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LECTURES ON HERNIA, GIVEN AT THE CITY HOSPITAL, BOSTON.

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No. I.—*On the History, Anatomy, Varieties, Statistics and Cause of Hernia.**

THE escape of any viscus from its containing cavity, called hernia, probably owed its name to the Greek *ἑρνος*, a branch, or offset; an offset from the peritoneum, somewhat analogous in form, and in form alone, to the *diverticula*, which are common as an error of formation in the ileum. This offset, when it becomes sufficiently enlarged to receive the escaping bowel, is called the *hernial sac*.

Various estimates have been made as to the frequency of this infirmity in proportion to all mankind, which vary from one in eight to one in sixteen. Probably a mean of one in twelve is sufficiently correct.

If, then, eight per cent. of all our race are afflicted with hernia, it is not strange that the attention of medical men in all ages should have been directed to its observation, nor that the literature of the subject should be immense in range and exhaustive in research.

Passing by the earlier writers, from Hippocrates and Celsus down, we find not much of any value to us now until about a century ago.

In 1757, Camper published the first plates on Hernia worthy of the name. These were wood-cuts, in folio form, and were sufficiently accurate in anatomy, though rough in execution.

Sir Astley Cooper, in 1804, gave to the world his admirable treatise on Hernia—inguinal, crural and umbilical, as well as the

* It is not pretended that these papers on Hernia contain anything essentially original or new. As abstracts of clinical lectures, delivered unwritten, and illustrated by cases, they were subsequently condensed and written off. They are merely short-hand, and it is hoped clear and succinct, notes on rupture. They are designed to render clearer to the student, what we have always found difficult to teach, the anatomy of hernia.

And it is hoped that the subsequent papers on the Differential Diagnosis, the Operations for a Radical Cure, and the Treatment of Irreducible and Strangulated Hernia, may present some points of interest to the physician.

rarer forms.* Published in large folio, with steel engravings of good merit, they yet owed their chief excellence to the descriptive text—so terse, clear, simple and direct, that, to our thinking, it has not been equalled since.

The plates were far surpassed by Scarpa in 1809.† The great Italian anatomist was so fortunate as to secure in Anderloni an engraver, who afterwards made himself a familiar name in classic works of art. As illustrations of the anatomy of a region peculiarly difficult to represent, they equal in clearness Albinus and Vesalius in other departments.

From 1806 to 1829, the two Hesselbachs—father and son—who gave their family name to the triangle which lies between the *rectus abdominis* and the obliterated *hypogastric* artery, published monographs on Hernia.

But as exhaustive reviews of the subject, it would be hard to surpass the theses of Cloquet, offered in concours, in Paris, in 1819.‡ These essays were based on 500 dissections of herniæ in the dead subject, on 200 preparations, and 600 drawings. Such industry may well put to the blush more modern efforts.

Langenbeck, of Berlin, in 1817, published a monograph on Hernia.

Perhaps the best known and most read of later works has been that of Lawrence, in 1838.§ This is a compendium, in the English language, of all other writings.

Not much later, Morton published, in London, some beautifully colored illustrations of Hernia.

Finally, in 1863, Mr. John Wood issued his monograph on Rupture and its Radical Cure.||

In the fourth volume of Holmes's Surgery will also be found an admirable review of Hernia by Mr. Birkett.

Taken in the order of frequency, oblique inguinal, crural, direct inguinal and umbilical comprise those herniæ which escape through the natural apertures left for the passage of the testis, or round ligament; the femoral vessels, and the omphalo-mesenteric vessels and duct; while thyroid, sciatic, perineal, vaginal and diaphragmatic herniæ are not only far more rare, but differ also in forcing for themselves a passage through the weak spots of the pelvic outlet, or the diaphragm. The term ventral hernia is restricted to that which occurs through a wound of the abdominal walls, or between the *recti*

* The Anatomy and Surgical Treatment of Inguinal and Congenital Hernia. By Astley Cooper, F.R.S. London. 1804. Folio, with Steel Plates. Also, of Crural and Umbilical Hernia. Folio. 1807.

† Sull' Ernie, Memorie Anatomico-Chirurgiche. Di Antonio Scarpa. Edizione Seconda. Pavia. 1819.

‡ Recherches Anatomiques sur les Hernies de l'Abdomen. Par Jules Cloquet. à Paris. 1817. Recherches sur les Causes et l'Anatomie des Hernies Abdominales; Thèse Soutenue publiquement. Par Jules Cloquet. 1819.

§ A Treatise on Ruptures. By W. Lawrence, F.R.S. Fifth Edition. London. 1838.

|| On Rupture, Inguinal, Crural and Umbilical; the Anatomy, Pathology, Diagnosis, Cause and Prevention; with new methods of effecting a Radical Cure. By John Wood, F.R.C.S. London. 1863.

muscles separated by pregnancy; and, finally, internal hernia is a term sometimes applied to strangulation within the abdomen.

The terms bubonocoele, scrotal hernia, enterocoele and epiploecle do not need remark. But there are two terms, used by older writers, which demand explanation, as they might mislead. They are *hernia humoralis*, meaning orchitis; and *hernia varicosa*, a varicocele or cirsocele.

The whole anatomy of oblique inguinal hernia may be summed up in the descent of the testis, and the changes it imposes on the parts through which it passes. The testicle, in the earlier part of the foetal state, lies just below the kidney, and, like the latter, just behind the peritoneum, by which it is partially enveloped in front. The gubernaculum, or leading string, which guides it to the scrotum, has developed upon it, according to Mr. Curling, three sets of muscular fibres—one set attached to Poupart's ligament, a second to the pubes, and a third to the scrotum. As the testicle descends along the psoas muscle, the first set direct it to the inner abdominal ring; the second draw it through the canal, while the third conduct it to the bottom of the scrotum. The testicle passes through these fibres in its descent, and they become involuted on the spermatic cord, forming the loops extending down from the internal oblique over the cord and returning to the pubes, under the name of cremaster muscle. But the testicle also pushes before it the peritoneum which over-lies it, and thence protruding it in a bag or sac, in its descent through the inguinal canal, carries a double layer before and over it to the bottom of the scrotum. Here the two layers invest the testis in a double covering, with a serous sac between—the cavity of the tunica vaginalis. Just as in all serous investments, the organ lies behind the membrane: one layer invests the testis in front, named the *tunica vaginalis testis*, or *propria*; the other layer adheres to the scrotum, which it lines, under the name of *tunica vaginalis scroti*, or *reflexa*. This may be rather trite anatomy to go over, but it seems necessary to review it, for a fair understanding of the subject. When the testicle descends, it leaves an open pouch of peritoneum behind it, which becomes entirely cut off afterwards, in the normal state. It is upon certain imperfections in this closure that the varieties of oblique hernia and of hydrocele depend.

When the closure of the pouch of peritoneum takes place between the scrotum and the abdomen, the lower pouch is called the *vaginal* process, the upper the *funicular* process of the peritoneum.

The first variation from the normal state is where the pouch does not close at all, and remains one cavity from the abdomen to the bottom of the scrotum. Through this the bowel slips down and forms a congenital hernia, lying in contact with the testis.

In the next form an attempt is made at closure, but is not fully carried out. The common canal becomes occluded at one point near the external ring; the funicular process shrinks up within the inguinal

canal, but the vaginal process remains open up to the external ring. Thus we have all connection with the peritoneum closed; but the closed cavity of the tunica vaginalis scroti reaching up on the cord as high as the external abdominal ring. If, then, a hernia protrude, it pushes before it its own pouch of peritoneum, and emerging at the outer ring, descends into or behind the large vaginal sac; and we thus have the anomaly of a rupture covered by two serous sacs instead of one. This is called *encysted hernia*—sometimes infantile hernia, but that is a misnomer.

In the third variety we have the connection between the scrotum and the common peritoneal cavity completely cut off; the vaginal process contracted to a normal size around the testis, but the funicular process dilated and patent for a short distance on the cord. Into this dilatation, which extends from the inner ring to a point an inch, more or less, below the outer one, a knuckle of intestine may gradually descend, and thence creep slowly down into the scrotum, where it does not lie in contact with the testis, but, usually, in front of the tunica vaginalis. This is the form of common oblique hernia, which comes on slowly and spontaneously at some period between childhood and maturity; not congenital, but so gradual that the patient cannot define its exact period of origin. After reaching the scrotum it is not distinguishable from the other ordinary forms of hernia.

Finally, we have the normal and perfect closure, where the vaginal process is converted into a serous sac around the testis, and the funicular process wholly retracted within the inguinal canal, where it assumes the name of infundibulum process, which envelopes the cord at the inner ring. The remains of the original serous passage shrink into an impervious mass, and, together with the traces of the gubernaculum, envelope the cord in loose areolar tissue. This, then, is the case in which either oblique or direct hernia occurs from a strain, or rupture, forms its own proper sac of peritoneum, emerges, in either case, at the outer ring, and descends into the scrotum in front of the testis and tunica vaginalis; and the only difference in the covering of the hernia is, that when oblique it is surrounded by the fibres of the cremaster, and when direct it pushes before it the conjoined tendon.

The same varieties of closure of the pouch of peritoneum cause and explain the varieties of hydrocele.

If the cavity is entirely unclosed, we may have a congenital hydrocele, where the fluid will return into the abdomen.

The vaginal process may be closed below, and one or more separate serous pouches exist above on the cord, either without or within the inguinal canal, and this constitutes hydrocele of the cord; or, finally, we may have entire closure above and below, and dropsy of the cavity of the tunica vaginalis testis and reflexa, constituting common hydrocele, beginning at the bottom of the scrotum.

Somewhat analogous changes occur in the passage of the round ligament in the female; and the funicular process of peritoneum which remains patent is then called the canal of Nuck. Wrisberg, in 19 out of 200 female bodies found an opening leading through the ring into the labium lined by peritoneum. It may be the cause of a congenital inguinal hernia in the female. An account of the dissection of such a case by ourselves will be found in Vol. Lxx., No. 7, of this JOURNAL.

In femoral, or crural hernia, we have always similar anatomical changes to deal with, without the variety of conditions which we have described in the inguinal forms. This is because the crural ring and canal are not pervious for the passage of any viscus like the testis through them. We have, it is true, a complex arrangement of fasciæ, which it is not necessary to dwell on here. But the pouch of peritoneum, forming the hernial sac, is always the same offset from the great peritoneal cavity; and the only difference is as to whether it be arrested at the crural ring or extend down through the saphenous opening.

In umbilical hernia, again, we have a simple and constant arrangement of parts. In infancy, the pouch of peritoneum protrudes through the unclosed foetal opening for the umbilical cord. Its coverings are only the skin and superficial fascia. It thus becomes very thin; the peritoneum in old cases is nearly absorbed, and it seems as if the hernia might burst through. Such herniæ are very dangerous to meddle with by operative procedure. In the umbilical hernia of adults, occurring mostly in obese females, we quite frequently have the rupture protruding through a small opening in the sheath of the rectus, near the umbilicus; being really a ventral hernia, though appearing to be an umbilical one.

An imperfect nomenclature has given rise to most of the difficulty of understanding and describing hernia. Thus the two pillars of aponeurosis of the external oblique muscle, which environ the outer ring, called external and internal, should be called lower and upper. The outer abdominal ring, though outermost with reference to the plane of the abdominal muscles, is innermost with reference to the median line of the body; and the inner abdominal ring, in like manner, is farthest out from the median line.

So, too, oblique inguinal hernia is called external, because it passes outside the epigastric artery, although it emerges from the abdomen through the inner ring; and direct inguinal hernia is called internal, because it lies inside the epigastric artery, although it passes directly out of the external abdominal ring.

If possible, a worse confusion occurs in naming the fasciæ concerned in femoral hernia.

Thus we have the iliac portion of the fascia lata forming Hey's ligament, or the outer, falciform border of the saphenous opening; and the iliac fascia proper, lining the iliacus internus muscle within

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the pelvis, and forming the posterior half of the sheath of the femoral vessels. Also, the transversalis fascia forming, above Poupart's ligament, the posterior wall of the inguinal canal, and below the ligament, by another expansion of it, forming the anterior sheath of the femoral vessels, or fascia propria of femoral hernia.

In mapping out the anatomy of the inguinal region, the great land-mark is the spine of the pubes. It can always be felt, even in the most unfavorable subject. Into the pubic spine is inserted the lower or outer pillar of the outer ring; and passing across to the symphysis, just above the spine, is the upper or inner pillar of the same opening. Over and a little outside the spine of the pubes the external abdominal ring is inevitably to be found. It may be best felt in the male by placing the finger at the bottom of the scrotum, and invaginating it up into the ring. Just above, and at the middle of Poupart's ligament, is the internal abdominal ring. Below Poupart's ligament, and about midway between the outer and inner abdominal rings, is the crural or femoral ring.

These relations are constant, and by starting from the pubic spine we can make them all out.

Thus, we can distinguish a femoral from an inguinal hernia, even though the former be rolled up into the site of the latter, by either drawing down the tumor and seeing if the neck be below or above Poupart's ligament, or by finding the pubic spine, and exploring the external abdominal ring.

The statistics of the London Truss Society for twenty-eight years, embracing a total of 83,584 cases of hernia, go to prove:—

First, That hernia is more frequent in males than females, there being 67,798 males to 15,786 females—or four to one. This must be taken with some allowance for the fact that women are more apt to conceal, and less apt to seek aid for hernia, than men. But the great preponderance of males is probably to be explained by their more laborious pursuits.

Second, That hernia is more common on the right side than the left, in both sexes. Thus of males, 24,316 right side, to 14,006 left, or 2 to 1. Females, 3,256 right to 2,255 left, or 3 to 2. Cloquet assigns as the cause of this, that in most severe labor we use the right side in such a way that a line drawn perpendicular to the plane of the diaphragm falls over the right inguinal region, and the strain comes on the openings of the right side.

Third, That inguinal hernia is the more common form in males, and femoral in females. Thus of inguinal hernia, 38,322 males to 1,097 females; and of femoral hernia, 699 males to 5,511 females. The cause is to be found in the anatomical differences of the sexes. In the male the inguinal canal is dilated for the testicle and cord. In the female the greater width of the wings of the ilium, and consequently of the femoral arch, leaves a larger crural opening, and predisposes to that form of hernia.

Fourth, That umbilical and ventral hernia are more common in females than males. Of umbilical, 2,775 females to 664 males. Of ventral, 415 females to 209 males. This is probably due to causes incident to pregnancy, and the separation of the recti muscles. According to Mr. Syme, the straining in labor is also a common cause of femoral rupture.

The real cause of hernia, apart from accidental rupture by sudden over-exertion, we believe to be, in great degree, hereditary; in other words, that a tendency to loose rings, or to various degrees of imperfect closure of the funicular process of peritoneum, runs in families, or descends from father to son. Great length of the mesentery or omentum has been assigned as a cause, but this would seem to be negatived by the occurrence of hernia in children, in whom those structures are very short.

The mode of formation of the hernial sac is of interest and importance. This pouch of peritoneum is distinguished into a neck, where it emerges from the rings; a body, and a fundus or dilated extremity. In the congenital hernia the neck is nearly as broad as the fundus. In the ordinary adult hernia the neck is narrow. In some sacs there may be one or more constrictions outside the rings; and there may be two, or even more sacs, in the same region, as figured by Cooper. The sac of peritoneum elongates and stretches as the rupture increases by the *vis à tergo* within the abdomen; and it, before long, becomes organized and thickened, and contracts adhesions to the scrotum and inguinal canal. Thus it happens that in very many herniæ, perhaps the majority, the sac becomes irreducible back into the peritoneal cavity, although the bowel can be returned within the abdomen. We may have a hernia, without a sac, of the cœcum, or colon, or bladder, or any viscus which, not wholly enveloped by peritoneum, can slide down behind it.

Although the sac be adherent, if its contents can be pushed back into the abdomen, it is called a *reducible* hernia. But adhesions are very apt to take place between the contents of the sac, whether intestine or omentum, and the sac itself, as well as of the latter to the surrounding parts. If both these events occur, the hernia is called *irreducible*. If, now, a temporary stoppage of the peristaltic action of the bowel in the rupture takes place, through the accidental presence of flatus or a fecal mass, the hernia is called *incarcerated*. If this state of things continues unrelieved we have, next, *inflammation*. Here the position of affairs has become critical, but *may* be relieved by fomentations, rest, opium, &c. But, finally, if either the above condition continues in an irreducible hernia, or arises *de novo* in a reducible rupture—which has got suddenly down and been nipped, as it were, unawares—we have next *strangulation*, mortification and death, unless relieved by an operation.