On some points connected with the anatomy and surgery of inguinal and femoral herniae : being the substance of the lectures delivered in the theatre of the Royal College of Surgeons in February 1831 / by G. J. Guthrie.

ON

SOME POINTS

CONNECTED WITH

THE ANATOMY AND SURGERY

OF

INGUINAL AND FEMORAL HERNIÆ:

BEING

THE SUBSTANCE OF THE LECTURES DELIVERED IN THE THEATRE OF THE ROYAL COLLEGE OF SURGEONS IN FEBRUARY 1831.

BY

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PORTUGAL, SPAIN, FRANCE, AND THE NETHERLANDS.

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THE following observations were written nearly two years ago, and the press has been standing for many months, with the hope that they might form part of the first volume of the Transactions of the Royal College of Surgeons in London. This hope being disappointed, they are unavoidably published, and will probably be the first of a series on various subjects, which may at some future day compose a volume of Contributions in Surgery.

2 Berkeley Street, August 22, 1833.

SURGICAL WORKS BY MR. GUTHRIE.

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The LECTURES ON THE ANATOMY AND DISEASES OF THE BLADDER AND URETHRA, delivered in the Theatre of the Royal College of Surgeons in the Spring of 1830, will be published in the course of the ensuing Winter.

ON

SOME POINTS

CONNECTED WITH

THE ANATOMY AND SURGERY

OF

INGUINAL AND FEMORAL HERNIÆ.

I HAD the honour of delivering the Lectures in the Theatre of the Royal College of Surgeons, in February 1831, on the Anatomy and Surgery of Inguinal and Femoral Herniæ; and I took the liberty on that occasion to demonstrate the anatomy of some of the parts concerned in these derangements in a manner which had not been commonly adopted, but which I trust will be found more satisfactory than the method which is usually followed. A difference of opinion in regard to the structure of a part of the body is not of much real importance, unless it involves some practical point; and it is under this impression I venture to hope that the dissections made on that occasion, and the elucidations and explanations which resulted from them, have enabled me to remove a discrepancy that existed between the anatomy and surgery of these parts, which I had always pointed out in my private lectures, but was unable previously to explain.

According to the prevailing opinion of modern surgeons, the parts through which an inguinal hernia passes or proceeds, have little or nothing to do with the causes of strangulation; which are supposed to depend upon certain circumstances connected with the state of the protruded parts themselves, rather than upon any positive contraction or diminution of the size of the aperture through which they pass. If it had been generally demonstrated or believed that the inner or superior opening of the inguinal canal was a muscular opening or split, through or between the fibres of which the protrusion took place, there would have been

little difficulty or hesitation in attributing the cause of strangulation to a sudden or irregular contraction of these fibres: but as such fibres were not believed to exist, or were supposed only to exist on the upper part, the impossibility of any circular contraction was necessarily inferred; and other causes of strangulation were sought for in the ingenuity of those individuals whose attention was devoted to the subject. I am quite aware, that these individuals have been and are among the number of the most celebrated anatomists and surgeons in Europe; that any effort to add to their labours may be considered an act of supererogation; and that any attempt to differ in opinion from them will be thought, perhaps, a matter of vanity. Facts have, however, forced themselves upon me so strongly, that I could not help acknowledging their influence; and it will be for those who doubt, to investigate this subject by their aid, and, by a similar patient inquiry, to confirm or confute the opinions I have founded upon them; viz. that the inner or superior opening of the inguinal canal is a muscular opening, or rather split, capable of a great degree of contraction, which is usually the cause of strangulation in cases of recent herniæ, and is by no means an infrequent one even in older ones. Before I was enabled to demonstrate the muscular structure of these parts, I had had the opportunity of examining the bodies of two persons who had died from strangulated herniæ, in both of whom the stricture on the intestine had been so great, that a common silver probe could not be easily passed in the canal of the gut. The last case was that of a person who had been operated upon, and died shortly afterwards; the intestine had been returned into the cavity of the abdomen, and was found lying behind the inner ring, with a narrow but deep indentation around it, marking the place at which the stricture had existed, and through which a probe could only be passed by dilating the contraction. I showed the preparation at my Lecture, and declared, what I believe to be true, that this could only have taken place from some direct muscular pressure from without, and not from any congestion or dilatation from within or below the stricture. I also acknowledged that I could not show, by dissection, in what manner this contraction had taken place, or by what parts it was effected. I have always, however, continued to impress upon the minds of the gentlemen attending my Lectures for the last ten years, that the principal cause of strangulation in recent hernia was a contraction of the superior or internal opening of the inguinal canal, the cause and nature of which I could

not satisfactorily explain; that it was, therefore, a point in anatomy deserving investigation, for a discrepancy of this kind could not exist in nature; and that there must be something defective in our knowledge of the subject.

That it may not be considered I am combating a shadow, I shall first show what are the opinions of some of the ablest anatomists who have written on these points, and then proceed to develope my own.

Mr. Samuel Cooper, whose Surgical Dictionary may be justly consulted as a summary of the opinions of the principal surgeons of Europe, has given, in the last edition of this Work (of 1830), page 653, the following account of the anatomy of the parts concerned in inguinal hernia, compiled with especial reference to the Works of Sir Astley Cooper, Messrs. Lawrence, Scarpa, Hesselbach, Cloquet, and Langenbeck.

"The tendinous fibres of the aponeurosis of the external oblique muscle, as they run downwards and forwards towards the pubes, separate from each other, so as to leave a triangular opening, called the abdominal ring, which is usually more capacious in the male than the female subject. The upper and inner pillar (as it is termed,) of this aperture is inserted into the symphysis of the pubes, and is the weakest of the two; the lower and outer one, which is the strongest, is chiefly a continuation of Poupart's ligament (Hesselbach, *Über den Ursprung, &c. der Leisten-und-Schenkelbrüche*, p. 4.), and is fixed into the angle and crista of the same bone. Some tendinous fibres cross the upper and outer angle of the ring, so as to diminish the triangular appearance of the whole aperture: these are said to be very strong in old herniæ. The anterior and thicker layer of the aponeurosis of the internal oblique muscle joins the tendon of the external oblique; the posterior and thinner one joins that of the transversalis; but the lower portion of this tendon, together with the corresponding part of the transversalis, goes wholly in front of the rectus muscle. Thus, the inferior border of the obliquus internus and transversalis, which originates from the upper part of Poupart's ligament, lies behind the outer pillar of the abdominal ring. Sir Astley Cooper first noticed, that a thin fascia proceeds from the inner edge of Poupart's ligament, and spreads over the posterior surface of the transversalis. This fascia forms the only partition between the peritoneum and the outer opening of the abdominal ring; and were it not for its existence, inguinal herniæ would probably be much more frequent. The partition in question, however, is said by

Scarpa to be formed by the aponeurosis of the internal oblique and transverse muscles; while Hesselbach, who has named the small smooth point, situated directly behind the outer opening of the abdominal ring, its crural surface, distinctly states that it is formed by delicate fleshy and tendinous fibres of the internal oblique muscle (*Über den Ursprung, &c. der Leisten-und-Schenkelbrüche,* p. 4.); and that behind them is the weakest part of what he names the internal inguinal ligament, in the rear of which is the peritoneum, with the intervention of a very loose cellular substance (*Op. cit.*, p. 26.). The internal inguinal ligament of Hesselbach is, therefore, clearly the same thing as the above fascia, first pointed out by Sir Astley Cooper. This point of the abdomen is one of the three weak places on the inside of the inguinal region, where herniæ are liable to occur; yet, weak as it appears to be, it is not the most common situation for such tumours. A computation has been made, that in a hundred cases of inguinal hernia, not ten occur at the point here specified (H. J. Brünninghausen, *Unterricht über die Brüche, &c.* Wurzb. 1811.). Mr. Lawrence observes, that if we trace the fascia transversalis from the crural arch upwards, we shall find it divided immediately into two portions, an internal and external, which leave between them a considerable interval, just in the middle of the crural arch. The former of these, which is the strongest and most decidedly fibrous, is connected by its inner edge to the outer margin of the rectus, and to the inferior margin of the tendon of the obliquus internus and transversus; and both are gradually lost above, between the peritoneum and transversus (*On Ruptures,* ed. 4. p. 179.)."—Mr. S. Cooper then proceeds to give the following explanation of the parts as they appear on dissection (p. 658.). "The removal of the integuments exposes the exterior investment of the hernial tumour, continuous with the margins of the ring, and formed of tendinous fibres from the aponeurosis, the cremaster muscle, &c. This is connected by cellular substance with the proper hernial sac, formed of the peritoneum. This production of the peritoneum passes within the ring of the external oblique, and then goes upwards and outwards. Behind and above the ring, the inferior margin of the obliquus internus and transversalis crosses the neck of the sac. When these muscles are reflected towards the linea alba, the fascia, ascending from Poupart's ligament, and forming the upper opening of the ring, is exposed, and the epigastric artery is discovered emerging from the inner side of the neck of the hernial sac (Camperi

Icones, tab. x. 6. M.), which, at this precise point, becomes continuous with the peritoneum lining the abdomen. The removal of the hernial sac will disclose the course of the spermatic cord in its descent towards the testicle; and when this is also elevated, the first part of the course of the epigastric artery, and its origin from the iliac trunk, are exposed. (Lawrence *On Ruptures*, edit. 4. p. 203.)"

The following is Cloquet's description of these parts :—

"The inferior fibres of the internal oblique muscle have a direction nearly transverse. They are usually intimately intermingled with those of the transversalis muscle, which is placed behind it. They are inserted externally into Poupart's ligament, internally into the pubes, between its spine and angle. The inferior edge of the internal oblique is then parallel with the crural arch (Poupart's ligament). In some persons it is separated, and very distinct from the transversalis muscle; in others it is so intimately connected with it, that they cannot be separated. A number of dissections, carefully made, appear to show, that the inferior edge of the transversalis muscle, composed of very pale fine fibres, passes in a transverse direction across the spermatic cord, at the spot where it enters the inguinal canal; that is, on a level with the superior opening of the canal. It is inserted internally in the inferior part of the linea alba, and slightly to the pubes by uniting with the aponeurosis of the internal oblique, the inferior edge of which muscle, arising, as I have said, from the crural arch (Poupart's ligament), descends parallel to it, covering the spermatic cord in the inguinal canal, and is attached internally to the pubes. The internal oblique crosses over the spermatic cord just at the point where it passes out from the superior opening of the inguinal canal. The fibres, which go to form the cremaster muscle, change their direction and form; those which were straight and nearly horizontal, become curved and vertical. They pass through and descend below the ring, forming successively, in front of the spermatic cord, several nooses or arches, with their concavities turned upwards, and which may be traced to the bottom of the scrotum. These fibres are situated upon the anterior face of the spermatic cord and tunica vaginalis.

"The inferior fibres of the transversalis muscle are very thin, run transversely, and give rise to an aponeurosis, which passes inwards, and soon unites with the internal oblique muscle, which lies exterior to it and goes to be inserted with it in

the linea alba, passing in front of the rectus muscle, and into the superior part of the pubes, behind the internal pillar of the ring and the pyramidalis muscle. The spermatic cord does nothing more than slide under the inferior border of the transversalis muscle, on a level with the superior opening of the canal.

" The *Fascia transversalis*," he says, (page 27.) after describing it minutely, " is an aponeurosis, the thickness of which varies: it springs from the posterior edge of the crural arch (Poupart's ligament), from the aponeurosis of the iliac muscle, from the external border of the rectus muscle, and is continued upwards with the cellular tissue on the internal surface of the abdominal muscles: below and towards the middle of the crural arch this aponeurosis gives rise to a membranous canal, commencing by a wide opening directed backwards and outwards, the internal edge of which is thicker than the outer. This canal descends around the spermatic vessels, forming their proper sheath. The fascia transversalis supports the peritoneum, which is behind it, the epigastric artery passing between them. Before, it corresponds to the transversalis muscle, with the aponeurosis of which it is often so closely united that it can only be distinguished from it by the different direction of its fibres.

" Finally," he says, (page 32.) " the passage of the spermatic cord through the abdominal parietes does not take place through a simple ring, but through a truly oblique canal. This is the *Inguinal canal.* The aponeurosis of the external oblique muscle is reflected, as I have already said, backwards, and then upwards to give origin to the fascia transversalis. By thus passing backwards and then upwards it forms a straight but deep groove, the convexity of which is turned downwards towards the crural canal, and rests partly on the psoas and iliacus muscles, the concavity being of course turned upwards, and corresponding to the inguinal canal. This groove (*gouttière*) extends from the pubes to the superior and anterior spine of the ilium, and gives attachment in nearly all its length to the fibres of the internal oblique and transversalis muscles; and, moreover, contains, in a part of its extent, the spermatic cord in man, and the round ligament of the uterus in the female. Its anterior wall is thick, and formed by the tendon of the external oblique muscle, having, posterior to it, the internal oblique; at the inner and under part, near the pubes, is the inguinal ring (the lower opening of the inguinal canal). The posterior wall of the canal is formed by the reflected portion of the aponeurosis of the external oblique (viz. the *fascia transversalis*),

which ascends behind and in connexion with the internal oblique and transversalis muscles. It is pierced by the superior opening of the inguinal canal, situated more outwardly and higher up than the inferior opening, from which it is about an inch and a half distant, being the length of the inguinal canal containing the spermatic cord. Between the superior orifice of the canal and the anterior superior spine of the ilium, the groove formed by the external oblique and Poupart's ligament is filled up by the internal oblique and transversalis muscles. Between the superior and inferior orifices, the groove constitutes the inguinal canal, containing these muscles and the spermatic cord. Lastly, the groove ends within the inguinal ring, at the pubes, by a small triangular space, bounded before by the internal pillar of the ring, behind by the tendon of the rectus and pyramidalis muscles, and often by a fasciculus of radiated tendinous fibres, which ascend in diverging from the external pillar of the ring, pass behind its internal pillar, and are affixed into the lowest part of the linea alba."

P. F. Blandin, the latest French writer on this subject, says, in his *Traité d'Anatomie Topographique*, Paris 1826, page 330 :—

" The inguinal canal, or inguinal passage, is flattened from the front backwards, is about an inch and a half in length, is directed obliquely forwards and downwards ; it occupies the abdominal wall in that triangular interval which I have already mentioned,—an interval bounded within by the rectus muscle, below by the crural arch, above by the conjoined inferior edge of the internal oblique and transversalis muscles ; a point of the abdominal wall which would be very weak, as these two last muscles do not descend to it, if a special aponeurosis, the fascia transversalis, was not fortunately superadded. The inguinal canal offers a middle and two extremities or openings ; the middle part has four walls ; of the two openings, one is superior, the other inferior.

" 1st. The anterior wall of this passage is formed by the aponeurosis of the great oblique muscle, covered by the fascia superficialis, the external vessels, and by the skin.

" 2nd. The posterior wall is formed by the fascia transversalis, lined posteriorly by the peritoneum, and having behind it the epigastric artery.

" 3rd. The inferior wall is formed by the hollow of reflection upwards from Poupart's ligament of the fascia transversalis.

" 4th. The superior wall, less strongly marked, is traced by the lower edge

of the internal oblique and transversalis muscles. The interior of this passage is lined by the hollowed-out prolongation of the fascia transversalis."

Velpeau is to the same effect, *Traité d'Anatomie Chirurgicale, ou Anatomie des Régions*, Paris 1826, tome ii. page 78.

Sir Astley Cooper, in his book on the Structure and Diseases of the Testis, (1830,) gives the following description of the anatomy of the inguinal canal, and which is a revision of, and improvement upon that to be found in his first Work on this subject.

" This canal is bounded at the lower part by the external abdominal ring, formed by the tendon of the external oblique muscle; at its upper part, by the internal ring, formed by the fascia transversalis. In dissecting it, after removing the integuments, the superficial fascia of the tendon of the external oblique muscle is laid bare. An incision is to be made through the tendon of the external oblique, beginning above the abdominal ring, and extending near to the anterior and superior spinous process of the ilium. The edges of the divided tendon being then turned down, the inguinal canal is brought into view. At the lower part of the canal, just above the abdominal ring, the spermatic cord appears in the centre, the cremaster muscle between it and Poupart's ligament; above it the tendinous insertion of the internal oblique muscle, which passes behind the upper part of the abdominal ring to the sheath of the rectus muscle. At the upper part of the canal, in this first view, the internal oblique is seen arising from Poupart's ligament, and crossing over the cord and part of the cremaster muscle in the form of an arch: some of its muscular fibres blend with those of the cremaster.

" Upon raising the lower edge of the internal oblique from Poupart's ligament, and turning it upwards, the transversalis abdominis appears. It arises from Poupart's ligament, under the internal oblique, and also blends with some of the fibres of the cremaster. It forms an arch over the spermatic cord, and is inserted, with the tendon of the internal oblique muscle, into the tendinous covering of the rectus. But the lower edge of the transversalis has a very peculiar insertion, which I have hinted at in my work on Hernia. It begins to be fixed in Poupart's ligament, almost immediately below the commencement of the internal ring, and it continues to be inserted behind the spermatic cord into Poupart's ligament, as far as the attachment of the rectus. Thus the inguinal canal is endowed with

muscular contraction, which, under the action of the abdominal muscles, serves to close it, to lessen the propensity to hernia. Sometimes a portion of muscle descends from the tendon of the transversalis in the course of the linea semilunaris, to be inserted into the fascia transversalis, behind the cord, and into Poupart's ligament. It is this circular insertion of the transversalis which is the cause of stricture in inguinal hernia, in the course of the canal, and nearly at the upper ring.

"Behind this insertion of the transversalis, the internal portion of the fascia transversalis appears, adhering strongly to the tendon of that muscle at the back of the inguinal canal. Thus the inguinal canal is, at its anterior part, formed by the tendon of the external oblique; in its posterior, by the tendon of the transversalis, and by its folded muscular fibres; behind which is the fascia transversalis, into which those fibres are also inserted. It contains the spermatic cord and the internal oblique muscle. Its lower part is bounded by the external abdominal ring, formed by the separation of the tendons of the external oblique muscle; and at its upper extremity are placed the two portions of the fascia transversalis, forming, with the tendon of the transversalis, the internal ring; the anterior continued from the edge of Poupart's ligament to the outer side of the spermatic cord; the posterior, or internal, descending behind Poupart's ligament, to form the crural sheath, and ascending behind the spermatic cord and tendon of the transversalis. Between the two layers passes the spermatic cord. From the edge of the two portions of fascia, a layer of membrane extends in a funnel shape, uniting itself with the spermatic cord: thus the cord becomes united to each aperture through which it passes; at the external ring, by the fascia superficialis; at the upper part of the canal, by membranous processes from the fascia transversalis, which descend upon and envelope the spermatic cord. The epigastric artery, arising from the external iliac at Poupart's ligament, curves inwards and upwards, behind the inguinal canal, to the rectus muscle, giving an artery to the cremaster in its course."

The reader cannot fail to be surprised at the great difference which exists between these different versions of the same thing, and that a plain matter of fact, and not of imagination; and a student in anatomy and surgery, on trying to reconcile them by an actual examination of the parts, will find considerable difficulty in making his dissection correspond with any one of the descriptions which have been quoted; and he will be led to conclude, either that the descrip-

tions are not sufficiently clear and distinct, if not in some respects faulty, or that there is so great a variety in the formation of these parts, as to render any one account of them inapplicable to the greater number. No student can look at the four engravings No. 1. of Plate I., and No. 1. 2. 3. of Plate II., appended to this paper, and believe that they are intended to represent the same parts in the same stage of dissection, without drawing very much on his imagination; yet they are really intended for that purpose.

I hardly dare venture to give the reason which in my mind has led to the great apparent discrepancy of opinion which exists between so many able men on so plain a matter of fact. It is possible that it may have arisen from the great minuteness with which it has been attempted to describe parts that scarcely deserve it, especially the fascia transversalis, and from the great variety which exists in the formation of several of the principal parts.

Sir Astley Cooper first gave to the fascia the name of fascia transversalis, and drew attention to it in so marked a manner as to attract that of other anatomists. Jules Cloquet made it an object of particular study, and Blandin and Velpeau consider it to have been more accurately investigated by him, on which account I have transcribed his account of it, page 5. Cloquet says, that he had not seen Sir Astley Cooper's Work, but had formed his ideas of it from that of Mr. Lawrence; and it appears to me that he, Blandin, and Velpeau, have fallen into a misapprehension on the subject, common to many of our own countrymen, who have described that to be fascia transversalis alone, which is in reality the tendon or aponeurosis of the transversalis muscle implanted upon it; for without such misapprehension it is impossible to say that the spermatic cord always lies on the fascia transversalis in any part of its course after it has passed the superior opening of the inguinal canal, and has emerged from under the fleshy fibres of the transversalis muscle; nevertheless this is said to be the case. The statement made by Cloquet, Blandin, and Velpeau, that the fascia transversalis arises from the inner edge of Poupart's ligament by a reflection upwards of that part, whilst Sir Astley Cooper describes it as passing beneath to form the sheath of the femoral vessels is another cause, I suspect, of the misunderstanding which has taken place. Cloquet, who wrote from very laborious observation, says, in a note at page 26 of his Work, and in addition to the observations I have quoted, page 6, "that very often the fascia transversalis is evi-

dently formed of two aponeurotic layers, which are united on a level with the top of the crural arch. Of these the anterior comes from the arch itself (Poupart's ligament), the posterior being only a continuation of the fascia iliaca, which quits the iliac muscle to ascend upon the anterior wall of the abdomen. These two layers thus reunited proceed back to back between the transversalis muscle and the peritoneum. It is easy to separate them on the outside of the superior opening of the inguinal canal, but on the inside and around it they are intimately united. When this formation is met with, the posterior layer passes usually behind the rectus muscle in its way to the linea alba, whilst the anterior one is continuous with the edge of the tendon of the rectus. The epigastric artery is sometimes posterior, sometimes anterior, and sometimes even between these two layers." This description, which Cloquet gives as of an accidental occurrence, is, in my opinion, that which most frequently takes place; and if the fascia transversalis be said to be composed of two layers, the anterior being fibrous, the posterior cellular, much confusion will be avoided.

The division which is made of the fascia transversalis into two parts, where it lines the wall of the abdomen, one being called external, the other internal, or anterior and posterior by Sir Astley Cooper, (but which are not the anterior and posterior layers of Cloquet,) the spermatic cord passing between them through an opening, which is named the superior opening of the inguinal canal; is also a fertile source of inconvenience to the student, who will seek in vain for any such opening. If he is taught to consider the fascia transversalis as a sheet of condensed cellular membrane divisible in some parts into two layers, passing upwards from Poupart's ligament to fortify the peritoneum, he will readily understand it; and if he is shown that at a certain spot it becomes much thinner and allows the spermatic cord to pass through, he cannot fall into any misapprehension. This part is not however an opening; it is merely the thin portion of the fascia which, as the testis escaped from the abdomen, was carried forward by that gland, and is now seen attaching itself to the spermatic cord. If this cord be drawn down and an incision be made around it close to where it is attached to the peritoneum, a sort of ring is formed, and if the finger be introduced, the thin part can be stretched or torn, until the firm internal edge of the denser anterior layer of fascia transversalis can be distinctly seen, having the epigastric artery a little to its inner side. The outer side of the ring is not so

well marked, and the hole thus made by the finger is usually so large, and its outer edge so weak, as to occasion little fear of any great constriction being made by it on any portion of the contents of the abdomen which may be protruded through it. It is therefore not the part which constitutes the stricture at what is called the inner ring.

When the peritoneum is carefully removed from the inside of the wall of the abdomen, by tearing through the cellular membrane which attaches the one to the other; the fibrous or anterior layer of fascia transversalis is not the part next brought into view, but a distinct layer of cellular structure resembling fascia, although oftentimes loaded with fat, which can be readily dissected off in a complete sheet, carrying with it the epigastric vessels which adhere rather to it than to the fibrous texture in front. This cellular layer I take to be the same thing as the posterior layer of Cloquet; but whether it is or not, it passes behind the rectus to meet its fellow from the opposite side, covers the iliac vessels below and passes under Poupart's ligament, forming their cellular and adipose sheath and the septum which passes between them. When this cellular layer is turned down, (as in Plate III. fig. 1.) the fibrous fascia transversalis is brought into view. If an attempt is made to turn the latter down from the transversalis muscle two inches above Poupart's ligament, it is often found to adhere very firmly to it, and to its aponeurosis. When muscular at this part, many of the fibres seem to be implanted on it, although both muscle and aponeurosis are sometimes wanting, in which case only can the spermatic cord lie upon the fascia transversalis. When the tendons of the internal oblique and transversalis muscles are complete and well marked, and they and the fascia transversalis are traced inwards to the rectus muscle, the two tendons are seen to pass in front of it very distinctly; the fibrous layer of the fascia transversalis on the contrary divides, the anterior and thickest part is attached to the anterior edge of the rectus; the other, which is very thin, passes behind the rectus to meet its fellow from the opposite side; but at the lower part close to the pubes, a portion of the fascia transversalis becomes very strong, and resembles, more than any thing else, a round white tendon going to be inserted into the pubes near its symphysis, and behind the rectus. The interspace formed by the recedence of the two insertions is very distinct, the rectus filling it up. The fascia transversalis passing externally from this sort of tendinous insertion, is attached to the inside of Gimbernat's

ligament, of which it forms the internal layer, and is then continuous with the pelvic fascia. Passing from the upper edge of Gimbernat's ligament, or the third insertion of the external oblique muscle, to the inner edge of Poupart's ligament, or the second insertion of the same muscle, the fascia transversalis seems to adhere so strongly as to appear to be a reflection upwards from it, which is the view taken of it by the French anatomists: but if care be taken in making the dissection, it can with some difficulty be separated from it, and be shown to pass under the ligament to form the septum crurale, and the anterior part of the sheath of the femoral vessels. Exterior to the femoral artery the fascia transversalis is firmly attached to Poupart's ligament, and is continuous with the iliac fascia.

The transversalis muscle lies immediately upon the fascia transversalis. Its inferior edge is said to pass over the spermatic cord at the inner or superior opening of the ring, in order to form, with the internal oblique, the sheath of the rectus. This I believe to be in many instances an incorrect description. In the demonstration of these parts in the Theatre of the Royal College of Surgeons, I had the opportunity of showing (see Plate I.) the transversalis muscle advancing fleshy or muscular, until it reached the spermatic cord; a portion of it then took the usual course above and over it, whilst another portion passed below it, the terminating muscular fibres of which were inserted along the inner edge of Poupart's ligament up to the pubes. The muscularity of this insertion was admitted by the various teachers of anatomy, and other competent judges who were present. The lower part of the abdomen was thus shown to be defended by a layer of muscular and tendinous fibres, lying upon the fibrous layer of the fascia transversalis; and the spermatic cord passed, not, as it is usually stated, under the inferior edge of the transversalis muscle, but through a split in it originally formed for the purpose of giving passage to the testis. This split or opening was rounded on its under part where the spermatic cord rested upon it, and formed a small opening essentially muscular in every direction, and much less in size than that which is described as the opening of the fascia transversalis, which adheres to the internal surface of the muscle.

It is this part therefore, and not the fascia transversalis alone, which constitutes the inner or superior opening of the inguinal canal for all surgical purposes. The transversalis muscle does not, however, in the generality of instances, send

its inferior portion forwards and beneath the spermatic cord in so marked a manner. This part of the muscle more frequently becomes tendinous and aponeurotic; but its fibres, although tendinous, are distinctly marked, running transversely in continuity with the fleshy fibres of the muscle, and are inseparably united to Poupart's ligament. In some instances the muscular fibres of the transversalis do not take so oblique a direction from without inwards and downwards, but crossing more horizontally, send down a narrow tendon, on forming with the internal oblique the sheath of the rectus, which descends almost perpendicularly for some distance, to be inserted into the tuberosity or spine of the os pubis. The inferior or aponeurotic part of the transversalis may be equally present, forming the inferior edge of the inner opening of the inguinal canal; but this formation cannot take place if the spermatic cord passes immediately over Poupart's ligament, in which case, this ligament forms the under part of the inner opening of the inguinal canal, the lower edge of the transversalis muscle the upper, and the fascia transversalis the sides. The epigastric artery runs within a few lines of distance from the internal edge of this part or opening; and between this vessel, on the outside, the edge of the rectus on the other, and Poupart's ligament below as the base, the triangular space of Hesselbach is formed, through which that sort of hernia takes place, which is called *internal* by him, but *direct* by Sir Astley Cooper, to distinguish it from the more common one which, passing through the inner or superior opening of the ring, is called *external* by Hesselbach, and *oblique inguinal* hernia by Sir Astley Cooper.

When the transversalis muscle is inserted broadly into Poupart's ligament by its superior fibres only, the anterior ones pass on to form the sheath of the rectus, and to be inserted into the tuberosity of the os pubis; but a layer of fibres internal to these (the folded fibres of Sir Astley Cooper,) are implanted on the fibrous external layer of the fascia transversalis, and curve downwards to be inserted into Poupart's ligament, or proceed, according to Breschet, to form what he calls the pretended ligament of Gimbernat, and which he will not admit to be a third insertion of the external oblique muscle. These fibres are depicted by Cloquet (Plate I. fig. 3.) as belonging to the fascia transversalis, and by Breschet (Plate III. fig. 1.), in his *Considérations et Observations Anatomiques et Pathologiques sur la Hernie Fémorale*, Paris 1819, as essentially going to form the internal layer of Gimbernat's ligament, of which the fascia lata of the thigh

supplies the outer. They are very distinctly shown in Plate III. fig. 1., and certain other fibres running in a less curved and more vertical direction, belonging to the anterior or fibrous layer of the fascia transversalis, are equally well marked. These fortify this part in an especial manner, and something like the way in which the outer angle of the external ring is strengthened by fibres crossing in a similar manner.

It may appear that I am laying claim to the discovery of the muscularity of the superior opening of the inguinal canal, after such a structure had been previously described by Sir Astley Cooper. I had not, however, seen his Work at the time; and it was in consequence of my mentioning my ideas to him, that he made the dissection with Mr. Owen and myself, engraved in Plate II. fig. 1, to show us his view of the subject. The opinion, that this opening is in many instances a muscular one, was I believe first advanced by myself, having always maintained that point since the year 1816, although I had not been able to give a demonstrative proof of it until the delivery of my lecture on the subject in the Theatre of the College of Surgeons. There is, however, a difference between us, as to the manner in which the muscularity is effected. Sir Astley Cooper considers it to be accomplished by what he calls the folded fibres of the transversalis, that is, the internal layer of the fibres of the muscle which turn down inside the ring to be inserted into Poupart's ligament, according to Breschet as tendon of the transversalis going on to form the internal layer of Gimbernat's ligament, or according to Cloquet being inserted into his anterior layer of the fascia transversalis, as a part of which he has depicted them. According to my view of the matter, the ring, opening, or split, cannot be rendered a complete muscular circle, by any muscular fibres, which merely pass over and curve round to one side for insertion; one half, or at most two thirds only of a circle can be effected by such disposition of fibres; but if an inferior portion of transversalis muscle be admitted, and in the manner I have demonstrated it, then the circle is completed, and its muscularity is established, in all cases in which such a disposition of fibres exists. If I might venture to try to reconcile these views, I would do it by saying, that the circular structure can only take place when the opening or ring is formed by a split in the muscle, or in it and its aponeurosis, and can only be shown advantageously as a circle when the part has suffered a certain degree of distention, which brings

it to that form; but even in that case there are no perfectly circular fibres, each apparently circular one being of necessity formed of two parts, one from the upper, and one from the under edge of the transversalis.

From the misapprehension which has taken place with reference to the inferior portion of the transversalis muscle, the coverings which a hernia of direct descent receives at this part has been a matter of doubt. Mr. S. Cooper gives (page 660 of his Dictionary,) the opinions upon this point of Messrs. Hesselbach, A. Cooper, Cloquet, Lawrence, and Stanley, leaving it, however, undecided whether the covering or investment is or is not formed as, he says, Sir Astley Cooper is reported to have described it in his lectures, viz. one half by the tendon of the transversalis, and the other half by the fascia transversalis. According to my version of the anatomy, it appears to me quite clear that there are two investments, one formed of the two layers of the fascia transversalis, and another external to that formed by the tendon or aponeurosis of the transversalis. The statement said to be made by Sir Astley Cooper can only be correct when there is no inferior portion of muscular fibre or of aponeurosis to the transversalis muscle, and which is sometimes wanting, although rather as an exception to the general rule, than as the general rule itself, or when the insertion of the superior fibres of the transversalis is effected by a narrow tendon. In the hernia of direct descent, or the internal inguinal hernia of Hesselbach, the coverings, when enumerated from within, are, the peritoneum, fascia transversalis, tendon of the transversalis, and tendon of the internal oblique more or less conjoined, the intercolumnar fascia, the superficial fascia and integuments. As this hernia passes to the inside, and rather underneath the spermatic cord, it does not receive a covering from the cremaster. The external inguinal hernia, or of oblique descent, lies upon or above and to the outside of the spermatic cord; the internal inguinal hernia, or of direct descent, lies to the inside of, or below and underneath the cord, constituting the principal features of diagnosis, especially in old herniæ. In the latter species, or of direct descent, the internal oblique muscle may not always be inserted low enough down towards the pubes, so as to give a covering to the hernia, which then only protrudes, or carries before it the transversalis. This fact will not however be discovered in operating; for the pressure on the parts causes such a consolidation of them, that the two tendinous expansions when they exist, become so closely united as to form but

one covering. When enumerated from without, the coverings are the integuments, superficial fascia, intercolumnar fascia, the tendinous expansions of the internal oblique and transversalis muscles when they exist, the fascia transversalis, and peritoneum.

The internal oblique muscle would in the male form a layer of muscular and tendinous fibres external to the transversalis, and a complete support or covering to this part of the abdomen, if it were not for the opening to admit of the descent of the testis and the passage of the spermatic cord. The *gubernaculum* testis, a part of original formation, is supposed to possess the power of drawing down the testis through this opening, which I very much doubt. I believe that the testis descends or ascends, as the case may be, at the proper period, for the same reason that a child is usually born at nine months in preference to any other period of utero-gestation, which is, as Avicenna says, by the will of God. The office of the gubernaculum appears to be to keep a passage open which might otherwise be closed, if it were not occupied in this manner, rather than to operate on the testis by any contraction of its substance. As the testis passes through the transversalis muscle it may bring down with it any fibres which lie in its way; and when this occurs, the transversalis is found to be united at this part to the internal oblique, and the fibres thus brought down assist in forming the cremaster muscle, which is nothing more than a certain portion of the lower edge of the internal oblique caught by the testis and carried before it. The fibres caught on the centre of the testis are carried down with it into the scrotum, by a gradual elongation, so that they form a sort of sling around the testis, which supports and can raise it towards the abdominal ring, whilst those fibres which are only entangled on its anterior and posterior surfaces, form arches, which descend before or behind according to the situation of the points of entanglement. The cremaster muscle is then a portion of the under edges of the transversalis and of the internal oblique muscles, arising also from Poupart's ligament by its under edge, until it is carried away by the descent of the testis; but the point of insertion of these fibres remains the same, viz. into Poupart's ligament near the pubes, after forming the sling and the arches above described, and which point of insertion was considered by Scarpa and others until the time of Cloquet, to be another or second origin, which is evidently an error. When the testis is detained in the abdomen, it is not for the

want of an opening in the transversalis or internal oblique muscles, but for some reason which has not yet been sufficiently explained, as the person commonly suffers from a hernial protrusion, the consequence of the part being less defended than usual by the natural structures.

The anatomy of the inguinal canal from without inwards is as follows. The tendon or aponeurosis of the external oblique muscle being turned down upon the thigh, the spermatic cord is seen lying in the inguinal canal, embraced by the cremaster muscle, which passes down upon it. The lower edge of the internal oblique separating from the cremaster which is a part of it, passes on to form its share of the sheath of the rectus. The cremaster being cut across and turned upwards, the spermatic cord is seen passing from under the fleshy edge or through the split of the transversalis muscle, and having beneath it another fleshy or aponeurotic portion of the same muscle descending to be inserted into Poupart's ligament. It is on this part that the cord lies, and it forms of course the posterior wall of the inguinal canal, having behind it more or less closely attached the fascia transversalis. If the internal layer of fibres of the transversalis curve downwards to be inserted into Poupart's ligament after passing over the cord, this part lies more decidedly upon them, and not on the fascia transversalis. See Plate III. fig. 1.

When, according to this view of the anatomy, an oblique hernia, or one of indirect descent, takes place, the peritoneum is protruded against and carries before it the thin portion of the fascia transversalis, which is nearly opposite to the opening in the transversalis muscle, through which the spermatic cord passes. The bend or elbow, which the cord makes in ascending to pass over the superior edge of the lower or aponeurotic part of this muscle, or the fascia attached to it, opposes an insuperable obstacle to a protrusion at this part, and the hernia necessarily passes above the cord and between it and the lower or fleshy edge of the superior part of the transversalis. The peritoneum covered by the thin part of the fascia transversalis having passed through the opening in the transversalis muscle, meets with the cremaster, from which it receives a covering. If the hernia is *incomplete*, by which is understood that it remains within the inguinal canal, it has no other covering; but if it is complete, or passes through the external ring as it is called, or the triangular opening of the external oblique muscle, it gains two additional layers; one from the thin fascia which runs from one column or

pillar of the external ring to the other, thereby closing the part, and is called, with great propriety, the intercolumnar fascia; the other from the superficial fascia lying under the integuments. The different coverings of an oblique inguinal hernia enumerated from without inwards, are, therefore, the integuments, superficial fascia, intercolumnar fascia, cremaster muscle, fascia (sometimes called also canalis,) transversalis, and the peritoneum. When an oblique inguinal hernia takes place, the opening, or what may be truly called the inner opening of the ring, is by this protrusion gradually stretched or dilated: but if this be too suddenly done, the irritation caused by it gives rise to spasmodic contraction, followed by inflammation in the muscular fibres passing over it; and the hernia becomes incarcerated or strangulated. If the split or opening in the transversalis is muscular above and below, the contraction upon the protruded parts will be considerable; if the upper portion only is muscular and the lower aponeurotic, the pressure will not be so great.

If the hernia is of long standing, two great changes take place in the situation and even in the structure of the parts. The opening in the transversalis muscle becomes dilated and rounded. This change takes place principally in the superior fibres of the muscle, which instead of running obliquely downwards and inwards become more curved, the convexity being upwards and inwards, and are of course brought so much nearer to the median line of the body, and to the pubes, which gives to the insertion of the muscle itself a peculiar curvature; which is rather the effect of derangement, than a natural appearance of the part. If the under edge of the opening be muscular, it will of course yield in a similar manner; and circular fibres will then be seen, which are not I believe observable in the part in its normal state. The fibres of the transversalis which come from above and below, and meet a little beyond the lower part of the opening, which is itself rounded to allow the spermatic cord to lie uninjured upon it even under pressure, represent rather the truncated apex of a triangle or split than a ring. As this opening is more used and increases in size, it becomes rounder, approaches nearer to the pubes, and the second change takes place, viz. the edges lose their sharpness, become less defined, harder and more tendinous; so that in very old herniæ the muscle loses all power over them, and the ring or opening remains unaffected by its contraction.

This view of the nature of the parts and the changes which they undergo,

appears to me to account in a satisfactory manner for all the circumstances and differences which take place between recent and old herniæ. It does more; it enables us to account for the great difference which exists in the treatment of these two conditions of hernia. It also reconciles and removes the discrepancy observable between the anatomy as hitherto described, and the surgery as hitherto taught. It removes the difficulty which students had in comprehending why some surgeons recommend one mode of treatment, and some another: why for instance bleeding has been recommended by Sharp, Pott, B. Bell, Sabatier, Richter, Callisen, Scarpa, and Sir Astley Cooper,—names which can never be surpassed in respectability; whilst Wilmer, Alanson, and others, have published against the practice.

In order to understand these points, it is necessary to consider the changes which have been stated to occur in the relative situation and structure of the parts, and to make a very marked difference between herniæ which are of recent origin and those of very long standing. In a RECENT HERNIA, or one which has taken place but a short time before it became incarcerated or strangulated, the parts through which it passes are comparatively but little altered from their natural state; and from the view which has been taken of their anatomy, the inner opening of the ring is a muscular structure capable of exercising great compression on the protruded parts, and often in a complete circle; so that when these fibres are spasmodically excited, the compression may be so great as to prevent all circulation in the hernia, giving rise to a state of strangulation; or it may be only to that extent which compresses and retains the protruded parts without entirely preventing circulation, and which is a state of incarceration. In either case inflammation will soon follow, (unless the pressure is removed,) in consequence of the sharpness of the edges of the compressing parts, and the force with which they contract on those that are protruded, whilst the secretion of fluids and of air into them adds to the mischief. The first and greatest object to be attained in a recent hernia which has become strangulated, is to take off the spasmodic and inflammatory contraction of the transversalis muscle forming the inner ring, which is best done by producing syncope; and there are three great and common means for effecting this object; viz. bleeding, the warm bath, and the tobacco enema. When blood is drawn in a recent hernia which has become strangulated, it should be done or continued, the patient sitting in an erect position,

until he faints. When the warm bath is used, it should be at a temperature not less than 100°, or even as hot as the patient can bear it, and he should be kept in it until he is in the act of fainting. If the tobacco enema be had recourse to, nearly the same effect should be produced by administering repeated small doses, or no good will result from its use. When the patient is in this state of syncope, or just approaching to it, an attempt should be made to restore the protruded parts by a well directed pressure, technically termed the *taxis*, provided they are capable of bearing it. On this point there is a marked difference between recent and old herniæ when strangulated; there is also no less difference in regard to the situation of the pain. In recent herniæ which have become strangulated in young and healthy persons, inflammation soon commences in the protruded intestine and in the part which is above the stricture; and if relief is not obtained, the intestine below mortifies, or ulceration takes place, or would take place if time were given, immediately at or directly above the part pressed on by the edge of the transversalis or stricture. The patient therefore in a recent hernia dies of acute inflammation followed by mortification, rather than of congestion followed by low inflammation and perhaps, although not always, by mortification; which is the state of parts to be found usually in old herniæ which have become strangulated. The symptoms correspond with the appearances found after death. In recent herniæ when strangulated, there is pain in two distinct places: at the umbilicus and extending from it to the pit of the stomach, and in the herniary tumour; and both may be equally acute to the touch as well as to the sense of the patient. In old herniæ the pain is felt at first, and often for a long time, at the umbilicus alone; the swelling shows little sign of derangement, and admits of considerable pressure being made upon it for several hours and even days after the incarceration and supposed strangulation are complete. It is a peculiarity in inflammation of the intestines, that the pain is referred to the umbilicus, whatever part of the intestines may be inflamed; be it the jejunum or the rectum, the fact is the same; and the acute pain there, and in the tumour in recent herniæ, only marks the higher degree of inflammation. I have twice seen patients in whom bougies have been forced through the upper part of the rectum: I have seen an ulcer eat its way from the rectum into the cavity of the abdomen, allowing the contents of the gut to escape: and in all these the principal and essential pain was felt at the umbilicus and upwards to the pit

of the stomach; and the same thing takes place in wounds. I have already stated the reason why the inflammation is more acute in recent herniæ, and it only therefore remains to show why certain remedies are more proper in one case than in another;—why bleeding, for instance, which is a sheet-anchor in recent herniæ that have become strangulated, is comparatively useless in old ones. In recent herniæ, the part forming the stricture is positively contracted from spasm and inflammation, and the pressure is direct. In old herniæ, the rounded smooth ring through which the protruded parts pass, does not admit of being diminished in size by any spasmodic action of the surrounding structures, or only in a comparatively trifling degree, and the pressure is therefore not direct; the ring is passive. The parts forced into it by any sudden exertion, suffer from their own distention, from whatever cause it may arise; and from the evils which must invariably follow from soft parts being made to press unduly against others of a much firmer nature. In old herniæ which have become strangulated, the first evil is from congestion and distention: the first stage is that of incarceration, followed ultimately by inflammation, first shown by pain at the umbilicus, and after a greater or less lapse of time by pain in the part, but which is never so acute as in the recent cases. It is, then, in recent cases of herniæ only which have become strangulated, that bleeding is of so much importance, aided by the warm bath, and followed by the use of the tobacco enema in young and healthy persons, previously to the performance of an operation. The application of cold to the tumour is in my mind always secondary to that of the hot bath, and should only be had recourse to in recent herniæ which have become strangulated, when it cannot be procured. On the same principle, however, cold when used must be efficient. In large towns, and in winter, a mixture of salt and pounded ice can at all times be obtained, and applied in a half-filled bladder, or the freezing mixture of Sir Astley Cooper, composed of two ounces and a half of nitrate of potash, with the same quantity of muriate of ammonia and ten ounces of water, which in cases of old hernia will often be found very efficient.

Tartar emetic is often talked of as a remedy in strangulated hernia; but as its effects cannot be controlled, and great nausea and vomiting are often produced, it is obvious that the efforts made in vomiting may be more detrimental than the debilitating nature of the remedy can be beneficial. Purgatives are always

injurious as such, being merely irritants; although calomel combined with opium in a soft state may be administered with advantage, as allaying irritation of the stomach and procuring ease. Injections of hot gruel, with salt and oils of various kinds, are useful, inasmuch as they clear the rectum, and may also reach the great intestines, if the tube of the syringe be long and introduced to its full length, which it always should be in every case of constipation, so that it may reach the sigmoid flexure of the colon: but an error must not be committed in such cases, by supposing that the discharges are from above the stricture unless all the symptoms subside, even if the protruded part is not returned.

The application of pressure or the taxis, is limited by the state of the part. In recent herniæ which have become strangulated, it must entirely depend on the pain felt by the patient. If the tumour is so painful when touched that the person cannot bear it, the operation ought not to be delayed; and more particularly if the swelling is hard and tense like a ball, or if any discoloration of the skin has taken place. In these cases, delay is not admissible; and the operation should be done without reference to the time the part has been supposed to have been strangulated; it being immaterial whether it has taken twelve or only two hours to arrive at this state. In a young and healthy person, an attempt may be made at once to return the protruded part by a well directed and steadily supported pressure in the direction of the swelling in the inguinal canal, the parts being relaxed by position. But if there be any pain in the tumour, and this is increased by the pressure, it will be advisable to bleed to fainting in the erect position, before further efforts be made at reduction. I have frequently reduced an incarcerated hernia after bleeding which was irreducible before, and much more frequently after the patient had been again brought to a state of syncope from the effects of the hot bath. The best time to make the attempt at reduction, is a few minutes after the patient has been taken out of bed and laid between the blankets. If it fails after a steady well supported application for at least fifteen minutes, the patient should be returned to the bath, and a second attempt be made in the course of an hour, provided always that delay is warranted by the non-painful state of the part, and the absence of severe general symptoms.

If a patient is presented with a strangulated hernia, even one of recent for-

mation, in whom the general symptoms are very severe, and evidently from that cause; the operation (that is, the obtaining of complete relief,) should not be delayed, although the tumour itself may be comparatively but little painful. These general symptoms are the pain at the umbilicus, the irritability of stomach, the anxiety of countenance, and the failing state of the pulse. These symptoms of inflammation of the intestines accompany each other; and when they are well marked, the danger is imminent, and the decision must be prompt. The two most important symptoms, are the anxiety of countenance, and the failing of the pulse; they mark the severity of the inflammation and its tendency to gangrene, whilst the pain and irritability of stomach only indicate its existence. They are, in fact, symptoms which must always be judged of by comparison; some people suffering more apparently than others, with less real cause: but the anxiety of countenance to which I allude, and which, when complete in a more advanced stage, is called the facies hippocratica, cannot be mistaken; neither can the pulse, the almost extinction of which more distinctly marks the great degree of inflammation. The state of the pulse in inflammation of the viscera of the abdomen is remarkable, from being small, hard, quick, and vibrating like a cord in the generality of cases; but when the inflammation sets in with great intensity, the pulse often alters its character, becoming smaller, and sometimes so indistinct as scarcely to be felt, rendering the abstraction of blood imperative; and the quantity to be drawn must be regulated by the pain, as ascertained by pressure on the umbilicus. The presence of pain on pressure, and the diminution or absence of pulse, are only signs of great inflammation. The absence of both pain and of pulse, are signs that gangrene has taken place; but then the anxiety of countenance will be so marked, the face so pale and so bedewed with large drops of perspiration, that an error cannot be committed as to what has occurred. In acute inflammation of the liver as well as of the intestines, the pulse will often become indistinct, and the countenance very anxious; the pain will be constant, and increased on pressure. As blood is drawn, the pulse rises, the anxiety of countenance and pain diminish, and the patient after the loss of from fourteen to twenty ounces feels more at ease. In all these cases of abdominal inflammation the pain is constant; it is often increased by paroxysms, but is never absent: there are moments of relief, but it is never complete: it is always augmented by pressure, whilst in colic, there

is in all cases an occasional positive absence of pain, and pressure gives relief. Let us suppose a young and healthy man to be brought to an hospital with an inguinal hernia of recent formation, presumed to have been strangulated only four or six hours. On examination, the swelling is found to be painful, and very tense when touched. The nausea and sickness are frequent; the pain at the umbilicus severe and increased on pressure; the pulse small and hard; the countenance distressed. What should be done? The answer is positive. 1. The operation with the least possible delay. 2. The exhibition of from four to six grains of calomel with a grain and a half of soft opium. 3. The abstraction of blood. 4. Stimulating injections per anum: and lastly, Gentle purgatives if the bowels do not act of themselves satisfactorily. If on the other hand a young and healthy man is brought to an hospital, with a similar hernia which has been strangulated from four to six hours, the part being but little painful, the umbilicus only tender on pressure, but not acutely sensible, the operation may be delayed until the effect of bleeding unto syncope in combination with the hot bath have been ascertained; but no time must be lost in the trial, and it is quite useless to make it if the herniary swelling will not admit of considerable pressure without much suffering. It is a difficult thing to decide when incarceration ends and strangulation begins, and it is consequently almost impossible to compute the length of time a part has been in that state; frequent observation has, however, taught us, that a hernia of recent formation cannot remain in a state of incarceration ending in strangulation for a longer period than ten hours, without placing the patient's life in great jeopardy, and that the operation is always less dangerous than the continuation of repeated and ineffectual trials at reduction. An operation, on the other hand, is not to be had recourse to until its necessity is evident; inasmuch as a person may die from it and not from the disease: and I have often been enabled to restore the protruded parts by a well directed treatment, almost at the moment when the failure to do so would have been followed by the operation.

I should regret, however, very much to be misunderstood on this point; for I am quite satisfied the general result of cases of recent herniæ has shown that it is better to operate even half an hour before it is absolutely necessary to do it, than to delay for ten minutes after the necessity for an operation has become obvious. The French surgeons, who operate at an earlier period than we gene-

rally do in this country, are certainly not less successful than ourselves; and of two extremes, theirs is assuredly the safest.

The practice of surgery with reference to recent herniæ is infinitely more clear and precise than it is with regard to old herniæ, and for the reasons I have assigned, viz. The symptoms are so much more marked and decided in their course and termination. It is not often that an error is committed in cases of recently strangulated herniæ; it is not uncommon in cases of old herniæ which have become incarcerated or strangulated.

In old herniæ which have become strangulated, the state of parts as well as the nature of the symptoms are essentially different. From the alteration which has taken place in the form, situation and structure of the openings through which the parts are protruded, they are not likely to suffer any diminution of size from muscular contraction; the herniæ are therefore incarcerated or detained, and the bowel is obstructed, rather than it is compressed and strangulated, and the symptoms are consequently more of obstruction than of inflammation. One of the purest cases of this kind I am acquainted with, I had the opportunity of seeing with Mr. Chinnock of Brompton. It was an old gentleman, who had an incarcerated inguinal hernia of three days' duration. The swelling was large and very hard; but as the integuments were thin, and the part not painful, it admitted of accurate examination. The hardness appeared to be dependent on a collection of solid fæcal matter, and after some trials a portion of it at the upper part was broken, and pressed through the external ring. This was followed by a second, and so on in succession until the whole was pushed into the abdomen, with the intestine which had contained it. The symptoms immediately subsided, and a dose of purgative medicine completed the cure. The openings in the abdomen through which the parts protruded were in this case entirely passive.

In some instances it has been proved by operation and consequent exposure of the parts, that the symptoms induced depended entirely on mere detention without compression, which had given rise to obstruction; the intestine in the sac showing little or no signs of inflammation, and the openings being sufficiently large to admit the fore finger in addition without any previous enlargement. The symptoms in these cases were caused by the obstruction, whether dependent on a peculiar apposition of different parts of the intestine, competent to produce such effect, or by adhesions between them and the sac, or from other causes.

In every case, however, the operation is required for the relief of the patient, if it cannot be obtained by other means.

In all these old and well-marked cases of the passive state of the abdominal opening, the symptoms on incarceration differ much from those that take place in recent herniæ which have become strangulated. The patient is uncomfortable, the rupture is not reducible, the bowels are confined, he suffers from eructations, followed by pains referred to the umbilicus and to the pit of the stomach, which become permanent, and gradually although slowly increase in intensity. The abdomen becomes sore, and the tenderness and pain are increased on pressure, although the rupture itself is scarcely painful, and admits of very great pressure being made upon it. These symptoms are soon accompanied by general ones; the pulse quickens and is smaller, perhaps a little harder than usual, the skin becomes hot and dry, the tongue foul, the stomach irritable, nausea is succeeded by vomiting, the countenance assumes a yellowish unhealthy appearance; and gradually deteriorating from this state, at the end of four, five or more days, the patient dies, worn out by the continuance of the constitutional irritation, but not suffering much pain in the herniary swelling. On examination after death, the intestines above the detained or strictured part appear to have suffered from low inflammation, rarely proceeding to gangrene. It is this kind of case which is described in books as being caused by inflammation coming on independently of the incarcerated hernia, but which I believe to be an error; and in all instances in which the symptoms do not yield to the usual means, the operation should be had recourse to, and the protruded parts returned if they will admit of its being done. The patient must die if it is not done; and if it is done without advantage, he has still had the chance of recovery, which good surgery entitles him to. I am, however, of opinion, that the operation will succeed in a great majority of cases if it be done in time, that is, before the constitution is so much affected as to be unable to recover itself after it has been done.

In these cases the treatment should differ materially from that recommended in the foregoing pages on recent herniæ. Bleeding to syncope will only weaken the patient and do little good. The warm bath will not be very effective, and tobacco enemata with elderly persons are sometimes dangerous. The three principal remedies in recent herniæ which have become strangulated are here of

little use, save as they act generally in reducing inflammation, because there is no muscular contraction to subdue; whilst on the other hand cold steadily applied may be of great service, when combined with such mechanical pressure as may be found advisable. In these cases stimulating injections are of great use, and if they be applied, as Mr. O'Beirne of Dublin advises, by means of a tube ten inches long, with a hole at the end of it, and introduced into the sigmoid flexure of the colon, the happiest results will I think follow in a much greater proportion than at present. It draws off the flatus as well as the watery contents of the bowels, whilst the cold acting on the tumour condenses the air contained in the incarcerated intestine, and tends to cause it to pass more readily into the abdomen.

In those cases which are of a mixed character, being neither of recent nor of old formation, the proper course to be pursued must depend on the judgment of the surgeon, in adopting an intermediate course, and in a proper selection of these different remedies.

The use of purgatives after the operation, which has been equally lauded and decried, without sufficient reason being given, admits of strict regulation on sound principles. In recent herniæ which have been operated upon, none but the most gentle aperients should be given; the object being to persuade the bowels to act, and not to force them by irritation. They have been, if they are not actually in a state of inflammation, and an irritating purgative may induce its return, and counteract the effect for which it has been given. If on the contrary it acts violently, the intestine, weakened by the congestion and inflammation which it has suffered, may not be able to sustain this superadded irritation. I have known an intestine returned to the cavity of the abdomen in a doubtful state, (which is the proper course to pursue,) give way under severe purging, and allow the fæces to escape by the wound; the patient recovered, but I have little doubt that mischief has been often done in a similar way. In old herniæ when the incarceration has continued some days, and probably arose from obstruction in the first instance, the happiest effects have often followed the exhibition of active purgatives after the restoration of the protruded parts, whether by the taxis or by operation, and it appears to me that it is in these cases only they are to be recommended.

With regard to the manner of performing the operation itself, I have nothing

to add worthy of remark. The sac should be cautiously opened on its anterior and lower part, where some fluid will usually be found, and then slit up as high as the external ring. If the stricture should not be situated there, but at the inner or superior opening being formed by the edge of the transversalis muscle, the method of proceeding depends on whether it is a recent or an old hernia. If a recent oblique one and the inguinal canal is little altered from its natural state, the aponeurosis of the external oblique muscle forming its outer wall, should be divided in an oblique direction outwards, so as to expose the swelling near its neck. This may now be drawn down, whilst the more external parts are drawn up so as to bring the stricture into view, when it and the neck of the sac should be divided together directly upwards. It has been recommended not to divide the anterior wall of the inguinal canal, but to introduce a cutting instrument on its flat side in an oblique direction outwards, for the distance of an inch and a half, and then to turn its edge, and cut in the dark directly upwards, which appears to me almost impossible to do, to say nothing of its being very dangerous. I therefore always advise that the aponeurosis of the external oblique be slit up to that extent, which will enable the surgeon, by drawing down the sac, to see whereabouts his knife is to cut and the direction it is to take. I am an advocate for dividing the neck of the sac with the stricture, rather than for leaving an inch of it uncut below the stricture. It was supposed that this would prevent an inflammation of the peritoneum; but the experience of the Peninsular war proved, that a cut of half an inch in length was as dangerous as one of an inch, and that the admission of air into the cavity of the abdomen did no mischief.

In old herniæ, and in those of direct descent, the openings are nearly opposed to each other, and this difficulty does not occur. The incision in all cases should be made directly upwards, because it more certainly obviates danger from the epigastric artery in case of an error as to the kind of hernia; but the division of this artery is after all but an anatomical bugbear. I am ready to admit that if a surgeon pokes a knife the length of an inch and a half in the inguinal canal, and then cuts with the end of it, he knows not what nor where, and in this manner divides a large artery, his patient's case may be hopeless; but if he has proceeded in the manner I have mentioned, he will have very little difficulty in placing a ligature on the artery as soon as he has cut it, and the danger to his patient will be but little increased.

If the symptoms denoting the presence of inflammation continue after the stricture has been completely removed, the means necessary to be employed for their removal must be had recourse to as in other cases of inflammation; for there is no axiom so much to be doubted in medicine, as that which leads to the belief that the removal of the cause will certainly lead to the subsidence of the effect.

In femoral hernia, the parts through which the protrusion takes place being entirely tendinous or aponeurotic, no positive contraction can occur in them, and the symptoms of incarceration and strangulation must depend on obstruction and distention of the contents of the hernia; these will be regulated of course very much by the extent to which the distention is carried, and the sharpness of the edges against which they press. The distinction between a recent and an old femoral hernia will not be quite so marked as between a recent and an old inguinal hernia; and it is usually believed that there is less prospect of returning a strangulated femoral hernia by the taxis, or without an operation, than a strangulated inguinal hernia.

The points of anatomy on which I wish to remark with reference to femoral hernia are few; and on referring to Mr. S. Cooper's Dictionary for the existing state of opinions on them, I find the accounts as given by Hesselbach, Langenbeck, &c. so prolix, and so minute as to be almost unintelligible to a person not already well acquainted with the subject. I shall therefore refrain from quoting them, and only notice those which are more commonly received, or remain a matter of doubt. Poupart's ligament from its origin at the superior spinous process of the ilium to its insertion at the pubes is extended over a space more or less filled up; and constitutes what is called the crural arch. From the ilium to the outside of the femoral artery, it is admitted that there is no possibility of a protrusion taking place. From this part the arch begins to spring, and terminates at the insertion of the ligament into the pubes. The outer portion of the arch is occupied by the femoral artery and vein which pass underneath it inclosed in a sheath formed by the two layers of fascia transversalis described at page 13. A septum separates the artery from the vein, whilst another septum confines the vein on its inside, and separates it from the absorbents generally, and from anything there may be in that situation, constituting all that I consider to be the true sheath of the vessels. There is however a space exceeding an inch,

extending from the septum on the inside of the vein to the pubes where Poupart's ligament is inserted by its lower pillar, and by what is called its third insertion, or Gimbernat's ligament. This is occupied by a continuation of the fascia forming a barrier nearly at a right angle with the septum or sheath on the inside of the vein, and is perforated for the passage of the absorbents. This is called by Cloquet septum crurale, being the barrier between the abdomen and the thigh, and when weakened and forced to descend before a hernia, it is called fascia propria by Sir Astley Cooper. This same part is also called the inner and superior opening of the crural canal by the German and French anatomists; the opening through the fascia lata of the thigh which gives passage to the vena saphena to join the femoral vein, being called the inferior and exterior opening of the same canal.

The French anatomists do not describe the anterior portion of the sheath of the vessels as formed by the fibrous layer of fascia transversalis which passes under Poupart's ligament, the crural arch, or arcade crurale for this purpose; but consider this sheath to arise from the ligament or arch, at its lower edge, and not in the manner I have noticed it; and although they describe very accurately the barrier which exists between the inside of the femoral vein and the pubes, they do not look upon it as a part of the sheath of the vessels.

The septum crurale, as Cloquet calls it, and which I think the best name for this barrier, is not a straight partition, but a curved one, being concave upwards or inwards towards the abdomen, and convex towards the thigh, so that by a little management in dissection it may be made to assume a funnel-like shape on the thigh, and to lead to the conclusion that anything passing into it from within must follow the inclination which such a formation naturally gives, and of course be projected against the vein, by the side of which it would pass out at the lower opening of what the French anatomists call the crural canal; this does not however occur when a femoral hernia takes place. The inside of the septum crurale, or that part which is next the abdomen, is concave, and the oval hollow formed by it is partly filled up by an absorbent gland, which is separated from the peritoneum by the cellular layer of fascia transversalis extended across from the edges of the hollow. It is into this concave septum, oval from side to side, that the hernial sac first passes; and it is this fact has made Sir Astley Cooper say, that a hernia is protruded into the sheath of the

femoral vessels; but this manner of expressing it leads to the same misapprehension, in my opinion, as the French mode of describing it as protruding into the superior opening of the crural canal. They both imply or admit of its being supposed that the hernial or peritoneal sac passes down by the side of and in direct contact with the femoral vein, which is demonstrably an error in those who so understand it.

In all the dissections of femoral herniæ I have had an opportunity of making, the septum crurale of Cloquet, or the fascia propria of Sir Astley Cooper, formed a distinct sac, separated from the septum on the inside of the femoral vein by a mass of condensed cellular structure, sometimes more than half an inch in thickness; the septum had been elongated into an outer sac for the hernia, and had grown down by the side of the sheath of the vein. The hernial sac or peritoneum is not then projected into the sheath of the femoral vessels, but into a separate sac, which it forms for itself by the side of them. When the French anatomists say that the hernial sac is protruded into the superior opening of the crural canal, takes the course of that canal, and re-appears at its lower opening, or where the vena saphena joins the femoral vein, it is only intelligible by understanding that the hernial sac lies in contact with the femoral vein, whereas it passes by the side of it, separated from it by two portions of sheath, viz. one formed by the septum on the inside of the vein, the other by the elongated part of the septum crurale, or fascia propria, which forms the outer sac. This lies on the pubic portion of the fascia lata of the thigh, and if it descends far enough, is found outside the opening for the passage of the vena saphena, but does not come through it from the inside.

The hernial sac having descended below Poupart's ligament, carries before it the septum, or fascia propria, and now has above it Poupart's ligament, behind it the pubic portion of the fascia lata; to the pubic or in-side, Gimbernat's ligament, to the outside the sheath of the femoral vein. Breschet considers Gimbernat's ligament to be erroneously described as a third insertion of the external oblique muscle, or as a part of Poupart's ligament; and supposes it to be formed behind by the transversalis tendon, and before by the fascia lata. The manner in which the transversalis sends down its fibres to form the posterior part, is shown in Plate III. fig. 1.; but the part which the fascia lata has in forming the anterior part, does not appear to me to be sufficiently appreciated. The

falciform process which lies over the femoral artery, and passes inwards to attach itself to Poupart's ligament, and to form the anterior part of Gimbernat's ligament, does more than this; it passes on, and is inserted also into the pubes, on a plane lower than the insertion of the inferior pillar of Poupart's ligament, so that, in fact, it forms an arch exterior to the septum crurale, which, when it is forced to descend, is compelled to pass under it; and it is this, and not Poupart's ligament, which causes the greatest compression on the hernia, and is the seat of external stricture. This portion of the fascia lata forms an arch in reality when a hernia is protruded underneath it; but in its natural state it is not the case; the absorbent vessels pass underneath it and through the septum near the sheath of the femoral vein; but as the falciform process of the iliac fascia lata passes on to its insertion in the pubes, it rests on, and is attached to, the pubic portion of the fascia lata. This attachment, although not a very intimate one, is sufficient to confine the part, but sometimes it is so strong just at the pubes, and forms so firm and complete a union, that drawing on one part evidently influences the other, and renders the arch a circle, through which the hernia is protruded. The anterior part, or the iliac portion of the fascia lata attached to Poupart's ligament, being tendinous, and firmly stretched across from point to point, can yield but little; the inside, or Gimbernat's ligament, can hardly yield at all; indeed it appears to retain its sharpness unimpaired. The sheath of the femoral vessels is scarcely displaced, and the under part, or the pubic portion of the fascia lata covering the pectinalis muscle, seems to be the only part which can easily make room for the hernia to be protruded. This it does by the separation of the attachment between it and the falciform process of the iliac fascia lata, and by the muscle beneath yielding to the pressure.

The structure thus described is of great importance, in giving rise to stricture when any additional matter is forced into the hernial sac, and is much more frequently the cause of strangulation than has, I think, been hitherto supposed.

When a femoral hernia has passed this point, it would descend on the inside of the thigh towards the knee, like a psoas abscess, if it were not prevented by the vessels passing from the femoral artery to the superficial fascia, which bound it below; and from the turn which it takes upwards, from the natural and almost constant bending of the thigh. The herniary swelling, small as it is on passing under Poupart's ligament, expands after it has passed it, turns upwards and

widens, so that as it increases it passes above the sheath of the vessels, above the fascia lata, and even sometimes above Poupart's ligament. In doing this the swelling changes its shape as well as direction, and becomes an oval tumour, having its axis directed from the ilium to the pubes, and in fat elderly people so much resembles an inguinal hernia, as to have been mistaken for it. I suspect that it has been herniæ of this form and shape, which have been supposed to come out immediately in front of the femoral vessels, in which situation a hernia is certainly of rare occurrence.

When a hernia commences, the peritoneum pushes some loose cellular or fatty membrane before it, until it reaches the more condensed cellular structure or fascia, which covers the oval hollow or concavity of the septum crurale; this it presses against the gland contained in the hollow, and usually causes it to be removed by absorption. The continued pressure now acts on the septum, it begins to yield, is elongated, and forms a sac, which, like the peritoneum itself, is thickened as it descends, and increases by a regular growth; its outer surface being rough and adherent to the surrounding parts, the inner being a smooth secreting surface, moistened apparently by a serous fluid, which keeps it distinct from the peritoneal sac inclosed within it; a quantity of fat is sometimes found between them, rendering the detection of the herniary sac more difficult. This sac is usually very thin, and contains little or no fluid, in which respect it is unlike the same investment in inguinal hernia, and renders the operation on this part more difficult. From without inwards the coverings are the skin, fat, superficial fascia, absorbent glands in various states of enlargement, the fascia propria, and on opening that a second sac, viz. the herniary or peritoneal one, and within this the omentum, intestine, &c. as the case may be.

It was the want of knowledge of the fascia propria as a distinct or external sac that made many surgeons suppose that they had met with something extraordinary, when they found one sac within another. But the more accurate knowledge we at present possess on this subject must also be modified by the fact, that it is possible for the peritoneal sac to adhere so intimately to the fascia propria as to be divided with it; and then if the surgeon does not accurately distinguish the next part to be intestine when it presents itself, he may open it, believing that it must be sac, and place his patient in the greatest danger. I understand that one of the most distinguished surgeons in France states, that

he once fell into this error. I have seen it once committed in England, the intestine being opened for the peritoneal sac; and Mr. Vincent informs me, whilst this sheet is passing through the press, that he has lately operated in a case, in which no fascia propria existed. After the sac formed by the fascia propria has been opened, the surgeon must proceed with the greatest attention; and when a second sac, or something like it, is brought into view, he must increase his caution. If he can raise this, or take a small pinch of it up with his finger and thumb, so as to satisfy himself that there is something separate from it within, he may be sure it is the peritoneal sac which presents itself, and may proceed to open it accordingly. But if he cannot do this, and the appearance of the part exposed leads to the belief that it may be intestine, he must not open it, but trace it upwards to Poupart's ligament, and where the firm compression appears to be made upon it, there proceed to divide the stricture until he can satisfy himself whether the part adheres or not. If it be intestine, it will not be adherent, and on the division of the stricture will be readily drawn down or reduced. If it be sac, its adherence to Poupart's ligament will prove its nature, when it should be opened and its contents exposed, if the division of the ligament does not admit of the perfect reduction of its contents.

The manner of dividing the stricture has been, and is still, a subject of discussion, some surgeons recommending that it should be done upwards and rather outwards, others directing that it should be done horizontally by a division of Gimbernat's ligament, according to the opinions they severally entertain of the seat of stricture. It is admitted that the stricture may be situated externally or internally, by the anterior border of Poupart's ligament, (according to my views it is formed by the fascia lata,) or by the edge of Gimbernat's ligament; but I am not aware of any proportion ever having been stated in which they occur. In the absence of this information I am disposed to believe that it happens much more frequently anteriorly than posteriorly, and which will of course regulate the operative process. Practical surgeons know that a very slight touch of the knife is often sufficient to give the requisite relief; and the distended part yields with a sound resembling that which would be heard on dividing a piece of parchment tightly stretched between two points. The stricture thus cut, readily yields to a little pressure with the nail or point of the fore-finger, and the part becomes sufficiently dilated to allow of the return of the contents of the herniary sac into

the abdomen. In by far the greater number of cases this mode of proceeding will be found as effectual as it is safe ; but if it should not be sufficient, and a further division of deeper-seated parts is necessary, in what manner should it be done ? By continuing the incision upwards, or by making a new one in connexion with it, but horizontally ? There are objections to both. It is urged against the operation upwards, that the spermatic cord may be divided by it ; but as the operation is usually performed on women, this objection has not so much weight, for this part may be easily avoided, and if necessary even drawn out of the way, but which I do not however think will be necessary. The division of the edge of Gimbernat's ligament by a horizontal incision is dangerous for two reasons : first the depth of the parts and the greater chance of cutting the intestine, which if protruded in any quantity can only with great difficulty be kept out of the way of the knife ; and secondly the danger of wounding the obturatrix artery when it happens to surround the neck of the sac. I know that if the end of the bistoury be just carried beyond the edge of Gimbernat's ligament and no further, it may be cut without injuring this vessel, which in these cases runs close to it ; but I have been made aware of more than one accident of this nature having occurred in operations performed by some of the best anatomists and surgeons in London, and the patients subsequently bled at intervals until they died from hemorrhage. It does not appear, then, that the ablest and best informed men can avoid such a misfortune, and I am therefore disposed to recommend that the operation should never be done in this way until the one directly upwards has been tried in vain ; and if attention is paid to the division of that portion of the fascia lata which is attached to Gimbernat's ligament and to the pubes as well as of the fascia propria, I suspect sufficient room will be obtained without cutting horizontally inwards. If this should be insufficient, of which I have great doubts, the horizontal incision may then be made with more ease and advantage, but to a far less extent. The obturatrix artery is something of an anatomical bugbear in this operation also ; it has very rarely been injured, although the case I have adduced shows that it may be cut, but then it may be tied, and ought to be tied in every case in which it has been divided. The operation is very simple. In the male a transverse incision should be made in the line of Poupart's ligament, the aponeurosis or tendon of the external oblique muscle is then to be divided and the spermatic cord exposed ; this is to be drawn upwards and kept in that

situation by a bent probe; Poupart's ligament is to be then cut through, until the first incision for dividing the stricture is met by that just made. The blood will now easily lead to the artery, which must be secured by ligature; and to render this easy of execution, sufficient space and a blunt knife only can be wanted, in addition to the forceps and ligature. In the female the operation is more simple, as the round ligament requires little attention being paid to it. It is surprising to see men who place a ligature on the external iliac or on the common iliac, as a matter almost of course, hesitate at tying the obturatrix artery, and even allow a patient to die in the mean time of hemorrhage.

EXPLANATION OF THE PLATES.

PLATE I.

The parts concerned in Inguinal Hernia on the left side.

1. 1. 1. Integument.
2. Fascia superficialis.
3. External oblique muscle.
3. *a*. Its aponeurosis turned down on the thigh.
3. *b*. Poupart's ligament.
3. *c*. The insertion of the external oblique into the os pubis.
4. *a*. The internal oblique muscle passing across the abdomen to assist in forming the sheath of the rectus.
4. *b*. A portion or slip of this muscle separated from its attachment, and hanging down outside the spermatic cord.
5. The superior fibres of the transversalis muscle passing above the cord to their insertion into the pubis.
6. The inferior fibres of the transversalis muscle passing below the cord, forming the lower edge of the internal or superior opening of the inguinal canal, and inserted into Poupart's ligament up to the pubes.

   The fibres marked 6 are all muscular; in some instances they are tendinous and aponeurotic; in others they are either wanting or so indistinct as scarcely to be distinguished from the fascia transversalis.
7. The cremaster muscle given off from the internal oblique, and partly from the transversalis muscles seen lying upon the cord at 7, and passing under it from 7 to 8.
8. The portion of the cremaster usually considered as a second origin, but which is in fact its insertion after its fibres have proceeded the whole length of the spermatic cord and testis, forming in this way a sling partly muscular, partly tendinous, whereby it may be drawn up towards the abdomen.

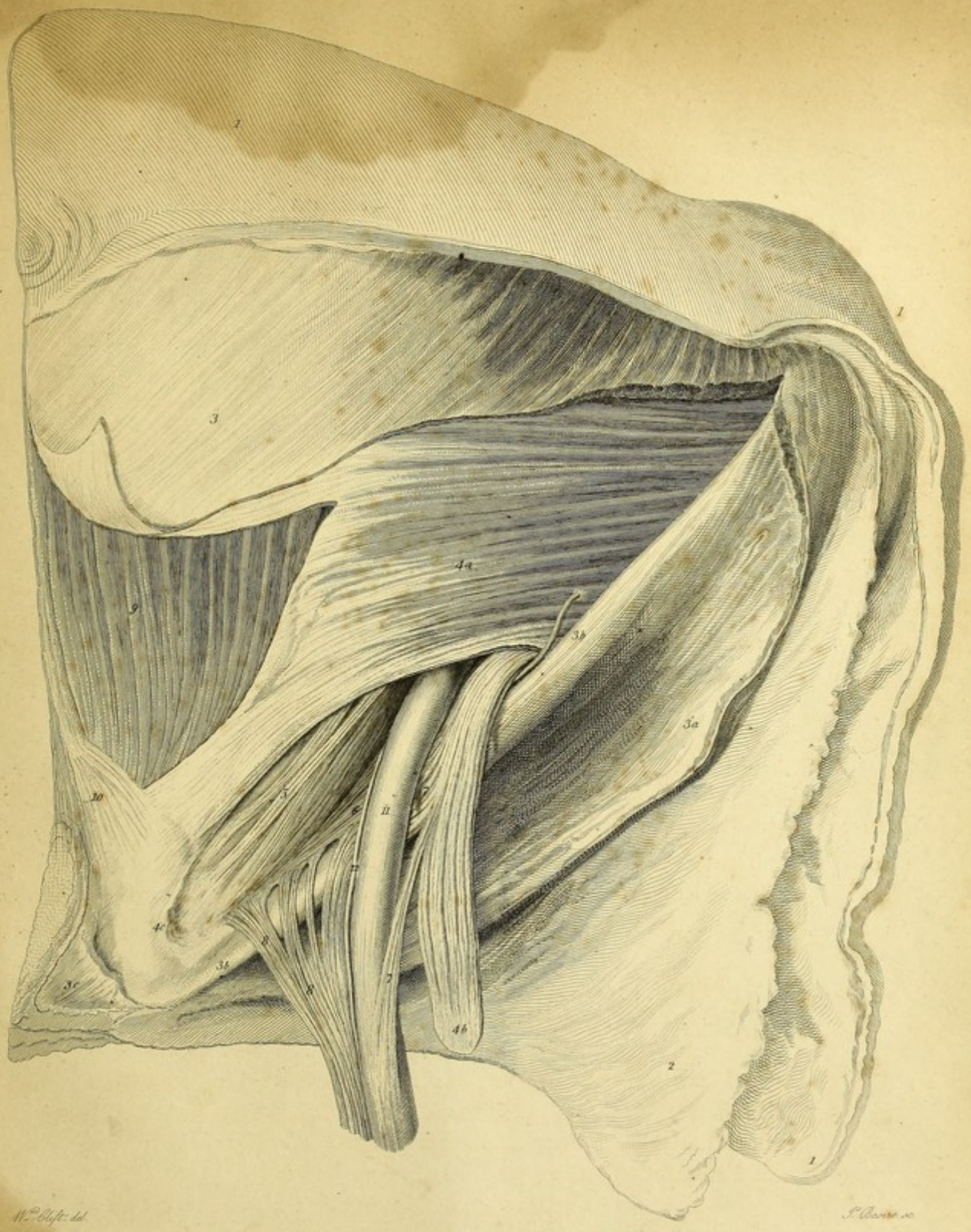
9. The rectus muscle, its sheath having been turned up.
10. The pyramidalis muscle.
11. The spermatic cord.
12. The cremasteric artery, a branch of the epigastric.

The preparation from which this engraving is taken, was made by Mr. Owen, and is deposited in the Museum of the Royal College of Surgeons, as well as that which shows the continuation of the cremaster muscle on the spermatic cord and testis.—The drawing was made by Mr. Clift.

PLATE II.

FIG. 1. The right side of the same individual whose left side is shown in Plate I. The drawing from which the engraving was taken was made by Mr. Clift. Sir Astley Cooper dissected the internal parts to show how far they accorded with the view of them given in his Work, and which is fig. 3.

A. Poupart's ligament.
B. The tendon of the external oblique, turned towards the linea alba.
C. The spermatic cord.
D. The cremaster muscle.
E. E. The internal oblique muscle; at the upper part its anterior surface is shown, at the under part it is separated from the transversalis, a little raised and turned upwards and inwards, so as to show the under surface of the muscular fibres at E.
F. The transversalis muscle partly exposed and raised in a similar manner; the under surface is shown by the line extending from F.; the outer surface of the same muscle is shown by the line extending from I., and which corresponds with No. 3. and 4. *c.* of Plate I.; and lower down with No. 6., or the fibres passing under the cord.
G. Fascia transversalis, outer division.
H. Peritoneum.
I. The inferior fibres of the transversalis.


1
3
4a
9
10
3b
3a
11
4c
3c
4b
2

J. The femoral vein.
K. The femoral artery.

FIG. 2. Is taken from Plate VI. of P. F. Blandin, *Traité d'Anatomie Topographique*, and which is supposed by him to be in accordance with the opinions entertained by those French anatomists who preceded him to 1826.

A. The inferior and united edges of the internal oblique and transversalis muscles, horizontally directed across the abdomen to the linea alba.
B. The crural arch, or Poupart's ligament.
C. Fibrous expansion detached from around the inguinal ring, *i. e.* the ring exposed by the removal of the intercolumnar fascia.
D. The internal or superior pillar of the ring.
E. The external or inferior pillar of the ring.
F. Muscular nooses or arches formed by the cremaster muscle on the spermatic cord, and derived from the inferior border of the internal oblique and transversalis muscles.
G. This is S. in the original, and is described as the aponeurotic fascia transversalis, which forms the posterior wall of the inguinal canal in a spot where, of the three muscles of the abdomen, only one is found, viz. the external oblique. This is internal to the cord.
H. This is also S. in the original, and represents the same thing, but external or to the outside of the cord.
I. The spermatic cord.
1. The femoral vein situated on the inside of
2. The femoral artery.
3. An opening made in the external part of the crural canal (sheath of the vessel), to show the anterior crural nerve situated immediately on the outside of it, and lying on the cellular structure covering the psoas muscle.
4. Saphena major vein.
5. A lymphatic gland and vessels.
6. Falciform or semilunar fibres situated at the junction of the vena saphena with the femoral vein.

7. The anterior wall of the crural canal or sheath of the vessels, opened and turned outwards and inwards to show the canal.

Fig. 3. Is a copy reversed of Figure 1. of Plate V. from Sir Astley Cooper's book on the Structure and Diseases of the Testis, showing the inguinal canal and course of the spermatic cord.

A. A. Poupart's ligament.

B. Internal oblique muscle.

C. C. Transversalis muscle arising from Poupart's ligament, and passing around the spermatic cord at the internal ring, so that the fibres of this muscle appear behind as well as before the spermatic cord, and thus the inguinal canal is rendered a muscular canal: this is a most important provision in preventing hernia; and when hernia exists, it is often the cause and seat of stricture.

D. The cremaster muscle arising from Poupart's ligament between the internal oblique and transverse muscles, and receiving fibres from the transversalis behind the cord.

E. The rectus muscle.

F. Its sheath from the internal oblique and transverse muscles.

G. Superficial fascia of the cord.

H. Spermatic cord.

I. I. The internal ring. By an oversight the line running from I. rather appears to stop at the cremaster muscle at D., than to go on to the inner ring.

K. The external ring.

N.B. The difference between F. and G. of fig. 2. when compared with F. and I. of fig. 1. is remarkable; it is no less so when compared with C. C. of fig. 3. of the same Plate, or with No. 5. and 6. of Plate I.

The French anatomists generally appear to consider that formation of the transversalis muscle to be the more natural one, in which it runs across to the linea alba, without being inserted into Poupart's ligament, when the spermatic cord will be found lying on the fibrous layer of the fascia transversalis, as in fig. 2. Plate II. at G.; and in order to show the loops or nooses formed of the

FIG. 1.

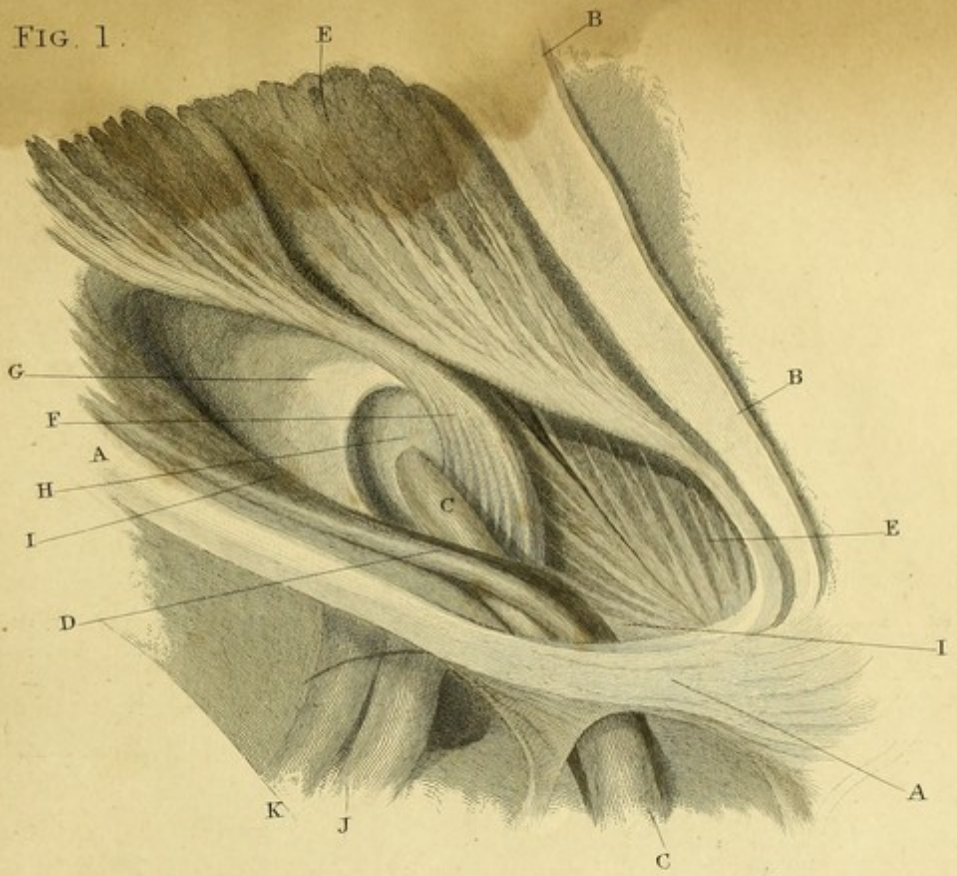


FIG. 2.

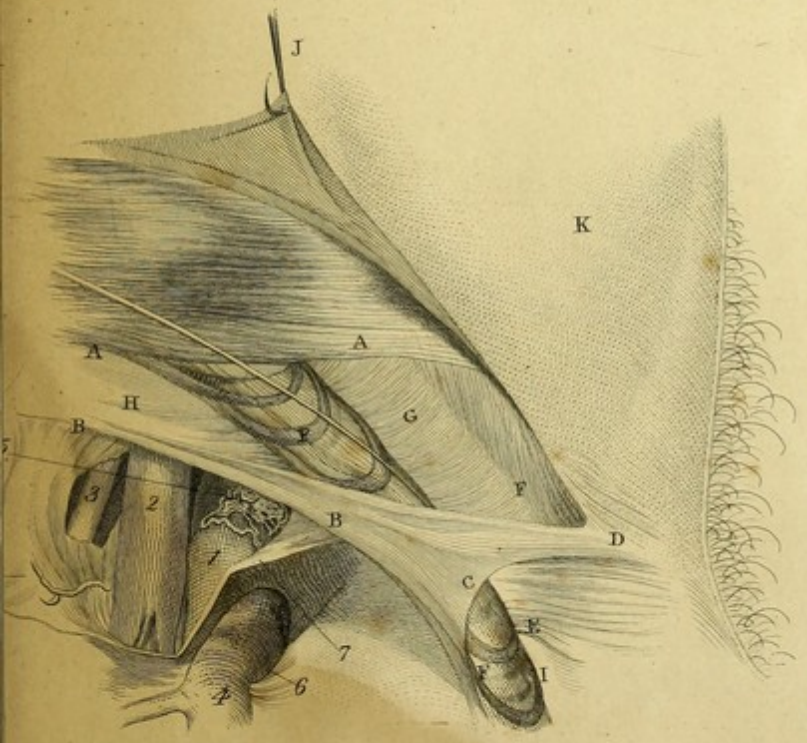
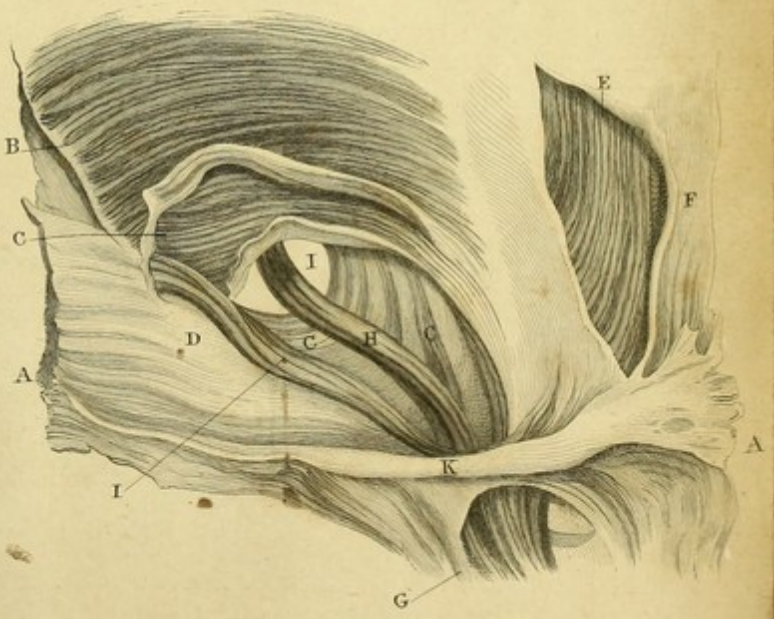


FIG. 3.



J. T. Wedgwood. Sculpt.

cremaster by the testis in its descent into the scrotum, they sacrifice the insertion of those fibres which do not take this appearance, as seen in Plate I. No. 8. Anatomists only can judge which description is most correct, and which formation is most commonly met with.

PLATE III.

An internal view of the left half of the pelvis and parts concerned in Inguinal and Femoral Herniæ.

1. The symphysis pubis.
2. The ilium, sawn across.
3. The rectus muscle, the inner layer of the fibrous fascia transversalis being removed.
4. The transversalis muscle.
5. Gimbernat's ligament.
6. The posterior or fibrous layer of fascia transversalis lying on or lining the transversalis muscle, the transverse fibres of which are seen passing on to the edge of the rectus.
7. Additional strengthening fibres to the fascia.
8. A particular tendinous insertion of it running behind the rectus to be inserted into the pubis at its symphysis.
9. The falciform edge of the fascia at the inner opening of the inguinal canal.
10. The lunated edge of the posterior part of the conjoined tendons forming the sheath of the rectus.
11. The internal or cellular layer of fascia transversalis turned down and lying upon the peritoneum which is seen underneath it.
12. The peritoneum.
13. The epigastric artery with its two veins turned down with the cellular layer of fascia transversalis.
14. The round ligament passing into the inguinal canal.
15. A femoral hernia covered by the cellular layer of fascia transversalis protruding through the crural canal or ring.
16. The fibrous layer of fascia transversalis, passing under Poupart's ligament,

and by the edge of Gimbernat's ligament, to form the septum crurale, and in this case of hernia the fascia propria of the hernial sac.

17. The part of the internal or cellular layer of fascia transversalis, which corresponds to the commencement of the inguinal canal; the inner edge of this has a very strong falciform appearance when the part is replaced in its proper situation.

18. Pelvic fascia.

This preparation was made by Mr. Owen, to illustrate the lectures delivered in the Theatre of the College of Surgeons. It is also preserved in the Museum. —The drawing was made by Mr. Clift.

THE END.

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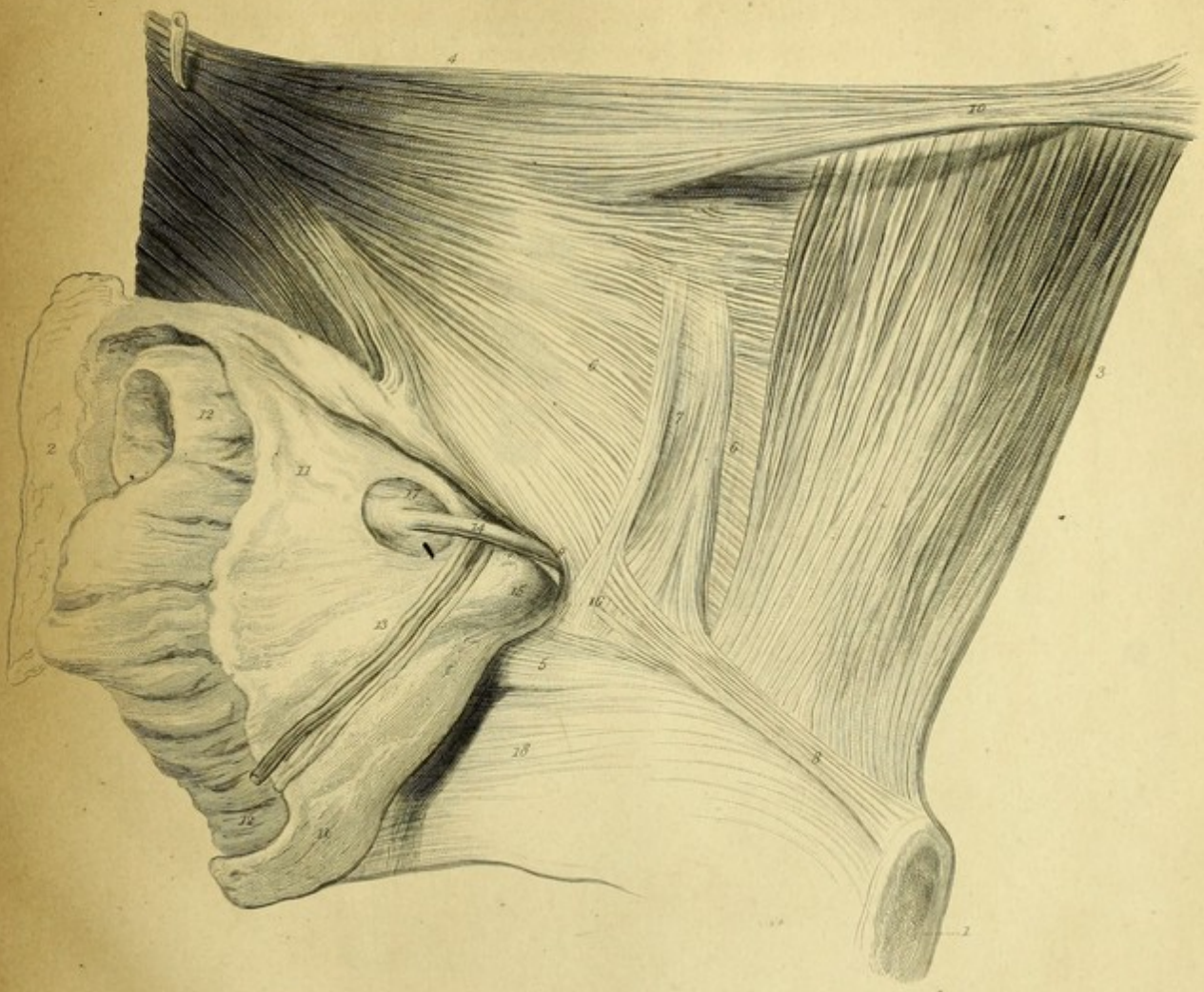

W. Cliff. del.

S. Bacon sc.