LECTURES ON HERNIA AND ITS RADICAL CURE.

Delivered at the Royal College of Surgeons of England.

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LECTURE I.

Introduction.—Limits of the subject.—Inguinal, Crural, and Umbilical Hernia.—Visceral and Parietal Causes.—Opinions acted on by modern Surgeons.—Structure and Development of the Hernial Areas.—Descent of Testis.—Imperfections of Evolution as Causes of Hernia.—Anatomy of the parts of Inguinal Hernia.—Structure and Mechanism of the Canal and Rings in Health and Disease.—Oblique and direct Hernia.—Congenital, Infantile.—Relation to forms of Hydrocele.

MR. PRESIDENT AND GENTLEMEN,—In undertaking the duty with which I have had the honour to be entrusted by the Council of this College, my selection of the subject of my lectures was naturally influenced by the fact that, twenty-four years ago, the authorities of this College, in conferring upon me the Jacksonian prize for an essay embodying the results of a new method of operating for the radical cure in sixty cases of inguinal hernia, encouraged me greatly in the investigation of this field of research.

Fully and deeply impressed with the idea that it was only by patient and long sustained efforts that a subject of so much difficulty in obtaining and recording true results, for periods long enough to be worthy of reliance, could be satisfactorily elucidated, I have, during this long interval, continued to modify, to perfect, and to extend, the scope of the method of operating which I then published for the first time.

The attention and efforts of surgeons have been turned in this direction from the earliest ages of surgical art. New methods have continually been brought forward, and old methods resuscitated, wholly or in part, with various degrees of success or failure. In no subject has the plausibility of theory been more contrasted with futility of result. The delimitation between the safety of success, and the fatality of failure, has proved most difficult to determine and to mark out.

Yet, notwithstanding, I think I may now say, with a due regard to scientific exactitude, that operative treatment, with a view to produce a radical cure of hernia, has gained ground in the confidence of the medical profession; and that the disappointing results, and repeated failures, of much-lauded methods, have not entirely established amongst us that despairing condition of opinion of which Lord Bacon says, "that he will not doubt to note as a deficiency" in the practitioners of his time, "that they inquire not the perfect cure of many diseases, but, by pronouncing them incurable, do enact a law of neglect, and exempt ignorance from discredit." (*Advancement of Learning*, book ii., p. 43.)

In an age when all things are tested, and brought to proof again and again, no exception can be made in a matter which so seriously affects the welfare of the very large number of our fellow-creatures who suffer and die from hernia.

In the course of the three lectures which are allotted to me, I shall not have more time than barely to deal with my own work in the wide field of hernia. A subject absolutely overloaded with literature and bibliography will not fairly permit of scant notices and mere honourable mentions. To read out the names, and to summarise the work of the labourers in this field only, would probably occupy the whole of the three lectures, and then would only imperfectly do the work of the many excellent text-books and encyclopædias. I shall venture, however, further on, to classify very briefly the varieties of the operative treatment of hernia. I shall confine myself to the more common forms of hernia, the most troublesome, and the most disabling, and, therefore, the more urgently calling for a more complete and satisfactory treatment than constant and, usually, imperfect truss pressure, namely, inguinal, crural, and umbilical hernia.

During the twenty-seven years which have elapsed since my first operation for the radical cure of hernia, I have operated upon 391 cases, namely, 370 inguinal, 16 crural, and 5 umbilical.

In 11 cases the hernia was double, and both sides were operated on. In 12 cases, operations, which at first failed, were repeated (in two cases three times), making a grand total of 414 operations.

Of the 370 cases of inguinal hernia, 219 were found on the right side, 128 on the left side, and 23 on both sides; 10 of them occurred in females; 123 were cases of congenital origin, occurring either in children, or seen in patients above 14 years of age with a history of congenital origin; 114 occurred in males, and 9 in females; of the males, 51 were found on the right side, 41 on the left side, and 13 on both sides. In 9 male cases, one of the testes was undescended, and placed at or above the superficial ring. Six of the undescended testes were on the right side, and 3 on the left. Of the 9 females, 6 occurred on the right side, and 3 on the left.

Of the 15 cases of crural hernia, 10 were found on the right side and 5 on the left; 3 were in males, and 12 in females. The 5 cases of umbilical hernia were all males.

Pathology and Causes of Inguinal Hernia.—In estimating these, we have to consider, first, the contained viscera of the peritoneal cavity, and their action under the influence of the muscles which surround and compress them; and, secondly, the formation of the containing walls, and the reason of their yielding in certain hernial regions. Of the contained viscera, the most likely to become displaced are the omentum and small intestines; the former because of its variable length and the mobility of its attachments to the stomach and colon; and the latter, because of the extensibility of the mesentery, necessitated by the alternating distention and contraction of the muscular tube which it encloses and retains. The colon, although frequently implicated in hernial tumours, especially in the umbilical variety, is less liable, in its ascending and descending portions, to hernial displacement, because of the shortness of the peritoneal processes which attach them to the abdominal walls in the shape of mesocolon. The more solid viscera, both abdominal and pelvic, although sometimes implicated in hernial protrusions, when large and of long duration, seem to be always dragged down, either by adhesions, or by their connections with the looser viscera or peritoneum.

It was held by Richter, Morgagni, and others of the older school of modern surgery, that the immediate and most powerful cause of hernia, especially inguinal, was an elongation of the mesentery, allowing of such an extent of play to the movements of the bowels as to permit protrusion through the weaker parts of the containing walls, and that a mesentery of normal length would not allow of such protrusion. Amongst the many able and experienced of their contemporaries, Scarpa stands eminent for the ability with which he contended against this theory, and maintained that, the elongation of the mesentery does not, in the formation of a hernia, precede the displacement of the intestine, but is simultaneous with it, and caused by the dragging of the already displaced bowel.

And there are many facts which appear to favour this opinion, and the conclusions of Samuel Cooper, in support of the same view of the question.

Distention of the bowels by food or air, and the muscular action upon them, presses the anterior wall of the abdomen forwards, by a simultaneous and equally distributed force in its action and reaction, being equal and similar almost to that of fluid pressure. The same distention tends, by separating the folds of the mesentery, to shorten its hold upon the bowel, and so to prevent its protrusion through the abdominal wall. When the abdominal cavity is opened by a wound, no protrusion occurs unless and until the bowels are distended with food, fluids, or air, and then it occurs freely. And it is common to find in the *post mortem* room a considerable part of the intestines lying in the cavity of the pelvis. If the bowels lie so far down as to rest on the pelvic viscera, which they commonly and normally do, they may certainly reach as far as the groin or deep inguinal and crural hernial apertures, which lie on a superior level. In expiration they are pressed still nearer to the spinal column, close against which, in thin persons, the muscular wall of the abdomen lies. In the normal condition, the mesentery of the jejunum, placed towards the left side, is the longest and loosest portion. At a point between the distance of 6 feet to 11 feet from the duodenum, Mr. Treves has shown that the mesentery attains to from 9 to 10 inches in length, from its root to its attachment to the bowel, the lower part measuring from 8 to 9 inches only. (Hunterian Lectures on the Anatomy of the Intestinal Canal and Peritoneum.)

At the right iliac fossa the lower part on the mesentery measures only about one half of this. The same observer calls attention to the fact that, just after birth, the development of the upper part of the small intestine is much more rapid than that of the lower, or that of the colon, which is comparatively late in its evolution. This depends upon the physiological changes resulting from the first imbibition

of food through the mouth, in the form calculated for easy and rapid and more or less complete absorption, with but little residuum in the shape of faeces. These, by their presence, stimulate the growth and action of the large intestine, heretofore a simple receptacle for the meconium. The caecum, also, is late in reaching to its final resting place in the right iliac fossa.

The early position of the stomach on the left side, with a more vertical direction than in the adult, tends to place the omentum more on the left side, where in the foetus and infants it is chiefly aggregated. This is apparently the cause why, in early life, omentum is more frequently and more abundantly found in an inguinal hernia on the left side than on the right. The later descent of the caecum and ileum on the right side, seems to be more than compensated for by the ultimate downward development of the mesentery and intestines on the right side, inasmuch as inguinal hernia is found much more frequently on the right side than on the left. In my own cases, as before stated numerically, inguinal hernia was found almost twice as frequently on the right side as on the left. The reason of this will be found to lie in causes referring rather to the effect of the evolution of the testicle upon the abdominal wall. In about the same proportion of two to one, this gland was found to be retained in the abdomen or groin more frequently on the right side than on the left.

Again, we do not uncommonly find in the dissecting room very long and lax and fatty polypoidal developments of the mesentery, and a very low attachment of its root to the hinder wall of the abdomen, with the whole of the contents of the lower abdominal regions pushed down as it were by a large liver or a hypertrophic stomach. And yet in such cases it is rare to find a hernia coexistent.

In one case out of 100 examined by Mr. Treves the intestines, in an old woman of seventy, reached as far down out of the belly as eight inches below the anterior superior iliac spine, and yet there was no hernia of any kind. I have myself found many similar cases in my dissecting room experience. On the other hand, in normal instances, as Mr. Birkett has pointed out, and Mr. Treves has verified, the intestines cannot be artificially drawn down below the level of the pubic spine, either into the scrotum or through the crural canal. It is evident, therefore, that in hernial cases, after the bowel or omentum has become engaged in the deep hernial rings, as far as which they normally reach, the omentum and mesentery, or both, must be elongated by a constant dragging pull upon these structures. And in point of fact nothing is more common than to find in hernial cases a long, pointed process of the omentum, more fatty and thicker than the rest, lying in the sac; or a coil of intestine which had been habitually the inmate of a hernial sac, projecting prominently beyond its neighbouring coils, with a longer mesentery than the rest.

The bearing of these considerations upon a proper judgment of the subject of the radical cure of hernia is evident. If the omentum is elongated and so formed as to slip easily and continually into a hernial sac, and keeping it open, or pressing upon the deeper hernial openings, an operation for the radical cure cannot really be sufficiently effective, unless a portion of the omentum be also removed at the same time. Such removal of the omentum I have, in my later operations, always effected when required. Any attempt at shortening of the mesentery seems so far, even in these days of daring abdominal enterprises, to be out of the scope of practical surgery.

The conclusion we may draw from the foregoing observations is that while the condition of disproportionate development in the intestines and abdominal viscera may predispose to, and assist in, the formation of a rupture, the chief causes lie in the imperfection of the structures from delayed evolution in and about the deep hernial apertures. As to the precise determination of the structures in which this deficiency of retaining power resides, there is again much difference of opinion. Before discussing this it will be necessary for us to consider the arrangement of the structures composing the abdominal wall, and their relation to the formation of hernia.

Anatomy of the Parts of Inguinal Hernia.—The more persisting and continuous support is evidently afforded by the strong aponeurotic and tendinous structures, which are thickest and strongest where resistance is most required, viz., in the groins.

Under the subcutaneous and tegumentary layers comes the aponeurotic tendon of the external oblique, passing in parallel fibres obliquely downwards, forwards, and inwards, to be connected, at the linea alba, with the similar ones on the opposite side, and blended more or less with the tendons of the internal oblique and transversalis muscles lying beneath them. The muscular fibres of the external oblique terminate in an elliptical border at the level of the iliac spine. From this point an intimate anterior superior combination of the outermost of the tendinous fibres with the fascia lata of the thigh, under the name of Poupart's ligament, passes

across the deeper groin structures, to be implanted upon the pubic spine and pectineal line. The iliac portion of fascia lata is connected with it below, from one point to the other, continuously, and holds it down in such a way that the superficial surface is concave, and forms the hollow of the groin, for the accommodation of the lymphatics and superficial vessels.

At the pectineal line, the deeper fibres are blended with, and help to form, a triangular offset with a lunated border outwards (Gimbernat's ligament), and here the fibres meet, and are united to the pubic portion of fascia lata, to the conjoined tendon, the triangular fascia, and to the deeper fascia, namely, the fascia iliaca and transversalis, which strongly bind it down, and keep it in its curved shape. These important parts are in relation, therefore, both to inguinal and crural hernia.

Above Poupart's ligament, the tendon of the external oblique is covered by the deep, loose, and movable layer of superficial fascia (Scarpa's fascia), which, giving off a wide elastic process of attachment to it, is itself continuous with the deep layer of superficial fascia of the thigh, and contains between its layers the lymphatic glands, vessels, and nerves before mentioned.

Of these vessels, the only ones that need be considered in relation to our subject are the superficial epigastric, and the superficial and deep external pubic branches of the common femoral. Of these, the first named emerge through the saphenous opening, or near it, pass upwards and inwards over Poupart's ligament, and the deep abdominal ring, indicating the course, tolerably closely, of the deep vessels of the same name which lie on the peritoneum.

The superficial external pubic emerges also through the saphenous opening, and crosses upwards and inwards over the superficial abdominal ring, towards the *mons veneris*, while the deeper ones of the same name emerge through the fascia lata, cross the pubis behind the spermatic cord, to anastomose on the scrotum and penis with other arteries.

The cutaneous nerves in relation with these are the ilio-inguinal, emerging from the superficial ring, to be distributed to the scrotum and lower groin on the thigh. Other small branches of the lower dorsal cutaneous nerves pierce the abdominal aponeurosis at varying distances from the linea alba, with similar branches of the lower intercostal arteries, to anastomose with the superficial epigastric. The genital branch of the genito-crural nerve also emerges upon the spermatic cord or round ligament, through the superficial abdominal ring, to become distributed, in the male, to the cremaster muscle and dartos scroti in the scrotum, while the crural branch of the same nerve pierces the fascia lata below Poupart's ligament, to be distributed on the upper and front part of the thigh, anastomosing with the internal cutaneous branch of the anterior crural.

Above Poupart's ligament, the aponeurosis of the external oblique forms an aperture for the transmission of the spermatic cord or round ligament, the superficial (external) abdominal ring. The sides of this opening form, with the pubic crest, an elongated oblique triangle, of which the outer (the external pillar of the ring) lies also inferior, and blends, or is identical with, the lower half of Poupart's ligament.

Flat at its outer half, it becomes rounded and cord-like at the inner or lower part, where it is implanted firmly upon the pubic spine. Outside this insertion it is grooved obliquely for the passage and lodgment of the spermatic cord, which, on emerging from the ring, lies outside the pubic spine, which forms an important internal relation to it, useful in protecting it from injury, and in diagnosis. This groove is found to be continuous with one formed in the canal by the attachment of the fascia transversalis and conjoined tendon to the deep surface of Poupart's ligament, in which the cord rests on its way through the inguinal canal, and which forms the lower boundary of that canal.

The internal pillar of the superficial ring is flat and riband-like, and can be traced downwards to the front of the pubic bone and symphyseal ligaments below the pubic crest, forming in the male a part of the ligamentum suspensorium penis. The triangular opening left between the pillars of the superficial ring is converted into an oval opening by the arrangement of some curved cross fibres, in bundles of an inverted arch-shape arciform fibres, closely connected by a thin but dense fascia, and deeply adherent to the tendinous pillars. The arciform fibres arise in a single bundle from the anterior superior iliac spine. They spread out, to be lost in the aponeurotic fascia, over the lower part of the linea alba. Below, the arciform fascia is continued as a sleeve-like investment over the spermatic cord, forming the inter-columnar or external spermatic fascia, which passes down into the scrotum upon the tunica vaginalis, blending with the cremaster fascia, which lies next below it. When the arciform fascia is divided, the pillars of the ring separate under pressure from within, proving that this

fascia forms a barrier against dilatation or separation of the pillars of the ring in the formation of a hernia.

Next in order, under the external oblique aponeurosis, come the internal oblique and transversalis muscles, with the cremasteric fibres, all covered by a thin, but dense, connective tissue layer, which connects the cremasteric fibres in a fascia, the fascia cremasterica.

The lower muscular fibres of the internal oblique arise from the deep surface of Poupart's ligament, as low down, in a well formed subject, as the lower third of Poupart's ligament, covering over the transversalis fibres, and also the deep abdominal ring. In a muscular man, they are frequently arranged in a thicker layer at this point, so as, with the subjacent cremasteric fibres, to form an elevation or swelling, visible externally, so as to resemble a bubonocoele somewhat. This swelling may be observed markedly emphasised in the well known athletic statue, the Farnese Hercules. The lower fibres of the muscle arch closely over the cord at the deep ring—blended, more or less, with those of the transversalis muscle which accompany them, reaching nearly as far down, and separated only by the small intercostal vessels and nerves, with the plexus of the ilio inguinal and ilio hypogastric nerves. Inside the canal, they unite in a dense tough fascia to form a conjoined tendon. The outer curved border of this tendon is continuous, and blended with the fascia which covers both the surfaces of the transversalis muscle, especially with the deeper layer called the fascia transversalis. The muscular fibres of the internal oblique are inserted in strong bundles upon its superficial surface, so as to cover it in muscular males.

If the forefinger be carried along the canal in a hernial subject, and passed as far inwards as possible, so as to lift the muscular layers, the conjoined tendon can be raised upon it, along with the combined oblique and transversalis muscles, presenting a salient crescentic margin, easily recognised by the finger.

The cremasteric muscular fibres arise externally from the lower third, or rather more, of the deep surface of Poupart's ligament; the higher fibres passing up behind the internal oblique, and connected with and sometimes receiving fibres from the transversalis muscle.

Below and internally, the fibres spread out in a fan-like way, the upper ones arching over the cord, to be implanted, continuous with those of the internal oblique, into the surface of the conjoined tendon. The lower two-thirds of the fibres pass out through the superficial ring upon the cord, forming a second sleeve-like investment, in combination with the connecting tissue. The inner ones form a more or less perfect series of loops, the recurrent fibres becoming lost in the fascia, about the angle of the pubis; while the outer or lowest are lost upon the fascia investing the tunica vaginalis. When the superjacent fascia intercolumnaris is opened, the finger can easily separate the cremasteric fascia from its connections, and invaginate it into the canal as high as the deep ring.

At the outer border of the rectus abdominis muscle, the conjoined tendon splits, a little above the pubis, to form the sheath of that muscle. The separation of the layers is marked externally by a crescentic depression, "the linea semilunaris," reaching from the pubic spine as high as the junction of the eighth and ninth rib cartilages, into which it is implanted. Its posterior layer covers the deep surface of the rectus muscle as far as the linea alba, except at the lower fourth or fifth, where the muscle is in contact with the fascia transversalis.

A curved margin is here seen, called the fold of Douglas, under which the epigastric vessels pass into the rectus muscle. In a perfectly formed subject, the outer border of the rectus muscle forms a deep convex curve outwards, from the crest of the pubis, so as to bring it into pretty close relation to the deep ring, and to form a protection against hernial protrusion in this place. The deep abdominal ring is an oval opening in the fascia transversalis, placed about three-fourths of an inch above the centre of Poupart's ligament, with its longer diameter directed upwards and inwards.

The opening is covered in front by a sleeve-like prolongation of the fascia transversalis, the borders of which give off over the cord a close investment of fascia, the fascia spermatica interna, or infundibuliform fascia, the latter name from its funnel-shaped appearance. Like the upper opening of a coat-sleeve, the aperture of the deep ring is seen only from its internal or deep aspect, presenting, when the peritoneum is stripped off, a sharp crescentic margin internally, over which the spermatic duct can be seen to curve acutely. At this point, the spermatic vessels, lymphatics, and vaso-motor nerves first join in the duct, lying on its outer and upper side, and bound to it by a connective tissue, the remains of the funicular prolongation of the peritoneum, which forms in early fetal life the continuation of the tube of the tunica vaginalis. It is lost below on the outer surface of the tunica vaginalis when completely shut off from the peritoneum.

When this has occurred, after the complete descent of the testicle, about the eighth month of intrauterine life, the connective tissue becomes strengthened and connected with the subperitoneal fascia—a cicatricial dimple on the peritoneal surface, forming a strong resisting barrier against the first protrusion of a rupture into the inguinal canal. On this aspect of the hinder wall of the canal is seen, in the subperitoneal fascia, a tolerably sized artery, given off from the external iliac just above Poupart's ligament, the deep epigastric artery. It passes upwards and inwards, to enter the sheath of the rectus at the outer part of the fold of Douglas, accompanied by two veins, one on each side, which join before they open into the external iliac vein. Between these vessels and the outer edge of the rectus is formed a triangular space, with its base towards the inner third of Poupart's ligament, the triangle of Hesselbach. This is covered by the fascia transversalis, closely adherent to the deep surface of the conjoined tendon of the internal oblique and transversalis muscles. In front of the latter, at the lower and inner angle of the aforesaid triangle of Hesselbach, can be seen a triangular arrangement of tendinous fibres, which can be traced from the internal pillar of the superficial ring of the opposite side of the body, across the median line or linea alba, downwards and outwards to the inner fourth of Poupart's ligament, with which, and with the conjoined tendon, it is intimately blended at the rectineal line.

Across the triangle of Hesselbach, on the deep or peritoneal surface, the obliterated hypogastric artery, forming part of the superior false ligament of the bladder, is seen to cross upwards and inwards towards the umbilicus. On each side of it is a loose pouch of peritoneum, which in direct inguinal hernia forms a sac for the rupture, and also affords material for the enlargement of the sac in the oblique variety.

The inguinal canal is a passage from the deep to the superficial ring, one inch and a half to two inches in length, and directed obliquely in a double sense, viz., oblique from above, downwards, and inwards, and oblique also from the deep to the superficial opening. It is closed in a valvular way by the close apposition and areolar connection of the deep and superficial walls or boundaries. This adhesion by connective tissue is torn or stretched in the formation of a hernia, or prevented altogether by the persistence of the funicular process of peritoneum in infancy, and it is one of the most important objects of a radical cure of hernia to restore this adhesion and reinstate the valvular action of the walls of the canal, if possible.

The deep wall is formed by the apposition and union of the layers of aponeurotic fascia—namely, the fascia transversalis blended with the conjoined tendon of the internal oblique and transversalis muscles, and, at the lower third, with the fascia triangularis, passing from the external oblique of the opposite side to the lower third of Poupart's ligament, and covering the lower tendinous origins of the rectus abdominis muscle.

The anterior wall is composed mainly of the aponeurosis of the external oblique muscle, where it forms the outer pillar of the superficial ring. At the outer two-thirds, beneath this, are the muscular fibres of origin of the internal oblique muscle, arching over the canal to unite with the edge of the conjoined tendon. Closely skirting the deep ring beneath this are the lower fibres of the transversalis muscle, connected with it by a tough fascia. At the inner or lower half are the fibres of the cremaster muscle, also closely attached, by its connecting fascia, to the conjoined tendon and fascia triangularis.

Below the canal is the grooved upper edge of Poupart's ligament, and above it are the arching fibres of the internal oblique and transversalis muscles. When pressure from within is made by the viscera, the hinder wall is pressed forwards against the front wall, and the passage is thus fortified against dilatation. At the same time, the elastic peritoneum and its fascia, closing strongly the deep ring, prevents the omentum or bowel from forming a depression, which would give it a hold and purchase wherewith to dilate the opening and canal.

Formation of Oblique Inguinal Hernia.—If this closed ring yield from imperfect formation, or want of tensile power, a depression is formed outside the epigastric vessels. This affords a prominent and resisting line or border, so that a hernial dimple or shallow sac is formed, permitting the viscera to protrude and press against the internal and external oblique fibres, and to bulge forward the anterior wall of the canal. Thus, a hernial protrusion is commenced (bubonocoele), which speedily, under muscular effort, turns downwards along the canal, rips up and stretches the connective tissue binding the walls together.

When, by a late and imperfect development of the gubernaculum or other causes, the testis has not descended in the eighth month of fetal life, a sac is already formed by the funicular process of peritoneum.

In these cases, the internal oblique and transversalis muscles, as well as the cremasteric fibres, are weak and improperly formed; and the former does not extend at its origin so far down as it ought, sometimes occupying only the outer third of Poupart's ligament. Thus, but a feeble resistance is afforded to the descent of a hernia at the moment of the greatest tension. At the same time, the superficial ring may be larger than usual, in consequence of being occupied by the testis in its slow and delayed descent. The intercolumnar fibres are feeble and yielding, and afford but little resistance to the separation of the pillars of the ring. The external aspect of the patient's groin in these cases is weak and bulgy, and the deficiency of development of the muscular fibres sufficiently evident. The rectus muscle is narrow, and does not arch boldly outwards to close up and protect the groin-area.

The testis may be in the deep ring or the canal, in the superficial ring, or just upon the pubic angle. In such cases, a hernia almost invariably follows the descent of the testis. When the gland is adherent in the canal, the epididymis may be drawn out and stretched, so as to be altogether below the testicle, with a pouch of peritoneum (the aborted tunica vaginalis) quite below both, and simulating the testis externally to the eye of the surgeon. The contour of the external genital organs in these patients is usually rounded and infantile, sometimes stunted.

The persistence of a small funicular process of peritoneum in the canal may result, even later than the infantile period of life, in a hernia; first the omentum, and then the bowel, dilating the canal down to its imperfect closure at some point above the testicle, where it forms a large tunica vaginalis. In children, such cases may thus have the fundus of the hernial sac invaginated into the large tunica vaginalis, giving a double serous covering or sac to a hernia. This is described in text-books as an infantile hernia, and is characterised as presenting three layers of serous membrane for division before the contents of the sac are reached. It must be considered as simply a variety of congenital hernia, in which the funicular offset of the peritoneum is not closed up at all, but the hernial contents descend and lie directly upon, and may reach beyond, the testicle. Such a hernia is characterised by its rapid progress downwards into the scrotum, having only to dilate the funicular tube of serous membrane, and to overcome but little resistance from the already open inguinal canal.

It is to a late descent of the testis, to an imperfect closure or a mere narrowing of the funicular process, and to the rapid development of the small intestine and omentum, that I attribute the occurrence of inguinal hernia in infants and young children. In adult cases, also, there is frequently a history of some sort of a swelling about the scrotum in childhood.

We have seen that, out of 370 cases of inguinal hernia, as many as 123 could be traced to a congenital origin. In a great proportion of these, ruptures had been present in the males of the family—in the fathers, uncles, or grandfathers—showing the hereditary nature of the cause. In many instances, there were open rings and a bulgy loose formation of the groin where no actual rupture was present, revealing the imperfect development of the muscular apparatus and surroundings of the spermatic cord. In many others, also, there was an imperfect development of the testicle on one or both sides, most frequently on the right side. The majority of cases of inguinal hernia being also on that side, tends to prove that the cause of this variety of hernia here assigned is the true one.

When the abnormally feeble barrier at the deep ring has once begun to yield, other agents tend to promote the formation of a complete hernia. The bubonocoele pushes forward the anterior wall opposite the deep ring, weakened by the want of formation of the lower part of the internal oblique and transversalis muscles. The continued action of the latter muscle, forming a horizontal muscular constriction on the abdomen, forces the intestines down upon the weakened ring. At the same time, the contraction of the recti muscles keeps them in the same position, and, by the backward pressure upon the sheath, forces the deep wall of the inguinal canal backward, and tends to open up the valve of the canal, while the sac finally slips down and emerges through the imperfectly closed superficial ring, and then opens up the channel of the spermatic cord down into the scrotum, distending the dartoid pouch-like investment.

In a condition of oblique inguinal hernia, the cord lies first below and to the inner side of the neck of the sack, the fundus of which is lodged, in the earlier stages of bubonocoele, in a deep groove behind the outer pillar of the superficial ring, and above Poupart's ligament. As it proceeds along the canal, the cord crosses obliquely behind the sac of the hernia, and finally lies behind and to the outside of the complete hernia, in the groove on the outer pillar of the ring, external to the pubic spine. The sac, when distended, fills up the canal,

adapting itself to the shape of the passage, so that there are usually found three slight constrictions, namely, one at the neck of the sac, one at the lower margin of the internal oblique, and one at the superficial ring. The first is usually the most marked, and is often attended with a thickening of the neck of the sac itself, which may constitute the strangulating portion of a hernia. The constriction may be at any of the three points indicated, but is most common at the first.

In the formation of a direct inguinal hernia, much less common, the deep ring has no share. It resists the applied force, while the conjoined tendon and the other layers of the hinder wall of the canal below the epigastric vessels, and between them and the hypogastric cord, yield before the loose peritoneal protrusion, or are, less commonly, split and really ruptured by the muscular force applied above. Pushed before the intestines, the loose and yielding peritoneal sac passes between those vessels, or internal to both of them. The spermatic cord usually lies to the outer side of the sac of a direct hernia, all the way along the canal.

Not unfrequently it was found, when operating to remove the sac, that the constituents of the cord were pushed in front of the sac, and sometimes spread out and separated from each other, and were even projecting into the cavity of the sac.

This constitutes a dangerous and perplexing condition to the operator when removing the sac of a large hernia. The distinction usually drawn between the direct or internal and oblique or external hernia from the relative position of the epigastric artery to the neck of the sac, is difficult or impossible to detect in the operation for the radical cure; and even in that for strangulation, it rarely affords any guide to the operator, to lead him to depart from the rule of cutting upwards. An oblique hernia of old standing may present the appearance of a direct one from the rings being drawn nearer to one another by the enlargement of the deep ring, and the neck of the sac may be in close contact with the edge of the rectus muscle. No trouble has ever been caused in any of my operations by the epigastric vessels, and no hæmorrhage has ever followed the operation.

The structures which the surgeon must divide to reach the sac of the oblique variety, outside the superficial ring, are as follows, namely, the integuments, including skin and two layers of superficial fascia, with the small cutaneous vessels and nerves; the fascia intercolumnaris; the cremasteric fascia, recognised by the presence of muscular loops, with the cremasteric nerve-vessels; the fascia infundibuliformis *vel* fascia propria; and then covered by a little adipose connective tissue, fascia subperitonealis, to the sac of the hernia.

The structures divided in cutting down to a direct hernia proper are the same, with the substitution of the fascia transversalis for the infundibuliform, and the conjoined tendon for the cremasteric fascia. The conjoined tendon is sometimes split by the hernial sac, and does not cover it. A few cremasteric fibres may, however, be seen in muscular subjects lying over the direct hernial sac, when this is placed close internal to the epigastric artery.

The occurrence of a double sac, one through the deep ring, and another through the conjoined tendon, is rare, but must be kept in mind.

A direct hernia is more commonly the consequence of an overpowering muscular force, rapid in its action and effects, and resulting in a distinct tear or rupture of fibres, than the other form of inguinal hernia, which is the result of gradual yielding. It is most frequent in adults whose muscular power is disproportionate to the existing strength of the fibrous structures. The neck of the sac lies close to the edge of the rectus; and there is no oblique valve-action capable of being restored by operation. Sometimes the hernial sac emerges from the canal by splitting the fibres of the outer or inner pillar of the superficial ring, and may thus, in the former case, be placed in close proximity to the femoral vessels.

Industrial and gymnastic exercises favourable to the prevention and cure of hernia are those which tend to strengthen the abdominal muscles and fascia, such as hanging and swinging by the hands upon the trapeze, swaying from one hand to the other, swarming up a pole, or up a rope or rope-ladder by the hands, or any motion or posture which stretches out the body and increases the tension of Poupart's ligament.

But force applied with the legs bent on the body, and the groin-structures relaxed, is injurious, and productive of rupture: as in rowing, tricycling, lifting heavy weights, and straining with the diaphragm. In all these, Poupart's ligament and the structures connected with it are relaxed; while the transversalis muscles exercise a constricting power upon the abdominal viscera, forcing them downwards upon the relaxed groin-structures, which give way before the force, and produce rupture. The rectus, also, when contracting, presses backwards its sheath and conjoined tendon, and so tends to open up the canal.

The contents of an inguinal hernial sac vary very much, and some-

times perplex the surgeon, both in diagnosis and operation. The funicular process may be patulous throughout, though too narrow to admit of either bowel or omentum. A serous effusion may be present, which forms a translucent tumour like hydrocele. This may disappear on the patient lying down, and may be reduced by gentle pressure more or less slowly, according to the size of the tube communicating with the peritoneum. This has been called a diffused hydrocele of the tunica vaginalis. It is usually present in children. Before it becomes absorbed, the canal of the funicular process may become closed at some point in the canal; and a doughy loosely fluctuating scrotal tumour may be present, which does not disappear on pressure or lying down. This is sometimes called a windy rupture; neither bowel nor omentum can be detected.

When the canal is closed up imperfectly in two places or more, a tumour may be formed on the cord, elastic and irreducible, from fluid effusion into the canal between the obstructed points, and the complaint then constitutes one form of encysted hydrocele of the cord. At the same time a pouch may exist at the deep ring, forming a true hernial protrusion.

Occasionally I have found in a hernial sac one or more of the bodies known as peritoneal concretions. Round as a billiard-ball, and sometimes of considerable size, such concretions seem to be formed by a deposit of albumen in layers around a detached appendix epiploica, and may slip up and down from the sac to the abdomen.

The hernia may be irreducible from enlargement by fatty or fibroid deposits in the omentum, constituting one form of incarcerated omentum.

Or the omentum may be adherent to the bowel, or one or both of these to the sac. If such adhesions be recent and not extensive they may be detached in an operation for cure, the omentum removed, and the bowel returned, all bleeding points being carefully ligatured. Sometimes I have found a secondary smaller sac budding from the primary hernial one, and filled with a hard and convoluted mass of adherent omentum. In some cases these have been found which in size and shape feel like a testicle, the real gland being obscured by the mass. They have not, of course, the testicular feel to the patient on pressure, and this forms something of a guide when the patient can be trusted to help in the diagnosis. Lastly, there may be present in an old and large rupture, on either side, a portion of large intestine, the caput cecum coli, a part of the bladder, uterus, and ovaries. I have never found either stomach, spleen, or kidneys in a hernial sac of any kind.

Adhesions and constrictions of the sac or contents of a hernia may give rise to strangulation, which illustrates the propriety of always, as a rule of operation on strangulated hernia, opening and examining the interior of the sac. This is still more forcibly inculcated when ulceration or sphacelus, or faecal extravasation might be present.

"The sac of the hernia may be so thin and delicate that the necessity for removing it is not apparent. Twisting and stitching up the neck along its whole length, together with the parietes and openings of the canal, have, in 261 cases out of 305, been found sufficient to cure cases of reducible hernia, operated on when none but reducible cases were judged proper for the radical cure. In the other cases, the sac was removed.

CONTINENTAL UNIVERSITIES.—According to the German University Calendar, the numbers of students in the medical faculties of the universities of Germany, Austria, and Switzerland, during the winter session 1884-85, have been: Vienna, 2,291; Berlin, 1,133; Munich, 874; Würzburg, 791; Leipsic, 695; Greifswald, 408; Breslau, 370; Grätz, 369; Freiburg, 307; Halle, 296; Bonn, 251; Königsberg, 247; Erlangen, 222; Heidelberg, 210; Marburg, 206; Strassburg, 304; Zürich, 199; Göttingen, 190; Tübingen, 185; Bern, 184; Kiel, 174; Jena, 155; Geneva, 144; Giessen, 135; Basle, 113; Rostock, 87.

At a special meeting of the Wenlock Town Council, on Monday, May 18th, upon the reading of a letter from Mr. Edward Glover Bartlam, resigning the office of borough coroner, a resolution "that Mr. Bartlam's resignation be accepted, and that, in accepting with regret such resignation, this council wish to express their thanks to him for the able and upright manner in which he has discharged the duties of borough coroner for the last forty years," was carried unanimously, and the town clerk was instructed to send a copy of the resolution to Mr. Bartlam.

The Prince of Wales has fixed Saturday, July 4th, for the ceremony of opening the Albany Memorial and other buildings of the National Hospital for the Paralysed and Epileptic, Queen Square, Bloomsbury. The Prince and Princess Christian have signified their intention to be present, and the Archbishop of Canterbury will take part in the proceedings.

ABSTRACT FROM A CLINICAL LECTURE

ON

FIVE CASES OF LAPAROTOMY FOR INTESTINAL OBSTRUCTION: THE MODE OF OPERATING.

By J. GREIG SMITH, M.A., F.R.S.E.,

Surgeon to the Bristol Royal Infirmary.

AN abdominal section for obstruction of the bowels is usually a very different proceeding from one for removal of a tumour. In the former case, the abdominal walls will be hard, tense, and unyielding, and the intestines will be full of fluid and gas under considerable pressure. When the abdomen is opened, and pressure is partly removed, the gas expands, dilating the bowels, and forcing them through the wound. In ordinary cases of laparotomy, where the gut is flaccid and empty, it is easy enough to isolate and run our fingers along it for a considerable distance; in cases of obstruction, this is a matter of great difficulty. The gut, when distended, is too large to be easily grasped between the fingers; its walls are too thin and impalpable to be isolated by mere touch; and, if any degree of peritonitis be present, it will inconveniently stick to the fingers. The exploring hand at every step is caught in the loops of distended bowel, which wind about in most confusing manner inside the abdominal cavity. In fact, it is just when the physical conditions are most strongly against us, that we have to look for the cause of an intestinal obstruction inside the abdomen.

A course of procedure has been laid down for our guidance in such cases, and it will be well for you always to follow this course. Though I have not yet derived any help from it, it is not unlikely to be of good service in leading us to the seat of obstruction. The plan is as follows. First carry the hand to the cæcum; if it be found distended, the obstructing cause will probably be somewhere in the large bowel below this, and the hand is carried up the ascending colon, across the transverse colon, and down the descending colon as far as the sigmoid flexure, seeking for the stricture all the way. If the cause be not here, we are then told to carry the hand from left to right under the distended coils, seek for collapsed bowel, and follow it up till we meet with distension, when we shall probably find the cause. Now, it is much easier to lay down these directions than to put them into practice. If the small intestine be much distended with gas, we may have the transverse colon pushed up under the ribs; and to reach it there over coils of dilated gut, under hard brawny abdominal walls, and, more than this, to isolate it and diagnose its condition, is an undertaking, to say the least of it, of very considerable difficulty. If we can find undilated bowel, we may follow it up readily enough; but how often do we expect to find empty bowel in these cases? I have not yet met with it. We must be prepared to find the bowel dilated everywhere, at some parts more than others, but nowhere collapsed; and we must be prepared to look for the obstruction amid the endless contortions of these soft, sticky, and dilated coils.

As I have said, I have always observed these directions, but only to find the observance so much valuable time wasted. To proceed to examine, inch by inch, the whole length of bowel, will undoubtedly be successful as far as the discovery of the site of obstruction is concerned; but not probably so as regards saving the life of the patient. In such a procedure, the amount of rough handling, and the length of time spent over it, must tell seriously against the chances of recovery.

The plan I would recommend to you is this. The most distended portions of bowel are usually nearest to the surface; move these about gently, and fix upon any part that appears to be more congested than another. Follow this part in the direction of increasing congestion down into the cavity, wherever it may lead. If now the cause be discovered, it may be at once treated. If not, I would then recommend a plan which has been almost universally condemned; that is, to permit the bowel to extrude. The wound is covered with some layers of fine cloth, or better still, by a large flat sponge wrung out of warm carbolic or boracic lotion, and covered with gutta-percha tissue to prevent evaporation and cooling; and the most distended coils are coaxed out under this covering. Carefully watch the gut as it comes out. One end of the coil will be more distended than the other, and