using the catheterizing telescope the sheath when in position can be left in place and a telescope for a right-angle view can be substituted as required. This is also of distinct advantage. At present, in addition to the direct-view catheterizing telescope, Dr. Brown has devised a cystoscope which permits of indirect-view catheterization. This in certain cases is of value in catheterizing the ureters. As now arranged the Brown instrument is a very perfect and complete cystoscope. In order to leave the catheters securely in place and withdraw the cystoscope, I devised a special telescope. In 1904 I removed the two separate catheter chambers on the direct-view catheterizing telescope and substituted for them a short single chamber or bridge about one-half inch long to support the catheters as they emerge from the sheath, and are directed toward the ureteral openings. With this



FIG. 16. AUTHOR'S CYSTOSCOPE FOR CATHETERIZATION OF THE URETERS AND FOR USE WITH SMALL BLADDER INSTRUMENTS. (Modification of Brenner-Brown direct vision cystoscope).

model, after the catheters are in the ureters, the telescope is slightly withdrawn to give the fingers of the left hand a chance to grasp them firmly. The telescope is then gradually withdrawn by the right hand till the short single chamber or bridge is reached at the distal end of the telescope. The telescope is then completely removed from the sheath and the catheters lie loose in its lumen. We can then feed our catheters gently down the lumen as we remove the sheath. As the heel of

the sheath comes to the perineum pressure there keeps the catheters from being displaced.

We then have the catheters lying in the ureters with the instrument completely out; a matter of considerable importance in a

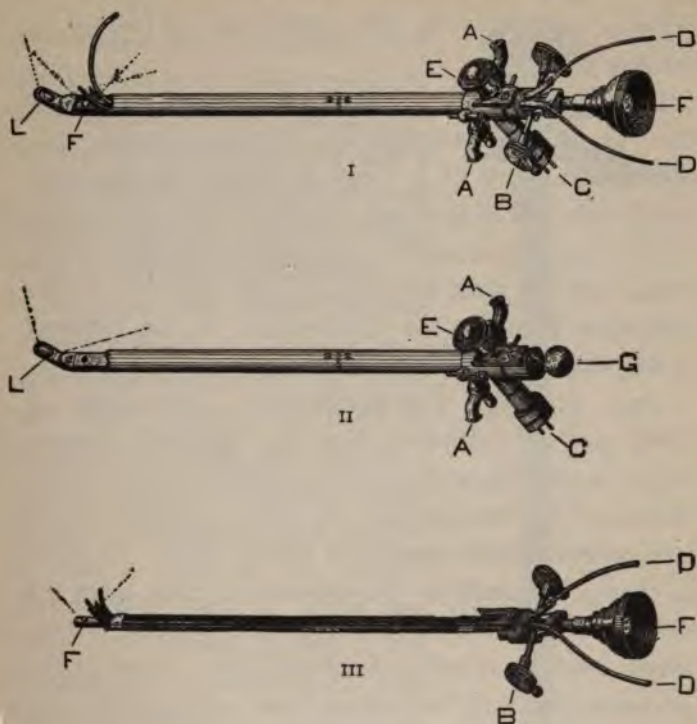


FIG. 17. THE BROWN-BUERGER COMBINED EXAMINING, IRRIGATING AND CATHETERIZING CYSTOSCOPE.

I. TELESCOPE AND CATHETERS IN SHEATH. A A, Irrigation cocks. B, arrangement for changing direction of catheters. C, Connection for light. D D, Catheters entering chambers. E, Button to hold telescope and obturator in place. F F, Lens system. L, Light.

II. OBTURATOR IN SHEATH. A A, Irrigating cocks. C, Connections for light. E, Button to hold obturator in place. G, Obturator protruding. L, Light.

III. TELESCOPE AND CATHETERS. D D, Catheters. B, Arrangement for directing catheters. F F, Lens system.

nervous patient or in one where the cystoscope is causing pain.

In addition to this advantage my model permits of the use of small instruments, forceps, curette, etc., for bladder work of a surgical nature. It also does away with two long closed chambers difficult to properly and quickly disinfect. The light arrangement and sheath are the same in both of these cystoscopes, the difference lying in the construction of the catheter arrangement.

THE INDIRECT CATHETERIZING CYSTOSCOPE of Nitze and modifications like the Bierhoff, Casper, Albarran, etc., have the catheter chambers placed in the sheath of the instrument. In these instruments the lens system and the sheath are all one piece. In order to change the angle of the catheters as they leave the distal end of the instrument, a small tongue is provided which is raised and lowered by a screw at the proximal end of the cystoscope close to the point where the catheters enter the separate chambers. W. K. Otis devised a cystoscope of the right angle or indirect type for observation only. It is also a very useful instrument. These instruments may be boiled by covering up the eyepiece with a screw top, but it is likely to damage them if continued for any length of time, so it is not as a rule desirable or necessary.

Besides the cystoscopes mentioned above we have the open-tube instrument as devised by Pawlik, and later introduced into this country by Kelly. This instrument has been found very useful in the female for

observation and in the knee chest position for ureter catheterization. The bladder by gravitation permits a dilatation with air and a very excellent unmagnified view may be obtained and small intravesical operations performed.

The open-tube method has also been employed in the male in a few experimental cases by Kelly and more recently by Luys in Paris. The latter has devised a special instrument for the purpose which is ingenious, and he has written a book on the subject. Before this work of Kelly and Luys was known to me I had made various attempts to examine the male bladder by the use of the open tube. Various postures had been tried by me, and recently I have had constructed a special open tube cystoscope with inverted light for use in the male. I call it a bladder speculum, and I feel convinced that before long we shall be doing much more for diseases of the male bladder by the open short tube. It certainly is practicable and only requires persistence to develop it.



FIG. 18. W. K. OTIS' INDIRECT OBSERVATION CYSTOSCOPE. Telescope and sheath separate.

The female bladder can be readily cystoscoped and the ureters catheterized with either the direct- or indirect-view instruments already described. They need not be as long, but it is of no inconvenience to have them the same length as the cystoscopes used in the male.

The particular advantage of the open-tube method in the male is: the facility with which we can approach ulcers, small growths, etc.

The direct-view instrument enables us, as a rule, to see the two-thirds of the bladder furthest from the outlet better, while with the prismatic type instrument we can usually see somewhat better the two-thirds of the bladder nearest the urethral opening. This rule of course is an arbitrary one, and we find many variations in it. We should, however, endeavor to use both types of instrument with equal facility. In spite, however, of our honest efforts to do this each individual physician will have leanings toward one or the other cystoscopes for most of his work. For many years after Brenner brought out his direct-view instrument in Germany the method was generally condemned and finally abandoned. The main reasons for this were owing, as I have explained, to the right-angle position of this instrument's beak, which caused much pain to the patient on its introduction, and because of the one catheter it carried being brought out above the field of vision. This made it well nigh impossible to catheterize a ureter and was changed later on. With modifications following the Brenner instrument the

method has become very generally the one of choice in this country, and some European surgeons now employ it with satisfaction in their work.

Necessary Instruments.—In enumerating the necessary outfit for the purpose of examining the bladder and catheterizing the ureters I shall enlarge this field to include nearly all the desirable instruments needed by a physician who expects to treat genito-urinary cases. In the first place he should have a table which permits of different positions and is comfortable for the patient. A table devised by Isaacs, of New York, fulfills all these requirements and is one of moderate cost. It is made of white enameled iron and can be easily and quickly manipulated by the physician. An irrigating bottle which can be easily raised and lowered to different heights is necessary for cystoscopy. This bottle should have a capacity of at least one gallon. In this we place our irrigating fluid. Boric acid two per cent. or mercury salicylate 1-2000 are both satisfactory media for distention and irrigation of the bladder. The salicylate of mercury will become readily soluble when boiled with common salt of about equal amount or with bicarbonate of soda. The bottle should not as a rule be raised more than three feet above the patient's pelvis. For lighting purposes a storage battery of eight dry cells with rheostat is necessary when we have no electric current of the kind so commonly used nowadays to light our offices and houses. If we have this latter we need a controller or condenser to

regulate the strength of the current which lights the endoscopic or cystoscopic lamps.

In the beginning a direct-view catheterizing cystoscope will be sufficient. This includes one telescope useful for catheterization of the ureters and observa-

tion by direct vision. A second telescope may be added to be used for right-angle observation.



FIG. 19. LIGHT CONTROLLER FOR USE WITH ENDOSCOPES, CYSTOSCOPES AND HEAD LIGHTS.

My modification of the Brenner-Brown cystoscope is the simplest in use to-day, with the exception of the open-tube instruments. It is easily cleaned, very reliable and also useful in operative work. Later on the addition of a Brown-Buerger cystoscope for ureter catheterization will be needed in about five per cent. of the cases.

The subject of ureter catheters is an important one and must be carefully considered. These should be of two lengths, the longest twenty-eight to thirty inches and others of about twenty-two inches of 5 French scale. The longer ones to enter the renal pelvis and the others simply for drawing urine from the lower part of the ureters. The eye of these catheters must be smooth as to its edges, clean-cut and of good size, with no blind pocket. The distal end,

blunt or olive pointed. They had better be kept out at their full length and not coiled. Long metal tubes or boxes do well for this purpose. They should be washed with fluid green soap, but never with alcohol. They can be put in boiling water for a minute or two and then wrapped in clean gauze or placed in a tube or box at full length. At best their life is short. The beginner better have at least six of them ready for use. If possible get them black, especially at the tip, as this aids in seeing them. The ones with stripes are sometimes of advantage, and we can well use them of different colors to distinguish right and left, especially if the instrument be withdrawn, leaving them in the ureters, as is desirable in many cases.

The proximal ends may be funnel shaped for the easy entrance of the syringe point in performing lavage of the renal pelvis and ureter. If, however, we remove the cystoscope leaving the catheters in the ureters these ends must be cut off. They can be temporarily adjusted by aid of small rubber tubing. This is, however, not necessary, as a small needle can be used to enter the catheter. For this purpose a small glass syringe holding half an ounce of fluid is essential. A soft rubber tip which fits over the catheter is also of value in washing out the ureter and kidney.

For practice in locating the ureters, and in some instances for dilating a stricture, bougies are useful. They may be made of whalebone and should have an olive-shaped tip. These are similar to the filiform guides used in urethral strictures, but must be longer.

We should have half a dozen extra lamps for the cystoscope and an extra cord for attachment to the controller. In fact, duplication of all the small parts is very desirable owing to the possibility of their getting out of order or perhaps lost. This is particularly important when the physician lives a long distance from the place where the instrument is made. Great care must be taken not to burn out the lamps by making the light too brilliant. With care a lamp may last six months. The next thing of importance for general use is a set of soft rubber catheters and also gum elastic catheters with tips at various angles. Bougies with blunt points, as well as a full set of steel sounds, are necessary. All these should be kept scrupulously clean by the use of tincture of green soap and boiling. They may be kept with the cystoscope in an instrument case in which is placed formalin tablets for the purpose of disinfection. Before being used the formalin should be thoroughly washed off, as it causes irritation of the mucous membranes. Special lamps are made to be placed in the instrument case to disseminate formalin in the form of gas. The gum elastic instruments should be kept separate and in some non-irritating powder to prevent their adhering to each other and thus becoming roughened. When this occurs they must be discarded. A syringe of the Keyes pattern for instilling cocaine into the deep urethra should be in the list of necessities. Bangs has a special cocaine depositor which is of much use in anæsthetizing sensitive urethræ.

A hand syringe holding three to five ounces, of the Janet pattern, is also valuable. The ones made of glass and metal are best. They, however, cannot be boiled.

Urethroscopes of various sizes beginning with 24 French scale to No. 30 are valuable for urethral examinations. The Chetwood-Valentine endoscope with the lamp held in place by a light carrier at the distal end is the best. To use with this we must have suitable applicators.

The same current of electricity lights this as that



FIG. 21. W. K. OTIS URETHROSCOPE. Light arrangement at proximal end.

used with the cystoscope. The urethroscope with the exception of the lamp and carrier may be boiled. All parts must be thoroughly cleaned. Green soap and alcohol are effective for this purpose.

For examining and operating on the urethra a frame speculum has been devised by F. Tilden Brown.

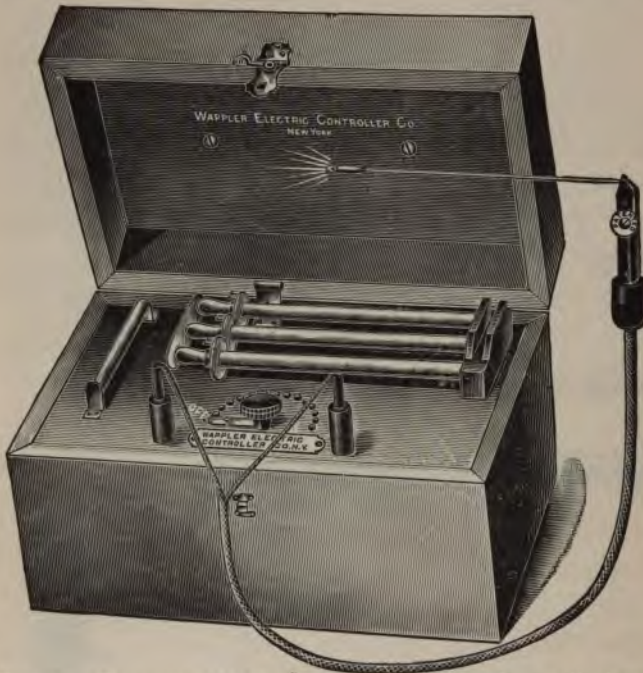


FIG. 20. CHETWOOD-VALENTINE URETHROSCOPE. Dry cell electric battery and rheostat. A serviceable instrument for anterior use.

Bierhoff has devised some ingenious small instruments for treating various urethral conditions which can be used with any urethroscope.

A sterilizer must be provided, and the simplest one is that with an adjustable tray on the plan of the fish boiler. It is long enough to hold urethral instruments and is inexpensive. A more elaborate one is not neces-

sary. This boiler can be quickly heated over a gas lamp and fulfills all ordinary needs.

Before closing this chapter I will also speak of the need of a Thompson stone searcher for general bladder sounding. I have devised for special cases an instrument called the phonophore, which is made of whalebone and provided at its distal end with a metal



FIG. 22. PHONOPHORE. Author's instrument for detecting stone in the bladder by sense of hearing. For use with and without cystoscope.

tip. To the proximal end rubber tubes carry sounds to the ears (Fig. 22). In children and in persons with tight strictures this instrument is useful for detecting stone by the sense of hearing. In some cases it is of value in conjunction with the direct vision cystoscope in searching diverticula in the bladder for suspected stone. I have used it in several cases with success. It was at first thought that stones in the ureter and kidney could be detected this way, but owing to the delicacy of the test and the ever-present extraneous noises made by contact with the cystoscope it is probably impractical for use in its present form in the upper urinary tract.

CHAPTER V

TECHNIQUE OF CYSTOSCOPY

GENERAL CONSIDERATIONS — TECHNIQUE — INDIRECT METHOD OF CATHETERIZATION—DIRECT METHOD OF CATHETERIZING THE URETERS—VARIOUS POINTS IN THE BLADDER TO BE OBSERVED IN CATHETERIZING URETERS.

A cystoscopic examination having been decided upon, the patient should, when there is time, be properly prepared by preliminary treatment. In many instances this is essential to make the examination a success. The preliminary treatment of the case renders the examination less of an ordeal to both physician and patient.

General Considerations.—In some instances before the cystoscope can be introduced a urethral stricture must be dilated or perhaps incised. A urethral caliber of No. 22-24 French is necessary for the introduction of most cystoscopes. Occasionally a pin-hole meatus has to be cut before examination.

In the presence of a chronic cystitis it is much better to irrigate the bladder for some days beforehand with boric acid twice a day. This will help through the resulting improved state of the bladder mucosa and will also accustom the patient to instrumentation. While doing this preliminary irrigation, the capacity of the bladder can be determined, and if necessary increased by mild distention. We should be able to get at

least three ounces of fluid into the bladder, but, better still, six to eight ounces. For the introduction of fluid a piston syringe holding three to five ounces is better than the siphon method. The bladder resistance can be determined more accurately by the hand syringe, and with a patient under a general anesthetic it is much safer. It is possible to rupture the bladder with a patient unconscious, and this must always be borne in mind. In case of a contracted bladder reported recently such an accident occurred. A two per cent. solution of boric acid is the most comfortable medium to use for this purpose.

In cystoscopy nervous and unduly sensitive patients cocaine in a one per cent. solution may be injected into the urethra and bladder to relieve pain. It must, however, be used with care, as a normal urethra, as well as an abnormal one, will absorb and may as a result produce constitutional symptoms. A healthy bladder will not absorb, but a diseased one will, so we must also be cautious in using it there too. Three minutes should be allowed to elapse after the injection of cocaine before the introduction of the cystoscope. We better not use more than one-half ounce of a one per cent. solution of cocaine at a time. In a few instances I have used morphine sulph. gr. one-fourth subcutaneously in conjunction with the cocaine locally. These drugs act well together and we get fewer systemic effects when they are thus employed.

In the majority of patients, however, who have had a preliminary preparation for cystoscopy we can get

along comfortably without either of these drugs. As a lubricant for cystoscopy glycerine is of value, but I prefer the Irish moss preparations which are sold in sterile tubes under various trade names. Oils are not serviceable, because they are apt to produce a blur of the lens. We must use something which will dissolve in a watery solution.

I have found in sensitive subjects that the preliminary introduction of the lubricant into the urethral canal facilitates the introduction of the cystoscope. The cystoscopic light must be carefully tested before we introduce the instrument. The light should not be too white, but just off the red for the best view. The patient's position is a matter of importance. He should be on a table which permits of the easy raising and lowering of the pelvis and also of the head and shoulders. The lithotomy posture with uprights to support the legs is best for cystoscopic examination. It is well to have the room in which the cystoscopy is performed somewhat darkened and well warmed. In many instances where the patient's urine is clear we can use it for the medium instead of boric acid, salicylate of mercury or other solutions. Any solution used should be cool. The advantages of the employment of the patient's own urine is that it is a natural medium and we get the best picture with it. Under all conditions, however, we must have as clear a field as possible. In the presence of much pus or blood from the bladder or kidneys an irrigating attachment is necessary for a satisfactory view. The average amount of fluid

medium a bladder will hold is eight ounces, and we should if possible use the same amount of distention at each examination. The reason of this is, that the bladder has different appearances with varying amounts of distention. The more we distend the paler and smoother the bladder wall becomes, and the smaller the amount of fluid the redder and more uneven the membrane appears. The ureteral openings also vary somewhat under varying pressure. It is easier and more comfortable for the patient to have a fair amount of bladder distention. While what I have said about the distention of different patients' bladders is important, it is more so in cases where we make several examinations of the same patient at varying intervals. The conclusions drawn from views made under like pressure are of more value than when made without regard to the matter of bladder distention. In suspected new growths, in ulceration of the bladder, and in some cases of hypertrophied prostate when there is free bleeding, adrenalin chloride 1-3000 solution, injected before examination through a soft rubber catheter, is frequently of great assistance in clearing the field. It is often absolutely necessary to enable us to form any accurate idea of the condition present. This should be allowed to remain in the bladder about ten minutes before we add the boric acid or other medium to get the proper distention. Particular care must be taken when we introduce the cystoscope to avoid all undue force. Trauma of the bladder by the cystoscope may not only produce free

and alarming hemorrhage, but it is likely to cause an infection. Cleanliness and gentleness, therefore, are of prime importance in all manipulations of this character. Another good agent to check bleeding in bladder and urethra is silver nitrate solution about 1-10,000 used freely till the bleeding is checked; then employ the clear medium for a view. After the bladder is filled by use of the piston syringe when general anesthesia is used, we may attach a fountain syringe to our irrigation inlet, and, if necessary, to keep the field clear, allow a gradual but steady change of the medium in the bladder to take place. The jar or bag should not as a rule be over three feet above the patient's pelvis. In the chapter on different types of instruments I have described the ones which have given me the best results. In many cases it is of advantage to first use the prismatic or indirect-view telescope to obtain a view of the trigonal tissue, base of bladder and ureteral openings.

Technique. —Having thus given a general explanation of the various conditions met with in relation to the technique of cystoscopy, I will now describe in detail each step to be taken in this kind of an examination. The cystoscopes should be thoroughly cleaned with tincture of green soap; then washed in hot water and finally rubbed off with alcohol ninety-five per cent. They are then placed in boric acid or salicylate of mercury solution. After the patient has been put in position the urethra is washed out with boric acid. Now if it seems best a solution of cocaine

one per cent. is introduced through a soft rubber catheter into the bladder and urethra. It is left in place from three to five minutes. Morphine, one-fourth or one-eighth gr., is of value in some patients in conjunction with the cocaine. It should be used hypodermatically. I, however, seldom use it or cocaine, having found it as a rule unnecessary. By the aid of the controller already described, or if there is no electric light in the house, a storage battery instead of it, we should see if our instrument lights up properly. This test must always be made just before the introduction of the cystoscope. The lubricant is now placed in the urethra and the cystoscope with light turned off gradually and gently passed into the bladder. The meatus in the male is usually the tightest point and next to it the membranous urethra. We must avoid, as far as possible, all trauma. After the instrument's beak reaches the triangular ligament a finger in the rectum often facilitates its passage into the bladder. When the sheath of the cystoscope enters the bladder we withdraw the obturator if we are using the direct vision cystoscope. The bladder is then again thoroughly washed with boric acid, salicylate of mercury or plain saline solution. We next inject into the vesical cavity about eight ounces of one of these fluids and this is left in place. The telescope has been carefully inspected as to its ocular properties, such as blurring, etc., and is now introduced through the sheath and firmly screwed in place.

With the instrument in position and the operator

seated, his eyes on a level with the proximal end of the telescope, the light is turned on. It is a good rule never to have the light turned on except when one is looking through the telescope. This rule makes burns of the bladder almost impossible. Even with the so-called cold lamps of low voltage there is danger of causing slight burns of the bladder wall. This may also happen with too small an amount of fluid in the bladder. All motions with the cystoscope should be deliberate, steady and with a distinct purpose. The view of the bladder is carried out systematically in order to cover the whole field so as not to overlook anything of importance. The bulging of the normal prostate can be seen in nearly all cases, but of course more plainly in old men with hypertrophy of that organ. We should next examine the base of the bladder, determine the condition of the lining membrane, whether transparent or opaque. If transparent, the appearance of the small intertwining blood vessels, their size and number, the color of the walls and the presence or absence of thickening of the muscular fibers as shown by corrugations, and in some cases more or less well-marked diverticula. Thickening with diverticula frequently point toward obstruction of some kind at the bladder neck or in the urethra. The distance of the lens from the object also changes its appearance and apparent size. The bladder should be thoroughly examined before catheterization of the ureters is attempted. The appearance of these openings must be studied, the efflux of

urine noted and also their relative positions compared. With the prismatic or indirect-view instrument we see the trigonal tissue apparently above (inverted), and of a darker color and more velvety appearance than the rest of the bladder. The division between the trigonal tissue and the rest of the bladder is distinct and runs in a curve across the field of vision. If we follow it from side to side we set the right and left urethral opening by a turn of the wrist. This line is sometimes called the inter-ureteral line and is often of help in locating the ureteral mouths. These openings are slit-like apertures running in health obliquely to right and left. They have a peristaltic action as the urine is ejected in swirls from them every few seconds. We must remember to always refer to them by the patient's right or left and not our own. If we do this from the start much confusion is saved when they are catheterized. The sphincters of the ureters have a distinct function in helping to prevent backing up of urine into the kidneys.

If there be blood or pus coming from one or both ureters it can usually be seen, but if in large amounts we may not be able to determine from which side it comes without the use of the ureteral catheter. This is owing to the fact that the field quickly becomes cloudy. The irrigating attachment here comes in as a very valuable aid in clearing the field. In all cases, however, when it is possible in presence of either pus or blood, we should, before operating, make a second examination to verify the first one.

By this method only shall we be able to avoid unfortunate errors, too many of which have been made in the past. Sweet oil should be used on the catheters to assist their entrance to the ureters and kidneys.

CATHETERIZATION BY INDIRECT METHOD.—With two catheters lying in the catheter chambers of the indirect cystoscopes we locate the ureteral opening on one side or the other, and by turning a screw convenient to the hand incline the tip of the catheter toward the opening. We advance it slowly along the catheter chamber, and as seems necessary increase or decrease the angle of the cystoscope and catheter in its relation to the opening. We continue this till the tip enters the ureter, when we very gently push it up toward the kidney. For obtaining separate urine we need not introduce the catheter more than three inches. The urine as it comes through from the kidneys appears in jets of a few drops, then stops a few seconds or even minutes; then comes again in the same way. If the catheter eye is in the kidney pelvis the flow of urine is more continuous. The other catheter when necessary is introduced in the same way and enough urine collected to make a microscopical and chemical analysis. Great care must be taken to avoid trauma to the ureter, and in consequence blood, following the manipulation. This point cannot be too strongly emphasized. With the indirect instrument it is extremely difficult to withdraw the cystoscope and leave the catheters in the ureters as we may wish to do in order to relieve the patient's pain. It is also

somewhat more difficult to guide the catheters into the ureters, as the work is all backhanded. We cannot make the same amount of pressure either as we can with the direct method, in overcoming strictures or narrowings. I have been able to get a catheter through a ureteral stricture with the direct-view cystoscope and found it impossible of accomplishment with the indirect type.

DIRECT METHOD OF CATHETERIZATION.—With this instrument a careful view of the bladder is first made as already described, base, wall, above, below, and on the sides, the fundus and all of the trigonal tissue possible to see. Everything of interest is noted and we then carefully withdraw the heel of the cystoscope over the region where the ureteral opening normally lies. The opening must be sought for by a withdrawing, never by a pushing motion. The beak of the instrument, as we withdraw, is gradually lowered, and the eye piece raised, thus smoothing out the folds of the mucous membrane. All should be done slowly, consistently, and gently.

Plate I, as seen in the front of this book, portrays a direct view of a normal bladder, with catheter entering right ureter. The delicate coloring of the healthy vesical cavity, the transparent mucosa and fine intertwining blood vessels are all clearly displayed. The different color of the trigonal tissue, deeper red, the raised area as the catheter is directed toward the kidney, all make a picture often seen with the direct-vision cystoscope.

The inter-ureteral line does not count for as much in this method of catheterization. As the ureteral opening comes into view it normally looks like a small mound with a dimple at the top. Also it may be likened to a crater lighted in the center, and has finely outlined edges. It is very delicate in structure, and can be seen opening as a swirl of fluid comes out, then closing till a repetition of the process occurs. The catheter is introduced by a gentle advancing movement of the catheter. If there be obstruction in the ureter the catheter may be held lightly with the fingers while the whole instrument is slowly advanced toward the ureteral opening. In this way all the desirable pressure can be employed to overcome spasm or any tightening. If the ureters cannot be readily seen, indigo-carmin in a freshly prepared four per cent. watery solution, may be injected before the next examination subcutaneously into the buttock. In thirty or forty minutes it will usually be seen coming from the ureters in a characteristic bluish smoky swirl. This is of much value in many cases of cystitis and obscure ureteral openings. ℥ss. is the usual dose.

The instrument withdrawn, catheters in the ureters. The patient is made comfortable in bed and the catheters if necessary retained in place an hour or two. When withdrawn a mild solution of silver nitrate, 1-10000, should be injected with a syringe to cleanse the ureter. This latter must, however, be done very slowly and in a small amount, to avoid production of renal colic. After the cystoscopy, a little of the dis-

tending fluid should be left in the bladder. I have never seen a case of infection follow ureteral catheterization. The only unpleasant result I have had was a case of acute suppression for twelve hours. The patient, however, came out of it without further complications. In this case the ureters were not catheterized, as they could not be found, owing to an abnormal bladder, probably of the hour-glass variety. In instances of severe bladder disease, such as new growths, also in prostatic enlargement, rest in bed for a few days following cystoscopy is usually desirable. Urotropin gr. v four times a day should be given a few days before and after cystoscopy.

CHAPTER VI
INDICATIONS AND CONTRA-INDICATIONS
TO CYSTOSCOPY

DANGERS IN TUBERCULOSIS—VALUE IN HEMATURIA, PY-
EMIA AND VESICAL CALCULUS—VARIOUS CASES GIVEN
IN DETAIL DEMONSTRATING THE ADVANTAGES AND
DISADVANTAGES OF THE CYSTOSCOPE.

In order to determine which cases are suitable for cystoscopy and ureteral catheterization a careful study of the past and present history of the patient is made. After this has been obtained a general physical examination should be instituted, so that a complete knowledge of all parts of the body has been acquired. This must always be done as a matter of routine. If we do not do this serious errors are likely to occur. For example, if we found a patient were afflicted with pulmonary tuberculosis we would, before making our cystoscope examination, have discovered it, and perhaps conclude that the urinary trouble was of the same nature. In consequence we might decide it better not to use the cystoscope. The urine must be carefully examined as a preliminary to any cystoscopy.

The character of the stream, its force, size, and appearance will sometimes tell us a good deal as to the condition of urethra and bladder.

In *acute gonorrhoea*, posterior or anterior, the cystoscope must not be used. It tends to aggravate the disease by producing trauma and also carrying the gonococci into the bladder. In cases of subacute or chronic gonorrhoea the cystoscope may be used if by rectal feel we find the seminal vesicles and prostate free from acute or subacute inflammation. In *gonorrhoeal epididymis* of an acute nature it is best not to use the cystoscope, because we may light up the existing disease, cause great pain, and also spread the trouble. This same rule applies to *deep urethritis* of a gonorrhoeal nature when there is any evidence of an acute process likely to resent instrumentation. It is much better in all the conditions above mentioned to treat the local condition by appropriate means, and when it is improved use the cystoscope for diagnostic purposes. If we find a *pinhole meatus* or a *urethral stricture* these must be taken care of before we attempt a view of the bladder.

In cases of *acute cystitis* due to gonorrhoeal conditions we must wait till there is a subsidence of acute symptoms before we attempt a cystoscopy. A true gonorrhoeal cystitis, however, is a rare occurrence. In *tuberculosis of the bladder and kidney* we have to face a condition of the genito-urinary tract which is usually intolerant to instrumentation, but where a cystoscopic view, and sometimes a catheterization of the ureters, are of much value. This is particularly so in conditions suggesting renal infection, which, by the way, is usually the first part of the urinary tract involved in

this disease. Patients with a tuberculous deposit in the genito-urinary organs are apt to be fearful of instrumentation, and will shrink from it with a nervous dread. They tolerate instruments badly, and are sometimes only manageable under general anesthesia. In *tuberculosis of the seminal vesicles and prostate*, when a urethral catheter placed in the bladder shows no evidence of tuberculosis in the urine drawn off, I think it best not to cystoscope. In those, however, with a questionable kidney and also a question of the bladder condition, cystoscopy is usually desirable. In fact, it is of the greatest importance in many cases. We should make the examination with general anesthesia, or use locally cocaine and hypodermatically morphine sulph. We must, however, be careful in the use of cocaine in a diseased bladder, because absorption is likely to occur, and as a result severe constitutional poisoning. As I have before said, a healthy bladder will not absorb, while a diseased one will. In these cases the physician should inform the patient of the need of the cystoscopy and of the likelihood of considerable constitutional reaction, such as chills, fever, etc., following. The patient better be put to bed and kept there for a few days after the examination. He should be given a light diet, plenty of water, and form in five to ten-grain doses three or four times a day. After we have introduced our cystoscope in a case of probable tuberculosis of the urinary tract we should first examine the bladder for large or small pearly tubercles; also for congested spots and ulcerations.

The region of the ureteral mouths is the most common site for such changes, and we may find in the neighborhood of one ureter a thickened opaque reddened membrane with areas of congestion of a very marked type, probably beginning ulceration; while on the other side we see a clear membrane and a healthy-looking ureteral opening. On the diseased side the ureteral opening is also apt to be puffy, with thickened edges. It often seems to lie open, then again the congestion and swelling about it make it difficult to find in the uniformly reddened membrane. This general reddening causes a loss of the usual landmarks which help guide us in searching for the ureteral openings. We may find fairly deep ulcers which are the seat of a tuberculous process and have in these the cause of hemorrhage through the erosion of a blood vessel.

On the healthy side of the bladder we can do no harm to the corresponding kidney if we use care. The catheter of course must always be passed with great deliberation. On the diseased side of the bladder a catheter in entering the ureter in tuberculosis is apt to meet with some tightening, and considerable firm pressure will often be necessary to overcome it. The urine obtained from both sides is collected and examined for tubercle bacilli. Supposing we have one healthy kidney and one tuberculous one, I advise early operation if the patient's general condition warrants it. A *nephrectomy* is the only proper treatment for a case of this kind. A patient may live for years with one kidney tuberculosis, but it is the exception. Nephrec-

tomy for renal tuberculosis has met with much success. We may say, therefore, in conditions where tuberculosis of the bladder or kidneys is suspected, cystoscopy and ureteral catheterization are of prime importance. But in all acute inflammation, tuberculous or otherwise, of the prostate, seminal vesicles, deep urethra and epididymis, we should wait till the acute symptoms subside before we attempt cystoscopy.

In instances of *hematuria* the cystoscope is frequently of much value in enabling us to determine the origin of the blood. We must, however, always bear in mind the possibility of having more than one source of the hemorrhage. In using the cystoscope in these cases we should make every effort to prevent injury to a new growth of the bladder. This is particularly likely to happen with villous growths of this organ. In such cases we should at time of examination be prepared to operate. This for two reasons: 1st, in case of severe hemorrhage from trauma in connection with new growth; 2d, because infection may follow such injury when bacteria in the bladder are stirred up or new ones introduced. In some cases of large growths of bladder where the vesical cavity is nearly filled by it, distention of bladder is impossible, even with general anesthesia. In such a case forcible dilatation is dangerous, and the use of the cystoscope should give way to a quick operation by suprapubic route.

I had a case of the kind where I was unable, even under profound general anesthesia to introduce more

than two or three drachms of fluid into the bladder. In this patient, a man of twenty-eight, the bladder was filled with a villous growth which had become infected and was the source of fearful pain. Removal was impossible owing to extent of growth. Suprapubic drainage was advised and gave the patient comfort for some months, when he died.

Hematuria, Cause Unknown.—This case is that of a man, twenty-four years old, who was referred to me by Dr. C. J. Colles, on March 23, 1906, for smoky urine. No symptoms or cause for it known. Patient thinks it has been present for a week. Admitted to Post-Graduate Hospital. Syphilis fifteen months ago and at present a bad condition of tongue and throat as a result. He has taken little treatment for syphilis.

General condition good. Cystoscope revealed a healthy bladder with blood from left uréter and normal urine from right. Microscope showed nothing abnormal besides blood. Blood count of fresh specimen drawn from ear normal, with no malaria plasmodia. On meatoscopy, owing to the large jets of blood, I could not at first determine its origin; right or left side. The ureter catheter showed it clearly, of course, but it points to the need of great care in determining the side involved. In this case I thought of hypernephroma, a villous growth, angioma, sarcoma, hemorrhagic nephritis, chronic granular kidney, or tuberculosis. It did not suggest stone to me. X-ray negative. The left kidney's lower lobe was on a level with the right, and to palpation seemed a

trifle enlarged, but not irregular or sensitive to pressure. I decided to give anti-syphilitic treatment a trial for a few weeks, so am now using injections of salicylate of mercury and also potassium iodid in full doses. The mouth has cleaned up well, but the hematuria is unchanged at the end of four weeks. The patient feels in perfect health in every way. Operation on kidney was advised but patient refused.

Stone in Bladder, Ureter and Kidney.—Here we have a decided use for the cystoscope, and it nearly always is indicated in examination of bladder, the ureter and kidney for suspected stone. In certain conditions of great irritability of bladder, however, the instrument produces pain and often bleeding, so that practically nothing can be seen. In these cases it is well not to persist, but to depend for diagnosis on stone searcher or X-ray, and use the cystoscope after crushing to determine condition of bladder mucosa, presence of particles of stone, possible diverticula and stones protruding from or in ureters. In one case reported by Fuller stones were found protruding from each ureteral orifice after removal of calculi from the bladder.

Eight Kidney Stones; ten ounces of pus in kidney; gonococci present in pus drawn from renal pelvis by ureter catheter; nephrotomy.—This case was operated on at the Murray Hill sanitarium with the assistance of Dr. Elliott Coues. It was one of much interest. Male, twenty-two years old, German. Gonorrhoea six years before I saw him, February, 1904. Mild at-

tack; given no local treatment. Family history negative. Patient's general condition when I first saw him was very bad. Loss of twenty pounds in weight. Symptoms all directed to region of bladder, for which he had been treated several years. Two years ago, a vesical stone was removed by suprapubic cut.



FIG. 23. EIGHT STONES TAKEN FROM KIDNEY. Symptoms mainly directed toward bladder. Author's case.

Urine, however, still remained, very cloudy, and was full of pus. Cystoscopic examination was not painful and showed a healthy bladder. Thick pus pouring from the right ureteral opening. This opening was retracted, large and much inflamed. Other ureteral opening normal. Both ureters were catheterized. Material obtained from right side was loaded with pus. No tubercle bacilli found. From the catheter in the pelvis of this kidney pus was obtained which contained numerous gonococci. Unfortunately no cul-

ture tests were made. Gonococci in the pelvis of the kidney, according to the literature, are rare. The diseased kidney pelvis was washed out twice a week for two months, employing argyrol and silver nitrate. At first some improvement was observed, but nothing permanent. It was decided at the end of this period to cut down on right kidney. A diagnosis of pyelitis calculosa was made. The kidney (right) was exposed by a lumbar incision and enlarged with a cut along the lower border of ribs. It was much bound down by dense adhesions and when finally exposed was found to be fully twice the normal size. Fluctuation was present at several points. Ten ounces of thin yellowish pus were evacuated and the kidney then opened by a cut along convex border. Eight stones were finally dislodged from the calices, two of them large as walnuts. No loose stones were found in the pelvis. The patient's condition became bad; pulseless, blue and clammy. I hurried the operation, leaving two rubber tubes in the kidney wound. He rallied well and in two weeks' time was up and out of the hospital. I should have then done a nephrectomy, but the patient would not consent. A rapid gain in weight and color followed operation, but a sinus remained.

This condition lasted about fifteen months. The patient then consented to another operation. At this operation no kidney tissue was found. A mass of connective tissue, honeycombed with pus cavities, occupied the position of the kidney. This mass of tissue was removed and an uneventful recovery fol-

lowed. The patient some months after operation reported himself in excellent condition; normal weight, and better than at any time he can remember.

TWO KIDNEY STONES, no pus, but cause of occasional hematuria and severe attacks of colic. One stone loose in kidney pelvis. Patient unable to work.—Male, twenty-seven years of age, American. Coachman. Gonorrhoea several years ago, but mild in type. Has had pain in region of left kidney for two years. Severe attacks of renal colic, but has passed no stones. Hematuria followed these attacks. He has been unable to work, owing to pain in back on being shaken, as in driving. On bimanual examination, left kidney sensitive, but not enlarged. Patient's general condition good.

Examination with cystoscope showed a healthy bladder, slight thickening over mouth of left ureter, but not at all pronounced. Urine practically the same from each kidney. X-ray had been used, but was indefinite. On operation a stone was found in the kidney pelvis and one in the kidney substance. Ureter free and seemed healthy. Kidney wound sutured completely, then rest of cut closed with exception of small drain to take off oozing and possible leakage of urine. None appeared and the patient made a rapid recovery. He complained especially following operation of pain over region of left ureter. This gradually disappeared. In one month the patient was back at work free from pain.

Tuberculosis and Calculus of Right Kidney.—Clerk,

American, male, thirty-two. No venereal history. Family history negative. Referred to me by Dr. George F. Morris, who had made a diagnosis of right renal tuberculosis. This opinion was based on microscopical findings of the mixed urine obtained by bladder catheter after bimanual examination of kidney. The patient was brought to me for a cystoscopic examination and catheterization of the ureters. With Dr. Morris' help the examination was made. The bladder was found healthy with the exception of some swelling and reddening at the mouth of left ureter. Inside the opening at a distance of one inch a tightening was encountered. It was passed after some slight pressure and the catheter entered the renal pelvis. A few drops of thick pus were obtained, examined and found to contain tubercle bacilli. Urine from left kidney normal. Bimanual examination over right kidney showed tenderness, but no appreciable enlargement. This was explained at operation by enlargement of upper half of kidney under ribs. Remainder of patient's organs were normal. General condition fair, but he had lost over twenty pounds during the past four months. The patient said the first thing to draw attention to his urinary organs was the pus in the urine. Never passed blood that he knows of. Has never had severe renal colic; an occasional stitch in right side, but not enough to make him seek medical advice. Patient consented to operation, which was done at the Post-Graduate Hospital. A vertical lumbar incision was made and

enlarged later by a right-angle cut along border of last rib. This was done to reach upper portion of kidney which was bound down by a mass of adhesions. Particularly so at the upper pole where the kidney was adherent to the diaphragm. The latter was slightly torn in breaking up the adhesions, but no complications followed this accident. The upper attachment was as high as the eighth rib, and at one time I thought I should have to resect the twelfth rib, but I did not find it necessary. The kidney had lost all resemblance to a normal organ. It was rounded and very rough. After its removal unruptured one point of fluctuation could be plainly felt. The ureter was tied in two places so no pus escaped into the wound. On cutting the organ open it was seen to contain much free pus, with a complete absence of normal kidney substance. It was one mass of tuberculous degeneration. In addition a small stone was found in one of the calices. The ureter appeared normal as far as I could palpate it and the renal artery so small that it was felt with difficulty. The pedicle seemed very low in its attachment, but this was probably due to the growth of the upper portion of the kidney.

The patient made a rapid recovery, leaving the hospital in two weeks with a small sinus rapidly healing. In this case the good kidney must have been doing the whole work for some time, so the question of compensation was not as important as where good kidney substance has been removed.

ONE KIDNEY STONE.—Mr. S. came in October,



FIG. 24. TUBERCULOSIS OF RIGHT KIDNEY. Complete absence of all healthy kidney tissue. A stone is seen projecting from a cavity near the pelvis. The center of the kidney one mass of cheesy degeneration.

1906, complaining of pain of twelve years' standing. He expressed it as a pain and weakness over the right kidney region. He was thirty-two years old. Personal and family history negative. For the past few years had severe attacks of renal colic. The attacks came on about every six months and lasted from one hour to three days. Blood was noted at these times in the urine.

He came to the Post-Graduate Hospital with a diagnosis of stone in the ureter, as the surgeon whom he had previously seen had been unable to pass the catheter more than two inches into the right ureter, from which no urine seemed to come.

He was cystoscoped after admission. The right ureter had a golf-hole appearance, and the urine from this side contained albumen trace, casts, blood and pus. There was no obstruction to the entrance of the ureteral catheter.

My diagnosis was a stone in the right kidney pelvis. The X-ray picture taken later confirmed the diagnosis. The kidney was opened and a small loose stone removed from the pelvis. The kidney was closed tightly by three sutures passed through the kidney substance itself. The third day after the operation the patient suddenly got out of bed and was found by the nurse sitting in a chair. The wound at this time was doing well and looked as though it would soon entirely close. Almost at once, after this undue amount of exertion, the urine became bloody, and the patient had a severe renal colic, which was relieved

on two occasions by removing blood clots from the right ureter with the ureteral catheter and cystoscope. When the first clot was removed, there was a marked gush of bloody urine from the ureter, which clouded the cystoscopic field. The urine remained bloody for ten days, after which it cleared for about a week, then, after a bit of exertion, again became bloody. At this time a small sinus made its appearance.

This condition, bleeding, then clearing for a few days, persisted for about five weeks.

The patient's wife up to this time refused to have him submit to further operation. He was in such bad condition, however, being very anemic and weak, that it became necessary to open the old wound, which was accordingly done.

The kidney wound was found spread wide open, the stitches having pulled out, and the cavity was completely filled with large chicken-fat clots and pus. These were removed and a tight packing and rubber tube introduced. After this the urine showed but slight evidence of blood.

At the end of thirty-six hours he began to run a temperature, and thinking he was absorbing from the packing, it was removed. The urine gradually became bloody, until the bladder was filled with clots, some of them as large as the palm of one's hand. He was given daily sixty grains of lactate of calcium, and the wound was injected every three hours with 1-3000 adrenalin. The hemorrhage gradually decreased, and in a few days ceased.

Recovery uneventful. Gained thirty pounds in weight in five weeks. Urine clear of blood, and wound tightly healed. The patient is back at work, with no pain and feeling perfectly well.

This case is interesting because of the long-continued hemorrhage followed by recovery without loss of his kidney.

Foreign Bodies.—In all cases where extraneous foreign bodies, such as catheters, bougies, etc., have been lost in the bladder, the cystoscope is of inestimable value in determining their position and in some instances also in their removal. Foreign bodies are more likely to be found in the female than in the male bladder.

In *prostatic hypertrophy* of middle age and old men the cystoscope may be of value. In using it the strictest asepsis must be practiced in order to avoid infection through abrasions of the mucous membrane.

The patient should, as a rule, be given preliminary treatment for a week or more by the use of a soft rubber catheter and bladder irrigation. In this way the bladder capacity may be tested and the patient accustomed to instrumentation. If there be a cystitis, this treatment will improve the condition and make the subsequent cystoscopy more satisfactory. In cases, however, of much bleeding, pain, and tenderness, cystoscopy should not be persisted in. If, however, it can be accomplished quickly and without these attending complications, it will often help us in determining

the bladder condition, presence of stones and sacculations. An idea also of the prostatic bulging, its size, etc., may be obtained by the use of the right-angle and retrograde telescopes. Occasionally, also, the presence of a neoplasm hitherto unsuspected may be revealed in addition to the hypertrophy of the prostate. This is particularly important where a perineal prostatectomy is the operation to be performed. In cases of suprapubic prostatectomy the cystoscope is of much less importance as a preliminary step, because by this route we can so readily explore the whole bladder at the time of operation. In prostatic hypertrophy catheterization of the ureters is usually inadvisable. It adds to the length of the cystoscopy and in cases of cystitis is distinctly contraindicated. The openings of the ureters, however, if possible, should be observed and their condition noted. If stone of the ureter is suspected, a bougie or catheter may be inserted; but except as an emergency measure it is better to wait till the patient has had the prostate removed or his condition has improved. There are two reasons for this: One is the danger of carrying infection from the bladder to the kidney; the second is the danger of shock following the manipulation owing to the longer period required in its performance. Most of the cases of this class are in men of advanced years and of lowered vitality.

In certain operations the ureteral catheter is of value. In *removing a stone from the ureter*, it is often of great aid as a guide, being placed in ureter

before operation. In certain operations on the female genitalia, such as cancer of the uterus, the ureteral catheter or bougie is of much value as a guide while separating the growth from the ureter. Many instances are on record where in the removal of the uterus or growths about it, one ureter, in some cases both, have been tied off by mistake. Naturally the results of such accidents are disastrous if not promptly recognized.

CANCER OF BLADDER, PROSTATIC HYPERTROPHY.—A man of fifty-four, seen in my service, November, 1905, at the City Hospital, bleeding freely bright red blood at end of urination. His prostate was enlarged and he needed surgical treatment. I cystoscoped him and with the cystoscopic telescope and forceps devised by me removed piece of a growth from bladder wall. Before operation this was examined and found to be malignant, so I decided, owing to the severe hemorrhage from which he had suffered for a long time, to operate. I did so by suprapubic route and removed

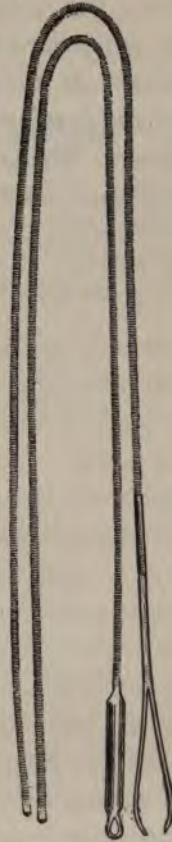


FIG. 25. AUTHOR'S FORCEPS AND CURETTE FOR USE WITH HIS CYSTOSCOPE in intravesical operations. (Post-Graduate Journal.)

a cock's comb growth extending back one inch on the floor of the bladder from trigonum. Cauterized stump and removed prostate. There was little or no infiltration of the bladder wall. The patient came out of the surgical shock well, but died in nine days of uremia. The kidneys on autopsy were found to be largely cystic, with little secreting power left.

CHAPTER VII

THE BLADDER. CAUSES OF CYSTITIS

SYMPTOMS OF CYSTITIS—METHODS TO BE EMPLOYED IN DETERMINING ITS PRESENCE AND CAUSE—SPECIAL FORMS OF CYSTITIS—DIAGNOSIS AND TREATMENT OF GONORRHEAL, TUBERCULAR AND TRAUMATIC CYSTITIS.

Cystitis.—The anatomy and relations of the bladder have been previously described, so I shall not repeat it here. When distended it is pear-shaped and has a capacity of eight to ten ounces. In the region of the outlet it is firmly held in place, but the remainder is freely movable and contracts and expands as the amount of pressure in and around it varies.

The bladder has four coats, which, taken together, are termed the vesical wall. In inflammation of the bladder the lining or mucous coat is the one first involved, but the disease may extend to the remaining coats and even into the perivesical tissue. By the term cystitis we mean inflammation of the bladder tissue as a result of bacterial infection. In such inflammation we must always have pus in the urine and occasionally blood. Bacteria gain entrance to the bladder wall by four different routes: 1st, from the urethra; 2d, from the kidneys; 3d, from one of the different organs in close proximity to the bladder wall, and 4th, through the blood current. In some instances

bacteria are present in the bladder without cystitis. This condition is known as bacteriuria.

There is no such disease as idiopathic cystitis. In every case of true cystitis we must have bacterial infection and pyuria. The cause or source of the bladder disease may be and often is very difficult to determine, but we must endeavor to find it in order to cure the cystitis, which is invariably a secondary process.

There are various degrees of vesical congestion which, if not relieved, may be the entering wedge for bacterial infection and resulting cystitis. They, however, must not be classed as cystitis till infection occurs. In some chronic masturbators the bladder mucosa is opaque instead of transparent, reddened and thickened. This is, however, not true cystitis, and should not be confused with it. A normal bladder resists bacterial invasion. If, however, the lining membrane is injured by instrumentation, or the urine is prevented from completely passing out at normal intervals, infection usually occurs and the diseased membrane readily absorbs. Experiments have been carried out with dogs to determine these points, and have clearly proven the statements I have just made. In order, then, for a cystitis to develop, bacteria must have in some way gained entrance and lodgment in the bladder mucosa. We must also bear in mind the danger of absorption in cases of cystitis, and in consequence be careful of the use in such bladders of cocaine and other local anesthetics. As a result of their

absorption constitutional symptoms may develop and serious consequences ensue.

The practitioner should remember that pain in the region of the bladder does not necessarily mean cystitis. Such pain may be due to reflex irritation from some other organ. In one class of cases the patient complains only of frequent urination. He is then sometimes told he has inflammation of the bladder. The following instance will demonstrate the point: A man calls on his family physician complaining of very frequent painless urination; perhaps twice as often as normal. A careful examination of the urine reveals a clear, very pale urine, free from pus, blood and shreds. Specific gravity 1030; no albumen but a large amount of sugar is found. Diagnosis glycosuria. The bladder was perfectly normal in every way. I could detail many such cases, but this one will be sufficient to show the need of careful study of all the available data before deciding upon a diagnosis. Cystitis has long been a convenient term to cover a multitude of sins. It has been used, however, altogether too loosely in the past, and I believe the time has arrived when more careful, intelligent observation will put a ban on such inaccurate nomenclature. Acute prostatitis, acute seminal vesiculitis, and acute gonorrheal posterior urethritis are often loosely called cystitis. None of these diseases is in itself cystitis. A true gonorrheal cystitis is not a common disease, but one would think so from the number of times we hear that diagnosis made. What I am

insisting upon is the importance of a correct diagnosis. Without it we are laboring in the dark and often damaging our patients.

The various methods to be used in making a correct diagnosis and as a result the institution of appropriate treatment will be described in detail as the different causes of cystitis are discussed.

In determining the cause of a supposed cystitis we must distinguish between those diseases or conditions outside the bladder which cause symptoms similar to those of cystitis, but where the bladder is not in any way involved, a *false cystitis*; and those other diseases or conditions which are situated in or about the bladder which have caused a bacterial infection of its lining membrane, and as a result a *true cystitis*. We may, of course, have several sources of a cystitis in one patient. In tuberculosis, one or both kidneys and the genital apparatus (seminal vesicles, prostate and epididymis) may be involved at about the same time.

Before discussing the various forms of cystitis I shall first give methods for the examination of cases suspected of bladder inflammation.

Methods to be Employed in Determining the Presence and Cause of Cystitis.—In acute cystitis we have three principal symptoms: frequent, painful urination and vesical tenesmus. The urine always contains pus and occasionally blood.

The symptoms I have just given are present at night or while the patient is lying down, but they are then usually less severe.

In patients with a urethral discharge a specimen should be smeared on a cover glass or slide and examined microscopically. The next step in our examination is to have the man pass his urine into three glasses. These specimens should be carefully observed microscopically and examined as previously explained. In the absence of urethral discharge, pus uniformly distributed through the three specimens of urine indicates inflammation of the bladder or upper urinary tract. In the presence of a urethral discharge the first urine passed will be the most cloudy. The only positive way, however, to determine the origin of pus in doubtful cases is by the use of the cystoscope. To distinguish quickly between the cloudiness caused by pus and that caused by a phosphatic deposit we add a few drops of acetic acid to a test tubeful of the suspected urine. If the cloudiness be caused by pus there is no noticeable change; if, however, we have a phosphaturia there is an immediate clearing and disappearance of the turbidity. We should now, before attempting urethral instrumentation, introduce a well-lubricated finger into the rectum. If the prostate, seminal vesicles and base of bladder are free from acute inflammation, we may proceed in our examination. If not, it is better to postpone urethral and bladder instrumentation till a later date.

Our next step in the examination is to attempt the passage of a catheter into the bladder. A soft rubber catheter of medium caliber should be the one of choice for this purpose. If we encounter stricture forma-

tion, hypertrophied prostate, or any mechanical difficulties, we must overcome them before the catheter will enter the bladder. The different methods of meeting these various obstructions are described in other parts of this book. I will suppose, therefore, that the soft catheter enters the bladder and any urine remaining in that viscus is evacuated. If this urine contain much pus we know the bladder or upper urinary tract is at fault. We may, of course, have more than one source of the bladder pus. This matter can only be determined by further examination. Besides noting the character of the urine drawn by the catheter we should observe the expulsive force of the bladder as indicated by the urine as it passes out of the catheter. The amount of urine remaining in the bladder after micturition is carefully noted and the bladder capacity tested. This latter test should be made with a piston syringe.

The urine is at once tested for its reaction with red and blue litmus paper, also its odor and general consistency noted. The bladder is washed with boric acid or a weak solution of silver nitrate just before we withdraw the catheter, and some of this fluid left for the patient to void. This tends to disinfect the tract, and should be done after instrumentation. Before instrumentation, however, boric acid and not silver should be used in washing out the urethra. The reason for this is that any solution which tends to act as an astringent makes passage of urethral instruments more difficult.

We now carefully palpate the abdominal and pelvic organs. The kidney is examined bimanually for enlargement, position and sensitiveness. The examination having convinced us that the urethra and organs at the bladder neck are not at fault, the cystoscope is the instrument to be used next. If the examination up to this point has been tedious it is better to postpone further instrumentation till another time. But, if the patient is comfortable and the bladder has a capacity of six to eight ounces, a cystoscopic examination if indicated may be made. In cases of chronic cystitis free washing of the bladder cavity is essential to obtain a clear picture of the intravesical condition. In sensitive individuals cocaine locally and in some cases morphine in addition hypodermatically, as explained before, may be employed.

If the cystoscopic view we obtain by this means satisfies us that pus in the urine is of bladder origin, our examination is complete. If, however, we believe it to be from the upper urinary tract, ureteral catheters should next be used to determine the condition of each kidney. These same observations apply with equal truth to cases of hematuria.

After obtaining separate urine with ureteral catheter, wash out the renal pelvis and ureter with silver nitrate 1-10,000, as we withdraw each catheter.

In certain diseases of the bladder and kidneys, especially in presence of much blood and pus, owing to the danger of error a second cystoscopic examination better be made before an operation is undertaken.

Principal Causes, Direct and Indirect, of Vesical Infection :

1. Gonorrhoea.
2. Tuberculosis.
3. Trauma resulting from the use of urethral and bladder instrumentation.
4. New growths of bladder.
5. Vesical calculus.
6. Various foreign bodies in bladder.
7. Diverticula, pouches and sacculi of the bladder.
8. Bar at bladder neck.
9. Hypertrophy of prostate.
10. Atrophy of prostate.
11. Urethral stricture.
12. Extension of bacteria through bladder wall, from uterus, vagina, rectum, prevesical space, seminal vesicles and prostate.
13. Pyelitis.
14. Pyelonephritis.
15. Pyonephrosis.
16. Renal calculus.
17. New growth of renal origin.
18. Ureteritis.
19. Infection of bladder as seen in typhoid, pyemia, and other constitutional diseases.
20. Infection of bladder resulting from the ingestion by the alimentary canal of irritating drugs which produce a vesical congestion and make possible the lodgment of bacteria.

21. Direct infection through blood stream or lymph channels.
22. Atony of the bladder.
23. Paralysis of the bladder.
24. Various neuroses of bladder.
25. Contracture of bladder neck.

GONORRHEAL CYSTITIS.—Infection of the bladder wall by the gonococcus is not of common occurrence. The mistake is frequently made of calling various symptoms usually present in acute gonorrhoea of the deep urethra, prostate, seminal vesicles and Cowper's glands, cystitis. It is a convenient term and usually satisfies the patient. The inflammation, however, in a large majority of these cases is in the prostatic urethra and not in the bladder. When the inflammation extends to the bladder the process is not usually of a serious nature and subsides under appropriate treatment

Diagnosis.—In the acute stage, when we have, in addition, profuse urethral discharge, it is best not to use urethral or bladder treatment, and we therefore cannot tell by the urine alone whether the bladder is involved. The rectal feel will tell us the condition of the prostate, seminal vesicles and Cowper's glands. The *symptoms* of acute gonorrhoeal cystitis and the same infection in the prostate and seminal vesicles are practically identical: frequent, painful urination and tenesmus. Occasionally, as the last drops of urine are squeezed out, a little blood is found mingled with it. This usually means a severe, acute inflammation of the deep urethra.

There is no use, however, in trying to make a *positive* diagnosis in this very acute stage. We know the prostate, seminal vesicles and prostatic urethra are usually more or less involved at the same time. We have gained this knowledge by our examination. Therefore we have found sufficient cause for the symptoms and should treat the case accordingly. To have an acute gonorrhœal cystitis without the prostate or seminal vesicles being implicated first, is practically unknown.

Treatment.—In acute inflammation of the bladder absolute rest is necessary if a rapid recovery is to follow. The next step is avoidance of all urethral and vesical instrumentation till the acute stage has subsided. If the patient cannot urinate owing to mechanical obstruction by the prostate or from some other cause, a soft rubber catheter should be passed into the bladder each eight hours. At such times, if we are convinced that we have acute inflammation of the bladder, a solution of nargol, one-fourth of one per cent., may be employed to wash out the viscus. No forced distention, however, should be attempted. To relieve pain morphine may be necessary. It can be employed either in rectal suppositories combined with belladonna, or used alone hypodermatically.

Morphin. sulph.gr. $\frac{1}{4}$

Ext. belladonnægr. $\frac{1}{4}$

oi. theobrom. gs.

M et fit suppos. No. 1

Sig. 1 suppository each 6 hours if necessary to relieve pain.

A hot water bag over the pubes and warm baths often give comfort. The diet should be light and the bowels freely moved with calomel or castor oil. Some soft, uncharged mineral water better be given so that the patient gets about six to eight glasses in the twenty-four hours. The general condition must be watched and the temperature carefully recorded.

Santyl Knoll in ten-minim capsules each six hours often proves soothing. We may also use Tr. Hyocyamus $\mathfrak{3}_{ss}$ to $\mathfrak{3}_i$ each six hours to relieve tenesmus. Formin in ten-grain doses is useful in diminishing bacterial growth in the bladder. In about a week or ten days the patient's condition should have improved sufficiently to permit of thorough local treatment. We must never lose sight of the original source of the cystitis and direct our energy toward the urethra as well as the bladder.

Vesical lavage of hydrarg-chloridi 1-80,000 should now be used daily with a gradual increase of strength to 1-30,000. It can be carried on by use of a soft rubber catheter and piston syringe. The cystitis in these cases usually promptly yields to this treatment and in a couple of weeks should have disappeared. After this we must continue our treatment of the urethra, prostate or seminal vesicles, as the case may be. Here, however, we often have to contend with an obstinate focus of infection.

TUBERCULAR CYSTITIS.—This practically never begins in the bladder, but is usually secondary to renal tuberculosis. The next most common source of it is

from a focus in the deep urethra, prostate, seminal vesicle or epididymis. I have seen one case as the result of a tuberculous abscess of the hip joint which discharged pus directly into the vesical cavity. In many instances a gonorrhoeal infection of the deep urethra, prostate or seminal vesicles has been the underlying cause of a tuberculous involvement of these organs which has later extended to the bladder mucosa.

Diagnosis.—In every suspected tubercular cystitis examination by instruments should be most carefully performed. Patients with this very serious malady are usually intolerant to instrumentation. When such cases are examined they are apt to suffer extreme pain and react badly afterwards.

As in all suspected diseases of the bladder, after the patient has voided urine, we should make a rectal examination to determine the condition of the prostate and seminal vesicles. If we find evidence of it in these parts, as shown by the nodular feel and great sensitiveness to pressure, we have probably located the main focus of the disease. We should also examine the testicles, vas deferens and epididymis for points of unevenness.

We now wash out the urethra with a warm saline solution and then pass a soft, medium-size rubber catheter into the bladder. In cystitis the urine obtained in this way will be cloudy and contain much pus. It should be examined for tubercle bacilli. If these are found we have positive evidence of tuberculosis.

The urine drawn by the catheter is of more value in our examination because we are not so likely to find smegma bacilli as in urine voided naturally. This bacillus closely resembles the bacillus of tuberculosis and cannot always be positively differentiated even by a competent bacteriologist. When in doubt inoculation of guinea pigs is the only way to determine the point.

In the later stages of vesical tuberculosis we frequently find several sources of the pus and may be unable to decide the point of the primary focus. In pulmonary tuberculosis we may have a secondary infection of practically the whole genito-urinary tract at almost the same time. We know that tubercular cystitis is a disease we often see, but in many instances an early diagnosis is not made. Hemorrhage from the bladder usually appearing at the end of urination, combined with a history of frequent, painful urination, much pus, an evening rise in temperature, and loss of weight, make a picture typical of vesical tuberculosis. Pain varies considerably, but is usually severe and may be agonizing when the bladder is the least bit distended. There is usually pain over the region of the bladder, much aggravated by internal and external pressure. Urination is always frequent night and day, associated with a large amount of pus in well-developed cases. This comes from the breaking down of the pearly nodules into cheesy degeneration which later result in ulceration. If these ulcers erode large blood vessels, we may have well-marked hemorrhages.

If the cystoscope be used in the early stage of vesical tuberculosis many fine nodules of a pearly color the size of a pin head may be seen. If the infection is secondary to a renal tuberculosis these pearly nodules will be situated about the ureteral mouth of the kidney involved. At the same time there will be thickening and opacity near the region of the opening. In vesical tuberculosis originating in a distant focus, as for instance, in the lungs, the bladder mucosa shows a rather uniform miliary involvement. In the latter type of vesical tuberculosis the infection is usually through the blood or lymph stream.

In the advanced stage of the disease there is a large amount of pus as a result of the cheesy degeneration of the tubercles. If the bladder be examined at this period with the cystoscope we see in vesical tuberculosis of renal origin marked infiltration, with reddened and ragged edges of one ureteral opening. The ureteral mouth is well opened and trumpet-shaped. Coming from it we frequently are able to see pus which may be so thick and tenacious that it has a clay-pipe-stem effect. As it comes into the bladder it breaks off in pieces the size of the ureteral lumen. This of course only occurs when there is a large amount of pus from the kidney. In cases of descending renal tuberculosis the appearance of the ureteral opening is very typical of this disease. If a ureteral catheter be used we sometimes find a tightening of the ureter a short distance from the bladder. We may not be able to pass even a small catheter through this narrowing. A large part

of the bladder membrane in these cases is reddened, opaque and bleeds easily on instrumentation. In the early stage, removal of the offending kidney will usually relieve the bladder condition. If, however, the advanced stage has supervened and we have ulceration and distinct foci of tuberculous ulceration in the vesical wall, distant from the ureteral openings, the outlook is not good. In this stage we occasionally have serious hemorrhages as a result of erosions of large blood vessels. If the infection of the bladder is secondary to tuberculous disease in the deep urethra, prostate, seminal vesicles, epididymis or testicle, the ureteral openings will not be involved, but most of the reddening, thickening and subsequent cheesy degeneration of the tubercles will be in the region of the trigonum. Tuberculosis of the bladder ascending to the kidney is in many quarters denied, but Willy Meyer has expressed his belief in it, and I see no reason why it should not occur. It seems to me, though, it must be very rare. While we know the gonococcus and colon bacillus do sometimes ascend from the bladder to the kidney, we also know the tubercle bacilli is not as vigorous a micro-organism as these other two; therefore, its ascent is less likely. In all cases there is in time a mixed infection.

Treatment.—We must in every instance of tuberculous cystitis make a careful search for the source of the disease. The treatment in any given case will depend mainly upon the position and extent of the original focus of the tuberculous process. To make

an accurate diagnosis we must make a cystoscopic examination. While some authorities are opposed to this method of diagnosis, I am a firm believer in it and have never seen any serious harm follow it. We must, of course, use care and be thoroughly familiar with the cystoscope before we attempt the examination. As I have said before, patients suffering from this disease are extremely sensitive, and unless gentleness is employed in the use of instruments considerable reaction to instrumentation is likely to result.

If our cystoscopic examination seems to show one kidney to be the source of the vesical involvement a nephrectomy is usually indicated. The patient's general condition must, however, be first carefully studied and improved as much as possible before this is undertaken. If both kidneys are involved, one badly and the other only slightly, the worst kidney may be removed. Here the ureteral catheter is of inestimable value. The urine should always be obtained from each kidney and thoroughly examined as to the relative functionary power of the two organs. If we find in addition to our kidney focus a tuberculosis of the lungs or other organ, an operation is usually not desirable. In such cases we must rely mainly on general treatment. Outdoor life and forced feeding, combined with light exercise, are essential. A warm, dry climate is especially favorable for cases of this kind. In regard to beneficial results of local treatment there are various opinions. I believe it to be of value when used cautiously. Washing out the bladder with bi-

chlorid of mercury solution 1-80,000 and gradually increasing it to 1-30,000, is often of value. We should not, however, overdistend the bladder while doing this. I think dilute solutions in fairly large amounts are better than strong ones in small amounts. This lavage should be used three times a week and always used warm. Heat gives these patients with vesical tuberculosis much comfort. It can be employed in the form of warm sitz baths and hot water bags over the bladder.

I do not believe in the use of solutions of silver nitrate in tuberculous bladders. It usually irritates and too much reaction follows, resulting often in severe tenesmus. We may use some of the silver salts, but I believe bichlorid of mercury to be the best for these cases. Nargol, one-fourth per cent., has been recently used in this class of cases with good results.

In internal medication in this disease for its effects on the bladder, I have little faith. In some instances sandalwood oil in ten minim doses seems to do good, but it is so apt to upset the digestion that I seldom use it. In cases of very severe pain rectal suppositories of morph. sulph. gr. one-fourth and belladonna gr. one-half are efficacious, but of course must be used with caution, as there is danger of the morphine habit. They also cause constipation and digestive disturbances.

If the epididymis be involved and the disease is progressing it should be removed. Abscesses in the prostate and seminal vesicles may be opened and drained. In some cases complete ablation of these organs has

been undertaken, but I doubt its value. Cystotomy and curettage of vesical tubercles have been employed, but wounds in tuberculous subjects are likely to remain open unless all the disease is removed, as in nephrectomy. A urinary fistula following cystotomy is the cause of much suffering, and I do not, as a rule, believe it wise to risk it. If the bladder be opened it should be done suprapubically. In the female we may curette tuberculous bladders through the Kelly cystoscope, and also make applications to any ulcers which are present. Vineberg reports good results following strong application of silver nitrate to tuberculous ulcers in this way in the female. If attempted it must be done by an expert, as the technique is extremely difficult.

Tuberculin has been used in genito-urinary tuberculosis with some favorable results, but we have not yet obtained enough reliable statistics to determine its value.

If tuberculosis of the bladder be recognized early and treated promptly, its cause removed when possible and the general or local disease combatted by every available means, a cure will often result. If, however, it is not treated early, all we can usually hope to accomplish is an improvement and an amelioration of the intense suffering usually present in vesical tuberculosis, a most distressing affliction.

TRAUMA RESULTING FROM URETHRAL AND BLADDER INSTRUMENTATION.—*Diagnosis.*—Trauma of the

deep urethra and bladder may pave the way for bacterial infection and, as a consequence, cystitis. If the instruments are not perfectly clean there is danger of infection. Even in cases of sterile instruments cystitis may follow injury to the bladder mucosa. This is possible because even in normal conditions of the urethra there are always bacteria present and these may easily be carried to the normal bladder as the instrument is introduced. To avoid this complication, besides sterilizing our instruments, we should also cleanse the whole urethra and bladder before instrumentation. This is accomplished by first washing out the front urethra with a warm solution of boric acid and then passing a soft rubber catheter into the bladder. We then gently wash the bladder and allow the patient to void five or six ounces of the solution after withdrawal of the catheter. Instead of boric acid we may use for this purpose salicylate of mercury 1-2000. If bichlorid of mercury is used it should not be stronger than 1-50,000. We must use great caution in introducing steel instruments. No sudden moves or much force should ever be employed. These precautions apply especially to the use of the cystoscope, stone crusher, sounds and instruments in cases of prostatic hypertrophy, stone and new growths of the bladder.

Treatment.—Cystitis resulting from trauma may be serious and by producing constitutional infection perhaps jeopardize the patient's life. Where much vesical hemorrhage follows trauma, drainage by supra-

pubic route is sometimes not only desirable but essential. In some cases a permanent urethral catheter may be tied in place, but if this is not well tolerated, a suprapubic or perineal cut may be made and drainage of bladder instituted. This too must be done without delay.

CHAPTER VIII

CAUSES OF CYSTITIS—(*Continued*)

NEW GROWTHS OF BLADDER—CALCULUS—FOREIGN BODIES IN BLADDER—DIVERTICULA, CONGENITAL AND ACQUIRED—POUCHES—SACCULI—ATROPHY OF PROSTATE—URETHRAL STRICTURE—EXTENSION OF BACTERIA THROUGH BLADDER WALL—CONDITIONS OF UPPER URINARY TRACT CAUSING CYSTITIS—VARIOUS CONSTITUTIONAL DISEASES WHICH MAY CAUSE BLADDER INFECTIONS—INFECTIONS FOLLOWING INTERNAL USE OF IRRITATING DRUGS—DIAGNOSIS AND TREATMENT.

NEW GROWTHS OF THE BLADDER are primary or secondary, depending on the tissue from which they arise. Symptoms of tumors of the bladder, according to Fenwick, may be divided into three stages: First, or latent period with no characteristic symptoms. The only cases where we get any symptoms in this first stage is where the growth is near the vesical outlet and its pedicle allows of sufficient mobility for it to partially block the opening, with resulting hemorrhage at end of urination.

In the second stage eighty-four per cent. of the cases of benign growth produce hematuria at the beginning or end of stream. No other symptoms as a rule, unless bladder instruments have been employed with resulting increase of hemorrhage, infection, and cystitis. The following case is an example of this:

Villous papilloma of bladder.—The case is that of a man of twenty-two, seen in 1903, who had been bleeding at the end of urination for two years. Blood bright red and seen at no other time. He was losing strength and weight. No marked urinary symptoms. The direct-view cystoscope revealed the presence of a small villous growth attached to the anterior wall of



FIG. 26. VILLOUS PAPILOMA. (Spooner—Post-Graduate Journal.)

bladder, an unusual position. It seemed the size of a peach stone and had a single pedicle one-half inch long. The field was so clear that the blood vessels in the growth could be plainly seen expanding and contracting. A suprapubic operation resulted in a complete cure, with no return as far as known. This operation was performed three years ago. The growth was microscopically benign; a villous papilloma.

The third stage is one of cystitis. Blood generally

ceases and purulent urine is passed. Patient becomes worn out and dies uræmic or exhausted.

Diagnosis.—These stages are often not well defined and use of instruments and other influences alter the symptoms. We know that a benign growth of the bladder may be present as long as twenty-five years, and the patient finally die of some intercurrent disease. We, however, must not depend in our treatment of a case on this remote possibility, for death from a malignant change of the benign growth is the usual outcome. Therefore, in the presence of a benign growth of bladder with hæmaturia and beginning cystitis we must decide upon appropriate treatment. We should, of course, be sure of the appearance, position and nature of the growth. The urinary analysis in the early stage of new growths is not of great value. It of course tells us of the presence of blood, but beyond this is not of much assistance.

The cystoscope is our greatest aid, but must be used with great caution. Next to it a rectal or vaginal examination with an empty bladder is often of advantage. We should while making the rectal or vaginal examination place one hand over the region of the bladder. The various other methods of differential diagnosis, as Hugh Cabot in a recent paper has well said, are ingenious, but they are too unreliable to be of value.

Early diagnosis is of great importance, but unfortunately too often patients are permitted to go on for years with symptoms suggestive of vesical new

growth, and nothing is attempted beyond palliative measures to relieve them till they are beyond surgical help.

The cardinal symptoms of bladder growths are hematuria and disturbance of bladder function. The character of the hemorrhage, and whether at the be-



FIG. 27. CARCINOMA OF BLADDER. (Spooner—Post-Graduate Journal.)

ginning or end of the stream, are of some value, depending, however, upon the length of time the blood has been in the bladder and on the position of the growth.

A cystitis depending on vesical neoplasm is, of course, the result of infection. This may result from congestion and erosion about the growth or it may result from instrumental injury; but in either case an opening is made for bacterial invasion. A cystitis of this character is incurable till we remove the cause. Washing the bladder in such cases is not to be recom-

mended, as it may produce trauma and even severe hemorrhage.

In using the cystoscope we should always be prepared for an early operation. I always, however, to avoid any chance of error, make two examinations in suspected bladder growths. In addition we should make a bimanual examination as before mentioned.

When we have made an examination and concluded that the bladder disturbances, cystitis, hemorrhage, etc., depend upon a new growth, the question arises as to its probable nature and the best method to treat it. This brings me to a consideration of the different symptoms and appearances of benign and malignant growths. Also another important point, and this is: Have we in addition to our bladder neoplasm any other coexisting disease which may influence our mode of treatment?

The following case was that of a man of twenty-two, who had been bleeding on completion of urination for a year or more. Referred by Dr. Arlitz, of Hoboken. When he came to me at the Post-Graduate Hospital, November, 1905, he was doubled up with the pain, suggesting the picture of a man with stone in the bladder. General condition fair. Had been in one hospital three weeks and treated by bladder irrigation for cystitis. Cystoscopic examination, to my surprise, was not painful, and the bladder became more tolerant as the examination progressed. I found considerable mucus and pus on a thickened bladder wall and a large area of villous growth, indurated base,

edge of trigonum surrounded by ulceration. The question of a tuberculous process came to my mind, and I am inclined to think it was present, in addition to the villous growth. I made several cystoscopic examinations and endeavored to get a picture, but without success. However, I operated suprapubically and removed the papilloma, which was in three parts. I drained also by perineum. The wounds healed very slowly and the suprapubic one tended to reopen. The operation was done in December, 1905, and at the last account in March the wound below had not entirely closed, but the man was entirely free from pain and in excellent general condition. He never passed blood after getting up from the operation. The urine showed one kidney involved in a pyelitis and it ought to be drained. No evidence of tuberculosis was ever found, the hospital pathologist making a diagnosis of a benign villous growth of bladder with a pyelitis probably secondary to the cystitis.

An enlarged prostate may prevent our thoroughly viewing the bladder. In children a rectal examination is particularly valuable. It sometimes has to be made while the patient is under complete general anesthesia. This is frequently necessary in nervous subjects, in children, and in those suffering from severe pain. Otherwise the abdominal muscles will contract and prevent a satisfactory examination. Occasionally the urine will contain parts of the growth. This is particularly so in cases of villous papillomata. To make a positive diagnosis a cystoscopic examination



FIG. 28. VILLOUS PAPILOMATA in a tuberculous subject. Author's case. (Post-Graduate Journal.)

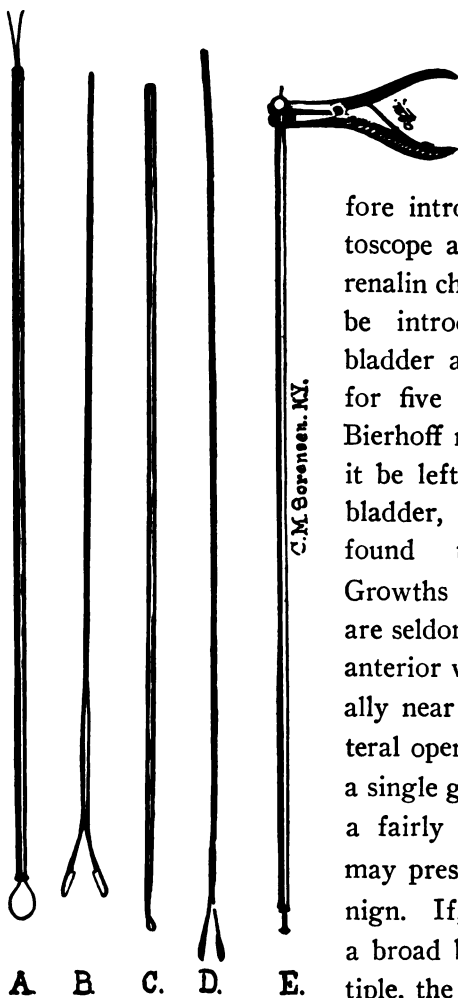


FIG. 29. AUTHOR'S INSTRUMENTS FOR USE WITH CYSTOSCOPE,—most recent models. A, Snare. B, Scissors. C, Curette. D, Forceps. E, Stone crusher. Interchangeable handle for use with all instruments.

is essential, and we should use both the direct and indirect instruments. Before introducing the cystoscope a solution of adrenalin chlorid 1-4000 may be introduced into the bladder and left in place for five to ten minutes. Bierhoff recommends that it be left an hour in the bladder, but I have not found this necessary. Growths of the bladder are seldom situated on the anterior wall, but are usually near one of the ureteral openings. If we see a single growth which has a fairly long pedicle we may presume it to be benign. If, however, it has a broad base and is multiple, the chances are that it is malignant. When a growth involves a ureteral opening the patient usually complains of pain

in the region of the kidney. This results from the back pressure caused by the growth as it obstructs the flow of urine from the corresponding kidney. In instances of growths with long pedicles situated near the vesical neck, hemorrhages, interruption and difficulty in voiding urine are usually present. In severe cystitis an examination may be practically impossible, particu-

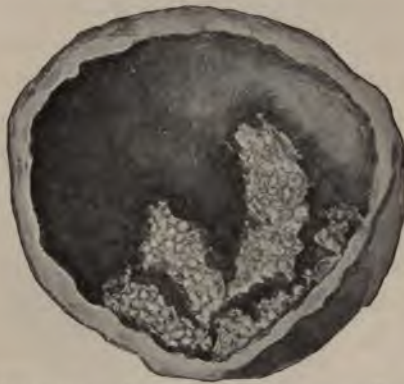


FIG. 30. CARCINOMA SCIRRHUS. (Spooner—Post-Graduate Journal.)

larly if we are in the presence of a soft growth which bleeds easily. If such be the case, a prolonged attempt to cystoscope the patient should not be made, but a suprapubic cystotomy better be promptly performed.

While referring to the value of my cystoscopic forceps, I shall mention the subject of intravesical operations. Nitze was the first to devise instruments of this kind and successfully removed many small bladder growths with them. Others, among them Casper and

Bransford Lewis, have also been successful in this field; but it is a matter of the greatest difficulty and few can acquire sufficient skill to do it. Of course in this connection I refer to the complete removal and not to the method I have employed to remove a part of a growth for examination before further surgical interference. There is always a question of the completeness of the operation, and to my mind the field for it in any hands will always be limited.

Treatment.—After obtaining a satisfactory view of the growth, its position, character and extent determined, what shall we do to relieve the patient? If the growth is single and has a fairly long pedicle, suprapubic cystotomy, and its removal, with the surrounding mucosa, may be carried out. If we have any question either by inspection or by the microscope of its nature—and we must always remember that benign growths eventually become malignant—what shall we do? If we operate at all on such doubtful cases, and particularly in those growths with hard indurated bases, a radical resection of the bladder wall is absolutely necessary. Dr. Watson, of Boston, goes as far as to say a double nephrostomy should be performed, and then at a later operation the bladder completely removed. The nephrostomy dooms the patient to wear a special harness with receptacles for the urine as long as he lives. Dr. Watson says his experience with bladder growths, which is large, makes him believe that any other method is useless. The question is an important one, and I am inclined to agree

with Watson. However, there are border line cases where we can seemingly remove the entire growth by resection of the bladder, and Fuller has reported some successful cases treated this way. Then again, most patients will not listen to such radical advice, and in these cases we must do something to make life bearable. Therefore, when double nephrostomy cannot be undertaken for one of the reasons I have given,



FIG. 31. CARCINOMA WITH ULCERATION, growth beginning in uterus. (Spooner—Post-Graduate Journal.)

suprapubic cystotomy, resection of the bladder and, if necessary, transplanting of the ureter may be undertaken. The ablation of the bladder and implantation of the ureters into the rectum or vagina is not desirable owing to rapidly ascending infection and death. Sometimes a suprapubic cystotomy and permanent drainage is the best plan.

The most important part of the whole subject is

to have in mind the need of an early diagnosis and prompt removal. Delay is the cause of many of the unfortunate results. If by early, accurate diagnosis we can obviate this the outlook for the patient is fairly good.

VESICAL CALCULUS.—Stone in the bladder is a condition which has been noted in medical literature for hundreds of years, but its causes are still obscure. It is not very common in this country, but is frequently



FIG. 32. PHOSPHATIC STONE removed from a bladder of a man of 70 years. Prostate removed at same time. Entire recovery followed.

seen in England, certain parts of Germany, Russia, Asia Minor, Egypt, and particularly common in India. Some of the English surgeons stationed in India have crushed from 800 to 1000 stones. It is supposed that the character of food and water has a decided influence on its formation. It is said that an operation for vesical calculus was performed by an English blacksmith on himself by suprapubic route in the sixteenth

century. If such were the case we cannot but have the highest admiration for the man's fortitude and ingenuity.

Bladder stones are primary and secondary. Primary stones are usually composed of uric acid and oxalate of lime. They form in the kidney pelvis and pass down through the ureter to the bladder. Here they grow large unless promptly passed through the urethra. The secondary stones form in the bladder and are usually composed of phosphates or carbonate of lime. Their formation is better understood, for here a cystitis or foreign body forms a nucleus and it is only a matter of time before the formation of a stone of considerable size. This is particularly likely to be the case in instances of poor bladder drainage caused by prostatic or urethral obstruction. Another cause of stone is diverticula. In many stones we find a nucleus of uric acid or oxalate of lime and an outer surface of phosphates or carbonate of lime. A change in the reaction of the urine from acid to alkaline may produce these so-called mixed stones.

The oxalate of lime stones are harder to crush than the uric acid. The phosphatic and carbonate of lime stones are usually quite easy to pulverize. Children and old men are the ones who suffer most from stones. They are uncommon in this country in women. The short, straight urethra of women makes the passage of stones easy. The majority of calculi in women have some foreign body nucleus. Many objects have been introduced by both men and women into the bladder

and been lost. These eventually become encrusted with lime salts and form the nucleus for calculi. This subject will be referred to under foreign bodies in the bladder.

In primary calculus we may have no cystitis, and particularly in elderly men have few symptoms from it for years. Usually, however, a cystitis results from the presence of the stone, it having a tendency to congest the bladder and to interfere with the act of micturition. I do not believe, though, a stone in itself ever produces ulceration of the bladder mucosa.

The number of stones found in a bladder varies very much. We may find only one or possibly a dozen. Single stones are usually oval or round and rough to the touch. An encapsulated stone is one which lies in a diverticulum and has become so large it cannot pass through the opening into the bladder proper. These are, however, uncommon. The following case is interesting from the number and position of the stones found on operation:

A. B., aged thirty-five, waiter, single, American; came to my clinic at the Post-Graduate Hospital, April, 1905, suffering from very frequent and intensely painful urination. Symptoms very urgent. External urethrotomy a year ago, at which time his symptoms were somewhat similar to his present ones. Got practically no relief as a result of the operation. Has a distinctly alcoholic history, and when drinking heavily is always much worse; being troubled at such times with continuous dribbling or complete retention.

I found that a sound of medium size slipped into the bladder without much difficulty, but caused severe pain, for which I had to cocainize the urethra. Some urine was then drawn by catheter which was very foul and full of thick ropy mucus and many shreds. Patient says he has passed gravel on several occasions. After prolonged washing of bladder a cystoscope was introduced with some difficulty, but owing to the blood and mucus little could be seen. However, more washing was resorted to and then adrenalin injected. With this a fair view could be obtained, but each motion caused the patient great pain. The bladder was very red and œdematous. In several places large flakes of membrane could be seen adhering to the bladder wall. A very pronounced desquamative or diphtheritic cystitis. The ureters were not visible. I saw no distinct ulcerative process, nor could I see anything of a malignant or tuberculous nature in any part of the bladder. Near the region of the left ureter, but further back and laterally, could be seen a white patch of tenacious, closely adherent mucus. This patch was about the size of a cent and could not be washed off. In order to remove it I employed my bladder forceps and by its aid I managed to remove some of this adherent mass. In what I obtained by the forceps I found considerable gritty deposits like coarse sand. Suspecting something back of the patch I next attached the phonophore, a description of which appears in the *American Journal of Urology* for March, 1905. With this instrument I penetrated the place where the white

spot was attached and by its aid detected a diverticulum about an inch and a quarter deep and apparently full of small stones. I tried with the forceps to empty the cavity, but on account of the pain and blood I was unable to accomplish my object. For a few weeks I endeavored by thoroughly washing the bladder to improve the condition, but with no marked success. I then suggested an operation and the patient, being in great distress and unable to work, readily agreed to it. He was then admitted to the hospital and I operated on him.

After a perineal cystotomy I introduced my finger into the bladder and in a few seconds pushed it to the bottom of the diverticulum. The pocket was a little larger around than my index finger. The patient was thin and I had no difficulty in exploring the whole of the bladder cavity. There was no true ulcerative process present. The pocket was full of little granules about the size of uncooked rice particles. I cleaned them out thoroughly with my finger and dull curette, then by means of direct irrigation I gave the cavity a complete washing. With dull scissors I cut several incisions into the pocket, thus much enlarging the openings in the bladder proper. Before finishing the operation I carefully scraped the whole bladder with a dull curette. I put in place a large perineal drainage tube and the bladder was drained for two weeks. The man left the hospital with the perineal wound rapidly healing. I have since examined his bladder several times with the cystoscope, and found a much-improved con-

dition with comparative freedom from mucus. The pocket has shrunk so much that it contains no stones or mucus. The patient now holds his water four to five hours, has no pain and is doing steady work. I am still washing his bladder with silver once or twice a week. He also reports a gain in two months of thirteen pounds.

We may have lime or other urinary salts in severe cystitis deposited on the bladder wall. While these are not really stone, at the same time, unless removed, they are apt to be the nuclei for subsequent stone formation. In their presence we should be suspicious of hidden stones either in the post-prostatic pouch behind a hypertrophied prostate or prostatic bar. They are often found between muscle fibers in trabeculated bladders or over the openings of diverticula. If the cystitis is severe and there is much mucus, pus and blood present a cystoscopic examination will not be of much value. The following case will illustrate this point:

G. J., a man of forty-five, coachman, of full habit, weighing over 200 pounds, was operated on by me two and a half years ago for tight stricture in membranous urethra. At that time he had been suffering with symptoms of urinary obstruction for ten years, gradually getting worse till, when he was brought to me, he had complete retention. The straining to empty his bladder had been extreme for several years. I did an external urethrotomy, freely incising a tight fibrous stricture. Owing to his great weight it was impossible

to thoroughly explore the bladder with my finger. I left a large perineal drainage tube in the bladder for two weeks. The patient made a good recovery. No cystoscopic examination was made at the time of this operation. On the tenth day a No. 32 F. sound could be easily introduced through the urethra. Patient was discharged to his home in Vermont with advice to use urotropin and wash out his bladder twice a week with boric acid solution. In addition his physician was advised to use a full-sized sound once a month. The patient's stream was strong and full after this, but the urine did not entirely clear up, and he complained of considerable pain in the lower back and testicles. Examination of the urine showed much pus and ropy tenacious mucus, but no evidence of kidney involvement. Things went on in this way for about a year and a half, when I attempted a cystoscopic examination. The pain and the urethral spasm were so severe, however, that the examination could not be satisfactorily completed. The patient would not submit to general anesthesia. Three months ago, the condition being about the same, the man came to me again and I advised a cystoscopic examination and another operation if necessary. I suspected a bar at the bladder neck which, forming a pouch, caused trouble by preventing a complete voiding of urine. I could determine no prostatic hypertrophy. The patient consenting, I made a cystoscopic examination under general anesthesia. I found a much-hypertrophied and chronically inflamed bladder. The ureteral openings were apparently large

enough to admit the finger tip. The presence of much tenacious mucus and free bleeding made the examination a difficult one, constant irrigation being necessary. Well back to the right side a very firm spot of whitish mucus could be seen. It was about the size of a quarter. I examined this spot carefully with the phonophore, suspecting a pocket and possibly the presence of a stone. I easily demonstrated the presence of a shallow pocket in which there was much gritty substance in combination with the tenacious mucus filling up the cavity. The patient had passed gravel on one or two occasions. A perineal cystotomy was performed, the bar at the bladder cut through and the pocket thoroughly scraped out. I would have preferred a suprapubic operation, but I had obtained consent for only the perineal route. A large perineal tube was put into the bladder and for two weeks drainage was continued. I used peroxide freely and at the end of the two weeks I removed the tube, the wound healing rapidly. The bladder would then hold ten to twelve ounces, whereas before four ounces was about the limit. It is too soon to say what the result will be. The pocket may trouble him again, but I am convinced that if it does I can by the aid of the cystoscope and forceps attachment remedy the trouble. In this case prolonged vesical lavage is imperative and is being carefully carried out.

We must also remember that a stone may become covered with dense mucus and in consequence be attached to bladder wall and not have the appearance of

stone or click when tapped with a stone searcher. The case I give below shows how this error may be made in presence of a prostatic hypertrophy with severe cystitis.

C. S., age sixty-one. Family history negative. Personal history: had an operation for hemorrhoids eighteen years ago; gonorrhoea about thirty-five years ago; no lues. Present history: about ten months ago began to have frequent micturition. Had to get up several times at night to pass urine. Some months before this a sore appeared on his nose, which proved to be a squamous epithelioma. It soon healed by the aid of the X-ray. When I saw him he was losing a little in weight, and general condition was not as good as usual.

The mixed urine showed sp. gr. 1030, acid, blood, and pus, and no sugar. Upon examination by rectum the prostate was slightly enlarged; seminal vesicles normal. There was no residual urine.

Three attempts to cystoscope him were made, before a clear field was obtained, there being each time a well-marked hemorrhage. I was able to control this upon subsequent examinations by using continuous irrigation. What looked like a small tumor was observed attached to the region of the right ureter. Fine tendrils could be seen hanging from this growth, and there was no metallic ring when it was touched by a searcher attached to the cystoscope. A "middle lobe" of the prostate was seen on several occasions.

This picture, the hemorrhage and all, led me to be-

lieve that I had seen a new growth of the bladder. At each cystoscopic examination the growth occupied the same position. A few days later he was operated upon by the suprapubic route, and the supposed new growth was found to be a stone covered with mucus and firmly attached to the bladder wall. An enlarged prostate and congested trigona accounted for the hemorrhage. This prostate, together with the stone, was removed on operation. Good recovery.

Male, age thirty-two. Health good until present illness. The patient got up in the morning and began work—that of painting. Suddenly he felt a sharp pain over the bladder, slightly to the right side in the region of the appendix. This pain gradually increased and became agonizing. When admitted to the Post-Graduate Hospital he said he was unable to urinate. It was then thought to be a case of acute retention, and a urethral catheter was passed into the bladder. About an ounce of clear urine was obtained which, upon examination, proved to be normal. No relief followed, and a diagnosis of blocking of the ureter by a stone at the bladder inlet was made. The absence of blood in the urine made me believe the right kidney was completely blocked. There was no pain in the back or the region of the scrotum. Temperature 100; pulse rapid; vomiting; cold, clammy skin; and fearful, grinding, steady pain.

The man was anesthetized and cystoscoped. The left ureter was open; the bladder normal. At the entrance and just inside of the right ureteral sphincter

a small, dark-colored stone could be plainly seen. This was a most unusual and clearly defined picture and was shown to about twenty matriculates. No urine came from the ureter. With my special forceps and cystoscope I entered the ureteral mouth, grasped and removed the stone. It slipped from the forceps and fell into the bladder. Here, again, it was shown to the matriculates. It appeared to be about the size of a bean, but nearly round. Owing to the patient's condition, no prolonged effort was made to remove it from the bladder, as I felt sure it would be passed by the urethra later on.

Immediate relief followed and the patient left the hospital in two days. He was told to pass his urine through gauze for a few days and report to me again. This he has not done. The case shows how a stone may block the ureter and produce no pain in the back or testicles, but simulate acute retention. Also the appendix had to be considered as a possible source of the trouble. The value of the cystoscope and forceps was never shown to better advantage; a cutting operation being avoided.

Diagnosis.—In vesical calculus we usually have pain, disturbances of bladder function and changes in the urine.

Pain is usually absent while the patient is lying down. As soon as he moves about or urinates the pain suddenly appears and may be very severe. It is usually worse at the end of the urinary act and is apt to radiate to the end of the pelvis. In many cases

while the urine is being voided the stone suddenly obstructs the flow, and the result is fearful paroxysms of pain. While moving about or actively engaged in exercise which produces sudden motions the bladder becomes irritable, with frequent micturition often accompanied by blood.

In primary calculi we usually have in time a resulting cystitis, when of course there is pus and, except in the very chronic cases, marked increase of all the symptoms. While these symptoms are the classical ones we have many cases of bladder stone without some or any of them. An encysted stone will not give them, and in old men with capacious bladders we frequently do not have them at all. It occasionally happens that in prostatic hypertrophy an unexpected stone is found at operation in the post-prostatic pouch which has produced no symptoms outside of the prostatic ones.

Blood, however, is practically always present. It may be macroscopical and appear at the end of the stream, but on the other hand it frequently happens that it can only be found by the aid of the microscope, and then perhaps only blood cells with the coloring matter squeezed out. We must always bear in mind too the possibility of an ascending pyelonephritis as the result of the cystitis and in consequence another disease influencing the condition.

A diagnosis can usually be made with considerable facility, and the condition is therefore a very satisfactory one to treat. In children with suspected stone

we should first, after obtaining the history and analyzing the urine, make a rectal or vaginal examination. The bladder must first be emptied and with one hand over the pubes the bladder is easily palpated. A stone can usually be felt in this way. This method of examining for stone can also be used in adult males, but owing to the increased distance of the bladder base from the anus it is not as reliable as in children and women.

The X-ray may also be employed, but it has not been of as much value in cases of suspected vesical calculus as was expected.

Thompson's stone-searcher is a valuable instrument to examine for bladder stone, but cannot well be used in very small children nor in adults with tight strictures. In enlarged prostates the stone may lie in the post-prostatic pouch and be out of reach. Also in cases of diverticula, or in other instances of severe chronic cystitis, the stone may be so covered with mucus that the searcher on touching it elicits no characteristic click. It is best used with four to six ounces of fluid in the bladder and with the buttocks well raised, so that the stone, if loose, will by gravitation fall back toward the fundus. The searcher is introduced like an ordinary sound and after it is in the bladder the beak rotated from side to side and the whole cavity searched. The fingers should grasp the instrument very lightly so the slightest grating may be noticed. We must also be careful not to confuse the sensation produced by thick fibrous tissue with that of stone.

A little practice will obviate this possibility. We may, however, confuse the sensation produced by deposit of lime salts on the bladder wall with true stone formation. This can be positively determined only by use of vesical illumination with the cystoscope.

It is, however, impossible to examine small children this way and larger ones only by use of specially constructed instruments. In such cases and in those subjects with tight stricture I have used the phonophore. Delicate sounds can be heard with this instrument, and I have in several cases used it successfully for this purpose. The cystoscope, while a valuable instrument in examining for stone, is nevertheless far from infallible for the following reasons: *First*, a severe cystitis or hemorrhage may prevent our obtaining a clear field. In such cases air may be substituted for fluid in distending the bladder. *Second*, the stone may be partly or wholly covered by mucus or lie in a diverticulum in the post-prostatic pouch. It has happened that stones have been overlooked from these causes. *Third*, an intolerant bladder may prevent our getting sufficient distention to use the cystoscope. While general anesthesia will usually overcome this last difficulty it will not always do so in a contracted bladder.

Treatment.—In cases of primary vesical bladder stone, its removal will usually cure the cystitis. Of course it may recur, but for the time being the local condition is cured.

In secondary stones we must try and determine the

cause of the cystitis and remove it. If there be a stricture, prostatic bar, prostatic hypertrophy, in fact, any condition which prevents good bladder drainage, we should treat it too if we expect to cure the patient. This brings me down to the question of operative treatment of vesical stone.

The best method for removal of uncomplicated stone is by crushing. This is not as simple an operation for the surgeon as cutting, but is much easier and safer for the patient if performed by experienced hands. Bigelow's lithotrite is a very satisfactory instrument. In nearly all cases general anesthesia is necessary, but even if a local anesthetic be used the patient should be put to bed for at least 24 hours after its use. The cystoscope is of much value after crushing to examine the bladder for remaining particles.

A Bigelow lithotrite consists of a male and female blade, an evacuator and large-caliber metal tubes especially made for the purpose. The lithotrite is introduced like a sound into a distended bladder. The patient is tipped so that the buttocks are raised above the shoulders. The stone is searched for and when touched the lithotrite blades are opened and an attempt made to grasp it. When this is accomplished, before attempting to lock the instrument and crush, we should turn it partly around to be sure the bladder mucosa is not caught between the blades and the calculus. After we are sure that the instrument is free, we lock the jaws by a special arrangement at the prox-

imal end and screw them together. We repeat this maneuver till we have broken the calculus into small pieces. We then withdraw the lithotrite and introduce the large caliber metal tube into which we fit the Bigelow evacuator. By use of this evacuator and metal tube particles of broken stone are drawn out. We repeat the crushing and evacuating till we are convinced that all particles have been removed from the bladder. The cystoscope should be used to determine this important point. Bierhoff has an attachment for his cystoscope, consisting of a small lithotrite for stone crushing which he has found useful in small calculi. After this operation it is well to leave a soft rubber catheter in the bladder for twenty-four hours and through which we may readily wash the viscus.

The above method is without doubt the method of choice in primary vesical calculi if the urethra is of sufficient caliber. Chismore devised an instrument of smaller caliber and much simpler than Bigelow's model for use in small urethræ and which is well adapted for crushing small stones. If, however, for some reason we cannot use the lithotrite we have to perform a cutting operation. If an operation be done, both the stone and its cause should be, if possible, removed at the same time. If the stone be large a suprapubic cystotomy is the method of choice. If small, and we have to do with urethral stricture or small prostatic hypertrophy, the perineal route is the one to be performed. Large calculi should never be forcibly drawn through a wound. There is danger of injury

to the soft parts, and sometimes serious death of tissue results. The suprapubic wound enables us to view and examine the bladder completely, which cannot be done by the perineal route. Therefore, in any case of doubt as to the presence of stone or the bladder's condition, we should employ the former route.

The wounds in these operations should be treated as previously described. In uncomplicated cases the bladder may be tightly sutured and then catheterized for a few days.

VARIOUS FOREIGN BODIES IN BLADDER.—Foreign bodies gain entrance to the bladder from urethra; through vesical wall, from injuries or by migration, from remote parts of the body.

We may find catheters whole or in part, pieces of steel instruments, straws, nails, hair-pins, lead pencils, chewing gum, in fact any object which can gain entrance by the urethra. Some of these are lost during catheterization or broken at operation. Others are first introduced into the urethra for purposes of masturbation and lost by accident. This latter accident is more often seen in women than in men. Van der Poel reported a very interesting case of a nail in the bladder of a man. Horwitz told me of the case he had in a young man who in order to prevent impregnating a woman placed in his front urethra beeswax before coitus. The act was accomplished and the wax was lost to view. The young woman could throw no light on the subject, so the matter went on till the man began to have evidence of vesical irritability and pain.

Horwitz could get little history from him, but decided to use the cystoscope, which he accordingly did, and found the beeswax reposing in the bladder. H. H. Morton reported another case of interest where he re-



FIG. 33. HAIRPIN FOUND IN WOMAN'S BLADDER. It was surrounded by a phosphatic stone. Plainly seen by cystoscope. Dr. Geo. W. Warren's case. (Post-Graduate Journal.)

moved a vesical stone and on examining it found for a nucleus a small bottle. H. Goldenberg told me of a case of his when he, in crushing for a stone, broke off the tip of a lithotrite, which happened to be one of foreign make. Later the patient passed it by the urethra without any complications following.

Substances in the form of suture material have been found in the bladder. These penetrate the bladder

walls from a remote operative field and became the nuclei of stones. Foreign bodies from the intestine may enter bladder wall.

Injuries of the bladder, as seen in gunshot or stab wounds, may result in foreign material being carried into the vesical cavity and eventually becoming encrusted with lime salts.

Treatment.—In some instances, after the introduction of various foreign bodies into the bladder by the urethra they pass out again with the urine. If they are only partly in the bladder, do not make the mistake of pushing them all the way in while trying to remove them. This is likely to, and sometimes does, happen in cases of lost catheters in men. The patient perhaps is catheterizing himself and the instrument slips out of sight into the urethra. Before following it down with instruments through the urethra, do as I once saw Fuller do in a case; grasp it firmly through the urethra from the outside. In the case I refer to, an old prostatic lost his catheter and Fuller took a double tenaculum and firmly grasped the catheter directly through the urethra at the penoscrotal angle. He then passed a pair of alligator forceps down the canal and caught the catheter from inside the urethra. After satisfying himself of a firm hold, he took off the tenaculum which had anchored the catheter and withdrew his alligator forceps plus the catheter. In this case the old man's life was in the balance, for he was unfit for an operation, and it was before the days of scientific cystoscopy. Since then I have been able to

withdraw pliable foreign bodies from the bladder with my cystoscope and special forceps.

Foreign bodies which remain in the bladder for a few weeks usually become encrusted with urinary salts, and if not removed cause cystitis and eventually stone. In most of these cases a suprapubic cystotomy should follow. After the removal of a foreign body the cystitis, under bladder washing, gradually disappears.

DIVERTICULA are congenital and acquired.

Diagnosis.—The congenital form is usually single, larger than the acquired form, and appears by the cystoscope to have a large round or oval opening with smooth edges. The interior appears black. The acquired form is usually smaller, generally multiple and has an uneven, ragged edge. There is usually a reddened area to be seen inside, and is not as deep as in the congenital form. These diverticula may harbor stones, and this fact may account for stones apparently disappearing temporarily. It is often extremely difficult to cure cystitis when we have well-marked diverticula, owing to the difficulty of washing and draining them.

I believe the history recorded below to be that of an acquired diverticulum resulting from years of straining caused by prostatic hypertrophy.

M. R., aged 65, had suffered from pronounced prostatic obstruction for years. This patient was referred to me by Dr. Albert Warren Ferris. In addition to the symptoms due directly to his hypertrophied prostate he had a diverticulum of the bladder

holding about eight ounces. The patient had noticed for some years, after emptying his bladder and retiring for the night, that he would feel the need of immediately repeating the act. Previous to the operation he had been catheterized for ten days, each six hours. It was then observed that after the urine had been drawn a change of position would cause about eight ounces more urine to flow from the catheter. At the operation, which was done by the suprapubic route, a large prostate was removed and the bladder carefully explored. No preliminary cystoscopic examination had been attempted owing to the patient's condition. I found both ureteral openings large enough to admit a finger tip, and on the left, back of the ureteral opening, I put my finger into a large cavity with an opening the size of a quarter. There was not the least sign of stone formation in this diverticulum or in the bladder proper.

Treatment.—Diverticula are difficult to treat and as a rule should not be operated on. If the bladder is well filled they can be washed out, but the cystitis caused by some of them, especially those deep ones with narrow necks, is very obstinate. Occasionally a stone will be lodged in one of these diverticula and gradually become too large to enter the bladder cavity. It must be also remembered that particles of a crushed stone may enter a diverticulum and be entirely overlooked if the cystoscope is not used after the crushing. Young has recently reported some excellent results following operations on diverticula.

T. F., 70, male, no occupation; has for eight years been suffering from symptoms of urinary obstruction. Prostate does not seem hypertrophied. By the advice of a physician he has been washing his bladder twice a day with two per cent. solution of boric acid. This treatment he has faithfully pursued for several years, with the result that the bladder was very tolerant to instrumentation. A stone was crushed two years ago and he came into the dispensary to find out if another one had recently formed. I examined him with the cystoscope, which was introduced without difficulty. The field of vision was clear, showing a fairly healthy bladder membrane, and on the right side was a pure white stone; size and shape of a small horse chestnut. On the patient's left and about an inch back of the ureteral opening I found a diverticulum with an opening the size of a cent. It seemed to be about an inch and a half deep, its lower wall not being visible as it sagged down below the opening. In order to test this cavity for stone or gritty deposits I used the phonophore, but with a negative result.

The patient suffered very little from the examination, which was done with cocaine. I was enabled to demonstrate the unusual conditions to several students. It is possible that the stones the patient has had may have formed in the diverticulum and then dislodged and grew larger in the bladder proper. He has passed several small stones by the urethra.

The great value of the cystoscope can readily be seen in this case as in the preceding ones. A crushing

operation was suggested, but the patient decided to wait a while longer. The stone was removed later.

POUCHES.—The term is used here by me especially in reference to cavities in the bladder directly behind an enlarged senile prostate or prostatic bar in younger men. It is called a post-prostatic pouch and disappears after the removal of the obstruction. It may harbor stones which are sometimes overlooked in perineal operations, particularly in very stout individuals.

SACCULI are small spaces seen between the muscular fibers in trabeculated bladders and are the result of the hypertrophy of the bladder seen in cases of enlarged prostate, stricture and other causes of increased bladder pressure. They are usually numerous and make a cystitis more difficult to cure. The removal of the cause of increased bladder effort is the principal way to treat them.

HYPERTROPHY OF PROSTATE may cause cystitis by preventing natural drainage and gives an opportunity for bacterial lodgment in the congested mucosa. This subject has been taken up in the chapter on prostatic hypertrophy.

ATROPHY OF PROSTATE may cause cystitis by reflexation of bladder neck, and as a result infection of mucosa from urethral bacteria.

Diagnosis is made by rectal feel and urethral catheter. The latter shows the presence of prostatic atrophy by decreased urinary distance. Treatment is by

vesical lavage, sounds and electricity, but the outlook for a cure is not good.

URETHRAL STRICTURE is a common cause for cystitis. It produces this by preventing good bladder drainage, with secondary congestion of bladder mucosa, resulting in lowered resistance and infection. Its relief results in the disappearance of the cystitis.

EXTENSION OF BACTERIA THROUGH BLADDER WALL from uterus, vagina, rectum, perivesical space, seminal vesicles and prostate.

Diagnosis.—Cystitis resulting from infection from one or more of these sources is not uncommon and accounts for some obscure forms of bladder inflammation. Fuller believes that in cystitis caused by disease of the seminal vesicles that he can see with the cystoscope evidence of the inflammation over the region of the seminal vesicles. In such cases he recommends drainage of the offending vesicle. If there be obstinate constipation we must overcome this by appropriate diet, exercise and saline enemata.

If the uterus or tubes are diseased our treatment in such cases must be directed to them. Only by such attempts to remove the cause can we hope to cure the resulting cystitis.

PYELITIS, PYELONEPHRITIS, PYONEPHROSIS, RENAL CALCULUS, NEW GROWTHS OF RENAL ORIGIN AND URETERITIS may all be the cause of vesical congestion and resulting infection. The cystoscope is our greatest help here, and with the ureteral catheter, aseptically

and skillfully used, we can usually determine the source of the cystitis.

Sarcoma of Kidney.—The following case, that of a carpenter, 62 years old, came to me in 1903 suffering from pain over the region of the right kidney. Loss of weight and strength and pronounced hematuria. Frequency of urination. Some years before he had received a severe injury from a fall on right lumbar region. He had been treated for years for the hematuria with negative result. My examination revealed a tumor in the right belly about the size of a child's head. Cystoscopy showed mild cystitis. Blood from right kidney, other side normal. Right ureteral opening much thickened, congested and patulous. On cutting down on the growth by abdominal route, an adherent mass involving right kidney was found, and owing to dense adhesions was with great difficulty removed. The adhesions were very vascular and considerable hemorrhage was unavoidable. Patient died in 24 hours. Diagnosis sarcoma. The growth should have been discovered and removed long before he came to me.

INFECTION OF THE BLADDER in typhoid, pyemia, and other constitutional diseases is not uncommon and is the result of the different micro-organisms being carried to the kidney by the blood current. Here they are taken up by the kidneys and passed down in the urine to the bladder. Microscopical examination and culture tests alone can determine which organisms are causing the cystitis. The cystitis is

usually mild, and with improvement in the general condition and use of Formin gr. x four times daily, gradually disappears. Mark Richardson, of Boston, some years ago made an extensive study of typhoid bacilli in urine and found in many instances that after the patient was up and about, even after several months, the bacilli were still present in the urine. With use of Formin they quickly disappeared, only to reappear again when it was discontinued for a few days. From this we can easily understand how typhoid fever may be spread if for long periods great care is not taken to disinfect the urine.

INFECTIONS OF THE BLADDER RESULTING FROM THE INGESTION OF IRRITATING DRUGS.—The first step in this process is the congestion following the use of the drug and then of continued lowered resistive power of the bladder mucosa resulting in bacterial lodgment. Cantharides and other irritating drugs may cause this, and we should therefore be on the lookout for such a possibility in our use of them.

Various other causes for bladder congestion, such as *chronic masturbation, repeated violent copulation, the practice of coitus interruptus, prolonged erections without coitus*, as in the engaged state, *hemorrhoids* and *exposure to wet or cold* may all have a predisposing influence in causing cystitis. Old prostatics and those who have suffered for a long time from stricture are most likely to be affected, for in these conditions the bladder mucosa is congested and the urine imperfectly voided.

CHAPTER IX

CAUSES OF CYSTITIS—(*Concluded*)

**CONDITIONS AFFECTING BLADDER CONTROL—ENURESIS—
ATONY OF BLADDER—CHANGES IN MUSCULAR FIBERS
AT VESICAL OUTLET—PROSTATIC BAR—ABERRANT
PROSTATIC LOBE — VALVES — VARICES — ULCERS OF
BLADDER — EXSTROPHY—INJURIES—PARASITES—FIS-
SURE—TRIGONITIS—DIAGNOSIS AND TREATMENT.**

VARIOUS CONDITIONS AFFECTING BLADDER CONTROL are, according to Casper:

1. Organic changes in motor nerves which permanently impair vesical function (paralysis and paresis of the bladder).

2. Injuries and pressure on nerves controlling bladder function. Frequently relieved by removal of cause.

3. Various diseases of the genito-urinary or neighboring organs which by pressure on the bladder or through so-called reflex action influence the bladder function. Usually curable.

4. Various functional disorders of the bladder of obscure origin seen in apparently healthy people. Many of these cases are difficult to permanently cure.

1. *Organic changes in special nerves which permanently impair vesical control.*—This condition is one usually present in patients suffering with other symp-

toms besides those noted in connection with the bladder. It is observed in myelitis, tabes, multiple lateral sclerosis, general progressive paralysis and in all diseases where the motor centers are involved in disease of the spinal cord. Somewhat similar symptoms are produced by injuries or pressure on the cord, but these are given under another division of the subject.



FIG. 34. TRABECULATED BLADDER. Seen in a tabetic subject.
(Spooner—Post-Graduate Journal.)

Hysteria may produce symptoms similar to those observed in chronic diseases of the spinal cord, but a careful examination of the patient will usually clear up the question of diagnosis. In the class of cases under discussion we must always bear in mind the probability that syphilis has been the cause of the spinal disease. While vesical symptoms may be among the earliest in a case of tabes and the other diseases above mentioned, a careful examination of such

a patient's general condition, reflexes, pupils, etc., will usually show the folly of treating the bladder alone. So in questions of operation in cases with retention, overflow, incontinence, etc., we must carefully examine the nervous system before forming a definite opinion as to the kind of treatment needed.

Symptoms.—If the motor nerves affecting the bladder musculature (detrusor) only are involved, we have retention of urine. In such cases if the tonicity of the sphincter remains unaffected the bladder gradually fills up till enough intravesical pressure is produced to overcome the muscle at the bladder outlet. Before this occurs, however, pain and strangury often appear and have to be relieved by catheter. The patient in such cases exerts abdominal pressure and in a sitting posture may pass a small amount of urine.

In other cases detrusor and sphincter are both affected, and as the bladder fills up there is a dribbling away of urine. There may be in these cases a few only of the motor nerve fibers uninvolved, and we in consequence have a certain amount of normal action left, and such cases are classed as bladder paretics. This condition of paralysis or partial paralysis is a very distressing condition and one which usually results in a chronic cystitis. These patients are often improved by treatment, but not cured.

Treatment.—The use of the catheter is essential to keep the bladder from becoming distended unduly and also for the purpose of irrigation. The urine should be drawn off under aseptic precautions at least once in

eight hours and washed with boric acid or mercury bichloride 1-50,000 once or twice a day. Each five days a silver solution 1-10,000 to 1-5,000 may be used for vesical stimulation. Electricity, faradic and galvanic, one pole in bladder or rectum and other over lumbar region, is occasionally of assistance. The bladder or rectal electrode is made of hard rubber tipped with metal. The urethral one is of the same material and shaped like a sound. It should be used three times a week for from five to ten minutes. The strength of the current varies according to individual toleration, but is usually between one and five milliamperes.

Sounds may occasionally be used to dilate the urethra.

General treatment consisting of electricity, nerve tonics, such as strychnine and phosphorus, and improvement in other parts of the body, may all be of value.

2. *Injuries to and pressure on motor nerves controlling bladder function frequently relieved by removal of cause.*—Hemorrhage, exudates, spondylitis, tumors, gummata, trauma, causing pressure on spinal column and cord, and temporary retention seen in those working as divers or underground, may all produce severe bladder symptoms.

Diagnosis.—In this class of cases a careful history of the patient and examination of reflexes will usually enable us to arrive at a correct diagnosis. Upon this will depend appropriate treatment.

Treatment.—In suspected gumma, antisyphilitic treatment in the form of intramuscular injections of salicylate of mercury, a grain and a half to two grains suspended in albolene, may be given each five days. A needle an inch and a half long should be used for this purpose. Full doses of Potas. Iodid. are also essential.

In hemorrhages and exudates pressing on cord the bladder symptoms will improve as absorption takes place. Injuries to the spinal column which produce pressure on cord must be, when possible, relieved by operation. In divers and those working in mines and tunnel-building where the atmospheric pressure is great, bladder symptoms in the form of complete or partial retention are not uncommon. In this latter class of individuals the condition is a temporary one, but must be relieved by the use of the catheter. In fact, nearly all these cases require the catheter, and it must be used with strict aseptic precaution in order to prevent infection and cystitis. This is very likely to occur and should be treated as has already been explained.

3. *Various Disorders of the Genito-urinary or other neighboring Organs which by Pressure on the Bladder or through so-called Reflex Action Influence the Vesical Function.*—Usually Curable by Removal of the Cause.—In this class of cases I have placed disorders of the seminal vesicles, prostate, uterus, various abdominal and pelvic tumors, loose kidney, new growths of kidney, stone in kidney or ureter, tubercu-

losis of kidney where the bladder is not involved, and urethral diseases producing spasm of vesical sphincter.

Diagnosis.—The urinary symptoms in patients suffering from the above enumerated disorders are often obscure. No doubt many of the cases classed as “nervous,” or “irritable” bladder have as a cause some one of the conditions mentioned above. We have symptoms which perhaps suggest cystitis, but on examination the bladder is found healthy. Fenwick has reported a case of renal tuberculosis with symptoms of cystitis and in addition fearful pain in glans penis. This became so severe that in spite of the patient being told that the pain was reflex he would not believe it, and in a moment of frenzy from pain amputated the end of his penis, the reflex seat of pain. The disease was, however, entirely limited to the kidney. I cite this case to demonstrate how reflex pain may add to the difficulty of diagnosis and also its effect on the patient’s mind.

Belfield believes that certain diseases of the seminal vesicles of chronic character may account for some cases of so-called “irritable bladder.” Tumors by direct pressure on bladder or ureter may produce urinary symptoms of a distressing nature. A loose kidney by reflex action occasionally causes frequent and even painful urination.

Treatment.—A true cystitis also may follow prolonged pressure on bladder. Therefore urinary antiseptics of the urotropin class are often of use in preventing infection. The bladder should also, if there is

evidence of bladder infection, be washed out three times a week with boric acid solution or mercury bichloride 1-80,000. This, however, is a palliative measure only while we are searching for the causes of the symptoms. When found they must be treated appropriately, which would in many cases mean an operation.

4. *Various Functional Disturbances of the Bladder of Obscure Origin Seen in People Apparently Otherwise Healthy.*—Many of these cases are difficult to permanently cure. In this division I have placed all those cases which must be classed under the heading of functional neurosis. In babies the detrusor muscle is stronger than the sphincter, and as a result when the bladder fills up it overflows. When the child reaches two years usually this relation by proper teaching has gradually changed so that the sphincter is the stronger and prevents the detrusor from contracting and emptying the bladder involuntarily. In other words, as the bladder fills, the sensory nerves in the bladder mucosa transmit impressions to the brain, which, in turn, through the bladder motor nerves connecting with sphincter muscles, cause increased tonicity to resist the detrusor. In cases of enuresis or bed-wetting in children the sphincter of the bladder has insufficient resistance to check action of detrusor, and the result is involuntary emptying of the bladder. The child by being put to bed with an empty bladder and also taken up once or twice in the night, gradually gains increased power over the sphincter, and in con-

sequence either sleeps through the night without wetting the bed or else is awakened by the bladder tension and passes urine voluntarily. The above seems to be the most logical way of explaining enuresis. A very acid urine, according to Bonney, may irritate the detrusor and be a cause of bed-wetting in children. Exposure to cold and wet also aggravates the condition. As the child grows older the sphincter becomes stronger and resists the action of the detrusor, and the child sleeps through the night.

Treatment.—Enuresis may persist till the child grows up, but this is not usually the case. The genital organs should be carefully examined and a tight meatus or foreskin cut and the clitoris in girls if adherent, freed. Silver nitrate in boys, strength $\frac{1}{8}$ to 1 grain to the ounce, may be employed to advantage once in five days as deep injection with Keyes' syringe. In girls the solution should be a grain to a pint and placed by catheter and piston syringe directly into the bladder and then voided. If the foot of the child's bed is raised during the night the condition is often improved. If the child is of a nervous temperament, sod. bromide at bedtime acts well. Belladonna also is of use in these cases.

In adults and children suffering from enuresis no fluids should as a rule be taken for a couple of hours before bedtime. In cases of acid urine this rule does not, however, hold. To waken a patient three to four hours after he has retired, an alarm clock may be used.

In cases of incontinence occurring during the day the

child should be systematically "sat down" at frequent intervals till gradually the power over the sphincter becomes good. It is useless and injurious to punish children for this distressing condition. I have in mind a boy who was constantly wetting his clothes day and night. An examination showed the presence of a vesical calculus. In this case the removal of the stone cured his incontinence.

Polyuria in neurotic individuals. This is shown by passage of an abnormal amount of pale urine of low specific gravity. An examination of such a specimen gives no evidence of disease. The attacks are usually variable, one day normal urination periods and the next frequency but without pain. In such cases the total water passed in twenty-four hours must be measured and examined, also the amount passed at each act of micturition. I have seen patients suffering from simple neurotic polyuria who were told they had "bladder disease," just because the intervals were frequent. A measurement of the urine will, however, in these cases show a normal amount as to ounces passed each time but with perhaps a double twenty-four hours' amount. These patients are usually people living under high pressure from a too exciting life and cannot as a rule be cured without a change of occupation.

In other individuals we have the so-called "*nervous*" bladder where no apparent cause for the trouble can be found even after a complete examination. These patients cannot urinate when they are expected

to, even if left in a room by themselves. They often suffer from pain at time of and following micturition. At times a normal amount of urine is voided and at other times a very small amount only. The symptoms are not present during sleeping hours. The urine passed in twenty-four hours during one of the painful days is increased in amount. Often days and perhaps for a week or two the amount is normal and the patient feels perfectly well. Such cases are extremely difficult to cure. Careful regulation of the diet, use of sufficient fluids in form of soft spring waters, to correct undue acidity, out-door life, are of more avail than local treatment.

ATONY OF THE BLADDER, while not caused by derangement of the nerves controlling vesical function, is frequently so classified.

Diagnosis.—In this condition the muscular fibers of the bladder completely or partially lose their contractile power and become unable to empty the viscus. It is usually dependent on a condition of general arteriosclerosis and consequent degeneration of some or all of the muscular fibers of the bladder. This condition is occasionally seen in old prostatics. There is, however, no direct relation between arteriosclerosis of the bladder and prostatic hypertrophy. The arteriosclerosis observed in atony of the bladder is part of a general hardening of the arterial system. In severe grades of parenchymatous cystitis we may get an atony of the bladder muscle. In this condition we sometimes find atrophy of the prostate. The patient has diffi-

culty in making urine and may have complete or partial retention.

Treatment.—If not relieved by catheter, there is overflow of urine as the viscus becomes distended. Cystitis usually results from this disease owing to imperfect drainage, and it must be relieved by catheter each six to eight hours and use of silver nitrate solution 1-10,000 as a stimulant and cleansing agent. This should be employed every two or three days. Boric acid solution, mercury bichloride, etc., in strengths previously described, is essential to help rid the viscus of bacteria. This treatment in cases of partial degeneration of the muscular fibers, combined with strychnia and general tonics, frequently produces much improvement in bladder tone. Galvanism should also be employed to stimulate the detrusor. We cannot, however, expect to completely cure cases of this type.

The remaining causes of imperfect bladder drainage are *thickening of muscular fibers encircling bladder neck, thickening or over-development of mucous membrane* in this region, *prostatic bar*, and *papillomatous growths* situated at the vesical outlet. Also an *aberrant prostatic lobe* may be a cause of obstruction. This latter condition bears no relation to senile hypertrophy of the prostate and is occasionally seen in young men and boys. It is undoubtedly of congenital origin. I have recently operated on such a case with a resulting cure. Not long ago H. Goldenberg showed me a man with almost complete retention, for which no cause had

been assigned. On operation a small papillomatous growth the size of a split pea was discovered blocking the vesical opening.

Diagnosis and Treatment.—The above enumerated conditions are all likely at first to produce hypertrophy of the bladder muscle and in time cystitis. The cystoscope often helps us to rule out causes other than those directly at the vesical opening. It is, however, difficult, even with a retrograde cystoscope, to see obstruction at the vesical outlet. In fact, in cases of muscular thickening or permanent contracture of the vesical neck, we usually see nothing of diagnostic value. Therefore, the symptoms must be carefully studied. In contracture and prostatic bar a perineal section and drainage is the operation of choice. The finger passed in through the perineal wound will in contracture of the vesical outlet give us a sensation of extreme contracture which does not readily yield. The fibers should be incised to the bladder floor. Prostatic bar is occasionally seen in young men and seems to bear no relation to senile hypertrophy of the organ.

In thickening and redundancy of the mucous membrane, so-called valves are sometimes formed and a suprapubic operation is the one of choice. This latter route is also best for the small papillomata such as Goldenberg operated on. Here we must see what we are doing, and for this purpose while operating an electric headlight should be used. This latter method is also to be used in cases of aberrant prostatic lobes for reasons which Lilienthal has well pointed out. It

is remarkable how small an obstruction will impede the flow of urine from the bladder.

Varices of the bladder are uncommon, but are occasionally observed. Henry G. MacAdam a short time ago saw such a case in his clinic at the Post-Graduate Hospital. The patient was a man of fifty-four who had been suffering with recurrent hematuria for several years. On cystoscopy there could be plainly seen on the left side of the bladder just back of the ureteral opening, several large blue veins which were undoubtedly the cause of the hemorrhages. In such cases, if the hemorrhages become severe a suprapubic cystotomy may have to be performed. If not severe, bladder washing with silver nitrate solution 1-10,000 or stronger, is to be recommended. To check bleeding adrenalin chloride 1-3000 is of value.

Ulcers of the bladder have been referred to under the heading of tuberculosis of the bladder and also in tumors of the bladder. With the exception of the solitary ulcer, which is rare and for which we can find no cause, ulcer of the bladder is a secondary process. Those produced by cystoscopic burns are sometimes seen, but since the use of the low-voltage lamps we have fewer of them. With skill in using the cystoscope they should never occur. Ulcers are usually covered with a grayish slough which is closely adherent at the edges: the surrounding mucous membrane is thickened and reddened; as we get farther from the ulcer it becomes paler, and unless there is a general cystitis normal tissue is finally reached. The mucosa about the

ulcer is like a rosette in appearance. If disturbed by probing it bleeds freely. When near the vesical opening, they are very painful and bleed easily. Much pus usually exudes from them. The cystoscope is our main reliance in determining their character and position. In fact, before the cystoscope came into general use little was known about ulcers of the bladder.

Traumatic ulcers may result from unskilled use of instruments such as the lithotrite. In some cases unskilled use of this instrument has torn pieces of membrane off and even caused rupture of the viscus. Ulcers may be so deeply seated as to include all the tissues of the bladder wall, and if pressure is produced by over-distention rupture may result. In treatment of bladder ulcers we must always bear this possibility in mind.

Treatment.—Direct applications to an ulcer in the vesical cavity can be made in women through the Kelly cystoscope by use of an applicator. Silver nitrate is the best substance for this purpose. Solutions from five per cent. to the full strength may be used. Actual cauterization is not safe, owing to the danger of perforation.

In men, by the aid of the cystoscope and air distention, we can easily make application to the bladder wall with one of several instruments. With my bladder instruments gray tissue covering an ulcer may be removed and applications made. Applications of silver may also be made by use of the ureter catheter even when the bladder is distended with fluid. The

ureteral catheter tip should be placed in contact with the ulcer and the solution injected. This should be done twice a week, silver of 10-20 per cent. In severe ulceration with much bleeding a cystotomy is often necessary. In men a suprapubic cystotomy is the operation of choice. Through this wound an ulcer can be readily treated and the bladder given complete rest. Irrigation should be employed daily. Mild silver nitrate solution in non-tuberculous ulcers is the one of choice. In tuberculous ulcers it is not desirable to open the bladder. The wound is not likely to heal for a long time in such cases, if at all. The reaction of the urine in all instances should be noted and an alkaline urine corrected by use of benzoic acid grain ten to twenty three to four times a day.

Exstrophy of the bladder is a condition where we have a congenital cleft in the abdominal wall and the posterior wall of the viscus protrudes. The anterior wall is absent so that the ureteral openings and interior of the bladder are uncovered. The patients are great sufferers and do not as a rule live long.

Treatment.—The only method of treating them is by operation, and even this is far from satisfactory. Guiteras has recently shown a very excellent result in such a condition produced by gradually building up an anterior wall to the bladder by skin-grafting. This man was about twenty-four years old and had been unable, owing to pain, to wear trousers. He wore a long coat and kept his hand constantly inside of it to keep the cloth from touching his bladder. He was

able after several operations to retain several ounces of urine, and said he had some sexual desire, with occasional erections. Associated with the condition was epispadias. There are different degrees of exstrophy, but in any event the life of the individual is one of agony caused by decomposing urine, irritation of the surrounding skin and lack of rest. These people, as I have already said, rarely live long, which is certainly very fortunate, as they are only a burden to themselves.

Injuries to the bladder from violence are not rare. They result from fracture of the pelvis in some cases; from bullet and stab wounds; from sudden blows over a full bladder; from intravesical instrumentation, as in stone crushing; and from over-distention resulting in rupture at the weakest point. This latter accident is quite easily accomplished while the patient is under general anesthesia, but not as likely at other times, owing to pain. In contracted bladders and in those with deep ulcerations or with deep diverticula, rupture is something we must guard against. In the use of actual cautery to ulcers and after removal of intravesical tumors, we may easily produce rupture. In some instances the bladder has been ruptured in rectal operations. In one case recently reported the bladder formed part of a hernia and was removed with the sac.

Treatment of bladder injuries is purely surgical. The evidence of ruptured bladder is no urine coming from the viscus, or if we inject fluid, little or none

returns. There is usually hemorrhage and great pain over the bladder, increased by pressure. The patient soon sinks into a condition of shock and must be relieved very promptly or he will die from urinary extravasation, and perhaps peritonitis. If rupture has included the peritoneum, the symptoms are more severe, and a fatal result, if an operation is not performed, rapidly follows.

The operation is carried out by opening the bladder freely above the pubis and searching for the tear. The cystoscope cannot be used. The bladder will be difficult to pick up, as no distention can be employed, so either a sound of large caliber is placed in the bladder through the urethra and pointed up, or we make first a perineal opening and use it in opening suprapubically. A headlight should be employed and the rent searched for and sutured. If the peritoneum has been torn we must repair that too. For this we have to make a larger incision so we can obtain a good view of the peritoneum. All wounds should be thoroughly drained for some days after the operation. Large drainage tubes are placed in bladder above and below, too, if it has been opened in both places. For sutures of the bladder small chromicized gut is the best. If prompt action is taken and the patient is otherwise in fair condition, the result is usually good.

Parasites of the bladder are rare in this country and I shall do no more than mention them here. According to Casper, three kinds have been found in the human family: First, the echinococcus; second, the

filaria sanguinis hominis; third, the distomum hematobium. The last form is also called Bilharzia, after its discoverer, and is occasionally seen in this country.



FIG. 35. EGGS OF DISTOMA FROM URINARY SEDIMENT. (After Purdy.)

It was undoubtedly brought in these cases from Africa, Brazil, etc. It produces hemorrhage and painful urina-



FIG. 36. BILHARZIA HEMATATOBIA. A, Male and female in copulation (X 10). B, Ova with polar and lateral spicula (X 12). C, Ovum containing embryo (X 40). D, Free embryo with cilia (X 50). (After Leuckart.)

tion. Hemorrhage may be checked by use of silver or adrenalin chloride. Surgical measures may be employed in some cases.

The *filaria sanguinis hominis* has also been seen in this country in persons coming from Southern countries. Under the microscope the parasites are seen to be

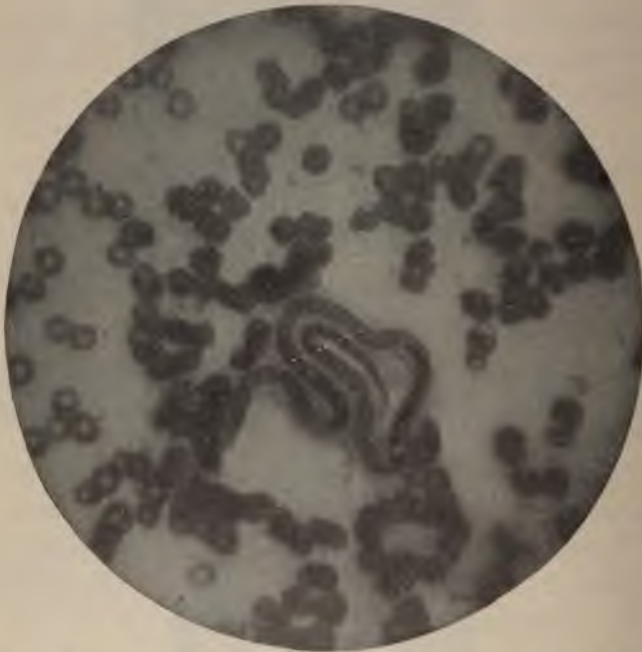


FIG. 37. *FILARIA SANGUINIS HOMINIS* IN HUMAN BLOOD. X 500.
From photograph. (H. T. Brooks.)

cylindroid snake-like bodies which are either enveloped in a firm membrane or lie coiled up in an oval capsule. The parasites invade the kidneys and give a milky appearance to the urine. This condition is called chyluria, or if blood be present, hematochyluria. When it invades the bladder, symptoms of cystitis

develop and we may have hemorrhage and even retention of urine. If the patient goes to another climate the parasites gradually disappear and he recovers. F. Tilden Brown and Richard O'Neil have recently reported interesting cases of filariasis. We see more of these cases than formerly in this country, many of them coming from our outlying possessions.

Fissure at the bladder neck in women is not uncommon, and Dr. Samuel Lloyd lays special stress on its importance. It causes much painful burning on urination. It should be treated by application of silver nitrate through endoscopic tube.

Trigonitis has not received as much attention as it deserves. It is not uncommon in both men and women. It may be easily overlooked in cystoscopy owing to its position. It is occasionally caused by gonorrhoea and may be very resistant to treatment. The trigonum appears very much redder than normal, is thickened and bleeds easily. Manipulation of it is painful. The end of urination is also very painful. Local applications through the Kelly tube in women, and in men, instillation of silver with Keyes' deep injection syringe, and bladder irrigation is the best form of treatment. The urine should be made bland by use of acetate of potash in cases of strong acid reaction. In all cases the correction of the predisposing cause of the trouble is essential to promote permanent cure.

CHAPTER X

DIAGNOSIS AND TREATMENT OF SENILE PROSTATIC HYPERTROPHY

THREE STAGES OF PROSTATIC ENLARGEMENT—SUPRAPUBIC
PROSTATECTOMY—PERINEAL PROSTATECTOMY—TWO-
STEP OPERATION—POST-OPERATIVE TREATMENT—
REPORT OF 84 PERSONAL CASES, 50 SUPRAPUBIC, 34
PERINEAL; MORTALITY, 6.

In senile hypertrophy of the prostate there is a non-inflammatory increase in the normal tissue frequently present in men after their forty-eighth year.

It is a benign new growth and is of two kinds according to the tissues involved; the hard and the soft. In the hard variety we have increase in fibrous and muscular tissue; a fibromyoma. In the soft variety the glandular substance is chiefly involved; an adenoma of the prostate. We may, of course, have an increase in the muscular and glandular tissues at the same time and thus get a mixed hyperplasia of the whole prostate.

It was at one time thought that prostatic hypertrophy was only part of a general disease of the body as seen in arteriosclerosis, but this was a mistaken theory and has been discarded. Prostatic hypertrophy is a common disease of middle life and old age. It is

usually very insidious in its onset and may never cause urinary symptoms. Where it does, the history of the man for several years past as obtained by the physician will often disclose important facts. With symptoms directed toward the bladder in men over forty-eight, in a majority of cases the prostate is at fault.

Diagnosis.—In all cases after we have obtained a careful history of the patient a rectal examination should be made. While a well-marked hypertrophy may easily be felt by an untrained finger, considerable experience in the rectal feel is essential to determine finer points in diagnosis. Some of these points relate to the consistence of the organ, its contour and apparent size, whether it is nodular or sensitive, and as to its mobility. The cystoscope is occasionally of value in determining the amount of intravesical enlargement, its position and general arrangement. A man may, by rectal feel, apparently have a very large prostate, but owing to its position it may not cause any mechanical obstruction to bladder drainage. On the other hand there may be little or no appreciable change noted by rectal feel where there is an intravesical enlargement, which, though small, causes a decided obstruction to micturition. This point is made clear when we consider the way a ball valve closes an opening. An enlarged isthmus or so-called third lobe may act in just this way. In addition to these two methods of determining the size and position of a prostatic enlargement we should measure the urinary distance. In

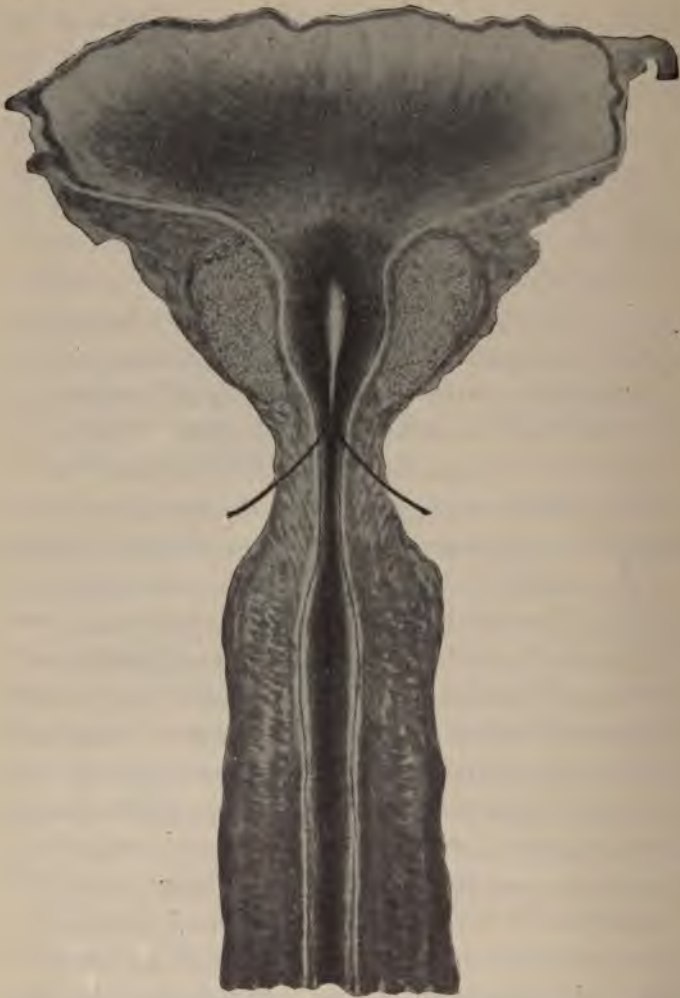


FIG. 38. SECTION SHOWING NORMAL PROSTATE, THE NECK OF THE BLADDER, THE ENTIRE DEEP URETHRA, AND THE POSTERIOR PORTION OF THE ANTERIOR URETHRA. The quills mark the openings of the ejaculatory ducts. (Fuller.)

many cases of hypertrophy the urethral catheter has to be introduced much farther into the urethra than is normal before it reaches the urine. This increased urinary distance results from the hypertrophy lengthening the prostatic urethra. After drawing the urine with the catheter we should measure it and so determine the amount of urine left in the bladder after the patient has endeavored to empty it. Urine obtained in this way is called residual urine, and its appearance, odor, reaction and amount should all be carefully noted.

The early history of a man with beginning prostatic hypertrophy is something as follows: Man over forty-eight, in good general health; may or may not have had gonorrhoea in early life. He notices that he rises once or twice during the night. No particular change in the urinary stream observed, although there may be a little less force than formerly. The stream does not start as readily as it used to and occasionally more has to be passed after apparently completing the act, or a little dribbles out into his clothes.

The patient himself may not have noticed the changes referred to, but perhaps comes in to see his physician for some other entirely different trouble. If we now make a rectal examination, sometimes no appreciable change in the prostate is detected. The patient is next requested to empty his bladder. After this a soft rubber catheter under aseptic precautions and with great deliberation should be passed into the bladder. In cases of beginning prostatic obstruction we

will probably obtain one-half to one ounce of residual urine. If in such a case the cystoscope be used, we usually find a healthy bladder.

The foregoing history and examination is the one usually noted in cases examined in the *first stage* of prostatic hypertrophy. The patient better be told of his condition and in a general way the outlook explained. He will in this way be prepared for a gradual increase of his disease and will also be in a state of mind which will make treatment more satisfactory. If later on an operation becomes necessary, he will be more ready to have it promptly performed and thus avoid the mistake so often made of deferring it till he has become much debilitated. The old idea among general practitioners was to do everything but advise operation, and as a result the patient went through years of terrible suffering and became generally run down and a poor operative risk. Whereas if he had been operated on earlier he would have been saved much suffering, his life made happy and much prolonged. The time a case should be operated on is one of great importance to patient and physician, and I shall endeavor to answer the question in a practical and clear manner.

We do not know the cause of prostatic hypertrophy, but in all probability there is more than one. Gonorrhoea and incorrect sexual hygiene have been placed among the causes. Both these conditions may result in secondary inflammation or congestion of the deep urethra and prostate. They may be influential in

producing the trouble. It is, however, a curious fact that men who have had stricture of the urethra for years, do not as a rule suffer from prostatic hypertrophy.

In patients afflicted with what may be called the *second stage* of prostatic hypertrophy we must be extremely careful in the use of all urethral and bladder instruments. Many of these men are reduced in strength, their resistive power is small and they are easily infected. They are rising four or five times at night, but never completely empty the bladder, usually a few ounces of urine remaining after each act. There is possibly no cystitis present, but instrumentation is likely to produce it by causing trauma and subsequent infection. There is often considerable tenesmus and straining. The stream has little force and spatters down toward the patient's shoes. He usually has much difficulty in starting the stream and at the end it dribbles into his clothes. It is best in a case of this kind where no instruments have ever been used to put the patient to bed before we examine him. Some urinary antiseptic like Formin gr. x t. i. d. should be given in a full glass of water. If the urine is alkaline Benzoic acid gr. xv t. i. d. may be added. Soft rubber catheters of medium size eighteen to twenty-two French sizes are the best. They must be carefully boiled for five minutes after use and put in sterile gauze. Before they are introduced into the urethra the parts should be washed with soap and water and the urethra irrigated with boric acid solution (warm).

Then a lubricant of sterile olive oil, glycerine, or one of the Irish moss preparations should be deposited on the catheter. The catheter is now gently advanced along the urethra till it reaches the prostatic region, and here, unless there is a stricture before we come to this part, we meet our difficulty. All metal and sharp-pointed instruments are dangerous, for, unless in very skilled hands, they produce trauma, and subsequent bacterial invasion is the result. A Nélaton tipped catheter of soft rubber will usually enter the bladder in these cases of prostatic obstruction. It may, however, take time and great patience to overcome the tightening. No force should ever under any circumstances be employed. The gum elastic or silk-woven catheter with the Coudé or bi-Coudé tips may be necessary if the soft rubber catheter does not have sufficient stiffness to overcome the resistance of the prostatic tightening. In other instances we may find it necessary to use the English blunt-pointed catheter. These can be easily molded to any curve we wish while warm, and then placed in cold water to make them firm and thus retain their shape. If, however, we find more stiffness is essential, the wire stylet will be of help. The catheter should be molded in the form of an S; that is, two large curves, practically semicircles. The larger curve encircles the prostate and the smaller one to bring the proximal end of the catheter low down between the patient's thighs.

Many of these patients in the second stage of prostate hypertrophy, who have two or three ounces

of residual urine, if the catheter is passed once a day and bladder washed with boric acid, get on for a long time very comfortably. Every effort should be made to prevent cystitis, but in time it is almost sure to develop. If a man suffering from this trouble is a laborer and unable to give himself proper care, I advise in this second stage a removal of the prostate. If he is a man who can have proper attention from his physician or a trained attendant, I believe it well to use the catheter once or twice a day with bladder washing, etc., as directed above. They should be carefully watched, however, for increasing trouble, and if the catheter is not well tolerated, and cystitis and increased residual urine develop, enucleation of the prostate is the best treatment. The *third stage* in prostatic hypertrophy is often critical and should be corrected by early operation. The dangers are loss of general strength from restless nights and painful efforts to urinate at frequent intervals; sudden and absolute retention with great difficulty or impossibility of catheterization; severe cystitis, ascending pyelitis and hemorrhages.

The above enumerated conditions make any operative interference difficult and add to its dangers. If an operation is performed early in a man of fairly good preservation the danger is very slight, mortality less than five per cent. If, however, we wait for an emergency condition to develop we have a higher mortality. The man's age in itself counts for little. It is his general condition, heart, blood vessels and kid-

neys which we must consider. A man of seventy or over is often a better risk than one of sixty.

Patients who are entirely dependent on the catheter do not live on an average more than four to five years. If an operation is properly performed there is no limit to life as far as the prostatic condition is concerned.

The bad results and high mortality in the past no doubt came largely from the custom of operating on these old men only as a last resort. Also, of course, too, from lack of skill on the surgeon's part. For the first reason several so-called minor operations were devised with the hope of their producing reduction in the size of the prostatic growth. They, however, have all been found useless or really dangerous, and so have been gradually abandoned. The enucleation of the prostate usually produces sterility, but not impotency. As most of these men are old, and many of them have long discontinued an active sexual life, the matter is not of great importance.

During the past ten years a vast amount has been done and written in regard to the subject of prostatics and their treatment. Much gain has been made in the surgical treatment of these old men, and the mortality, by increased skill in operating and in the after care, has been reduced from fifty per cent. or more down to less than seven per cent. for all cases.

In this book I shall not attempt to give more than an outline of the work done in the field of prostatic surgery. To-day the methods of treating the hypertrophied prostate are enucleation by the suprapubic or

perineal route and the galvanocautery methods of Bottini and Chetwood. To Young, of Baltimore, the profession is greatly indebted for much original work in the operation on, and valuable investigations in the pathology of, prostatic hypertrophy.

The pathology of the prostate has been carefully described in a monograph by Green and Brooks. In examining a prostate microscopically the possibility of malignancy should always be considered.

Suprapubic Prostatectomy.—To Belfield, of Chicago, and McGill, of Leeds, is ascribed credit for the first operation on the prostate by this route. In 1895, Fuller, of New York, carefully described an operation for complete suprapubic enucleation of the prostate, with such important changes from the method of his predecessors that the operation is distinctly one for which he deserves full credit and which properly is given his name. Freyer, of London, in 1901, did practically the same operation, but failed to give Fuller credit. Watson, of Boston, in 1897, performed a suprapubic prostatectomy. The suprapubic operation is in my opinion the one of choice. The surgeon, however, should be familiar with the perineal route as well. I am convinced that the perineal drain used by Fuller in his suprapubic operation is unnecessary, nor do I suture the bladder after enucleation.

Operative Technique.—It is performed by me as follows: The patient having been observed carefully for a few days, his bladder irrigated, his heart action, kidneys and general condition studied, is prepared for

operation. He then is given gas and chloroform or ether anesthesia, he first being placed on his back on a table which permits of the Trendelenberg posture. The surgeon should have at least one assistant besides the nurse. An incision two inches long is first made from the pubes in the median line toward the navel down to the fascia and recti muscles. These latter are divided by the handle of the knife bluntly. Now a catheter, which has been previously placed in the bladder, is used to distend this cavity with air by the aid of a rubber bulb. This is better than water distention because the bladder rises into the wound. We now peel back the attachment of the peritoneum from the bladder. The next step is to retract the wound well and pass threaded needles one on each side through the bladder wall. A small cut is now made between these two sutures and the bladder opened and explored. The guys should be left in place. If we wish to enlarge the bladder opening it is better to do it by separation of the fibers rather than by cutting. The prostate is carefully examined and its size and contour determined. We explore the vesical cavity for stones or new growths; and get a better idea of the bladder by this operation than by any other method. Now, with a pair of blunt scissors, or with the finger tip, make a small slit in the prostatic capsule posterior to the urethral opening in the median line. Into this opening the surgeon passes the index finger of his right hand and begins the process of

enucleating the prostate from its capsule. At the same time the index finger of the left hand or perhaps two fingers are introduced into the rectum as suggested by Ramon Guiteras. This is done to aid the enuclea-



FIG. 39. AFTER SUPRAPUBIC PROSTATECTOMY. Diagrammatic drawing, showing, above, a flap of mucous membrane left by shelling out a prominent third lobe, and below, a remnant of the urethral mucous membrane extending back into the cavity from which the prostate has been removed—either of which would tend to form a valvular closure of the urethra. (A. T. Cabot.)

tion by lifting up the prostate and also to prevent tears in the rectum in cases where there are adhesions be-

tween the prostate and rectal wall. The whole operation should not take more than fifteen minutes and frequently even less time. Too much haste, however, is as bad as too long a time. In cases of tough fibrous prostates with adhesions to the rectum we may have considerable difficulty in the enucleation.

After the removal of the prostate, the bladder is cleared of all clots and a large glass drainage tube of No. 40 French scale, also a small one, are placed in the bladder. These are held in place with adhesive plaster. Gauze is placed over the wound and over all is placed a heavy dressing of absorbent cotton to catch leakage. No stitches are taken in the bladder or abdominal wound. The patient is put to bed and as soon as possible given frequently repeated drinks of some soft spring water. Never under any circumstances should these patients receive opium or any of its alkaloids. It depresses the whole economy. Many old men, I feel sure, have been killed by this means. The after-treatment I shall consider later.

Two-step Operation.—In 1896, Lilienthal, of New York, suggested and put into practice a two-stage operation for certain cases of enlarged prostate. The first operation as done by me is a quick suprapubic cystotomy under local anesthesia. The bladder is drained for one to four weeks. When the cystitis and the patient's general condition have markedly improved, a prostatectomy is performed through the same wound. The idea is to give the enfeebled pa-

tient two little operations instead of one big one. I now use it in all suprapubic cases, and believe it will eventually be the operation of choice. It is a procedure akin to nephrotomy and subsequent nephrectomy for pus kidney.

The preliminary cystotomy does all a complete prostatectomy can do; that is, gives perfect drainage without much shock. The patient should not remain in bed more than from two to three days after it. The second operation, the enucleation of the prostate, is carried out in most cases with surprising ease; the man suffers from no more shock than after the cystotomy, and should be out of bed in a few days. Gas anesthesia is often sufficient.

Perineal prostatectomy.—Samuel Alexander, Bryson, Goodfellow, Young, Smith and many others are strong advocates of this operative route. It is performed by me in the following way: The patient after being shaved and scrubbed is placed on his back in the lithotomy position and a perineal section performed by median incision. The prostate is now carefully examined through the incision. If well up in the bladder a retractor of the Young or Syms type will often be of service in bringing it within reach. The prostate is now separated from its capsule with the index finger of the right hand. The index finger of the left hand is placed in the rectum to assist in the enucleation. After the lobes are somewhat freed, a prostatic finger hook devised by me is useful in grasping and removing the loosened lobes or parts of them. We next intro-



FIG. 40. AUTHOR'S
PROSTATIC FINGER
HOOK for use in
removing prostate
after enucleation.
(N. Y. Med. Jour-
nal.)

duce a perineal rubber drainage tube of No. 45 French scale. A couple of deep stitches are now taken in the wound, and the tube tied in place. The tube can usually be removed in three to five days.

The *Bottini operation* has been in use for many years and has recently met with considerable favor. Many surgeons who do prostatic operations advise the use of the Bottini method in certain debilitated old men. Surgeons of high standing, like Horwitz, of Philadelphia, Willy Meyer, Bangs and Guiteras, of New York, and Hagner, of Washington, all have had excellent results with this method.

Chetwood, of New York, has devised a method of *galvanocautery* on somewhat the same principle. By this method the bladder is first opened by perineal section, and then by aid of sight and touch, a special instrument is used to cauterize obstructing tissues. The bladder is then drained by a perineal tube. Wishard, of Indianapolis, has devised an instrument somewhat similar to the Bottini.

The question of the best operative route in prostatic surgery is an important one. In my opinion there is no one route for all cases. In a personal experience of eighty-four prostatectomies, fifty by suprapubic and thirty-four by perineal route, I have come to the conclusion that both routes are valuable.

I believe the two-stage method of operation will eventually supplant the Bottini, Chetwood and Wishard methods of galvanocautery. It will also, I believe, reduce mortality figures to the vanishing point.

In cases with a small prostate, by rectal feel apparently low down and easily movable, I believe the perineal route the one of choice.

In a man with a large prostate difficult to reach by the rectum, not easily movable, and with a probable large intravesical so-called third lobe, I choose the suprapubic method. In all cases of doubt as to the bladder condition, the possible presence of calculi, pockets or a new growth, the suprapubic route is the one to be preferred. I now use the two-step operation in all my suprapubic work.

In my opinion the percentage of cases suitable for suprapubic and perineal operations is as follows:

| | |
|------------------------------|--------------|
| Suprapubic route, two stage, | 90 per cent. |
| Perineal " | 10 per cent. |

In operating by the suprapubic route we are always able to completely examine the bladder, a matter of much importance. We cannot do this with the cysto-

suprapubic operations the drainage tube may be left in the wound five to ten days; in perineal cases, three to five days. The wound must not be disturbed any more than we can avoid. The tubes can be drained by siphonage into a receptacle under the bed.

As to internal treatment, Formin, gr. viiss, three to five times daily is of decided advantage. Benzoic acid, gr. xv three times daily if the urine be alkaline, is helpful in preventing decomposition and formation of phosphatic deposits in the bladder. Strych., gr. 1-30, each four to six hours, if the patient's heart needs stimulation. Castor oil, ℥i, for the bowels is an excellent cathartic. It should be given on the second day. The diet should be simple, but nourishing, consisting of milk, toast, broths, beef juice, eggs and cereals, the great object being to strengthen our patient and by every known means get him up and back to his routine life as soon as possible. No class of cases needs more skill and good judgment on the part of the medical attendant and nurse than the prostatic. After the patient is up and about with drainage tube removed and wound healed following perineal prostatectomy, a full-size blunt steel sound should be passed at occasionally for a few weeks. After its introduction the bladder and urethra are to be washed with boric acid or mild silver solution.

After suprapubic prostatectomy, however, this rule need not be followed, it seldom being necessary to use sounds unless there has been found in addition to the hypertrophied prostate some urethral narrowing.

CHRONIC MYELITIS; TABES, ETC.—Occasionally we see a patient with symptoms closely resembling those produced by prostatic enlargement, but which are in reality caused by some disease of the spinal cord.

Differential diagnosis.—We therefore must be on our guard to prevent mistakes in diagnosis. An operation on one of these purely spinal cases would be useless and of course have an unsatisfactory result. The patella and pupillary reflexes should be tested and the patient thoroughly examined as to the condition of his nervous system. The bladder in one of these individuals is frequently trabeculated, holds a large amount of urine, and is usually markedly free from pain on instrumentation.

There is also, as a rule, a cystitis, owing to poor bladder drainage, the patient often being unable to void his urine.

Treatment in such case after we have made a diagnosis by careful consideration of the history and physical examination, is to wash the bladder daily with boric acid, two per cent. solution or Hydrarg. Chlor. 1-80,000. This must be done very thoroughly, and the patient in addition better be catheterized each eight hours.

Internal urinary antiseptics and tonics are often of value. Mercury and potassium iodid are usually indicated.

We may find in some of these patients calculi in the bladder, which cause much pain and where an operation is indicated to relieve the discomfort.

The following notes were taken from the histories of eighty-four prostatics operated on by me during the past five years :

A man fifty-seven years old was operated on at the Post-Graduate Hospital, November 22, 1905. He had been suffering with prostatic disease for several years, and for three months previous to operation had been unable to urinate. He was catheterized, but was steadily going down hill, until he found it impossible to work at his trade as carpenter. When he came into the hospital he was in a bad condition.

The special point of interest about this case was the presence of a large third lobe. As a rule I cystoscope these cases, but in this instance I did not. If I had I would have seen the third lobe attached by a pedicle which extended up into the bladder ; difficult to reach and extract by the perineal wound. In getting out the two lateral lobes I broke off the pedicle of the third lobe, which, in consequence, could have been easily overlooked. I always make a very thorough examination of the bladder in these cases at time of operation, particularly where I do not use the cystoscope. After a good deal of difficulty I succeeded in getting the large lobe out, but in getting it through the wound it produced some pressure ; a slough followed and made convalescence much slower. If I had made a supra-pubic cut I could have removed it better that way. As it was the slough jeopardized the man's life. The bladder drainage was good, the urine was practically normal, and everything else was in his favor. He is now steadily gaining, is getting control of his bladder,

and will very soon be able, I think, to urinate properly. It usually takes these cases at least six months to regain perfect bladder control.

Age sixty-five, civil war veteran, operated on by suprapubic route four years ago. Had cardinal symptoms of prostatic enlargement, four to six ounces residual urine; made good recovery and died two years later of pulmonary tuberculosis.

Age fifty-nine, watchman, small fibrous prostate, great frequency of urination, residual urine small in amount. Operated on four years ago by perineal route. Reports himself in good condition, but says the stream comes "gradually." Completely empties his bladder. Sexual power unchanged.

Age eighty-four, formerly a coachman. Operated on three years ago while in an emergency condition. Severe hemorrhages and complete retention. In state of shock. This was before I had taken up the two-stage method. Large, soft, adenomatous prostate. Suprapubic cut and perineal opening for drainage. Prostate completely removed, also a stone. Lived six days and died of double pyelonephritis. Autopsy: Ureteral openings admitted finger tip. Before I operated on this case his former medical adviser had been unable for a week to draw urine by catheter from the bladder, so had injected fluid till the viscus, by a mighty contraction, forced the fluid, clots, etc., out. This man, considering his severe treatment, should have been drained suprapubically preliminary to prostatectomy. I began to use the two-stage operation about that time.

2

Age fifty-four, operated three years ago; medium-sized prostatic adenofibroma. Suprapubic route; prostate quickly removed; a large stone, the size of a pullet's leg, was found in the post-prostatic pouch. This had been overlooked by several surgeons. Good recovery, but the case was lost to observation after leaving the hospital.

Age sixty-three, driver; complete retention, operated on two years ago by the perineal route. Adenomatous prostate of medium size. Wound healed on sixteenth day, and he completely emptied his bladder in a few weeks. He has at present some scalding on urination, but feels well; is at work and has normal sexual feelings.

Age fifty-four, car-driver; small fibrous prostate; four ounces of residual urine; mild cystitis; kidneys show evidence of back pressure. Perineal enucleation two years ago; wound healed in two weeks, and six months after operation he reported himself well. Completely empties the bladder every four or five hours.

Age seventy-four, has cystitis, chronic nephritis; using catheter daily, but not entirely dependent on it. Perineal removal of a hard, medium-size fibrous prostate two and a half years ago. Firmly adherent to the rectum as result probably of old abscess in younger days. Some difficulty in removing it. Prompt healing and good bladder tone followed. No evidence of malignancy. No further notes on case.

Age fifty-six, clergyman; referred to by Dr. Ferris two and a half years ago; cardinal symptoms of pros-

tatism of medium severity. Prostate low down and easily reached by rectum. Perineal enucleation took ten minutes. Prostate came out in two parts, which proved to be a fibroma. Rapid recovery and a year later reported that he slept all night and felt as well as he ever had. He thought his sexual power better than formerly. Completely empties his bladder.

Age sixty-three, severe urinary symptoms; ten to twelve times at night and great pain at all times; six or eight ounces residual urine. Diabetes. Operated on a year ago, but owing to certain circumstances the two-stage operation was not performed, to my regret. A perineal operation quickly performed (ten minutes) and a small, hard prostate removed. Good recovery from anesthesia and satisfactory state for several days, when slough appeared in wound and the patient began to fail. He died in two weeks in state of coma. No autopsy.

Age sixty-three, veteran of civil war. Operated on by perineal route two years ago; six to eight ounces of residual urine, albumin and casts. Very painful and frequent urination night and day. Had been suffering with bladder symptoms for five or six years. In hospital two weeks and at home another week before wound healed. In two months patient was urinating normally and completely emptying his bladder. Says sexual desire is about the same as before operation. Continues in excellent health.

Age seventy-three, operated on two years ago by perineal route; mild cystitis, three to four ounces of

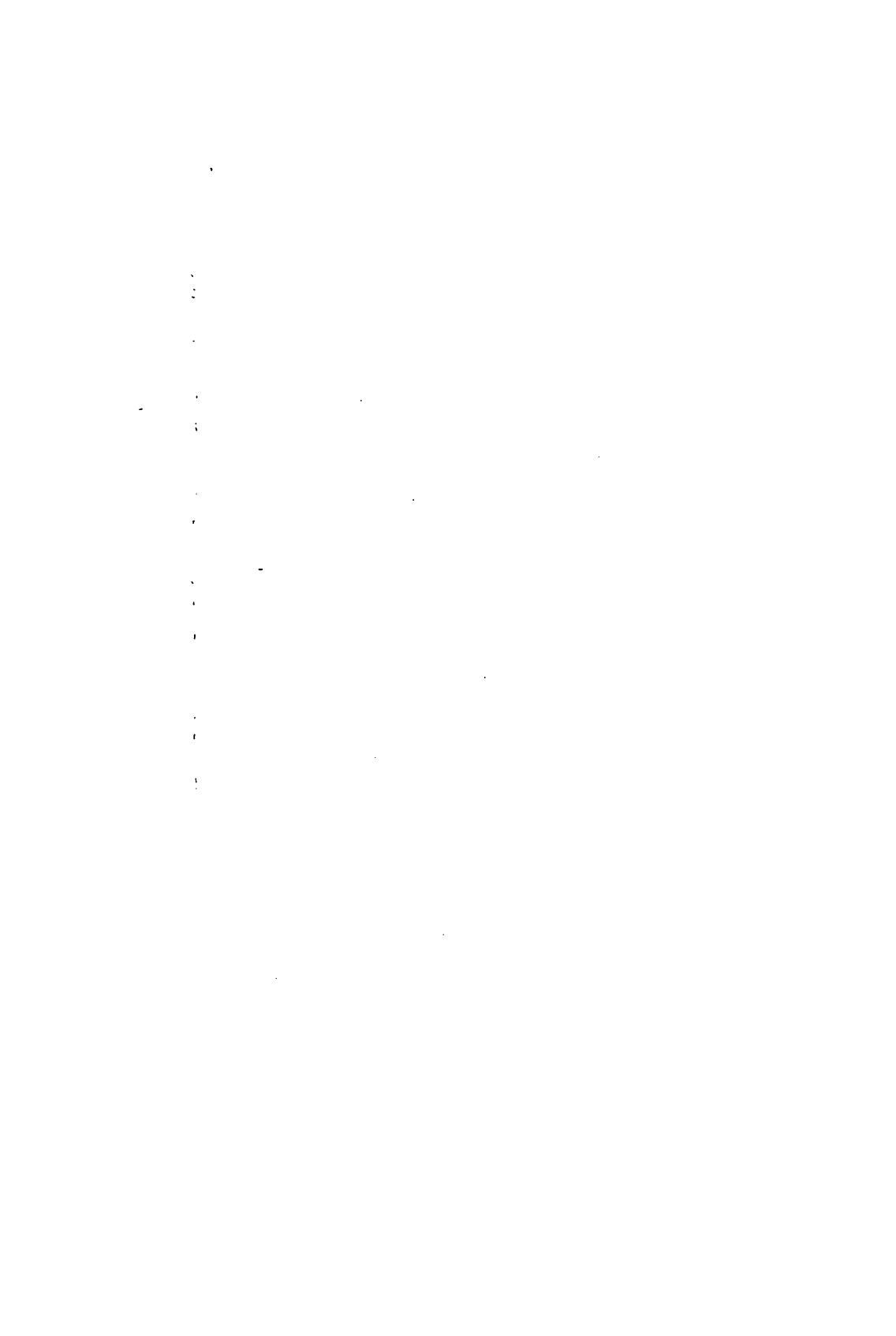
residual urine, rises four to six times. Prostate by rectum, medium size, low down and easily removed; considerable hemorrhage followed, but this seemed rather to improve the arterial condition, which was one of high tension. His wound healed promptly and he now reports himself in normal condition, not getting up at night to urinate. No note on sexual condition.

Age sixty-seven, veteran of the civil war. Operated on suprapubically nine months ago. All done under local anesthesia without much pain. Prostate small and hard, but difficult to reach by rectum. Had a secondary hemorrhage, which was controlled by adrenalin gauze, packed into prostatic wound. Wound did not heal in six weeks, so a perineal cut was made and a false passage slit open. This and the other wound healed in three weeks, but at end of four months still had some incontinence. This was improving when the patient disappeared from observation.

Age seventy-five; referred to by Dr. Hopke. Operated on suprapubically eight months ago. An interval between operations of three weeks. Each operation took about nine minutes. In this case there were symptoms dating back twenty-five years. When I saw him he had a severe cystitis; no rest at night and was rapidly running down; twelve to fifteen ounces of residual urine. Was catheterized once daily. This was a "third lobe" case of a fibrous prostate. At present sleeps all night, empties bladder and feels as well as he ever has in his life. Two years after operation in sound health.

Age sixty-five, operated on three months ago. Complete retention and overflow of urine night and day. Bladder found to contain thirty-two ounces of urine. Has a large amount of albumin casts and a well-developed goitre, a scrotal hernia, well-marked arteriosclerosis, arcus senilis and severe chronic bronchitis. Suprapubic cystotomy under local anesthesia. The prostate, of a very large, adenomatous type, removed; ten minutes under chloroform. The patient wished the operation done at one sitting, and as he stood the preliminary cystotomy well, I consented to finish. Convalescence eight weeks, during which time he had pneumonia (lobar). Before leaving hospital was voiding urine normally. He passed ten to twelve ounces at a time. Catheter showed he emptied it completely. Skin incision not closed, but it seemed best to have him leave the hospital. Has made no report since leaving the ward.

Age fifty-nine, operated on three months ago. Complete retention at that time of ten days' duration. Difficulty in urination for two or three years before. Suprapubic enucleation; very fat abdominal wall, but a good result followed with only slight slough. I was unable to complete the cystotomy with local anesthesia, owing to the patient's nervousness and fat abdominal wall. Healed in seven weeks. Complete emptying of the bladder. Gets up at present twice at night. He has erections as before operation.



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