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THE

SURGICAL ANATOMY

OF

THE GROIN,

THE FEMORAL, AND POPLITEAL REGIONS.

BY

THOMAS MORTON,

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ILLUSTRATED WITH LITHOGRAPHIC PLATES AND WOOD ENGRAVINGS.

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THE present publication is intended to form, with the Surgical Anatomy of the Perinæum already published, part of a Work, which, when it shall have been completed, will contain a description of the Surgical Anatomy of some of the most important regions in the human body.

The drawings, from which the lithographic plates have been engraved, were very carefully made after my own dissections; as were also those from which the wood-engravings have been taken, with the exception of Nos. 4 and 5, which were accurately copied from similar plates in Hesselbach's Essay upon the Origin and Progress of Herniæ.

I take advantage of the present occasion gratefully to acknowledge my obligation to Sir Astley Cooper, who has kindly permitted me to copy the engravings which illustrate the description of the injuries of the hip-joint, from the plates relating to that subject in his Treatise on Dislocations and Fractures.

THOMAS MORTON.

UNIVERSITY COLLEGE,
APRIL 30, 1839.

THE SURGICAL ANATOMY

OF

THE GROIN.

CHAPTER I.

EXTENT OF THE REGION OF THE GROIN. — PRELIMINARY REMARKS.

The groin, or, as it has been more recently termed, the inguino-femoral region, comprises within its limits the triangular space or hollow which is observed at the upper part of the thigh where it bends upon the trunk, and is included between the ligament of Poupart above, and the sartorius and adductor longus muscles on either side. This space, the external surface of which is usually a little concave in its outline, especially when, in the living subject, the thigh is attempted to be flexed upon the pelvis, or when, after death, it is abducted and rotated outwards, may be compared in several respects to the depression of the axilla in the upper extremity. This hollow appearance of the region of the groin is extremely well seen in those persons who, originally possessed of a large muscular developement, have become rapidly emaciated in consequence of some wasting disease, as hectic, fever, &c.; but in very corpulent individuals the natural limits of the region are not so clearly marked out, nor can it be easily distinguished from the general contour of the limb, unless the muscles which bound it laterally are excited to a violent degree of contraction. The base of the triangular space is, as has been already described, formed by Poupart's ligament, and therefore corresponds exactly with the

deep linear depression which marks, externally, the flexure of the thigh upon the pelvis.

Preliminary remarks.—Before commencing the dissection of the groin, the following inequalities of its surface are deserving of notice; viz. at its most external limit is situated the striking prominence of the anterior superior spinous process of the ilium, to which the sartorius muscle and the iliac extremity of the crural arch are attached; beyond this, the projecting curved line of the crest of the ilium may be traced for a considerable distance until it ceases at the posterior superior spinous process: more internally than the anterior superior spine of the ilium is observed a smooth plain surface, which corresponds with the iliac portion of the fascia lata, where it covers the iliacus, psoas magnus, and rectus muscles; next to it is a hollow depression, more or less strongly marked according to the condition of the subject, whether it be corpulent or otherwise; it is occupied by a quantity of loose cellular and adipose substance, together with numerous lymphatic glands, underneath which, in the living person, the pulsations of the great femoral artery may be readily distinguished, as that vessel emerges from the cavity of the abdomen, passing underneath Poupart's ligament.†

It is in this situation that the interruption to the circulation of the blood through the trunk of the common femoral artery can be most easily effected, by the simple pressure of the thumb upon it as it runs over the horizontal branch of the os pubis, since it is only separated from that bone by a few of the fibres of the psoas magnus muscle.‡ (See the woodcut No. 2, at page 87, figs. *e*, *s*, and *u*.)

† To be well acquainted with the natural healthy appearance of the upper part of the thigh, will frequently prove of great advantage in the endeavour to establish a ready and correct diagnosis in several of the numerous obscure affections which occur in the region of the groin.

‡ In the hospital of University College, and in the French hospitals generally, it is the constant practice to employ pressure in this manner upon the trunk of the common femoral artery, during the performance of amputation of the thigh or leg, instead of using the tourniquet; but in private practice, and on other occasions when a sufficient number of intelligent and trustworthy assistants are not at hand, it is more advisable to take advantage of the security which the application of the tourniquet affords.

There yet remains to be observed a still deeper hollow, upon the pubal side of the great femoral artery and vein, which is limited superiorly and internally by the tuberosity of the os pubis and the adductor longus muscle. It is in the situation of this depression that the tumour of a femoral hernia protrudes externally. (See Plate IV. fig. 3, and also Plate VI. figs. 1 and 2.)

The principal diseases which, by their occurrence within its limits, demand from the surgical student a perfect and intimate acquaintance with the anatomy of the region of the groin, are, buboes and other abscesses, aneurism and wounds of the great vessels, varix of the saphena vein, with encysted and other tumours; the diseases and injuries of the hip-joint; and lastly, but not the least important, from the great frequency of its existence, and the delicate operations required for its relief, the femoral or crural hernia.

When we take up a dried preparation of the bones of the pelvis, from which all the soft parts that naturally invest them have been removed, with the exception of the ligaments, which are extended across from one bone to the other, and serve to connect them together, or to give attachment to muscles, we observe, on each side of the cristæ of the ossa pubis, a large, deep, and irregular excavation of the anterior margin of the ossa innominata, which extends outwards, as far as to the anterior superior spinous process of the ilium. (See the wood-engraving, No. 1. *a*, *b*, *c*, *d*, *e*, *f*.) If we trace the margin of the bone between the two above-mentioned points, we shall find that several eminences and depressions are situated along the border of the excavated space, which give rise to the inequality of outline alluded to: thus, for example, there is, a little distance from the anterior superior spinous process of the ilium (*a*), and separated from it by a deeply curved depression, another prominence (*the anterior inferior spinous process*, *f*,) which gives attachment to one of the tendons of the rectus muscle; passing along in a direction towards the mesial line, we soon meet with another elevation in the margin of the bone (*the ileo-pectineal eminence*, *e*,) situated immediately above the acetabulum, and indicating the junction of the bones of the ilium and pubis, which existed separately in the young subject, previously to the completion of the developement of the osseous system.

From the last-mentioned process of bone, the horizontal branch of the os pubis (*d*) constitutes the posterior boundary of the space as far as to the root of the spinous process or tuberosity (*b*). Between the ileo-pectineal eminence, and the spine of the pubis, the superior edge of the horizontal branch of the os pubis is remarkably thin and sharp, (*the pecten of the os pubis*,) and forms part of the brim of the true pelvis: it also constitutes a part of the ileo-pectineal line, and gives attachment to Gimbernat's ligament, and to the conjoined tendons of the internal oblique and transversalis muscles of the abdomen.

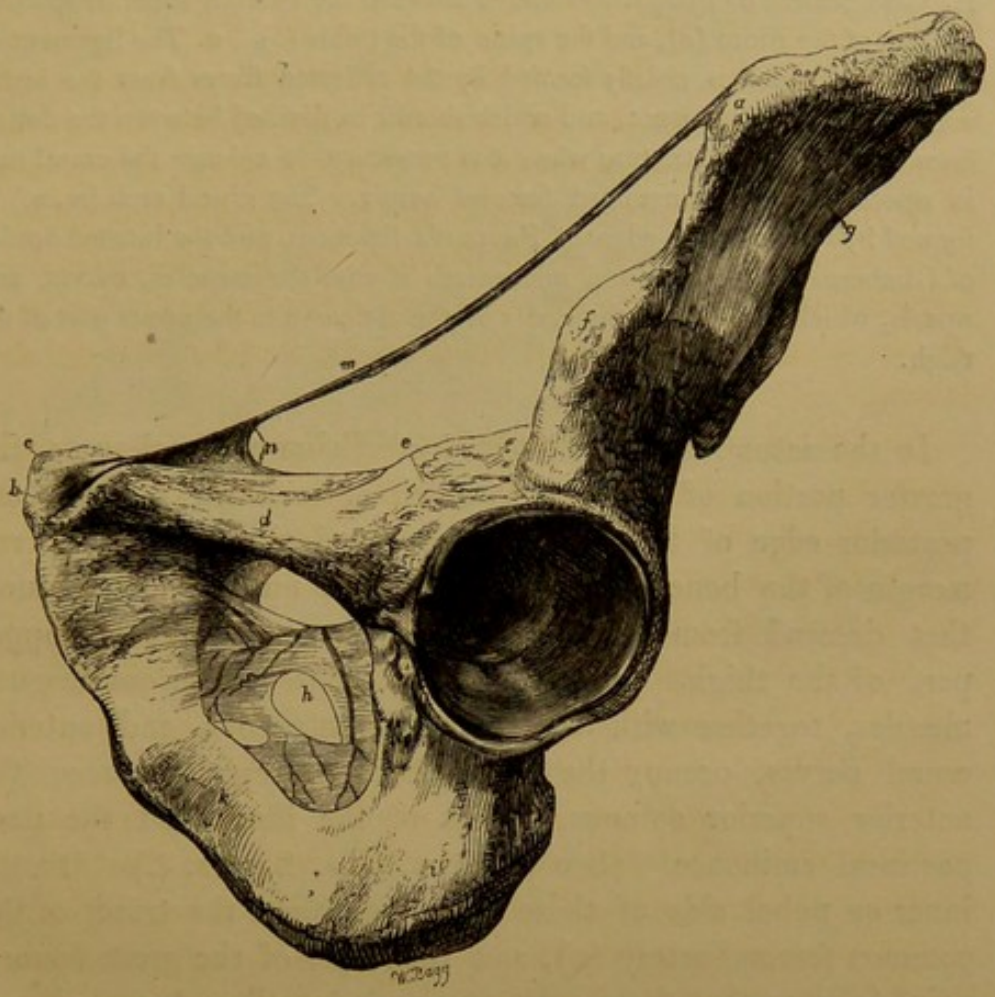
The *crural arch.*—The ligament of Poupart,† as it stretches across from the anterior superior spinous process of the ilium, to the spine, or tuberosity of the os pubis, bounds the excavation of the os innominatum anteriorly, and thus converts it into a wide hollow passage, or outlet, by which several large muscles and vessels issue from the cavity of the abdomen to the thigh; and hence the name which has been given to it, of the crural arch. (See the woodcut No. 1. fig. *m*, at page 85.)

Gimbernat's ligament.—Some of the fibres of Poupart's ligament will be noticed, on close examination, as leaving the direction which is pursued by the rest, and bending obliquely downwards and outwards as they approach towards the tuberosity of the os pubis, passing to be inserted into the pubal portion of the pecten, or ileo-pectineal line (*n*). This thin stratum of tendinous fibres, the dirction of which, in the erect position of the body, is almost horizontal, has been named Gimbernat's ligament,‡ and is commonly found rather larger in men than in women; its external margin is thin, sharp, and concave in its outline, and is directed towards the femoral vein, from which it is only separated by a small oval space, occupied by some loose cellular tissue, and occasionally a lymphatic gland. (Woodcuts Nos. 1 and 2, fig. *n*.)

† Also called the Fallopian ligament, ligament of the thigh, crural arch, endon of the external oblique muscle.

‡ So named, after Don Antonio de Gimbernat, surgeon to the King of Spain, who accurately described its structure in 1768, and recommended its division with the knife for the removal of the stricture in cases of strangulated femoral hernia. *Vide* Nuevo Metodo de operar en la Hernia crural, por D. Antonio de Gimbernat; Madrid, 1779. A new Method of operating for the Femoral Hernia, translated by Thomas Beddoes, M. D.; 8vo. Lond. 1795.

No. 1.



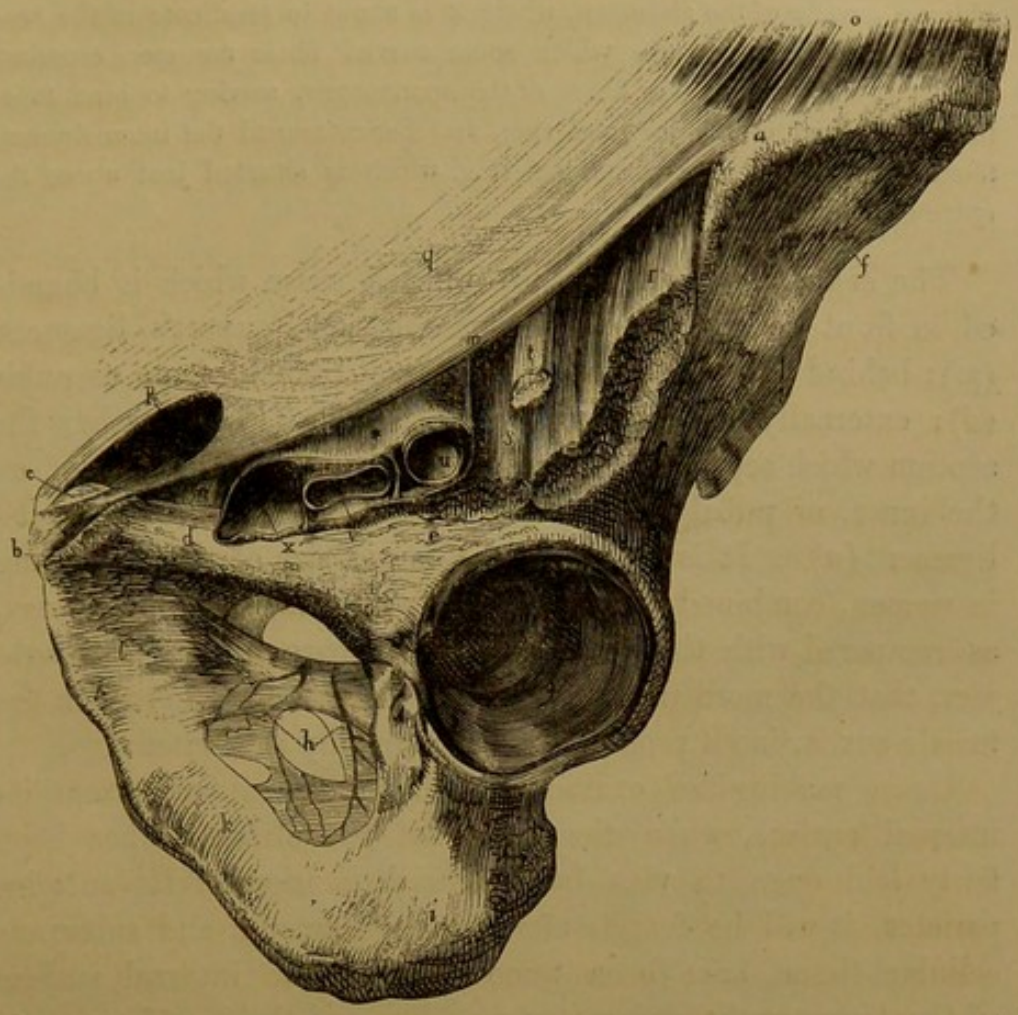
The wood-engraving represents the crural arch of the left side as it appears when all the soft parts, with the exception of the ligaments, have been dissected from the os innominatum. The irregularly curved line of the anterior margin of the bone is seen to be converted into a hollow outlet or passage by Poupart's and Gimbernat's ligaments, as they are stretched across in front of the excavated space. *a*. The anterior superior spinous process of the ilium. *b*. The spinous process or tuberosity of the os pubis. *c*. The angle of the os pubis; the space between *b* and *c* is the crista of the os pubis. *d*. The horizontal branch of the os pubis: superiorly, its margin is thin and sharp, and is named the *pecten* of the bone; inferiorly, it arches over the thyroid foramen, which is represented as being partially filled up by the obturator ligament. *e*. The ileo-pectineal eminence, which marks the junction of the os pubis and the ilium when the developement of the osseous system has been completed: it is against this prominence of the bone that the femoral artery may be securely compressed with the thumb, so as completely to arrest the current of the blood through the vessel. *f*. The anterior inferior spinous process of the ilium, to which one of the heads of the rectus muscle of the thigh is attached. *g*. The dorsum of the ilium. *h*. The thyroid foramen, partly closed up by the

obturator membrane. *i*. The tuberosity of the ischium. *k*. The ascending ramus of the ischium. *l*. The body and descending ramus of the os pubis. *m*. The ligament of Poupart, extended between the anterior superior spinous process of the ilium (*a*), and the spine of the pubis (*b*). *n*. The ligament of Gimbernat, which is chiefly formed by the reflected fibres from the lower edge of Poupart's ligament, and which should be divided between the dotted lines to remove the stricture when it is necessary to enlarge the crural ring in operations for strangulated femoral hernia. The crural arch (*m*, *n*,) is formed by the posterior edge of Poupart's ligament, and the lunated border of Gimbernat's ligament; and underneath it pass the muscles, nerves, and vessels, which issue from the cavity of the abdomen to the upper part of the thigh.

In the natural and undissected condition of these parts, the greater portion of the space, which is included between the posterior edge of Poupart's ligament and the irregular curved margin of the bone, is completely closed up by the structures that descend from the interior of the belly to the upper part of the thigh. The iliacus internus and psoas magnus muscles, together with the external cutaneous and anterior crural nerves, occupy the whole of the interval between the anterior superior spinous process of the ilium and the ileo-pectineal eminence. (See woodcut, No. 2. *r*, *s*, *t*.) On the inner or pubal side of these are placed, first, the trunk of the common femoral artery (*u*), and then that of the great femoral vein (*v*); so that there only remains a small and oval-shaped space (*x*), which is unoccupied, except by some loose cellular tissue (the *septum crurale* of M. J. Cloquet), and some lymphatic vessels, which, passing along the inner edge of the femoral vein, ascend into the cavity of the pelvis from the structures of the inferior extremity, to reach the absorbent glands which are situated upon the internal border of the psoas muscle, alongside of the external iliac vessels.

The wood-engraving represents, a vertical section of the limb having been made immediately below Poupart's ligament, the mode in which the greater part of the space that is included by the crural arch is filled by the muscles, nerves, and vessels which make their exit from the abdomen to supply the lower extremity, leaving only a small oval-shaped space (the crural ring), upon the iliac side of Gimbernat's ligament, unoccupied, except by some loose cellular tissue, absorbent vessels, and sometimes a lymphatic gland.

No. 2.



a. The anterior superior spinous process of the ilium. *b*. The spine, or tuberosity of the os pubis. *c*. The crista of the os pubis. *d*. The horizontal branch of the same bone. *e*. The ileo-pectineal eminence. *f*. The dorsum ilii. *g*. The cavity of the acetabulum. *h*. The thyroid foramen, filled up by the obturator membrane. *i*. The tuberosity of the ischium. *k*. The ascending ramus of the ischium. *l*. The body and descending ramus of the os pubis. *m*. Poupart's ligament, which, together with *n*, Gimbernat's ligament, constitutes the crural arch; beneath which, the iliacus muscle *r*, the psoas magnus muscle *s*, the anterior crural nerve *t*, the femoral artery *u*, the femoral vein *v*, and the crural ring *x*, are situated.† The femoral artery and vein, with the crural ring, are seen included within a membranous sheath or common investment, *, the anterior wall of which is formed by the fascia transversalis, and the posterior by the fascia iliaca. On each side of the femoral vein will be perceived a membranous septum which separates that vessel from the femoral artery on the one side, and from the crural ring on the other, at the same time serving to bind the anterior and posterior parietes of

† The femoral hernia descends from the abdomen through the crural ring.

the sheath more firmly together. *o*. marks the fleshy fibres of the external oblique muscle of the abdomen, where it is about to terminate in the tendinous aponeurosis *q*, near which some curved fibres are seen crossing, almost at right angles, the fibres of the aponeurosis, serving to bind together the pillars of the inguinal ring, and hence named the intercolumnar fibres. *p*. The external abdominal ring, which is situated just above the spine of the os pubis.

The *crural ring*† is the oval-shaped space which is bounded in front by the thin posterior edge of Poupart's ligament (*m*); behind by the *pecten*, or horizontal branch of the os pubis (*d*); externally by the great femoral vein (*v*), or rather the septum which separates that vessel from the lymphatics; and on the inner, or pubal side, by the lunated border of Gimbernat's ligament (*n*). It is owing to the larger size of the crural ring in women, combined as it is in them with smaller inguinal rings, as compared with the size of the same space in the male subject, that the more frequent occurrence of femoral hernia in the female sex is, in all probability, to be mainly attributed.‡

Upon making an examination of the crural arch from its internal surface, when the cavity of the abdomen has been fairly laid open to view by a crucial incision of its anterior parietes, it will be found, after the peritonæum and subserous cellular tissue have been removed from the internal surface of the transversalis and rectus muscles, and the iliac fossa, that the space between the anterior superior spinous process of the ilium and the external iliac vessels, in addition to being closed up by the nerves and muscles mentioned above, is greatly fortified by the peculiar manner in which the strong membranous expansion that binds down the psoas and iliacus muscles (*the fascia iliaca*) is connected to the posterior edge of Poupart's ligament, where it joins with a similar membrane investing the internal surface of the transversalis and rectus muscles (*the fascia transversalis*); the point of their conjunction being distinguished by a dense whitish line, or band, situated immediately behind and parallel with the crural arch. It is, doubt-

† The crural ring was described by Mr. Hey under the term of *the Femoral ring;* and by others as the *Upper*, or *Posterior, opening of the crural* or *femoral canal*. By Sir Astley Cooper it is called the *Femoral aperture*.

‡ *Vide* Observations on Crural Hernia, by Alex. Monro, jun. M.D.; Edin. 8vo. 1803, p. 55.

less, chiefly owing to this connexion of the fascia iliaca with the fascia transversalis behind Poupart's ligament, that a protrusion of any of the abdominal viscera is so rarely permitted to occur in the interval between the anterior superior spinous process of the ilium and the great femoral vessels. (See the wood-engraving, No. 3, fig. *g*, *g*, *g*.)

No. 3.

The wood-engraving represents a view of the crural arch, taken from behind, when the cavity of the abdomen has been laid open, and the peritonæum and loose subserous cellular tissue removed from the inner surface of the muscular parietes, so as to expose the *fasciæ iliaca* and *transversalis* where they invest and strengthen the several structures filling up that part of the crural arch which intervenes between the anterior superior spinous process of the ilium and the external iliac vessels. *a*. The anterior superior spinous process of the ilium. *b*. The symphysis pubis. *c*. the situation of the spine of the os pubis. *d*. *d*. The horizontal branch of the os pubis.

e. The external iliac artery. *f*. The external iliac vein. *g. g. g*. The posterior surface of Poupart's ligament, behind which the fascia iliaca (*l*) is seen uniting with the fascia transversalis (*m*). *h*. The fascia transversalis passing out of the pelvis upon the great vessels forming the anterior layer of their funnel-shaped sheath (seen in the woodcut No. 2, *). *i*. The crural ring, through which the femoral hernia descends. *k*. Gimbernat's ligament, covered by the fascia transversalis. *l*. The fascia iliaca, lining the psoas and iliacus internus muscles, and passing out of the pelvis underneath the iliac artery and vein, to form the posterior wall of the funnel-shaped sheath of the femoral vessels. *m*. The fascia transversalis, which lines the internal surface of the transversalis and rectus muscles. *n*. The situation of the internal abdominal ring: beneath the letter is seen the cut extremity of the round ligament of the uterus, which escapes here to enter into the inguinal canal. *o*. The rectus muscle dissected. *p*. The opening by which the obturator artery and nerve issue from the pelvis: the inner surface of the bone is here covered by the pelvic fascia, which is a continuation from the fascia iliaca.†

The funnel-shaped sheath of the femoral vessels.—As the external iliac vessels emerge from the abdominal cavity, passing underneath the crural arch, they assume the appellations of femoral artery and vein, and carry along with them a complete investment from the fasciæ which line the internal surface of the iliac region; this investment, or sheath, is, at the first, wide and loose around the vessels, and more particularly so upon the inner or pubal side of the great femoral vein, but it gradually contracts its dimensions as it descends upon the front of the thigh, (see Plate IV. fig. *t*, *t*,) and finally becomes intimately blended with the proper cellular tunic of the artery and vein opposite the point where the internal saphenous empties itself into the common femoral vein, and the profunda femoris arises from the common femoral artery. This production from the fasciæ which line the internal surface of the abdominal muscles has received, in consequence of its figure, the name of the *funnel-shaped sheath of the femoral vessels*. It may be described as being formed anteriorly by the fascia transversalis, and posteriorly by the fascia iliaca; it is also subdivided into three distinct compartments by the membranous septa which are situated one on each side of the femoral vein, and connect the anterior and posterior parietes of the sheath more firmly together. One of these septa is placed between the femoral artery and the vein, while the other lies on the inner or pubal side of the latter vessel, which it separates from the space that serves to trans-

† Vide the Surgical Anatomy of the Perinæum, page 29, et seq.

mit the great trunks of the lymphatic vessels of the lower extremity into the interior of the abdomen. (See the woodcut No. 2, *u*, *v*, *x*.; and Plate IV. fig. 1, 2, 3.) The most external of the subdivisions of the funnel-shaped sheath of the vessels contains the common femoral artery; the second, or middle division, is occupied by the great femoral vein; while the third, or that which is nearest to the tuberosity of the os pubis, corresponds with the crural ring, and is closed, in the natural condition of the parts, by some loose cellular tissue† and lymphatic vessels: occasionally, however, an absorbent gland will be found lying within it.

It is into the last-mentioned of the three subdivisions of the funnel-shaped sheath of the femoral vessels that the peritonæal pouch, which forms the sac of a femoral hernia, commences to descend when it is extruded from the abdominal cavity.

† The *Septum crurale* of M. Jules Cloquet. *Vide* Recherches Anatomiques sur les Hernies de l'Abdomen, par Jules Cloquet; 4to. Paris, 1837; page 74.

CHAPTER II.

SURGICAL DISSECTION OF THE PARTS CONNECTED WITH THE ANATOMY OF FEMORAL OR CRURAL HERNIA.

For making the dissection of the structures which are connected with the anatomy of femoral hernia, a female subject should be selected; and one that is rather lean and attenuated will be found to be much more suitable for this purpose than one which is more corpulent, as it is very difficult to demonstrate upon the latter, in a clear and satisfactory manner, the numerous layers of fasciæ described in the best treatises upon this disease.

Position of the subject.—The subject should be laid upon its back, and a moderately sized block of wood introduced underneath the loins: the thigh, upon which the dissection is intended to be made, is, in the next place, to be abducted and rotated outwards, with the knee a little bent, so that the leg and foot may rest upon their external surface. The first incision of the dissection should be commenced over the prominent crest of the ilium, a short distance from the anterior superior spinous process, and extended in a straight line, across the lower part of the belly, to a little above the symphysis pubis: from the termination of this first cut, let another be carried in a vertical direction downwards, along the inner border of the thigh half way to the knee; after which it may be made to incline with a gentle curve over the front of the thigh, and brought to a termination upon the outer aspect of the limb. (See the Plates I, II, and III.) The flap, which has been thus marked out, and consisting of the skin only, is now to be dissected carefully, by light touches of the scalpel, from the subjacent layer of cellulo-adipose substance, commencing the separation at the superior and internal angle, and continuing until the whole of it has been raised from its connexions; after which it may be thrown loosely over the external border of the thigh. (See Plates, I, II, and III.)

The *skin* of the region of the groin is very thin and delicate in its texture, and is slightly covered by the hair extending

from the external organs of generation, which should be removed with the razor previously to the performance of any operation upon this part.

Numerous sebaceous follicles are situated underneath the skin, particularly near to the angle of the flexure of the thigh; and it not unfrequently happens that in young children, and in adults who are exceedingly corpulent, these glands secrete a thin, acrimonious, and irritating matter, which, if not quickly removed, excoriates the adjoining surfaces, and from the continual chafing of the parts, which ensues upon the constant motions of the limb, gives rise to considerable irritation and annoyance of the patient. When this has happened, the most effectual treatment consists in the continued application of the Goulard lotion, with a strict attention to cleanliness by frequent ablutions of the affected parts, which greatly tends to prevent the secretion from lodging in the flexure of the thigh, and renders it thus much less acrid and irritating in its properties.

The process of cicatrisation of all ulcerations in this part is very frequently greatly retarded because sufficient attention is not paid to enforce absolute rest of the limb, and the maintenance of the thigh in that position which is most favourable to the gradual approximation of the edges of the sore, viz. flexed upon the abdomen by means of a large pillow placed underneath the knee. I have frequently seen instances in which many ulcerations situated in the groin, which had existed for a considerable length of time, and resisted all other means employed to cure them, assumed the healing process almost immediately upon the adoption of these principles in their treatment, viz. rest, and the flexed position of the thigh upon the pelvis.

Suppurated buboes, and other superficial abscesses of the groin, ought to be early opened by a free incision, which should be made in the direction of Poupart's ligament when the swelling is situated over it, but through their longest diameter when they are formed lower down upon the front of the thigh. When a bubo has been permitted to burst of itself, there frequently remains an obstinate indolent ulcer, the edges of which are thin, undermined, and of a dull purplish or leaden colour. When this is the case the edges should be freely incised at several points of the circumference of the sore, so as to allow of their free retraction, when they usually coalesce by granu-

lation with the subjacent surface of the ulcer; which, unless this were done, would obstinately resist all other endeavours to heal it. Well-applied pressure, by means of a graduated compress and the spica bandage, is worthy of being tried in the treatment of old and obstinate ulcerations of the groin.

In scrofulous subjects we frequently meet with cases in which, after an abscess in the groin has burst, or been opened, the sore is prevented from healing by the presence of a greatly swollen and indurated gland, which projects from the centre of the ulceration: when this occurs, it is better to destroy the gland by the repeated application of the potassa fusa, than to excise it with the knife; the powerful stimulus of this caustic acts very beneficially upon the naturally indolent ulcer, and its use is not likely to be attended with the troublesome hemorrhage which occasionally follows the removal of a gland with the knife from a sore so closely situated over the course of the great femoral artery.

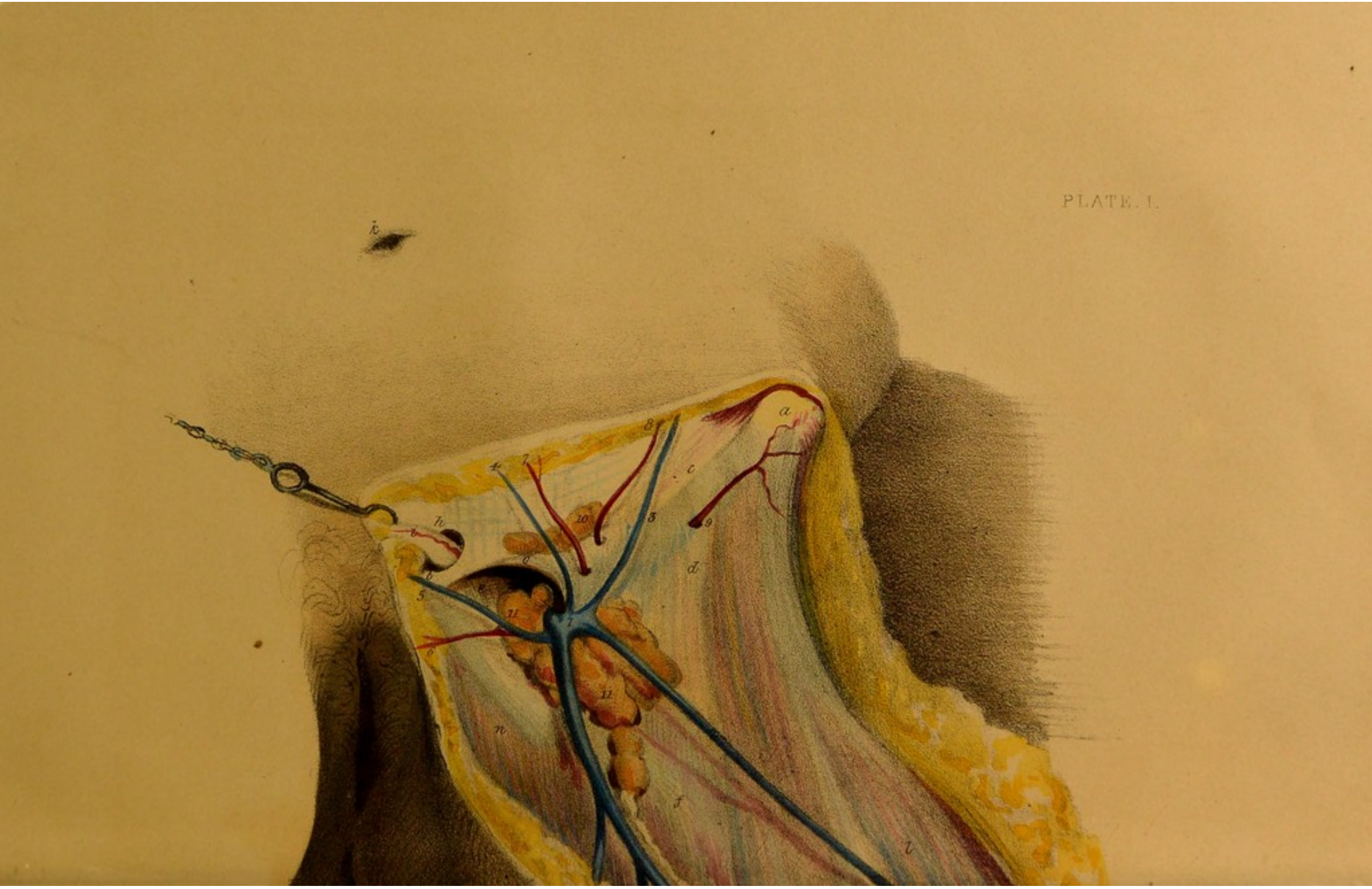
All sinuses which burrow under the skin of the groin, and which frequently result from badly treated suppurations of the inguinal glands, should be freely laid open with the knife, unless they extend beneath important structures, such as the spermatic cord, the great vessels, &c.

The skin of the groin is sometimes the seat of fungoid carcinoma, the treatment of which by the stronger caustics, such as the chloride of zinc, nitric acid, &c. can only be successful when it has been actively put in force during the very first commencement of the disease, and before it has extended itself much as regards either its surface or depth.

The *superficial fascia*.—The subcutaneous layer of cellular tissue which is exposed by the dissection of the skin forms a part of the superficial fascia of the groin, which here consists of two distinct lamellæ, between which are situated the cutaneous vessels, and a considerable number of lymphatic glands. If the subject be rather emaciated, this disposition of the lamellæ of the superficial fascia may be very clearly demonstrated; but it becomes extremely difficult to show it upon those subjects in which the cellular tissue is much loaded with adipose substance, as the superficial fascia is then hardly distinguishable from the ordinary layer of subcutaneous adipose tissue.†

† In some persons, frequently females, the superficial fascia of the groin appears to be one or two inches in thickness, from the circumstance of so

PLATE. I.



London, Taylor & Walton, Upper Gower Street.

The external or cutaneous lamella of the superficial fascia of the groin is a thin stratum of cellulo-fibrous membrane, of considerable density and firmness ; it is traversed by a number of whitish lines, bands of condensed cellular tissue, which are disposed in a transverse direction, parallel with Poupart's ligament, near to which they appear most distinctly marked, as they gradually diminish towards the middle of the thigh, below which point they finally disappear. The external lamella of the superficial fascia of the groin extends over Poupart's ligament and the crista of the ilium, but without adhering closely to these structures, and is continuous with the corresponding layer of the superficial fascia which covers the abdominal parietes.†

The external lamella of the superficial fascia is, in the next place, to be dissected off from the cutaneous vessels and glands which lie beneath it, and then reflected over the outer aspect of the limb, in the same manner as the skin. (See Plate III. *z*.) Some care is required in doing this, in order that the subjacent structures may remain uninjured, as they rest upon the deep lamella which separates them from the fascia lata. With this view it is most advisable to commence raising the external lamella at the inferior and internal angle of the incisions, where it covers the saphena vein, and thence to pursue the dissection along the course of that vessel, and its numerous contributory branches which ramify underneath it. (See Plate I. figs. 1 to 9.)

EXPLANATION OF PLATE I.

This plate represents a view of the structures which are exposed when the skin and the external lamella of the superficial fascia of the groin have been dissected, and reflected over the outer border of the thigh. The margin of the saphenous opening of the fascia lata is partially exposed towards its upper and inner part.

a. The anterior superior spinous process of the ilium.

b. The spinous process, or tuberosity of the os pubis.

c. Poupart's ligament, which is stretched between these two points.

d. The iliac, or external portion of the fascia lata.

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great a quantity of adipose substance being deposited in the cellular tissue between its lamellæ.

† See Part III. the Surgical Anatomy of Inguinal Hernia.

e. The pubic, or inner portion of the fascia lata.

f. The fascia lata, single and undivided, below the entrance of the saphena vein.

h. The external abdominal ring.

i. The round ligament of the uterus, which is held aside by a hook, as it escapes from the external abdominal ring to become inserted into the fatty structure of the mons veneris. A small artery is seen upon its inferior surface.

k. The umbilicus.

l. The fascia lata covering the rectus muscle.

m. The fascia lata covering the sartorius muscle.

n. The fascia lata covering the adductor longus and gracilis muscles.

o. Hey's ligament, or the falciform process of the iliac portion of the fascia lata, called also the femoral ligament, and superior cornu of the saphenous opening. This frequently requires to be divided in operations for the relief of strangulated femoral hernia, in order to remove the stricture upon the protruded bowel.

1. 1. The internal or great saphena vein, which terminates by joining with the common femoral vein, about one inch below Poupart's ligament.

2. The anterior saphena vein. This branch does not always exist; but, when it does, it is worthy of notice, as it lies in front of the superficial femoral artery, where that vessel must be exposed in what is called Scarpa's operation.

3. The external circumflex ilii vein.

4. The superficial epigastric vein.

5. The superficial pudic vein.

6. The superior external pudic artery.

7. and 8. Two small vessels taking the course of the superficial epigastric artery.

9. The external circumflex ilii artery.

10. Three or four small lymphatic glands, which are situated immediately over Poupart's ligament, and are generally the seat of buboes from venereal sores upon the penis.

11. 11. Several absorbent glands situated alongside of the saphena major vein, which frequently swell and inflame, in consequence of some disease, or source of irritation, situated lower down in the leg, or foot. The highest of these may swell, and sometimes obscure the diagnosis of a femoral hernia.

12. A delicate lymphatic vessel, which has been injected with mercury.

A complete femoral hernia protrudes from the saphenous opening in the dark hollow which is included between the letters *e*, *o*, and the figure 11.

When the external layer of the superficial fascia has been in this manner dissected from its connexions with the saphena vein and the other vessels and glands, its structure may be more closely inspected: it will be found to consist, externally, of a loose cellular tissue, while its internal surface presents a uniform, smooth, and glistening appearance, resembling a thin but firm membrane spread over the superficial vessels and glands in this region, which it materially serves to bind down and support in their respective situations.

The numerous small arteries and veins which converge towards the centre of the groin, may now be more completely exposed by carefully removing the loose cellular tissue which surrounds them. The lymphatics which ascend from the integuments of the leg and foot may be shown by scratching through, with the point of the knife, the cellular substance along the external border of the great saphena vein, in the same direction as the course of that vessel; many of these delicate tubes will be thus observed to enter the inferior extremity of the conglobate glands of the groin (*vasa inferentia*), while as many leave on the opposite side (*vasa efferentia*), for the purpose of conveying the lymph onwards towards the centre of the circulation: they then pass through the saphenous opening of the fascia lata into the crural canal, and so into the cavity of the abdomen, where they join with the absorbent glands that lie alongside of the external iliac vessels. (See Plate I. figs. 11, 11, and 12.)

Several delicate lymphatic vessels may also be displayed in the same manner, which descend from the integuments of the abdominal parietes, and from the superficial coverings of the external parts of generation, to pass through three or four small absorbent glands, which are situated parallel with, and immediately over, Poupart's ligament. (See Plate I. fig. 10.)

It is by a reference to the course which is pursued by the lymphatic vessels, that we are enabled to explain the production of those enlargements of the glands in the groin which frequently follow the formation of irritable sores at a considerable distance from the swollen gland, and thus even to decide almost at the first view, from a consideration of the figure and situation of the enlarged gland, whence the primary irritating cause has arisen. If, for example, the swollen and inflamed

gland be situated just over Poupart's ligament, and more particularly if its greater diameter be disposed transversely to the direction of the long axis of the limb, then the swelling has, in all probability, been produced by some affection of the external genital organs,—it may be, a chancre upon the penis, or a gonorrhœal discharge from the urethra; while, on the other hand, if the tumour be situated lower down upon the front of the thigh, and its longest diameter be placed obliquely, and parallel with the course of the saphena vein, then we may feel tolerably well assured that the cause will be detected still lower down upon the limb, perhaps about the ancles, upon the heel, or between the clefts of the toes.

It should not, however, be overlooked, in the decision of doubtful cases, that an inflammatory swelling of the glands of the groin may be excited, and maintained, by diseases about the perinæum and region of the anus.

Inflammation of the superficial absorbents of the thigh frequently ensues after contused and lacerated wounds of the leg and foot; it is generally accompanied by very severe febrile disturbance of the whole system. The affection is indicated by numerous tortuous red lines, which are very tender under pressure, running chiefly in the same direction as the course of the saphena vein. If the disease be not very quickly checked in its progress, it is commonly followed by diffuse inflammation of the subcutaneous cellular tissue of the limb.

Veins.—The great or internal saphena vein commences from the plexus of smaller veins which exists upon the dorsum of the foot, and, after ascending in front of the inner ancle, and internal border of the leg, passes behind the inside of the knee-joint, whence it inclines upwards and forwards, until it terminates by joining with the trunk of the common femoral vein, about an inch, or an inch and a half, below Poupart's ligament, where it passes through the large oval aperture in the fascia lata, which has been named, from this circumstance, the saphenous opening. In its course the great saphena vein receives numerous branches from the integuments on either side; and it is not unfrequently joined near its termination by another vein of considerable size, which, commencing near the knee, ascends in a vertical direction along the front of the thigh (see Plate I. fig. 2). This vein, sometimes called the *anterior saphena*, is worthy of being noticed, when it is present, as

it lies exactly underneath the line of the first incisions that are usually made in Scarpa's operation of tying the trunk of the superficial femoral artery for the cure of popliteal aneurism ; it must, therefore, be very liable to be wounded, (a circumstance which, from the great size of the vein, it would be very desirable to avoid,) if the first incisions be not made with a sufficient degree of caution. Immediately before its termination, the internal saphena vein receives three or four branches of smaller size, which converge to meet with it at this point : they are,—1. *Vena epigastrica superficialis ;* 2. *Vena pudica externa ;* and 3. *Vena circumflexa ilii externa.* These veins correspond in their course and distribution with the superficial branches of the femoral artery of the same name. (See Plate I. figs. 3, 4, 5.)†

After the superficial lymphatics and veins have been examined, attention should, in the next place, be turned towards the superficial branches of the common femoral artery, which ramify between the lamellæ of the superficial fascia. These are commonly four or five in number, and have been severally named as follows : 1. *Arteria epigastrica superficialis ;* 2. *Arteriæ pudendæ externæ, superior et inferior ;* 3. *Arteria circumflexa ilii externa.* (See Plate I. figs. 6, 7, 8, and 9 ; and Plate III. figs. r, s, t.)

1. *Arteria epigastrica externa,* vel *superficialis,*‡ is a small branch which springs from the trunk of the common femoral artery, a little below Poupart's ligament ; and after emerging through the saphenous opening, or more frequently through a small aperture in the iliac portion of the fascia lata, ascends in an oblique course, upwards and inwards, over the crural arch, where it is placed between the two layers of the superficial fascia of the abdomen : it terminates near the umbilicus, by dividing into a number of ramusculi which anastomose with the branches of the deep epigastric and internal mammary arteries, which issue from numerous small apertures in the tendon of the external oblique muscle.

† Where it is convenient to do so, it is advisable to inject the saphena and femoral veins with melted wax, or tallow, by means of a pipe introduced into the former vessel as it passes behind the inner side of the knee-joint ; the other veins may be also injected from smaller pipes introduced into them as they ramify upon the parietes of the abdomen.

‡ " *Arteria ad cutem abdominis.*"—Haller.

The course of this artery lies over the situation of the internal abdominal ring, and frequently crosses the upper part of the inguinal canal; so that it is occasionally divided in the first incisions of the operation for strangulated inguinal hernia, and sometimes, also, though not often, in that for the relief of femoral hernia.

2. *Arteriæ pudendæ externæ, superior et inferior.*—These arteries are usually two in number, though occasionally there may be three, or even more, which pursue the same course. The first of these runs superficially; for, escaping through the lower part of the saphenous opening of the fascia lata, it takes its course inwards and upwards towards the spine of the os pubis, where it crosses over the spermatic cord in the male subject, and the round ligament of the uterus in the female, as these structures issue from the external abdominal ring, or lower aperture of the inguinal canal. (See Plates I. and III. figs. 6 and r.) It is distributed by numerous branches to the integuments and dartos of the scrotum.

The inferior branch also passes out from the saphenous opening, where it will generally be found between the saphena and femoral veins, as it lies in the angle which is formed by the junction of these veins with one another. (See Plate III. fig. r.) It soon, however, dips downwards and gets underneath the pubic portion of the fascia lata, where it rests upon the fibres of the pectineus and adductor longus muscles, until it reaches near to the angle of the os pubis, a little below which it again pierces the fascia lata; and, after mounting over the spermatic cord, a little lower down than the preceding branch, it divides into several ramusculi for the supply of the integuments of the penis and scrotum in the male, and the structures of the mons Veneris and labia majora in the female.

3. *Arteria circumflexa ilii externa*, vel *superficialis*.—This is the smallest of these branches of the common femoral artery; it generally pierces the iliac portion of the fascia lata at some distance from the external margin of the saphenous opening, when it divides into several branches which are distributed to the integuments covering the crest of the ilium, where it anastomoses freely with the internal circumflex ilii, external circumflex and gluteal arteries. This artery sometimes springs from a common trunk with the superficial epigastric artery. (See Plate III. fig. t.)

Some of these arteries are very liable to be wounded in the operation of placing a ligature upon the common trunk of the femoral artery, if the edge of the knife be carried too freely upon the sides of the vessel preparatory to passing the needle around it. In such a case, as the hemorrhage is usually pretty smart, and continues even after the trunk has been tied above, another ligature should be placed below the point from which the wounded vessel has its origin, unless, indeed, the open mouth of the bleeding artery can be secured in the ordinary way.

In addition to the branches of the common femoral artery that have been just described, there are numerous smaller arteries, which issue from the saphenous aperture, or through other foramina that exist in the iliac portion of the fascia lata, and are distributed to the lymphatic glands of the inguinal region and the circumjacent cellular substance; but they are too insignificant in their size, and inconstant in their course and distribution, to deserve any farther notice.

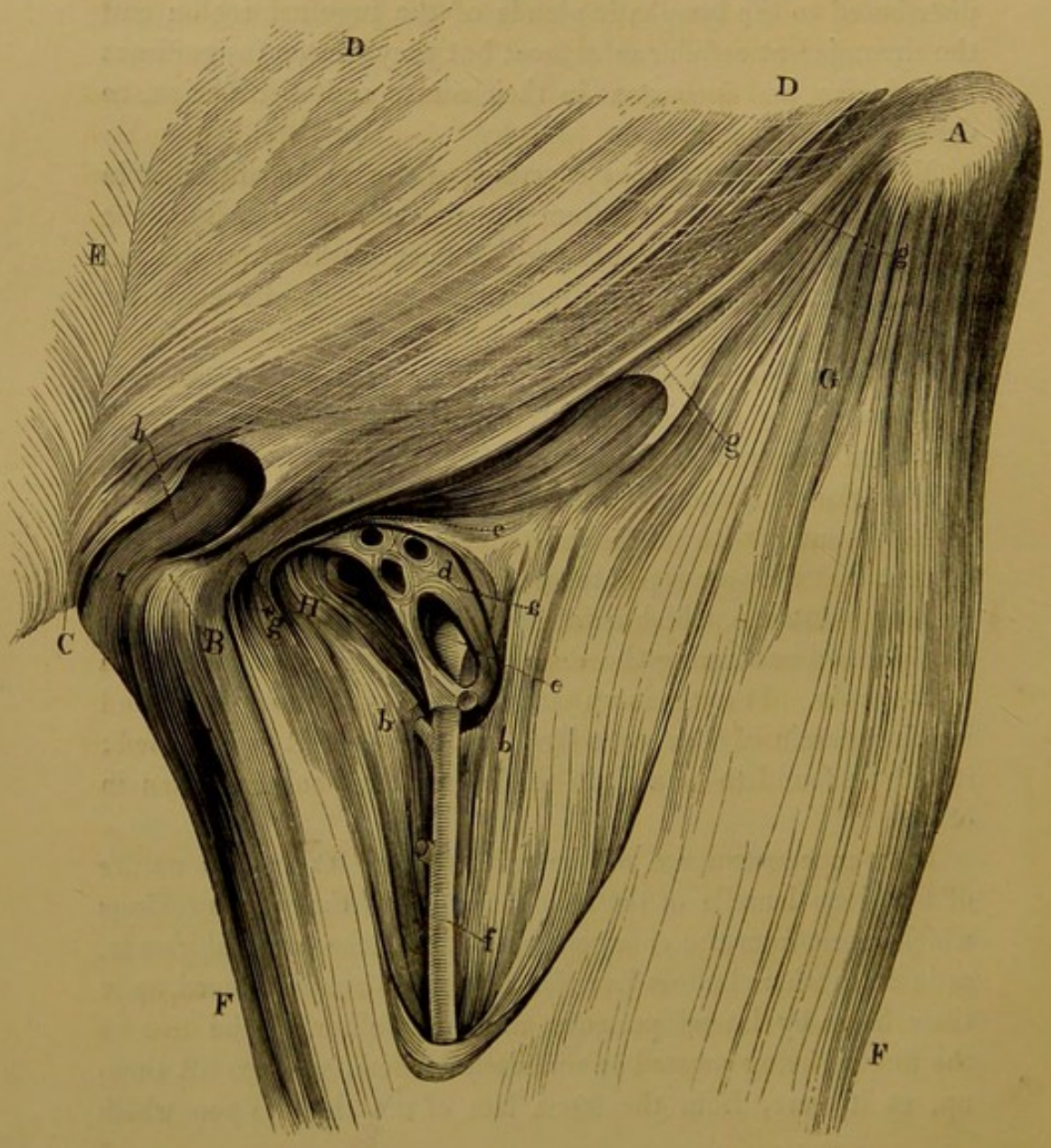
Nerves.—The cutaneous coverings of the region of the groin are supplied with nerves from the descending branch of the genito-crural, as well as by some filaments which are derived from the anterior crural and ilio-inguinal branches of the lumbar plexus.

The superficial vessels and lymphatic glands rest upon the deep lamella of the superficial fascia of the groin.—It will have been observed, in the course of the dissection, that the absorbent glands, lymphatics, and superficial vessels are not in immediate contact with the fascia lata, above which they are situated, but that they are separated from it by a thin stratum of loose cellular substance, which is interposed between them ; this may be described as forming the deep lamella of the superficial fascia of the groin. It extends upwards as high as to the anterior and inferior margin of Poupart's ligament, to which it is attached; it will be found to be a little thicker in some subjects than in others.

It is in consequence of the yielding and extensible nature of the deep lamella of the superficial fascia, that the swellings which result from the enlargement of any of the inguinal glands, as in cases where buboes have formed, are so readily moved upon their bases by lateral pressure, and even allow of the tips of the fingers being pressed in underneath them, so as to lift them up, as it were, from the fascia lata of the thigh, upon which

they repose. These circumstances frequently prove of the highest importance and utility in the attempt to establish an accurate and correct diagnosis in obscure cases of tumours in the region of the groin, when accompanied, as they occasionally are, with all the rational symptoms of strangulation of some part of the alimentary canal; since upon a reference to these facts depends the principal means of distinguishing a simple enlargement of one of the lymphatic glands of the groin, from the tumour which is formed by the sac of a small femoral hernia, the basis or neck of which is seated much more deeply, and is more firmly fixed to one spot, than the swelling which is formed by a swollen gland is ever found to be.

No. 4.



The wood-engraving is intended to represent the saphenous aperture of the fascia lata covered by the *cribriform fascia*, which is extended over it, and adheres very closely to the crescentic margin of that aperture.

A. The anterior superior spinous process of the ilium. *B*. The spinous process, or tuberosity of the os pubis. *C*. The situation of the symphysis pubis. *D. D.* The tendinous aponeurosis of the external oblique muscle of the abdomen, upon which are seen some curved white lines representing the intercolumnar fibres. *E*. The linea alba. *F. F.* The fascia lata of the thigh, divided superiorly into *G*. the iliac, or external portion; and *H*. the internal or pubic portion. *I*. The crest of the os pubis. *a*. The *cribriform fascia* adhering to the crescentic margin (*b. b. c.*) of the saphenous aperture. *d*. Some of the apertures in the cribriform fascia, which serve for the transmission of several of the cutaneous vessels. *e*. The great femoral vein. *f*. The internal, or great saphena vein, which empties itself into the common femoral vein, after bending over the edge of the inferior cornu (*b. b.*) of the saphenous aperture. *g. g*. Poupart's ligament, which forms at *g*.* the inferior pillar of the external abdominal ring, which is marked *h*.

The *fascia cribriformis*.—This term is given to that portion of the deep lamella of the superficial fascia of the groin which is stretched over the saphenous opening of the fascia lata, and is traversed at numerous points of its extent by the several arteries, veins, and lymphatic vessels which pass through that opening in their course to join with the deep-seated vessels.†

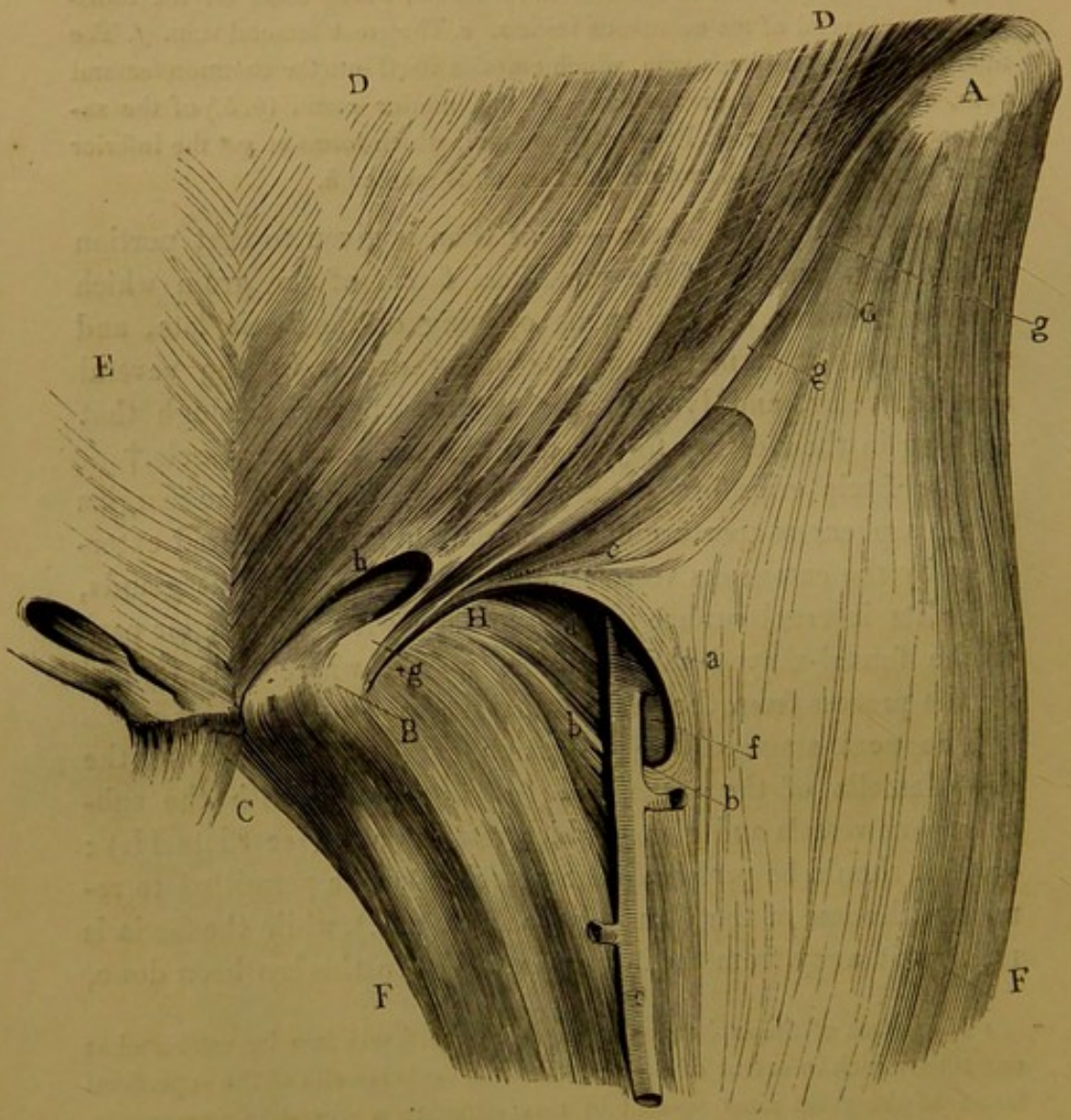
The fascia cribriformis adheres pretty closely to the margins of the saphenous aperture of the fascia lata; it is covered externally by the cutaneous vessels and superficial absorbent glands, while its internal surface is in apposition with the anterior part of the funnel-shaped sheath of the vessels, where it is formed by the process from the fascia transversalis.

The next stage of the dissection consists in removing the deep lamella of the superficial fascia, together with the subcutaneous vessels and glands which rest upon it (see Plate II.); or, if it should be preferred, the vessels may be permitted to remain with some of the glands (as in Plate III.), while the fascia is neatly cut away from the interspaces. When this has been done,

† If the area of the saphenous aperture in the fascia lata be estimated at one square inch in extent of surface, then the deep lamella of the superficial fascia of the groin must present in this situation a sieve-like appearance, from the great number of small vessels, besides the saphena major vein, which pass through it. In some of the schools of anatomy it is taught that the cribriform fascia is a part of the fascia lata of the thigh; but this, I believe, is not the most accurate view of the subject.

an oval-shaped aperture, of considerable size, is observed in the fascia lata, immediately below and a little external to the root of the tuberosity of the os pubis; the edge of which is sharp, and very clearly defined upon the external and inferior part of its circumference. This opening has received the appellation of the *saphenous aperture of the fascia lata*,† from the circumstance of the great saphena vein entering by it to join with the trunk of the common femoral vein.

No. 5.



† "Lacuna pro vasis cruralibus externa."—Hesselbach.

The wood-cut represents the saphenous opening of the fascia lata, when it is completely dissected. The cribriform fascia and all the small sub-cutaneous vessels have been removed, and there only remains the great saphena vein, as it is about to terminate in the trunk of the common femoral vein. *A*. The anterior superior spinous process of the ilium. *B*. The spine or tuberosity of the os pubis. *C*. The situation of the symphysis pubis. *D.D.* The tendinous aponeurosis of the external oblique muscle of the abdomen. *E*. The linea alba. *F. F*. The fascia lata of the thigh, which divides superiorly into *G*. the iliac portion, and *H*. the pubic portion. *a*. The crescentic or falciform margin of the saphenous opening, terminating inferiorly in *b.b.*, the inferior cornu; and superiorly in *c*. the superior cornu, which is attached to the pubic portion of the fascia lata, immediately above the letter *H*., where it is seen to bend inwards underneath the pubal extremity of Poupart's ligament: the letter itself is placed upon the anterior wall of the crural canal, which is formed by the iliac portion of the fascia lata. *d*. The posterior wall of the crural canal, which is formed by the pubic portion of the fascia lata, where it passes upon the pectineus muscle behind the sheath of the vessels. *e*. The great saphena vein. *f*. The great femoral vein, which receives the preceding vessel. *g.g.g.* * Poupart's ligament, which i sinserted at *g*. * into the tuberosity of the os pubis, and there forms the inferior pillar of the external abdominal ring. *h*. The external abdominal ring: the letter is placed upon the edge of the superior, or internal pillar of the ring. *i*. The crista of the os pubis.

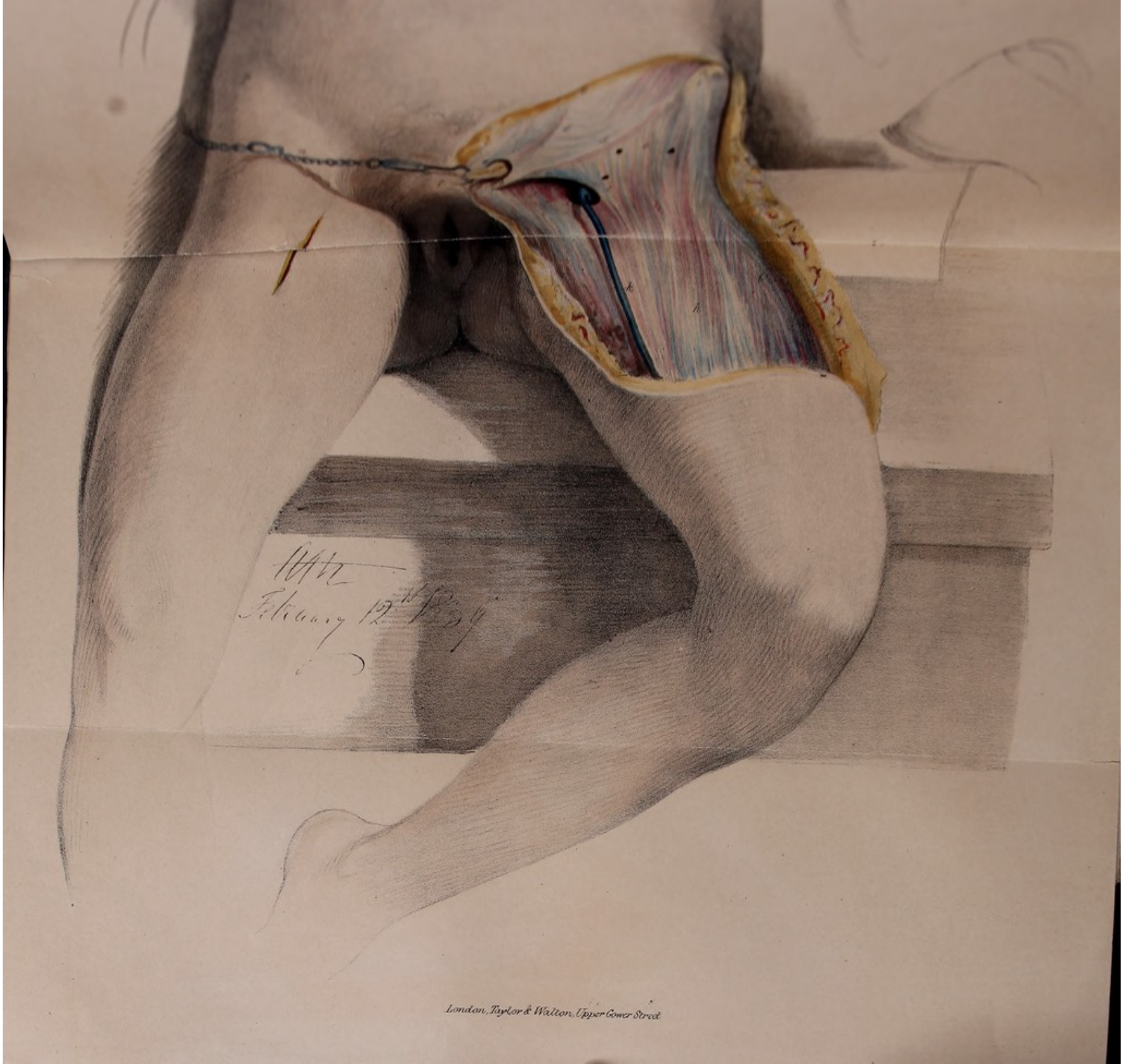
As the margin of the saphenous opening in the fascia lata is most clearly defined at the point where the great saphena joins with the femoral vein, it will greatly facilitate the neat exposition of the edge of the opening if the removal of the cribriform fascia be commenced at this point, and continued by carefully following, in a gentle curve, the sharp margin of the opening, (as represented in Plate II. figs. *l*, and 1, 2, 3; and in Plate III. figs. *g*, *h*, *i*,) upwards and inwards, towards the base of the tuberosity of the os pubis. It is advisable, also, in some instances, to use the handle, rather than the edge of the scalpel, to break up the delicate connexions of the cribriform fascia to the crescentic margin of the saphenous aperture and the sheath of the femoral vessels. Any of the small arteries, which may pierce the fascia lata at other points than the saphenous aperture, may be cut across close to the spot at which they emerge from underneath the fascia. When these directions have been properly executed, the cribriform portion of the deep lamella of the superficial fascia will have been entirely removed and the fascia

lata investing this part of the thigh completely exposed to view. (See Plates II. and III.)

The *fascia lata* encases the whole of the thigh from the knee to the pelvis and Poupart's ligament, sending off from its internal surface numerous processes, which serve to separate the muscles of the thigh from one another, and to maintain them in their oblique position during their various actions. Inferiorly, the fascia lata is attached to the bony prominences of the knee-joint, below which it is continuous with the fascia of the leg; posteriorly, the fascia lata is attached to the linea aspera of the femur by a very strong and thick process, which separates the vastus externus from the biceps flexor and adductor magnus muscles; superiorly, it is fixed into the outer labium of the crista of the ilium, the sacro-sciatic ligaments, the tuberosity and ramus of the ischium, the ramus of the pubis, as also into the symphysis and crest of the same bone.

At the point where the internal saphena vein terminates in the great femoral vein (which is about one inch and a half below the crural arch), the fascia lata, which, covering the front of the thigh, had hitherto presented an uninterrupted and uniform surface, divides into two portions; one of these ascends in front of the sartorius, rectus, psoas, and iliacus muscles, and the great trunks of the femoral artery and vein, to become attached to the lower edge of Poupart's ligament, in the space between the anterior superior spinous process of the ilium and the base of the tuberosity of the os pubis. (See Plate II. fig. *e*; and Plate III. fig. *c*.) The other division of the fascia lata ascends upon the gracilis, adductor longus, and pectineus muscles, to be fixed into the crest and ileo-pectineal line of the os pubis; and, after passing behind the femoral vessels, divides at the internal border of the psoas muscle into two lamellæ, which serve to inclose it and the iliacus muscle in a sheath; after which the deeper-seated layer is blended with the strong fibrous capsule of the hip-joint. (See Plate II. fig. *f*.; and Plate III. figs. *d*, *h*.)

The iliac and pubic portions of the fascia lata.—The division of the fascia lata, which ascends in front of the sartorius muscle and the femoral vessels, is called the *external* or *iliac portion* of the fascia lata; while that which rests upon the adductor longus and pectineus muscles, and passes behind the femoral



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vessels and their sheath, is named the *inner* or *pubic portion.* These divisions of the fascia lata are continuous, as has been already mentioned, with one another, underneath the angle which is formed by the junction of the internal saphena with the common femoral vein.

The *external* or *iliac portion of the fascia lata* extends upwards and inwards, in a curved direction, from the point just now mentioned, to be inserted into the pubic portion, close to the root of the tuberosity of the os pubis, and in front of Gimbernat's ligament. This portion of the fascia lata is also strongly attached to the lower edge of Poupart's ligament, between the anterior superior spinous process of the ilium and the spine of the os pubis; it is in consequence of this connexion between these structures that the crural arch is rendered so much more tense and unyielding when the thigh is extended, abducted, and rotated outwards, than when it is placed in the opposite positions.

EXPLANATION OF PLATE II.

This plate represents a view of the saphenous opening of the fascia lata, when all the cutaneous vessels and glands (which are represented in Plate I.) have been removed, with the exception of the great saphena vein. The cribriform lamella of the superficial fascia has also been removed, with the inner wall of the crural canal, which was formed by the sheath of the femoral vessels, so as to render the crescentic margin of the saphenous opening more distinct.

a. The anterior superior spinous process of the ilium.

b. The spinous process or tuberosity of the os pubis.

c. The crista of the os pubis, which supports the round ligament as it issues from the external abdominal ring.

d. Poupart's ligament, which is stretched across between the spines of the ilium and os pubis.

e. The iliac, or external portion of the fascia lata. Three small foramina are seen here, which served for the exit of the superficial epigastric and circumflexa ilii arteries.

f. The inner, or pubic portion of the fascia lata, which covers the upper part of the adductor longus and pectineus muscles, and afterwards passes behind the great femoral vessels.

g. The external abdominal ring.

h. The fascia lata covering the sartorius muscle.

i. The fascia lata covering the rectus muscle.

k. The internal, or great saphena vein, which terminates at one

inch below Poupart's ligament, in the common femoral vein, which is marked *l*.

m. The external incision which must be made to take up the superficial femoral artery.

n. The chain and hook which hold aside the round ligament of the uterus.

o. The umbilicus.

p. The situation of the anterior superior spinous process of the ilium of the right side.

1. The inferior cornu of the saphenous opening of the fascia lata.
2. The superior cornu ; it is seen to bend inwards underneath the pubal extremity of Poupart's ligament, and to be inserted in front of Gimbernat's ligament, into the pubic portion of the fascia lata, near to the ileo-pectineal line. It is sometimes called the femoral ligament, Hey's ligament, and the falciform process of the iliac portion of the fascia lata.
3. Gimbernat's ligament.
4. The tendon of the external oblique muscle of the abdomen, with the intercolumnar fibres marked upon it. Some of the fleshy fibres of the internal oblique muscle are seen through the intervals between the fibres of the tendon of the external oblique, which, commencing to split at 6, form by their divergence, as they proceed towards the spine and symphysis of the pubis, the external abdominal ring at *g*.
7. The mons, into which the round ligament of the uterus is inserted. The flap of the integument and superficial fascia, which is marked 5, has been reflected over the outer aspect of the limb.

*The saphenous opening of the fascia lata.**—This aperture, which is of an oval figure, is situated at the superior and inner part of the inguinal region, immediately external to the tuberosity of the os pubis, and at a little distance beneath the pubal extremity of Poupart's ligament. The longest diameter of the saphenous opening is about one inch and a half, and is directed obliquely downwards and outwards. When it is measured across, the breadth of the opening will rarely be found to exceed half an inch in extent. Slight variations from these admeasurements will, however, be occasionally found to exist in different subjects.

* *Foramen saphenum ; Lacuna pro vasis cruralibus externa ; L'ouverture inférieure du canal crural.*

The margin of the saphenous opening is thin, and very sharply defined, particularly underneath the internal saphena vein, where that vessel is about to empty its contents into the common femoral vein; and, if it be carefully traced upwards on either side from this point, will be found to terminate in two elongated processes, or *cornua*, each of which is slightly incurvated towards the centre of the aperture; so that the edge of the opening has been commonly termed the *crescentic margin*.

The *inferior cornu* inclines obliquely upwards and inwards, and soon becomes blended with the pubic portion of the fascia lata covering the pectineus muscle. (Plate II. fig. 1.)

The *superior cornu* is much longer than the preceding, and is also more curved in its direction; for, after it has ascended in front of the femoral vessels, it bends down underneath the pubal extremity of Poupart's ligament, and terminates by being inserted into the pubic portion of the fascia lata at its attachment, in front of Gimbernat's ligament, to the ileo-pectineal line. The superior cornu of the saphenous opening is particularly deserving of attention; since it must, in consequence of its attachments and curved direction, arch completely over the neck of the sac of a complete femoral hernia, and moreover has been frequently described by many eminent surgical writers as forming the principal seat of stricture in cases of strangulated crural hernia. (See Plate II. fig. 2.; and Plate III. fig. i.)

The late Mr. Hey, of Leeds, named it the *femoral ligament*,† and strongly recommended its division as the means of removing the stricture of the gut in the operation for strangulated femoral hernia. Since the period at which he wrote it has been commonly described by other writers under the appellation of *Hey's ligament*.

Mr. Allan Burns, also, has described the superior cornu very

† Mr. Hey, who was accustomed to divide the stricture of femoral hernia in an oblique direction upwards, writes thus: "The union of the falciform process of the fascia lata with Gimbernat's ligament, together with the sheath of the great vessels, form a ring, through which the femoral hernia descends, and by which it is compressed in the strangulated state."—See the explanation of Plate VI. and also of Plate V. marked *b*; Plate IV. fig. *g*.; in Mr. Hey's Practical Observations in Surgery. Second Edition, 8vo. 1810.

minutely, and proposed to call it the *falciform process* of the fascia lata; which denomination is now very generally adopted in the schools.†

The margin of the saphenous opening is naturally not so distinctly and clearly defined as it is represented in the drawing which has been made of the dissection (see Plate II. figs. 1, 2,), for at this point the iliac portion of the fascia lata is doubled slightly upon itself, so as to become intimately adherent to, if not continuous with, the funnel-shaped sheath of the great vessels; the removal of the cribriform fascia has also contributed, in a great degree, to give the sharpness of outline that is figured in the plate.

It is in a great measure owing to the connexion that exists between the margin of the saphenous opening, and the sheath of the vessels, that the fundus of the sac of a complete femoral hernia is usually prevented from descending any further downwards upon the thigh, but is rather turned, or tilted forwards and upwards, so as to rest upon the falciform process and the lower part of the aponeurosis of the external oblique muscle of the abdomen.

EXPLANATION OF PLATE III.

This plate represents the anatomy of the saphenous opening of the fascia lata in the male subject. The superficial fascia has been removed, and only the superficial vessels and absorbent glands permitted to remain upon the fascia lata.

a. The anterior superior spinous process of the ilium upon the right side:

b. The spine or tuberosity of the os pubis.

c. The external, or iliac portion of the fascia lata of the thigh.

d. The internal, or pubic portion of the fascia lata.

e. The tendinous aponeurosis of the external oblique muscle of the abdomen.

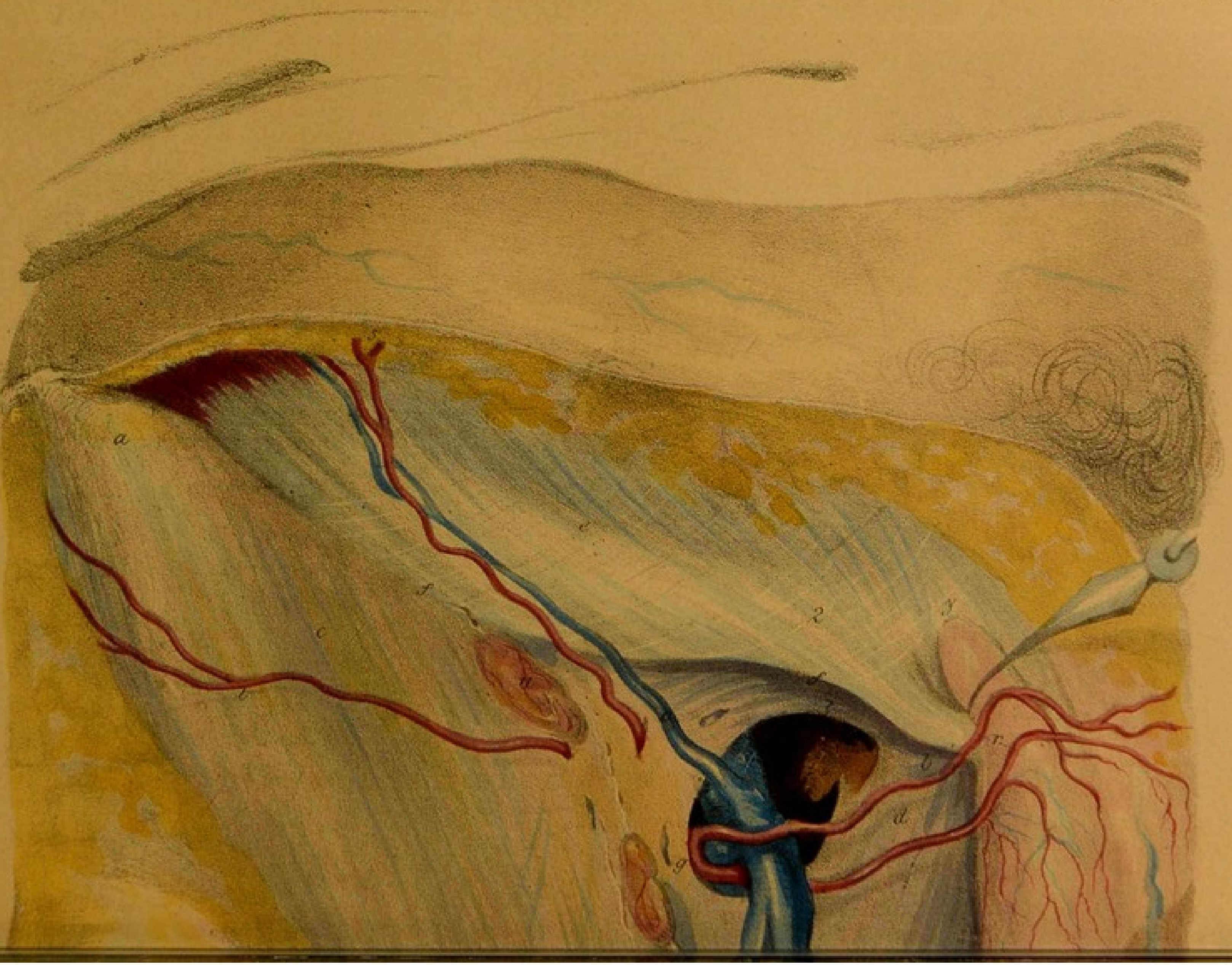
f.f. Poupart's ligament.

g. The inferior margin of the saphenous opening, which, after passing underneath the great saphena vein, terminates at *h*. the inferior cornu of the aperture.

i. The superior cornu, or falciform process, which is seen very distinctly in this drawing to be attached to the pubic portion

† Vide Observations on the Structure of the Parts concerned in Crural Hernia. By Allan Burns. With two plates, illustrating the description. 1 vol. Edin. Med. and Surg. Journ. July 1806, p. 274.

PLATE. III.



Wm Farland lith.

J. G. Moyle Esqre

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of the fascia lata, underneath the pubal extremity of Poupart's ligament, and anterior to Gimbernat's ligament. In many cases of strangulated femoral hernia this process must be divided, in order to relieve the stricture upon the protruded intestine contained within the sac.

l. The great, or internal saphena vein, which opens into the great femoral vein (*q*.) about one inch below Poupart's ligament.

m. The anterior saphena vein.

o. The superficial epigastric vein.

p. A vein which frequently joins the great saphena, and comes from the inner and back part of the thigh.

q. The trunk of the great femoral vein, which has been exposed by removing the internal wall of the crural canal, or sheath of the great vessels.

r. The external pudendal arteries, which issue from the saphenous opening, and cross over the spermatic cord in their course to the integuments of the scrotum. These vessels are divided in the first incisions of the operation for strangulated scrotal hernia.

s. The superficial epigastric artery.

t. The superficial external circumflex ilii artery.

u.u.u. Several of the superficial lymphatic glands of the groin, which frequently swell and suppurate from disease about the heel and lower part of the leg and foot. Several absorbent vessels are seen running through these glands.

v. The penis.

x. The spermatic fascia which covers the cremaster muscle upon the cord and testis.

y. The external abdominal ring.

z. The superficial fascia of the groin dissected up, and reflected, with the integuments, over the outer border of the limb.

1. The fleshy fibres of the external oblique muscle of the abdomen.
2. The intercolumnar fibres.
3. Gimbernat's ligament. On the iliac side of this, and between it and the femoral vein, may be seen a dark oval-shaped hole, which is the crural ring, or superior aperture of the crural canal, and through which the sac of a femoral hernia is at first protruded. Between this opening and the edge of the falciform process (*i*) is situated the crural canal, the anterior wall of which is formed by the superior cornu of the saphenous opening of the fascia lata, as it arches over the front of the great vessels to be attached to the pubal extremity of Poupart's ligament.

If the innermost compartment of the funnel-shaped sheath of the great vessels be opened, as it descends obliquely from within the lunated edge of Gimbernat's ligament, to become blended with the external cellular coat of the femoral vein, at the point where the internal saphena vein opens into that vessel, a hollow space or cavity (the *crural canal*) will be exposed to view, but which in the undissected condition of the parts is occupied by some loose cellular tissue and lymphatic vessels. An absorbent gland will, occasionally, be found lying within this part of the sheath of the vessels. When these structures have been removed, the little finger may be introduced into the aperture made in the sheath of the vessels, and with the employment of a gentle force may be easily passed upwards into the cavity of the abdomen; a slight resistance only being offered to its progress by the cellular tissue which lines the external surface of the peritoneum, where it is stretched across the superior aperture of the crural canal.

The *crural canal* is the short passage which extends between the saphenous opening of the fascia lata and the crural ring. It is formed by the innermost of the three compartments into which the funnel-shaped sheath of the great vessels is subdivided; the other two divisions of the sheath being completely occupied by the trunks of the common femoral vein and artery. (See the woodcut No. 2, *u*, *v*, *x*, and *.) The anterior wall of the crural canal seldom exceeds half an inch in extent, and is formed by the fascia transversalis, covered by the falciform process of the iliac portion of the fascia lata. The posterior wall is formed by the fascia iliaca, and is considerably longer than the anterior wall, for it measures nearly one inch in length; it is supported by the pubic portion of the fascia lata, which here binds down the fibres of the pectineus muscle. The external wall is formed by the femoral vein, or rather by the septum, which, lying along the pubal side of that vessel, serves to separate it from the trunks of the absorbent vessels of the lower extremity, and to connect the anterior and posterior parietes of the canal more firmly together. The internal wall is constituted by the fasciæ transversalis and iliaca, as they unite with one another to complete the inner part of the funnel-shaped sheath of the vessels. (See the woodcut No. 2, x.) It is supported there by the cribriform fascia.

The crural ring.†—When the finger is introduced into the crural canal so as to reach its superior extremity, or the opening by which it leads into the cavity of the abdomen, it will be easy to demonstrate the structures which bound what is termed the *crural ring*. The thin and sharp lunated border of Gimbernat's ligament is situated towards the mesial line; the posterior edge of Poupart's ligament lies in front, the femoral vein is external, and the ileo-pectineal line of the os pubis, covered by its ligament, behind. (See the woodcut No. 2, *d*, *m*, *n*, and *v*.)

The figure of the crural ring is oval, its long diameter being directed transversely, and, in the healthy state of the parts, about half an inch, or a little more, in extent. The crural ring is rather larger in women than in men, which circumstance may be considered in some degree sufficient to explain the more frequent occurrence of femoral hernia in the female sex.‡

In the male subject, the spermatic cord, as it lies within the inguinal canal, is situated close above the anterior margin of the crural ring; a fact which should always be borne in mind while operating for strangulated femoral hernia, since (as some very eminent authorities direct us to divide the stricture directly upwards) if the incision be not very limited the spermatic artery may be wounded.§

In the female, the round ligament of the uterus bears the same relation to the crural ring, (and consequently to the neck of the hernial sac,) as the spermatic cord does in the male, but it is not of the same importance.

The internal, or deep epigastric artery, as it ascends from its origin from the external iliac artery towards the region of the umbilicus, runs obliquely along the superior and external angle of the crural ring, and must be exposed to imminent risk of being wounded if the edge of the bistoury be carried too freely upwards and outwards while enlarging the ring in the operation.

When the obturator artery is given off from the epigastric,

† Femoral ring,—lacuna pro vasis cruralibus interna,—l'ouverture supérieure du canal crural. (See the woodcut No. 2, at page 87, fig. *x*. and also the woodcut No. 3, at page 89, fig. *i*.)

‡ Vide Observations on Crural Hernia. By Alexander Monro, junior, M.D. 8vo. Edinburgh, 1803, page 52.

§ Scarpa on Hernia, translated by Wishart, p. 262; and Arnaud, Mem. de Chirurgie, tom. i. p. 758.

(a variety that occurs about once in three subjects,) it most frequently descends upon the pubal side of the external iliac vein to reach the thyroid foramen; and, when it does so, will always be placed upon the iliac or external side of the crural ring, and therefore altogether removed from the edge of the knife as commonly directed in the operation for femoral hernia.† (See Plate V. figs. 5 and 6.)

It is, however, by no means an unfrequent occurrence to meet with the obturator artery arising from the epigastric, and taking a more sweeping course, when it runs for a short distance along the superior margin of the crural ring, and then descends behind the lunated border of Gimbernat's ligament in its way to reach the thyroid foramen, through which it passes to be distributed to the adductor muscles of the thigh.‡ (See the wood-engraving No. 6, page 115.)

If a femoral hernia were to be formed in an individual in whom this variety in the course of the obturator artery were present, the neck of the sac would then be surrounded for, at least, three-fourths of its circumference, by large and important vessels, to avoid injuring which a very great deal of caution must be observed in introducing the probe-pointed bistoury, no matter in which of the several directions that are prescribed by surgical writers the edge of the knife is carried.§

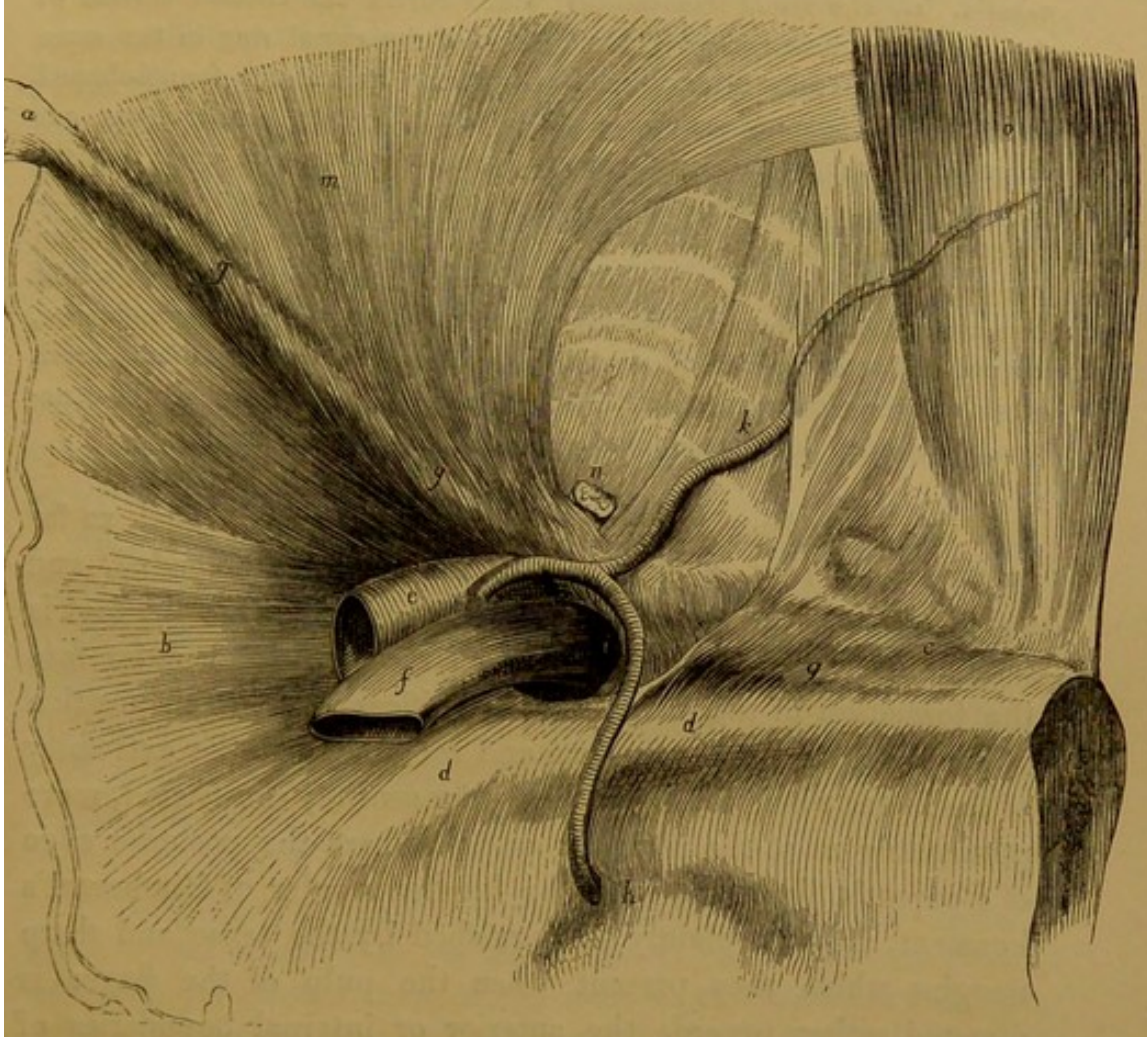
† In twenty-one preparations of crural hernia, possessed by Sir Astley Cooper, there are six which have this variety of the obturator artery. Sir Astley Cooper has never dissected a case in which the obturator ran round the neck of the sac.

‡ The relation which the course of this variety of the obturator artery bears to the crural ring would appear to depend upon the length of the common trunk, which divides into the obturator and epigastric arteries; for, when the obturator springs from the epigastric soon after its origin from the external iliac artery, then it descends along the external side of the crural ring, as was the case in the subject from which the drawing of Plate IV. was taken; but if, on the contrary, it does not arise from the epigastric so near to the origin of the latter, then it takes a more circuitous course, and runs round nearly three-fourths of the circumference of the crural ring, as is seen in the woodcut, No. 6, fig. *h*.

§ For cases of this kind see Sir Astley Cooper's work on Crural Hernia, second edition, page 26; and Plate VIII. fig. 4, in which Dr. Barclay's preparation is engraved; also a paper by Mr. Wardrop, in the Edinburgh Medical and Surgical Journal, for April 1806, page 203, with a drawing.

The wood-engraving represents a view of the crural ring, taken from the interior of the abdomen; the obturator artery is seen springing from the epigastric, at some distance from the origin of the latter vessel, and then taking its course, in a curved direction, along the upper and internal margins of the crural ring, in its way to reach the thyroid foramen. The course of the obturat orartery, which is here represented, forms a striking contrast to that which is figured in Plate V.

No. 6



a. The anterior superior spinous process of the ilium. *b*. The cut surface of the symphysis pubis. *c*. The situation of the spine or tuberosity of the os pubis. *d. d*. The horizontal branch of the os pubis, covered by the fasciæ transversalis and iliaca. *e*. The external iliac artery, about to emerge from the cavity of the abdomen, with *f*, the external iliac vein. These vessels receive a sheath or funnel-like investment from *l*, the fascia iliaca, and *m*, the fascia transversalis. *g. g. g*. The posterior edge of Poupart's ligament, obscurely seen through the fasciæ which cover its internal surface. *h*. The obturator artery, descending to pass through the thyroid foramen. The

artery is seen to arise from a common trunk with the internal epigastric, and to run round the superior and internal edges of the crural ring. *i*. The crural ring. *k*. The internal or deep epigastric artery, giving off *h*, the obturator artery, as it is running over the superior and external angle of the crural ring. *l*. The fascia iliaca, which joins with the fascia transversalis (at *g*. *g*.) between the anterior superior spinous process of the ilium (*a*), and the external iliac artery (*e*); it is seen to pass underneath the iliac artery and vein, and thus to form, by passing out with them through the crural ring, the posterior part of the funnel-shaped sheath of the femoral vessels. *m*. The fascia transversalis, which covers the internal surface of the abdominal muscles, and, passing out of the crural ring in the same manner as the fascia iliaca, forms the anterior wall of the funnel-shaped sheath of the femoral vessels. *n*. The round ligament of the uterus, cut across as it emerges through the internal abdominal ring, to enter into the inguinal canal. *o*. The rectus muscle uncovered of the fascia transversalis. If a femoral hernia were formed in an individual in whom this variety from the usual course of the obturator artery existed, the neck of the sac would be surrounded by important vessels upon three-fourths of its circumference, requiring that great caution should be exercised in the use of the knife, while enlarging the margins of the crural ring for the removal of the stricture in the operation for the relief of strangulated femoral hernia.

If the finger be again introduced into the crural canal, as far as the crural ring, while the leg and thigh are extended, and abducted from the mesial line, at the same time that the foot is rotated outwards, all the tendinous structures which enter into the formation of this canal and its orifices will, in this position of the limb, be found very firm and resisting, and the extremity of the finger which is in the canal very sensibly constricted, more particularly so at the superior orifice, where the posterior edge of Poupart's ligament, with the lunated border of Gimbernat's ligament, may be plainly distinguished by the tense and sharp margins which they present when the pulp of the finger is directed either towards the anterior or internal boundaries of the crural ring. Still keeping the finger in the crural canal, let the position of the limb be changed, the thigh be raised upwards and bent upon the belly, at the same time that the knee is rotated inwards and towards the opposite side : when this has been done, the parietes of the crural ring will be observed to be immediately relaxed to a remarkable degree, so that the extremity of the finger, which previously was introduced with difficulty, may now be moved freely within the canal. This alteration in the relative position and degree of tension of the parietes

of the crural canal is to be attributed to the influence which the movements of the lower extremity are capable of exercising over them, through the medium of the iliac portion of the fascia lata, which is connected to the inferior border of Poupart's ligament, between the anterior superior spinous process of the ilium and the tuberosity of the os pubis; and of the falciform process or superior cornu of the saphenous opening attached to the pubic portion of the same membrane, close to the base of the latter process of bone. (See Plate II. figs. 2 and 3, and Plate III. fig. *f. i.*) When the thigh is extended and rotated outwards, the iliac portion of the fascia lata drags downwards the crural arch, and thus tends to constrict the dimensions of the crural canal and diminish the magnitude of its superior and inferior apertures; but when the limb has been placed in the opposite position, it has no longer any such influence. The relaxed condition of the fibres of the psoas and iliacus muscles, when the thigh is bent upon the abdomen and rotated inwards, must also have some share in the production of these changes in the state of the tendinous structures surrounding the canal.

From the foregoing examination it will be perceived that this must be the most favourable position in which we can place the limb when about to attempt the reduction of a strangulated femoral hernia by the *taxis*, before an operation is considered absolutely necessary; or, in the performance of the latter, when endeavouring (after division of the stricture) to replace the protruded viscera.†

† If the blade of the scalpel be introduced by the saphenous opening, passed up the crural canal, and thrust through the peritonæum, (which naturally forms a sort of pouch or depression opposite the crural ring,) the cavity of the abdomen may be opened, and a piece of the small intestine drawn down through the canal without much difficulty; so that several of the peculiarities of a femoral hernia may thus be more aptly illustrated by this than by any other proceeding. The fold of the small intestine which has been thus drawn out of the cavity of the abdomen will be seen, when it is artificially distended, to project forwards, and to be tilted upwards over the edge of the superior cornu of the saphenous opening, so that its greater convexity actually rests upon the falciform process of the iliac portion of the fascia lata and the lower part of the aponeurosis of the external oblique muscle, and consequently over the neck of the tumour, with which it is united at an acute angle. Hence it follows, for the safe and successful employment of the taxis in cases of strangulated complete femoral hernia, that the fundus of the tumour should be first brought down from its position upon the tendon of the external

Dissection to expose the funnel-shaped sheath of the great femoral vessels.—The funnel-shaped sheath of the femoral vessels may now be dissected, and its structure examined. (See the woodcut No. 2, at page 87, fig. *.) For this purpose the iliac portion of the fascia lata should be cut away from its connexion with the lower edge of Poupart's ligament, and its internal extremity, or the falciform process, detached from its insertion into the pubic portion of the fascia lata in front of Gimbernat's ligament; the triangular-shaped flap which is thus marked out may be carefully raised from the subjacent structures, and reflected downwards and outwards over the lower part of the rectus and vastus externus muscles. The fleshy fibres of the sartorius, iliacus, and psoas muscles, on the external or iliac side of the vessels, must be neatly exposed by removing the condensed cellular tissue that invests them; at the same time, the anterior crural and external cutaneous nerves, with the superficial femoral artery and vein, may be displayed as is seen in Plate IV. fig. 1, 2, 3.† The pectineus, adductor longus, and gracilis muscles, are to be shown by removing the pubic portion of the fascia lata.

The funnel-shaped sheath of the great vessels.—When these directions have been followed, the femoral vessels will be found to be inclosed in a perfect sheath, or membranous investment, which is formed in front by the prolongation upon them of the fascia transversalis, which descends behind Poupart's ligament.

oblique muscle into the hollow at the centre of the groin, before any endeavour is made to push it upwards into the belly. It is manifest that the employment of the *taxis* must be very injurious, and extremely dangerous, if continued for ever so short a time, unless the angle, which the fundus of the sac forms with the neck in cases of complete femoral hernia, be effaced by thus bringing down the chief bulk of the tumour from the situation in which it is placed. The delicacy of the manœuvre of introducing the point of the bistoury under the edge of the stricture for its division in cases of strangulated hernia may also be illustrated in this manner, and the necessity shown of protecting the folds of the intestine which lie within the sac, with the fingers of the left hand, during this important step of the operation, lest they should slip before the edge of the knife, and be wounded as it is raised to enlarge the deep-seated ring. The protruded portion of the intestine may, in the next place, be gently replaced within the abdomen, as after the operation has been performed in the living subject.

† The sheath of the vessels is very well displayed in Plate XIV. fig. c, c, of Sir Charles Bell's Dissections. folio. Edin. 1799.

(See Plate IV. fig. *t*, *t*.) The fascia iliaca descends in a similar manner behind the great vessels, and is joined with the fascia transversalis closely along the iliac side of the common femoral artery; but on the opposite, or pubal side, they are united with each other at a little distance from the great femoral vein. (See Plate IV. fig. 3.) The form of this sheath has been compared to a funnel, whence its name; for it is much wider superiorly than inferiorly, where it becomes blended with the external cellular coat of the vessels opposite the point where the saphena major joins with the femoral vein.

Let an incision be now made, in a vertical direction, through the anterior wall of the sheath, over the centre of the great femoral artery, and when that vessel is uncovered by a few movements of the scalpel on each side of it, it will be seen to lie in a distinct compartment. (Plate IV. fig. 1.) A similar incision may be made over the course of the great femoral vein, (Plate IV. fig. 2,) and a third over the centre of the front wall of the crural canal. (Plate IV. fig. 3.) When this has been done, the femoral vein is shown to be separated from the artery, which lies on its iliac side, by a thin septum or membranous process, which connects together the anterior and posterior walls of the sheath, and also from the lymphatic vessels and glands, which are situated within the crural canal, by a similar septum. (See Plate IV. fig. *u*, *u*.)† Thus of the compartments into which the funnel-shaped sheath of the great vessels is subdivided, the external and middle are completely occupied by the common femoral artery and vein, so that no hernia can occur into them; whereas the third, or that which is nearest to the pubes (Plate IV. fig. 3), being only loosely filled by some lymphatic vessels,‡ and cellular tissue, will readily admit of a portion of the intestines being protruded into it, as happens in cases of femoral hernia.

† See also the woodcut No. 2, at page 87, figs. *u*, *v*, *x*, and *.

‡ Some lymphatic vessels run upon the coats of the femoral artery and vein, but by far the greater number are confined to the crural canal.

EXPLANATION OF PLATE IV.

This plate represents the funnel-shaped sheath of the great femoral vessels, as it is exposed by removing the fascia lata covering the muscles of the upper and anterior part of the thigh, and dissecting the subjacent vessels and nerves. The sheath of the vessels has been laid open in such a manner as to show the three compartments into which it is subdivided by the septa, which, springing up on each side of the femoral vein, connect the anterior and posterior parietes together.

a. The anterior superior spinous process of the ilium.

b. The spinous process of the os pubis.

c. c. Poupart's ligament.

d. Gimbernat's ligament.

e. The deep crescentic arch which is formed by a connexion between the fascia transversalis (*t. t*.) and some tendinous fibres which lie parallel with and behind Poupart's ligament.

f. The sartorius muscle.

g. The adductor longus muscle.

h. The pectineus muscle.

i. The iliacus muscle.

k. The psoas muscle.

l. The gracilis muscle.

m. The rectus and vastus internus muscles covered by the fascia lata of the thigh.

n. The fleshy fibres of the external oblique muscle of the abdomen.

o. The tendinous aponeurosis of the same, which is crossed by the intercolumnar fibres.

p. The external abdominal ring.

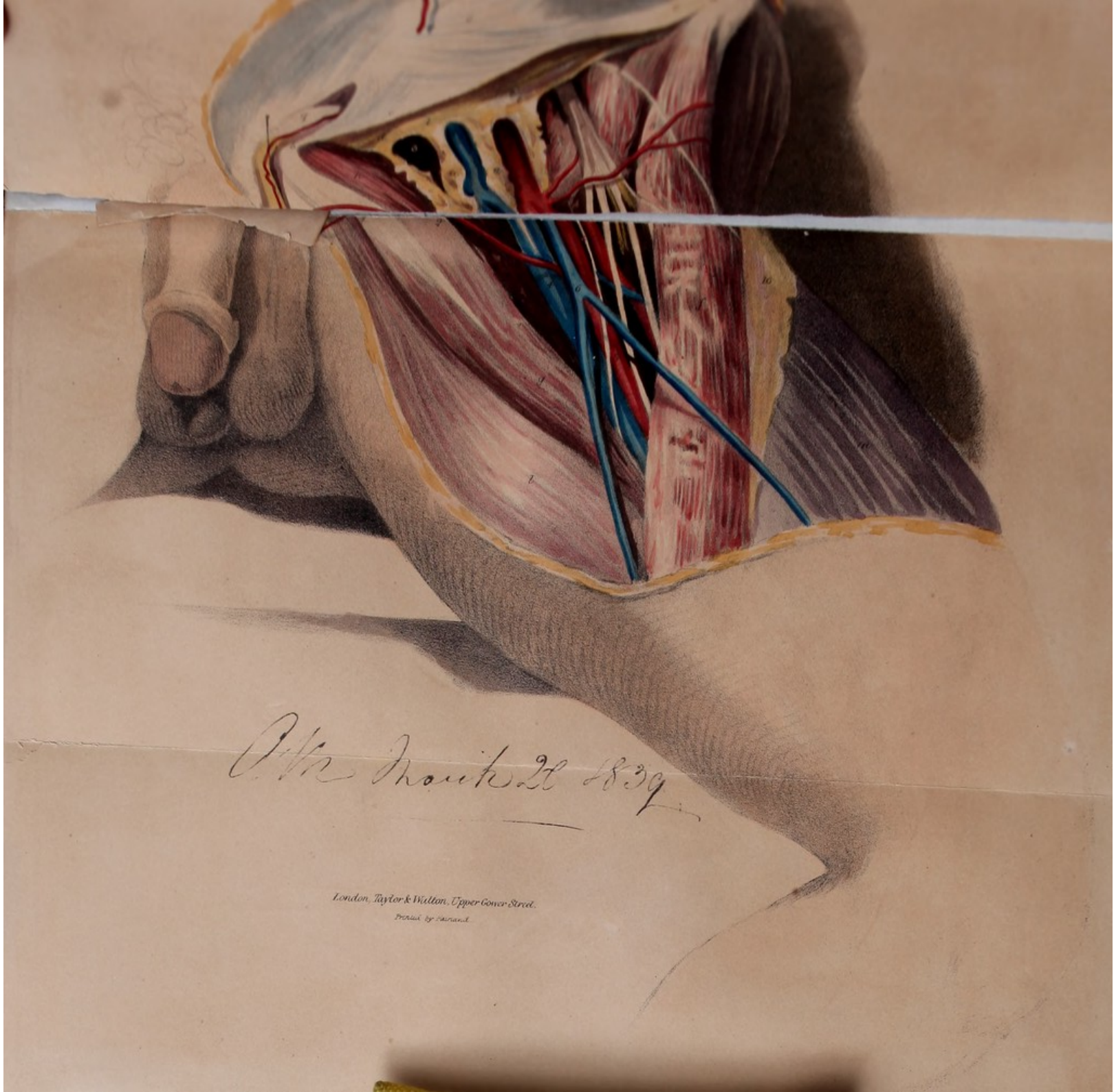
q. The spermatic cord held aside by a pin. The spermatic artery is seen as it runs along the posterior side of the cord.

r. The trunk of the anterior crural nerve dividing into a lash of branches, two of which (the long and short saphenous nerves) accompany the superficial femoral artery.

s. The external cutaneous nerve.

t. t. The anterior wall of the funnel-shaped sheath of the vessels, which is formed by the fascia transversalis. (See the wood-engraving No. 3, at page 89, fig. *.) It has been cut open in order to show the compartments that contain the femoral vessels and the crural canal.

u. u. The thin membranous septa, or partitions, which connect the anterior and posterior parietes of the sheath together, and separate the common femoral vein on one side from the artery, and on the other from the crural canal.



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1. The trunk of the common femoral artery.
2. The trunk of the common femoral vein.
3. The crural canal, through which the sac of a femoral hernia is protruded from the cavity of the abdomen.
4. The superficial femoral vein.
5. The superficial femoral artery. It is just below the situation of this figure that the ligature is placed upon this vessel, in the modern operation, originally recommended by Scarpa as an improvement upon the method of John Hunter.
6. The saphena major vein, which, after receiving the anterior saphena, joins itself with the common femoral vein a little below Poupart's ligament.
7. The external circumflex artery, which is here given off by a common trunk with the profunda femoris.
8. A branch of the external circumflex artery, supplying the sartorius and tensor vaginæ muscles.
9. The external pudic artery, which in this instance arose from the femoral artery several inches lower down than usual.
10. The iliac portion of the fascia lata, which had covered the vessels, reflected downwards and outwards.
11. The superficial epigastric artery cut across.
12. The umbilicus.

A femoral hernia descends in the innermost of the three compartments into which the funnel-shaped sheath of the femoral vessels is subdivided: this has already been described as the crural canal, and contains naturally some loose cellular tissue and lymphatic vessels, with occasionally an absorbent gland.

CHAPTER III.

DISSECTION TO EXPOSE BY AN INTERNAL VIEW THE STRUCTURE AND RELATIONS OF THE CRURAL RING.

This is, perhaps, the most important of the dissections which it is necessary to make in order that a complete and accurate knowledge may be obtained of the surgical anatomy of femoral hernia; since the relative position of the great femoral vessels, and their more important branches, to the crural ring, and consequently to the neck of the sac of a femoral hernia, will be better understood by it than from any other view. For this purpose the parietes of the abdomen, together with the peritonæum lining their internal surface, should be cut through by an incision carried from the crest of the ilium, a little distance beyond the anterior superior spinous process, to the linea alba, where it may terminate above the umbilicus; and thence in a vertical direction downwards to the symphysis of the pubes. The triangular-shaped flap thus marked out should be held upwards and forwards, at the same time that the small intestines are removed from the cavity of the pelvis, so that the internal surface of the peritonæum as it lines the iliac fossa may be more clearly seen. (See Plate V.)

The peritonæum presents a strongly marked depression immediately on the pubal side of the great external iliac vessels, as they are about to emerge upon the upper part of the thigh after passing underneath Poupart's ligament. This depression, or fossa, corresponds with the lower part of the external inguinal pouch, and, if the extremity of the forefinger be firmly pressed upon this point, the peritonæum will gradually yield, and may be easily forced downwards for some way into the crural canal, so as to represent very closely the mode in which it is protruded before the intestines in cases of femoral hernia: with a little perseverance, the extremity of the finger may thus be

made to carry the peritonæum so far before it as to allow of its being plainly perceived upon the outer surface of the groin, where it projects through the lower aperture of the crural canal, —the saphenous opening of the fascia lata.

The peritonæum should, in the next place, be removed from the internal surface of this portion of the abdominal parietes, in order that the external iliac vessels, together with the fasciæ which cover the psoas, iliacus, and transversalis muscles, may be completely exposed.

The peritonæum is connected to these fasciæ (*the fascia transversalis and fascia iliaca*) by some loose cellular tissue, which readily allows of the peritonæum being dragged down from the iliac fossa to a great extent, so as to form the sac in cases of large femoral herniæ.

This layer of cellular substance, which lies externally to the peritonæum, has been named the *subserous cellular tissue*,† and in corpulent subjects is frequently found to be of considerable thickness, and to resemble very much in its appearance the omentum, for which, indeed, it has sometimes been mistaken by the most experienced surgeons during the progress of operations for the exposure of the sac in cases of strangulated femoral hernia. In some instances the subserous cellular tissue will be found to furnish a large, thick, and tolerably firm process of a pyriform figure, which, descending through the crural canal, projects by its larger extremity through the saphenous opening, where it forms a distinct tumour, possessing all the external characters of a portion of the omentum inclosed within a delicate sac, so that it is easily mistaken at the first view, and before the complete dissection of the parts, for an example of femoral hernia containing omentum.‡

Cysts containing a clear albuminous, or sometimes, sanguinolent fluid, have been found in the subserous cellular tissue lying over the sac of a strangulated femoral hernia, so as to render the operation a much more delicate proceeding than it is usually found to be.§

† Fascia propria of the French anatomists.

‡ Several preparations illustrative of these appearances of the subserous cellular tissue are preserved in the Museum of University College.

§ See a clinical lecture by Mr. Cooper, which is reported in the London Medical Gazette of March 2, 1839, p. 836.

EXPLANATION OF PLATE V.

Fig. 1.

This plate represents the internal view of the structure and relations of the crural ring. The parietes of the lower part of the abdomen have been laid freely open by a crucial incision, and the triangular-shaped flap on the left side is held upwards and forwards by means of a hook, while the flap of the opposite is thrown over the upper part of the right thigh. The small intestines, with the sigmoid flexure of the colon, have been removed from the iliac fossa and cavity of the pelvis; after which the peritonæum and subserous cellular tissue were carefully detached from the fasciæ and great vessels of this region.

a. The situation of the anterior superior spinous process of the ilium.

b. The symphysis pubis.

c. The pecten of the horizontal branch of the os pubis.

d. Poupart's ligament.

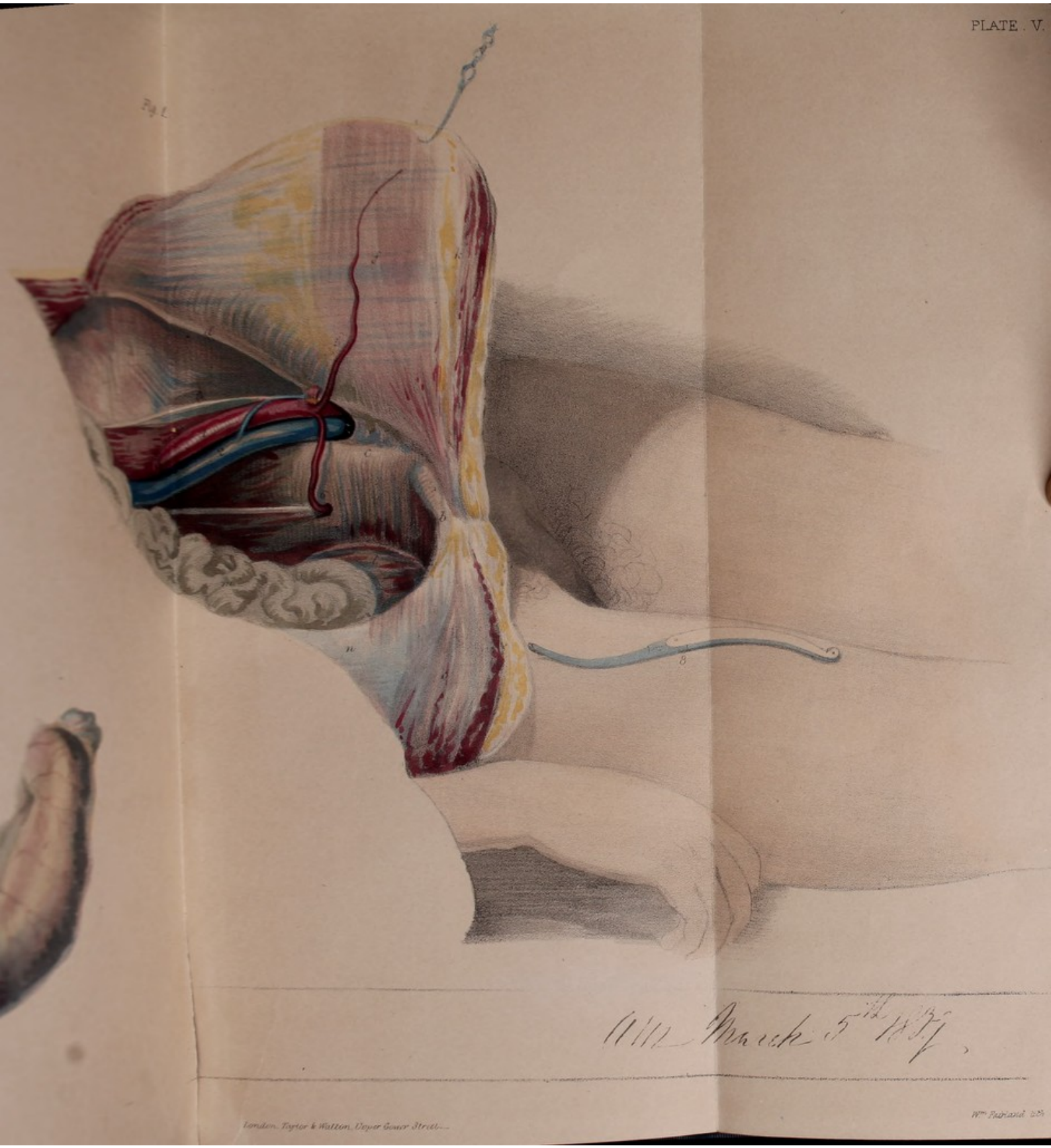
e. Gimbernat's ligament; the thin and sharp lunated edge of which regards the external iliac vein, from which it is distant about half an inch, which is the usual width of the crural ring.

f. *g*. The fascia transversalis, which at *f* covers the rectus muscle, and at *g* the transversalis.

h. *i*. The fascia iliaca, which covers at *h* the iliacus internus muscle, and at *g* the psoas magnus. The fasciæ, iliaca and transversalis, unite with one another along the internal surface of Poupart's ligament, in the interval between the spine of the ilium and the great vessels, the line of their junction being indicated by a whitish tendinous band. When they have arrived at the iliac border of the artery, they separate from each other, the fascia transversalis passing in front of the vessels, and the fascia iliaca behind them, so as to form the anterior and posterior walls of the funnel-shaped sheath of the femoral vessels; they afterwards reunite with each other upon the inner surface of Gimbernat's ligament. The dark space between the lunated edge of Gimbernat's ligament and the femoral vein is the *crural ring*, through which a femoral hernia commences its descent from the abdomen. The anterior boundary is formed by the posterior border of Poupart's ligament; internally, by Gimbernat's ligament; posteriorly, by the ileo-pectineal line of the os pubis; and externally, by the external iliac vein and artery. The deep epigastric artery runs obliquely upwards along the superior and

Fig. 1

Fig. 2.



March 5th 1835

London. Taylor & Walton. Upper Gower Street.

Wm Pickland lith

external angle of the ring. In the subject from which the drawing was taken, the obturator artery, which came off from a short common trunk with the epigastric, descended along the external edge of the opening, and, therefore, would not be exposed to any injury from the edge of the bistoury used for dividing the crural ring upwards and inwards in an operation for the removal of the stricture in strangulated femoral hernia, an accident which might happen in the case represented in the wood-engraving No. 6, at page 115, where the obturator and epigastric arteries arise from a common trunk, which is rather longer than in the present instance. In the male subject the spermatic cord, as it descends through the inguinal canal, lies just above the crural ring, and, therefore, is liable to be injured if an incision directed upwards be not very carefully made. In the female the round ligament of the uterus holds the same relation to the front of the crural ring, but it is not of the same importance as the spermatic cord, along the posterior surface of which a large artery and duct (the spermatic artery and vas deferens) run in their course to the testicle.

k. The linea alba: the incision has divided some of the innermost fibres of the rectus muscle of the right side (*o*).

l. The urinary bladder, which, being empty, is contracted into the pelvis.

m. The small intestines, removed from the left iliac fossa.

n. The transversalis muscle of the right side.

o. The rectus muscle of the right side.

1. The external iliac artery.
2. The external iliac vein, which runs along the inner side of the artery.
3. The external pudic, or genito-crural nerve, which lies upon the sheath of these vessels.
4. The common trunk, which, soon after its origin from the external iliac artery, divides into the deep epigastric artery, 5, and the obturator artery, 6.
7. The obturator nerve.

The round ligament of the uterus has been cut across, just as it enters into the inguinal canal; its divided extremity is seen projecting over the curve of the deep epigastric artery at its commencement.

8. Is a probe-pointed bistoury, which is used in the operation of enlarging the crural ring in cases of strangulated femoral hernia.

The crural ring should be enlarged in the operation for strangulated femoral hernia, when the seat of the stricture is situated here, by dividing the lunated border of Gimbernat's

ligament obliquely upwards and inwards, at its junction with the posterior edge of Poupart's ligament; in this step of the operation very great care should be observed that no part of the instrument but its probe-point should project *within* the cavity of the abdomen.

Fig. 2.

Shows a piece of the ileum which had been strangulated for three days within the crural canal. The case was one of femoral hernia occurring in the male subject, and was attended with other circumstances which rendered the diagnosis exceedingly difficult. Mr. Quain, being consulted upon the third day, performed the operation, but the patient sank in a day afterwards under an attack of peritonitis, which had commenced previously.

a. The portion of the small intestine which had suffered from constriction within the superior aperture of the crural canal. It did not comprise more than one-half of the entire calibre of the gut; but the acute angle at which the remainder of the intestine was bent, was quite sufficient to prevent the passage of the fæces along the canal. The strangulated portion was very dark-coloured, with shreds of coagulable lymph effused upon its surface; there were small ecchymoses under the peritonæal coat, but it had, nevertheless, retained its vitality.

b. The upper end of the ileum, which was more inflamed, and greatly distended with fæcal matter.

c. The lower extremity, which was scarcely altered from its natural character and appearance.

d. The mesentery.

e. The portion of the calibre of the gut (about one-half of the circumference) which had not been compressed into the crural ring.

The septum crurale.—The superior orifice of the crural canal (the *crural ring*) is naturally closed by a layer of condensed cellular membrane, which is sufficiently strong and resistent in most subjects to afford a considerable obstacle to the formation of a femoral hernia; while, in others, it is very thin and weak. This structure adheres to the tendinous margins of the crural ring, and may be regarded as forming part of the inner layer of the fascia transversalis. It has received from M. Cloquet, who first described it minutely, the appellation of the *septum crurale*.† The superior surface of the septum crurale is a little

† *Vide* Recherches sur les Hernies, par J. Cloquet; 4to. Paris, 1817, p. 74.

concave, and supports the peritonæum and subserous cellular tissue; frequently, a small oval-shaped lymphatic gland will be found upon it. The inferior surface, on the contrary, is convex, and projects downwards into the crural canal. The septum crurale is traversed by the numerous lymphatic vessels which have already been described as ascending by the inner side of the great femoral vein from the inferior extremity to the cavity of the abdomen, where they terminate in the absorbent glands, which are situated on either side of the external iliac artery and vein.

The deep crescentic arch.—This may be described as consisting of a band of tolerably strong tendinous fibres, which are situated under Poupart's ligament; it appears to be formed, on the iliac side of the great vessels, by a connexion between the fascia transversalis, and the tendinous origins of the obliquus internus and transversalis, with part of Poupart's ligament; and on the pubal side by the same fascia, in union with the conjoined tendons of these two muscles, as they descend to be inserted into the ileo-pectineal line behind Gimbernat's ligament.

There is a good deal of dissection to be made to show this deep arch as a distinct structure, and it may be very fairly criticised as in some degree artificial. After having made the dissection of the tendinous aponeurosis of the external oblique muscle, and of the crural arch, as is usually recommended for the display of the structures connected with the anatomy of the inguinal canal, the flap of the tendon of the external oblique should, in the next place, be held up and dissected from the internal oblique muscle, as far down as the edge of Poupart's ligament. The ligament is then to be divided into two laminæ, by forcing the handle of the scalpel between the external and internal oblique muscles, where they are attached to the ligament: by pushing the handle of the knife towards the thigh, it will pass under the iliac portion of the fascia lata; then, by moving it in a horizontal direction, between the os pubis and the ilium, the tendon of the external oblique muscle and the iliac portion of the fascia lata, (which are connected together through the medium of the superficial part of Poupart's ligament,) will be completely separated from the parts underneath, so that the ligament will appear to be formed by them only. If the attachment of the aponeurosis and Poupart's ligament to the

anterior superior spinous process of the ilium be now cut through, a view will be obtained nearly similar to that which has just been destroyed, for the deep crescentic arch has almost the same form as the superficial arch.†

† See the Appendix to Part I. p. 5, of A System of Dissection, by Sir Charles Bell; folio, Edinburgh, 1799: A Memoir on the Crural Arch, by Mr. Liston; 4to. Edinburgh, 1816, page 13: and A Manual of Anatomy, by John Shaw; 8vo. London, 1822, third edition, page 59; from which work the above description has been taken.

CHAPTER IV.

Section I.

FORMATION AND PROGRESS OF A FEMORAL HERNIA.

Femoral Hernia is of much more frequent occurrence in women than in men; yet there is reason for believing that the comparative rarity of this disease in the male sex is by no means so great as was once supposed, and commonly described in the writings of the best authors, towards the close of the last, and in the commencement of the present, centuries.† It is extremely probable that this erroneous impression arose in consequence of the existence of the affection in the male subject having been frequently permitted to pass unobserved, on account of the very trifling size which the tumour generally attains in men, when compared with its ordinary magnitude in women.‡

When a femoral hernia is at first formed, that portion of the peritonæum which lines the internal surface of the abdominal parietes over the crural ring, and which in the natural condition of the parts presents an obvious depression, corresponding with the lower part of the external inguinal pouch, is protruded before the intestines into the crural canal, and thus placed within the innermost of the three compartments into which the funnel-shaped sheath of the femoral vessels is subdivided.

The peritonæum, as it thus descends before the hernial protrusion, pushes before it the subserous cellular tissue, and the septum crurale, with what cellular and adipose substance there may be present within the crural canal.

Incomplete femoral hernia.—So long as the hernial sac is lodged within the crural canal, and does not project through the

† See the Practical Observations in Surgery, by Wm. Hey, second edition, p. 151. Also the works of Morgagni, Arnaud, Scarpa, and others.

‡ M. Breschet says that he has seen more than thirty examples of femoral hernia in the male subject during a few years that he followed the clinical instruction of the late Baron Dupuytren, at the Hôtel Dieu of Paris. Thèse sur la Hernie Femorale, par G. Breschet, p. 82.

inferior aperture or outlet of that passage, the disease is said to form an *incomplete femoral hernia.*†

The peritonæum forming the sac of this variety of hernia is now covered by the structures which have just been described as being pushed down before it,‡ and rests upon the pubic portion of the fascia lata, only separated from it by the fascia iliaca, forming the posterior wall of the crural canal: in front of it is the superior cornu of the saphenous opening, or falciform process of the iliac portion of the fascia lata; it is separated on its external side from the femoral vein by the septum, or membranous process, which is naturally interposed between that vessel and the mass of the absorbents of the inferior extremity; and on the side which is next the pubes, it is limited by the internal wall of the funnel-shaped sheath of the vessels.

The incomplete femoral hernia forms a tumour of very small size, and is a dangerous variety of the disease, since its presence cannot always be clearly ascertained, particularly in corpulent persons, by any manual examination, however carefully and skilfully conducted; for the swelling is greatly obscured by being so firmly bound down by the falciform process constituting the anterior wall of the crural canal.

Numerous cases have been recorded of patients having lost their lives in consequence of the strangulation of a small knuckle of the intestine within the neck of the sac of an incomplete femoral hernia; but which, as there was no external tumour present to which the symptoms could be satisfactorily referred, were regarded as instances of ileus, peritonitis, or some other internal affection of the alimentary canal, and treated as such, but of course, without any success.§ On the examination of the body after the death of the individuals thus affected, a very small part of the small intestine, not exceeding, in the majority

† This variety is described by Sir Astley Cooper as the hernia within the sheath of the crural vessels.—Cooper on Crural Hernia, p. 25.

‡ These membranes become blended together by the pressure of the tumour, and are united into one, which has been termed by Sir Astley Cooper the *fascia propria* of the sac.—Op. citat. p. 2.

§ For cases of this kind see Surgical Observations, by Sir Charles Bell, Part II, p. 181; Nouveaux Eléments de Médecine Opératoire, par Alf. L. M. Velpeau, t. ii. pp. 330-1; Mr. Else's case in the Med. Obs. and Inq. vol. iv. p. 355; and Mr. Lawrence's work on Hernia, 4th edit. p. 493.

of instances, one-third of the whole calibre of the bowel, has been found tightly embraced by the margins of the superior orifice of the crural canal. In such cases, the contents of the bowel are effectually prevented from passing along the intestinal tube, by the acute angular fold which is produced by the retention of even so small a portion of the circumference of the gut within the neck of the sac.† (See Plate V. fig. 2d, *a*.)

Complete femoral hernia.—When the lower part, or fundus of the sac of a femoral hernia protrudes through the saphenous opening, or inferior aperture of the crural canal, it immediately projects forwards, and extends itself in every direction, but more particularly outwards, over the great femoral vessels, where it forms an obvious tumour in the fold of the groin, which is of an oblong shape, the longest diameter being disposed transversely, parallel with Poupart's ligament, upon which its fundus frequently rests. This change in the direction of the course of a femoral hernia is owing to the close adhesion of the superficial fascia of the thigh, and of the funnel-shaped sheath of the great vessels, to the inferior margin of the saphenous opening of the fascia lata, which prevents the further descent of the tumour upon the front of the thigh; and also to the greater laxity of the cellular substance superiorly, which readily allows of its extension upwards: to these influences should be added the constant motions of the limb, which must greatly tend to tilt the fundus of the sac over the falciform process. Sometimes, indeed, the fundus of the sac of a femoral hernia ascends so high that it rests not only upon the falciform process of the fascia lata and Poupart's ligament, but also upon the lower part of the aponeurosis of the external oblique muscle of the abdomen, where it might be mistaken, from its figure and position, for an inguinal hernia.‡ In very few instances are the superficial vessels, which occasionally issue from the saphenous opening of the fascia lata, spread over

† A case of this kind occurred in a female servant of Dr. Copland. See Dict. of Pract. Medicine, Part II. p. 367.

‡ Sir Astley Cooper once went with a physician into the country to operate, as he was told, on a case of inguinal hernia; but, when he examined the patient, he found that the hernia was crural, and had been for three days strangulated, during which time repeated attempts had been made to reduce it by pressing the tumour towards the spinous process of the ilium. It was reduced in five minutes by employing pressure proper for the crural hernia. *Vide* Cooper on Crural Hernia. 2d edit. part ii. p. 4.

the sac of a complete femoral hernia; and, therefore, it is erroneous to attribute generally its ascent to any influence exercised by them upon the tumour. In the greater number of cases of femoral herniæ these vessels will be found to pursue their course under the base of the tumour, and are hence seldom divided in the operation, even when the first incisions are made in the same direction as Poupart's ligament, at right angles to their course. (See Plate VI. figs. *l*, *m*, *n*.)

The crural ring is not unfrequently considerably dilated by the protrusion through it of a femoral hernia. The situation of the femoral vein is but little altered, for it lies along the external and inferior side of the tumour: the deep epigastric artery runs over and is frequently in pretty close contact with the superior and external angle of the neck of the sac. In a complete femoral hernia the semilunar edge of the falciform process of the fascia lata is also pushed upwards and outwards, so as to be converted into a well-formed tendinous arch, which, through the medium of its connexion with the pubic portion of the fascia lata, encircles the greater part of the neck of the sac.

EXPLANATION OF PLATE VI.

This plate represents the situation of the femoral hernia externally, when the integuments and the superficial fascia have been removed by dissection from the front of the thigh.

a. The anterior superior spinous process of the ilium.

b. The spinous process or tuberosity of the os pubis.

c. The anterior border of Poupart's ligament, where it stretches across between the spine of the ilium and the tuberosity of the os pubis. It will be observed how the ligament is drawn downwards, and the crural arch made tense, by the position of the limb, which was abducted, and rotated outwards, previously to making the dissection.

d. The iliac or external portion of the fascia lata of the thigh, which is attached, superiorly, to the lower edge of Poupart's ligament.

e. The pubic portion of the fascia lata covering the pectineus and adductor longus muscles.

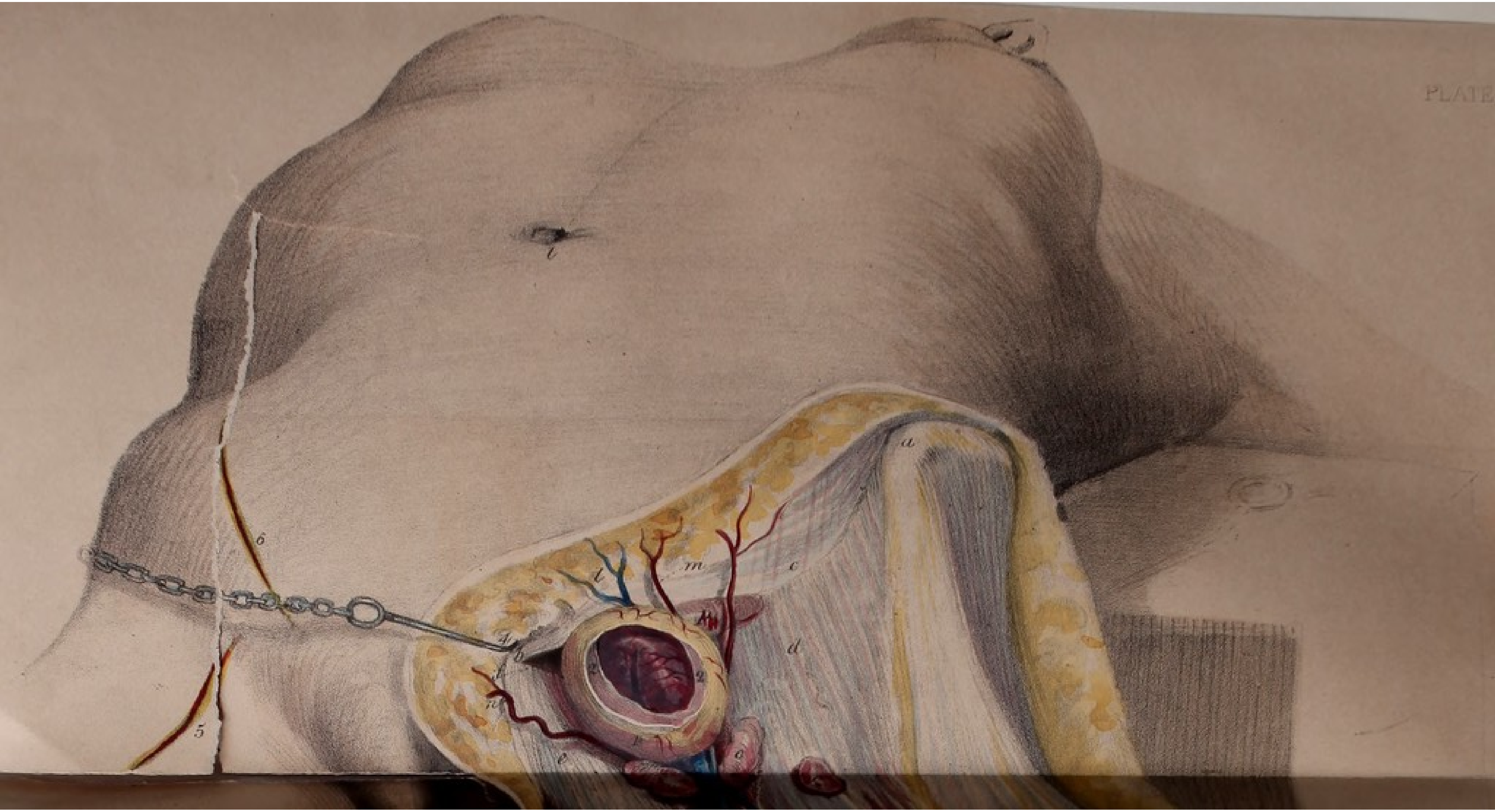
f. points, by a dotted line, to the situation of Gimbernat's ligament, and of the superior extremity of the falciform process of the iliac portion of the fascia lata, where the latter arches over the neck of the hernial sac.

g. The fascia lata covering the rectus muscle.

h. The fascia lata covering the sartorius muscle.

i. The fascia lata covering the adductor longus muscle.

PLATE



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London, Taylor & Walton, Upper Gower Street.

k. The saphena major vein, which receives several contributory branches from the integuments covering the inguinal region.

l. The superficial epigastric vein, which runs along under the base of the hernial tumour, in its course to join with the great saphena.

m. The superficial epigastric arteries, which, in this subject, were two in number.

n. The superficial or external pudic artery.

o. o. o. o. Several lymphatic glands, which lie upon the fascia lata in the course of the saphena major vein, and which frequently swell, and inflame from irritation, in cases of disease about the leg and foot.

p. Two smaller absorbent glands, lying over Poupart's ligament, which are frequently the seat of venereal buboes, consequent upon chancres situated on the external organs of generation.

q. A lymphatic vessel, which ascends alongside of the great saphena vein, and passes through the inguinal glands.

r. The middle anterior cutaneous nerve of the thigh.

s. The skin and superficial fascia of the groin, dissected off, and folded over the external border of the limb.

t. The umbilicus.

1. 1. The fascia propria of the femoral hernia, which is formed by the subserous cellular tissue, and the sheath of the vessels. It is sometimes extremely similar in its appearance to the omentum, for which it has been mistaken, and so induced the surgeon to reduce the sac into the belly, with its contents still strangulated by the neck of the true sac. (See the case at page 150.)

2. 2. The peritonæal membrane which forms the sac of the femoral hernia. It is very thin, and seems almost transparent.

3. A portion of the small intestine contained within the hernial sac, and strangulated; its colour was of a deep purple.

4. The round ligament of the uterus, held aside by the hook between the points where it emerges from the external abdominal ring, and is inserted into the fat covering the pubes.

It is evident, from the drawing, that any attempt to employ the taxis in a complete femoral hernia should be preceded by first withdrawing the hernial tumour from above the aponeurosis of the external oblique muscle of the abdomen, and the falciform process upon which it has been tilted.

5. marks the situation and extent of the first incision made in the operation for placing a ligature upon the common femoral artery.

6. indicates the first incision which is made in Sir Astley Cooper's method of performing the operation for tying the external iliac artery.

Section II.

VARIETIES OF FEMORAL HERNIÆ.

Besides the natural divisions of femoral herniæ into those that are complete and incomplete, both of which are sufficiently frequent in their occurrence to be observed almost every day, there are yet other varieties which are much more rare, and deserving of some notice here.

M. Cloquet possesses a preparation in which the deep epigastric artery is seen to run along the inner border of the sac of a femoral hernia which had descended in front of the great femoral vessels.†

Hesselbach mentions an instance in which the sac had descended behind the crural arch, in the interval between the anterior superior spinous process of the ilium and the great vessels. In this case the fundus of the sac lay beneath the iliac portion of the fascia lata, and its neck was crossed anteriorly by the internal circumflex ilii artery. In another case, which is mentioned by the same author, the epigastric took its origin from the profunda femoris, and ran along the inferior and internal border of the neck of the sac of a femoral hernia. Mr. Macilwain, one of the surgeons to the City of London Truss Society, says that he has known of not less than six instances, which are recorded in the books of the society, in which the hernial sac was protruded upon the iliac side of the vessels.‡ Mr. Stanley, surgeon to St. Bartholomew's Hospital, has dissected two cases of femoral herniæ, in which the sac descended from the abdomen, by the outer side of the femoral vessels, but close to them. In one of these instances, the epigastric artery arose from the femoral, and gave origin to the obturatrix artery. The common

† "L'artère épigastrique peut se trouver en-dedans du sac de la hernie crurale; celle-ci descend alors au-devant des vaisseaux fémoraux. Je ne possède qu'une seule observation de ce cas."—Recherches Anatomiques sur les Hernies, page 85, proposition xlviii.

‡ *Vide* Macilwain on Hernia, p. 293.

trunk, and its division into the epigastric and obturator branches, were placed anteriorly to the sac. The sac, about the size of a walnut, was situated directly in front of the femoral artery and vein.†

The variety in which the neck of the sac is surrounded by the obturator artery coming off from the epigastric, has already been fully noticed in a preceding part of this work.‡

M. Cloquet has seen an instance in which the hernial sac had passed through an opening in the posterior part of the sheath, so that it lay immediately on the pectineus muscle, having in front of it the femoral artery and vein, from which it was separated by the pubic portion of the fascia lata.§

Sometimes the sac of a femoral hernia is multilocular, or divided into several compartments, which communicate with one another. Hesselbach delineates, in his work upon hernia, a remarkable instance of this kind, in which the surface of the tumour was rendered extremely irregular by dense bands stretched across it in various directions as it emerged from the saphenous aperture.‖

Sometimes the tumour is of an hour-glass figure, which appearance may arise from the constriction produced by a large vessel crossing over the exterior of the sac.¶

The size of the femoral hernia seldom exceeds a pigeon's egg; but occasionally instances have been seen in which it had attained a much greater magnitude, and then it generally descended upon

† *Vide* Lawrence on Hernia, 5th edit. p. 486; London, 1838.

‡ *Vide* p. 114, and the wood-engraving No. 6.

§ "J'ai vu le sac s' engager par une ouverture de la paroi postérieure du canal crural. Il reposait immédiatement sur le muscle pectiné, et avait au-devant de lui l'artère et la veine fémorales, dont il était séparé par le feuillet profond de l'aponévrose *fascia lata*."— Recherches sur les Hernies, p. 85, prop. xlvi.

‖ Hesselbach de Ortu et Progressu Herniarum, p. 45. Plate xiii.; and also Observations on Crural Hernia, by Alexander Monro, M.D. Plate ii. fig. 2; in which the sac is seen divided into four compartments, three of them communicating with each other.

¶ Dr. Macfarlane, in his excellent reports of the surgical practice of the Glasgow Infirmary, relates two instances in which the tumour of a femoral hernia was rendered of an hour-glass shape by a large vessel, probably the external pudic, crossing over the front of the sac. Edinburgh Medical and Surgical Journal, 1837, p. 37.

the front and inner side of the thigh towards the knee, instead of being tilted upwards as is usual in ordinary cases. The largest femoral herniæ seen by Sir Astley Cooper were of the size of the fist, and occupied the entire of the hollow from the anterior superior spinous process of the ilium to the tuberosity of the pubes. Professor Thompson mentions a case of irreducible femoral hernia in a woman, which extended half-way down the thigh, and in which the parietes of the sac were so thin that the peristaltic motion of the intestine could be distinctly perceived.† In the spring of the year 1836, a woman who laboured under symptoms of incarceration of the contents of an immense femoral hernia on the right side, was admitted into the College Hospital, under the care of Mr. Cooper ; the tumour, which was as large as as a man's head, reached about half-way down to the knee. Its contents were chiefly intestine, and could, with some difficulty, be reduced into the belly ; but it was not easy to retain them there. This enormous hernia had ensued upon the performance of the operation for a strangulated femoral hernia, on the same side, about eight years previously, since which time she had neglected to wear her truss constantly.‡

Section III.

DIAGNOSIS OF FEMORAL HERNIA.

The affections of the groin which are most liable to be confounded with femoral hernia, and to render the diagnosis obscure, are inguinal herniæ, enlargements of the inguinal glands, varicose enlargement of the femoral vein, encysted tumours, and lumbar abscess.

A femoral hernia, so long as it remains in a simple reducible state, is easily recognised by the situation of the tumour, more particularly of its neck or deep-seated part—by reference to the history of its origin and progress—by the increase of size and

† *Vide* Cooper on Crural Hernia, 2d edit. p. 1 ; and Plate III. fig. 3, Plate VIII. fig. 2. Much useful and valuable information will be derived from a perusal of the fourth chapter of Sir Astley Cooper's work on Crural Hernia, 2d edit. p. 25, entitled " Of the Varieties of Crural Hernia."

‡ Several similar cases are related by Mr. Lawrence as having occurred either under his own observation, or in the practice of others. *Vide* Lawrence on Ruptures, 5th edit. p. 488.

the impulse which ensue upon the patient coughing, or making any similar exertion—by its disappearance, frequently with a distinct gurgle, under pressure — by the possibility (after this has been effected) of insinuating the tip of the finger into the lower part of the crural canal, which now appears empty from the reduction of the contents of the sac — and by the quick reappearance of the swelling as before, as soon as the pressure has been remitted, and the patient coughs or makes any exertion.

Too much attention cannot be paid to the precise situation which the neck of the sac of a femoral hernia occupies; it is *under* Poupart's ligament, placed between the tuberosity or spine of the os pubis on the one hand, and the point where the great femoral artery may be felt pulsating on the other. This is by far the most important point to be determined in establishing the diagnosis in difficult and obscure cases of femoral herniæ.

Femoral hernia, when large, has been mistaken for inguinal hernia; but this mistake is not very likely to occur if attention be paid to the preceding remarks, as the neck of an inguinal hernia is seated *above* Poupart's ligament, and in femoral hernia the external abdominal ring will be found free, so as to admit the extremity of the finger. Cases may, however, be met with, in which inguinal and femoral herniæ occur together, accompanied by other circumstances which render the diagnosis exceedingly difficult, and only to be effected by a nice discrimination of the characteristic features of each.† (See Plate VI.)

The diagnosis of a femoral hernia, from an enlargement of one of the superficial glands of the groin is not always as easy as might be supposed, although it may be of paramount importance to the safety of the patient that the diagnosis should be early and clearly established. Of all the other affections which have their seat in the region of the groin, none are so likely to complicate the diagnosis of a femoral hernia, and render it difficult and obscure, as an enlargement of one of the superficial inguinal glands which lie over or within the crural canal. Indeed, many cases have occurred in which it was impossible to decide, without an operation, whether the tumour present in the groin was really only an enlarged absorbent gland, or a strangu-

† For a case of femoral hernia in a man rendered obscure by an inguinal hernia, and the patient lost by the unimpressive character of the symptoms, see the Surgical Observations by Sir Charles Bell, Part II. pp. 187—9.

lated femoral hernia; moreover, the two may occur together—and it is of importance to remember that a femoral hernia may be situated, and its contents become strangulated, behind an enlarged gland.†

In the greater number of cases, however, a glandular enlargement may be distinguished from a femoral hernia by the greater mobility of the swollen gland upon its base, and the extent to which it may be easily moved from side to side, at the same time that it is frequently possible to grasp and lift up the tumour in such a manner that the tips of the fingers may be inserted underneath it; circumstances which, joined with the history of the case, will go far to prove that the swelling cannot be a hernia.‡

It has now become an established maxim in the practice of surgery, when there is present a tumour in the situation of a femoral hernia, the nature of which cannot be satisfactorily determined, and there supervene symptoms of strangulation of

† Mr. Cooper mentions a case which occurred in his own practice, in which the diagnosis was rendered more than usually difficult by a mass of diseased fat and glands; but on dissecting deeply, the sac, which was very small, was detected lurking behind several large glands, and the stricture divided. The woman got quickly well, Mr. Cooper remarks, as most patients do in whose cases the operation is not deferred till too much inflammation and other mischief have had time to take place. *Vide* the First Lines of the Practice of Surgery, 6th edit. p. 504.

‡ If the following cases be contrasted with each other, it will show how contradictory symptoms will sometimes prove, and how much must be left, in similar instances, to be decided by the particular tact and judgment of the surgeon:—

Mr. Macilwain, surgeon to the Truss Society of the City of London, was requested to visit a woman who had laboured for several days under all the rational symptoms of strangulated intestine, such as hiccough, nausea, vomiting of stercoraceous matter, and absolute constipation; in addition to which there was a firm, smooth, and somewhat elastic tumour, occupying the situation of the crural ring; the skin covering the swelling was quite natural. Mr. Macilwain considered that, under all the circumstances, it would be best to cut down to the swelling, which he accordingly did immediately, but only found an enlarged gland with a suppurating cavity in the centre. The woman eventually recovered under the exhibition of purgatives combined with opium. *Vide* Surgical Observations, by G. Macilwain; 8vo. London, 1830; p. 308.

Sir Astley Cooper was called to a lady who had laboured under symptoms of strangulated hernia for several days, during which time she had been

the intestine, that the operation should be performed as though it had been clearly decided that the swelling was actually a hernia; since the use of the knife is, in a case of this kind, a source of little or no additional danger to the patient, and will frequently prove to be the best and surest means of preventing the repetition of those fatal cases in which patients have been permitted to die, unrelieved from strangulation of the small intestine, under the belief that the swelling in the groin could not be a hernia.†

Varix of the femoral vein.—This case is not of frequent occurrence, but it has been mistaken for a femoral hernia;§ and under that impression trusses have been applied for its relief, but, as might be expected, without any benefit. The enlargement appears to be seated where the saphena major pours its contents into the great femoral vein, and forms a tumour of an oblong shape, about the size of a walnut, which

attended by a physician and an apothecary for *ileus*, to whom she had not mentioned that she had a tumour in the groin. Another surgeon, who had been consulted upon the case, discovered a swelling in the right groin, which was firm, and did not feel to him like a hernia. Upon examination Sir Astley Cooper found a gland, enlarged to the size of a pullet's egg, and very moveable; but, upon feeling behind this gland, he could perceive an elastic tumour distinct from the swollen gland. This hernia was reduced by the taxis after ten minutes, when all symptoms of strangulation disappeared, and the lady quickly recovered.—Cooper on Hernia, Part II. p. 3, 2d edit.

A surgeon in considerable practice ordered a poultice to be applied to promote the suppuration of a tumour in the groin, which he supposed to be a venereal bubo; the poultice was applied for three days, after which the man was sent into Guy's Hospital, where the operation was immediately performed, but the intestine was found mortified.—Op. cit. p. 3. Mr. Lawrence has mentioned in his work a case in which a hospital surgeon mistook a strangulated femoral hernia for a bubo.

† See the cases recorded by Mr. Else in the fourth volume of the Medical Observations and Inquiries; Sir A. Cooper's work, Part II. p. 3, 2d edit.; Lawrence on Ruptures, 6th Edition, p. 493. M. Velpeau mentions a case in which the surgeon passed a ligature around the base of an enlarged gland in the groin, and destroyed his patient's life. The thread had embraced a piece of the small intestine in a sac behind the gland.—Velpeau, Méd. Opér. tom. ii. pp. 330, 331, 333.

§ Cases of this kind, which were treated as femoral herniæ, will be found in the Gazette Médicale, Dec. 1836; Petit's Traité des Malad. Chir. tom. ii. p. 299; Sir A. Cooper's work, Part. II. p. 4, second edition; and the Surgical Observations, by Mr. Macilwain, p. 300.

is increased in the erect posture, and receives an impulse upon coughing; but its nature is quickly recognised by the facility with which the finger may be pressed into the vein, by the thinness of its coats, and, after it has been reduced, (the patient lying in the recumbent posture,) by the reappearance of the tumour as soon as he rises, although the finger is kept firmly applied to the crural ring, so as effectually to prevent any protrusion of the contents of the abdomen by that aperture. Last summer there was shown to me a well-marked case of this kind, in the wards of La Charité, in Paris, under the care of M. Velpeau; but, as that surgeon remarked, it was impossible for any properly educated person, who paid the slightest attention to the characteristic appearances of the affection, to be deceived as to its actual nature. An instance of this varicose condition of the saphena and femoral veins, at their junction with each other, was met with in the dissecting-rooms of the College this winter. The tumour was of the size of a pigeon's egg.

Adipose and encysted tumours, occupying the situation of the bend of the thigh, have been mistaken for femoral hernia, as happened in the case which is recorded by Desault, and in another mentioned by Mr. Macilwain.†

The history of the case, the fluctuation which is perceptible in the tumour, and its situation, which is commonly upon the iliac side of the femoral vessels, will always be sufficient to enable a surgeon to distinguish psoas abscess from a femoral hernia.‡

† *Vide* Desault's Chirurgical Journal, tom. i. p. 252; and Macilwain's Surgical Observations, p. 314.

‡ Mr. Cooper mentions having seen a case of psoas abscess which had been mistaken by another practitioner for a femoral hernia. *Vide* Dict. of Pract. Surgery, 7th edit. p. 944.

Section IV.

OF THE EMPLOYMENT OF THE TAXIS FOR THE REDUCTION OF A FEMORAL HERNIA.

This operation forms a very important part of the treatment of a strangulated femoral hernia, since, whilst its judicious employment will often prevent a severe operation, and rescue the patient from the most dangerous circumstances, it yet frequently happens, from its misapplication, that so much injury is inflicted upon the tender coats of the inflamed intestine as to frustrate all other attempts to afford relief, however skilfully they may afterwards be administered. The most dangerous error, and which is nevertheless by no means the most unfrequent in its occurrence, is that of mistaking a femoral hernia for an inguinal hernia ; which not only involves a failure in obtaining the end sought for—the reduction of the intestine—but also must expose the patient to the dangers attendant upon contusion and even laceration of the swollen tunics of the strangulated portion of intestine.†

The patient should be placed upon his back, the shoulders and head elevated, and the thigh of the affected side flexed upon the abdomen, with the knee rotated inwards, in order that the crural arch shall be rendered as perfectly free as possible from all tension communicated to it either from the fascia lata or from the abdominal muscles. Sometimes additional benefit is obtained by ordering the opposite limb to be flexed and rotated inwards, in a similar manner, at the same time. During the employment of the taxis it is also useful to keep the patient engaged in conversation, which greatly tends to diminish the resistance of the muscular parietes of the abdomen. The surgeon then grasps the hernial tumour with the fingers of the right hand, and, if it be large, and have risen so much upwards as to have been tilted over the falciform process of the fascia lata, and upon the surface of the

† See Sir Charles Bell's Operative Surgery, vol. i. Plate VII. fig. *f.*; in which a representation is made of the injury which the coats of the bowel may receive from being too rudely pressed against the stricture : also the Medical Gazette, vol. xiii. p. 926, in which the hernial sac, with its contents, had been reduced by the taxis, but the strangulation still continued, and produced the death of the patient.

aponeurosis of the external oblique, draws it downwards into the centre of the upper part of the thigh, in order to obliterate the angle which is formed between the fundus and neck of the swelling. When this has been done, he steadies the parts about the neck of the sac with the fingers of the left hand, while he makes a gentle but gradually increasing pressure upon the whole of the contents of the hernia with his right hand. The direction of this pressure upon the tumour should be (when the angular reflection of it described has been effaced) upwards, with a slight inclination outwards, so as to avoid compressing the contents of the sac against the spine of the pubis and Gimbernat's ligament. If there be any gurgling sensation perceived in the tumour during the employment of the taxis, it is an encouragement to continue in our efforts to reduce the intestine, as it probably arises from the passage of some of the fluid and gaseous contents of the gut from the strangulated into the unaffected part of the alimentary canal. It is much better to maintain the pressure gently for a considerable time, than to act with more haste and to employ a greater degree of force, in a shorter period. Moving the neck of the tumour a little from one side to the other, and endeavouring to draw it outwards, as it were, sometimes prove very useful in altering the exact relations of the strictured part of the bowel to the neck of the sac, and in this manner facilitate the return of a portion of its contents, after which the whole will in general quickly follow. I have known the taxis to succeed almost immediately in a great number of cases sent into the hospital for the express purpose of being submitted to the operation with the knife, and in which the first attendants had tried the taxis most indefatigably for an unusual length of time, but without success, simply because the patient had not been placed in that position which is most favourable to effect the relaxation of the structures attached to and composing the crural arch. It is extremely injurious to persevere very long in the employment of the taxis, as it it can be readily ascertained by any one who is qualified to estimate the resistance, whether there is any likelihood of the hernia being reduced without a previous division of the stricture; indeed, it is the deliberate opinion of many of the best writers in surgery, that the taxis has been productive of much more harm than good, in consequence of the long-continued and persevering efforts to re-

duce, at all risks, the contents of a strangulated hernia, rather than to have recourse to the knife. When the abdomen is swollen, and there is tenderness of it and of the tumour under pressure, the taxis should not be persevered in; but immediate recourse had to the operation with the knife, which the history of surgery amply proves to be followed by success, in exact proportion to the gentleness and short duration of the efforts previously employed in the attempt to reduce the strangulated intestine by the taxis.† The taxis sometimes succeeds, although it may have failed a short time before, after the exhibition of such active remedies as are well known to reduce the vascular action and muscular tone of the individual to whom they are administered; these are the hot bath, free venæsection, tartar emetic,‡ and the tobacco enema; all other remedies are of very little avail, and therefore need scarcely ever be employed in cases of acute strangulated femoral hernia.

Section V.

THE OPERATION FOR STRANGULATED FEMORAL HERNIA.

The taxis, aided as it may have been by the hot bath, &c. having been fairly tried, and the hernia still remaining unreduced, it is of the utmost importance that the operation for the removal of the stricture upon the strangulated bowel should be delayed no longer; for it is very generally admitted, if it be not completely proved, that a fatal amount of injury is much earlier inflicted upon the tunics of the intestine by the stricture in cases of femoral herniæ, than in any other kind of rupture. Sir Astley Cooper mentions, in his work on hernia, two cases; in one of which death occurred in eight hours, and, in the other, in twenty-one hours from the commencement of the symptoms: although he says, at the same time, that he has known the operation to have succeeded when it has been performed as long as eight days

† *Vide* the works of Desault, Richter, Pott, Hey, Velpeau, Lawrence, and many other equally distinguished surgeons, who are unanimous in deprecating violent and long-continued attempts to reduce strangulated herniæ by the taxis.

‡ A considerable number of cases of strangulated hernia have been successfully treated in the hospital of the College, by prefacing the taxis with nauseating doses of tartar emetic: of course, if vomiting be produced, the action of the abdominal muscles might be productive of much harm; the doses of this medicine should therefore be very moderate.

from the first accession of the strangulation. The principal guide, then, in deciding as to the proper moment for relinquishing the employment of the taxis, and other milder remedies for the operation, appears to be the degree of tenderness and tension of the belly; for if this be at all considerable, and especially if increasing, then it is evident that no time is to be lost. The justly celebrated Mr. Hey writes thus: "I have now performed the operation forty times; and have often had occasion to lament that I performed it too late, but never that I had performed it too soon."†

The bladder should be emptied before the operation is performed, as instances have occurred in which it was wounded while dividing the stricture.‡

The operation may be done as the patient lies in bed, or he may be placed upon a table properly prepared for the purpose. The surgeon places himself on the same side as the hernia, and commences the first incision one inch above the situation of the crural ring, extending it obliquely downwards and outwards, over the centre of the tumour below the crural arch. The object of beginning the incision so much above the superior edge of the tumour, is to obtain plenty of room over the neck of the sac, which must be freely exposed, so as to permit of its division with the probe-pointed bistoury, in a latter part of the operation, with greater ease and safety. The least painful and most expeditious way of making this incision, is to pinch up the integuments, so as to make a fold obliquely across the tumour, through which fold the bistoury should be passed with its back turned towards the tumour, and then carried, at one stroke, outwards to the surface.

Many surgeons prefer making the first incision over the tumour parallel with Poupart's ligament, and then meeting it at the centre by another cut, which is carried obliquely upwards and inwards over the neck of the sac, so as to resemble the letter L reversed; while others, again, recommend a crucial incision. The form of the incision is, however, of little importance, provided that it is made in such a manner as to disclose freely the neck of the sac at its upper and internal part.§ If it be a large hernia, the

† Hey's Surgery, 2d edit. page 130.

‡ Op. citat. p. 156; in which a case in the practice of a surgeon of some eminence is mentioned, where this accident actually occured.

§ Mr. Cooper's Surgical Dictionary, p. 738, 7th edit.

incisions need not extend over the whole of the tumour, which would be very inconvenient, but only over the upper part.

It seldom occurs, in making these incisions, that any of the superficial arteries of the groin are injured; though, no doubt, a case may be met with occasionally, in which either the superficial pudic or epigastric arteries running over the tumour might be divided, when, if the vessel bleeds freely, it should be secured by a ligature before proceeding any further in the operation.

The investments which the sac receives from the superficial fascia and the fascia propria, are in the next place to be divided, either with the hand unsupported, as is recommended by Scarpa and Mr. Liston,† or upon the director, which is to be introduced under them, after pinching up a small fold with the forceps, and making a slight horizontal cut with the scalpel.

The number of layers which cover the hernial sac appears to vary in almost every case, since they greatly differ from one another in their thickness and density, as well as according to the particular method of operating which may be adopted by the surgeon with regard to the use of the scalpel and director; but, where a director is not used, these may in general be reduced to three, viz. the integuments, the superficial fascia, and the fascia propria.

When the superficial fascia has been divided, an oval-shaped fatty body presents itself, which, on being slightly moved, may be insulated from the adjacent structures, and which, in fat persons, resembles a portion of the omentum, having precisely the same shape and size as the hernia; so that a doubt is apt to arise in the minds of those present, whether the hernial sac has been opened or not, and whether the hernia is really omental. But, on pressing gently this fatty tumour, a certain resistance and elasticity is felt, which is not proper to the structure of the omentum. Therefore, on laying hold of it with the points of a pair of forceps, and dividing layer after layer, the hernial sac at last appears under this fatty capsule, from which it may be distinguished by its smooth thin texture, and its transparency. This is one of the most delicate steps of the operation for femoral hernia in both sexes; and more particularly so, because, in general, the hernia, on being stripped of its coverings, is of small size, sometimes very small, so that it requires,

† *Vide* Operative Surgery, by Mr. Liston; 2d edit. p. 482.

on the part of the surgeon, unusual information and great dexterity, to separate this fatty sheath from the true hernial sac, without dividing the latter, and injuring the viscera contained in it.†

In several instances, the fascia propria has been mistaken for the sac itself: and thus it has happened, even in the practice of the most skilful and experienced surgeons, that the margins of the crural ring have been cut external to the sac, which was then forcibly pushed back into the belly, with its contents, which, being still tightly girt by the thickened neck of the sac, remained strangulated, and caused the death of the patient. After these operations, the unopened hernial sac, with its contents, have been shown to have been pushed up into the loose cellular tissue which connects the outer surface of the peritonæum to the fasciæ lining the iliac fossa.‡

It should be recollected, also, that cysts, having many of the appearances of the proper hernial sac, may be met with in the subserous cellular tissue, (which, indeed, is a part of the fascia propria,) and might cause some embarrassment, if their nature be not recognised by the operator. An interesting case of this kind occurred in the hospital of the College during the course of last winter, in the practice of Professor Cooper, in which several cysts filled with a clear sanguinolent fluid were opened before the hernial sac was arrived at.§

The peritonæal sac having been exposed, a small piece of it is to be held up between the fingers, or the blades of the forceps, taking very great care to exclude any portion of its contents,

† *Vide* Scarpa on Hernia, translated by H. Wishart, p. 271; 8vo. Edin.

‡ For cases of this kind, see Sir Astley Cooper's work on Crural Hernia, 2d edit. p. ii. p. 11; the works of Le Dran, obs. 58; De La Faye, in Dionis's Surgical Operations, 5th edit. p. 324; and Arnaud, Traité des Hernies, tom. i. p. 96; Cloquet, Recherches, pp. 112-16; Scarpa, translated by Wishart, p. 143; London Medical Gazette, vol. i. pp.485-6, and vol. xiii. p. 926; the Dictionnaire de Médecine et de Chirurgie Pratiques, tom. ix. p. 571, article Hernie: also Mr. Lawrence's valuable Treatise on Ruptures, 5th edit. pp. 92 and 150.

§ *Vide* the London Medical Gazette for March 2, 1839, p. 835. It would seem that Sir Charles Bell has met with the same appearances, for he says that "Sometimes the sac is covered, not only with lymphatic glands, but with vesicles of serum, and these give to the tumour a great irregularity: they require a careful dissection.—Illustrations of the Great Operations of Surgery, by Sir Charles Bell, p. 41, folio; also, Médecine Opératoire, par M. Velpeau, tom. iii. pp. 362-3.

and an opening cautiously made with the scalpel held horizontally. The director, or the probe-pointed bistoury, is then to be introduced into the opening, between the inner surface of the sac and the intestine, and the former laid freely open, more especially in a direction upwards towards its neck.

When the contents of the sac have been examined, the stricture should be divided, in order to admit of the easy return of the strangulated intestines. For this purpose, the left forefinger should now be gently introduced between the inner surface of the sac and the bowel, and the stricture sought for at the upper and inner angle of the wound. The tip of the finger-nail, should be insinuated underneath the band which forms the stricture, and the blunt extremity of the probe-pointed bistoury (placed flat upon the finger) glided just within the sharp margin of the stricture; after which the edge of the knife is to be turned upwards, and, the handle being raised, the tendinous band which resists the return of the bowel will be easily divided. If a director be used, its point should be very carefully passed underneath the stricture, and the knife carried along its groove, and raised as just mentioned,—but the finger is preferable, for, at the same time that it guides the instrument, it serves to protect the bowel. Generally speaking, a cut of about two or three lines in extent will suffice to remove the stricture.† There is no fear of wounding any of the vessels which may take their course over the neck of the sac, unless the probe-point of the bistoury be carried much too far within the crural ring.‡

† Sir Astley Cooper recommends the incision of the neck of the sac to be made upwards and with a slight obliquity inwards, so as to divide the fascia transversalis and the posterior edge of Poupart's ligament; Pott, Hey, Dupuytren, and Hesselbach, cut upwards. Gimbernat, Langenbeck, Scarpa, Todd, and Lawrence have found the division of the internal edge of the crural ring sufficient to remove the stricture; while Professors Cooper, Liston, Syme, and many others, cut obliquely upwards and inwards. It will be readily admitted, however, that it is not so much the direction of the incision, as its extent, that forms the essential point of practice in this part of the operation; and it is very fortunate that a slight cut of from two to three lines is usually sufficient for the removal of the stricture, by dividing the several parts which have been regarded by these writers as the seat of the strangulation, at the same time that it does not reach any of the vessels which may perchance run over the neck of the sac.

‡ Mr. Guthrie states that he has been made aware of more than one in-

It may be asked what is the seat of the stricture in femoral hernia? The answer to which question is, that it is not the same in all cases, though, in by far the greater number of instances, the constriction is relieved by the division upwards and inwards of the falciform process of the fascia lata and the lunated edge of Gimbernat's ligament, where they join with each other. In some instances it will be the fibres of the deep crescentic arch; in others, again, the neck of the sac itself, and produced by a thickening and contraction of the subserous and peritonæal membranes where they lie within the circumference of the crural ring.

The stricture having been divided in an oblique direction upwards and inwards, the contents of the sac may be returned, provided there be no contraindicating circumstances; in effecting the reduction attention should be paid to the position of the limb, which ought now to be flexed upon the trunk, and rotated inwards, so as to relax more completely the crural arch, at the same time that great care is taken to handle the intestine with extreme gentleness. If both have been protruded, the bowel should be returned before the omentum. If the omentum presents the appearance of a large and hard mass, and of such a form as not to be readily passed back through the crural

stance of the obturator artery, surrounding the neck of the sac, having been wounded in operations for strangulated femoral herniæ, which were performed by some of the best anatomists and surgeons in London, and that the patients subsequently bled at intervals until they died from hemorrhage.—(*Guthrie on Crural Hernia*, 4to. *p.* 36.) Dr. Trüsted, of Berlin, mentions a case in which the surgeon wounded the obturator artery, while cutting the crural ring inwards, and the patient died eight days after the operation; six ounces of putrid blood were found in the cavity of the pelvis.—(*See Cooper's Dict. of Pract. Surg. p.* 741; *7th edit.*) M. Velpeau has recorded a similar case which occurred in the hospital of La Charité, Paris, in which the hemorrhage was arrested by a graduated compress, the furthest extremity of which projected into the iliac fossa; it was kept there for five days, and then removed without being followed by any return of the hemorrhage. —(*Méd. Opér. tom. ii. p.* 489.) Mr. Hey wounded a large vessel, probably the epigastric, when cutting directly upwards, in the case of an old woman, and not on that side of the intestine which was most distant from the femoral artery. The incision was, however, half an inch in length, which is rather longer than is necessary. Mr. Hey found it impracticable to ligature the vessel, but placed a piece of sponge, supported by a firm compress, upon the bleeding spot, which he kept there for fourteen days, when it was removed. This case

ring into the belly, it may be either left in the sac, or cut off with the knife, taking the precaution of tying each of the bleeding vessels, as they are divided, with a small thread. If the omentum should be gangrened, the mortified portion may be excised, and such vessels as bleed ligatured; the remainder may then be reduced into the neck of the sac, where it is to be retained by the ends of the ligatures which hang out at the external wound.

Before the operation is concluded, the extremity of the little finger should be introduced into the neck of the sac, in order to ascertain with certainty that the hernia has been fairly reduced into the belly; as instances have occurred in which operations, in all other respects well performed, have failed in affording relief, in consequence of the intestine being entangled at the neck of the sac, or even pushed up between the peritonæum and the fasciæ lining the iliac fossa.† The operation having been finished, and the intestines fairly reduced, the edges of the wound should be brought together with one or two points of suture, after which a pledgit of lint may be applied, supported by a compress and spica bandage.

Treatment after the operation.—The principal circumstance requiring attention after the reduction of the intestine, is the

also did well.—(*Pract. Obs. p.* 161; 2*nd edit.*) Arnaud relates the case of a young man who died a few minutes after the operation for strangulated femoral hernia, in whom it was afterwards found that the artery of the spermatic cord had been divided.—(*Mém. de Chirurg. tom. i. p.* 758.)

Sir Astley Cooper mentions a case in which the surgeon, mistaking a femoral for an inguinal hernia, cut the stricture at the crural ring in a direction towards the ilium, and in consequence wounded the femoral vein. The venous hemorrhage was very profuse, and delayed the operation fifteen minutes, and was stopped with very great difficulty. He also mentions another case, in which the surgeon cut outwards, acting under the same mistaken impression, and narrowly escaped destroying his patient.—(*Sir Astley Cooper on Crural Hernia, p.* 4; 2*nd edit.*)

† The following case illustrates the importance of attending to this rule:—An old woman, who had laboured several days under symptoms of strangulated femoral hernia, submitted to the operation. The surgeon, having exposed the sac, divided the stricture formed by Poupart's ligament; but the sac itself was not opened at the first, for it was considered to be the intestine. It was endeavoured to reduce the hernia satisfactorily, but in vain; when, on closer examination, it was found that the peritonæal sac had not been divided. The sac was now fully opened, and, as the stricture had been divided

procuring of evacuations from the alimentary canal. The best method of producing these is to throw up a copious enema, which will, in the greater number of instances, be speedily followed by plentiful evacuations, with a marked relief to the pain, sickness, and vomiting. It may be sometimes necessary to accelerate the action of the intestinal canal by purgatives administered by the mouth; and of these a table-spoonful of castor oil with a few drops of laudanum, or dram doses of the sulphate of magnesia in peppermint-water, given every hour, are the best. The earliest appearances of peritonæal inflammation should be anxiously watched for during the first few days after the performance of the operation; and, should they supervene, combatted at their commencement by venæsection, if the patient's strength will admit of it, and leeches to the belly, which may be followed by fomentations, and a large blister. In cases where the operation has been had recourse to early, the patient will most frequently recover, without any bad symptom occurring after the relief of the strangulated bowel; but, on the contrary, when the operation has been long deferred, and especially after persevering and violent efforts have been employed in the attempt to reduce the hernia by the taxis, nothing, I believe, will avail to prevent a fatal termination. In these cases the coats of the

externally to it, there was supposed to be no occasion to divide it at the neck; nor was the intestine drawn down to be looked at, but it was readily returned, as the surgeon said, into the abdomen. The wound was then closed by a suture. Three days after the operation had been performed, during which time the symptoms of strangulation obstinately persisted, the woman died. On opening the abdomen, the intestine was found very firmly constricted by the mouth of the peritonæal sac, and on looking into the sac from the wound in the thigh, no intestine was at first perceived; but, when examined more closely from within, it was found pushed up between the peritonæum and the sheath of the femoral vessels: so here it had remained, and of course the symptoms continued. (*Vide* Sir Astley Cooper on Crural Hernia, note at the bottom of page 11, 2nd edit.) In Plate VII. fig. 4, of the same work, is a representation of the hernial sac, which had been returned into the abdomen unopened, in a case in which death ensued from the strangulation of the intestine by the neck of the sac still continuing unrelieved. Similar cases are recorded by Scarpa, Sir Charles Bell, Lawrence, Dupuytren, and Breschet. See a very interesting Clinical Lecture, by Sir Charles Bell, on Femoral Hernia, in the 13th vol. of the Medical Gazette, p. 926; London, 1834.

intestine have suffered so much injury from the long duration of the constriction, and the violence of the taxis, that they fall into a state of chronic inflammation, which ends, frequently, after the lapse of several weeks, in the death of the patient. In such a case, the portion of the intestine which had been strangulated may be readily distinguished from the rest of the alimentary canal by the dull iron-grey tint or slate-colour which it presents, and sometimes also by numerous petechial spots which are perceptible upon various points of the surface, being situated underneath the peritonæal coat.

A truss should be applied before the patient is allowed to get up from bed; for it is a general observation that femoral herniæ are much more liable to recur after an operation, than inguinal, and, when this has happened, to become very much larger than before.

There is reason to believe that death ensues in some cases of strangulated hernia, although the stricture has been divided, and the intestine safely returned into the belly, from the portion of gut which had been down in the sac still refusing to act: for its muscular coat has suffered so much injury by the long continuance and violence of the strangulation, that it is no longer able to propel the fæcal contents of the intestinal canal; or, in other words, that the part of the bowel which had been included within the stricture is paralyzed, and thus, though freed from all constriction, may, nevertheless, remain a cause of obstruction and death.†

The appearances which are observed after death, when an individual dies from strangulated hernia, unrelieved by any operation.—When the abdomen is opened, the intestines are found inordinately distended, inflamed, and discoloured; and the inflammation of the peritonæum is not confined solely to that portion of it which invests the alimentary canal, but extends also to that which lines the inner surface of the abdominal parietes.‡ There is, at the same time, usually present in the cavity of the abdomen, a greater or less quantity of serum, mixed with numerous flocculi of recently effused coagulable lymph; the effusion not unfrequently presenting the appearance

† *Vide* a Clinical Lecture on Cases of Hernia, by Sir Charles Bell, in the 13th vol. of the Lond. Med. Gaz. p. 925.

‡ Op. citat. p. 984.

rather of a sero-purulent fluid than of a pure serosity. The convolutions of the intestines around the strangulated portion are commonly adherent to one another by coagulable lymph which is poured out upon their peritonæal surface. The portion of the intestinal tube which intervenes between the stomach and the strangulated part, is greatly distended with air and fæcal matter, and also violently inflamed; while that which is situated beyond the stricture is comparatively empty, and retains its natural appearance. The piece of the bowel which is included within the grasp of the stricture is of a reddish-brown or deep purple tint; sometimes it is even black; and, in the more advanced stages, frequently of a grey slate, or greenish hue.† Sometimes there are evident spots of mortification present here and there, and the whole of it may be so soft and pulpy as to break down readily under the simple pressure of the finger. Occasionally the intestine will be found to have given way directly opposite the stricture, and the fæces to have been extravasated into the abdomen.

In those instances in which death ensues, notwithstanding that the stricture upon the intestine has been removed by an operation, the morbid appearances are much the same as in the preceding case, though they may be, perhaps, somewhat less intense in degree. The portion of the bowel which has been the subject of the strangulation is, however, always readily distinguishable from all the rest of the alimentary canal by the greater depth of its colour, which has been frequently known to persist as long as fifteen or twenty days from the time at which the strangulation was removed by the division of the stricture. The peritonæum at the seat of stricture is usually found puckered and drawn into folds, which, adhering to one another by their opposite surfaces, close the orifice of the hernial sac, the lower part of which in some instances becomes distended with a serous fluid, so as to resemble a simple cyst.‡

† *Vide* a Paper by the Author, on the Symptoms of Strangulated Intestine, in the London Med. Gaz. p. 507-8; December 1837.

‡ *Vide* a Clinical Lecture by Professor Cooper, in the London Medical Gazette for the 11th of May 1839, p. 253.

CHAPTER V.

OF SOME OF THE DISEASES WHICH FREQUENTLY OCCUR IN THE GROIN.

Bubo.—This term is sometimes restricted, though improperly so, to the swelling which is produced by an inflammatory enlargement of one of the lymphatic glands in the groin in consequence of venereal ulcerations, or discharges affecting the external organs of generation, since these glands may swell and inflame from many other causes, independently of any syphilitic taint.

The venereal bubo, when it follows the presence of a chancre upon any part of the pénis, has its seat commonly in one of the superficial lymphatic glands which lie parallel with, and upon Poupart's ligament. (See Plate I. fig. 10.) The longer diameter of the swelling is directed transversely to that of the limb; and its situation, which is exactly in the bend of the thigh, explains the great pain and difficulty which are experienced by the patient on walking, or using any similar exercise.

A swelling of one of these glands may be caused by a simple gonorrhœa, but then it seldom proceeds to suppuration.

The glands which lie alongside of the great saphena vein (Plate I. fig. 11.) frequently inflame and become swollen in consequence of ulcers or some similar source of irritation situated lower down upon the limb; as, for example, between the toes, upon the ancle, heel, and lower part of the leg and thigh. The inflammation, which is at first situated in the lymphatic vessels and one of the absorbent glands, may become diffused by extending itself to the surrounding cellular and adipose tissue, and terminate in a large and deep abscess of the groin. These glands are also occasionally found to become enlarged from disease about the anus, and the perinæal and glutæal regions, which should be removed before we can expect much benefit to follow the application of remedies to the swelling itself. In all these cases the long diameter of the tumour is parallel with the course

of the saphena vein, which alone will frequently be sufficient to indicate the origin of the affection. In persons of a scrofulous habit of body the inguinal glands may enlarge and suppurate without any other obvious cause than some violent exertion of the limb.

All buboes, as soon as suppuration is fairly established, should be freely opened by a neat incision, which should be made to extend through the whole length of the tumour in the direction of its longest diameter. There are, however, some cases in which it is better to employ, for the purpose of opening a bubo, a finely pointed pencil of the potassa fusa; for example, some of the buboes which occur in scrofulous persons, or in individuals possessing a hemorrhagic diathesis, in whom it would be extremely dangerous to employ the knife.†

When the sore resulting from the opening of a bubo does not heal, but remains indolent, and its edges are high and callous, much benefit will frequently result from the use of well-applied pressure by means of a compress and the spica bandage; but if, on the contrary, the edges be thin and undermined, and of a purplish colour, they should be either freely incised at several points, so as to allow of their retraction upon the parts underneath,—removed with the knife,—or destroyed by the application of the potassa fusa. When a large indurated gland remains in the centre of the sore, and interferes with the due progress of cicatrisation, it should be destroyed by repeated applications of the caustic potash, as its removal with the knife may be followed by very unpleasant hemorrhage, which may prove exceedingly difficult to control, since a ligature cannot always be made to hold upon the bleeding vessel, the coats of which, being softened by the previous disease, readily give way when the knot is drawn. A small hernial sac, it must also be recollected, may lie close underneath an enlarged gland, and might be laid open were the tumour to be cut away with the knife.‡

† A man of the name of Ploughwright was admitted about a month since into University College Hospital, under the care of Mr. Liston, on account of a large bubo in the left groin, which was opened in this manner with the caustic potash; for it was deemed dangerous to employ the knife, as he had several times nearly lost his life by hemorrhage from the most trivial wounds.

‡ M. Velpeau recites a case of this kind, in which death ensued from the injury done to the intestine that was contained in the sac. *Vide* Nouveaux

Sometimes an inguinal gland becomes swollen, and remains enlarged for a long time, without any change taking place in its condition: in such a case the repeated application of blisters, followed by the employment of pressure, will frequently succeed in procuring its rapid removal by absorption.

Psoas abscess.—This affection, while in its early stages, might be mistaken, in a cursory examination, for a femoral hernia; but the history of the symptoms, the fluctuation which is perceptible in the tumour, and very frequently its situation, which is usually much nearer to the spine of the ilium than that of a femoral hernia, will always afford sufficient grounds upon which a correct diagnosis may be founded.†

Steatomatous tumours.—Fatty tumours are frequently met with in the groin, and in some instances, owing to the co-existence of many of the symptoms of strangulated intestines, have, from their small size and their situation, been mistaken for femoral herniæ, accompanied with symptoms of strangulated intestine.‡ I have seen several adipose tumours of very considerable size situated in this region. In general their removal by the knife is easily effected, as they seldom adhere very closely to the sheath of the great vessels, which lie beneath them.§

Scirrhus of the glands of the groin.—The glands of the groin are rarely affected with scirrhus, yet some cases of this kind have been recorded by various authors. The nature of the disease is, however, rarely detected in sufficient time to enable the surgeon to interfere with any prospect of success from an operation, as the glands which are more deeply seated in the

Eléments de Médecine Opératoire, tom. ii. p. 333; Paris, 1832. There is a preparation preserved in the Museum of the College in which a small hernial sac adheres to the base of an enlarged inguinal gland, which occupied the centre of an ulcer in the groin.

† Mr. Cooper mentions an instance in which the surgeon, who had been first in attendance, mistook a psoas abscess for a femoral hernia. *Vide* The Dict. of Practical Surgery, 7th edit. p. 944.

‡ Several cases of this kind are detailed in the second volume of M. Velpeau's work upon Operative Surgery, p. 333.

§ During my residence in the hospital of Newcastle-upon-Tyne, a tumour of this nature, which was as large as the head of a young child, was extirpated by Mr. Heath, one of the surgeons to that admirably conducted institution. Similar cases will be found in Sir Astley Cooper on Hernia, part ii. p. 4; 2nd edit.; Recherches sur les Hernies, p. J. Cloquet, 7e Obs. p. 25; 4to. Paris, 1819, and in the Lancet for 1839, p. 39.

iliac fossa are, in most cases, similarly affected. The glands of the groin frequently become diseased secondarily in malignant affections of the lower extremity; and hence it is right to ascertain their condition by a careful examination before any operative procedure, such as amputation, is performed for the removal of the primary disorder.†

Hydatid tumour.—The celebrated Desault relates the case of a girl from whose groin he removed a hydatid tumour, for which she had been advised by several other surgeons to wear a truss.‡ In another instance, which is mentioned by Dr. Monro, a sac of the size of an egg, which contained within it a quantity of hydatids, was removed from the upper and inner part of the thigh, where it might be readily mistaken for a hernia, as the hydatids contain a watery fluid, have thin and elastic coats which communicate to the touch nearly the same kind of sensation as a protruded portion of intestine, and are contained within a covering very similar to a hernial sac.§

† Dr. Warren relates the case of a lady in whom the glands of the groin were affected with scirrhus.—Surg. Obs. on Tumours, by D. Warren, U. S. 8vo. pp. 169-71.

‡ See a case of spurious hernia, occasioned by a hydatid of a considerable size, cured by excision, in Desault's Surg. Jour. trans. by R. Gosling; Lond. 1794; vol. i. p. 238.

§ Observations on Crural Hernia, by Alexander Monro, M.D.; Edin. 8vo. 1830; p. 80.

THE SURGICAL ANATOMY

OF

THE THIGH.

CHAPTER I.

DISSECTION OF THE GREAT VESSELS AND NERVES OF THE THIGH.

As this dissection serves to illustrate the principal points connected with the surgical treatment of femoral and popliteal aneurism, wounds of the great vessels, and amputations of the thigh and leg, &c. especially when these operations are followed by secondary hemorrhage, it is desirable that it should be executed with great care and attention. The dissection which has already been made for the purpose of displaying the anatomy of femoral hernia has, in some measure, anticipated the present; but there will be found no difficulty in continuing it in such a manner as to allow of every desirable object relating to the above-mentioned subjects being obtained, without having recourse to a fresh limb.

The cutaneous nerves of the anterior part of the thigh should be traced to their ultimate distribution previously to the dissection of the fascia lata from the muscles upon the lower part. They are three, and not unfrequently more, in number; and are named external, middle, and internal cutaneous.

1. The *external cutaneous* nerve is a branch from the second and third division of the lumbar plexus, from which it descends obliquely upon the iliacus muscle, in its way to reach the crural arch; underneath which it passes, at a short distance from the

anterior superior spinous process of the ilium. (See Plate IV. fig. *s*.) Below the crural arch the nerve rests upon the upper part of the sartorius muscle, and soon pierces the fascia lata, when it divides into two branches, the larger of which runs almost vertically downwards to the external border of the knee, distributing numerous filaments to the integuments covering the vastus externus muscle; the other branch is much smaller than the preceding, and, inclining backwards, crosses over the tensor vaginæ muscle to ramify in the skin covering the anterior part of the gluteal region.

2. The *middle cutaneous* nerve is a branch of the anterior crural, and pierces the fascia lata about three inches below Poupart's ligament; it may be traced, as it lies upon the fascia enclosing the rectus muscle, as far as to the skin covering the patella. (See Plate VI. fig. *r*.)

3. The *internal cutaneous* nerve is also a branch from the anterior crural, and follows nearly the course of the great saphenous vein, ramifying in the skin covering the vastus internus muscle, as far as the inner border of the knee.

The integuments of the front of the thigh receive, besides the nerves which have just been described, numerous filaments from various other branches of the anterior crural and obturator nerves, as well as from the ilio-inguinal and genito-crural nerves of the lumbar plexus.

The femoral vessels.—The femoral artery and vein may be exposed throughout their course, by merely raising the fascia lata from the muscles which occupy the front and inner surface of the thigh, and carefully removing the loose cellular and adipose substance which fills up the interstices between them, so as to avoid injuring the numerous branches that spring on each side from the main trunks. The deep-seated branches of the anterior crural nerve may also be displayed at the same time. (See Plates IV. and VII.)

EXPLANATION OF PLATE VII.

This plate represents the dissection of the large vessels and nerves on the front of the thigh, after the fascia lata has been removed from the muscles.

a. The anterior superior spinous process of the ilium.

b. The tuberosity and crest of the os pubis.

c. The crural arch.

d. The cut surface of the os pubis, near its symphysis.

London. Taylor & Walton, Upper Gower Street.

e. The tendinous aponeurosis of the external oblique muscle of the abdomen.

f. The external abdominal ring.

g. The sartorius muscle, the lower part of which has been turned slightly aside, in order to display the superficial femoral artery in the middle third of the thigh.

h. The adductor longus muscle.

i. The pectineus muscle.

k. The adductor brevis muscle, which lies behind the preceding muscles.

l. The gracilis muscle.

m. The adductor magnus, which lies behind the pectineus and two other adductor muscles.

n. The rectus muscle.

o. The vastus externus muscle.

p. The vastus internus muscle; above the letter is seen a branch of the anastomotica magna artery.

q. The tensor vaginæ femoris.

r. The trochanter major of the thigh-bone.

s. The patella.

1. The common femoral artery.
2. The superficial femoral artery. The figure is placed upon the vessel, in the situation where the ligature is carried round it in Scarpa's operation. A small nervous filament frequently passes obliquely over the vessels at this spot.
3. The profunda femoris giving off the external circumflex artery, and then inclining inwards, behind the superficial femoral, and afterwards furnishes the perforating branches.
4. The femoral vein.
5. The superficial femoral artery in the lower part of its course. It was here that Hunter was accustomed to secure the vessel, in his celebrated operation for the cure of the popliteal aneurism. The internal, or long saphena nerve, is seen lying upon the superior and external side of the artery.
6. The lower part of the strong tendinous aponeurosis, which, passing from the vastus internus to the adductor longus and magnus muscles, binds down the vessels in the middle third of the thigh.
7. The trunk of the anterior crural nerve, which, a little distance below Poupart's ligament, divides into a large lash of branches.

* The crural ring.

The *femoral artery* is the continuation of the external iliac, which assumes this name as it passes underneath the crural arch midway between the anterior superior spinous process of the ilium and the symphysis pubis. From this point the

femoral artery descends almost vertically to the junction of the middle with the lower third of the thigh, where it passes through a tendinous aperture in the triceps muscle, to reach the popliteal region. The course of the femoral artery may be indicated by a line extended from the middle of the space between the anterior superior spinous process of the ilium, and the symphysis pubis, to the centre of the popliteal region. Relations.—The femoral artery lies very superficially in the first part of its course, as it is only covered by the common integuments, some lymphatic glands, and the fascia lata; but in the middle third of the thigh it is situated more deeply, and is additionally concealed by the sartorius muscle, and the strong tendinous aponeurosis which is stretched across the vessels from the vastus internus to the adductor longus and magnus muscles. (See Plate VII. fig. 6.) Posteriorly the femoral artery at first rests upon the inner edge of the psoas muscle, which separates it from the horizontal branch of the os pubis, and the fibrous capsule of the hip-joint: as the muscle soon sinks deeper to be inserted into the trochanter minor, the artery is then supported upon some loose cellular tissue, in which are situated the profunda artery and vein; it afterwards rests upon the tendinous insertion of the adductor longus muscle, and near its termination upon the conjoined tendons of that muscle and the adductor magnus. Near the crural arch the femoral vein is placed upon the pubal side of the artery, and lies upon the same plane with it; but, as they descend together, the vein gradually inclines backwards, so as to become placed a little behind the artery, which position it generally retains throughout the remainder of their course to the popliteal region. Externally the femoral artery is successively in relation with the psoas magnus, the inner edge of the sartorius, and the vastus internus muscles. The trunk of the anterior crural nerve is at first separated from the artery by the sheath of the vessels, and the external fibres of the psoas muscle; but, towards the termination of the superior third of the thigh, one of its principal branches (the *internal saphenous nerve*) enters into the sheath of the vessels, and lies upon the outer edge of the artery, as far as to the point where the latter passes through the triceps muscle to reach the cavity of the ham; there the nerve separates from the artery, and soon becoming superficial, pierces the fascia lata, just below the inner side of the knee, and passes

down the leg in close relation with the internal saphena vein. (See Plates IV. and VII.) Several delicate filaments of the anterior crural nerve cross obliquely over the vessels as they descend upon the thigh, and must frequently be included within the ligature when the femoral artery is tied in the usual situation; but their size is much too small to render them of any particular importance. One of these smaller branches may be seen lying upon the artery in the Plates IV. and VII.†

There are three or four small lymphatic glands situated upon the femoral artery; these may become enlarged, and simulate an aneurismal tumour from having a pulsation communicated to them from the subjacent vessel.

Ulceration of the inguinal glands may extend to the coats of the femoral artery, and so give rise to a fatal hemorrhage; an accident which I have seen occur in a case of a phagedenic ulcer following a venereal bubo in the left groin.

Branches of the femoral artery.— The *profunda artery* arises from the external and posterior surface of the common femoral, usually from an inch and a-half to two inches below Poupart's ligament. (See Plate VII. fig. 3.) It is not unfrequently, however, found to arise from the femoral much higher than this point, and, in some instances, opposite the lower border of the crural arch: occasionally, indeed, it is given off from the external iliac artery.

Immediately after its origin, the profunda runs a little backwards and outwards, in front of the psoas and iliacus muscles; but it soon changes its direction, and, inclining inwards, passes behind the superficial femoral artery and vein, and gets under cover of the adductor longus muscle; between which and the adductor magnus, it continues to descend, gradually approaching the linea aspera of the femur, near which it pierces the fibres of the last-named muscle, and is finally lost among the flexor muscles on the posterior aspect of the limb. Near to its origin from the common femoral, the profunda gives off two large branches, which are named the *external* and *internal circumflex* arteries; and, as it runs underneath the abductor longus, it fur-

† The great pain which is occasionally felt by patients in whom the femoral artery is tied, when the knot of the ligature is drawn tight, is, doubtless, caused by one of these delicate nerves having been included within the circle of the thread.

nishes three or four others, which have been denominated the *perforating* arteries.

The *external circumflex artery* runs transversely outwards, passing in front of the neck of the thigh-bone, between the rectus and cruræus muscles: it divides, near the outer edge of the femur, into numerous branches, some of which ascend underneath the rectus, sartorius, and tensor vaginæ femoris muscles, and anastomose with the gluteal and circumflex ilii arteries; others run transversely over the outer surface of the trochanter major near its base, and communicate with the branches of the sciatic and internal circumflex arteries; while a third set, which are also the largest in size, descend obliquely between the rectus and cruræus muscles towards the knee-joint, where they inosculate with the articular branches of the popliteal artery.

The *internal circumflex artery*, after its origin from the profunda, inclines suddenly backwards, and passes between the psoas and pectineus muscles, so as to reach the external obturator muscle, in front of which it gives off several branches, some of which communicate with those of the obturator artery; it also sends a small branch into the hip-joint, which enters through the cotyloid notch, to supply the synovial structures of that articulation. The continuation of the artery then winds round the neck of the femur to gain the interval between the quadratus and adductor magnus muscles, after which it soon divides into branches, which anastomose with those of the sciatic, gluteal, and external circumflex arteries.

The branches of these arteries, and even the trunks themselves, are sometimes injured in dislocations of the hip-joint, and fractures of the neck and superior third of the thigh-bone, giving rise to extensive extravasation of blood among the muscles of the upper part of the limb.

The *perforating arteries* are three or four in number, and are so named from traversing, soon after their origin from the profunda, the fibres of the adductor brevis and magnus muscles; these vessels divide at the posterior surface of the limb into numerous branches, which are distributed to the hamstring muscles, and also communicate with the sciatic and circumflex arteries superiorly, and inferiorly with the articular branches of the popliteal artery.

The *anastomotica magna* is given off from the femoral artery,

while it is concealed in the tendon of the triceps ; it runs along in the substance of the vastus internus muscle to the knee, where it joins with the vascular plexus which is formed around that joint by the articular branches of the popliteal artery. (See Plate VII. fig. *p*.)

The femoral artery gives off, also, several small and irregular branches to the muscles which are situated on either side of its course ; but they have not received any particular names.

Varieties.—The circumflex arteries frequently arise from the common femoral, instead of the profunda ; the epigastric artery has been seen, though rarely, to arise from the inner side of the common femoral artery; and the epigastric itself has been observed, in some instances, to give origin to the internal circumflex artery. The profunda artery rarely arises from the femoral lower down than two inches from Poupart's ligament; but, on the other hand, it is not unfrequently seen to take its origin at various intermediate points between that distance and the lower border of the crural arch : all which are circumstances of great importance in the consideration of the comparative merits of the operations of placing a ligature upon the common, and superficial femoral, and external iliac arteries, with the view of arresting the violent secondary hemorrhages which occasionally ensue after severe injuries and amputations of the inferior extremity. Sir Charles Bell operated upon a negro who was affected with popliteal aneurism, in whom it was afterwards found that the superficial femoral artery was double, and that the two trunks were again united as they entered the popliteal space. In this case the blood in the sac of the aneurism was, nevertheless, coagulated ; although a considerable quantity had continued to circulate through it from the artery which had not been included in the ligature.†

M. Manec, in his work upon the ligature of the arteries, relates an instance in which the superficial femoral artery was absent altogether, and its place supplied by the sciatic artery, which descended upon the back of the thigh to become the popliteal.‡

† See the Lancet, vol. x. 1825-6, p. 629; The Dublin Hospital Reports, vol. iv. p. 313; Anderson's Quarterly Journal for October 1826 ; and Sandifort, Obs. Pathol. iv. 97.

‡ *Vide* A Theoretical and Practical Treatise upon the Ligature of Arteries; translated from the French of M. J. Manec. Lond. 4to. 1832, p. 209.

The *femoral vein*.—The femoral vein is the continuation upwards of the popliteal vein, and extends from the opening in the triceps adductor muscle to the lower edge of Poupart's ligament, where it ends in the external iliac vein. At its commencement inferiorly the femoral vein is situated behind, and a little to the outer side of the artery; but, in proportion as it ascends towards the groin, it winds round the posterior surface of that vessel, to gain its inner or pubal side; immediately below Poupart's ligament the femoral artery and vein lie on the same plane. The femoral vein receives two large branches at the distance of an inch and a-half below Poupart's ligament, viz. the profunda and great saphenous veins. The femoral vein also receives numerous other branches in its progress, all of which correspond very exactly to the branches which are given off from the artery. In the middle third of the thigh, the femoral vein is sometimes double, and then the artery lies between them; very frequently there is a smaller vein, which runs along the outer side of the superficial femoral artery, from which smaller branches of communication pass across that vessel to join at various points with the main trunk.

When the femoral vein pours out much blood in amputations of the thigh, and the hemorrhage cannot be arrested by milder means, it must be tied in the same manner as an artery, which I have seen done on several occasions, without any bad consequences resulting.

The anterior crural nerve.—In addition to the cutaneous branches, described at page 157, the anterior crural nerve divides into several others, which are for the most part distributed to the vastus externus, rectus, cruræus, and sartorius muscles. Two of the largest of its branches, however, are particularly deserving of notice, on account of their relation to the femoral artery in the middle third of the thigh. (See Plate VII. fig. 7.) The larger of these, *nervus saphenus major*, enters the sheath of the vessels near the point where the sartorius crosses over their course, and thence lies close upon the external border of the superficial femoral artery, as far as the opening in the triceps, where it then leaves it, to descend underneath the sartorius muscle, to the inner side of the knee-joint, upon which it distributes some of its branches; the nerve afterwards becomes subcutaneous, and joins the internal saphena

vein, which it accompanies as far as the inner edge of the foot, whence it passes onwards to the great toe. The other branch is rather smaller than the preceding, and lies a little more externally; it does not, therefore, enter into the sheath of the vessels, but inclines towards the vastus internus, the fibres of which it soon pierces in its descent to the knee-joint, upon which it is finally distributed.

The obturator nerve, which also furnishes branches to the articulations of the hip and knee, anastomoses with some of the branches of the internal saphenous nerve.

The severe pain which is so commonly felt on the inner side of the knee by patients suffering from coxalgia is, doubtless, owing to the irritation which the trunks of these nerves suffer in consequence of their proximity to the hip-joint.

OF THE LIGATURE OF THE ARTERIES OF THE THIGH.

The operation of placing a ligature upon the superficial femoral artery is most commonly performed for the cure of popliteal aneurisms, or to arrest the profuse secondary hemorrhages which sometimes follow compound fractures and deep wounds of the leg, where it is frequently impossible to determine with precision the exact source of the bleeding; or when it occurs after amputation below the knee, at a period when the stump is not in a condition to allow of the wound being re-opened, and an endeavour made to secure the open mouth of the vessel.

The superficial femoral artery may be tied in two different parts of its course; in the middle third of the thigh, before it passes through the opening in the triceps muscle to enter into the popliteal region, or where it lies in the upper third before it is crossed by the sartorius muscle.

Mr. Hunter's operation.—Previously to the year 1785, surgeons were in the constant habit of laying open the sac of a popliteal or femoral aneurism, and, after scooping out its contents, placing a ligature upon the artery, above and below the aperture in its coats; but this operation, besides being very difficult and tedious in its performance, was so rarely followed by success, that many excellent operators preferred performing amputation of the thigh. It was at this period that Mr. Hunter introduced the present practice of exposing the artery at a dis-

tance from the disease, by removing the seat of the operation to the inner part of the front of the thigh, where the femoral artery lies under cover of the sartorius muscle.

Mr. Hunter began his operation by making an incision of about three or four inches in length upon the anterior and inner part of the thigh, rather below its middle, which incision was continued obliquely across the inner edge of the sartorius muscle.† The fascia lata having been opened to the same extent as the incision of the integuments, the inner border of the sartorius muscle is exposed to view, and is then lifted to the outer side of the wound, so as to enable the operator to feel with his finger the pulsations of the artery as it lies underneath the tendinous aponeurosis, which is stretched over it from the vastus internus to the adductor muscles, and binds it down in this situation. A slight incision, about an inch long, is, in the next place, to be made through this fascia along the side of the artery, which is now exposed. In this part of its course the vein usually lies behind the artery, and the great saphenous nerve rests upon its external border. (See Plate VII. fig. 5.) The artery being disengaged from its lateral connexions, the aneurism needle should be carried carefully round it, from within outwards, so as to avoid as much as possible doing any injury to the coats of the vein. The artery only having been included in the ligature, it is to be secured by the usual knot, and one end of the thread cut away; after which the edges of the wound are to be brought neatly into apposition with each other by means of a few strips of adhesive plaister, aided, perhaps, by a couple of sutures.

With the view of avoiding any injury to the saphena vein, and the numerous lymphatic vessels which run alongside of it, many surgeons have since recommended that the femoral artery should be exposed by making the incisions on the outer side of the sartorius muscle; but in this mode of performing the operation there is a greater liability to err in the search for the artery, by falling upon the fibres of the vastus internus muscle, which have been mistaken for those of the sartorius.

The objections which have prevailed against Mr. Hunter's operation, in favour of that proposed at a later period by

† *Vide* Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; 8vo. Lond. 1793; vol. i. p. 148.

Scarpa, are, that the femoral artery is less easily found lower down than in the upper third of the thigh, where it lies almost subcutaneous; and that the disturbance of parts, which is necessarily created by the lifting up of the sartorius muscle, and opening into the strong tendinous sheath of the vessels, is frequently followed by extensive and long-continued suppurations in the course of the vessels, which on several occasions have been productive of secondary hemorrhage, from ulceration of the coats of the artery where they are embraced by the ligature: in addition to these objections it may also be reasonably urged, that it is more advisable to go still farther from the seat of the disease, for the cure of which the operation is performed, since the coats of the artery are much less likely to be affected there than lower down.

Scarpa's operation.—Throughout the upper third of the thigh the femoral artery runs very superficially, so that its pulsations may be distinctly felt on pressing with the fingers from the crural arch downwards to the point where it is crossed by the sartorius muscle, which is usually about four inches below the lower edge of Poupart's ligament. (See Plate VII. fig. 2.) A little above this spot the artery is easily reached, and may be tied with great facility, without removing the sartorius from its natural situation. Besides, at this place the ligature may be applied at a sufficient distance below the origin of the profunda artery, without any risk of the current of blood, which circulates through that great and important branch, proving a hinderance to the formation of the clot, or preventing the union of the opposite sides of the tied artery. It may be added, also, that there is every reason for believing that the ligature will be applied where the coats of the artery are healthy.

In this operation the first incision should be begun at about an inch and a half or two inches below Poupart's ligament, and carried vertically downwards for three inches; dividing the skin and the superficial fascia of the thigh. If the anterior saphena vein should present itself, it may be withdrawn to the inner side of the wound. The next incision divides the fascia lata, which may be done, according to the choice of the operator, with the hand unsupported, or upon a director introduced underneath it by a small opening at the centre of the wound. If it be necessary, from its unusual breadth, the inner edge of

the sartorius muscle may be drawn a little to the external side of the wound, after which the sheath of the vessels, covered by a thin layer of fascia, will be exposed to view, when, a small portion of it being lifted up between the blades of the forceps, it may be opened to the extent of about an inch, so as to admit of the needle being safely carried round the artery, without injury to the vein or nerve which lie upon either side of the vessel. After the ligature has been tied, one of its ends should be cut off, to promote the immediate union of the sides of the wound. The edges of the incision should be brought together, with or without the use of sutures, as may be considered most expedient, so as to obtain, if possible, the cure of the greater part of the wound by the first intention.

The operation of placing a ligature upon the common femoral artery.—To place a ligature upon the common femoral artery, between the lower border of the crural arch and the origin of the profunda, a small external incision will suffice, as the vessel lies almost subcutaneous in this part of its course. The patient is to be placed upon his back, and the thigh turned a little outwards, with the knee slightly bent; the surgeon, after having determined the situation of Poupart's ligament, commences his first incision a few lines above it, and continues it downwards over the course of the artery for about two inches, when, taking the forceps in one hand, he dissects down to the vessel, cutting through the subcutaneous cellular tissue, and the iliac portion of the fascia lata, pushing aside any of the lymphatic glands which may present themselves, until the sheath of the vessels is exposed, which is next to be opened to a sufficient extent to enable him to carry the needle safely round the artery, which should be done in the direction of from within outwards. If it were to happen in this operation that any of the superficial arteries were divided, it would be proper, should the hemorrhage from it continue after the ligature had been placed upon the main trunk, between the origin of the vessel and the centre of the circulation, to endeavour to secure it in the ordinary way, by placing a ligature upon the bleeding orifice; but, if this cannot be effected, another ligature must be placed upon the main trunk on the distal side of that part of the artery from which the wounded branch takes its origin.

The ligature of the external iliac artery has been found a

much more successful operation in arresting secondary hemorrhages from branches of the femoral, than that of tying the trunk of the common femoral between the lower edge of Poupart's ligament and the origin of the profunda. Mr. Hadwen mentions eight cases in which a ligature was applied to the common femoral artery, in six of which consecutive hemorrhage ensued, in four the external iliac artery was tied, and two died; leaving only two in which the ligature separated favourably.†

The ligature of the external iliac artery.—There are two methods practised of placing a ligature upon the external iliac artery; the first of these was employed by Mr. Abernethy, and the second was afterwards introduced by Sir Astley Cooper, and is now much more generally employed than the former.

Mr Abernethy's method.—The patient being placed in the recumbent posture upon the table, or a firm bed, an incision of three or four inches in length is made obliquely through the integuments, in the course of the external iliac vessels. The superior extremity of this incision will be situated about two inches from the anterior superior spinous process of the ilium, and it will terminate inferiorly a little above the ligament of Poupart. The edges of the wound being held apart, the aponeurosis of the external oblique muscle is exposed to view, and must be divided to the same extent as the external incision. In the next place, the finger is to be introduced underneath the lower edge of the internal oblique and transversalis muscles, so as to separate them from the fascia transversalis and the peritonæum, and to protect the latter while the muscular fibres are divided with the probe-pointed bistoury. An opening having been carefully made into the fascia transversalis, the finger is then passed into the bottom of the wound, and the pulsations of the artery sought for as it lies upon the inner edge of the psoas muscle. The sheath of the vessels is, in the next place, to be opened, and the ligature passed round the artery, taking care to avoid injuring the vein, which is situated upon its inner edge. This plan of performing the operation is not so generally adopted as that which has been since recommended by Sir Astley Cooper.

Sir Astley Cooper's method.—In this operation the first inci-

† *Vide* a Paper entitled "The History of a Case of Popliteal Aneurism, with Observations," by Samuel Hadwen, House Surgeon to the Lincoln Hospital, in the Med. Chir. Trans. vol. xxi. p. 318.

sion, which should be from three to four inches in length, should extend from a point situated one inch and a half above, and to the inner side of the anterior superior spinous process of the ilium, downwards in a slightly curved direction, (the convexity of the incision regarding Poupart's ligament,) to a little above the situation of the external abdominal ring. (See Plate VI. fig. 6.) By this incision the tendon of the external oblique muscle is laid bare, and must be cut through to the same extent, as likewise the fleshy fibres of the internal oblique and transversalis muscles, which may be done either upon a director introduced underneath them as they lie obliquely across the upper part of the inguinal canal, or with a probe-pointed bistoury guided upon the finger. The fascia transversalis is now to be opened near the upper part of the wound, as the peritonæum is less closely attached to it there than below; this opening is to be enlarged downwards with great care, lest the peritonæum should be in any way injured either by the edge of the knife, or by being torn by the finger. An assistant is directed to retract the superior edge of the wound, and along with it the great bag of the peritonæum and the spermatic cord, so that the surgeon may the more easily see the artery as it lies upon the inner edge of the psoas muscle, external to the vein. In many cases it is necessary to divide with the point of the knife a dense fascia which crosses over the vessels in this situation, and binds them down to the fascia iliaca, before the attempt to pass the needle round the artery can be safely made. The needle should be carried round the artery from within outwards, on account of the position of the vein, which lies upon its inner edge. If the genito-crural nerve be seen in this operation, as it lies upon the sheath of the external iliac vessels, it would be proper to hold it aside, so as to exclude it from the ligature. It should also to be recollected, that the epigastric artery may be wounded if the incision be carried too freely inwards towards the linea semilunaris,—an accident which occurred in one of the operations performed by Dupuytren.†

It is alleged by those who adopt Mr. Abernethy's plan of operating, that they can apply the ligature higher up on the artery than by pursuing the method recommended by Sir Astley

† See Mr. Cooper's Dictionary of Practical Surgery; 7th edit. p. 157.

Cooper; but this advantage, if it do really exist, which is subject to dispute, is counterbalanced by the greater risk of wounding the peritonæum, which is much more extensively disturbed in the former than in the latter operation. As a rule, the ligature should be placed, in either operation, at such a distance above the origin of the epigastric artery, (for example, about an inch,) as will permit of sufficient space for the formation of a coagulum, and thus diminish the possibility of secondary hemorrhage occurring, when the ligature separates from the artery.

After the ligature of the external iliac artery, the collateral circulation of the limb is principally carried on by the anastomosing branches of the gluteal, sciatic, internal pudic, and obturator arteries, with the circumflex and profunda branches of the femoral artery, and with the articular branches of the popliteal.†

† *Vide* An Account of the Anastomosis of the Arteries at the Groin. By Sir Astley Cooper, Bart. Medico-Chirurgical Transactions, vol. iv. p. 425.

THE SURGICAL ANATOMY

OF

THE POPLITEAL REGION.

The Popliteal Region, sometimes denominated the Ham, is a space of considerable extent situated behind the knee-joint, and may be described as including within its limits the lower third of the thigh, and the superior fourth of the leg.

When the muscles of the back part of the leg and thigh have been dissected, the popliteal region presents a lozenge-shaped figure, (see Plate VIII,) which is divided into two unequal portions by a line carried transversely across the space, opposite the flexure of the knee-joint. The superior division of the region is a little larger than the inferior, for it extends as high as the point where the fleshy belly of the biceps flexor separates from the semi-tendinosus and semi-membranosus muscles, (with which it had previously lain in close apposition, from their common point of origin at the tuberosity of the ischium,) to descend obliquely outwards to its insertion into the head of the fibula. (See Plate VIII. fig. *a*.) The inferior portion of the space is, when viewed externally, of rather smaller extent, as it is limited inferiorly by the junction with each other of the two heads of the gastrocnemius muscle. (See Plate VIII. figs. *e*, *f*.) When regarded more deeply, the popliteal region extends from the triangular-shaped opening in the triceps adductor muscle, as far downwards as the inferior edge of the popliteus muscle.

The ham or popliteal region is bounded superiorly, and externally, by the biceps (fig. *a*); and lower down by the external condyle of the femur, the outer head of the gastrocnemius and the plantaris muscle (fig. *f*, +); superiorly and internally by the semi-tendinosus, semi-membranosus, and gracilis muscles (figs. *b*, *c*, *d*); internally and inferiorly by the inner head of the gastrocnemius and the internal condyle (figs. *e* and *g*); posteriorly by the skin and fascia lata; and anteriorly by the posterior flat surface of the lower third of the femur, the back part of the knee-joint, and the popliteus muscle. Occupied by a large quantity of adipose substance, it contains, in addition, the popliteal nerve, vein, and artery, with their branches, which are numerous, and of considerable importance (figs. *h*, *i*, *k*, *l*, and *m*).

Dissection of the popliteal region.—The subject should be laid upon its face, with the lower limbs hanging down over the edge of the table; if it should be required, the trunk of the subject may be additionally elevated by placing a large block of wood underneath the belly.†

The first incision, for the dissection of the popliteal region, may be made in a perpendicular direction, along the inner border of the limb, commencing about five inches above the knee-joint, and terminating about four inches below it; from each extremity of this incision another cut is to be made at right angles to it, and extended across, in a transverse direction, to the opposite border of the limb. When the flap of skin, which has been thus marked out, has been raised, with the subcutaneous layer of adipose tissue (the *superficial fascia* of some writers), and reflected outwards, that portion of the fascia lata of the thigh which covers in the cavity of the ham will be exposed to view. In the popliteal region the fascia lata is extremely strong and resistant, being composed of numerous dense transverse fibres, which are greatly fortified by the aponeurotic expansions of the tendons of the ham-string muscles. The principal set of the fibres of this portion of the fascia lata run in an oblique direction downwards and inwards, and are interwoven with numerous

† Previously to commencing the dissection of the popliteal region, it is recommended that the veins should be injected with some coloured wax or tallow injection, which is easily done from pipes inserted into the posterior saphena vein, and the venæ comites of the posterior tibial artery, as they are passing behind the ancles.

others, leaving between them several small openings, by which some filaments of the middle posterior cutaneous nerve of the thigh (a branch from the smaller sciatic nerve) emerge, to ramify in the integuments of the ham.

When the fascia lata has been examined, it is to be dissected off from the muscles, and reflected in the same manner as the integuments; in doing which the branches of the middle posterior cutaneous nerve may, by a little care, be preserved. This nerve descends in the mesial line close underneath the fascia lata, and may be traced for a considerable distance upon the calf of the leg in company with the posterior saphena vein, which should also be preserved, where it ascends between the fascia of the leg and the belly of the gastrocnemius muscle, to join with the popliteal vein, by dipping deeply down into the ham between the two heads of that muscle. (Plate VIII. fig. *n*.)

The fascia lata having been reflected, the several muscles which bound the popliteal region on each side are exposed to view: on the inner side are seen the semi-tendinosus (fig. *b*), semi-membranosus (fig. *c*), and gracilis (fig. *d*) muscles, together with the internal head of the gastrocnemius (fig. *e*); on the outer side are seen the two portions of the biceps flexor muscle where they unite to join with the common tendon (fig. *a*) by which they are attached to the head of the fibula, and a little lower down, and inclosed by it, is the external head of the gastrocnemius muscle (fig. *f*). The fleshy and tendinous fibres of each of these muscles should, in the next place, be neatly displayed by removing the thin fascia by which they are covered, preserving, at the same time, the small vessels and nerves which supply them.

The large quantity of adipose substance which occupies the interspace between the muscles of the ham, should now be cautiously removed, in order to exhibit the great sciatic nerve, which ordinarily divides, near the superior angle of the popliteal region, into its two principal branches, the posterior tibial and peronæal nerves (figs. *h*, *i*, *k*); from both of which numerous filaments proceed to be distributed to the integuments of the leg and foot, and to the muscles of the calf of the leg. Two of the cutaneous branches have received names, one of them being denominated *nervus communicans tibialis*; this nerve will be found lying alongside of the posterior saphena vein deeply in the

cleft between the heads of the gastrocnemius muscle. (Plate VIII. fig. 3.) The other, *nervus communicans fibularis*, (Plate VIII. fig. 5,) is given off from the peronæal nerve, as it is descending alongside of the inner edge of the tendon of the biceps muscle, between it and the external head of the gastrocnemius. (Plate VIII. fig. 4.) These branches converge in their descent, and unite with each other a little below the middle of the calf of the leg; after which the common trunk so formed may be traced, having pierced the fascia in company with the posterior saphena vein, behind the outer ancle, and along the external border of the foot, to the skin covering which, and the three or-four external toes, it distributes numerous branches; one of these is not unfrequently found to join with a branch of the internal saphena, and also with the anterior tibial nerve upon the dorsum of the foot.

A little deeper in the cavity of the ham, and somewhat nearer to the mesial line than the posterior tibial nerve, will be found the popliteal vein (fig. *l*), which is closely connected to the outer cellular coat of the popliteal artery, along the external and posterior edge of which it is placed. Sometimes the popliteal vein is double, and then the artery is situated between the two trunks, and is crossed at various points by smaller veins which connect them together; a circumstance which is worthy of being remembered, as it might otherwise prove a source of embarrassment in the operation of placing a ligature upon the popliteal artery.

The popliteal artery (fig. *m*) lies deeply in the centre of the popliteal space, and much closer to the surface of the bone than either the nerve or vein; in exposing it the knife should not be used too freely on either side, lest the articular branches, which spring from the main trunk at right angles to its course, should be cut across. (See Plate VIII. figs. 1 and 2.) It is also advisable, in this stage of the dissection, that the muscles which bound the popliteal region on each side should be relaxed, so as to admit of being drawn more widely apart, which may be easily done if the lower part of the limb be raised by bending the knee-joint; by so doing, much more room, and greater freedom to use the knife with safety to the smaller branches of the artery, will be gained, than if the limb were to remain extended as before. These directions having been executed, and all the adi-

pose substance removed, the cavity of the ham will be completely exposed to view, and an accurate and just idea of its great depth, and of the exact relation which the several important structures contained within its limits bear to each other, and to the bones which form the knee-joint, obtained. (See Plate VIII.) To complete the dissection of the popliteal region, the internal head of the gastrocnemius must be detached from its connexions to the inner condyle of the femur (fig. *g*), and reflected downwards and outwards; after which the lower part of the artery can be easily dissected, and the inferior muscular and articular branches traced to their respective distribution.

The muscles of the back part of the thigh connected with the popliteal region.—The *biceps flexor cruris* arises by two heads, one of which is much longer than the other, and is attached to the outer surface of the tuberosity of the ischium; the short head is fixed to the linea aspera of the femur, between its inferior extremity and the insertion of the glutæus maximus muscle. The two portions of the muscle unite with each other a little above the knee-joint, and soon end in a tendon, which is inserted into the upper and outer surface of the head of the fibula, covering, at the same time, the external lateral ligament of the knee-joint. The structure of the muscle is fleshy, except at its origin from the tuber ischii, and at its insertion, which are tendinous. Relations—posteriorly with the glutæus maximus muscle, and the fascia lata; anteriorly, with the sciatic nerve, the adductor magnus muscle, the external articular arteries, the gastrocnemius externus, and the outer condyle of the knee-joint; the peronæal nerve is situated along the inner side of its tendon. This muscle forms the outer hamstring.

The *semi-tendinosus* is attached superiorly to the posterior surface of the tuberosity of the ischium, and is also connected with the tendon of the biceps for about two inches below that point; near the commencement of the lower third of the thigh the muscular fibres end in a long round tendon, by which it is inserted into the inner border of the tibia, about two inches below the knee-joint. Superiorly, the structure of the muscle is fleshy; inferiorly, it is tendinous. Relations — posteriorly with the biceps and fascia lata, and anteriorly with the adductor magnus and semi-membranosus, upon the latter of which it rests in the lower part of the thigh, and behind the knee-

joint; the expanded tendon of the sartorius muscle conceals its insertion into the tibia.

The *semi-membranosus* arises from the tuberosity of the ischium, between the preceding muscles and the quadratus femoris, and is inserted into the inner and back part of the head of the tibia, where it gives off a process, which is reflected obliquely upwards and outwards upon the posterior ligament of the knee-joint and is finally attached to the external condyle of the femur. The muscle is fleshy in its middle, but tendinous at its extremities. Relations — anteriorly, with the quadratus femoris and adductor magnus muscles, the popliteal artery and vein, the internal articular arteries, and inner condyles of the knee-joint; posteriorly, with the biceps and semitendinosus muscles and the fascia lata; internally, with the sartorius and gracilis muscles; and, exernally, with the great sciatic nerve. This, with the preceding muscle, forms the inner hamstring.

The first incisions in the operation of tying the popliteal artery, should be made along the external edge of this muscle.

The *gastrocnemius* arises superiorly by two heads, which are attached to the upper and back part of the condyles of the femur, and to the two diverging lines into which the linea aspera is divided inferiorly; the fibres of the muscle converge as they descend, and become blended with each other at the upper part of the leg, where they form a thick fleshy mass resting upon the soleus muscle, with which they are inserted into the tendo Achillis, which connects them with the under and back part of the os calcis. The internal is rather larger than the external head of the muscle. The structure of the gastrocnemius is fleshy and aponeurotic superiorly, fleshy in the centre, and tendinous inferiorly. Relations—posteriorly, with the skin and fascia of the leg, the communicating branches of the posterior tibial and peronæal nerves, and the posterior saphena vein; anteriorly, with the capsular and synovial ligaments of the knee-joint, (a delicate bursa mucosa usually intervening,) the popliteal vessels and nerves, and the plantaris, soleus, and popliteus muscles. The two heads of the gastrocnemius are included superiorly between the hamstring muscles, the peronæal nerve lying in the groove between the tendon of the biceps and the external head.

The *plantaris* is a very small muscle, which lies between the

gastrocnemius and soleus. The fleshy fibres of the muscle are not more than two inches in length; and, taking their origin from the capsular ligament of the knee-joint covering the posterior surface of the external condyle, soon end in a long and delicate tendon, which descends obliquely from without inwards to its insertion into the inner part of the os calcis by the side of the tendo Achillis: the plantaris muscle is not unfrequently absent, or partially deficient.

The popliteal artery.—The superficial femoral artery assumes, as it enters the cavity of the ham after passing through the opening in the triceps adductor, the name of the *popliteal artery;* which appellation it retains until it has reached as far as the lower border of the popliteus muscle, where it terminates by dividing into two large branches,—the anterior, and posterior tibial arteries. The popliteal artery thus extends from the commencement of the inferior third of the thigh to below the superior fourth of the leg, and its length may be estimated in the adult at about seven inches. The direction of the course of the vessel is at first slightly oblique, downwards and outwards, (see Plate VIII. fig. *m*,) until it gains the deep hollow between the condyles of the femur; after which it runs vertically downwards to its termination.

Relations.—The popliteal artery corresponds by its anterior aspect with the flat surface of the lower part of the femur, the posterior ligament of the knee-joint, and the popliteus muscle; from which structures it is only separated by a thin layer of loose adipose substance, which enables the artery to accommodate itself more readily to the various and extensive motions of the articulation behind which it is situated. The popliteal artery is covered, posteriorly, by the large mass of fat which occupies the greater part of the popliteal cavity, and by the skin and fascia lata. The popliteal vein lies along the posterior and external edge of the artery, to the outer coat of which it is very closely connected by the dense cellular tissue which forms here the sheath of the vessels. The sciatic nerve is much more superficial than either the artery or vein; and is, moreover, placed somewhat external to them both, except towards the lower part of the ham, where its internal division, the posterior tibial nerve, is situated directly behind the vessels. (Figs. *h*, *i*, *k*, *l*, *m*.) By its internal border, the popliteal artery is in relation with the semi-membranosus muscle, which slightly overlaps it in the first part of its course; so that it is requisite that

this muscle should be drawn a little aside (towards the inner border of the limb) in the operation of tying this part of the vessel: more inferiorly, it is in relation with the internal condyle of the femur, and the inner head of the gastrocnemius muscle.

The short head of the biceps flexor, the plantaris, and the external division of the gastrocnemius muscles, with the outer condyle of the femur, are in relation with the external border of the artery.

Branches of the popliteal artery.—The popliteal artery furnishes several branches to the structures which lie adjacent to it; some of which have received names, and are deserving of more particular attention, both on account of their size, and, more especially, as they constitute the principal medium by which the collateral circulation of the limb is carried on when the main trunk has been obliterated, as after the operation for the cure of popliteal aneurism, &c. These branches are, 1st, *rami articulares superiores;* 2nd, *rami articulares inferiores;* 3rd, *ramus azygos*, vel *articularis medius;* 4th, *rami surales.*

1. *Ramus articularis superior externus.*—This branch leaves the trunk of the popliteal artery at a right angle, and immediately afterwards inclines outwards to pass between the biceps flexor muscle and the bone, just above the external condyle of the femur. After distributing a few branches to the external head of the gastrocnemius, biceps, and vastus externus muscles, it divides into numerous ramusculi, which spread over the outer and front surfaces of the knee-joint, where they freely anastomose with the branches of the inferior perforating and external circumflex arteries superiorly, and with those of the inferior external articular and anterior tibial recurrent arteries inferiorly. (Plate VIII. fig. 1.)

2. *Ramus articularis superior internus* arises from the inner side of the popliteal artery, and, running towards the internal border of the limb, passes between the bone and the tendons of the semi-tendinosus, semi-membranosus, and adductor magnus muscles, just above the inner condyle of the femur; after which it soon divides into a numerous lash of branches, which form a vascular network upon the inner side and front of the knee-joint, when they anastomose with the branches of the anastomotica magna and inferior articular arteries, as well as with the corresponding vessels of the opposite side. (Plate VIII. fig. 2.)

Besides these branches, the popliteal artery furnishes several

others to the flexor muscles as they are placed on each side of the upper part of its course through the ham. They are sometimes named the *rami musculares superiores.*

3. *Ramus articularis medius* vel *azygos.*—This is a very small branch, which arises from the anterior surface of the popliteal artery near the centre of the back part of the knee-joint; it pierces the fibres of the posterior ligament, and is distributed to the crucial ligaments and synovial membrane of that articulation.

4. *Ramus articularis inferior internus* arises from the popliteal artery low down in the cavity of the ham, and, after passing between the internal head of the gastrocnemius and the popliteus muscle, takes its course inwards and forwards between the internal tuberosity of the tibia and the internal lateral ligament of the knee-joint, where it is also covered by the tendons of the semi-membranosus, semi-tendinosus, and gracilis muscles. Its branches freely anastomose, upon the front and lateral surface of the knee-joint, with the articular arteries of the opposite side, and with the branches of the superior internal articular artery.

5. *Ramus articularis inferior externus* takes its origin from the outer side of the popliteal artery immediately below the flexure of the knee-joint; it then inclines obliquely downwards and outwards, and, passing underneath the plantaris and external head of the gastrocnemius, as also the external lateral ligaments of the knee-joint, divides into numerous small branches, which inosculate freely with the vascular plexus which is formed by the branches of the other articular arteries upon the sides and front of the knee.

6. *Rami surales* vel *musculares inferiores.*—The popliteal artery, after giving off the articular arteries, supplies several large branches, on each side, to the muscles of the calf of the leg; viz. the popliteus, plantaris, soleus, and gastrocnemius, amongst the fibres of which they descend for a considerable distance below the knee.

These arteries usually require to be secured with the ligature after amputations of the leg below the knee, particularly when the circular method is that which has been employed.

Varieties of the popliteal artery.—Few arteries are less liable to variation in their size and course than the popliteal artery: nevertheless, instances are occasionally met with, in which the division of the principal trunk takes place much higher up in the popliteal region than is usual; so that the

anterior and posterior tibial arteries commence their course between the condyles of the femur, instead of opposite the lower border of the popliteus muscle.† Portal states having seen two arteries of equal size in the ham, which resulted from a high division of the femoral artery.†

The popliteal vein.—The popliteal vein is formed by the junction with each other of the venæ comites of the anterior and posterior tibial arteries; it ascends through the ham, lying at first behind the artery, but as it approaches the opening in the triceps it gradually inclines towards its posterior and external edge. The coats of this vein are extremely thick and strong; and it is so closely connected with the artery, to the external border of which it clings by means of the small contributory branches which open into it, and which correspond with the branches of the popliteal artery, that much caution is required to carry an aneurism needle safely round the latter vessel without including the vein, or doing some injury to its coats by the point of the instrument. In the operation of placing a ligature upon the popliteal artery, it is advisable to pass the needle around the vessel from without inwards; as the point of the instrument is much less likely to injure the vein when it is carried round the artery in this direction than in the opposite course.

Very frequently there are two popliteal veins, and then the artery is situated between them, and is crossed at various points by several small branches of communication, which pass from one venous trunk to the other.§

The popliteal vein receives several small branches as it ascends through the popliteal space, the chief number of which correspond with the branches given off from the artery. The posterior saphena vein usually empties itself into the popliteal vein, dipping down between the heads of the gastrocnemius muscle; though occasionally it will be found to take a different course, and, instead of opening into the popliteal vein, to continue to ascend through the ham underneath the fascia lata,

† Dr. Ramsay has given a drawing of a preparation, in which the anterior tibial artery runs between the popliteus muscle and the back part of the knee-joint. In that case the popliteal artery divided between the condyles of the femur. Also, a System of Operative Surgery, by Wm. Hargrave, p. 86.

‡ M. Portal, Anatomie Médicale, tom. iii. p. 326.

§ *Vide* the Lancet for 1837, p. 905.

and then, after piercing the fibres of the adductor magnus muscle, to terminate in one of the contributory branches which unite to form the vena profunda femoris.

Lymphatic vessels and glands. — Numerous lymphatic vessels pass through the popliteal region, some of which come from the superficial lymphatics of the back part of the leg and foot, and reach the ham by taking a similar course to the posterior saphena vein. The deep-seated lymphatics are those which ascend in company with the three sets of deep-seated veins, which, by their junction with each other, form the popliteal vein. The lymphatic vessels in the ham are very numerous, and pass through four or five absorbent glands, which are placed on different sides of the popliteal vessels, to the coats of which they are intimately coherent.

These glands sometimes enlarge, and form solid tumours, which may, by their pressure upon the vessels and nerves, produce painful sensations, with edema of the leg and foot; they may also, from the same circumstance, receive a pulsatile motion from the artery as it lies underneath them, and thus render it difficult to distinguish clearly between a swelling in the popliteal region from this cause, and an aneurismal dilatation of the coats of the artery itself. The lymphatics of the popliteal region, after passing through the glands which lie upon the vessels, ascend along with the femoral artery and vein to the glands of the groin; which circumstance renders it necessary to examine carefully the condition of the glands of the inguinal region and iliac fossa before it is determined to amputate the thigh for diseases in the ham which may be suspected to be of a malignant nature, lest, after the operation has been submitted to, the patient may suffer from a return of the affection nearer to the trunk of the body.

EXPLANATION OF PLATE VIII.

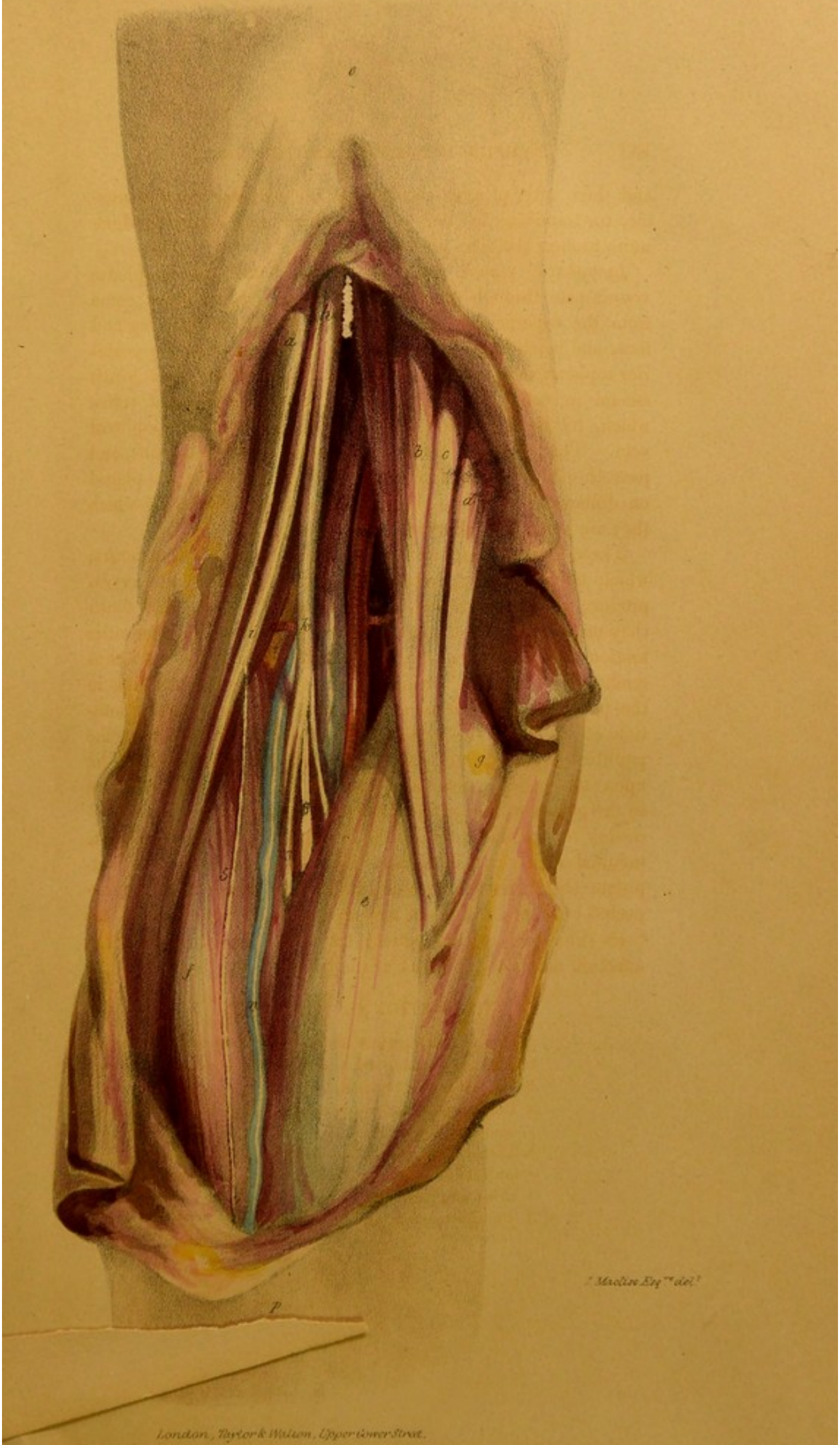
This plate represents the popliteal region when the dissection of the muscle, and vessels which it contains within its limits, has been completed.

a. The biceps flexor cruris muscle, which forms the external boundary of the ham.

b. The semi-tendinosus muscle where it rests upon

c. the semi-membranosus muscle; they form the inner hamstring muscles.

d. The tendon of the gracilis muscle.



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e. The internal head of the gastrocnemius.
f. The external head of the same muscle.
g. The internal condyle of the femur.
+ The posterior flat surface of the lower part of the femur.
h. The great sciatic nerve, before it divides into its two principal branches,
i. the peroneal nerve, and
k. the posterior tibial nerve.
l. The popliteal vein, which receives the posterior saphena vein (*n*), which joins with it by dipping between the heads of the gastrocnemius muscle.
m. The popliteal artery, which here lies upon the posterior flat surface of the inferior third of the femur (+).
n. The posterior saphena vein.
o. The integuments of the back part of the thigh.
p. The integuments of the calf of the leg.
1. The superior external articular artery.
2. The superior internal articular artery.
3. The *nervus communicans tibialis*.
4. The continuation of the posterior tibial nerve.
5. The *nervus communicans fibularis*.

OF SOME OF THE DISEASES WHICH OCCUR IN THE POPLITEAL REGION.

Abscess in the ham.—In the early stages of this disease it is not always possible to determine with certainty what may be the cause of the symptoms; but, when matter has formed, its presence will be indicated by the swollen state of the integuments, which are also more red and hot than is natural. This inflammatory swelling of the integuments and subcutaneous layer is circumscribed, and, at the same time, pits upon pressure. The patient suffers much from pain in the part, which obliges him to keep the knee in the bent position to obtain any relief. The sense of fluctuation is frequently very obscure, on account of the contents of the abscess being so firmly bound down by the fascia lata. The history of the case,—joined with the unnatural increase of heat and redness of the part,—the febrile excitement,—and the absence of the characteristic pulsation, are sufficient to distinguish the case from one of aneurism of the popliteal artery. The abscess should be opened early, and very freely; and the limb must be placed in the straight position as soon as the patient can bear it, in order to prevent the tendency to perman-

ent contraction of the knee-joint, which frequently follows the healing of abscesses in this situation.†

The matter which forms from disease within the pelvis, as in some cases of lumbar abscesses, may find its way down the back part of the thigh in the loose cellular tissue between the flexor muscles, and thus make its appearance externally in the ham.‡

Disease of the bursæ mucosæ.—Sometimes the synovial bursæ which are connected with the tendons of the flexor muscles of the thigh become diseased, and form tumours in the ham of very various magnitude and consistence. I recollect very well a tumour of this nature which was extirpated from the ham of a young woman who was admitted some years ago into the hospital of Newcastle-upon-Tyne: the patient appeared to be doing very well for a short time after the operation, when the knee-joint suddenly became affected; which rendered it afterwards necessary to perform amputation of the thigh, which was soon followed by the death of the patient. M. Velpeau mentions his having successfully removed tumours of this nature from two persons during his attendance at the hospital of La Pitié.§

Sarcomatous tumours.—Firm and hard tumours of a fibrous, or fleshy structure are occasionally developed in the ham, and in

† The following case of abscess of the ham will serve to illustrate the description given above:—William Halliday, aged 57, was admitted into the College Hospital under the care of Mr. Cooper, in November 1835, on account of a painful tumour in the ham. "On examination there is a deep-seated swelling of the soft parts behind the knee-joint, with an edematous state of the integuments covering the swelling, and which are also of a dusky red colour; the redness disappearing under pressure, but returning as soon as it is removed. The surface of swelling also pits upon pressure with the points of the fingers. An unnatural degree of heat is perceptible when the hand is closely applied over the swelling; at the same time, an obscure sense of fluctuation is to be felt on a close examination of the part with both hands. The disease is of a fortnight's duration, and has gradually attained to its present state. The patient experiences much pain, is unable to walk, and is obliged, for the sake of the relief which it affords him, to keep the knee bent." The swelling was laid freely open by a long and deep incision, and about a pint of healthy-looking pus discharged.

For similar cases see Anat. Chirurgicale, par M. Velpeau, tom. ii. 582-3.

‡ *Vide* Traité Complet d'Anatomie Chirurgicale, par M. Velpeau, 3rd edit. tom. ii. p. 553; 8vo. Paris, 1837.

§ *Vide* Op. citat. tom. ii. p. 569, 3rd edit.

some instances appear to originate from disease in some of the lymphatic glands which lie in contact with the sheath of the vessels. Upon other occasions they have been found to have taken their origin from the cancellated structure of the spongy heads of the bones forming the articulation of the knee-joint. Some of these tumours may present the appearance of osteo-sarcoma, inasmuch as there are sometimes numerous spiculæ deposited within their substance. These tumours are at the first deep-seated, being situated between the great vessels and the bones which form the knee-joint, so that they cannot be extirpated, except by amputation of the thigh; which, however, should not be had recourse to if the inguinal glands be diseased.

Sir Charles Bell met with a case in which a large tumour had formed in the substance of the posterior tibial nerve, after a blow upon the back part of the thigh; the patient died, exhausted by the continual sufferings which he had endured for two years.†

Popliteal aneurism.—Aneurism of the popliteal artery is, perhaps, of more frequent occurrence than that of any other artery in the body, the aorta being excepted. In the greater number of instances it would seem most probable that the affection is produced in consequence of the coats of the artery, which have lost their natural appearance and elasticity from disease, giving way under the influence of some violent strain, or sudden motion of the knee-joint, behind which it is so closely applied; and hence it is that we find that the disease in question has been most frequently observed in persons who are in the constant habit of making long-continued and violent exertions of the muscles of the lower extremities, such as grooms, coachmen, porters, troopers, and others.‡ In some few instances, aneurism of the popliteal artery has been produced by wounds of the coats of this vessel from the point of a sword;§ or by injury from a musket-ball, as it crossed the region of the ham.‖ Sir Charles Bell relates a case in which it was caused

† Bell's Oper. Surg. vol. ii. p. 232.

‡ For cases of this kind see the Med. Chir. Trans. vol. viii. p. 492; and vol. ix. p. 411: also Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; London, 1793; vol. i. p. 142.

§ *Vide* Principles of Surgery. By John Bell, vol. i. p. 328.

‖ First Lines of the Practice of Surgery; 6th edit. p. 155.

by the ulceration of the coats of the artery, which was pressed upon by the sharp edge of the inferior fragment of the thigh-bone, which had been broken in its lower third, a little above the condyles.† From the close connexion with one another of the popliteal vein and artery, a venous aneurism may be produced in the ham, instances of which have been related by several surgeons.‡

The aneurism of the popliteal artery is seldom brought under the notice of the surgeon until it has made considerable progress, since, from the great depth at which the affected vessel lies, and from the yielding nature of the structures which are adjacent to it on either side, the swelling must attain a certain magnitude before it forms any tumour externally and attracts the attention of the patient.

In the commencement of the disease a small swelling is felt, deeply seated in the ham, when the fingers are pressed forcibly into the hollow between the tendons of the flexor muscles of the knee; the tumour, when it is grasped between the fingers, throbs violently, and is felt to dilate at each pulsation of the artery at the bend of the groin: the pulsation in the tumour can be arrested at pleasure, by making pressure upon the femoral artery in a degree sufficient to interrupt the flow of the current of blood through it. The swelling in the ham continues to increase, sometimes very slowly; at the same time that its pulsations become stronger, and more perceptible to the fingers, to which they communicate a thrilling sensation. There is now a feeling of heaviness and numbness in the limb, with frequent cramps and throbbing pains in the part affected, and extending downwards to the leg and foot, in consequence of the pressure which the tumour begins to exercise upon the large branches of the great sciatic nerve. When the tumour is firmly grasped in the hand, its whole bulk seems to be dilated at each impulse of the heart, and, if sufficient pressure be made upon the artery in the bend of the groin, the size of the tumour will be perceived to undergo a very sensible diminution; but it quickly, though gradually, regains it former bulk as soon as the pressure upon the femoral artery has been removed, and

† Engravings of the Arteries, by Charles Bell; royal 8vo. London, 1824; 4th edit. p. 53.

‡ Eléments de Médecine Opérat. par M. Velpeau, tom. i. p. 149.

the current of the blood again allowed to flow on uninterruptedly.

When the ear is applied over the swelling, a loud *bruit de soufflet* is generally heard, and at the same time the head of the auscultator is lifted up at each action of the heart.

Thus far the aneurism may be said to be of moderate size, and to constitute a well-marked example of the *circumscribed false aneurism* of the popliteal artery, and is a favourable case for the interference of the surgeon, who may proceed to ligature the superficial femoral artery with every prospect of success.

As the tumour enlarges, the pain which is experienced by the patient becomes more and more severe, and he is no longer able to extend the limb as before, nor to walk without limping, on account of the bent position in which he is compelled to keep the knee for the sake of relief from the painful sensations which this position is capable of affording. There is great variation in the length of time during which an aneurism of the popliteal artery remains circumscribed: in some instances it has been known to remain, without any change, for many months; while, in others, the whole of the muscles and cellular tissue of the leg and thigh have been infiltrated and gorged with blood in as many weeks from the first appearance of the disease. If from the neglect of the patient, or from any other cause, the disease be permitted to pursue its course unchecked by art, then the swelling commonly becomes larger and much harder than before; its pulsation becomes more feeble, and is perceived with much greater difficulty, nor can the bulk of the tumour be diminished, as before, by pressure upon the artery at the groin.† The temperature of the limb below the knee is lowered, and the skin covering the tumour loses its natural colour, and becomes livid, threatens to slough, which in the end does actually take place, and, as the eschar cracks and loosens,

† There is a very interesting and instructive case recorded by Mr. Lawrence in the 8th vol. of the Med. Chir. Trans. of London, in which a popliteal aneurism was mistaken for a large and rapidly increasing fleshy tumour, and the leg amputated. Previously to the performance of the operation, Mr. Lawrence plunged an abscess lancet into the softest part of the tumour to the whole depth of the blade, without giving issue to any fluid. On examination of the limb after its removal, the tumour was found to have been formed by a popliteal aneurism, containing an immense mass of firm bloody coagulum.—*Vide* the Med. Chir. Trans. Lond. vol. viii. p. 497.

hemorrhage ensues, which is repeated from time to time, until the patient sinks under the continued loss of blood, unless the art of the surgeon, successfully employed, rescues him from the imminent danger which constantly hovers over him when the disease has attained to this advanced stage. In these protracted cases, the bones which form the knee-joint are frequently deprived of their periosteum, and become carious,—the ligaments diseased,—the popliteal vein obliterated, —and the nerves and muscles greatly altered from their natural appearance and structure—by the constant and increasing pressure of the tumour; so that the only remedy which can be proposed for the relief of the sufferer is, the speedy removal of the disease by amputation of the thigh.†

Of the operation for the cure of popliteal aneurism.—In former times (previously to the year 1785), it was the practice to lay freely open by an incision the sac of a popliteal aneurism, and, after scooping out its contents, to place a ligature upon the artery immediately above and below the aperture in its coats. Experience had, however, shown that this method was not only attended with considerable difficulty in its performance, but that it was rarely successful; and it was so frequently followed by the death of the patient from secondary hemorrhage, or from the exhaustion consequent upon the long-continued and profuse discharge from the extensive and unhealthy sore produced by the operation, or from mortification of the limb, in consequence of the destruction of the collateral vessels, that many surgeons of the greatest eminence preferred practising amputation of the limb in all such cases.‡ Indeed, in a great number of those who recovered from the operation, the knee remained permanently bent, so as to render the limb entirely useless, from the cicatrisation of so extensive a wound in the ham. It was from a consideration of these circumstances that the celebrated Hunter was led to examine this subject; an examination which terminated, by a train of the most clear and philosophical reasoning, in the introduction of the modern operation for aneurism, by which the artery is tied with facility where it is readily

† The operation of tying the superficial femoral artery, as is at the present day usually practised, for the cure of the popliteal aneurism, has been described in a preceding part of the work, to which the reader is referred.

‡ Trans. of a Society, vol. i. p. 138.—Potts' Works, by Earle, 3rd edit. vol. iii. p. 220.

got at, and where its coats are sound, leaving the aneurismal tumour to be removed by the absorbents, at the same time that the anastomosing vessels are preserved in the best condition possible for carrying on the circulation during the period which is requisite for the cure of the disease. The great merit of establishing the principles upon which the operation effects the cure of the disease, of confirming its superior advantages by numerous cases, and of procuring for it a universal adoption by the surgical profession, belongs, without the possibility of contradiction, to John Hunter.‡

The operation of tying the popliteal artery.—The patient, having been placed upon the table, should lie upon his face, with the limb extended. The first incision, which must be three or four inches in length, should be made along the external border of the semi-membranosus muscle, and should divide the skin and subcutaneous layer of adipose substance. The direction of this incision may be slightly oblique from within, outwards and downwards, so as nearly to correspond with the course of the artery as it winds round the inner and posterior surface of the lower third of the femur, to gain the interval between the condyles of that bone. The fascia lata, having been thus exposed, may be divided to the same extent as the first incision, either upon a director introduced underneath it, or with the hand unsupported. The external border of the semi-membranosus muscle is now exposed to view, and should be detached from its connexions by a few light touches with the edge of the scalpel, in order that it may be held aside by means of a blunt hook. The adipose substance which fills the popliteal region is, in the next place, to be cut through in the same careful manner, so as to lay bare the sheath of the vessels as they lie deeply underneath the edge of the preceding muscle, which, when it is largely developed, completely overlaps them. It must be recollected that the artery is situated more deeply in the cavity of the ham, and also lies more internally than the vein, with the coats of which, however, it is in very intimate contact. In many cases the great sciatic nerve is not seen in the operation as thus performed, for it is placed rather to the external side of the popliteal vessels; but if, from any cause, it should present itself under the knife, it may be withdrawn to the outer side of

‡ See the description of Hunter's operation for the cure of the popliteal aneurism, in the Transactions of a Society, &c. p. 148.

the wound by means of a retractor, or by the finger of an assistant. The sheath of the vessels having been opened to a sufficient extent (about one inch) to admit of the aneurism needle being passed around the artery, much advantage in the execution of this step of the operation will be gained by causing the knee-joint to be slightly flexed for the purpose of relaxing the hamstring muscles, which position will permit the surgeon to obtain a more distinct view of the important structures that occupy the deeper part of the ham. The aneurism needle, armed with a single ligature, should be passed from without inwards, so as more effectually to exclude the possibility of injuring the coats of the vein. The popliteal artery alone having been included in the ligature, it is to be secured in the ordinary manner.

In some persons the popliteal vein is double, and then the artery may lie between them; a circumstance which would require greater care to be exercised by the operator while carrying the needle round the artery.

The cases in which this operation may be performed are those in which a profuse hemorrhage follows a deep wound in the popliteal region, when it might be considered advisable to enlarge the original wound for the purpose of exposing the wounded vessel, and securing it by a ligature placed above and below the opening in its coats; another case is, where there is an aneurism of some of the deep-seated arteries of the leg, or repeated secondary hemorrhage from a wound of one of these, and in which it is found impossible to secure the mouth of the bleeding vessel.† Some surgeons, however, would prefer, in all such cases, performing the ligature of the superficial femoral artery, to the operation of securing the popliteal artery itself.

When we regard the great number and considerable size of the branches which are furnished from the popliteal vessels and the great sciatic nerve to the heads of the gastrocnemius, soleus, and plantaris muscles, as well as the possibility of the existence of a high division of the trunk of the popliteal artery itself, we have, I think, sufficient reasons for renouncing the operations, which are described by sytematic writers, of placing a ligature upon that vessel in the latter part of its course.

† In the spring of 1835 Mr. Cooper tied the popliteal artery with complete success, in the case of a young man who was suffering under repeated secondary hemorrhage from a deep wound in the calf of the leg.

THE SURGICAL ANATOMY

OF

THE HIP-JOINT.

This articulation is the most perfect specimen of the class of enarthroses, or ball-and-socket joints, which is found in the human body.

The globular head of the thigh-bone is maintained in the cavity of the acetabulum by means of a strong fibrous capsule and an inter-articular ligament, to which may be added the cotyloid and transverse ligaments; all of which are more or less covered by the synovial membrane which lines the interior of the joint.

The *capsular ligament* is extremely strong and thick, excepting at its internal part, where it is rather thinner and looser in its texture than at any other point. It is attached superiorly, around the greater part of the outer margin of the acetabulum, to the periosteum and rough surface of the bone; but over the cotyloid notch its fibres are implanted upon the transverse ligament. Inferiorly it is fixed in front into the anterior inter-trochanteric line, and posteriorly into the neck of the femur, at the distance of two or three lines from the oblique ridge which extends on the back part of the bone between the trochanters.

The capsular ligament of the hip-joint is greatly strengthened in front by a thick band of dense fibres, which pass in a radiated manner from the anterior inferior spinous process of the ilium to the anterior inter-trochanteric line into which they are inserted. These fibres are sometimes called the ilio-femoral ligament.†

The *ligamentum teres* is not perfectly round in the whole of its extent; as, at the extremity where it is attached by two divergent processes to the opposite margins of the cotyloid notch, it is rather flattened and of a triangular figure; towards its centre,

† Ligamentum accessorium anticum.

and other extremity, by which it is fixed into the fossa or pit upon the inner surface of the head of the femur, it is round.

The *cotyloid ligament* is a triangular-shaped band of fibro-cartilaginous fibres, which are arranged in a spiral manner around the osseous margin of the acetabulum, which they serve to deepen; these assist, by embracing closely the head of the femur, in retaining it more firmly within its socket. The external and internal surfaces of the cotyloid ligament are covered by the synovial membrane of the hip-joint. A portion of this ligament may be said to be stretched across the cotyloid notch, and has therefore been named the *transverse ligament.*

The *synovial membrane* of the hip-joint invests the globular head and greater part of the neck of the thigh-bone, from which it is reflected upon the internal surface of the capsular ligament, and thence over the cotyloid ligament into the acetabulum, furnishing at the same time a process which encases the round ligament.

A large mass of fatty substance is situated in the notch at the bottom of the acetabulum, between the synovial membrane and the bone; its probable use is to diminish the friction between the articulating surfaces of the bones forming the hip-joint.†

The ligamentous structures of the hip-joint receive their principal supply of blood from some small branches of the obturator and internal circumflex arteries, which enter into the articulation by passing through the cotyloid notch underneath the transverse ligament. One of these vessels furnishes a delicate twig, which reaches the cancellated structure of the head of the thigh-bone by running along in the centre of the round ligament.

Several small filaments of the obturator nerve are distributed to the ligaments and synovial membrane of the hip-joint.

The external surface of the capsular ligament of the hip-joint is covered in front by the psoas and iliacus internus muscles,—a large bursa mucosa, which sometimes communicates with the interior of the joint, being interposed; an abscess may form in this bursa independently of any disease of the articulation, in front of which it is placed. Superiorly the tendon of the rectus and the fleshy fibres of the gluteus minimus muscle cover the joint. Posteriorly are placed the pyriformis, superior gemellus, the reflected portion of the obturator internus, inferior gemellus, the

† Formerly this fatty mass was regarded as the gland that secreted the synovial fluid which lubricates the joint, and was named the gland of Havers.

tendon of the obturator externus, and the quadratus femoris muscles. On the inner side are situated the fleshy portions of the obturator externus and the pectineus muscles.

The bony margin of the hip-joint is sometimes fractured in consequence of severe falls upon the hip; an accident which may give rise to symptoms resembling, in many respects, those of a fracture of the neck of the thigh-bone, for which injury it might easily be mistaken.

When it is recollected that the three bones which form the os innominatum are united with each other (in the adult) in the acetabulum, an explanation is at once perceived of the stellated appearance which fractures of the pelvis, when they involve the acetabulum, commonly present; this lesion being generally produced by heavy falls upon the trochanter major, by which the head of the femur is driven with great violence against the acetabulum.

Section I.

DISLOCATIONS OF THE HIP-JOINT.

A dislocation of the hip-joint is an accident which is much more rarely met with in practice than fractures of the neck or upper part of the thigh-bone. The head of the femur may be dislocated from the cavity of the acetabulum in four different directions, which may be stated in the following order, which is also that of the relative frequency of their occurrence:† viz. first, The dislocation of the head of the bone upwards and outwards, upon the dorsum of the ilium; secondly, Backwards, into the great ischiatic notch; thirdly, Downwards, forwards, and inwards, into the foramen ovale; and fourthly, Upwards and inwards, upon the horizontal branch of the os pubis.‡ To these some other surgeons have added the dislocation of the head of the femur, downwards and backwards, upon the tuberosity of the ischium;§

† The French writers consider the dislocations of the hip-joint to take place in a different order of frequency to that which is stated in the text; viz, 1. upon the dorsum ilii; 2. on the thyroid foramen: 3. on the pubis; and 4. into the ischiatic notch. *Vide* Dict. de Médecine, Paris, 1825, tom. xiii. art. Luxation, par M. Marjolin.

‡ Sir Astley Cooper mentions, that, according to his observations on the subject of dislocations of the hip-joint, the proportion of cases in twenty would be as follows: twelve on the dorsum ilii; five into the ischiatic notch; two in the foramen ovale; and one on the pubes.—See Sir Astley Cooper's work on Dislocations, p. 89.

§ *Vide* the Medico-Chirurgical Transactions of London, vol. xx. p. 117; and the London Medical Gazette, vol. x. p. 19.

which, however, must be of very rare occurrence, since Sir Astley Cooper states that he has never seen an instance of it.

1. *The dislocation upwards and outwards upon the dorsum ilii.*—This dislocation is commonly produced by falls upon the side, while the thigh is bent forwards and inwards; so that the head of the femur is twisted outwards, and violently thrust against the superior and external part of the capsular ligament, which it tears through, and so slips upon the dorsum of the ilium above, and behind the acetabulum.

No. 7.

In this dislocation there is a remarkable diminution in the length of the limb, which is an inch and a half, or two inches, shorter than on the sound side.—The knee is slightly advanced in front of the other, and is inclined towards the lower part of the opposite thigh. The great toe rests upon the instep of the other foot. The thigh is bent upon the pelvis, and the whole limb is inverted, but admits of a still further degree of flexion and adduction, during which motions the head of the

bone may be distinguished, if the patient be thin, or there be not present much swelling from extravasated blood, moving in its new position upon the dorsum ilii; but neither abduction, rotation outwards, nor extension of the limb can be performed; any attempt at which is accompanied with very great pain to the patient. The trochanter major is rather less prominent than natural, since the neck of the bone lies in the same line with the dorsal surface of the ilium; in addition to which it is situated much nearer to the anterior superior spinous process of the ilium. From the same cause, the usual roundness of the hip is also obliterated. To all these symptoms it may be useful to add, that the limb appears immoveably fixed in its new position; from which it cannot be removed without the employment of considerable force, which must also be used in the proper direction.

In this dislocation much injury is sustained by the muscles more immediately surrounding the hip-joint: the pyriformis, quadratus femoris, obturatores externus and internus, with the gemelli, are frequently torn near their insertions into the trochanteric fossa; the fibres of the pectineus, and some of those of the adductor brevis, are also occasionally torn. The capsular ligament of the hip-joint is extensively lacerated towards its external and superior aspect, and the ligamentum teres is torn across. The head of the bone has been found lying, in some cases, between the gluteus maximus and medius, and in other instances between the latter muscle and the gluteus minimus;† a large quantity of blood is also found extravasated between these muscles, and in the subcutaneous cellular tissue over the region of the hip-joint.

Reduction. — If the patient be very strong and muscular, or if a considerable time has been permitted to elapse after the receipt of the injury, the attempt to reduce the head of the bone into its proper position should be preceded by the administration of large nauseating doses of the tartar emetic, aided, if necessary, by copious venæsection and the use of the hot bath. As soon as these remedies have produced their intended effects, the patient should be placed upon a firm table, or in a large bed, lying upon his sound side: the pelvis is to be maintained in a fixed position, by means of a band carried round between the perinæum and the upper part of

† See Sir Astley Cooper on Dislocations, v. p. 90; and the Dublin Hospital Reports, vol. iii. p. 395.

the thigh, while extension is made by means of another band fixed upon the thigh just above the knee, which should be bent; the dislocated limb is then to be slowly and steadily drawn obliquely downwards across the lower third of the opposite thigh, and, when the head of the bone has been in this manner brought down as far as the edge of the acetabulum, it may be raised a little by the surgeon placing his hand underneath the upper part of the thigh, so as to lift it up, as it were, from the ilium, which must at the same time be depressed, and thus facilitate its return into the cotyloid cavity.†

2. *The dislocation backwards and upwards into the great ischiatic notch.* — This accident occurs when a person falls violently upon his side, with the thigh much bent forwards, and at the same time rotated inwards. It may also happen consecutively during attempts to reduce the dislocations upon the dorsum ilii, or upon the thyroid foramen, if sufficient attention be not paid to the direction of the extending force which is employed.‡

The symptoms of this dislocation are, the thigh being very slightly bent, and the knee turned inwards, but not so much so as in the dislocation upon the dorsum ilii. The prominence of the hip is lost, because the trochanter major is more deeply seated; it is, also, placed further backwards than is natural. The groin appears flattened, at the same time that the buttock appears somewhat fuller than usual. The toe rests against the ball of the great toe of the opposite side. When the patient stands erect, the toes, but not the heel, touch the ground, and the whole limb is slightly inverted; nor can rotation outwards be performed, though the thigh may be flexed, and rotated inwards.

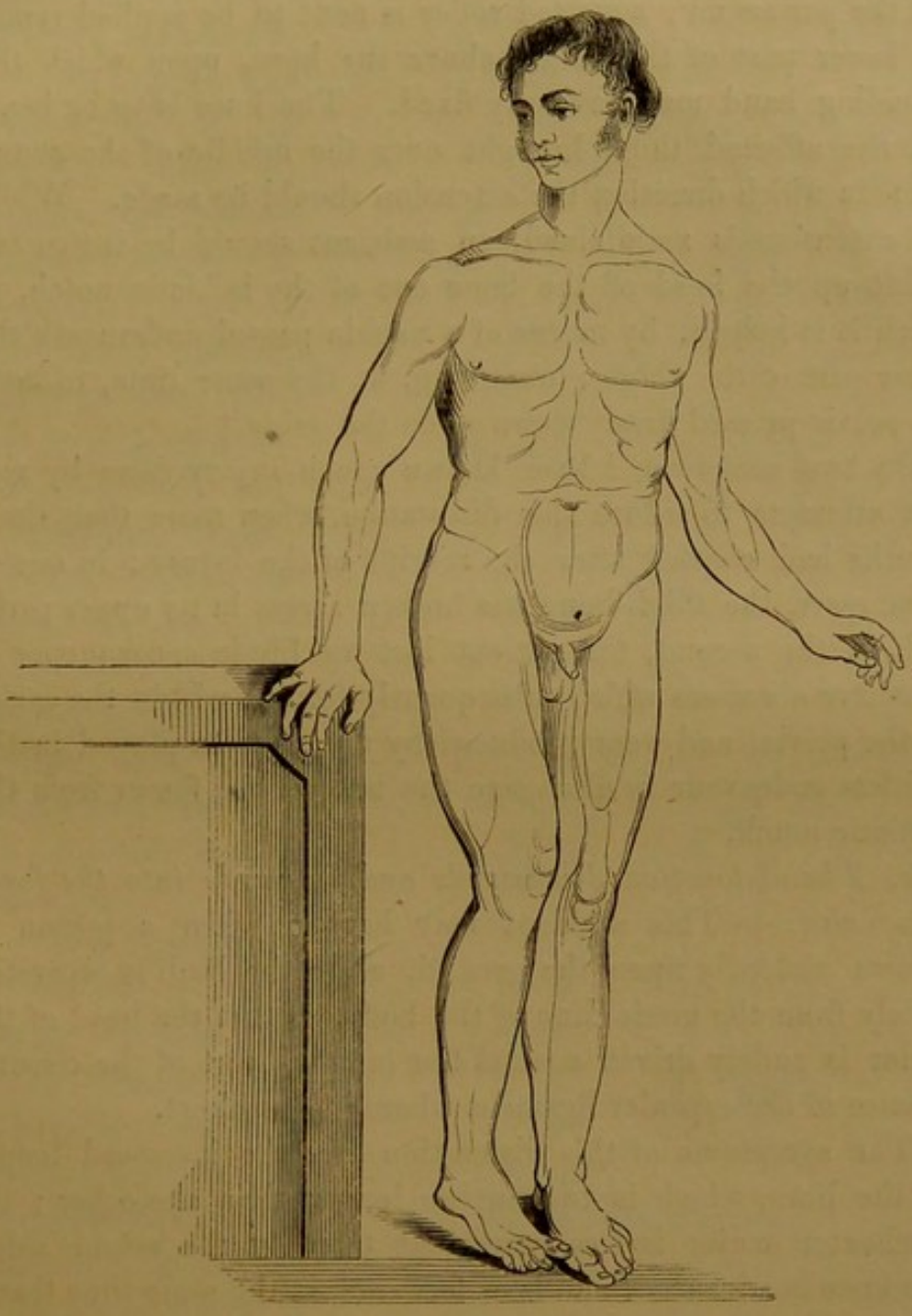
In this dislocation the capsular and round ligaments are lacerated, as well as the tendons of the external rotator muscles, which are inserted into the trochanteric fossa; and the fibres of the pectineus and adductor brevis muscles are placed upon the stretch. The head of the femur rests upon the inferior edge of the pyriformis muscle, under cover of the lower edge of the

† For a delineation of the plan to be pursued in the reduction of this dislocation, see plate viii. fig. 1, in Sir Astley Cooper's work on Dislocations.

‡ Op. citat. p. 59.

gluteus medius, surrounded by a quantity of extravasated blood.†

No. 8.



† See a paper on Dislocations of the Hip-joint, by Mr. Scott, in the Dublin Hospital Reports, vol. iii. p. 389.

Reduction.—The reduction of this dislocation is the most difficult to be effected of all those to which the head of the thigh-bone is subject; but it is best effected in the following manner:—The patient must be laid upon his sound side, and the pelvis fixed by a girth passed between the inside of the thigh and the perinæum; a wetted roller is next to be applied round the lower part of the thigh, above the knee, upon which the extending band may be firmly fixed. The knee is to be bent, and the affected thigh brought over the middle of the sound one; in which direction the extension should be made. While the extension is maintained, an assistant should be instructed to lift up the head of the bone out of the ischiatic notch, in which it is lodged, by means of a napkin passed underneath the upper part of the thigh; observing, at the same time, to keep the pelvis pressed firmly down upon the table.†

On two occasions, I have known much injury done by violent attempts to reduce this dislocation, when more than three months had elapsed after the receipt of the injury: in one of these cases, the thigh-bone was broken across in its upper part; and, in the second, the patient lost his life in consequence of extensive abscesses which subsequently formed within the cavity of the pelvis, and were produced by the force employed in the fruitless endeavour to disengage the head of the femur from the ischiatic notch.

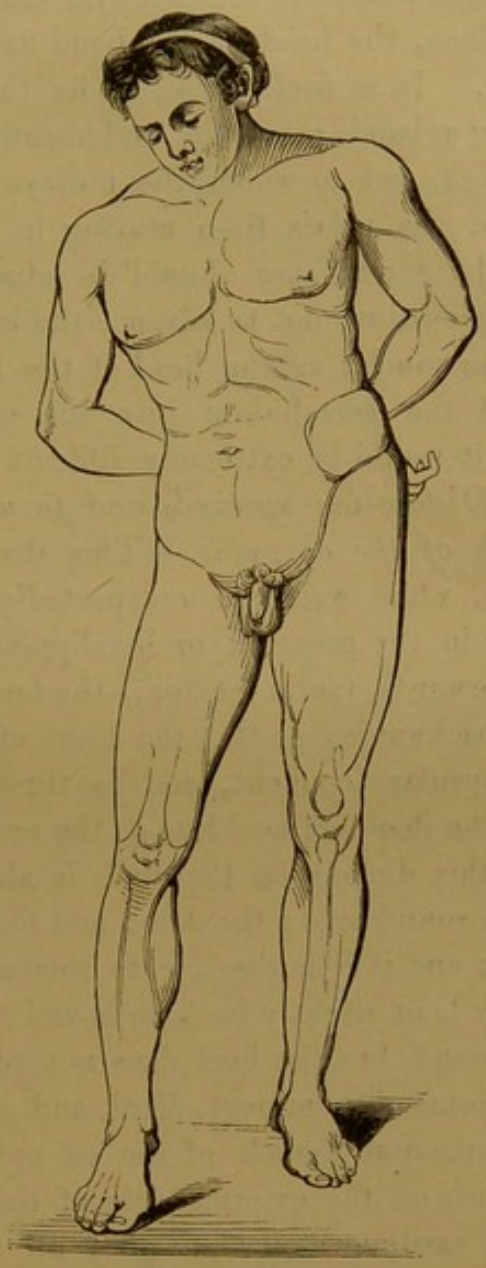
2. *The dislocation downwards and forwards into the foramen ovale.* — This accident may happen when a person is thrown violently upon the ground, while the limb is separated widely from the mesial line of the body, so that the head of the femur is rudely driven against the internal part of the circumference of the capsular ligament where it is weakest.

The symptoms of this dislocation are, the increased length of the limb, which is two inches longer than the other; the trochanter major is less prominent than on the sound side; the knee is advanced, and bent forwards, at the same time that it is widely separated from the other, and cannot be brought any nearer the axis of the body without exciting very great pain. The body is inclined forwards, owing to the tense state of the psoas and iliacus internus muscles. The glu-

† See Sir Astley Cooper's work, plate ix. fig. 3.

teal muscles are placed upon the stretch, which gives a flattened appearance to the buttock. In thin persons, the head of the bone may be felt on pressing deeply between the pectineus and adductor longus muscles, forming a firm globular tumour upon the upper and inner part of the thigh. When he stands, the patient stoops forwards, and supports himself in the erect posture upon the toes, while the heel is considerably elevated from the ground. In some instances of this dislocation the foot has been observed to be turned a little outwards; but, in the majority of cases, it is directed straight forwards.

No. 9.



The ligamentum teres and the capsular ligament are torn through; and the head of the bone, having escaped from the cavity of the acetabulum, is lodged upon the fibres of the obturator externus muscle, which separate it from the thyroid ligament. The pectineus and adductor brevis have been found lacerated after this dislocation, as also the fibres of the quadratus femoris, and the tendons of the external rotator muscles, which are inserted into the trochanteric fossa.

Reduction.—This dislocation is in general very easily reduced. The patient should be placed upon his back, with the thighs separated as much as possible, when the band which is intended to fix the pelvis is to be placed between the thigh and the pudendum: the surgeon then lays hold of the ancle of the dislocated limb, and draws it over the sound leg; when this has been done, the head of the bone usually slips into the acetabulum. It is useful, also, to fix the pelvis more securely by passing a band round it, underneath that which passes round the thigh, and to which the pulleys are attached, in order to prevent the pelvis from moving in the same direction as the thigh.† Great care should be observed, in the reduction of this dislocation, not to advance the knee and leg of the affected side too much; as the head of the bone might otherwise slip behind the acetabulum into the great ischiatic notch, from which it would be extremely difficult to remove it.

4. *Dislocation upwards and forwards upon the horizontal branch of the os pubis.*—This dislocation happens when a person, while walking, unexpectedly puts his foot into some hollow in the ground; or by slipping, when making a sudden step forwards, (as in fencing,) the body being at the same time bent backwards; so that the head of the bone bursts through the capsular ligament, and is thrown forwards and upwards upon the ileo-pectineal line of the os pubis.

In this dislocation the limb is about one inch shorter than on the sound side; the knee and foot are turned forcibly outwards; and it is impossible to rotate the thigh inwards, but it may be bent slightly backwards and forwards. The toes touch the ground, but the heel does not reach it. The head of the bone forms a prominent, hard, and globular tumour in front of the horizontal branch of the os pubis, underneath Poupart's ligament, on the external side of the femoral artery and vein, and is easily perceived to obey all the motions of the limb; the natural prominence of the trochanter major is lost, as it is situated forwards and inwards immediately under the anterior superior spinous process of the ilium.

In this, as in all other dislocations of the hip-joint, the capsular and round ligaments are torn, and the head of the bone is

† See plate viii. fig. 2, of Sir Astley Cooper's work on Dislocations.

lodged upon the pubes underneath the psoas and iliacus muscles and the anterior crural nerve, which lies over the neck of the thigh-bone.

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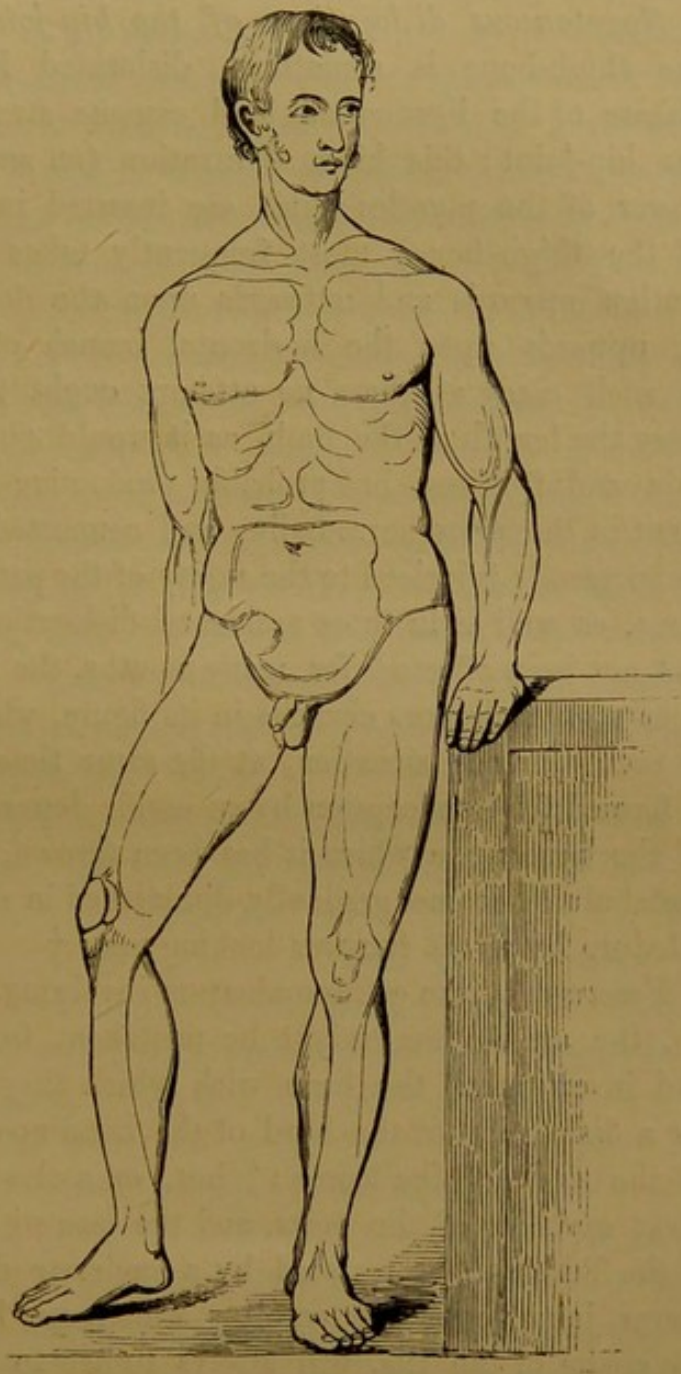

Poupart's ligament has been found torn up, so as to admit more easily the head of the femur between it and the pubes.† The tendons of the external rotators are sometimes torn near their attachments to the trochanteric fossa.

Reduction.—The patient should be placed upon the sound side, and the pelvis fixed by a broad band passed between the upper and inner part of the thigh and the fold of the perinæum; another band is to be placed upon the lower part of the thigh above the knee, and extension of the limb made (the knee being bent at right angles) in an oblique direction, downwards and back-

† Op. citat. p 84.

wards. It will be useful, when the extension has been steadily kept up for a few minutes, to raise the head of the bone from its situation upon the pubes by means of another bandage applied round the upper part of the thigh close to the perinæum.

Spontaneous dislocations of the hip-joint. — The head of the thigh-bone is sometimes dislocated in consequence of disease of the ligamentous and osseous structures which form the hip-joint; this kind of luxation (on account of the great power of the muscles which are inserted into the upper part of the thigh-bone) most frequently takes place in the direction upwards and outwards upon the dorsum of the ilium, or upwards upon the horizontal branch of the pelvis; but in such cases as these no attempt ought to be made to restore the length of the limb, as it would not only prove to be vain and fruitless, but probably productive of so much excitement in the parts surrounding and connected with the joint, as to be greatly injurious to the safety of the patient. In all these cases, as well as in those accidental dislocations where reduction has not been effected for many months, the head of the thigh-bone soon undergoes changes in its figure, which adapt it better to occupy its new situation, at the same time that a new cavity is formed for its reception by an ossific deposit from the surface of the bone upon which it has been thrown, while the original acetabulum becomes gradually diminished in size, and frequently filled up by a soft fungous-looking mass.†

Fractures of the os innominatum involving, as they frequently do, the acetabulum, might be mistaken, from the shortening and inversion of the limb with which they are accompanied, for a dislocation of the head of the bone upwards, or a fracture of the neck of the femur;‡ but, on a closer examination, the great mobility of the parts, and the ease with which the length of the limb can be restored by a moderate degree of extending power, joined with the crepitus which can be felt on handling the cristæ of the ilia, will always suffice to establish a correct diagnosis. In these accidents it is always proper to introduce the catheter, as the urethra may have been torn by the sharp

† Numerous specimens illustrative of the various changes that occur in the acetabulum and head of the thigh-bone under these circumstances, are to be seen in the museum of University College.

‡ Sir Astley Cooper on Fractures and Dislocations, p. 95.

fragments of the rami of the os pubis and ischium should they be broken; an accident which I have witnessed in three instances.

Fracture of the neck of the femur.—A fracture of the neck of the thigh-bone is of very frequent occurrence in elderly persons, and is usually produced by falls upon the side of the hip, by which the neck of the femur is pressed between two resisting surfaces in such a manner that it is suddenly snapt asunder; for it no longer possesses, from the changes which are incident to old age, sufficient elasticity to resist the shock. Since the pelvis is wider, and the trochanter major much more prominent in women than in men, though of the same age, we find that this accident is much more frequent in individuals of the former sex than of the latter. This accident is, moreover, very rarely met with in persons who are under fifty years of age; but I have seen it happen in a young woman of seventeen, and also in a strong healthy man of forty years of age. Sir Astley Cooper states, that, out of two hundred and twenty-five cases of this accident (fracture of the neck of the femur within the capsular ligament) which he has seen, only two occurred in persons who were less than fifty years of age;† the correctness of which statement has been repeatedly confirmed by the observations of numerous other distinguished surgical writers.

Sir Astley Cooper divides the fractures which occur of the neck of the thigh-bone into two classes, in one of which the seat of the fracture is altogether within the capsular ligament, whereas in the other it is external to it, opposite the point where the neck of the femur springs from the trochanters; a distinction which is, however, of comparatively little use in practice, excepting as regards the prognosis, which is somewhat more favourable in the latter than in the former case, provided that the patient be not very far advanced in years.

The symptoms of this accident are a diminution in the length of the limb, which is an inch and a half, or two inches, shorter than the opposite side. There is also usually eversion of the foot and knee, so that they rest upon their outer border as the patient lies upon his back in bed. When the patient is supported in the erect posture, the toes, but not the heel, touch the ground, and he is unable to bear any of the weight of the body upon the limb. The trochanter major is less prominent on the injured side than is natural, and, besides, it

† Op. citat. p. 111.

is drawn by the action of the large muscles of the hip nearer to the crest and anterior superior spinous process of the ilium. By a little force the limb may be easily extended to its proper length, and the proper position of the knee and foot readily restored; but the unnatural appearances are immediately repro-

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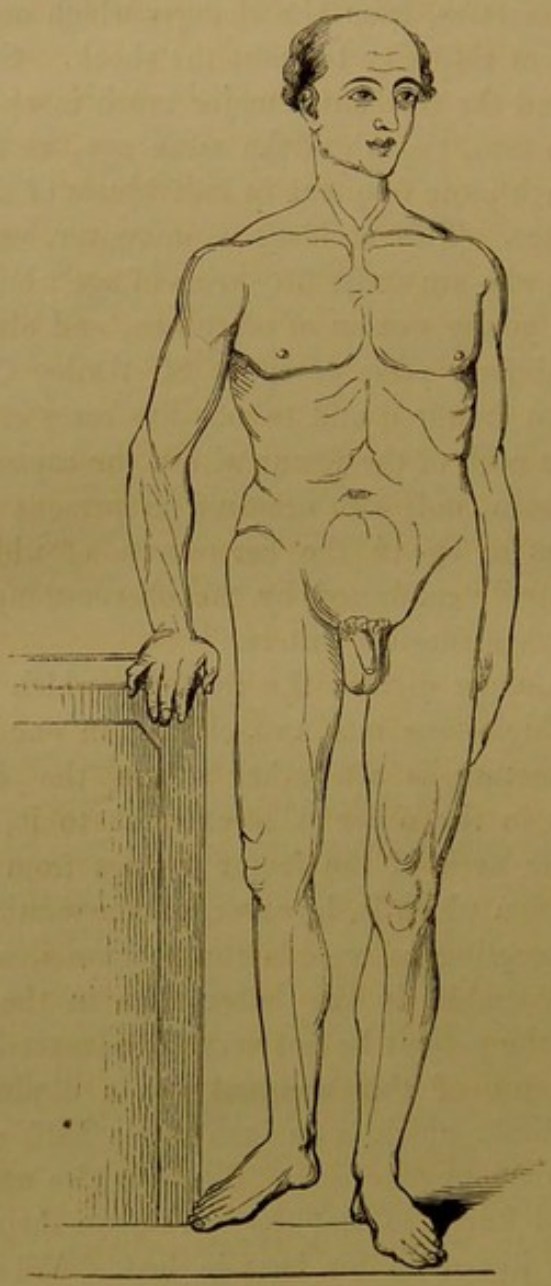

duced when the extension is relaxed. If the limb be drawn down to its original length, and is then rotated, a crepitus will

be felt on firmly grasping the trochanter major with one hand; when, at the same time, it will be observed that the trochanter does not revolve upon the axis of the neck of the thigh-bone, and so describe the arc of a considerable circle, but that it turns shortly upon its own centre, and on the same axis as the shaft of the femur itself.

Persons who have suffered a fracture of the neck of the thigh-bone may, nevertheless, still possess considerable power of flexion and extension of the limb; though these movements are, generally, accompanied with considerable pain. In some instances, where this accident had occurred, no crepitus could be detected on the closest examination; nor was any shortening or eversion of the limb observed until a considerable period of time had elapsed from the occurrence of the injury.† Some persons, indeed, have been known to have walked for some distance after the receipt of this injury; which circumstance must have been owing, in all probability, to some peculiarity in the line of the fracture, by which the broken surfaces of the bone were closely wedged or dovetailed into one another, and had not separated until after a considerable space of time.‡

The knee and foot may be inverted in a fracture of the neck of the thigh-bone; of which unusual circumstance several explanations have been offered by different writers. Sir Astley Cooper considers that this is only likely to occur before the muscles have had sufficient time to contract.§ Mr. Syme states, that it is his opinion that this variation in the appearance of the limb is most likely to be produced when the fracture splits the trochanters, so as to detach the smaller one from the shaft, and also the posterior part of the greater, into which the muscles that perform rotation outwards are inserted, leaving the anterior portion of the process which receives the insertion of the gluteus medius connected with the body of the

† Baron Dupuytren relates several cases of fracture of the neck of the femur, in which the displacement of the broken ends of the bone did not take place until even as many as thirty days had elapsed from the receipt of the injury. See Leçons Orales, tom. ii. p. 47.

‡ A case of this kind is cited in Sir Astley Cooper's work on Dislocations and Fractures, 4th edition, p. 158.

§ Op. citat. p. 106.

bone.† According to Dupuytren, the inversion of the limb must be owing to the peculiar direction of the line of the fracture, which must be oblique, and situated in such a manner that the pointed extremity of the inferior fragment is placed behind that of the superior portion.‡

In all doubtful cases the fracture of the neck of the femur is to be distinguished from the dislocations of the hip-joint by a careful consideration of the distinctive characters of the several displacements to which the head of the thigh-bone is liable, and by contrasting these successively with those which belong to the former accident; thus, it is distinguished from the dislocation downwards and forwards upon the thyroid foramen, by the shortening or equal length of the limb in the former and its positive elongation in the latter accident. It is also distinguished from the dislocation upwards on the horizontal branch of the os pubis, by the forced and steady abduction of the limb,—the great immobility when we endeavour to rotate it inwards,—together with the evident position of the head of the bone underneath Poupart's ligament, where it forms a hard globular tumour, which obeys all the motions of the limb — symptoms which belong to this accident alone. In the luxation backwards into the ischiatic notch the limb is shortened and inverted, (which it may be also in a case of fracture of the neck of the femur,) yet in the case of the luxation there is a great fixity of the upper part of the limb in its new position, with an impossibility of rotating it outwards; neither of which symptoms can co-exist with a fracture of the neck of the femur, in which there is always the greatest latitude and freedom of motion. The same conditions, but in a more marked degree, will amply serve to establish a correct diagnosis between a dislocation of the head of the bone upon the dorsum ilii and a fracture of the neck of the femur.

The best plan of treatment which can be pursued of a fracture of the neck of the femur, consists, I believe, in placing the limb in the straight position, and retaining it there of a proper length by means of the long splint applied along its outer border: the apparatus should be applied for eight or ten weeks;

† See The Principles of Surgery, by James Syme, F.R.S.E.; 8vo. Edin. 1832; p. 232.

‡ Leçons Orales du Baron Dupuytren, tom. ii. p. 53.

except, perhaps, in the case of very old people who are the subject of a fracture of the thigh-bone within the capsular ligament, since in these no prospect of bony union of the broken surfaces can ever be entertained. It is now, however, very generally admitted that osseous reunion of a fracture of the neck of the thigh-bone, although situated within the capsular ligament, may take place under favourable circumstances, but that it is of very rare occurrence.

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