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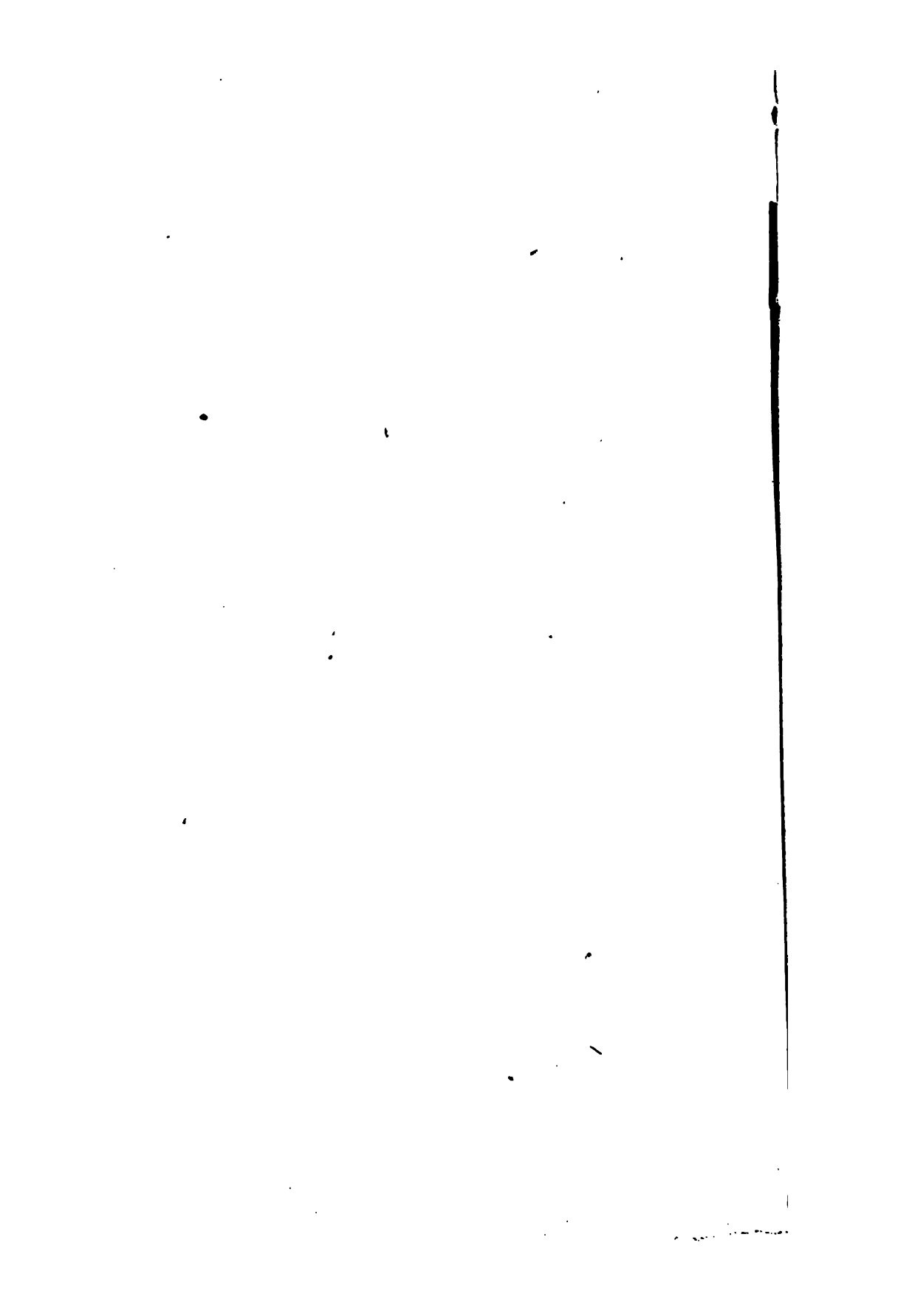
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A TREATISE

Fr. J B

ON

DIAPHRAGMATIC HERNIA;

BEING

AN ACCOUNT OF A CASE OBSERVED AT THE MASSACHUSETTS GENERAL HOSPITAL;
FOLLOWED BY A NUMERICAL ANALYSIS OF ALL THE CASES OF THIS AFFEC-
TION, FOUND RECORDED IN THE WRITINGS OF MEDICAL AUTHORS,

Between the years 1610 and 1846.



BY HENRY I. BOWDITCH, M. D.,

ONE OF THE PHYSICIANS OF THE MASSACHUSETTS GENERAL HOSPITAL; MEMBER OF THE SOCIETIES FOR
MEDICAL OBSERVATION OF PARIS AND OF BOSTON.

BUFFALO:

PRINTED BY JEWETT, THOMAS & CO.

1853.

Ka

YANSHI ZHAI

P R E F A C E .

THIS monograph sufficiently explains itself. Suggested by a case, accidentally met with at the hospital in this city, I prepared the memoir, some time since, for the Boston Society for Medical observation. It has already lain many years among my papers, and doubtless would have rested there many more, had not my friend Dr. J. C. Dalton, Jr., induced me, a few months ago, to present it to him for publication in the Buffalo Medical Journal, of which he was, at that time, acting editor. A few copies are now republished from that periodical.

I have prepared it in a strict accordance with the numerical system, as expounded by Louis. It claims to give, in exact language, the precise state of our knowledge of Diaphragmatic Hernia, so far as that knowledge can be gained from the records left us by authors. It is founded on an analysis of eighty-eight cases, that being the number of recorded facts of this nature, found in Medical Literature during the period from 1610 to 1846. This is a larger number than has ever before been collected by any American or European writer on the subject. I hope that the memoir will be useful to the future student of Diaphragmatic Hernia, but the examination of it can never afford any one a tithe of the pleasure or profit the original preparation of it afforded me.

H. I. B.

Boston, July 4, 1853.

DR. J. BIZOT, OF GENEVA, SWITZERLAND.

Boston, July 4, 1853.

MY DEAR BIZOT,

Allow me to dedicate this monograph to you, as one who will fully appreciate the labor undergone, and the pleasures experienced during its preparation. It may serve to remind you of La Pitié and of the many delightful hours we spent there under the eye of our venerated master, Louis.

I remain, my dear Bizot,

Most sincerely your friend,

H. I. B.

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RECORD OF THE CASE.

The following, imperfect, notes of the case were obtained from the records kept by the surgeons of the hospital. I examined the youth on the day of his entrance, in order to observe the effects produced on the action of the heart by so severe an injury as fracture of the spine. I was much surprised to find the signs detailed below, and was satisfied that the intestines were in the left pleural cavity. I supposed that there had been rupture of the diaphragm at the time of the accident. On several subsequent examinations, every one, I believe, coincided with me in this diagnosis, as to the fact of the altered position of the alimentary canal. The case, I believe to be wholly *unique*, in certain particulars, viz, in the preservation of life and tolerably good health for so many years, whereas it appears from recorded cases, that death usually supervenes, either immediately after birth, or at a very early age, in the vast majority of such cases.

Sept. 29, 1846. F. L., æt. 17, laborer, entered the hospital with fracture of the spine. It appeared that when a child he was surprised, on comparing his chest with those of his school-fellows, to find that his heart did not beat as theirs did, but to the right of the sternum. He had been troubled all his lifetime with palpitations of the heart, and by frequent "stitches" in the left side; and often had attacks of total unconsciousness, by which he was for some time wholly disabled.*

Sept. 25. While resting from his work of raising a piece of timber, the derrick he had been using, broke, and fell, striking him about the middle of the back, and fracturing the spine.

The manner in which the blow was received cannot be exactly ascertained. The only facts obtained are, that he was sitting down at the time, when the derrick swayed, broke, and struck him on the back, probably not directly.

The effects of the accident were temporary loss of consciousness, paraplegia, and imperfect anæsthesia below a line, drawn around the body through the

* Facts learned from a friend after the death of the patient.

umbilicus, and severe pain in the left chest and abdomen, which diminished after two days. The accident occurred at Gloucester, where he received medical treatment. A catheter was passed twice daily, and two or three cathartics given. On the fourth day, he was brought to the hospital on a litter.

On examination. Intellect unaffected. Skin hot. Pulse 132. A protuberance on the back, occasioned by the spinous processes of the three lower dorsal and first lumbar vertebræ. Complete paralysis of lower extremities, with slight degree of insensibility. Fullness and dullness on percussion at hypogastrium.

Pulsation of heart natural, but entirely to the right of median line. Respiration thoracic. Right chest laboring more than left. Left chest more prominent than right, both in front and at side. On percussion, left front chest highly resonant as far as a line dropped from anterior boundary of axilla. Beyond that, dull, even on the back as far as median line. Right chest natural.

On auscultation. No respiration over whole of left chest except from the clavicle down to the space between the second and third ribs. In its place a mixture of gurgling, whistling, and blowing sounds was heard, like those heard over the abdomen, and produced by flatus and intestinal motion. These were not generally affected by cough or inspiratory effort, though sometimes excited by either. No bronchial or amphoric sound. Metallic tinkling occasionally. Voice natural. Impulse and sounds of heart most distinct at right of sternum.

Diagnosis. Probably rupture of diaphragm and intestines in left chest. Catheter was passed. Elixir opii., gtt. xxx. given, and patient left for the night.

Sept. 30. Slept well. Had no pain. Pulse 132.

Oct. 1. Lies quiet; makes no complaint except of flatus. Enema; laxative diet.

Oct. 13. An amphoric sound, with metallic tinkling, is occasionally heard in left front chest, most intense over cartilages of fourth and fifth ribs. It seems rather stomachic than pleuritic, or pulmonic, its tone being very sharp; it is but slightly affected by the respiratory act.

Oct. 15. Respiration labored. Cough frequent. Throat is clogged with mucus, which he raises with great difficulty. Urinary bladder seems to contain air. It is resonant up to umbilicus, but found contracted on the catheter being used.

Oct. 17. Very feeble. Does not readily answer. Appetite quite good. **tatory sounds the same. Mouth sore.**

Oct. 18. As yesterday. Urine passed freely by catheter. Bladder is felt in hypogastrium as a small, hard, round tumor.

The above detail of symptoms is sufficient for my purpose. The patient died Oct. 20.

The post-mortem examination was made very hurriedly, owing to circumstances beyond our control. The trunk presented no unusual appearance in front. Abdomen moderate in size, certainly not distended. On raising the sternum, the stomach, the major part of the colon, and several folds of the small intestine, with the omentum, were found in the left chest. These organs were much distended with flatus, but appeared perfectly healthy. No trace of recent lymph or injection about them on the pleura. The lung was compressed to the greatest degree and looked like a lung that had been confined by a pleuritic effusion, save that it had not the usual *sodden* aspect observed in pleurisy. The heart was pressed to the right side, but that, with the right lung, was healthy. The liver, resting upon the right side of the diaphragm, was normal. The spleen was healthy, and in its usual situation under the left ribs. The bladder was seen above the pubes, and contained about half a pint of purulent, flaky-looking, very offensive urine. A fold of small intestine was adherent to its fundus, by soft adhesions, and extended from there to the umbilicus, and was much distended with air. The coats of the bladder were dark and gangrenous. The diaphragm was perfectly healthy at the right side, but was almost wholly wanting at the left. It consisted — 1st. Of a triangular piece extending from front backward. This was $5\frac{1}{2}$ inches long from sternum to spine, and only $2\frac{1}{2}$ inches broad at its base, which was attached to the sternum and cartilages of ribs. Toward the spine it presented an opaque, whitish, rounded, somewhat cord-like aspect. On examination it was found composed of a muscle, and on each side was serous membrane, viz., pleura and peritoneum. Near the sternum and vertebræ, for the space of about an inch, these two membranes were united, and smoothly so, the line of demarkation in the part near the spine being invisible, while in that toward sternum they were joined by a cellular structure. The intervening space showed the muscle about $\frac{1}{4}$ inch thick, and the two membranes firmly attached to it. 2d. There was a small semilunar portion only of the diaphragm near the spleen, lying by the side and a little underneath the intestines, that had passed into the thorax. But over the whole of the breast and a good part of the side, the peritoneum and pleura seemed continuous, forming one large smooth cavity.

It was evidently a fetal arrest of development.

ANALYSIS OF CASES REPORTED BY AUTHORS.

The preceding case having been one of exceeding interest to me, I determined to investigate the whole subject, as I might find it displayed upon the records of medical science of the past and present (1846) times. The results of that investigation, I propose now to lay before the society.

The earliest writers of our art believed that a wound of the diaphragm must inevitably be fatal. Even the celebrated Dr. Fothergill, in a letter that he wrote to Dr. Mead about one hundred years ago, and in which he gives a very interesting account of a case of Diaphragmatic Hernia, thus exclaims: "Every one skilled in medicine, I think, will suppose, from the history, that the disease was a new one. But who would ever have conjectured that the diaphragm (*septum transversum*) was divided asunder, and that a large portion of the stomach and intestines had rushed through this opening into the breast?" And again, in his naive enthusiasm, he says: "Behold! a sight never, that I am aware of, seen before!"*

Unfortunately, Dr. Fothergill's learning failed him on this point, as I shall now proceed to show.

A century and a half, or thereabouts, before the above letter was written, we find two cases reported in the quaint but still admirable *Opera Chirurgica* of the father of French Surgery, old Ambrose Paré. One of them proves the incorrectness of the above mentioned opinion of the older writers, that a wound of the diaphragm is necessarily fatal.†

Following him, I find a letter written in most barbarous Latin, by Senertus to Fabricius Hildanus, in which a melancholy tale is told of a soldier, who, in despondency of heart, fell upon his sword. It entered about the fourth and came out at the ninth rib, wounding the diaphragm in its course; as was proved six months afterward, at which time hernia was discovered.‡

Still later, comes to my notice a case of congenital disease of this kind, mentioned by Riverius. The sufferer, he tells us, was a pensive youth, 24

* Works of John Fothergill, &c. By John K. Lettsom. London, 1784.

† *Opera Chirurgica* ab Ambrose Paræo. Franckfort, 1610. Ch. 30, p. 230.
 ‡ *Opera* Gulielmi Fabricii Hildani. Franckfort, 1646, cen. 2, obs. 33, p. 108.

years of age, and one lung was almost wholly compressed in consequence of hernia of some of the organs of the abdomen.*

Other cases appear in the Philosophical Transactions,† Memoires de l'Academie Francaise;‡ but the first person who attempted a regular treatise on the subject was Kirschbaum, a little before the middle of the last century. He has collected seventeen cases from his own observation, and from the works of others. His dissertation is well worthy of the times and of the place in which it is now found; namely, in works of the "most excellent Haller."§

Not long after this, that extraordinary man, the pupil of Valsalva, and upon the fame of whose genius Italy might well have rested a century,—Giambattista Morgagni took, as the subject of a part of one of his letters, the question of diaphragmatic rupture. He treated it, as he always has treated his subjects of investigation, in a most accurate and manly style. ||

Passing through the numerous, though briefly related and tantalizing, cases, recorded by Lieutaud,¶ the interesting observations by Dr. McAulay** and others by Vicq d'Azyr†† and Portal,‡‡ we come to the great surgeon of modern times, and his magnificent work on the general subject; I allude to Sir Astley Cooper and to his work on Hernia.§§ To this gentleman we owe the first systematic and thorough discussion of the various forms of this complaint, although I think that one more class may be justly added, consisting of only two recorded cases, to which I shall allude at a future time.

Since the publication of Mr. Cooper's works, many isolated cases of this complaint have been published, and may be found in the various journals of the day. Admirable treatises have been written upon it by Lawrence,|||

* Lazari Riverii Opera Med. Univer. London, 1698, Obs. Cent. Quart., obs. 67.

† Philos. Trans. Abridg. 1594 to 1703, vol. iv., 630. Sir Charles Holt.

‡ Memoires de l'Academie, 1729, pages 11 and 124. Cases by Chauvet and Senac.

§ Dissert. Chirurg., vol. iii., p. 217. Lausanne, 1755.

|| Seats and Causes of Disease, vol. iii., Letter 54.

¶ Historia Anatomica Medica Auct., Joseph Lieutaud, vol. i., obs. 208, &c.

** Medical Observations and Inquiries, vol. i. London, 1771.

†† Memoires de l'Academie Francaise, 1772. Second part, p. 81.

‡‡ Cour d'Anatomie Medicale, par Antoine Portal, Tom. v., p. 82. Paris, 1803.

§§ A Treatise on Hernia, by Astley Cooper, &c. London, 1824.

||| On Ruptures. London, 5th edition. 1838.

Cloquet and Berard,* Percy,† Stierling,‡ Dreyfus,§ Auzelly|| and Mehliss.¶

Upon 88 cases, some collected by these various authors and others found scattered through medical journals published since the commencement of the present century, I shall rest the results that I shall present. I have subjected them to a strict numerical analysis. This is the largest number ever collected for this purpose, and although some of them, especially the earlier ones, are not quite so much in detail as we could wish, I think some curious results may be obtained from the whole mass. This seems to be a small number of observations; but I know that I have carefully examined many works and journals from 1610 down to 1846, and I am convinced but few more can be found. Every one, also, who consults his own experience, must feel assured of the infrequency of this occurrence. Curling says only two cases have occurred in ten years at the London Hospital, 1000 patients being annually admitted.

CLASSIFICATION OF THE SUBJECT.

I propose to treat the subject under the following general heads:

1st. Anatomical Characteristics.

* Dictionnaire des Sciences Medicales, in 30 vols., 1835. Art. Diaphragm.

† Dictionnaire des Sciences Medicales, 1818. Art. Diaphragm.

‡ Dissertatio Inauguralis Anatomico-Chirurgica de hernia diaphragmatis cum tabulas iii. Auct. *Hüb. Griff. Stierling*, Heidelberg, 1834, in 4to. See Archives Gen'les de Medecine, second series, vol. xii., p. 387.

§ Abhandlung ueber die Brueche des Zwerchfells in beziehung auf gerichtliche arzneikunde, &c., &c. Tübingen, 1829. Journal des Progres, (vide below.)

March 15, 1847. I have not been able to procure copies of the two last mentioned, but of one of them, at least a very full account is given in the Journal des Progres des Sciences et Institutions Medicales, 1829. Paris, Tom. 17, p. 125. With the results of this author I shall frequently compare my own, because his paper purports to be an analysis of facts.

|| These pour le doctorat en Medecine, presentée et soutenue le 30 Août. 1842, par Aristode Raymond Auzelly.

¶ Die Kraukheiten des Zwerchfells des Menschen von C. W. Mehliss, M. D. Eisleben, 1845. (B. and F. Med. Rev.)

- 2d. Symptoms.
- 3d. Causes.
- 4th. Ages, sex, profession, &c., of patients.
- 5th. Duration of life in congenital cases and in those produced by wounds.
- 6th. Do. during fatal attacks.
- 7th. Different species of Hernia.
- 8th. Diagnosis.
- 9th. Prognosis.
- 10th. Treatment.

I. ANATOMICAL CHARACTERISTICS.

On which side of the diaphragm was the hernial opening found ?

Table 1.

It was observed in the left side of diaphragm	41 times.
" right "	18 "
" both "	3 "
Diaphragm was wanting	1 "
" and mediastinum were absent	1 "
" was pushed up into chest on one side,	2 "
Mediastinum wanting, with double rupture,	1 "
Doubtful which side of diaphragm was ruptured,	21 "
	88

Why is it that rupture of the diaphragm occurs so much oftener on the left than on the right side? There are many reasons why this should happen:

1st. Among the more obvious, it may be mentioned that the great mass of the liver, partially united, as it is, to the diaphragm, becomes a kind of bulwark to defend the right side of this muscle from undue pressure.

2d. The right crus of the diaphragm is longer and stronger than that of the left side.

3d. There are two fibrous bands at the right side of the diaphragm, which do not exist at the left.

4th. We have in addition to all these means of support for the right side

the exposed condition of the left side of the diaphragm, and two minor points of interest, bearing on this subject, viz: two distinct pouches in the left side, one for the spleen, the other for the cul-de-sac of the stomach to rest in.*

These reasons appear to me more than sufficient to account for the fact that hernia of the right is less frequent than that of the left side. But great as it is, the numbers do not give so strong a view as the expression by Scheller, of Berlin, who says that "the hernia of the right side is excessively rare."†

Nevertheless, although the proportions given by my numbers may not be entirely accurate, owing to the comparatively small number of cases analyzed, they are a greater approximation to the truth than any general assertion.

EXAMINATION OF THE PECULIARITIES OF HERNIA OF THE RIGHT SIDE.

Hernia into the right side of the thorax occurred 18 times. Of these cases, 11 presented the very unusual form of hernia with a complete sac, formed by the pleura and peritoneum. So rarely has this form of the affection been observed that all writers on the subject have noticed its infrequency. Cloquet and Berard said,‡ in 1835, that in all the Annals of Medical Science, they could find but two such facts. Though they were in error, when they made the number§ of recorded facts so small, they were right on the general proposition that sacculated diaphragmatic hernia is very seldom met with. Lawrence speaks to the same purpose.|| Sir Astley Cooper had never seen a case.¶

But a still more curious fact is this, viz: that these 11 cases of hernia of the right side compose more than five-sevenths of all the cases of sacculated hernia that can be found in the records of ancient or modern time. To make this more plain I shall give another table.

Table 2.

Hernia was found 41 times at the left, and sacs existed 3 times.

“	“	18	“	right,	“	11	“
---	---	----	---	--------	---	----	---

* For these various anatomical details, I am indebted to the great work by Bourguery and Jacob. *Anatomie Elementaire en 20 planches.* Paris, 1836.

† *Archives Gen'les de Medecine*, 3d Ser., vol. 18.

‡ *Diet. des Sciences Medicales*, 1835. Art. Diaphragm.

§ At least five I have found in authors who wrote before 1835.

|| *On Ruptures.* London, 5th ed. 1838.

¶ Yet Mons. Auzelly (*These pour le Doctorat en Medecine*, Paris, 1842.) would limit the definition "hernie diaphragmatique" to such cases only.

The mention of an additional fact will make this tabular statement yet more prominent. 2 of the 11 cases had 2 sacs each, making 13 sacs on the right side of the diaphragm, while only 3 have existed at the left side of the median line.

The *causes* of the greater prevalence of sacs at the right side than at the left side are, I think, as follows:

1st. Just back of the ensiform cartilage, the diaphragm, where it comes in contact with the mediastinum, is thinner in its fibrous structure than elsewhere, and cellulo-vascular openings separate this fascia from the cartilages of the seventh rib.* Cloquet and Berard say: The anterior fibres, (of the diaphragm,) often leave a triangular space behind the ensiform cartilage, through which the cellular tissue of the mediastinum is continuous with that of the anterior parietes of the abdomen.† Wilson ‡ gives the following plate, (Fig. 1,) and it is illustrative of this subject. It represents the anterior part of abdominal surface of the diaphragm. 1. Section of ensiform cartilage; 2,2. Right and left portions of muscles of D.; 3. "A thin fasciculus which arises from the ensiform cartilage, leaving a small triangular space on both sides which is

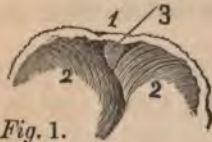


Fig. 1.

completed only by the serous membranes of the abdomen and chest." It is exactly at these weak points, I believe, that sacs usually commence. I have been able to make a small numerical statement in support of this idea. In 7 of the 11 cases in which sacs were found at the right side of the diaphragm, the part through which the hernia had taken place was noticed as in the following table:

Table 3.

In 2	it was	"to the right of the ensiform cartilage."
2	"	"just back of the ensiform cartilage."
In 1	it was	"through the anterior fibres."
1	"	"aponeurosis."
1	"	"muscular structure."

In other words, in 5-7 of the cases, the rupture took place as indicated above. I do not, however, quote these remarks as *proving* what I say, or as

* Bourgery and Jacobs, Elemens, &c., ut supra.

† Dictionaire des Sciences Medicales, 1835.

‡ Anatomist's Vade Mecum. London, 1840.

being of any great weight in themselves; but I believe it to be a rule of common sense, as well as of the highest reason, that a small fact sometimes becomes highly significant when conjoined with others, whereas, isolated, it is of little or no value.

2d. These sacs form gradually, and not unfrequently in the following manner: Small portions of fat, situated about the ensiform cartilage, are gradually pressed through the thin, weak spots on each side of the muscular fasciculus just described as existing back of the ensiform cartilage. Gradually, a small fold of the intestine follows after, pressing forward the fat and keeping it at the bottom of the cavity. Such sacs may vary from the size of a thimble to one capable of holding the liver, and in one case on record there were appendices, as it were, to the main sac, each containing small quantities of fat.* In some cases the sacs are represented as having passed up into the mediastinum and thence into the right pleura. And this last fact brings us to the final reason why they tend to the right rather than the left.

3d. In the annexed figure we have an ocular demonstration why, after a sac begins to form under the ensiform cartilage: it first presses into the mediastinum, and thence much more readily goes to the right than to the left side of the thorax.

A glance at this plate shows how much more it is likely for hernia, that comes on by degrees, to occur at the right than at the left. The right pleural cavity is, in fact, much nearer the median line A B, than the left one is, and 2d, the left is compressed to about one-third the size of the right.

* The following case by Berard, Jr., (Supplement to Scarpas,) illustrates these views: "The opening of the diaphragm was caused by the non-insertion of its anterior fibres into ensiform cartilage. There were two sacs, one at the right three inches long, of the size of the intestine; other at left, size of thimble. The mouths of these were smooth and round, and a little smaller than the fundus. At the bottom of the smaller one was a small globular body of fat. The mediastinum was distended with fat, and from both sides of it were protruded several little fatty tumors like appendices epiploicæ."

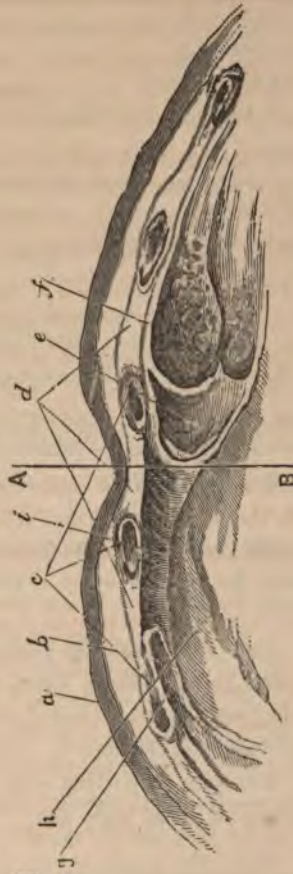


Fig. 2.

This figure shows a horizontal section of the front of the chest on a level with the ensiform cartilage, and seen from above.

a, skin; *b*, muscles on the parietes of the chest; *c*, sections of cartilages, &c., of ribs; *d*, intercostal muscles; *e*, cavity of right pleura; *f*, lung collapsed; *g*, left pleural cavity; *h*, part of pericardium.* A B, median line.

Contents of the Sac. They were noted in six cases.

* Copied from Bourguery and Jacobs' plates. See above.

Table 4.

The omentum was found in it	6 times.
The colon; usually a part of it,	5 "
" An enormous mass of intestine,"	1 "
Right end of stomach and part of the duodenum,	1 "
Appendices epiploicæ,	1 "
A mass of fat was at the bottom of one and floating } in the cavity of the pleura,	1 "
Part of liver, stomach, colon and spleen,	1 "
" " "	1 "

Usually one or more of these parts were found into the same sac, and in one case, were parts of the stomach, duodenum, omentum and arch of the colon.

In two of the cases, it is expressly mentioned that there was no adhesion, and the parts could be easily drawn out.

In one case, there was an adhesion of the liver to the interior of the sac; and in two more, there were adhesions to the contents, and likewise, externally, to the ribs, causing the parietes to be drawn in with each act of respiration.

Nature of the Sacs. They were invariably composed of the two serous membranes, peritoneum and pleura, with, at times, some thickened cellular membrane over them; they were usually rounded, or conical, smooth at the fundus, and at times wrinkled near the mouth. The mouths were usually smaller in circumference than other parts; they were rounded, like the pylorus, and variable in thickness; at times, quite thin.

RUPTURE OF BOTH SIDES OF DIAPHRAGM.

There were, as we have seen, three cases of this kind. (Table 1.) It must be, therefore, a very rare affection, except, perhaps, in very malformed subjects.

Two of these cases were congenital, and in one the child never breathed; in the other, life was sustained ten months, but with very severe symptoms, (dyspnœa, vomiting, &c.;) and the third was that of a man who, at the storming of a certain citadel, was thrown down from a high rock and killed almost instantly.

From these facts, though small in number, we may certainly be confirmed

in the idea, which would naturally arise, that with a double hernia it is impossible to have a comfortable life, and usually death supervenes immediately. At the same time, however, the second case wholly sets aside the opinion that children, born with hernia of the diaphragm, even of a most severe character, invariably die. As we proceed we shall find other cases in confirmation of this suggestion.

DIAPHRAGM AND MEDIASTINUM WANTING.

This is a very rare affection. Only once have I found it recorded. (Table 1.) Unfortunately this case is given, with very few details, by Lientaud, as having been noticed previously by Diemmerbrock.* But, strange as the fact may appear, the child, thus wanting in two of the most important parts, lived to the age of seven years; always suffering, however, "from chronic asthma and frequent cough."

The mediastinum was wanting in one case, given by Sir Chas. Holt.† The child lived two months, moaning, and with constant dyspnoea. Absence of mediastinum, and hernia of the left side were observed at the autopsy.

DIAPHRAGM PUSHED UP INTO THE CHEST.

This is likewise of very rare occurrence, only two specimens of it having been observed among the 88 cases. (Table 1.) Strictly speaking, there is no hernia in the case, the whole muscle on one side being thrust upward, and thereby compressing the corresponding lung. One was the case of a soldier to whom, after a debauch, an antimonial emetic had been given, and death was the result. At the autopsy, the diaphragm was found pressed strongly up into the chest. Of this case, however, a person may have some doubt; but I do not see that any one can doubt about that related by Senac.‡ In that, the right side of the diaphragm was greatly pushed upward, almost to the clavicle, and the right lobe of the liver was in the space. The lung, of course, must have been as much compressed, as if there had been a rupture of the diaphragm.

ABSENCE OF THE MEDIASTINUM WITH DOUBLE HERNIA.

I have found only one case of this kind. (Table 1.) It is quoted by

* *Historia Anatomica Medica*. Paris, 1767. Vol. i., page 100, obs. 792.

† *Philosoph. Trans.*, ut supra.

‡ *Memoires de l'Academie Francaise*. 1729, page 124.

Kirschbaum,* and by Lieutaud,† having been originally recorded by Becker.‡ It is one of the most extraordinary in the annals of medicine. The subject of it was a child, five years old at the time of its death, and who, from the age of two years, had had gradually augmenting dyspnoea, with forcible elevation of the chest, great liability to cough, and some dyspeptic symptoms. At death, the heart and liver lay in the right, the spleen and stomach in the left pleura. Verily it seems hardly possible for a human being to have lived, even a moment, under such circumstances, and yet, supposing that the organs were (some of them at least) thrust into their abnormal positions not immediately after birth, the symptoms distinctly showed that the major part of the disease must have been affecting the little patient for months, perhaps years, before death.

CONDITION, SITUATION, &C., OF THE OPENING IN THE DIAPHRAGM, &C.
NOTICED IN SEVENTY-SIX CASES.

Table 5.

It was described as <i>round</i>,	. . . . .	19 times.
“ <i>a lunar arch</i>,	. . . . .	4 “
“ <i>oval</i>,	. . . . .	1 “
“ <i>smooth</i>,	. . . . .	5 “
“ <i>large</i>,	. . . . .	19 “
“ <i>cartilaginous</i>,	. . . . .	2 “
“ <i>thick, callous</i>,	. . . . .	3 “
“ <i>opaque, yellowish, firm and even</i>,	. . . . .	1 “
“ “ <i>muscular</i>,	. . . . .	1 “
“ <i>thin, soft edges</i>,	. . . . .	1 “
“ <i>large and recent</i>,	. . . . .	10 “
“ <i>edges uneven, red, fringed</i>,	. . . . .	2 “
“ “ “ . . . . .	. . . . .	1 “
“ <i>torn from sternum and side of chest</i>,	. . . . .	3 “
“ “ <i>attachment near œsophagus</i>,	. . . . .	1 “
“ <i>owing to deficiency of fibres</i>,	. . . . .	5 “
“ <i>through œsophageal opening</i>,	. . . . .	3 “
“ <i>aperture for intercostal nerves</i>,	. . . . .	2 “

* Haller's Diss. Chirurg. (as above,) vol. iii., 217.

† Hist. Anatom. Med., vol. i., obs. 216.

‡ Acta Erudita Lips. A 1706, Apr., p. 17.

Pleura and peritoneum were united	3	" times.
Peritoneum abruptly terminated	1	"
A valvular apparatus formed by pleura,	1	"
It was in the muscular structure	9	"
" front of "	1	"
" tendinous "	11	"
" behind sternum immediately,	1	"
Narrower than the sacs	1	"

EXAMINATION OF THE INFERENCES TO BE DRAWN FROM TABLE FIVE.

The *rounded, oval, or semi-circular tendency* of the openings is very manifest, (24 times.) This has been observed previously by authors, and a moment's consideration of the anatomical structure of the diaphragm will lead us to the reasons for this form. The muscular fibres run somewhat in a circular direction; hence their contraction would tend to the production of, *first*, a rounded aperture, modified, perhaps, by accidental circumstances, into the semi-circular or oval; and *second*, we learn from this structure of the diaphragm the almost total impossibility of a closure of the wound, in case of any injury of the diaphragm, causing a rupture of its coats.

The *smooth and polished or cartilaginous and thick* aspect, is very manifest from the table, (10 times.) In fact, I have no doubt that this number expresses too small a proportion. The long-continued, though, perhaps, gentle polishing by the vermicular movement of the alimentary canal, must inevitably tend to this result. Authors have noticed it before. It was very manifest in our case at the hospital, where there must have been less friction than in the majority of the cases. The same remarks may be made in regard to *thickness*.

In only one case of a chronic character were the edges described as *thin and soft*.

The opening is represented as large in 19 cases. Of these, 11 were the effects of recent severe injuries, such as falls, severe pressure, wounds, &c., followed either instantly, or in a few days, by death. The remainder were either congenital or of several years' duration. This would seem to indicate that even a large rupture of the diaphragm, though *eventually*, usually fatal, is not so necessarily fatal at the time of accident as one would at first sight suppose. I do not, however, lay much stress on this result, because some of the cases may not have been sufficiently explicit, in regard to the exact size,

only a few of them having been measured, and the word *large* being in itself very indefinite.

It was *uneven* and *fringed* in three cases, two of which were from severe injury and from labor pains and evidently recent. The other was an old case of accident. Serious symptoms and signs of enteritis supervened, and death took place a year afterward; but there was nothing at the autopsy to explain the cause of this unevenness.

In two of the above cases, there was a bloody appearance of the edges and parts about, from the extravasation of blood.

The diaphragm had been largely torn from *the sternum and ribs* in three cases, from the parts *near œsophagus* in one. In two of these, one arising from over-exertion under difficult circumstances, and the other from a fall from a cabriolet, death was instantaneous. The two others were congenital or of a year's duration, thus confirming what we have said above, that some cases, at least, may not result in instant death, even though a very extensive rupture take place.

Among the five in which there was "*a deficiency of muscular fibres*," three presented it at the posterior part, forming in one a "chasm." In the third the fibres were absent in such a way as to allow of a sac being formed. The first three were cases — 1st, of a still-born child; 2d, of one who lived three-quarters of an hour only; the last was that of an adult man.

DILATATION OF ŒSOPHAGEAL OPENING.

The cases of *dilatation of the œsophageal opening* were very curious. They were three in number. They were all in adults; two of these were drunkards. In one, only, a small part of the ileum had entered into the chest; in two others a much larger quantity, viz., stomach, epiploon, duodenum, jejunum, and part of ileum. Unfortunately, few details are given.

DILATATION OF AN INTERCOSTAL NERVE OPENING.

There were two cases of *dilatation of the passage made by one of the intercostal nerves*. The details are too indefinite for analysis. In both, however, the pancreas and a part of the colon were the parts that had passed into the chest, and in one the pancreatic vein was ruptured. The cause of these organs being thus forced upward is undoubtedly their position, directly underneath the hernial opening.

The statistics in regard to the *union or otherwise of the pleura and peritoneum* do not afford, as I think, a just idea of the usual condition of these

membranes. Nor can I state any general rule in regard to it. In our hospital case, and at a hasty examination, these two membranes seemed to present a uniform smooth surface over the major part of the ribs from the sternum to the side; but on the muscular mass that extended from the sternum to spine, the two were united at both extremities for half an inch or thereabouts, and in the intervening space, they were separated by a cellular membrane. In one of the cases in the table, it was impossible to distinguish the dividing line. This was that of a child, twenty months old. On the contrary, in one of the severest and most chronic cases on record, given by Sir Astley Cooper, the peritoneum terminated abruptly at the orifice.

ADHESIONS OF DIFFERENT ORGANS TO THE DIAPHRAGMATIC APERTURE.

The fact of adhesion is mentioned only eight times, and although this may not express the exact number, I have no doubt, from other statements, made by authors in regard to the *smoothness, roundness, &c.*, of the aperture, that this conveys a tolerably accurate idea of what really happens. In one case, these adhesions were very strong, requiring the scalpel for their removal. In the others they seem to have been more slight.

The omentum adhered in three cases, the spleen and colon, each, once; and finally, the pleuræ were adherent around the edges of the aperture in one.

WERE THE ORGANS STRANGULATED OR NOT AT THE OPENING?

The facts relating to this topic are twelve, of which five are described as cases having an entire freedom from strangulation, and allowing an easy return of the organs from the chest. In the other seven there was a very close grip by the aperture upon its contents. Very serious effects were visible as consequences of the stricture. In all but two of them, the stomach or intestines thus caught were highly inflamed, usually dark or livid, and once gangrenous and ruptured. In two, peritonitis in various parts was observed, and a bloody fluid was found in the peritoneum.

Of the five cases in which there was no constriction, two presented nothing remarkable in the parts adjacent to the aperture, and in the remainder there was only a slight degree of inflammation, and this very limited in its extent.

But we must beware of inferring that there is no strangulation before death, when we find no great constriction after death. We all know that the abstraction of the vital force must diminish very much the constriction

in cases of common internal strangulation, and as we shall be well aware, when investigating the symptoms, that almost all the patients die with symptoms of such strangulation, we may reason upon both species of hernia in the same way, and make deductions, somewhat more general, than statistical data would, at first sight, seem to warrant.

DOES HERNIA OCCUR THE MORE FREQUENTLY THROUGH THE MUSCLES
OR TENDON OF THE DIAPHRAGM?

Authors have left this question undecided, and we must do the same. For out of twenty-seven cases, in which mention is made of the part through which the opening occurred, we have as follows:

Table 6.

Through muscular part,	15 times.
“ tendonous part,	11 “
“ “ chiefly; a little in muscle,	1 “

Again,

Table 7.

	ACCIDENTAL.	CONGENITAL.
In those where the <i>muscular portion</i> was ruptured, the hernia was	7 times.	2 times.
In those where the <i>tendonous structure</i> was ruptured, the affection was	8 “	1 time.

From these tables I infer that the tendon and muscle are nearly equally liable to rupture from accident. The numbers, however, are too limited for very great accuracy.

WHICH OF THE ABDOMINAL ORGANS WAS MOST FREQUENTLY FOUND IN THE THORAX, AND ON WHICH SIDE DID THEY USUALLY LIE?

Table 8.

	THORAX.		
	LEFT.	RIGHT.	DOUBTFUL.
The stomach was found in the	34		
" " 		4	
" " 			6
The small intestines, part of	21		
" " 		4	
" " 			4
The large intestines,	26		
" " 		5	
" " 			8
The liver, part or whole,	8		
" " 		7	
The gall bladder,		1	
The pancreas,	4		
" " 			2
The spleen, "	11		
" " 			2
The omentum "	24		
" " 		3	
" " 			3
The mesentery, "	1		
" " 			1
Contents of stomach found in	1		
The mass of the floating intestines,	1		
" in chest, especially at R.	2	2	
The kidney,		2	
Blood or bloody fluid,	7	1	1
Fluid,	1	2	1
" or fetid gas,	1		
	142	31	28

The gross results of this table amply confirm what we have previously

proved, in regard to the greater frequency of rupture of the diaphragm at the left than at the right side.

But it will be useful to examine the facts less in detail. The relative frequency of hernia of the different organs is as follows, viz: Stomach, (44); large intestine, (39); omentum, (30); small intestine, (29); liver, (17); spleen, (13); pancreas, (6); mesentery, (2); kidney, (2).

This result agrees very well with that obtained by Dreyfus.* In examining 55 cases he found the stomach had penetrated into the chest 37 times; the colon, 24 times; omentum, 19 times; small intestine, 14 times; spleen, 11 times; pancreas, 8 times; duodenum, 6 times; and liver, 4.

CONDITION OF THE VARIOUS ABDOMINAL ORGANS.

STOMACH.

This organ was most frequently displaced, (46 times in 82 cases,) but these numbers do not represent the *exact* proportions, because some of the reporters of cases have not mentioned the organ. Dreyfus makes it 37 in 55 cases.†

It was *wholly* in the chest in 32 of the cases; the greater part of it was there in 5; cul-de-sac in 4; large curvature and right end of do, and pyloric half, each once.

CONTENTS OF THE STOMACH.

The contents were recorded eleven times. They were chiefly gaseous in seven cases, and once the stomach was said to be enormously distended by air. This flatus was mixed with some fluid in three cases, and food in one case. The organ contained a dark, fetid matter in five cases; in one of which it had acid, and in two, reddish characters. Half-digested food was found in two cases. In two, half-coagulated blood was the chief substance contained in the organ.

SITUATION OF STOMACH.

Its *position* was, at times, much changed. In three cases it was turned up into the chest, the large curvature being bent upward toward the clavicle, the pyloric and cardiac orifices nearly level with the diaphragm. In another, the pylorus was on a level with 3d rib, the large curve toward the mediastinum; and in a fourth there was a still greater change, viz., the pylorus

* Abhandlung, &c. Journal des Progres, 1829, Tom xvii.

† Journal des Progres, &c., 1829, vol. xvii., p. 130.

was near the clavicle, while the cardiac orifice remained at the diaphragm, where in one case it was said to be constricted. In another, exactly the reverse took place, viz., the cardiac orifice was thrown up. In one case it was inverted forward, while the large curve was adherent to the left of the diaphragm. It was compressed in one case under the concave surface of the liver, and thrust to the right side in another.

Any one of these situations we can readily imagine would be liable to produce some difficulty in the digestive functions. I shall allude to this subject again when treating of the symptoms.

INJURIES RECEIVED BY THE STOMACH.

It was wounded in two cases.

It was torn in the cul-de-sac, letting its contents into the thorax, in one. This occurred under a beating during a drunken frolic. The rupture was one and a half inches long.

It had a small semi-circular opening in one case where it was strangulated, and through this blood had oozed into the chest.

Though these numbers are few, I cannot but think that they indicate that the stomach is but rarely injured in these cases. The organ is such a conspicuous one, and has been examined so many times, that so grave a lesion as rupture could hardly have escaped notice had it existed.

CONGESTION AND INFLAMMATION, &c.

The mucous membrane was said to be dark colored, (port wine color in one,) in five cases; and it was easily scraped off in one; sufficiently firm in another. The organ presented, on its peritoneal surface, marks of recent inflammation, where in contact with the intestines, in a case of general peritonitis. It was purplish outside, in another; and firmly adherent in a third. It seemed well, but more vessels than usual were seen under the peritoneum, in one. It was emphysematous, toward its splenic portion, in one.

Finally, the organ was larger, paler, and thinner, in one case.

THE OESOPHAGUS.

It presented a very abrupt change of its course in all the cases, (3,) in which it was noticed. In all it descended through the diaphragm as usual, but turned back toward the left to enter the abnormal aperture caused by the hernia, and to join the stomach in the chest.

It was pushed to the right side, back of the vena cava and diaphragm, in one case.

SMALL INTESTINES.

Contents. They were inflated with air in six cases. The amount of air varied, but it was in great quantity so as to enormously distend the canal in three cases. Otherwise, the contents presented nothing remarkable.

Situation. The duodenum, in one case, was so pulled out of place, that it bent the common biliary duct and almost closed it. Of course, the changes in this respect depended entirely on the parts of the small intestine carried into the chest. The part nearest the aperture was most frequently changed in its position. Hence the duodenum was more frequently in the chest than other parts, but a great part of the convolutions were at times found there. (See table 8.)

CONGESTION AND INFLAMMATION.

In seven cases the small intestines were represented as inflamed, &c.

In only one case, however, was there anything like general peritonitis. In all the others, there were merely lines or patches of congestion, of an acute character. In one, where a mass of colon was greatly constricted, the parts were dark, soft, and ruptured. In another there was an old partial adhesion of the intestines.

I think we may infer from these few facts, that anything like general peritonitis, to hasten the death, must be of very rare occurrence.

The colon, however, presented evidence of more serious trouble than the small intestines, a fact which coincides with our previous results. (Table 8.) We proceed now to its examination.

COLON.

The transverse colon, or parts of it, was most commonly found in the chest.

It was said to be *distended with air*, in five cases. In one of these the walls of the intestine were thickened by the strangulation. This distention, of course, varied with the degree and point of stricture of the canal. The canal was empty and contracted in the parts below and at the stricture, and before it, dilated. In one case it was full of meconium, and in the chest. It was in a still-born child, and it was pushed between the œsophagus and aorta, carrying the mediastinum before it.

In one case, it was contracted; in another, it was twisted upon itself.

It was either *inflamed* or dark, soft, and at times very livid in eight cases, and twice *ruptured*. The arch of the colon was adherent to the parts adjacent to it; twice to those within the thorax, and once to the opening of the diaphragm. The rupture appears to have been caused by severe constriction by the diaphragmatic aperture; as in both cases, in which it happened, there was a great strangulation of the parts.

LIVER.

This organ was noticed nineteen times.

Either one lobe, (as in three cases); or a considerable part, (as in two cases); or the whole organ, was found *in the right* cavity of the chest. Parts of the left lobe, (as in four cases); or the whole organ, (as in one case,) were found in the *left* cavity. Of these ten, six were cases of congenital hernia, and the patients were still-born, or death supervened soon after birth. In one it was the result of severe accident; the cause was doubtful in three more.

In four cases it was *much compressed* in that part that passed through the stricture; so that in two of them the parts in the thorax and abdomen seemed almost like distinct organs, united by pedicles.*

It was *strangled, softened, and flaccid*, in three cases; its left lobe thin and flabby in one; nodulated in one; torn in one; its veins and bile ducts much distended in one; thrust to the right side in another; it was pushed up into chest, without rupture of the diaphragm, in two.

Most of these appearances were probably owing to the rupture. It is said to have been scirrhus and gangrenous in one; nothing remarkable in others.

The effects of the changes in the form and position of the liver must at times produce very serious results; for example, such an obstruction of the gall-ducts as to produce jaundice. In the case mentioned above, the child died ten months after birth, and one of the symptoms mentioned is, "skin sometimes yellow," (see gall-bladder in this case,) and this is the sole case of the eighty-eight in which this symptom is mentioned.

GALL-BLADDER.

This organ is mentioned in four cases. It was empty and collapsed in two, and in one of these the organ had been ruptured by a fall of thirty feet.

* These, &c., ut supra, by Auzelly.

It was large and filled with ξ iss, thick black bile in the third case, owing to the fact that the bladder was pushed up more than usual and that the duodenum, being pulled out of its place, caused an abrupt turn and almost closure of the ductus communis choledochus. (See symptoms. Jaundice.)

In a fourth it was large, situated in thorax, thickened, and with an old cicatrix inside of it, and four calculi. The bile-ducts were thickened and lengthened.

THE SPLEEN.

This organ was mentioned sixteen times.

It was *torn in several directions*, and bathed in blood, in two cases; one from a severe bullet wound that penetrated the diaphragm and allowed the stomach and spleen to pass into the thorax; the other from the patient being overrun by a chaise; and in this case, the spleen and a quart of blood were found in the thorax.

It lay *lengthwise* in the lower part of the chest in one case.

It *adhered* to the diaphragmatic opening in another.

In one case it had been carried up by the stomach, and lay near the junction of the second and third ribs with the vertebral column.

With the exception of these injuries and malpositions, the organ seems to have been not abnormal. In fact, it would seem, *a priori*, as if it would be more difficult to produce any change in this organ than in the alimentary canal, and our statistics agree with our reasoning.

THE PANCREAS.

This organ was mentioned nine times.

It lay *wholly in the chest* in two cases. One of these was after drunkenness and an emetic; the other was one of congenital opening. In the former case, the pancreatic vein had been ruptured, and the parts were bathed in blood. A *portion of the organ* was found in the thorax in three more cases, the rest of it being in the abdomen. In all the cases in which the side of the chest was mentioned, (*viz.*, three,) it lay at the left side. These facts prove that, like the spleen, it is but rarely carried into the thorax.

It was pulled out of its usual situation in one other case, without being involved in the hernia.

It had a *purulent infiltration* about it in one case, in which a soldier had twice fallen on his sword.

It was said to be well in the two other cases.

From these facts I infer that the pancreas is rarely disturbed in any manner in this disease.

KIDNEYS.

These organs were mentioned five times.

The right one lay partly in the chest, at the right side, in two cases. In one, it was the result of the trunk having been crushed by a heavy wagon; in the other, of congenital malformation.

In one case, it was ruptured; death having occurred from accident. In the other case, the organs were well.

Similar remarks may be made in reference to this as were made above, with regard to the pancreas and spleen. The kidneys are but rarely affected in cases of diaphragmatic hernia.

THE OMENTUM.

This part was noticed thirty-one times; it was in the chest thirty times. (Vide table 8.)

It was condensed and adherent to the stomach in . . .	2 cases.
“ dark and adherent to the diaphragmatic opening, . . .	1 “
“ thin and with old adhesions to do. and to sac, . . .	2 “
“ adherent by old bands to pleura near clavicle, . . .	2 “
“ of a vivid red color,	1 “
“ had a purulent infiltration about it,	1 “
“ formed a solid cord,	1 “
“ condensed,	1 “

Thus we see that about one-third of the cases presented some of the modifications of inflammation, evidently showing that the omentum is irritated by its frequent change of position, &c., caused by the rupture. It seems, moreover, to be a part liable to slip into the thorax.

THE MESOCOLON.

It was mentioned once as elongated.

I have thus examined all the organs of the abdomen that have been noticed by writers in diaphragmatic hernia. I have detailed the peculiarities, &c., of each, but there is another point of interest, viz., their combinations in the hernial sac or in the pleural cavities.

The following table gives an idea of their combinations, in the various cases analyzed, in the cavities of the pleuræ, or in the sacs, in eighty cases:

Table 9.

The stomach alone was	found 10 times.
“ and omentum	“ 8 “
“ “ and colon	“ 5 “
“ “ and small intestines	“ 3 “
The stomach, omentum, and pancreas	“ 1 “
“ “ and duodenum, spleen, liver,	“ 1 “
“ “ small and large intestines	“ 1 “
“ “ duodenum and arch of colon	“ 1 “
“ “ colon, pancreas	“ 1 “
“ “ intestines and spleen	“ 1 “
“ “ duodenum, colon, spleen, liver	“ 1 “
“ and duodenum and colon	“ 1 “
“ and intestines, spleen, pancreas	“ 1 “
“ and ileum, colon,	“ 1 “
“ and small intestines and colon	“ 1 “
“ and intestines, liver	“ 1 “
“ and colon	“ 1 “
“ and intestines	“ 1 “
“ intestine and spleen	“ 1 “
“ and spleen	“ 1 “
“ “ and liver	“ 1 “
“ “ other viscera	“ 1 “
The small intestines	“ 4 “
“ “ liver	“ 2 “
“ “ renal capsule	“ 1 “
The colon	“ 8 “
“ and omentum	“ 3 “
“ and liver	“ 1 “
“ “ and pancreas	“ 1 “
“ All intestines ” or “ floating viscera ”	“ 4 “
Intestines with mesentery	“ 1 “
“ liver, colon, omentum	“ 1 “
“ “ kidney	“ 1 “
“ omentum, spleen, pancreas	“ 1 “

Omentum,	found 2 times.
Spleen,	" 1 "
Kidney,	" 1 "
Liver,	" 1 "
"Viscera,"	" 2 "
Sac containing no viscera, but fat merely,	" 1 "
	80

In general we may say, that, of *single organs* which are liable to pass into the thorax, the order is as follows: Stomach, colon, small intestines, in the proportions of 10, 7 and 1.

But the combinations are much more frequent, and the stomach in its various connections with the other viscera, stands pre-eminent.

The spleen, kidney, liver, and omentum, were each found once alone. Of these the omentum and liver were contained in sacs; and the spleen and kidney were forced there by violent accidents.

In its combinations, the stomach was conjoined with the omentum most frequently, next with the colon, and afterward with the small intestines and other organs.

The position of the stomach, colon, and small intestines, are such as explain their relative liability to hernia.

THE ABDOMEN.

Noticed eighteen times.

This part was described as *hard and contracted* in one; *contracted* in one; and as being *flat* at the upper part of the hypogastrium, (*bas ventre*), in four cases. See symptoms (abdomen.)

Some authors have noticed this subsidence of the abdomen as indicative of a loss of its usual viscera. It obviously may happen. It was not particularly manifest in our case. But it is equally evident that any unusual distention of the alimentary canal, with gas, would tend to counteract any subsidence from the hernia. The suddenness of the death, apparently, has something to do with this result, inasmuch as no time may be allowed for inflammation and consequent distention of the abdomen.

Of the six cases mentioned above, three were in accidents of a most severe character and causing instant death; a fourth was from congenital malformation of the diaphragm, and death occurred in a few hours after birth; in the fifth, a fatal result came from an attack thirty hours previous, although the hernia had been produced by a fall a year before; in the sixth alone was

there any time for inflammation to commence, or probable distention to occur. In this, the man lived four days after a fall, and had had hernia, probably, for several months, owing to an injury of the same kind.

The abdomen was, on the contrary, *distended*, swollen and tight in two cases. In one of these the air was effused into the peritoneum from a rupture of the colon, and the man died on the fifteenth day. Of the other, unfortunately, no symptoms are given.

It was of its usual size in one case.

The peritoneum was represented as *congested* everywhere in one case, of long standing, but which proved fatal in thirty hours after the patient had taken acidulated drink. This fact, in connection with what we have previously seen, confirms our opinion that universal peritonitis is a rare occurrence in this affection.

It was firmly united to the pleura in two cases.

Blood was effused in five cases. All of them were the result of falls from a height, or from the persons affected having been thrown down or run over by a carriage. In this last case it was from the vena cava being lacerated that death occurred. The quantity varied. It was slight in two; but in one, lbs. vi. were found in the hypogastrium.

MUSCULAR SYSTEM AND UTERUS.

Blood was effused into the muscles in one case of a patient who had fallen.

The *uterus* presented nothing peculiar to this affection. In one case it contained a full grown, entirely healthy, foetus. The mother died from the effects of labor, which augmented all the symptoms usually attendant on diaphragmatic hernia, and to which she had been, for some time, liable.

CONDITION OF THE ORGANS OF THE THORAX.

Exterior.

The left side of the thorax was described as *larger* than the right, in one case; in another, the thorax was more prominent generally; it was longer and narrower in a third; and compressed transversely and very prominent in front, in a fourth. No sufficient and accurate observation has been made by writers upon the subject. In the second case, there was a tearing of the diaphragm in various directions, so that the intestines were forced into

both cavities. I cannot but feel that this point has been much neglected, and the probability is that we should frequently find as great a difference between the two sides of the thorax, as we find in cases of pleurisy or pneumo-thorax.

THE LUNGS.

A glance at table 8 would satisfy any reader that the lungs must be more or less *compressed* in almost all the cases of diaphragmatic hernia. Of course, the amount of this compression will depend upon the amount of extraneous matter introduced into the chest. I have examined all the cases, and find that they may be classified as follows:

Table 10.

Very much compressed,	. . . . .	8 times.
Much	"	47 "
Somewhat	"	24 "
A little	"	5 "
Not at all	"	1 "
Doubtful	"	3 "
		88

Whence it appears that eighty out of eighty-eight of the pulmonary organs must have been so compressed as to have been seriously interfered with in their functions. (Vide "symptoms" dyspnoea, &c.) We shall, hereafter, allude to this subject as illustrative of the causes of some of the symptoms. This compression may be said to have been almost the sole chronic difficulty which the organs had to contend with; for they are not described as, otherwise, seriously deranged. On the contrary, in some cases of extreme compression, it is stated that they could be inflated and were healthy. In only one case, was any old disease noticed. In that, the man fell gradually into phthisis, and tubercles were found in the lungs. The fact is interesting, moreover, in leading us to suspect, (we cannot be entirely sure, because all the cases are not sufficiently in detail,) that even great compression in these cases does not tend to really injure the delicate pulmonary structure. This corresponds entirely with our case, for in that, the left lung seemed as healthy as if nothing had been pressing it, when in fact the stomach, colon, and small intestines had been compressing it from birth.

In a few cases, (six,) the lung was described as *congested, œdematous, hepaticized or carnified*. In one of these cases there was so much compression that the organ rested on the spine.

The lung was *adherent*, by old adhesions, in three cases. I cannot say whether this represents the ratio of all the cases. I fear it does not. I think, however, we may safely infer that inflammation of, and adhesion of, the displaced abdominal organs to the lungs, &c., is not so common as one would suppose, *a priori*, they would be. And here we see the absolute necessity of having in the records of our cases, many negative statements. Had all the authors, whose cases I am analyzing, definitely stated that there was *no* adhesion of the pleura, there would have been no doubt in the present instance.

The lungs were wounded in three cases.

Of the two lungs, the left was the most frequently and obviously compressed. At times, it was fairly laid upon the spine, but the mediastinum and heart being thrown to the opposite side, the other lung must have been but poorly able to perform its own function, much less to do a double share of duty. Hence have arisen the dyspnoea, &c.

Finally, in one case, the lungs were emphysematous, distended, did not collapse, and the mucous membranes were red and filled with puriform mucus. In this case the sacs were too small to produce a compression to any great amount.

PLEURÆ.

This part was noticed twenty times.

Little is mentioned of the pleuræ; whence I think we may infer that severe general inflammation of them is rare in this complaint. They were, however, represented as more or less inflamed in five cases, in three of which some recently effused membrane was observed.

There were old adhesions in nine, but all except one was of a local character; either adhesions to an old cicatrix, or to the diaphragmatic opening, or of the omentum to the pleura, &c. In one case, however, they were so strong as to cause a drawing-in of the chest during life.

It was mentioned that there were no adhesions in six cases.

There was a *fluid* in both cavities in one; and in two more there was some in the right or the left cavity. It was bloody in one. There was a great quantity of blood effused into the pleura in four cases, three times at the right and once at the left. This was evidently caused by the severity of the accident that produced the hernia. I think that from these facts we may infer that the pleuræ were not usually much diseased, in any manner.

THE MEDIASTINUM.

Was noticed ten times.

It was wholly absent in two cases. One was in a child who lived two months with this trouble and a hernia, which, at the time of death, consisted of all the intestines save the rectum. The patient suffered much from dyspnoea, restlessness, and finally, pined and died. The second case was that given by Lieutaud. I have already spoken of it.

It was torn, to the extent of five inches, from its attachments to the sternum in the case of the soldier, who was thrown over the ramparts during the storming of a citadel.

It was said to have been pushed aside by the hernia in four cases; but it is evident that this number does not give a correct impression, if compared either with the number ten or eighty-eight, for the fact that the lungs were much compressed fifty-five times out of eighty-eight, and somewhat so twenty-four times more, proves that the mediastinum must have been pushed aside an equal number of times. In one case, it was pressed, in the form of a pouch, to the right side, between the aorta and oesophagus.

ENSIFORM CARTILAGE.

This part was turned backward and to the right in one case, in which a sac existed at the right side of the diaphragm. It was in the person of a man *æt.* 60 years.

THE THYMUS GLAND.

It was mentioned in only two cases; in one of these it was described as healthy; in the other, as having been pushed to the left side of the thorax.

ORGANS OF CIRCULATION.

The *pericardium* contained some yellow serum in three cases. These were the only times it was noticed at all. In one case there were several ounces of fluid, but otherwise this part seemed to be but little liable to disease.

THE HEART.

The heart was noticed thirty-one times.

Its *change of position* was the most marked, and most abnormal condition. It was thrust to the right side fourteen times; to the left five times. Position not observed in other cases. How well do these data accord with what we have observed as to the greater frequency of hernia of the left than

of the right side. One class of facts supports another. But do these numbers give the relative frequency of the displacement of the heart in all the eighty-eight cases? Undoubtedly not, I think, because, according to table 10, we have seen that the lungs are very frequently and severely compressed. Now although the heart would doubtless remain in position while under the influence of some compression, it must yield under much pressure. Therefore, I think, that instead of being put out of place once in five times, it must be displaced in more than half of the cases and probably much oftener than that, it will be slightly removed from its usual seat.

Its *dimensions* are represented by the terms, empty, small, contracted, in four cases; very large in two. Its right auricle was distended in one; and ventricles contained thick, black blood in the second. It is described as sufficiently large in one.

In other words, it would seem, from these statements, that any cardiac symptoms that may arise must probably come from the displacement and not from any organic change of the organ. This displacement, combined with the great compression of the lungs, would seem, *a priori*, to point to some cardiac symptoms. We shall treat of these hereafter.

AORTA AND VEINS.

The descending *aorta* was pressed to the right side, in a case of a child in whom the intestine, full of meconium, was pushed upon the aorta and mediastinum. (See mediastinum.) This canal must, however, be very materially altered in its position, especially about its arch, by the thrusting of the heart so frequently to the right side. It seems to me that such change might be likely to produce some change in the pulse, and perhaps a difference between the two radials; but in no case was that fact mentioned.

The *vena cava* was ruptured in one case near the diaphragm, in consequence of injury from a carriage passing over the body. The *pancreatic vein* was likewise ruptured in one case, which is given by Kirschbaum, after a violent emetic had been administered to relieve drunkenness. The *umbilical vein* was much elongated and very turgid in a case in which there was hernia of the right side and a considerable part of the liver had passed into the chest.

HEAD.

This cavity has never been examined in this complaint, probably from the paucity of cerebral symptoms and the attention of physicians having never been attracted to it.

II. SYMPTOMS.

In considering this subject, I shall make two divisions of the symptoms, viz :

1st. Those antecedent to the fatal attack.

2d. Those occurring during that period.

In each one of these, I shall endeavor to point out those which seem to be merely accessory and accidental, and those more important ones, which are evidently dependent upon and caused by the hernia.

I. SYMPTOMS ANTECEDENT TO THE FATAL ATTACK.

CEPHALIC SYMPTOMS..

(*Previous to fatal attack.*)

A priori, one would anticipate, perhaps, some disturbance of the cerebral functions whenever, from any sudden exertion or excitement, some interruption should take place in the even tenor of the already labored respiration. But, on consulting authors, I find less to sustain this idea than I could have anticipated. The cephalic symptoms are mentioned but twice, and these, with my own, afford no data whereby to judge the question. In our own case, the lad was liable to swoon on any violent exertion, and to be unconscious for some time. I explain it in the same way that we explain syncope in diseases of the heart.

This is the only symptom that can, by possibility, as I think, be referred to the disease. In the two other cases, there was a fetid discharge behind the ears, in one; and a depression of mind in the other described by Hildanus.*

PULMONARY SYMPTOMS.

(*Previous to fatal attack.*)

These symptoms were noticed in twenty-nine cases.

Dyspnœa. This symptom was observed in sixteen out of nineteen cases. This proves the great prevalence of this symptom, and accords very well with the fact that the lungs are so frequently compressed and the heart put out of place.

* Op. Hildani as above.

It was great in two; constant in two; the chest was forcibly elevated, with dyspnoea augmenting till death, in one; it was worse at night, and when the clothes were wrapped closely around the trunk of the body, also when in a recumbent than when in a sitting posture, in one. This was the severest class of cases. It was milder in others, viz., like "chronic asthma," in two; constant in some degree, and very much augmented on exertion, in two; occasional, in three; sudden, evanescent, and without evident cause, in one, the patient being at other times free and easy; not great or none at all, in two.

I endeavored to classify these various degrees of dyspnoea by the lesions found after death, as it seems very natural that there would be some relation between these two ranges of facts.

In my first endeavor to make these comparisons, I thought I should be able to give definite results; but on more minute examination I became satisfied that only the most general and indefinite deductions could be made. Two of the cases mentioned had most serious lesions, viz., rupture of the diaphragm and absence of the mediastinum. They were in my first division, and the patients had severe dyspnoea. Generally, however, the lesions in the second class were not of so severe a character as this, and the symptoms were milder. Nevertheless, our own case is a stumbling block to nicety of diagnosis; for surely the patient could not have been very much troubled, by a complete want of the left side of the diaphragm and compression of one lung, since he was able to do a laborer's work. It is possible, when our powers of diagnosis are more accurate and we recognize the disease before death, we shall be able to use this symptom as a means of nice diagnosis, more than the present record of facts allows of our doing. The actual statistics point toward what we may prove to be true some years hence. Does the numerical method allow of such prophecies? That method, as I understand it, has two objects: 1st. The rigid deduction of laws from observed facts. 2d. The suggestion of other laws which it cannot prove, but which future observation may confirm or annul. If, as numeralists, we cannot take this view, we make ourselves slaves to bare statistics, and give up our reason, thus checking that far-reaching power, which makes us men and not children.

What is the reason for the evanescent attacks of dyspnoea; and why is posture at times a relief; why is there no dyspnoea at times?

The evanescent attacks of dyspnoea, suddenly coming and at times as suddenly giving off, are to be explained, I think, by the fact that by over-exertion, injury, or certain positions, &c., a larger quantity of the intestinal canal is forced upon the lungs, or perhaps the part already in the chest becomes

suddenly distended with gas. Whatever may be the circumstances, we can easily conceive that they may be very transitory in their nature.

That posture should be likely to have much influence upon such a case as our own, we can easily conceive. Gravity would, while the patient was in an erect posture, tend to relieve the symptoms by taking from the compression of the lungs, and this was the fact in the observation given by Dr. Fothergill.* It was in his case such a remarkable feature, that the little sufferer, during the ten months of its life, never could lie down after the first nap, but slept in the nurse's arms, so that if during the first sleep in a horizontal position, too great an amount of intestine fell through the large opening into both pleuræ, the same might tend to fall back again while in a more erect posture. One person could not lie on his back without dyspnoea.

Finally, why is not dyspnoea constant? In the first place, it is doubtless more general than our numbers would make it. But second, there are some cases on record in which the amount of hernia is so slight as scarcely to be enough to produce pressure on the lungs; and again, in some professions, (as that of a student,) there may be such slight exertion made as that the dyspnoea will be imperceptible or of the most trivial amount. Finally, the opening may be large enough in the diaphragm to allow commonly a free passage to the organs. Hence, sometimes, there would be compression; and at others, entire freedom of the thoracic organs.

COUGH.

(Previous to fatal attack.)

This symptom is mentioned six times.

It was represented as either frequent, or as nearly constant from the time of the accident or from birth, in congenital cases. It was spoken of as dry in one case. I cannot believe that this fairly represents the relative prevalence of this symptom. However, from our facts, we cannot deduce more.

A slight expectoration is mentioned once.

PAINS IN THE CHEST.

(Previous to fatal attack.)

These were noticed in five cases.

* Works, 1784. (See above.)

They were always in these cases in the left side, and in one of them they extended to the shoulder. In this last, a full meal aggravated it, and in one of the others it came on and disappeared so suddenly that it was supposed to be spasmodic. In all these cases, the opening in the diaphragm was at the left side. The symptom did not seem connected with any apertures in the diaphragm of peculiar size or shape, nor with the amount of abdominal viscera in the chest. The colon was displaced in all the cases, alone and only to the size of the fist, in one; it was connected with omentum in another with the stomach in the third, and with the stomach and omentum in two more.

PECULIAR SYMPTOM.

(Previous to fatal attack.)

In the case mentioned by Sir Charles Holt,* there was an appearance of a very peculiar character, viz: "an odd sort of working of the breast, a crawling around the ribs of both sides, as if a knot of worms were there." In this case, there was a congenital, hernial opening on the left side, and the mediastinum was wanting.

I presume this motion was caused by the vermicular movements of the alimentary canal within the chest. It has some analogy to what our patient observed, who felt air pass, at times, from a spot high up on the left breast down to the pubes. This symptom is well worth attention as a means of diagnosis, and it becomes of more importance, as we may sometimes excite it, by allowing the patient to swallow while we are auscultating.

FITS OF SUFFOCATION.

(Previous to fatal attack.)

These occurred, in one case, viz., that of a child who lived ten months. It was, in fact, a kind of access of dyspnoea. While nursing, the little patient would fall into a violent fit of passion. The crying and extra-exertion would produce an access of suffocation which, from its severe influence upon the whole system, instantly subdued the temper of the child, by causing physical prostration.

* Philosoph. Transactions, vol. from 1694 to 1702.

CARDIAC SYMPTOMS.

(*Previous to fatal attack.*)

The pulse was always "disturbed, small and tremulous," and very rapid, in the only case in which it was mentioned.

The heart beat to the right of the sternum in one case. These data evidently give no accurate results. For a discussion of this point, see article "Pulse during attack."

ABDOMINAL SYMPTOMS.

(*Previous to fatal attack.*)

Noticed thirteen times.

Vomiting. This was observed seven times; the tendencies usually commenced after the injury or soon after birth, and continued, with more or less liability on the part of the patient, until the fatal attack. It was augmented in three cases, by over-eating; and in one case, even the smell of food, or acescent food, tended to produce it.

The matters vomited are not mentioned, save in one case. In that, (a nursing child was the patient,) it was a kind of fetid, purulent pap.

In all these cases the stomach was found either wholly, or in part, in the chest. (See symptoms during attack, article vomiting.)

The other *stomachic* symptoms were as follows: weakness of it in one; liability to oppression in two; troubled by acescent food in one; dyspepsia in one; nausea and desire to vomit in one; fullness after eating, one.

These combined with the vomiting, make ten cases, out of the thirteen in which the stomachic symptoms were observed, and they seem to me to prove that the stomach is very frequently the sufferer in diaphragmatic hernia. This will be still more evident when we examine the same subject, as it relates to the symptoms during the fatal attack.

Abdominal pains or *colics* were noted in nine cases, or in three-fourths of the cases in which any abdominal symptoms were observed. They were usually of a violent character, and lasting from birth or the time of injury; occurring at irregular intervals, and were frequently brought on by excess in eating. They were so particularly liable to affect a worthy soldier, described by Ambrose Parè, that he was obliged wholly to forego his wonted 9 o'clock supper, after his apparent recovery from a bullet wound in the thorax. They seem generally to have been felt at the upper part of the abdomen near the

diaphragm, or they were referred to the stomach. In only one case was it in the left hypochondrium. I think we may regard this sign as an important one for the future diagnosis of any case.

I endeavored to learn whether any particular state of the diaphragmatic affection, or of the parts in the hernia, would account for these pains. I found that in four of the cases, in all of which the colics were severe, the apertures in the diaphragm were small. In two more, the opening was possibly a little larger, one being two and a half inches in diameter; the other, having the cesophageal aperture opened. In one case the liver and stomach &c., were in both sides of the chest; in a second, the stomach and omentum were condensed into a ball inside of the thorax; and in the third, the diaphragm had been torn from the spine near one of its crura.

Perhaps at a later period of the paper, in the article "Pains, &c., during fatal attack," we may be better able to decide this question.

The other abdominal symptoms were as follows: a *dragging sensation*, as of something attached to the right side and referred to the region of the stomach. This was noticed in one case, in which the stomach was thrust to the right side of the abdomen. "*Enteritis*" occurred in one case, in which a man fell from a great height, and recovered after suffering some time from this disease. Another person had an "abdominal difficulty;" probably, tuberculosis. One was described as having attacks of strangulated intestine; and of two remaining, one had *diarrhœa*; the other, *costiveness*. It is plain that we can deduce only the most general conclusions from these isolated facts.

GENERAL STATE OF BODY, SKIN, &C.

(*Previous to fatal attack.*)

The skin was wrinkled, and sometimes yellow, in one case of a child aged ten months, affected with congenital hernia, and in whom the common bile duct was almost closed by a change of position of the duodenum. (See gall-bladder, page 31.) There was a vesicular eruption, (accidental, I presume,) about the mouth, in another.

The lips were of a violet hue, and cheeks of a deep red, in two congenital cases, in which death occurred after two and ten months; the patients were always restless and uneasy, and, in one, accompanied with much pining until death. One was "weakly and little."

In one case, a man, ten years after an accident, fell into phthisis and hectic

symptoms. In the case of one man, it was said that though unhealthy he was able to work at his trade of mason. One, only, was said to be *well*.

The details of this case, however, as given by Morgagni, are scarcely sufficient to allow us to lay much stress on it. But our own case is a proof that the greatest degree of hernia may exist on one side and the patient may be *muscular* and able to do the hardest work, though liable to accesses of dyspnoea, &c. In two of the cases recorded, the patients were said to be very muscular. This fact is quite in accordance with what is seen in other conditions, where the disease consists of a merely local disturbance without the constitution being necessarily affected.

Table 14 supports this idea; for out of twenty-five cases in which the occupations of the patients are given, twenty-four were engaged in business, requiring activity and exertion of strength.

I find, moreover, that of fifteen individuals of whom any mention is made of the amount of development of the muscular and adipose texture, there were of women, five either fat or inclined to be so, only two thin; of men five were robust and muscular, and only one thin. (It may be remarked that this last was the only case in which phthisis was discovered); of children, three, and all of them were thin. It seems to me that from these facts we may infer that, although the patients suffering from diaphragmatic hernia may have troublesome, and at times, dangerous symptoms, nevertheless, when they arrive at adult age, there is nothing to prevent a full development of the muscular and adipose tissues.

II. SYMPTOMS DURING THE FATAL ATTACK.

CEPHALIC SYMPTOMS.

They are noticed five times.

Convulsions were observed in a child who died a few hours after birth. The extraordinary dyspnoea seemed to be the cause of it. At the autopsy, a considerable portion of the liver was found in a hernial sac. This symptom was seen likewise in the case of a man, in whom death occurred in a few hours, after having been preceded by the "greatest degree of dyspnoea." In him the hernia consisted of the colon, omentum, and pancreas, with blood from rupture of the pancreatic vein.

Grinding of the teeth was noticed in the case of a child, who died in twelve hours, and in whom the stomach and omentum only were in the chest.

Delirium occurred in but a single case; and in that, I think it may have been more owing to a comminuted fracture of the leg than to the hernia.

There was *numbness*, without paralysis of the legs, in one case.

I think we may safely infer that cerebral symptoms are uncommon in this affection. The result above obtained corresponds—1st. With the fact that authors have never examined the head after death, which they certainly would have done sometimes, if any serious symptoms had occurred; and 2d. With what I have stated above, when treating of symptoms that occur previous to the fatal attack.

THORACIC SYMPTOMS.

(*During the fatal attack.*)

Noticed in thirty-six cases.

PULMONARY SYMPTOMS.

Of the thirty-six cases in which mention is made of any pulmonary symptoms, in twenty-seven there was some *labor in the respiration*. This large proportion proves that some modification of labored breathing must take place in at least three-fourths of all affected with diaphragmatic hernia, and I am inclined to believe that this is a small proportion, because from our previous investigations we have seen—1st. That the lungs are compressed in a larger proportion of times, and I cannot conceive of there being so much pressure without a corresponding dyspnoea. 2d. The results, upon this point, in our investigation of the antecedent symptoms confirm this view of the case. We meet, in our daily practice, with cases of dyspnoea which, at the first glance, are not very obvious; it is rather breathlessness than dyspnoea, and I presume some such cases have been omitted.

This symptom varied in its degree. It is described in one case as orthopnoea; as the greatest dyspnoea, or dyspnoea; breath interrupted; frequent and labored; very imperfect; suffocative on lying down; much oppressed, confined; panting; short and quick; in the other cases.

I endeavored to find out if possible, as when looking at this question previously, whether this symptom in its different degrees of severity bore any relation to the amount of disease in the diaphragm, or of the hernia of the abdominal organs into the chest, but I found it to be impossible. It seems to depend on causes which are not indicated in the cases. More thoroughly detailed cases may elicit more on this subject than can be done at present.

In one case, the respiration is said to have been always *free*. It was the case of a drunkard, and he seems to have sunk with vomiting and purging after immoderate drinking, and possibly may not have died so much of the hernia as of his bad habits.

COUGH.

This symptom is spoken of in only eight of the thirty-six cases. Possibly in some cases the record of it is omitted, although this symptom really occurred. In fact, I can scarcely believe that it should occur so seldom, although this result is similar to that which we obtained from examination of antecedent symptoms. We have examples, however, of a similar absence of cough in various diseases, involving the pleura and parts adjacent to the lungs. Pleurisy, for example, very frequently produces very little cough. It seems to me that we should be allowed to deduce, (1st. From the infrequency of its being noticed in diaphragmatic hernia; and 2d. From the character of the symptom when recorded,) that as a symptom, diagnostic of the disease, it is of very little importance. The cough was said to be frequent in three cases; and in one case, there was an inability to cough, owing to pain being caused by it. In other cases it was noted without any qualification.

EXPECTORATION.

This symptom confirms what we have said in regard to the cough. It was mentioned but three times and always as having occurred after a fall. In two, in which extravasations of blood were found in the abdomen, a little blood was raised, but as the lungs were found simply compressed I doubt whether it came from the pulmonary structure. In the third there was a copious raising of mucus. May we not infer that, if this symptom does occur more frequently, it is nevertheless rather an accidental than necessary accompaniment?

HICCOUGH.

This was noticed eleven times, or in nearly one third of the cases, and becomes, therefore, an important symptom of the affection. It was usually frequent and severe. In one case it existed during the last nine days of the patient's life, and was constant; in another it was loud and the immediate precursor of death. It sometimes resembled sobbing, and in one case, a child was born, sighed three-fourths of an hour, and expired.

In examining it with reference to the morbid anatomy, I found it occurred

twice in cases in which the right side was ruptured, nine times in hernia of the left. I did not find this sign connected with rupture of any particular structure of the diaphragm, or hernia of any particular number of organs, or bulk; for, in one case, there was only a small part of the ileum in the aperture, and in another were the greater part of the small intestines, omentum, spleen, and pancreas; while the remainder of the cases presented every variety between these two.

I might cite, as another reason for admitting this as an important sign in this affection, the well known fact that hiccough is generally considered one of the symptoms of any disease of the diaphragm.

PAIN IN THE CHEST AND SIDES.

In regard to this symptom I refer the reader to the article "Pains, &c., in the abdomen.

VOICE.

In one case, (of a child that died half an hour after birth,) I find recorded that there was difficulty of breathing from birth, that some time elapsed before the patient cried, and that when it did so, there was a peculiar note to the voice. I know not whether the very peculiar state of the parts, found after death, will explain this symptom, but the coincidence is a curious one. In this case alone have I found that the colon, full of meconium, was pushed up between the aorta and spine, and was pressed upon the trachea as high as the first rib.

PHYSICAL SIGNS.

These signs have been almost wholly neglected. Laennec* has stated that they would prove of much service in this affection, but, as he had never seen a case, he merely makes the suggestion that it may be recognized by absence of the respiratory murmur and the presence of borborygmi in the chest. Mr. Lawrence, so far as I can discover, is the only person who ever, (before our case at the hospital,) recognized the hernia by these signs,† or, as I may add by any other, save by the morbid appearances after death. It may have been suspected, but never definitely diagnosed.

I proceed now to name them, and under each head I shall, in addition to

* *Traité de l'Auscultation Médiate.* Paris.

† *London Lancet*, Sept. 5, 1835.

giving the usual analysis of facts, which in this particular will be very meagre, make suggestions in regard to some that *must* have been present though not noticed.

Inspection. This was used five times, including our own case. In three the chest was dilated; a roundness, prominence of the affected side being marked in some. In one case the cartilages seemed luxated inward; and in another, the abdominal parietes were drawn up and down with each inspiration. In our case, there was a quietness of the whole side. I may allude here to the peculiar symptom described above, viz., a "crawling round the ribs," which, although I have not much confidence in its being observed frequently, may, however, occasionally occur.

So much for the records of science. But may we not step now beyond these narrow limits and declare that, according to known physical laws, there *must be* in the majority of cases, a prominence and a partial or complete immobility of the side of the chest in which the hernia exists? In looking at Table 10, I find that in fifty-five out of the eighty-eight cases the lungs were *much* compressed, by which term it is meant that the stomach or intestines, or other of the abdominal viscera, occupied the place of a major part of the lung. If we remember that (by Table 9) only in four cases of seventy-nine was there a single small organ in the chest, but that in seventy-three cases out of the same seventy-nine, either the stomach or some of the intestines were there, with some one or more organs; if we recollect likewise that the portions of the alimentary canal, when thus incarcerated, often become much distended, we can readily believe that the side of the thorax will be distended and partially immovable. This prominence and immobility must likewise be most manifest in front, because the lung would tend to be pushed up and backward in consequence of its natural attachments to the spinal column. These considerations induce me to believe that in a great majority of the future cases of this kind, prominence and immobility of the thorax will be important aids to diagnosis.

Palpation. I am not aware that this was used at all except, perhaps, to recognize the changed position of the heart. Yet as physical laws exist there must be a different vocal fremitus on the two sides of the chest, when the lungs are forced back by an intestine distended with gas, and the walls of the chest are thereby more expanded than usual. What difference there should be I cannot say. That a difference would exist I have no doubt.

I have alluded to the use of this method in recognizing the changed position of the heart, but as auscultation will do this more effectually, I must refer to that.

Mensuration might be used very frequently, and as usefully as we employ it in pneumo-thorax, pleurisy, &c., but I do not think it has ever been used, and probably in cases of recent rupture, we shall generally be unwilling to use it, owing to the sufferings of the patient.

Auscultation. This was used in six, possibly in seven cases. I likewise recognized the affection chiefly by the use of this mode of examination.

Mr. Lawrence* found little or no *respiratory murmur* on the affected side. In this case, a large part of the intestines, the whole omentum, part of the spleen and the whole pancreas compressed the lungs to the size of a man's fist.

Dr. Reid † found "a respiratory murmur" in the left side in his case, and yet there were more than six pounds of fluid with one foot of colon and omentum in the pleural cavity. It is to be regretted that Dr. R. did not give a more detailed account of this case, and one is led to doubt whether the sound may not have been transmitted from the other lung; because the lung of the diseased side was found pressed back against the spine and attached to the diaphragm and "containing no air." Possibly the sound may have resembled that heard in cases of large effusions into the chest.

In our case, and one other, there was *absence of the respiratory murmur* on the diseased, with puerile respiration on the healthy side. But in our case, when the patient took a deep inspiration, the murmur was heard perfectly vesicular and pure to the second rib. A full breath increased certain *borborygmi*, which had taken the place of the respiratory murmur below this point. To the inexperienced ear they seemed to form so completely a part of the act that they were, at times, supposed to be in the lungs. But they had exactly the characteristics of the sounds heard over the abdomen in cases of intestinal disturbance, a mixture of gurgling, whistling and blowing, and though excited at times by the act of respiration, they could be heard, even when the patient held his breath. It seemed as if the distention of the lung excited the vermicular motion. But this was not always the case, because often I could not excite them, either by a forced cough or inspiration.

Occasionally a *metallic tinkling* was heard, such as we sometimes hear over the stomach. One day, an amphoric sound was heard, quite intense, over the cartilages of fourth and fifth ribs, seeming to be stomachic though affected slightly by the act of inspiration. Might we not excite these various sounds (*borborygmi*, &c.) by making the patient drink some stimulating liquid?

* Lancet, Sept. 5, 1835.

† Edinburgh Medical and Surgical Journal, Jan., 1840.

The *voice* appeared natural in our case, and in one that occurred in Guy's Hospital. I do not find that it has been noticed in others. It deserves attention, for I believe some modification of it may often be present.

In three cases, a subcrepitant *râle* was heard, twice in the back, once in front and upper part of the back. Bronchophony, likewise, was heard in one. In all, pneumonitis was found at the autopsy, and these modifications of the respiratory murmur and voice were owing to this accidental circumstance.

It seems to me very probable that some auscultatory phenomena might be produced by pressing suddenly on the abdomen, and thus forcing air into the intestines while in the pleural sac; or by disturbing the contents of the intestines and thus causing peristaltic action.

The pulsations of the *heart* were noticed in four cases, and in three of them they were to the right of the sternum. In our hospital case, it was heard there likewise. These numbers give, I know, a very inadequate idea of the real number of times that the sounds will be heard out of their usual situation.

When treating of the pathological anatomy of the heart, I remarked on the probable frequency of this displacement. I would likewise refer now to what I stated when speaking of inspection; for the argument, drawn from Table 9, applies to this subject as well as to prominence of the chest. This dislocation of the heart must be considered an important element in the diagnosis.

May not I suggest that not infrequently a bellows murmur will be heard, owing to the constrained position of the heart? It has never been noticed, but were I to perceive it I should be very careful of inferring from its existence any serious lesion of the organ.*

Percussion. This method was used five times. There was dullness four times at the back of the chest, in three of which there was either pneumonia or pleuritic effusion; and in the other, the liver, colon, and omentum, were in a sac. In one there was good sound, in which, though there was a slight degree of pneumonia, there were the stomach and colon to distend chiefly the left side of the thorax. Finally, in our case there was decided tympanites. This result, I believe, conveys a very inaccurate idea of the real use of

* Since writing this, I have seen a record of a case in which a *souffle* was observed about the roots of the bronchi. The heart in this case was pushed strongly to the left by a sac at the right side. (Bul. de la Société Anatomique, Auzelly's Thesis.†)

† Thèse pour le doctorat en Médecine. Paris, 1842, par Aristide — Raymond Auzelly.

percussion in this complaint. For in seven only of all the cases was there sufficient fluid to cause dullness; in only six were the lungs carnified or hepatized, &c. On the contrary, by reference to Table 9, we find that in seventy-two out of the eighty cases, either the stomach or some portion of the alimentary canal was in the chest. Now, although in some of these cases only a small portion of the canal was in the chest, or perhaps if in the thorax it was contracted,—this is not the usual result; but the stomach or intestines are distended with air. This distention must cause tympanites as in our case, and generally in front of the chest, especially at the left side of the same. There may be, also, a removal, toward the right, of the usual dullness observed over the heart, owing to the organ being pushed out of place.

PULSE AND FEVER.

The pulse was noticed eleven times.

Its increased frequency was remarked in all but two of the cases. It was small or feeble in eight; tremulous in two; firm or hard in two; soft in one; strong and full in one; and intermitting in one. It has evidently been omitted in a majority of the records, and we cannot make any deductions, except, perhaps, that an increased frequency seems not uncommon, but of this we cannot be certain, because, as the time of the examination is not mentioned, except in two cases the record may have been made of the latest hours of life only.

Fever was spoken of but twice, but cold, clammy sweats were observed five times. This part of the subject needs further research.

The skin was cold and livid about the chest, abdomen or extremities, in six cases. It was covered with cold, clammy sweats, in three.

ABDOMINAL SYMPTOMS, &c.

(*During the fatal attack.*)

Noticed in thirty-five cases.

Tongue and throat, &c. They were not mentioned but twice. In the case of the former it was clean and moist at one time, and only had a little brownish coat on another occasion.

In one case there was *great distress in the throat*, but the post-mortem appearances did not account for it.

Great *thirst* is mentioned in one case. A *grinding of the teeth* occurred

in another. Anorexia and *cardialgia* occurred in a beer drinker, who died in consequence of an immoderate draught of his favorite liquor.

There was *rejection of food* before it reached the stomach, in one case. In this the stomach was wholly inverted in the pleura, so that food must have found access to it with difficulty.

STOMACH.

Nausea or retching, or ineffectual efforts at vomiting, were noticed six times. I found that these symptoms were not particularly caused by the abnormal position of the stomach; at least, to produce them it was not necessary for the stomach to be confined in the chest, for, in two out of the three cases in which nausea was mentioned, the stomach was not above the diaphragm. In two cases of *ineffectual efforts at vomiting*,* the same general result was obtained. In one of Kirchbaum's cases, I find the expression — *weakness of the stomach* — which, I presume, indicates a similar symptom. In this case there was likewise vomiting, and the stomach had passed into the chest.

But the principal symptom in the disease, connected with the stomach, was *vomiting*. Mention is made of this twenty-two times. Add to these four cases of retching, &c., and four more of whom it was said that the individuals died of iliac passion, and who probably had vomiting, we have thirty cases out of thirty-five who had either a disposition to vomit or actual vomiting.

This, then, becomes a very important symptom for the diagnosis. In fact no other, save dyspnoea, can be compared with it. Their combination in any case, of course, is still more important. We shall discuss this point at a future time. (Vide Diagnosis.)

This symptom not merely existed; but in the majority (fourteen out of twenty-two) of the cases, it is recorded as severe, very severe, constant or as "vomiting of every thing."

The matters vomited were mentioned in eight cases. They were dark and foetid in three cases; it was a kind of purulent pap, acid and fetid in one; a brownish mucus, probably altered blood, with *sarcinula ventriculi* in one; it was distinctly blood in one; and stercoraceous in two, toward end of life.

In one of the above which had altered blood, the matters vomited gave an acid reaction, had no taste, and was covered with a yeasty froth.

* Increasing very much the pains in the abdomen.

On comparing this symptom with the post-mortem appearances, I found that the stomach, in one case, was merely violently pressed up against the diaphragm; in three others, other abdominal organs were in the chest; in the remainder (eighteen in twenty-two) this organ was either wholly or in part in the chest.

PAINS ABOUT THE ABDOMEN AND CHEST.

These pains were noticed seventeen times in the abdomen. In two cases they were described as great distress at precordia; in ten they were very severe, intolerable, excessive or violent pains or colics; in four they were chiefly limited to the left side; in two to the right, one of which of last had a dragging sensation at the right; in one it was confined to the upper part of the abdomen; in another, chiefly to hypochondrium. Finally, in one case, it was stated that there was no pain in the region of the stomach, but there was a violent pain at the lower part of the sternum.

Pains were "in the side" or chest in eight cases, but four of them were among the seventeen who had pain in the abdomen. These pains were generally severe and acute, and never recorded as dull.

In comparing these results with the post-mortem appearances, I have been foiled, as heretofore, but there seemed to be more severe and intolerable pains in those cases in which a small part of the intestines was firmly strangulated than in others, where there was a larger quantity of viscera in the chest. I cannot lay much stress on this point as the number of facts are too small and records too indefinite.

ALVINE DISCHARGES.

Noticed eleven times.

Costiveness, usually of an obstinate character, was reported seven times. These prove that this symptom occurs frequently. But it is to be regretted that we do not find more detail in the cases given by authors, because I believe that the character and frequency of the alvine discharges would have presented interesting points for diagnosis and prognosis. Sir Astley Cooper says that in diaphragmatic hernia, we have the usual symptoms of internal strangulation, combined with those of asthma. As costiveness is very commonly the accompaniment of this strangulation, we must, I think, meet with ~~the~~ ~~symptom~~ ~~oftener~~ than our numbers would seem to indicate.

The bowels were loose, with foetid dejections, in four cases; they were flatulent in one.

ABDOMEN.

It was *tense and sore*, on pressure, in one case. This was one in which general but not severe peritonitis existed.

It was <i>tympanitic</i>	in 2 cases.
“ retracted	“ 2 “
“ tense	“ 1 “
“ hard or rigid	“ 2 “
“ depressed and drawn inward at each inspiration	“ 1 “

These facts are important from their very meagreness. It confirms the inferences which I drew when treating of the pathological condition of the abdomen. In the diagnosis of the disease it is of some importance for the practitioner to feel assured that, in the vast majority of the cases, there is no general peritonitis.

URINE.

This was noticed only once. It was free, without blood; scanty, turbid from lithates, with purple sediment. The state of the kidneys are not mentioned in the autopsy.

OMENTUM.

This was protruded through the abdominal parietes in one case, in which there were two wounds about the ensiform cartilage.

SKIN AND GENERAL STATE OF PATIENT.

Mentioned in twenty-three cases.

Great lassitude or faintness in five cases. In two a wound had been inflicted. In one there was great depression after vomiting came on. In two cases, the patients were able to walk some distance after accidents which ruptured the diaphragm. One of them rode in a coach nearly 150 miles, without any complaint, though he became ill soon after his arrival, more than twenty-four hours after the accident.

That great lassitude should be likely to happen in case of so severe an accident as rupture of the diaphragm, seems very probable. I therefore

doubt whether our numbers express very accurately the number of those who are prostrated by it. But it is an extremely interesting fact that a man is at times able to sustain himself for so long a period as twenty-four hours after a rupture, in which one-half the stomach was forced through the diaphragm and some blood effused.

RESTLESSNESS, &C.

This feature of the affection was observed eight times. Once it was simple "discomfort." The left lung was in this case very much compressed. There was a starting and shuddering at birth, so great that "fits" were feared, and death took place in one and a half hours after birth. A third was unable to lie on the right side. In the remainder there was great restlessness, patients sometimes tossing about in agony at the intensity of their sufferings.

COUNTENANCE.

The eyes were found open, haggard, or starting from their sockets, in three cases. All three cases were the results of severe falls. The face was pale in three cases; it had an anxious look in three more. It was expressive of great suffering in two; it was red, after having been livid previously, in one. After death it had a smiling aspect in one; it was natural in another; the veins of the forehead were distended, the commissures of the mouth were drawn apart showing the teeth, and the lips were covered with a bloody fluid in another; it was drawn to one side, as from paralysis, in one.

I think that we may infer from these few facts that the countenance frequently indicates the severity of the disease. The last two cases are the only ones in which I find notice of what some authors say is so very common in this and other affections of the diaphragm, viz., the sardonic smile. I do not believe that it is of such frequent occurrence as has been stated.

INCIDENTAL APPEARANCES.

In ten other cases there were various conditions, not connected, save incidentally, with the hernia, viz., fractures, redness of skin, vesicular eruptions, &c., but of these I need not to speak.

III. ORIGINAL CAUSES OF THE HERNIA.

I have made the following table for sixty-eight cases:

Table 11.

It was congenital	in 26 cases.
It was from drunkenness and debaucheries	" 3 "
" " bullet wound	" 3 "
" " stabs with sword or lance	" 9 "
" " "wounds"	" 3 "
" " absence of diaphragm	" 1 "
" " falls	" 13 "
" " labor pains	" 2 "
" " sudden strain	" 1 "
" " blows	" 4 "
" " being run over	" 2 "
" " fracture of the rib	" 1 "
	68 cases.

By the above table we perceive that the congenital cases of diaphragmatic hernia are about one-third of the whole number. There is another class of cases of which, until the last year, we might have anticipated few examples in this country, viz., those in which the hernia is caused by stabs or bullet wounds; but, probably, among the military who have fallen on the plains of Mexico, we should find not a few pathological specimens of this kind. Some one or more of the survivors of that unholy war may be bearing even now the results of it, in the form of hernia of this nature.

IMMEDIATE CAUSES OF THE FATAL ATTACK.

These causes are noticed by writers thirty-four times.

Table 12.

By a fall	in 9 cases.
" violent emetic	" 3 "
" laxative medicine	" 1 "
" drunkenness	" 5 "
" inordinate use of cabbage and vinegar	" 1 "
" " cold acidulated water	" 1 "

DIAPHRAGMATIC HERNIA.

" excess at a ball	" 1 "
" bullet wound	" 1 "
" stab	" 3 "
" blow	" 1 "
" strain, violent and sudden	" 1 "
" being run over	" 8 "
" violent crying	" 1 "
" labor pains	" 2 "
" a long walk	" 1 "

34 cases.

In eleven cases the hernia was congenital and almost immediately fatal; making in all forty-five cases in which the causes of fatal attack were given.

INFERENCES TO BE DRAWN FROM THE ABOVE TABLE.

The table is interesting in many particulars. It may be again classified, whereby we shall bring out four great classes of causes of the fatal attack.

Table 13.

1st. Pressure either from internal or external causes,	17
2d. Indigestible and irritating substances taken into the stomach,	12
3d. Wounds,	4
4th. Congenital,	11
5th. Great fatigue from a long walk,	1
	<hr/> 45

From the second class of causes we have important indications for prophylactic treatment; and of this I shall treat more fully hereafter.

The comparison of the number of fatal results immediately after birth in congenital cases, with the absolute number of congenital cases on our record, proves very conclusively that congenital hernia of the diaphragm is by no means so necessarily immediately fatal in its consequences as some authors would have us believe — eleven in twenty-six of those affected with it, or a little less than one half having died at birth.

IV. AGE, SEX, PROFESSIONS, &c., OF THOSE AFFECTED WITH THIS HERNIA.

The average age of seventeen males was $35\frac{16}{17}$, or 36 years nearly, the oldest being 60 and the youngest 19.

Of three females the average age was 25 years, the oldest being 28, the youngest 19 years. In addition to these, we have the indefinite but expressive phrase "old woman" applied to one of the patients.*

There were four under 7 years of age, with sex unknown, and nine still-born infants, sex, likewise, unknown; finally six, whose age and sex are alike unknown.

The relative number of the *sexes* was as follows: out of seventy cases in which the sex is named, there were

Of males,	53
Of females,	17

It may be a question why there should be this great difference between the sexes in their liability to this disease. A glance at table 13 will readily solve the question. We see that of the five classes of causes, only two apply with equal force to males and females, viz., second and fourth; whereas the other three, viz., first and third, are almost exclusively liable to affect the male sex, from the fact that the males are the laborers and warriors of the race.

The *professions* of those suffering from this complaint, are interesting as indicating the amount of real deterioration to health caused by it. In only twenty-five cases is any record made, and the result is as follows:

Table 14.

Common soldiers,	7
Officers, (military,)	3
Masons,	2
Shoemakers,	2
Sailors,	4
Husbandmen,	1

* Since this was written I have found the case of a female, aged eighty. It is evident, therefore, that a greater number of facts is needed before we can decide the question.

Slater,	1
Conductor of Diligence,	1
Postillion,	1
Laborer,	1
Carpenter,	1
Student,	1
	25
<i>Total.</i> Laborious professions,	22
Light do. (student and shoemaker,)	3
	25

Ten of these twenty-five died in consequence of their injuries, either instantly, or after a few days. The remainder lived a greater or less time afterward, and performed some of the most laborious duties of life. For example: a sailor went several India voyages; a husbandman died at a good old age; a postillion cracked his whip for ten long years, and at length died of a second fall; a shoemaker kept himself busy at his last for a great while; all enjoyed a comfortable degree of health but were liable to those symptoms to which I have alluded in another part of this paper. (See symptoms antecedent to fatal attack.) Our hospital case was a striking illustration of the fact that a man may have diaphragmatic hernia and yet be able to perform much hard work. He was in fact a most beautifully proportioned youth, a sort of Antinous, as he appeared, when his trunk and limbs were laid bare during the examination of his fractured spine. All his muscles were fully and gracefully rounded, and their undue prominence was prevented by a certain quantity of adipose matter indicative of perfect health.

V. DURATION OF LIFE.

I shall consider this subject under two points of view, viz., the duration of life in congenital and accidental cases. Under the latter term I include all except the congenital.

There were twenty-six *congenital* cases, and of these persons

Table 15.

11 died within two hours after birth.
6 within two years.

1 at seven years.

8 not until the adult age.

Duration of life in the *accidental* cases, thirty-one in number.

Death was *instantaneous* in four cases; (arising, one from falls; one from a severe blow; one from a violent and sudden strain; one from labor pains.)

It took place within twenty-four hours in twelve cases; (*viz.*, two from wound; one from fall; two from being run over; one being beaten and drunk; one from drunkenness; one from crying violently; two after an emetic; one from cabbage taken; one from labor pains.)

It occurred within a week in seven cases; (one from a stab; two from a fall; one being run over; one cold water; two from drunkenness.)

It took place within a year in five cases; (two from wound; one from drunkenness; two from falls.)

Life lasted more than a year in three cases; (*viz.*, two from wounds; one from a fall.)

In one of these last cases life was prolonged thirty-eight years.

The shortest time was about two years.

It will be seen by the above statements that

28 died within a year after the accident.

3 lived beyond that period.

This proves, conclusively, that accidental diaphragmatic hernia is much more liable than congenital soon to destroy life. Or to express the same in numbers: about one-tenth live more than a year in accidental cases; a little more than one-half live beyond that period in congenital cases.

VI. DURATION OF LIFE IN THE FATAL ATTACKS.

In twenty-seven cases the duration of the attack is mentioned. The average of all of these is two days and fifteen minutes. The shortest time was, of course, instantaneous death; the longest was nine days. The causes that operate the most quickly are those which produce sudden and violent strains, such as blows, falls, &c.: the next in order may be ranked all indigestions, from having taken too much of substances that are prejudicial to the stomach. But it is impossible to make a definite classification. The average duration proves the fearfully rapid course of the fatal attack.

VII. DIFFERENT SPECIES OF HERNIA.

Sir Astley Cooper* made three species, and that division has been usually followed by authors, in England and on the continent, since his days. They are as follows:

1st. In the first species we find the parts, of which the hernia consists, are forced through some one of the natural openings of the diaphragm; for example, that of the aorta, vena cava inferior, an intercostal nerve or the œsophagus. May we not also consider the sacs, of which I have heretofore spoken, as the result of enlargement of small apertures naturally existing between the anterior mediastinum and the cavity of the abdomen? It seems to me as reasonable to classify this set of facts under this head, as it is to put those cases there in which it is said that an intercostal nerve passage is dilated.

2d. In this species, are included all hernias resulting from a malconstruction of the diaphragm.

3d. Hernias from accidental wounds or lacerations of the diaphragm.

To these I would add a fourth kind; although, in the opinion of some, the cases are not, strictly speaking, cases of hernia.

4th. Those cases in which one side of the diaphragm is violently forced up into the chest, so that the lung is compressed, and all the signs of the affection, as seen in the other classes, are observed.

In a former part of this paper I have investigated some of the points connected with this subject.

Of the relative frequency of these four classes, I obtain from sixty-eight cases the following:

Table 16.

Hernia from accidents,	. . . . .	41
“ “ malconstruction,	. . . . .	20
“ “ dilatation of natural openings,	. . . . .	5
“ “ diaphragm being pushed up,	. . . . .	2
		68

* On Hernia. London. Fol. 1804.

These numbers agree with the opinions advanced by Sir Astley Cooper. Of the first three, he says, the third is of very rare occurrence. He had never seen one.

The second kind he says is more frequent.

The first kind is the most common, but as most of the accidents are, in the opinion of Sir Astley, caused by the small sword, this class will, of course, ebb and flow according to the character of the age.

VIII. DIAGNOSIS.

The recognition of this disease has usually been made only after death. Some writers have said that it would be impossible to discover it during life. It has, in fact, been recognized, I believe, but a very few times before death. I find only two recorded instances, viz., that by Mr. Laurence, of London, and our own case, recognized by myself and others, at the Massachusetts General Hospital. The reason for this apparent difficulty in the diagnosis is the extremely infrequent occurrence of the affection. No man can hope to see more than one case during his lifetime, and therefore, as his attention is not drawn to the subject, he is unable to recognize the affection when it falls under his notice. Yet, from the investigation I have made upon the subject, I am disposed to believe that the diagnosis of diaphragmatic hernia is as easy, as that of almost any other chronic, and, possibly I might add, acute disease. The rational signs distinctly point to it, in most cases; the physical signs will generally afford the *experimentum crucis*, and definitely settle the question. In our own case at the hospital, these signs alone proved that the intestines or stomach must be in the left side of the thorax, and if we, as good observers should have done, had compared more accurately than we did the rational with the physical signs, we should, I think, have been compelled to infer that there was a congenital diaphragmatic hernia, instead of a simple rupture of that muscle; which latter condition we were led to believe was the case from the circumstances of severe injury in the back, under which the patient entered the hospital.*

I shall treat of the subject of diagnosis under the following heads:

* Since writing the above, I learn that the house surgeon made this inference from facts in the early history of the patient, but which, from the sufferings of the patient I had been unable to obtain.

First. Congenital cases.

Second. Cases in which a sac is formed.

Third. Accidental cases.

First. DIAGNOSIS OF CONGENITAL CASES.

This category of facts may be still further divided, viz: 1st. Into those who die at birth or immediately afterward. 2d. Those who live for a few months, or years, in a state of more or less constant ill health. 3d. Those who arrive at the adult age, and are able to perform many of the duties of life, even those, at times, involving the hardest kind of labor.

1st. In the first class, nearly one half never breathe, nor can they be made to breathe. They die at the moment of their birth. It is literally "death in life" with these little creatures; for, although the placental circulation may have gone on in perfect order, and the infant may be well formed, save in the want of a part, or the whole of the diaphragm, his doom is sealed at the moment of his first effort of inspiration. He can not inspire and he dies instanter, or with a few gasps or sighs. He may make some very feeble attempts at crying; and, in very rare cases, may seem to be recovering; but he will relapse and die within a few hours. The other functions of the body may be, though very imperfectly, performed; the circulation may go on, but the heart should be ausculted, for we shall frequently find it beating out of its wonted place. If it be so, our diagnosis and prognosis may be more decided. The nervous system may sympathize, and shudderings or severe convulsions may occur, to close the scene. If with these symptoms, we find lividity of the skin and evidently general distress, referable to trouble in the respiratory function; if auscultation and the physical signs, already detailed, confirm the rational signs, we certainly may be as sure of our diagnosis, and of the proper method of treatment, as we can be of almost any disease, pneumonia, for example.

In addition to these means of recognizing the affection, I would remark, that any external malformation, such as spina bifida, &c., combined with the above-named symptoms, should lead us to suspect malformation of the diaphragm, upon the same principle that when signs of cephalic disease occur in the course of any malignant affection, that is well marked externally, we infer that the same disease has commenced in the brain. Facts sustain my assertion, several cases of monsters having exhibited this malformation.

2d. Congenital cases in which the patients live months, or a few years, but

generally in ill-health. Dyspnoea seems to be the most prominent symptom. It is either constant or the patient is very liable to it upon the slightest exertion; the attacks come on suddenly, and as suddenly leave; sometimes position and clothing have much influence. The whole constitution of the individual seems bad, and the symptoms generally point to a chronic difficulty about the respiratory function; the little patients are at times emaciated and feeble. Auscultation will come to our aid as in the previous case.

3d. There are some who arrive at the adult age, notwithstanding there is a very material malconstruction of the diaphragm. It seems almost impossible that such persons should be able to perform any hard work, but such is the case in not a few instances, and not merely are they able to perform all the work of hard laboring men, but they have at times a degree of *embonpoint*. This was particularly the case with our youth at the hospital, with his fair, ruddy countenance, and rounded swelling limbs and chest. But though thus generally healthy, these individuals are liable, on severe or sudden exertion, to violent, and at times, prostrating attacks of dyspnoea, causing, as in our case, total loss of consciousness. These attacks may come on very suddenly and as suddenly disappear.

The *pulse* in these cases is at times very materially altered, quickened and tremulous, owing to the dislocation of the heart.

Pain in the side about the region of the diaphragm, is not uncommon. *Colics* and costiveness are not very common.

Vomiting is frequently seen, and this is a very dangerous symptom to be excited either by an emetic or by improper food; for it aggravates the affection.

But after all, no symptoms of a general nature can, in these cases, be equal in value with the physical signs.

Second. DIAGNOSIS OF CASES IN WHICH SACS ARE FORMED.

Some writers* have hinted that there is a distinct difference between the symptoms of these cases, and of those in which there is a rupture, or a dilatation without a sac through the various layers of the diaphragm. That one may imagine a difference, I will not deny, but that the records of science give any support for such an hypothesis I am disposed to doubt. My reasons for this opinion are that the records are too slight wherefrom to draw any inferences.

* Arch. Gen'les de Méd., 2d ser. tom. 12, p. 387.

Third. DIAGNOSIS OF HERNIA ARISING FROM ACCIDENTAL RUPTURE
OF THE DIAPHRAGM.

This class of cases may be divided into those in which 1st. The patient dies immediately or in a very short time after the accident; and 2d. Those in which the individual recovers from the immediate effect of the injury, and rupture is discovered at death, or may be suspected during life, by the symptoms incident thereto.

1st. Of those who die in consequence of the accident, some few persons* are found, in whom no marked and very severe symptoms come on until after the lapse of some hours after the accident. In all the cases alluded to I have found the men† were drunk, or nearly so, and their faculties were probably so benumbed that they did not experience the ill-effects they would have felt, had they been clothed in their right minds and sensibilities. But generally a most violent train of symptoms commences immediately, varying of course somewhat according to the amount and peculiar character of the lesion. Many die immediately after having been so wounded by a bullet, or having fallen from such a height, as to entirely and very promptly destroy life. About an equal number die within a few days; nine days being the longest, and thirty-three hours the shortest period in our cases. In these persons violent breathlessness, orthopnoea, or simple dyspnoea is observed most frequently. With this, pains in the thorax, or either of the hypochondria, are likewise common. Cough is occasionally present but more rarely, causing increased pain in the chest and abdomen. Very rarely is there any expectoration; but at times hæmoptysis or hæmatemesis occurs, that is if either the lungs or stomach are wounded. The pulse is very much quickened and must be altered as in any severe affection of this nature. Vomiting, or ineffectual efforts to do so are frequent, and in the midst of these symptoms, coupled with the prostration that commonly follows a severe internal injury, the patient dies.

2d. At times he recovers from the immediate effects of the injury, owing, probably, to its being of a less severe character than in the cases already considered. In this case the individual may have no untoward symptom, until symptoms of some internal strangulation occur, and he dies, and at the

* M- Wheelwright's case, *Med. Chirurg. Transac.*, vol. v., page 574. 1815.

† *Annals de Med.* Sept. 1834.

autopsy we shall find the remnants of the former injury in the shape of an abnormal aperture in the diaphragm, and a hernia into the chest of the abdominal organs. This freedom from symptoms, until the fatal attack, is, however, rare, and it is fortunate for humanity that it is so, for when they occur, and do not prove fatal, they may be of infinite service to us in our subsequent treatment of the patient, by enabling us to prescribe certain dietetic and other rules whereby the individual may possibly arrive at a green old age, instead of being cut off in the vigor of manhood, as was the case recently in a very remarkable example.* These symptoms are, a liability to dyspnoea on exertion, pains in the hypochondria, or chest; colics, costiveness and vomiting. Here, too, should we use with great care, the physical signs. In one case on record, the heart beat to the right; in ours, likewise, there was the same fact. If, then, we find the heart beating in a different place from usual, and other rational and physical signs indicating diaphragmatic hernia, we must charge our patient to be cautious in every action, for the sword of death hangs suspended by a hair over him. The symptoms above stated, may be liable to recur for many years. He may have several attacks of them and may recover, or he may be cut down by the first strangulation of the contents of the hernia, which of course is the cause of the severer attacks, while those symptoms that are habitual, the dyspnoea, &c., are owing to the compression of the lungs, from distention of the stomach and intestines, &c.

Finally, however, death comes on, perhaps after a debauch, an emetic, or another accident, or it may be without any evident cause. The symptoms are the same as those already described as precursors of death, and joined to them we may have hiccough, syncope, cold clammy sweats, and lividity.

DIFFERENTIAL DIAGNOSIS.

Might not asthma, pneumo-thorax, phthisis, cardiac disease, or a case of that rare disposition of the organs in which the heart is found at the right side, &c., could not common colic, biliary calculi, abdominal hernia, or internal strangulation, simulate diaphragmatic hernia? If we examine carefully the origin, the course and actual state of the symptoms, and do not neglect the physical signs, I can scarcely conceive of a mistake being committed.

* Alexander Barrow, U. S. Senator from Louisiana, we learn from the public papers, died of this internal strangulation, in consequence of an old sword wound of the diaphragm. As we shall see when speaking of the treatment, the journey he was engaged in, the necessary disturbance of the whole system consequent thereupon, might have been foretold to him, had the disease been previously recognized.

Asthma, it is true, causes dyspnoea, but the symptoms are excited by very different cause. The symptoms we recognize, likewise, at once, as the result of a constriction of the bronchi marked by a wheezing, and by physical signs to correspond. Cough, too, is always present in asthma—rather rare in this hernia. Auscultation would allow us to hear wheezing every where in one case, whereas absence of respiration or borborygmi would be discovered in the other.

Pneumo-thorax is rarely latent and chronic; it comes on suddenly during phthisis or some similar disease. It has but rarely any abdominal symptoms; the symptoms occur but once, and these are usually fatal. The physical signs may admit of doubt, but usually the borborygmi will settle the matter.

A change in the usual disposition of the organs will not commonly be accompanied by any symptoms. The heart may beat at the right side, but the respiration will be pure throughout the chest.

Simple phthisis or cardiac disease I cannot believe will ever afford any serious difficulty in the diagnosis.

The passage of gall stones may cause severe pains about the diaphragm, but rarely thoracic symptoms. Moreover the physical signs are different in this case and in hernia.

In regard to the supposed similarity of abdominal hernia or internal strangulation, the fact, first, that in the former there would be usually some external tumor; and second, that in both all thoracic symptoms would most probably be absent; and finally, that we have the physical signs very different in the two classes of cases; these facts, it seems to me, would be sufficient for a thorough discrimination of the two affections.

IX. PROGNOSIS.

We have seen that congenital cases of diaphragmatic hernia are not necessarily, immediately, fatal, the number immediately resulting in death to the whole number of congenital cases, being about one to two four-elevenths. A similar remark may be made in regard to hernia resulting from accidents; for we have found that a little less than one-tenth of all the cases are not fatal, but the patients are alive more than a year after the accident.

But though death may not be the result, we shall, most probably, have a series of symptoms clearly indicative of the disease. Upon this point, however, I must refer to the detailed account of the symptoms and to the

chapter on Diagnosis. From these we may infer somewhat as to the probable course of the disease. If we can persuade a man to take reasonable care of the digestive functions, to avoid costiveness; to cease from all very violent exercise or employment; in fact, to do all things in such a way as most to promote quiet health, then our prognosis may be favorable. If, unfortunately, he should be taken ill, we should avoid all violent means, especially those operating severely on the alimentary canal. If these precautions be observed, we may enable a person to enjoy a comfortable degree of health; and in case of actual strangulation, afford him a tolerably fair chance of recovery. If, on the contrary, the individual is of irregular habits, indulges his palate, and is generally of a dissipated life, our prognosis must be unfavorable.

With regard to the result of the actual attack, the severity of the local symptoms and their effects upon the whole system, must be our guide. For example, as long as the vomiting and costiveness, and pulmonary symptoms are slight, and the pulse and powers of the body are not prostrated, we may give some hope. But if the dyspnoea is intense, the vomiting stercoraceous, the pains about the chest or diaphragm agonizing; if the pulse become frequent and feeble; if the skin is covered with a clammy sweat; if the strength of the patient fail, our prognosis must be very unfavorable.

Finally, it must be remembered that all I have stated above is closely allied to, and may, in fact, be considered as absolutely dependent upon an accurate diagnosis. This has never been made but twice, and in these cases it was too late to do service. We must do better than our predecessors, better, likewise, than we ourselves have done, and recognize the affection before the commencement of its fatal attack. This, as we have seen, can undoubtedly be done, if we will but be accurate in our examination of the rational and physical signs, and connect them with previous facts in the history of the patient, in the way indicated in various portions of this paper.

X. TREATMENT.

In considering this part of our subject, I shall rely little upon the analysis of the results of treatment in the individual cases recorded; but rather upon the suggestions that have arisen in consequence of the study, that I have made, of the whole course of the affection. The reasons for so doing are these: 1st. The small number of cases in which any records are made of

any treatment. In only thirteen, in fact, is there any record. 2d. Owing to the ignorance of most of the observers in regard to the true nature of the affection, their modes of treatment have been entirely empirical, and generally very absurd, and not a few times absolutely hurtful to the patient. Occasionally, a course of action, having a good influence, has been commenced, but owing to this same ignorance of the actual morbid condition, all the good has been destroyed, by subsequent exhibitions of remedies of a most pernicious tendency. The consideration of this question of treatment still further naturally divides itself into the *prophylactic*, and that to be followed during an attack. Of the two branches of the subject, I consider the former the more important.

The *prophylactic* mode of treatment, which I shall lay down, will, of course, depend wholly upon what we have learned of the condition of the parts in this affection, and of the tendencies to their strangulation under various circumstances. I have already alluded to this when speaking of the prognosis. Let me suppose either that a child present, from the moment of birth, signs of this hernia, or that an adult is liable to fits of dyspnoea, or costiveness, &c., (see Diagnosis,) after a fall, or a wound in the trunk from a sword or bullet, &c. Let me suppose that the physical signs, inspection, have enabled us to decide which side of the diaphragm the rupture exists, what course are we to advise our patient to pursue, in order to avoid the risk of a fatal attack of strangulation?

If we turn to the list of causes of the fatal attack, we shall see that there are two conditions of the system which are particularly liable to produce serious effects, viz: 1st. Any condition that would be likely to produce violent, or sudden, or long-continued strain on the abdominal muscles; and 2d. Any ingesta taken into the stomach which excite it into undue action. We should therefore advise the patient to give up the practice of any employment likely to produce the first result; for example, that of a seaman, a soldier, or coach driver, or even of common laborer. He should select some more quiet, though not sedentary employment, as the least liable to produce the results that are anticipated. This treatment I recommend, also, because, from Table 14, I learn that the laborious professions seem more liable to this disease than should be their proportion supposing all equally liable to it. But, at the same time, that he may choose a more quiet business, he must be very careful not to select one liable to produce irregularity of the digestive operations; for instance, that of a tailor would not be very good for a man; and the same remark may be made in regard to the business of a seamstress of a female. In both of these professions dyspepsia, and its train

of evils, costiveness and vomiting, &c., are apt to occur, and if they do, the patient will narrowly escape with his life. The business of baker, bricklayer, grocer, servant, merchant, or either of the so-called, liberal professions, would be the better.

2d. We should advise the patient to be very careful that his digestive functions go on well; we should assure him that by a debauch he runs the risk of his life; and that by undue eating of unusual food of any kind, a danger is incurred which no wise man would incur for the mere gratification of the palate. He should use that food which is easiest of digestion, and which has neither a constipating nor a purgative effect; but which will enable him to have regular and sufficient and easy alvine discharges daily. These remarks are suggested by Table 12. It may be further remarked, while upon this subject, that on no account should emetics or cathartics, of a violent nature, be prescribed for one having this hernia; for antimonial emetics, that is, *any violent emetics* are very liable to produce death in these cases.

The treatment of a patient suffering from symptoms of actual strangulation, is less satisfactory than one could wish. There are records in thirteen cases only, and even if there had been notes of a greater number, they would hardly have taught us much, for every case on record, in the annals of medicine, has proved fatal, which fact presents a most conclusive argument that, up to the present hour, at least, no course of medication has been of any avail, or if it has been, no medical record at present existing, can prove it to have been so. But are we to infer from this state of things, that we shall never be able to cope with this affection? By no means. When, by our more accurate diagnosis we shall be able to recognize, *early* in the period of strangulation, we may, by cautious treatment, be able to give the patient a fairer opportunity of recovering, than nature, unassisted by art, would afford him; and certainly a far better chance than the various empirical methods pursued by all previous practitioners.

I shall speak of the various remedies that have been used, and give my own views upon the advantages, or disadvantages likely to result from each.

Venesection was used five times, and never with any effect. On the contrary, the distressing symptoms went steadily on till death. The amount of blood taken seems never to have been very great, only once is it stated that ℥xvi. were taken. Are we to infer from this result that venesection is never to be performed? I think not. The cases are too few in number to authorize such a deduction, especially as it does not appear that in any of the cases

delirium was produced. Now to do much good, *i. e.* to produce any material relaxation of the strangulation, it seems to me a decided effect should be produced. At the same time, however, there are serious objections to its use, *viz.*, we deprive a man of a great portion of his life's strength by venesection and we do so without much hope of good. I think, however, we should be justified in bleeding a stout patient, who is suffering much pain and who has a strong pulse; but we should be chary of such a method in the cases of more feeble persons.

Leeches were used once without relief, and I do not believe they ever would do much good.

Cathartics and enemata were given four times. This is, likewise, a small number of cases whence to make any deduction. Yet I think a fair examination of these few, and some, *a priori*, reasoning on the subject, will lead us wholly to reject these two methods as something worse than useless.

The patients were never relieved by either of the methods. On the contrary, all were great sufferers from violent spasms, or colics, or vomiting; and in one, at least, the vomiting was excited by the medicine, and in another the pains in the abdomen were more severe after their use. And we may fairly, *a priori*, ask the question: Is not this exactly the result we should anticipate? Does an able surgeon give cathartics in a case of strangulated inguinal or crural hernia? To force, by the peristaltic action, more of the contents of the intestine into the strangulated part would be mischievous. Why, then, should we use cathartics and enemata in hernia of the diaphragm? There is no reason, but our ignorance and our disposition always to play the hero in any case of obscure abdominal trouble resembling colics. If a man does so, he is liable to be the cause of the destruction, perhaps, of human life. I am, therefore, fully of the opinion that all cathartics, even of the gentlest kind, should be avoided. The only hope for the patient rests on the entire quiet which the intestinal canal preserves.

Emetics. Some may doubt about the truth of the assertion that the physician may be the cause of death by the administration of cathartics. I feel perfectly certain that such would be the case in the use of emetics. If we look at the table of causes, (Table 12,) we find that a violent emetic was the cause of the fatal attack in three cases. In the single case in which it was mentioned as having been used as a remedy, the dyspnoea became much greater after it, and death took place an hour after its exhibition. Taking ~~facts~~ into consideration, that vomiting is a very troublesome symptom

of the disease, I think we are fairly justified in concluding that emetics, not only do no good, but that they tend to aggravate the affection, and, therefore, should never be administered.

Opiates were used four times. In one case, where they were freely administered, the patient lived until the sixth day. Though one case affords but small data, whereupon to build an opinion, still as this was a severe case, and continued longer than the average number of days before death, it seems to me to be of some importance. In the other cases in which opiates were administered, they were given in very small quantities and without any definite aim; so that no marked effect was produced, save in the relief of pain.

But does it not seem reasonable that they should be of service in preventing any undue peristaltic action of the bowels, while we are using other remedies for the relief of the inflammatory condition of the ring and parts adjacent. Thus the analysis of facts and reasoning, *a priori*, lead us to conclusions exactly the reverse of those to which the subject of cathartics has brought us.

Other remedies of a general and very indefinite nature, are mentioned by authors, such as "soothing antiphlogistics;" and "stimulants afterward," "remedies for spasm of the stomach;" "creosote," "vesication and sinapism" to side. But of these I shall say nothing.

Bathing was used once, for a quarter of an hour, with relief. But should it not be used more freely? Nothing that I know of has a more powerful effect on the system than long-continued bathing. It evidently relaxes all parts with which it comes immediately in contact, and I think that the cold bathing, as used by the hydropathists, would tend, at least in a degree, so to lower the pulse, and diminish any local inflammatory tension even of the diaphragm, that it is worth a trial.

Ether. Were I satisfied that stricture existed in the diaphragm, I should be disposed to use this new method freely. It would do no harm and would temporarily relieve the pain and give relaxation to all the parts, and thus give a chance, at least, of active relief to the strangulation.

Operation. Finally, as a last resource, might not an operation for cutting the strangulated ring be attempted? It never has been done, though Laennec has suggested it. Yet I see no good reason why it may not be possible to recognize, by the physical signs, the side at which the disease exists, and the probable amount of the affection. Having learned these two points, and having tried other means of relief without success, ought we not to undertake the more serious operation of the scalpel?

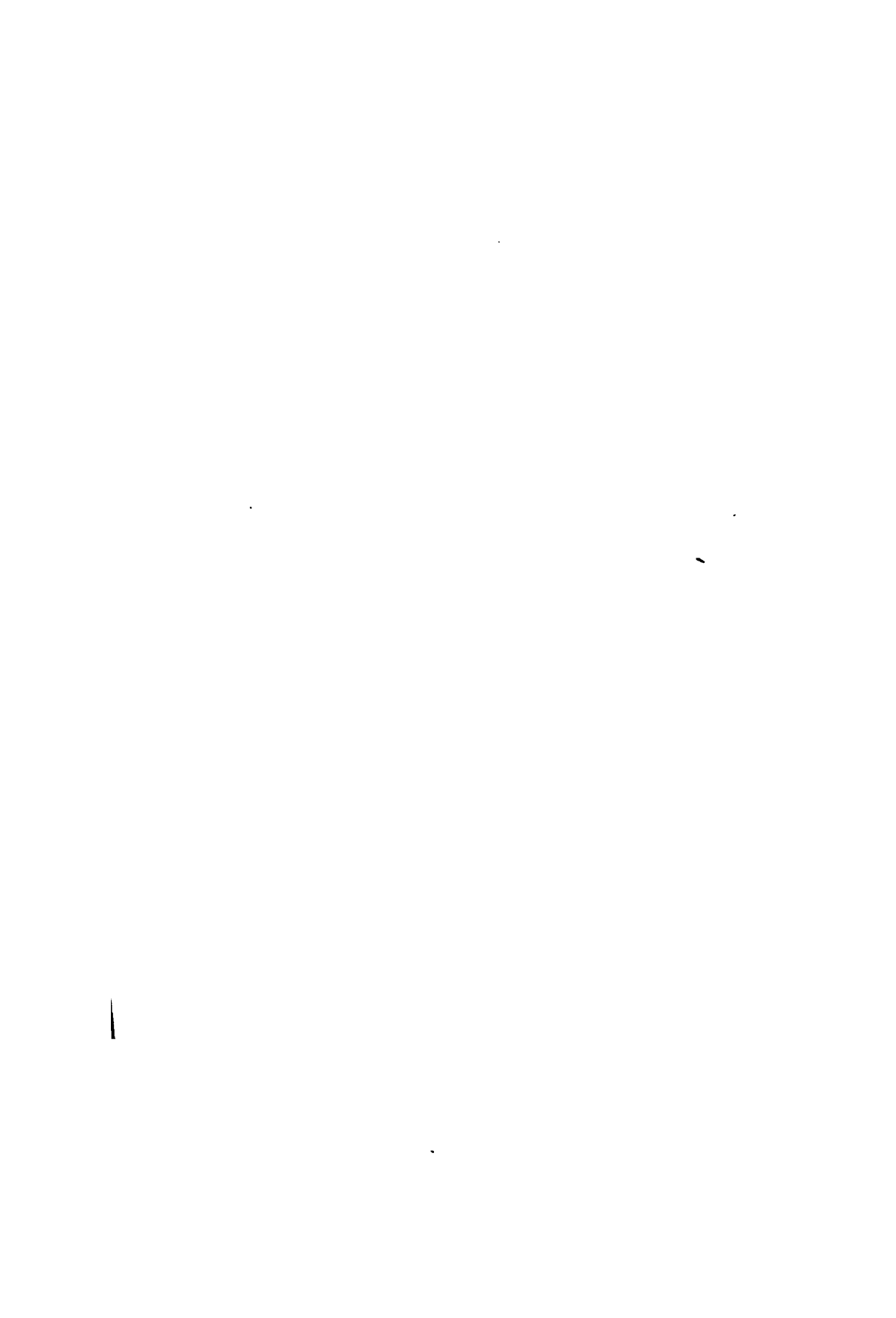
Where should the incision be made? Sacs commence about the lower and front part of the mediastinum; therefore, near this is a proper place to commence the incision. Passing along the edge of the ribs for the space of three or four inches, we should divide the muscles and come upon the peritonæum covering the lower part of the diaphragm and reflected thence upon the inside of the abdominal muscles. It would be possible, (I think,) to push aside this membrane and not enter the cavity of the peritoneal sac until we might be able to make out the exact place of stricture, and there a very slight incision only would be necessary. But in this operation there is, at present, so much of difficulty owing to the proximity of important organs, and to the distention and alteration of position of the abdominal organs, that it will probably have few to perform it, especially as the disease is so rare, that no person would be likely to have more than one or two opportunities for operating during his whole lifetime.

List of works from which the above cases were taken, or which were consulted during the preparation of the monograph:

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 1646. Gulielmi Fabricii Hildani, opera. Frankfort.
 1698. Lazari Riverii Op. Medica Univers. Obs. 67.
 1702. Philosophical Transactions of the Royal Society of London; abridgment. Paper by Sir Charles Holt.
 1729. Mémoires de l'Académie des Sciences. Article by Chauvet & Senac; also 1772, by Vicq d'Azyr. Paris.
 1755. Haller's Dissertationes Chirurgicæ, vol. iii. Dissertatio de Hernia Ventriculi; by Kirschbaum. Lausanne.
 Morgagni Works, vol. iii., letter 54. Seats and Causes of Disease.
 1767. Historia Anatomico-Medica; Josephus Lieutaud. Paris, vol. i.
 1771. Medical Observations and Inquiries. London.
 1784. Works of John Fothergill. Edited by J. R. Lettsom. London.
 1803. Cours d'Anatomie Médicale. Antoine Portal. Paris.
 1804. On Hernia. Sir Astley Cooper. London.
 1807. Edinburgh Medical and Surgical Dictionary; by Morris & Kendrick.
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 1825. Revue Médicale et Journal de Clinique, vol. xvii. Paris.
 1827. Journal des Progrès Médicales. Do., 1828.

1828. *Medico-Chirurgical Review*, vol. ix., p. 280.
1831. *London Lancet*, April; Nov., 1834; Sept., 1835; April, 1840; Aug., 1843.
- 1832, '3, '41. *London Med. Gaz.*, vol. x., p. 42; vol. xii., p. 673; vol. xxviii., p. 390
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1835. *Dictionnaire des Sciences Médicales*, in 30 vols. Paris. Art. Diaphragme. Cloquet & Berard.
1838. *Treatise on Hernia*; by William Lawrence. London.
1839. *Archives Generales de Médecine*, 3d ser., 19 vols.; vol. vii.; vol. xviii.
1842. *Thèse pour le Doctorat en Médecine*, par Aristide Auzelly. Paris.
1846. *Bulletin de la Société Anatomique*. Case by Mons. Gabier.
Philadelphia Medical Examiner, vol. iii., p. 384.
British and Foreign Medical Review, vol. iv., p. 260.
Encyclophonie des Sciences Méd. Ser. 6, Tom. 12, p. 267.

In addition to the above works, from which I have obtained the cases, I have examined all the medical and scientific journals and transactions which I could find up to the date of the paper, together with all treatises upon the subject of hernia, to which I could obtain access.



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