A

MANUAL

OF

ANATOMY;

CONTAINING

RULES FOR DISPLAYING

THE STRUCTURE OF THE BODY,

So as to exhibit the

ELEMENTARY VIEWS OF ANATOMY,

AND

THEIR APPLICATION

TO

PATHOLOGY AND SURGERY:

To which are added,

OBSERVATIONS

ON THE

ART OF MAKING ANATOMICAL PREPARATIONS.

BY

JOHN SHAW,

BEING AN OUTLINE OF THE DEMONSTRATIONS DELIVERED BY HIM, TO THE STUDENTS IN THE SCHOOL OF GREAT WINDMILL STREET.

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THE LECTURES

ON

Anatomy and Surgery,

IN THE

SCHOOL OF GREAT WINDMILL STREET,

ARE GIVEN IN

TWO DIVISIONS.

The First Course commences on the First Day of October, and the Second, on the Nineteenth of January.

TERMS.

The Fees are the same as those determined by the Anatomical Society, in 1798, and which have been since adopted by all the regular Schools of Anatomy in London.

Gentlemen who wish to become private Pupils will receive information from the Teachers.

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OF VOL. II.

ought to make a perpendicular section of the pelvis, that he may examine the parts contained in it.

The first dissection of the thigh and leg should be confined to the muscles and ligaments only.

The plan which the more advanced student should follow is very different from this which I have laid down for the beginner; I shall not enter upon it at present, but proceed to describe the manner in which the first dissection of the muscles of the Abdomen is to be made.*

Before commencing the dissection, the fibres of the muscles should be put upon the stretch by placing a large wooden block under the loins, by letting the legs hang over the table, and by throwing the arms towards the head.

After the body has been put into this position, an incision is to be made through the integuments, in the direction of the linea alba, extending from an inch above the ensiform cartilage to the symphysis of the pubes. A second cut should then be made from the upper part of the first, in a semi-circular direction over the origins of the External Oblique from the ribs, to the

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* This dissection is so difficult that the student must not be disheartened if, in his first attempt, he does not make a display of muscular fibres and glistening tendons, such as he may sometimes see exhibited on the table of the lecturer.

posterior superior spinous process of the ilium. An incision from the umbilicus to the osseous part of the sixth rib will facilitate the dissection. The dissection of the first muscle, (External Oblique,) may now be commenced at the cross cut.

As this is often the first part which the student dissects, I shall give a particular description of the manner of proceeding. The cutting edge of the knife is to be placed perpendicular to the muscular fibres on the margin of the ribs, and is to be carried in the line of the incision towards the umbilicus. The knife may be set boldly on the fibres which are between the ribs and the linea semilunaris; but between this line and the umbilicus much caution must be used, as the muscle here forms a tendinous expansion, which, if mistaken by the young dissector for cellular membrane, is in danger of being cut away. In dissecting the tendinous part, the edge of the knife should not be held perpendicular to the tendon, but rather in a slanting direction.

After some fibres of the muscle have been exposed in their whole extent from the origin on the ribs to their insertion into the linea alba, the forceps may be laid aside, and, instead of them, the finger and thumb of the left hand are to be used to pull the flap of skin downwards and outwards, so as to make the fibres

of the muscle still more tense. The dissection is then to be continued, in the manner already described, down to the ilium; but I must observe that, as the cellular membrane becomes denser, near the groin, it may be mistaken for the tendon, and if, under this idea, it is not at once removed with the skin, it will be difficult afterwards to make the muscle clean.

The upper part of the muscle is now to be exposed. It is difficult to do this part of the dissection neatly, for the muscle, where it lies on the ensiform cartilage, is so thin that it is liable to be raised; and thus the origin of the rectus may be exposed. The most likely way of avoiding this error is to begin the dissection of the upper flap, at the cross cut, and to continue in the same line up to the ensiform cartilage.

The whole of the external oblique will now be seen; but to make its serrated origins appear more distinct, a small part of the Pectoralis major and Latissimus dorsi should be dissected.

This method is the easiest for the young dissector; the student who is accustomed to dissection, need not make the cross incision from the umbilicus to the semi-circular cut, but may commence at the sternum, and carry the flap down towards the ilium.

As I frequently see the young student experience considerable difficulty in shewing the

muscles of the abdomen, I shall give the description of the origin and insertion of them fuller than those of any other part.

The *Obliquus Descendens*, or *Externus*, may be seen to arise, by seven or eight distinct portions, from the seven or eight inferior ribs. The four or five upper portions mix their digitations with corresponding slips of the serratus magnus, and the two or three lower with the latissimus dorsi; sometimes a slip unites with the pectoralis major. The muscular fibres proceed obliquely downwards and forwards, and, at the semilunar white line, terminate abruptly in a thin tendon, which, at the linea alba, is united with the muscle of the other side. The tendon is so thin at the upper part, that the muscular fibres of the rectus may be seen shining through it;—this is the part already described as very liable to be raised by the young dissector. While the tendinous expansions of the muscles of each side are united in the middle of the abdomen, so as to form the superficial part of the linea alba, the more oblique fibres are inserted into the external margin of the two anterior thirds of the crista, and to the anterior superior spinous process of the os ilii, to the os pubis, and to the whole length of Poupart's ligament.

External Oblique.

The Spermatic cord in the male, and the Round Ligament of the Uterus in the female, may be seen passing between the tendinous

fibres of the muscle. This opening is called the External Abdominal Ring. The dissector need not now be particular in his attention to it, but wait until the *surgical view*, which will be presently described.

Abdominal Ring.

We may now look to the general appearance of the muscle. First, the origins from the side of the thorax, come down in thin layers over the ribs; then a stronger and more fleshy part winds round betwixt the false ribs and the ilium; the expanded tendon on the fore part of the belly is bounded by the *Linea Alba;* the muscular fibres terminate in the *Linea Semilunaris,* which is that tendinous white line that runs, in a curved direction, from the os pubis to the margin of the ribs. In the space betwixt the two lines the Rectus is indistinctly seen through the transparent tendon, and intersected by white bands, which are formed by the union of its intermediate tendons with the tendons of the oblique muscles.

Linea Alba, and Semilunaris.

In the middle of the linea alba the remains of the Umbilical opening will be seen. It appears like a perforation in the tendons, and is filled up by a dense cellular substance, viz. the remains of the umbilical vessels. The peritoneum will afterwards be found firmly attached to this part.

Umbilicus.

To dissect the next muscle, (the Internal Oblique,) the body should be thrown a little more

upon one side. The dissection may be begun, by separating the serrated origins of the obliquus externus from the ribs, and from their connexion with the latissimus dorsi. The external oblique is then to be held as if it were the skin, and is to be detached from the internal, by carrying the knife in a direction parallel to the fibres of the latter, taking care to leave the cellular membrane which lies betwixt the two, on the external muscle. It is difficult to separate the two muscles from each other at the upper part, father than the linea semilunaris, for at this line, their tendons are united firmly; but on the lower part of the abdomen, the whole extent of the internal oblique may be easily shown by cutting through the attachment of the external oblique to the ilium and Poupart's ligament.

Internal Oblique.

It is not easy to determine which should be the origins, and which the insertions of the internal oblique, for the origin may occasionally be considered as the insertion, and vice versa. Here, we may describe it as arising from two thirds of the iliac portion of Poupart's ligament; from the whole extent of the spine of the ilium; and from that fascia formed by the tendons of certain muscles of the back, which is called fascia lumborum. This last origin is sometimes described as from the lowest lumbar vertebra and os sacrum, by a tendon, which also gives

origin to the Serratus Posticus Inferior. The fibres which rise from the posterior part of the spine of the ilium run obliquely upwards, to the three lowest ribs, into which they are inserted by fleshy fibres, and into the four next ribs by a thin tendinous membrane. The fibres which arise from the middle of the spine, run towards the linea alba; but at the linea semilunaris, the tendon splits, and one portion having united to the tendon of the external oblique, runs anterior to the rectus, and is inserted into the whole extent of the linea alba—while the other portion of the tendon, which passes behind the rectus, does not extend to the whole of the linea alba, but is gradually lost about half way between the umbilicus and os pubis; so that the lower part of the rectus is not contained in a tendinous sheath. That portion of the internal oblique which arises from Poupart's ligament is inserted into the tuberous angle of the os pubis: but here, the dissector is sometimes a little puzzled by a set of fibres, which he will discover in the male body, passing from the edge of the muscle towards the spermatic cord. They form the cremaster, and arise generally from the internal oblique, but sometimes from the ligament; they cover the spermatic cord, pass with it through the ring, and are lost upon the upper part of the tunica vaginalis testis.

emaster.

Unless we are now at liberty to put the body

into whatever position we please, it will be very difficult to dissect the next muscle (the Transversalis;) and it will be almost impossible to show its origins before the muscles of the back are dissected; for its fibres rise from the edges of the eleventh and twelfth ribs, and from the transverse processes of the last dorsal and the four superior lumbar vertebræ. Coming from this deep source, they must pass between the quadratus lumborum and sacro lumbalis. Therefore, at present, we can show only the connexions which the Transversalis has with the muscles on the anterior part of the abdomen. Transversalis

We may commence the dissection by raising the attachments of the internal oblique from the cartilages of the ribs, from the fascia lumborum, and from the spine of the ilium. It is difficult to separate the lower edges of the two muscles from each other, for they lie so close together, that, in raising the attachments of the oblique, we are apt to lift the transversalis also. The separation is most easily begun at the spine of the ilium, as a small artery marks the line of division between the muscles at this part. In this dissection we cannot make the transversalis appear very clean, as we must carry the knife across the line of the fibres.

It will be difficult to separate the obliquus farther than the Linea Semilunaris, for there,

the tendons of the two muscles are intimately united.

The tendon of the transversalis, being attached to the posterior portion of the obliquus, passes with it behind the rectus, from the ensiform cartilage to a point midway between the umbilicus and pubes; but, below this point, both muscles pass anterior to the rectus, to be inserted into the os pubis; so that, at the lower part of the abdomen, neither of the muscles are posterior to the rectus. It will be afterwards found, that there is only a little cellular membrane between the lower part of the rectus and the peritoneum.

When the internal oblique has been raised so as to expose the whole of the transversalis, we shall find that its origin and insertion are very similar to those of the oblique; but still it is generally described as arising from the cartilages of the seven lower ribs, from the fascia lumborum, from the transverse processes of the last dorsal and the four superior lumbar vertebræ, from the spine of the ilium, and two thirds of Poupart's ligament; the fibres then pass to the linea alba and pubes.

The muscles which remain to be dissected
ectus. are the Rectus and Pyramidalis. The most important part of the anatomy of the rectus is its sheath. It has been already seen to be formed by the spliting of the tendon of the internal ob-

lique, to the anterior portion of which, the tendon of the external oblique is attached, while the tendon of the transversalis unites with the posterior layer. The Rectus itself may be exposed by cutting through the tendon of the external and the anterior layer of the internal oblique, at their attachment to the linea alba, but some difficulty will be experienced in separating the sheath from the belly of the muscle, in consequence of the Lineæ Transversæ. The muscle will be found at its lower end to be attached to the symphysis pubis, and at the upper, to the ensiform cartilage and the cartilages of the fifth, sixth, and seventh ribs. At the lower part of the belly, a pyramidal set of fibres will generally be found, forming the muscle, called the Pyramidalis. It arises from the symphysis pubis, and is inserted into the linea alba, about two inches above the pubes. Pyramidalis.

After the parts have been thus dissected, they can be demonstrated in such various views, and with such quick succession, that they cannot fail to be effectually understood. And having carefully observed their strict anatomy, we can easily recapitulate their general character and uses.

It may be observed how great a space there is in the skeleton to be covered from the edge of the thorax to the brim of the pelvis, and backwards to the spine; and recollecting that in this

space are contained the soft viscera of the abdomen, and that these must be sustained by an elastic and yielding covering, it will be understood how this covering, whilst it supports the viscera, and yields to, and assists the operations of the diaphragm, must support and poise the whole trunk upon the pelvis; and that, although the muscles are thin and delicate, yet having so great a lever as the edge of the thorax, while the centre of motion is in the spine, they must bend the upper part of the body with great force. We may now perceive that the abdominal muscles are muscles of respiration, that they are muscles of the trunk, and that they compress and retain the viscera. Considering them as muscles of respiration, the student will understand how peculiarities in the manner of breathing become a symptom of disease, and why we endeavour to substitute the action of these muscles, and of the diaphragm, for the external muscles of respiration, in fractures of the ribs, sternum, &c.

The question, Do the viscera of the abdomen suffer an unceasing pressure? is very important, for we are led to consider how the effects of pressure of the abdominal muscles may become a means of diagnosis in diseases of the abdomen; and what are the effects of the removal of pressure by the delivery of the child, or the drawing off the water in ascites.

However, the most important subject of inquiry in the dissection of the abdominal muscles, is the anatomy of the openings by which the intestines generally protrude in Inguinal or Femoral Hernia. But before the young student can attend with advantage to this subject, he ought to make himself master of the dissection of the viscera of the abdomen, and of the muscles and arteries of the thigh.

FIRST VIEW

OF THE

VISCERA OF THE ABDOMEN.

THE first general view of the viscera may be taken from the body, on which the muscles have been dissected.

Before exposing the cavity of the abdomen, the student should attend to those arbitrary divisions, which have been called the Regions of the Abdomen. To mark these, one line should be drawn across the abdomen, between the most prominent parts of the cartilages of the ribs, and another between the superior spinous processes of the ilia. These lines will divide the belly into three parts, each of which may be sub-divided.

The space above the middle line includes the Epigastric and the right and left Hypochondriac regions,—the cartilages of the ribs form the lateral boundaries of the Epigastric region, the centre and upper part of which is often called Scrobiculus Cordis. If we take the umbilicus for a centre, and describe a circle, the radius of which extends to the upper and lower line, we

shall include in it, the Umbilical region: on each side of which, is the Iliac region; and nearer to the spine, and on the same parallel, are the Lumbar regions, or the Loins. Below the lower line we have, in the middle, the Hypogastric, or Pubic region, and on the sides, the Inguinal regions.

In making the dissection of the abdomen, to discover the cause of death, we must have a regard to what will least disfigure the body; the method of doing this, will be pointed out afterwards; but in the present dissection, the muscles may be cut, in the manner best suited for giving a general idea of the anatomy.

The transversalis, of the right side, may be divided, so as to expose the surface of the peritoneum; then, by insinuating the finger between the muscle and the peritoneum, and by carrying it towards the spine, we shall form some idea of what is meant by the common expression, "that the viscera are behind the peritoneum." Peritoneum. In doing this, we may observe, that the surface of the peritoneum in union with the muscles, is of a cellular texture: we shall afterwards find that the inner surface is smooth and serous.

We may now expose the cavity of the abdomen, by making an incision on the left side of the linea alba, from the ensiform cartilage to the umbilicus, and then from the umbilicus to

the spine of the ilium, on each side: the lower flap may be laid over the pubes.

irst View of he Viscera.

The view of the viscera now before us, is most perplexing, and we may safely say has no resemblance to their situation in the living body; indeed it must be impossible to put any one turn of the intestines into the relation which it had to any other, while they were supported by the natural and uniform pressure of the abdominal muscles in the living body. If we consider what the condition of the viscera must be, when compressed by the respiratory muscles, or when the body is in full action, and, when, at the same time, the viscera are, by their peculiar peristaltic action, propelling their contents from the stomach to the rectum, we may form some idea of the incorrect notions we should have of the course of a wound, or the seat of disease, were we to take our impressions from the present state of the viscera, which we see falling into almost inextricable confusion as soon as the muscles are cut through.

These observations I have thought it necessary to make, as I very frequently find students teasing themselves with what they call "relative position;"—not only forgetting that the position of the parts is changed in consequence of death, but that the state of all the viscera, from the œsophagus to the rectum, varies, according to their being full or empty.

We may now proceed to examine the common appearance of the parts within the abdomen.

When the abdomen is first opened, a small portion of the liver will be seen to project from under the ribs; part of the great arch of the stomach will generally occupy the centre and left side. If the body be that of a young person, and if there have been no disease in the abdomen, the great omentum or epiploon will extend from the stomach over the small intestines. The great intestine, or colon, if distended, will lie very close to the stomach; it may perhaps be seen under the transparent omentum. If we lift up the omentum from below, and turn it over the margin of the ribs, we shall then see the small intestines and the colon. If the bladder be distended, a small portion of it will be visible.

First View of the Viscera.

Before examining the several viscera, we should attend to the inflections of the peritoneum. It is difficult for a young student to understand the relation which this membrane has to the viscera; for when the abdomen is laid open, he is apt to imagine, that the intestines are contained within the membrane: but they may be shewn not to be so; if we trace the peritoneum from the inside of the transversalis muscle, we may strip it from the back of the colon;—thus proving, that this intestine is not surrounded by it.

Inflections of Peritoneum.

By a little care, we may show that the membrane has the same relation to the other viscera, and to the muscles of the abdomen. Hence, the peritoneum has been described as a loose bag, the internal surface of which, has the character of a serous membrane, which, being interposed between the muscles and the viscera, adheres to each, through the medium of its external cellular surface.

It is not easy to show all the connexions of the peritoneum, for it not only forms a covering to most of the viscera, but also holds them in a certain relative position to each other; whence, some parts of it have been described as ligaments, viz. of the liver, spleen, colon, small intestines, &c. A general idea of the inflections of the peritoneum may be acquired by tracing it, from the inside of the right transversalis muscle over the colon, to form the lateral part of the mesocolon,—then to the small intestines, to form the mesentery,—and from them, to the sigmoid flexure of the colon, and to the abdominal muscles of the left side; from which it may again be traced towards the point where we commenced on the right side. It is more difficult to trace the peritoneum from above downwards.

We may begin to trace it at the diaphragm; from which it may be seen to pass off to the liver. From the liver, it may be traced, under

the name of the lesser omentum, to the stomach; then, from the stomach to the arch of the colon, as the great omentum. If we hold up the colon, we shall be able to trace the peritoneum, from the surface of the gut towards the spine, as the mesocolon, or, as it is sometimes called, "the ligament of the colon," and which is needlessly divided into two portions called "right and left mesocolon." From the lower part of the mesocolon, we may trace it to form the mesentery of the small intestines. From this it passes down to the rectum, and here it is called "the mesorectum," from which, we may trace it in the female to the uterus, as the plica semilunaris, and then to the bladder; from which, as in man, we may again trace it to the muscles of the abdomen,—and, so, round to where we began.*

Inflections of Peritoneum.

The principal difficulty in following the inflections of the peritoneum, is owing to the great, or gastro-colic, omentum, the laminæ of

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* I shall here merely enumerate certain parts of the peritoneum, which the student will have no difficulty in discovering:—*ligamentum dextrum ventriculi*; the *vinculum œsophagi*; *vinculum inter œsophagum et lienem*; *plica renalis et capsularis*; *plica à rene ad colon*; *plica duodeno renalis*; *plica hepatico renalis*. When the lower part of the muscles of the abdomen are cut from the umbilicus to the ossa ilii, three lines will be seen on the peritoneum,—the central one, from the fundus of the

which have been always matter of much annoyance to the student. If the omentum be not thickened by disease, it will be seen running from the stomach down nearly to the pelvis; and if it be lifted up, it will be found attached to the arch of the colon. If the colon had been far removed from the stomach, the omentum would have appeared more simple; for then we might have traced, one layer from the upper, and another from the lower surface of the stomach, to the corresponding parts of the colon; but as the colon lies close upon the stomach, and as the omentum is of a great length, it is necessarily reflected back upon itself to pass to the colon, so, that below the line of the colon, the two layers of the omentum must be doubled, and hence it may be said that the loose portion of the omentum which covers the small intestines is formed of four laminæ.*

Omentum.

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bladder to the umbilicus, is formed by the part which in the fœtus was called "urachus;" and the two lateral lines are the remains of the umbilical arteries. These parts are external to the peritoneum, but adhere so closely to it in the adult, as to appear to be produced by a thickening of the membrane.

* The portion of the great omentum which runs towards the cæcum is called "omentum cæci;" this is quite different from the "appendices epiploicæ," which are found on the colon, and are sometimes called "omentulæ intestini crassi."

The young student is not less puzzled by the descriptions which are generally given of the bag of the omentum, and the foramen of Winslow,—perhaps the difficulty will be lessened if he examines the parts in the following manner.

In pulling the stomach down from the liver, the lesser omentum or mesogastrium, will be seen; and in doing this, the vessels which are passing to and from the liver may be seen or felt; these vessels are surrounded by the peritoneum and a portion of cellular membrane, which, having been described by Glisson as bearing some resemblance to a capsule, has been called the capsule of Glisson. If the finger be put under the right side of these vessels, it will pass under the ligamentum hepatico duodenale, and into the Foramen of Winslow, which is the opening of the great bag of the omentum, the boundaries of which may be traced in the following manner:—If we push the finger towards the left side, it will be seen under the omentum minus; if farther, it will pass under the stomach; if we try and push it backwards, it will be stopped by the pancreas and the parts lying on the spine; if we pass it in a direction downwards, it will be obstructed by the mesocolon, and, if upwards, by the liver; if there be no adhesions formed, we shall be able to pass it up between the stomach and colon, into the space between the duplicature of the omentum

Capsule of Glisson.

Foramen of Winslow.

which, in a young body, may be distended, so as to appear like a bag, by blowing with a pair of bellows into the foramen of Winslow.

When the omentum is dissected from the stomach and colon, the viscera will appear very confused; but, by a little management, the parts may be unravelled. Look in the right iliac region for the termination of the small intestine (the ileon) in the great intestine (the colon); make a small opening in the ileon, about six inches from the colon; introduce a blow-pipe, and blow towards the colon;—the colon, being distended, will be seen with its membrane (mesocolon) to form a natural division in the abdomen, all the small intestines being below, and the stomach, &c. above it. When the colon is distended, we can understand the terms which are given to its several parts, viz. *caput; cœcum; processus vermiformis; ascending part of the arch; transverse part of the arch; descending part; and sigmoid flexure.*

Colon.

The small intestines are seen lying in a confused mass within the embrace of the colon: to unravel them, the blow-pipe should again be put into the lower part of the ileon; and by then blowing upwards, the whole of the intestinum tenue, or small intestine, will be distended. The upper part, which will be now easily found, should be tied, just before it passes under the mesocolon.

Small Intestines.

The small intestines are generally divided into five parts, three of which are given to the upper portion, called *jejunum*, and two to the lower, viz. the *ileon*. The arteries seen in this view, are all branches either of the superior or inferior mesenteric.

The small intestines may now be removed from the mesentery, by cutting away, all that is between the ligature on the ileon, and that on the jejunum.

We may now examine the viscera above the line of the colon. If the blow-pipe be introduced into the remaining part of the jejunum, the air will distend the duodenum and the stomach. The colon is then to be pulled downwards, and is to be removed, by dissecting away the mesocolon from the parts below it; by doing so, we shall get a view of the liver, the stomach and spleen, the duodenum and pancreas. If we pull down the stomach, we shall see the œsophagus coming through the diaphragm, and entering its cardiac orifice; upon its left side we shall see the spleen, attached by a set of small vessels. Tracing the arch of the stomach downwards, we come to the pylorus; by taking this between the finger and thumb, we shall discover the thickening of the coats which forms the sphincter of the pylorus, improperly called a valve. Immediately below the sphincter, is the beginning of the duodenum;

Stomach Duodenum and Spleen.

this gut appears generally so large, as, from its size, to be entitled to the name of Ventriculus Secundus; it may be traced up towards the gall bladder, from which, taking an irregular turn upon itself, it passes towards the left side, across the spine: at the point where it is passing over the spine, we see that it is bound down by the mesocolon,—and here, we may also observe, that the peritoneum does not so entirely cover it, as it does the other intestines.

Liver.

The edge of the liver may now be held up by an assistant, that we may have a view of the gall bladder, and of those vessels and ducts which are contained within the capsule of Glisson. As the part of the liver into which those vessels are passing, has something of the form of a gateway, the name *vena portæ* has been given to the principal vessel of the liver.

When the arteries and veins are injected, there will be no difficulty in discovering the several parts; but even in the uninjected state, they will be easily found, by merely taking off the cellular membrane investing them. The vessel on the left side will be the Hepatic Artery; the large vessel in the middle is the Vena Portæ; the Ductus Communis Choledochus is on the right side, and will be known by its dusky yellow colour. It will be easy to trace from this, the Ductus Cysticus; into which such a hole is to be made as will admit a blow-pipe:

Vessels of the Liver.

by blowing towards the liver, the gall bladder will be distended; and by blowing in the other direction, we shall distend the hepatic ducts, and the ductus communis choledochus: by this the dissection will be facilitated. Perhaps a better mode of distending these parts will be, to make a very small puncture into the upper part of the gall bladder; from which the bladder and all the ducts may be at once injected, or filled with air. Ducts of the Liver.

The cellular membrane is now to be carefully taken off from the pancreas, so as to expose the duct, which is like a vein, but of a whiter colour; it runs into the duodenum, close to the ductus communis choledochus. A second duct of the pancreas will be generally found coming from that part of the gland which is called the head, and which adheres closely to the duodenum. Pancreas.

Before separating the liver from the diaphragm, the ligaments should be observed:—1st. the Round ligament, or the remains of the umbilical vein: 2d. the Broad, or Suspensory ligament, formed by the peritoneum passing from the muscles of the abdomen, and from the diaphragm: 3d. the Coronary ligament, being the attachment of the liver to the diaphragm, through the medium of the peritoneum; and 4th and 5th, the two Lateral ligaments, which are only the right and left extremities of the Coronary ligament. Ligaments of the Liver.

We may now proceed to separate the liver, stomach, &c. from their attachments to the abdomen. If we cut through the round and suspensory ligaments, the liver will be retained only by the coronary ligament; in cutting this last ligament, we must also divide the Venæ Cavæ Hepaticæ. In removing the stomach, the œsophagus must be pulled down; it should be tied with a double ligature before it is cut.

The pancreas, &c. will be easily separated by cutting through a few vessels, and a little cellular membrane. The viscera may be put into water, for future examination.

Kidneys.

The only viscera now remaining, are the kidneys and their appendages. There are but few observations necessary to be made on them at present, as they will be described in the dissection of the vessels of the abdomen; the young dissector should only look to their general situation, and observe that, in consequence of the quantity of fat and cellular membrane which covers them, they are not so closely invested by the peritoneum, as the chylopoetic viscera are; and therefore, they are often described as being situated without the abdomen.

Diaphragm.

We may now show the muscular fibres of the diaphragm, by taking off the peritoneum which covers it; but in doing this, we must avoid cutting through the diaphragm, or the air will rush into the chest, and then it will fall relaxed.

We may observe the three openings in the diaphragm, viz. the central one, between the crura, for the aorta and thoracic duct; the right, or tendinous one, for the vena cava (which vessel has probably been torn, in pulling away the liver); and, on the left side, the hole for the œsophagus.

The kidneys may be removed, that we may complete the first general dissection of the abdomen, by showing the course of the deep muscles, viz. the Quadratus Lumborum, Psoæ, and Iliacus Internus. The cellular membrane covering these muscles is very loose, and easily removed; the small vessels and nerves which run upon them may be cut through, but the aorta should be preserved. At the upper part of the quadratus a strong ligament will be seen running from the extremity of the last rib, to the transverse process of the first lumbar vertebra; this is the Ligamentum Arcuatum. Upon the iliacus and psoas there is a strong fascia, which is also closely united to the Poupart ligament. To trace the muscles to their insertion, this fascia should be cut through; but at present we should not follow them to the trochanter, for in doing this, some of the muscles of the thigh would be destroyed.

Deep Muscles.

Ligamentum Arcuatum.

TABLE
OF
THE DEEP MUSCLES OF THE ABDOMEN.

ORIGIN AND INSERTION OF THE DIAPHRAGM. The diaphragm is a broad thin muscle, which, with its tendon, makes a complete transverse septum or partition betwixt the thorax and abdomen; it is concave downward and convex upward; the middle of it, on each side, reaches as high within the thorax as the level of the fourth rib.

The diaphragm is generally described as consisting of two muscles and an intermediate tendon.

THE SUPERIOR OF GREATER MUSCLE OF THE DIAPHRAGM. OR. By distinct fleshy fibres: 1. from the cartilago ensiformis; 2. from the cartilages of the seventh, and of all the inferior ribs on both sides, and ligamentum arcuatum.

IN. From these origins, the fibres run radiated from the circumference to the centre of the septum, and terminate in a cordiform tendon, which forms the middle of the diaphragm, and in which the fibres from the opposite sides are inserted and interlaced. To the right of this tendinous centre there is a perforation for transmitting the vena cava.

THE INFERIOR OF LESSER MUSCLE OF THE DIAPHRAGM. OR. The second, third, and fourth lumbar vertebræ, by several tendinous heads, of which the central and longest are called the crura. (Between the

crura, the aorta and thoracic duct pass; and, on the outside of these, the great sympathetic nerves and branches of the vena azygos perforate the shorter heads.) The fibres run upwards, and form, in the middle, two fleshy columns, which decussate, and leave an oval space between them for the passage of the œsophagus and eighth pair of nerves.

In. The back of the central tendon of the diaphragm.

Use. The diaphragm is the principal muscle of respiration: when it is in action, the fibres bring the septum towards a plane, by which the cavity of the thorax is enlarged; when relaxed, it is pressed by the abdominal muscles, which, acting through the viscera, thrust it up, and compress the lungs.

Quadratus Lumborum. Or. From the posterior part of the spine of the os ilium.

In. Into the transverse processes of all the lumbar vertebræ; into the last rib near the spine; and, by a small tendon, into the side of the last vertebra of the back.

Use. To move the loins to one side; to pull down the last rib; and when the muscles of both sides act, to bend the loins forward.

Psoas Parvus. Or. The sides of the two upper vertebræ of the loins. Sends off a small long tendon, which ends thin and flat, and is

In. Into the iliac fascia and Poupart tendon.

Use To strengthen the insertion of the abdominal muscles, and prevent their yielding in the straining

of the muscles of the trunk. This muscle is often wanting.

Psoas Magnus. Or. 1. The body and transverse process of the last vertebra of the back; 2. from all those of the loins.

In. The trochanter minor of the thigh bone; and into that bone, a little below the trochanter.

Use. To bend the thigh forwards, or, when the inferior extremity is fixed, to assist in bringing the body forward.

Iliacus Internus. Or. 1. The transverse process of the last vertebra of the loins; 2. all the inner lip of the spine of the ilium; 3. the edge of that bone, between its anterior superior spinous process and the acetabulum; 4. from most of the hollow part of the ilium. It joins with the psoas magnus, where it begins to become tendinous, and is

In. Into the lesser trochanter.

Use. To assist the psoas magnus.

Between these two muscles and the capsular ligament of the Hip Joint there is a very large bursa.

DISSECTION

OF THE

ARTERIES AND VEINS

OF

THE VISCERA.

IF the student does not intend to examine the minute structure of those viscera which he has removed from the body, he should now proceed to dissect the muscles of the thigh, or, if it be a male body, of the perineum. But before describing those parts, I shall point out the method of dissecting the vessels of the abdomen, and the manner of showing the minute anatomy of the several viscera.

The arteries which supply the viscera are easily arranged; indeed, the whole anatomy of them is so simple, that we ought not to sacrifice the abdomen to the arteries only, but should endeavour, at the same time, to make a dissection of the venous system.

The method of injecting the vessels will depend upon the manner in which the thorax is to be dissected.

If the subject be young, and if it be intended to make a preparation of the arteries, then, those of the abdomen are to be filled, in common with the others, from the arch of the aorta; but, in the usual dissection, where the parts are not to be preserved, the arteries may be injected after the muscles of the abdomen have been dissected. To do this neatly, we should tie the aorta above the diaphragm, and one of the iliac arteries at its origin from the aorta, and then put a pipe into the other common iliac, as close to the aorta as possible, so that there may be enough of the artery left, to enable us afterwards, to put a tube into it for the injection of the lower extremity.

Injection of the Arteries.

If we inject the arteries of the viscera of an adult subject, at the same time with the vessels of the upper part of the body, from the arch of the aorta, neither the vessels of the viscera, nor of the limbs, will be fully distended, as the size and dilatability of the vessels of the abdomen will take off the force of the syringe from the smaller vessels.

The objection to introducing the pipe into the aorta, above the diaphragm, and injecting downwards, is, that a great part of the thorax must be destroyed, to enable us to manage the pipe properly.

The best composition for the injection of the vessels of the viscera, is a strong solution of

glue, coloured with red lead, or an injection made of tallow and turpentine varnish. As both of these compositions must be used while warm, it is necessary to heat the vessels of the abdomen; this is most easily done by making an opening into the intestines, and injecting a quantity of hot water into them.

The veins must be injected before the intestines are examined; and as there are no valves in them, it will be easily done.

Injection of the Veins.

The veins of the liver may be injected from the ramifications of those in the mesentery; or the veins of the intestines may be injected from the trunk of the vena portæ. To find the vena portæ as it enters the liver, the stomach should be held down, and the smaller omentum cleared away from betwixt the stomach and liver: the vein is then found (covered in part with cellular substance) running obliquely across the spine, and parallel to the biliary duct. If we be uncertain of its situation, the substance of the liver may be pressed gently with the hand, or the blood urged along the veins of the intestines, and then the vena portæ will rise from the confusion, as a large dark blue vein.

Vena Portæ.

But to inject all the veins which form the vena portæ, we should put a pipe into the ileo colic vein. This branch has its name, from being subservient to the caput coli, and that part of the ileon which joins the colon; it may

be found by folding back the small intestines from the right os ilium, and exposing the caput coli. After puncturing the vein, and fixing the tube, a ligature should be put upon the part of the vessel behind the tube, that the injection which comes round, may be prevented from escaping. Before throwing in the injection, the veins should be repeatedly syringed with warm water. The injection may be made to run more minutely into the vessels of the intestines by pressing gently upon the trunk of the vena portæ.

As the venæ cavæ hepaticæ may be filled by a successful injection, the vena cava should be tied just above the diaphragm. The vena cava itself should not be injected, as its branches can be easily traced without their being filled. When they are injected at the same time with the other vessels of the abdomen, they encumber the dissection very much; but if we wish to fill them, a pipe should be put into the iliac or femoral vein.

When all the vessels are injected, the small intestines should be removed, and the colon blown up in the manner already described, in the first dissection of the abdomen. All those arteries which are seen on the part of the mesentery which has been left, and also on the right side and middle of the mesocolon, are branches of the superior mesenteric artery;

Manner of Dissecting the Vessels.

while those which run towards the sigmoid flexure and rectum, are from the inferior mesenteric.

The dissection is to be begun with the loose mesentery, by dissecting off the peritoneal coat and fat from the vessels. These arteries in the mesentery, have no appropriate names, as they compose one set of innumerable branches, forming, before they reach the small intestines, frequent anastomoses and arches, by which the capacity of the branches combined must be wonderfully increased, in proportion to that of the single trunk from which they arise.

From the UPPER MESENTERIC ARTERY, upon the right side, three branches are given off to the colon, viz.

1. The ARTERIA ILIO-COLICA; whose ramifications connect the branches which go to the small intestines, with those which go to the colon. It runs down to the caput coli and last turns of the ileon. Its branches upon the small intestine, inosculate with the branches distributed to the small intestines from the same trunk; upon the great intestine, it inosculates with the second colic branch, viz. Superior Mesenteric. Ilio-Colica.

The COLICA DEXTRA; which will be found running from the root of the superior mesenteric artery across towards the right side of the colon, where it begins to rise over the kidney, inoscu- Colica Dextra

lating freely with the last branch, and upwards with

Colica Media. The COLICA MEDIA.—This branch goes directly upwards from the trunk of the upper mesenteric artery, as it comes out from under the mesocolon. After running a little way upon the mesocolon, it divides; and one of the divisions going towards the right side, makes a large circle upon the mesocolon, and forms a great inosculation with the right colic artery; while the other division, going towards the left side, makes a similar sweep, and joins with the left colic, which is a branch from the lower mesenteric artery. These two branches of the median colic artery give off numerous ramifications, which supply a great extent of the middle part of the colon.

Inferior Mesenteric. The INFERIOR MESENTERIC.—The branches of the inferior mesenteric artery are easily found. The dissection may be made from branch to trunk, beginning with the hæmorrhoidal artery lying upon the back and upper part of the rectum. Proceeding up along the gut, numerous branches are found distributed to that part of the colon which forms the sigmoid flexure. These are derived from the uppermost branch of the lower mesenteric, which, as it supplies the left side of the colon, is called the COLICA SINISTRA; it communicates with the median

Colica Sinistra.

colic branch of the upper mesenteric artery, and completes a great circle of inosculations, reaching all the length of the intestinal canal.*

Veins.

OF THE ACCOMPANYING VEINS SEEN IN THIS VIEW OF THE INTESTINES.—The branches of the veins run in company with the arteries, however different they may be in the direction of their trunks; therefore, the names and distribution of the one set of vessels being known, the other must be known also;—all vessels should be named according to the parts to which they are distributed, and not from the trunks from which they are sent off; their distribution being constant, their derivation irregular.

The veins, as seen in this view of the parts, preserve a uniform course; their varieties consisting only in the direction of the trunks in which they are gathered to form the vena portæ.

Following, then, the demonstration of the arteries—The *hæmorrhoidal vein*, rising from the back of the rectum, may be easily found; the *vena colica sinistra*, coming from the left part of the colon, is joined to the last; the *vena colica media*, the *vena colica dextra*, and the *vena ilio colica*, being united, return the blood from

* In the dissection of the lower mesenteric artery, its root is found entangled by the nerves of the inferior mesenteric plexus, which is formed by branches from the sympathetic, and by branches from the superior mesenteric plexus, and great cœliac plexus.

the arch of the colon; while one great branch, which is promiscuously divided among the small intestines, carries back the blood from them to the vena portæ.—These veins will be further traced in the next view of the intestines.

The dissection of the cœliac artery, of the trunk of the vena portæ, of the arteries and veins of the stomach, and of the corresponding arteries of the liver, gall-bladder, and pancreas, may now be made.

Separate the arch of the colon from the stomach, and lay it down in the manner described in the first dissection.

There is now much difficult dissection. The stomach will be seen lying under the projecting liver; the spleen towards the left end of the stomach; the pancreas will be found lying directly across the aorta, reaching from the spleen to the duodenum, and involved in the root of the mesocolon.

Cœliaca. The ARTERIA CŒLIACA supplies all the parts lying in the upper division of the belly, above the mesocolon. It is the second artery of the abdominal aorta, coming off at the point where the great artery seems to be extricating itself from the diaphragm. It rises directly from the aorta, as a short trunk, which divides quickly into branches.

The best way to dissect this artery, is to dis-

tend the stomach slightly, and then to pull it down, so that we may dissect the lesser omentum from betwixt it and the liver. The artery will then be found, dividing at once into three branches, viz. *Coronaria Ventriculi, Hepatica, and Splenica,* and as they depart in different directions from one point, or centre, the trunk is called the *axis arteriæ cœliacæ.*

The ARTERIA CORONARIA VENTRICULI will be found going off towards the left side, and spreading largely over the upper part of the stomach. If it is found to be larger than the other branches, it may be expected to send a branch to the liver, which will pass to the right, and then upwards, till it be lost in the fossa ductus venosi. When there is no branch sent to the liver, the trunk holds its course to the left or superior orifice of the stomach. Here it divides into two branches: one of which encircles the cardiac orifice, and inosculates with the gastro-epiploic artery above the spleen; the other runs along the lesser arch of the stomach, sends a branch over the side of the stomach, and, continuing its course, inosculates with the pylorica, or coronaria dextra. In tracing these branches upon the lesser curvature of the stomach, we shall find several nerves, which are branches of the eighth pair, or par vagum. Coronaria Ventriculi.

The ARTERIA SPLENICA arises from the trunk, or axis of the cœliac artery. It passes under Splenica.

the stomach, and along the border of the pancreas, where it gives off the pancreaticæ parvæ. Continuing its serpentine course, it gives the vasa brevia to the stomach, and small branches to the mesocolon. When it reaches the spleen, it makes a curve in its bosom, and enters it, in several branches. It sends off from its branches in the spleen, a considerable one to the stomach, which, inosculating with the right gastro-epiploic artery, is called the gastro-epiploica sinistra.

Hepatica. The ARTERIA HEPATICA runs in a direction opposite to the splenic artery, towards the right side. After having run some way in the direction of the trunk of the vena portæ, it divides, nearly at the same place, into four branches, which spread over the trunk of the vena portæ. The first vessel sent off, is the arteria gastro-epiploica dextra, so named from the distribution of its principal branch; or sometimes called the duodeno-gastrica, from that branch which goes to the duodenum. This artery, descending under the pylorus to gain the great curvature of the stomach, with its accompanying vein, catches the eye while the viscera are yet entire. It is seen beautifully distributed to the stomach and omentum; and reaching the left and obtuse end of the stomach, it inosculates largely with the gastro-epiploica sinistra of the splenic artery. As the right gastro-epiploic artery runs

across the lower edge of the duodenum, it gives off the pancreatico duodenalis, which runs down the intestine, and sends a considerable branch along the pancreas.

The hepatic artery, after sending off the gastro-epiploica dextra, divides into the right and left hepatic branches. From the left hepatic, the coronaria dextra is sent off, which, turning backwards, spreads its branches upon the pyloric end of the stomach, inosculating with the proper coronary of the superior orifice, and with the pyloric arteries, which are numerous and important twigs from the surrounding greater arteries: the coronary sometimes comes off from the trunk of the hepatic artery. The continued trunk of the left hepatic artery, climbing upon the vena portæ, enters the liver, and, separating into branches, is distributed within the liver, to the whole of the left lobe, the lobe of Spigelius, and part of the right lobe. The right hepatic artery, passing under the hepatic duct of the liver, is distributed to the right lobe of the liver, and gives a branch, which is called the cystica, to the gall-bladder.

In dissecting the root of the cœliac artery, and the part of the aorta, betwixt it and the superior mesenteric artery, we see the cœliac plexus, which is formed by branches from the semilunar ganglions of the sympathetic nerves, and from the eighth pair, which is principally distri-

buted to the stomach. From this plexus an immense number of smaller nerves are sent out, forming lesser plexuses, to the duodenum, liver, spleen, &c. for these see page 206, Vol. I.

Vena Portæ.

Of the VENA PORTÆ.—The vena portæ is formed by the union of the veins from the intestinal canal, with those of the spleen, pancreas and stomach.* Near the liver, these veins are collected from three great branches, corresponding to the Cœliac, Upper, and Lower Mesenteric Arteries. The trunk of the vena portæ lies obliquely across the spine, under the body, and upon the head of the pancreas. The branch answering to the cœliac, is the splenic vein. It forms one of the great divisions of the vena portæ, as it gathers the blood from the spleen, stomach, pancreas, and omentum; it passes from the left towards the right side.

The veins coming up from the lower part of the belly, corresponding to the mesenteric arteries, are the mesenterica major, and the mesenterica minor. All the veins from the mesentery, and from one half of the colon, meeting together, form the first of these; which, from its size, is the most important vein of the intes-

Vena Mesenterica Major.

* In dissecting these veins, there is much cellular substance to be cleared away; if the injection be at all brittle, it is difficult to dissect upon their thin coats without cutting them, or breaking the injection.

tines. Its branches run in company with the extremities of the superior mesenteric artery, and, when united into one vein, join the trunk of the vena portæ.

Mesenterica Minor or Hæmorrhoidea Interna.

The vena mesenterica minor carries back the blood from the left side of the colon, and from the rectum, accompanying the lower mesenteric artery in its whole course. From the branch which mounts up upon the back of the rectum, it has been called the hæmorrhoidea interna. This vein joins sometimes with the splenica; more commonly with the mesenterica major. As the great mesenteric trunk goes up under the duodenum, it receives the veins of the pyloric orifice, and those answering to the pancreatico-duodenal artery.

The trunk of the vena portæ runs across the spine towards the liver; in this course it receives the veins from the right side of the duodenum, and lesser arch of the stomach, answering to the lesser coronary, or right coronary artery of the stomach; it then mounts obliquely upwards and towards the right side, and enters the porta of the liver, where it immediately divides into two great branches which are called the transverse cylinders or sinuses of the liver.

As the vena portæ approaches the liver, it runs parallel with, and between, the ducts and the hepatic artery.—They are here included in

one sheath of cellular substance, viz. the capsule of Glisson.

The vena portæ may be considered as a vein which in its action resembles that of an artery,* as it distributes in the liver the blood which it collects from the arteries of the intestines.

Venæ Cavæ Hepaticæ.

The proper veins of the liver, the Venæ Cavæ Hepaticæ, return their blood directly to the heart. These, in their extremities, are distributed much like the vena portæ; but upon dissecting the under surface of the liver, they are found to run up towards the attachment of the liver to the diaphragm, and to enter into the inferior cava near the heart.

Renal and Spermatic Arteries.

The RENAL or EMULGENT arteries and the SPERMATIC may now be seen by lifting up the mesocolon; but in order to show them distinctly, the chylopoetic viscera should be removed; and then we shall have a more distinct view of the trunk of the aorta, and of the large branches going off from it. In order to remove the viscera, we should first cut through the trunk of the cœliac artery, and through the superior and inferior mesenteric arteries; leaving small portions of each, by which we may recognise them. The œsophagus is then

* In the camel which was dissected in Windmill Street, in April, 1821, I found it to be as distinctly muscular as the œsophagus.

to be divided; by now separating the liver from the diaphragm, the whole of the viscera above the mesocolon may be removed. In lifting the colon, we must take care that we do not cut through the arteries to the kidneys, or the spermatic vessels; indeed, these vessels ought to be exposed before the colon is raised, as the spermatic arteries will be much endangered if we pull the caput coli and sigmoid flexure rudely up. A portion of the rectum should be left.

We may now observe, that the aorta passes between the crura of the diaphragm, entering the abdomen rather on the left side of the spine, but, as it passes down, it comes more to the middle. The vena cava is seen to be distinctly upon the right side of the spine, and continuing in the same line, until it passes through the perforation in the tendon of the diaphragm.

Kidneys

We should now turn our attention to the kidneys.—We see one on each side of the spine, and lying on the last ribs, the right, being rather lower than the left. In a young body, we see a fatty mass lying on the upper part of the kidney,—this decreases in size in the adult; it is called the Renal Capsule, or Glandula Atrabiliaris: besides this, there is generally a quantity of fat surrounding the kidney. From the bosom and lower part of the kidney, we see the Ureter, or duct, passing towards the pelvis;

Renal Capsule.

which, with the arteries running from the aorta to the kidneys, may be exposed, by merely removing the cellular membrane. The only thing that tends to make the dissection of the vessels difficult, is the number of nerves which encircle the several branches.

Ureter.

We ought not to dissect too closely between the right crus of the diaphragm and the aorta, for here is the Thoracic Duct, which, with a little care, may be preserved, so that we may either inject it, or fill it with air by the blowpipe; but, though a large vessel, it is difficult to find it, on account of its being empty and its coats transparent. It is sometimes possible to fill it, by throwing air or mercury into the substance of one of the lymphatic glands which lie by the side of the lumbar vertebræ.

Thoracic Duct.

The arteries seen, when the cellular membrane, &c. is removed, will be—the phrenic arteries, which are sometimes branches of the cœliac; the trunk of the cœliac; the superior mesenteric artery; the capsulares, which sometimes come from the emulgents; the renal or emulgents; the right spermatic, from the aorta; the left spermatic, often from the left emulgent; and, lastly, the inferior mesenteric,—all these are seen coming from the forepart of the aorta: but, besides these, a regular set of vessels pass into the spaces between the vertebræ,—these

are the lumbar. There are also generally some small irregular branches to the glands, &c.

We may also in this view observe that the aorta, passing down towards the pelvis, divides into two great branches, viz.

The Common Iliacs; from which, all the arteries of the pelvis are given, except those to the rectum from the inferior mesenteric, and those to the uterus, in the female, from the spermatic.

Before examining the arteries farther, we may observe how the Vena Cava is formed. The veins of the stomach and intestines, the pancreas and the spleen, we have already traced into the vena portæ. We see the great vena cava formed principally by the veins from the lower extremities; but we shall find that the veins of the kidney and of the testicle also run into it. We may observe that the left emulgent vein, as it crosses over the aorta, is much longer than the right; and that the left spermatic vein almost always joins the left emulgent, while the right passes direct into the vena cava. The cava occasionally receives some branches from the lumbar veins; it then passes up towards the diaphragm,—sometimes it passes through a hole of the liver,—(which should be recollected in removing this viscus); but it is more commonly covered by a portion of the liver, which forms an arch: just as it

Veins forming the Cava.

is passing through the diaphragm, it receives the venæ cavæ hepaticæ, and the phrenic veins.

TABLE OF THE ARTERIES WHICH ARE SENT OFF FROM THE ABDOMINAL AORTA.

I. PHRENICA DEXTRA.
II. PHRENICA SINISTRA.
III. CŒLIACA.
IV. MESENTERICA SUPERIOR.
V. MESENTERICA INFERIOR.
VI. CAPSULARES.
VII. RENALIS DEXTRA ET RENALIS SINISTRA.
VIII. SPERMATICA DEXTRA ET SPERMATICA SINISTRA.
IX. SMALL BRANCHES WHICH GO TO THE URETERS, FAT, &c.
X. LUMBALES.

I. & II. PHRENICA DEXTRA & PHRENICA SINISTRA, give branches to the Diaphragm, inosculating with the Mammariæ Internæ, and also irregular branches to the Pancreas, to the Membranes of the Liver, and to the Spleen.

III. CŒLIACA, from which come, 1. Coronaria Ventriculi Superior; 2. Hepatica; 3. Splenica.

From the Coronaria Ventriculi Supe-

RIOR there come two sets of branches, viz. a superior division to the Stomach, to the Œsophagus, to the Diaphragm and Omentum Minus; and the inferior division, to the Lesser Curvature of the Stomach, and the Pylorica Superior.

From the HEPATICA.—1st. The Hepatica Dextra, which gives off the Cystica—2d. Hepatica Sinistra. Sometimes, 3d. Coronaria Dextra—4th. Gastro Epiploica Dextra. The lesser branches which come from these are called *Pylorica Inferior—Pancreatica Duodenalis—Pancreaticæ* and *Epiploicæ.*

From the SPLENICA.—Pancreaticæ—Gastro Epiploica Sinistra—and Vasa Brevia.

IV. MESENTERICA SUPERIOR.—Distributed to the whole of the Small Intestines; and gives off to the Great Intestines, ILIO COLICA—COLICA DEXTRA—COLICA MEDIA.

V. MESENTERICA INFERIOR has, as branches, COLICA SINISTRA—HÆMORRHOIDALIS INTERNA.

VI. CAPSULARES.—These, though called here primary branches, are very irregular, coming generally from the Renal, and even sometimes from the Phrenic.

VII. RENALIS DEXTRA ET RENALIS SINISTRA, to the Kidneys.

VIII. SPERMATICA, to the testicles in man —to the ovaria in the female.

IX. IRREGULAR BRANCHES, to the Ureters, &c.

X. LUMBALES—Five on each Side.

XI. ILIACÆ COMMUNES, divided into the ILIACÆ EXTERNÆ, and ILIACÆ INTERNÆ.

XII. SACRA MEDIA.

The table of the arteries of the pelvis will be given after the description of the dissection of the parts in the pelvis.

The nerves of the abdomen, though difficult to dissect, are easily arranged, for they come principally from two great sources, the par vagum and the sympathetic. But, as it is not possible to form an accurate idea of them, without, at the same time, having those of the thorax dissected, I have described them with the nerves of the thorax, in Vol. I. p. 205.

MANNER OF EXAMINING

THE

MINUTE STRUCTURE OF THE VISCERA.

THE minute structure of the viscera ought to be more attended to, than it generally is, in the dissecting-room; but as I cannot enter fully into the description of it here, I shall only point out the manner of proceeding.

After the liver, stomach, duodenum, spleen, and pancreas have been removed, in connexion with each other, certain parts will be more distinctly seen than when they were in situ. The examination will be facilitated, if we distend the stomach with air, for then the entry of the Œsophagus into the Cardiac Orifice of the Stomach, the Great Curvature, the Lesser Curvature, and the attachment of the Spleen to the Stomach, through the medium of the Vasa Brevia and membranes, will be easily understood. The dissector will, of course, again examine the several vessels and ducts of the liver and pancreas.

The greater part of the stomach is covered by the peritoneum which is called its *Peritoneal* coat. By stripping off a portion of this, the

Coats of the Stomach.

Muscular coat will be seen, the principal fibres of which may be traced from the œsophagus. Before examining the *Internal* or *Villous* coat, the stomach should be separated from the other viscera, by cutting through the duodenum, immediately below the pylorus. It is then to be opened, or inverted.

The internal, villous, or mucous coat varies in its appearance in the several parts of the stomach. Near the œsophagus, it resembles fine cuticle, which, in some cases, may be seen to terminate in a distinct line. In the great curvature, it has more the appearance of a secreting coat; indeed in some animals, there is a distinct glandular apparatus here. Towards the pylorus, the mucous coat assumes the character of the inner membrane of the intestines.

Pylorus.

We may now see the impropriety of calling the structure at the pylorus, a valve, for it is distinctly a sphincter muscle, which, according to the ancients, was as a porter, that would not let any indigestible matter pass;—from this idea of its use, they gave it the name of pylorus.

The student may form a more correct idea of the structure and functions of the different parts of the stomach, by examining those of certain animals, particularly of the horse, or ass, for the cuticular lining on the upper part;—of other domestic animals, as of the pig, for the glandular appearance near the pylorus;—of the sheep

or ox, as examples of the complicated structure of the stomach of the ruminating animal, which forms a contrast with the stomach of those of the carnivorous kind, as the dog, cat, lion, &c. The stomach of birds is also worthy of examination, as there is not only much difference in the structure, from that of an animal of the class of mammalia, but there is also much variety in the stomachs of the different tribes of birds, as of those which live upon grain, and those which are carnivorous.

The opening by which the ducts enter into the duodenum, is to be particularly attended to; when the gut is laid open, or inverted, it may be seen; but as the ducts open obliquely into the intestine, we shall be generally obliged to pass a probe from the ductus communis choledochus into the gut, to mark the point at which it and the pancreatic duct enter. A few muscular fibres, resembling those of the muscles of the ureters in the bladder, may be discovered in connexion with the opening. Duodenum.

The whole of the Intestinum Tenue is of the same structure, having a *Peritoneal*, *Muscular*, and *Villous* coat; but as the Jejunum is a larger and thicker gut than the Ileon, the different coats will be most distinctly seen in it. If we tear off a portion of the peritoneal coat, in the direction of the length of the gut, we shall see the *Longitudinal* muscular fibres; if we take it Coats of the Intestines. Longitudinal and Circular Fibres.

off in the circle, the *Circular* fibres will be shown. The muscular coats of the stomach and intestines will be more distinctly seen after the part has been plunged once or twice into boiling water. The *Valvulæ Conniventes*, or folds of the mucous or villous coat, will be seen by inverting a portion of the intestine, and putting it into water. If we distend the inverted gut with air, and then squeeze it, we shall show the cellular coats.

Valvulæ Conniventes.

The minute structure of the intestines is more distinctly shown, after they are injected with size and vermilion; to do this nicely, we should cut off a portion of intestine, with its mesentery, and, after tying the two ends of the gut, put a pipe into that vessel which appears to be the trunk of the branches that are passing to the intestine.

Upon the injected gut, some small transparent vessels may be seen, running in a longitudinal direction; these are the lacteals; after opening one with a lancet, we may distend it with air, or mercury, which will, perhaps, pass into the glands of the mesentery, and then into the secondary vessels, which lead to the thoracic duct. When the injected gut is opened, the villous nature of the internal membrane will be more evident; perhaps some white points may be seen upon the surface; they are the mouths of the lacteals, full of chyle; but this appearance

Lacteals.

will only be found when the process of absorption has been going on immediately previous to death. The best illustration of the lacteal system is made, by giving an animal some very nourishing food about an hour previous to killing it, and by putting a ligature round a part of the intestines, or by tying the thoracic duct immediately after death. The lacteals will be then distinctly seen, filled with the white matter called chyle; they are much more numerous on the jejunum, than on the ileon.

The colon is next to be examined: there can be no difficulty in distinguishing this from any of the other intestines; for we have not only the great omentum attached to it, but also little projections of peritoneum, called Appendices *Epiploicæ*, or Omentula; but the longitudinal and circular bands of muscular fibres, are the most distinguishing marks. The *Circular* bands are very numerous, but there are only Three *Longitudinal* ones. On examining the gut more minutely, we shall find that there are very few lacteals upon it, but many absorbents; and on the inner surface, that there are few valvulæ conniventes.

Colon.

Appendices Epiploicæ.

Circular and Longitudinal Bands.

The parts at the union, between the ileon and colon, are complicated; when the gut is distended we see them more distinctly; the whole is called *Caput Coli*, upon which we particularize,—the *Cæcum*, which is the name given

Caput Coli.

Cæcum.

to that gut, which, in horses, is nearly a yard long, but in the human body, is only about two inches in length, and is not observable except when distended with air; the *Processus Vermiformis* will be easily discovered, from its resemblance to an earth worm. The shape of the *Valve*, between the colon and ileon, is best seen when the gut is dried; but even in the fresh state, on opening the cæcum in water, the valve may be seen to be formed, by the projection of part of the muscular and internal coat of the ileon into the colon, so as to present an appearance like the flood gates of a canal.

Processus Vermiformis.

Valve.

Rectum.

The peculiarities of the rectum will be observed in the dissection of the parts contained within the pelvis; at present, I shall only remark, that there are, in the colon, and particularly in the rectum, mucous folicles, which have been called *Glandulæ Solitariæ*, to distinguish them from folicles which are found in sets in the small intestines, and have been there, called *Glandulæ Aggregatæ:*—these openings are more distinctly seen in the rectum of the horse or ass, than in the human body.

Glandulæ Solitariæ and Aggregatæ.

The most important parts of the liver have already been seen; but when it is completely separated from the other viscera, some points may be more easily understood. In the liver taken from a young body, the substance of the Round Ligament will not be firm, nor com-

Liver.

Round Ligament.

pletely closed in the centre, but so open, that a probe may be pushed into it; this is in consequence of the Umbilical vein, which degenerates into the round ligament, not having yet become so condensed as it is in the adult. If we trace the Round or Umbilical ligament, we shall find it become connected with the vena portæ, and then pass to the upper and back part of the liver; but it does not retain the same name through its whole course; for as, in the fœtus, the vessel which passed from the vena portæ, though really a continuation of the umbilical vein, was called the Ductus Venosus,—so is the ligamentous matter, in the adult, above the transverse fissure, called the Remains of the ductus venosus; and even the portions of the great fissure receive names corresponding to the terms used in describing the two divisions of the umbilical vein which lie in it.

Umbilical Vein.

Ductus Venosus.

There are only two fissures in the liver which should be named:—the *Umbilical*, which divides the right from the left lobe,—and the *Transverse*, in which the great branches of the vena portæ lodge. But anatomists have chosen to call the sulcus, in which the gall bladder lies, the *Fissure* of the *Gall Bladder;* the depression on the back part of the liver, for the passage of the great vein, has been called the *Fissure* of the *Vena Cava*, though it is not unusual for the cava to pass through the substance of

Fissures.

the liver;—even the notch corresponding to the convexity of the vertebræ, is sometimes called a fissure. Besides those fissures, there are often irregular depressions, as if the lobes had been cut with a knife.

Lobes.

There are generally five lobes of the liver described, but the *Right* and *Left* Lobe and the *Lobulus Spigelii* are the only important ones; as the Lobulus *Quadratus*, or *Anonymous*, is only that portion of the liver which is between the gall bladder and the umbilical fissure,—and the *Lobulus*, or *Processus Caudatus*, is that part of the right lobe which projects to the Lobulus Spigelii.

Lymphatics.

On the surface of the liver there are a great many lymphatics, the branches of which can be injected from the trunks, as the valves may be broken down by the weight of the quicksilver. The greater number of the trunks pass towards the porta, so that they, also, as well as the principal vessels and nerves of the liver, are contained within the capsule of Glisson.

The substance of the liver was called by the ancients, *Parenchyma;* a name implying little more than a confused mass. If we make a section of the liver, we shall see a great number of sub-divisions formed by the membrane which supports the various sets of vessels, but still the parts are so intermingled, that we are forced to use the same term as the older Anatomists, in

describing the appearance of the general mass of the liver. The small bodies, of which the substance is principally composed, have been called *Acini;* these have been supposed to be the terminations of the minute branches of the vena portæ, which are called *Penicilli.* The ducts, which have been described as conveying the secretion from the *Acini*, are, at their commencement, called *Pori Biliarii.*

Acini, Penicilli.

Pori Biliarii.

The examination of the structure of the Spleen will be still less satisfactory, as we cannot even discover a duct in it. When the substance is minutely injected, it seems to be composed almost entirely of vessels, the extremities of which appear to communicate with cells, connected by cellular membrane which has a particular stellated appearance when a section is made. The use of this part will probably remain always a problem; but when we look to the immense size of the vein, passing from the spleen to the vena portæ, we must suspect it to be in some way subservient to the liver.

Spleen.

The Pancreas has much resemblance, in its structure, to the parotid; and if we inject its duct, we shall find it distributed, in the same manner as the ducts are arranged in the salivary glands about the jaw.

Pancreas.

The structure of the Kidney is more easily understood than that of any other viscus. The

Kidney.

parts may be seen in the uninjected kidney, but much more distinctly, in one which has been minutely injected.

Fœtal Kidney

The Kidney in the Fœtus is of a lobulated form, but in the adult, these lobes are so condensed together that the external surface of the gland appears uniform and smooth. Its lobulated structure may be shewn, by making a section of the gland; we shall then distinctly see the several lobes. These lobes may be considered almost independent of each other; for a separate branch of the renal artery passes to each, and has so little communication with those of the other lobes, that we may inject each of them with a different coloured fluid.

Cortical part.

The Cortical part of the kidney appears to be that, in which the secretion of urine is effected. It is highly vascular, and when minutely injected, small round bodies, which are called *Corpora Globosa*, or *Cryptæ*, are seen in it; these have, by some anatomists, been described as small glands,—by others, as the termination of the convoluted artery. From these bodies, we may discover small lines passing towards each of the white papillæ in the centre, and which is called the central or tubular part; these lines are said to be the *Tubuli Uriniferi*, terminating in the ducts that are called the *Ducti Bellini*, and which carry the urine that

Corpora Globosa, or Cryptæ.

Tubuli Uriniferi.

Ducti Bellini

is secreted in the cortical part, to the *Papillæ*. Upon each papilla, a depression may be seen, and if we squeeze the part of the kidney corresponding to it, a little urine will drop from it. The *Pelvis*, is the name given to the membrane forming the upper part of the duct, or *Ureter;* the portions of this which pass up on each papilla, are called either *Calices* or *Infundibula*, according to the manner in which they are examined; thus, if we look at them as running upwards, they will resemble the calices of flowers—but if we take them in another view, they will appear as little funnels.

Papillæ.

Pelvis.

Calices, or Infundibula.

The structure of the kidney differs much in certain classes of animals, from that of the human body. In the kidney of the sheep, there is a very close resemblance to that of man; but in the lion, dog, cat, &c. the kidney is never lobulated, but has only one papilla,—whence it is called a single kidney. In the ox it continues lobulated through the whole life of the animal: but the best examples of the lobulated kidney, are those of animals which occasionally inhabit the water, as the bear, seal, &c.

The Capsula Renalis, or, as it has been called by the ancients, Glandula Atrabiliaris, is of very curious structure, resembling a piece of fat: in the fœtus, it is large, in proportion to the kidney; but in old age, it is hardly possible to

Capsula Renalis, or Glandula Atrabiliaris.

discover it;—the only thing observable, is a cavity, in which there is occasionally a thick blackish fluid.

This short sketch of the manner of investigating the minute structure of the viscera, is intended only to induce the student to prosecute this subject, which, though difficult, is highly interesting and important.

SOME OBSERVATIONS
ON THE
MANNER OF EXAMINING A BODY
TO
DISCOVER THE SEAT OF DISEASE.

WHEN called upon to make an examination of the state of the abdomen of a person, who has died in consequence of visceral disease, we should endeavour, in opening the body, to disfigure it as little as possible. The best manner of proceeding, is to cut through the skin only, in the line of the linea alba, from a little above the middle of the sternum, to the pubes. The skin may be quickly dissected from the muscles, and pulled over towards each side: the muscles may then be cut in any direction.

If the body be not very fat, this longitudinal cut in the skin will give us sufficient room for our examination; but we may be obliged to make a transverse incision below the umbilicus. When the dissection is finished, and the skin is sewed up, the incision should be concealed by strips of strongly adhesive plaster.

The morbid anatomy of the viscera is a subject so extensive, that it is not possible for me to enter into it fully here.—All that the limits of this work will permit, is to endeavour to point

out a few of the circumstances, which are liable to lead those who are not conversant with anatomy, to make erroneous statements of the appearances which they see in making the examination of a body.

It is not unusual to see a minute description given of "a very curious displacement of the viscera:" but the position of the viscera in the dead body, depends on such a variety of circumstances, that we ought not to attach importance to any trifling change from that, which is considered natural. The omentum is frequently described as *extra sedem:* but its situation varies so much, that it is difficult to determine what its most common position is, in those bodies which have been moved. I have observed, that if there has been inflammation in one of the viscera, at any period, the omentum will be found attached to it: indeed, adhesion of the omentum to the uterus, is the most common appearance of disease in the abdomen of the female.

It is a common mistake to describe the loaded state of the vessels, as an appearance denoting previous inflammation: the state of the true inflamed intestine is so distinct, that it can hardly be forgotten, after it has been once seen. In the first stage, there are numerous small vessels upon the gut, like those on the eye in ophthalmia, with a suffusion around them; in the se-

Inflammation of the Intestines.

cond stage, there is matter, or lymph, effused; and in the more advanced state, adhesions are formed between the surfaces of the intestines. But there are many different kinds of peritonitis In that which is called idiopathic, the peritoneum will be found coated with lymph; but after inflammation, in consequence of strangulated hernia, the substance of the intestine will appear more affected than the proper peritoneum. I cannot enter farther on this subject; but shall refer to a very important and early work, by Mr. Bell, in which much interesting matter on the morbid anatomy of all the viscera will be found.

We must not fall into the mistake of supposing, that the air which rushes out, when the abdomen is opened, has been formed during the life of the patient; for though there may be cases of true tympanitis, still the most probable cause of the formation of this air, is the change produced after death, by putrefaction. In some cases of gangrene of the intestines, air may have escaped into the general cavity immediately before death. The great distension of the stomach and intestines, is commonly produced by the change which takes place in their contents after death; though there is always more or less air within the intestines during life.

Air in the Abdomen.

From the variety of appearances of inflammation,—from the black spots,—and from the

different forms of ulceration and corrosion, which, I have seen in the stomachs of those who have died without any marked symptoms of affection of that viscus,—and from the close resemblance which many of these have had to the stomachs of persons who have swallowed poison,—and from the similarity of the appearances produced by gastritis, and other diseases, to those caused by poison,—I have come to the conviction, that the *appearance* of the stomach or intestines, in a question of poison, is not to be depended on. In the last book which has been written on poisons, (that of Orfila,) the list of appearances which is given, as to be expected, where poison has been taken, corresponds exactly with those which I have sometimes found in stomachs where I was certain no deleterious matter had been taken.* I am happy to think, that this degree of uncertainty will prevent the anatomist from being called on to decide a question which may involve the life of a fellow creature.

Appearance after Poison.

The dissolution of the coats of the stomach, by the action of the gastric juice after death, is more frequently found in the bodies of children, than

Corosion by Gastric Juice

* I lately examined the stomach of a patient who had suffered from stricture of the Œsophagus to such a degree, that she had been able to swallow only a little milk in the course of the day, for a considerable time previous to her death.—The stomach was studded with the black patches which are frequently described as the effect of poison.

of adults. The opening is generally very large, and almost always at the great Curvature. The state of the coats has more resemblance to parts which have been subjected to a strong chemical solvent, than to those destroyed by a morbid action.—There is no crowd of small vessels on the edges of the opening, nor are the margins thickened and abrupt as those of ulcerated holes, but they are thin and floculent.

In examining the abdomen of children who have died in consequence of irritation in the bowels, we shall frequently find one portion of the gut invaginated in the other. This is introsusceptio; in the child, it is seldom the cause of death, but in the adult, it is generally attended with such inflammation as to produce strangulation and death. If a patient has died with symptoms of hernia, and no external tumour be discovered, we may expect to find either an introsusceptio, or a portion of the intestine strangulated, by a noose formed of condensed omentum, or mesentery; in these cases, the portion of gut above the point of strangulation will be red, thickened, and distended; while the portion below, will be pale and empty.

Introsusceptio.

If a patient has long suffered from chronic inflammation of the abdomen, we may expect to find the intestines glued together; this is a common appearance in the abdomen of those who have been frequently tapped. In the scro-

Adhesions of the Intestines

phulous child, we shall probably find the mesenteric glands enlarged and cheesy; in such a case the lacteals will often be found filled with scrophulous matter.

In the greater number of those who die of fever, the intestines appear gorged with blood —not inflamed; but on opening the lower part of the small intestines, we generally discover small ulcers, with thickened edges: this appearance is almost always found in the great intestines of those who have died of dysentery. I may here remark, that a small pouch occasionally projects from the side of the ileon; but this is not in consequence of disease,—it is called *Diverticulum Ilii.*

State after Fevers.

The most common appearance of disease in the liver, is the tubercle, which occasionally suppurates. When we look to the proximity of the colon to the liver, and know, that in the previous inflammation they generally adhere,—we cannot be surprised, that an abscess of the liver should occasionally communicate with the colon, and the matter be discharged by the rectum.—If there be gall stones in the gall bladder, or ducts, we must not be surprised to find the coats thickened, as this is a natural consequence of the irritation.

Of the Liver.

It is hardly possible to say, whether the softening of the spleen is to be considered as a mark of disease, for it is, generally so, in all

Spleen.

old subjects. The peritoneal coat is frequently thickened, and particularly in those who have suffered from intermittent fever, as the Walcheren.

The pancreas is naturally very firm,—whence it is not unfrequently described, by those not familiar with anatomy, as scirrhous; I suspect, that, like the other salivary glands, it is very seldom diseased. Pancreas.

A softening and lobulated form of the kidney, is the first appearance of disease in this viscus. The kidney may be the seat of primary disease, as of scrophula or stone; but the most frequent cause of disease in this gland is irritation of the bladder, in consequence of the presence of a calculus, or from a stricture in the Urethra. We should not forget, that there is occasionally a curious variety in the natural form of the kidney, viz. the two kidneys united with each other, so as to present the form of a crescent,—whence this *lusus* is called the horse shoe kidney. In such cases, I have sometimes found three ureters, but generally only one. It is not unusual to find two ureters come from one of the kidneys, which, in other respects, is of the common form. Kidney.

DESCRIPTION

OF THE

MANNER IN WHICH THE DISSECTION

OF THE

MUSCLES OF THE ABDOMEN SHOULD BE MADE,

TO ILLUSTRATE THE ANATOMY OF HERNIA.*

THERE is no subject which Students are so anxious to comprehend, as the anatomy of Hernia. Those who have read much on the question before they have dissected, begin in utter despair of understanding the subject; but if they be directed in their operations, they will, in the second or third attempt, make an accurate display of the parts. Still they are not satisfied; they believe that there must be something mysterious, and unusually difficult in those fasciæ, which have received such various names, and have required such extraordinary descriptions.

One great cause of the difficulty, is the neglect, by even the best authors, to describe

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* This is nearly the copy of a paper which I published some years ago in the Journal of Foreign Medical Science.

the state of the body from which the views have been drawn. In a thin anasarcous body, all the fasciæ that have ever been described, may be easily shown: the Fascia Transversalis will be so distinct, that a student, even in his first dissection, will be able to make out the Internal Ring, according to the description given by Sir A. Cooper; while in a fat subject, this will be a difficult task, for even the experienced dissector.

Unless the student be told how to place the limb, and how to use the knife, in the dissection of the parts concerned in femoral hernia, it will not be possible for him to show the various Crescentic Fasciæ. The young dissector naturally proceeds, with a sharp knife, to clear away the fat, glands, and cellular membrane, while the limb is lying in a straight line; by doing this, he cannot avoid cutting through the connexion of the fasciæ, so as to destroy all resemblance to those views, which have been made, by merely detaching the loose cellular membrane and glands with the handle of the knife, while the legs were forcibly separated from each other.

It is of considerable importance in this dissection to have a good body. That of a strong muscular man is not so well adapted for the display of the anatomy of the groin, as that of a person who has died of a lingering disease.

The body of a male, is the best for the dissection of the inguinal canal, and that of a female, for the parts connected with femoral hernia. The subject is to be so placed that the abdominal muscles may be made tense; this is most conveniently done, by placing a block of wood under the loins. To put the fasciæ of the thigh upon the stretch, one leg ought to hang over the side of the table.

The dissection of the upper part of the external oblique, is to be made, according to the general rule of removing all the cellular membrane from the muscular fibre; but this plan must not be followed lower down, than to a line drawn from the one anterior superior spinous process of the ilium to the other; the skin only, should be raised below this,—it may be carried down to three fingers' breadth below the line of Poupart's ligament.* By this method we shall leave upon the groin a quantity of condensed cellular membrane, between the layers of which is the arteria epigastrica superficialis. This membrane may be traced from that which covers the pectoralis muscle, and the upper part of the muscles of the abdomen; it has generally received the name of fascia super-

Fascia Superficialis Communis.

* Tendon of the external oblique; Fallopian, or Poupart's ligament; Crural Arch: Ligament of the thigh; Femoral Ligament.

ficialis communis, as it is connected both with the inguinal and femoral hernia. This fascia* is now to be dissected from the tendon of the external oblique. Its attachment to the expanded tendon is very weak, and the union between it and the spermatic cord is so slight, that the handle of the knife can be pushed between them, as far down as to the bottom of the scrotum. The attachment between the iliac† portion of Poupart's ligament and this fascia is very strong; but its connexion with the pubic portion of the ligament is so slight, that the handle of the knife is sufficient to destroy it. We can separate the fascia with great ease for about an inch below the edge of the ligament, but not farther, without using the knife, as it becomes intimately united to the inguinal glands, and to the fascia lata.

First View of the Ring.

Although we have raised this fascia, the accurately defined pillars of the abdominal ring,

* Fascia Superficialis of Sir A. Cooper; described by Camper and many others as only a membranous layer; by Scarpa, as a prolongation of the fascia lata. In the scrotum of the fœtus, it forms the external lamina of the peritoneum of Langenbeck.

† The terms *iliac* and *pubic* are better than *external* and *internal*. The length of the Poupart ligament may be divided into three portions: two of the thirds are called *iliac*, the other *pubic*, being that, which is nearest to the pubes.

which are generally represented in plates, as the first stage of the dissection, are not yet visible; farther dissection will be required, to show them; for a fascia, which shall be presently described, covers the ring, so that as yet, a prominence only is seen, which we shall find to be formed by the spermatic cord.

By looking narrowly into the depression which has been formed by raising the fascia superficialis from the edge of the pubic portion of Poupart's ligament, we may see lymphatic vessels passing across from the glands, to perforate a membrane, which, though it appears to be a continuation of the lower edge of Poupart's ligament, has been, by some, described as a distinct fascia, under the name of *Cribriform*, in consequence of the appearance which it presents when the lymphatics are cut short. Occasionally a small gland is projected through the membrane.

Cribriform Fascia.

With this view before us, the most useful points connected with the question of femoral hernia may be understood. The general course of this hernia is either to displace the gland, which projects through the Cribriform fascia, or to break through the meshes of the net work. It then passes into the hollow which has just been described. The direct course of the hernia would be, to descend upon the thigh; but it is prevented from passing far down, by the close

Course of a Femoral Hernia.

connexion which there is between the fascia superficialis and the glands of the groin. As the hernia is prevented from descending upon the thigh when it increases in size, it turns up and breaks through the slight connexion which there is between the pubic part of the Poupart ligament and the fascia superficialis, and thus takes the place of an inguinal hernia. This should explain to us, that the acute angle made in the gut is the principal cause of stricture in femoral hernia, and from the knowledge of this, we ought to deduce principles upon which we should proceed, when we attempt the reduction of a femoral hernia so situated. The first endeavour should be to bring the base of the sac to a straight line with the neck; to succeed in doing this, we must first push the tumour downwards.

Manner of reducing a Femoral Hernia.

It has occasionally happened, that a femoral hernia has passed up into the abdomen before the surgeon had finished the operation, and he has been blamed for operating in such a case. It has been said, that the gut, going up before the stricture was cut, proved that there was no necessity for the operation; but, instead of joining in the censure, we think that it would even be advisable, in some cases, to cut through the fascia superficialis, so as to allow the sac to come to a straight line, rather than persevere long in the use of the taxis. All who have seen

Stricture in Femoral Hernia.

many cases of femoral hernia must allow, that a cut through the skin and fascia, in an early stage, would not be so dangerous, as a protracted attempt to reduce the gut by the taxis. We have further to consider, that if it be not possible to reduce a hernia, after the fascia superficialis has been cut, that it could not have been reduced by the taxis; in such a case, all the steps of the operation must be performed.

Inguinal Hernia.

We should now return to the anatomy of the Inguinal Hernia. If we pull the spermatic cord towards the scrotum, we shall see a thin fascia passing off from the tendon of the external oblique, and attached to the cord. It has been called Fascia Propria. It is very strong in cases of old hernia; and, even in the natural state of the parts, it is so distinct, that it obscures the margins of the ring. By cutting this thin fascia, where it is connected with the cord, and by letting go the cord, the upper part of the pillars of the ring will be distinctly shown; but to make the opening of the ring quite apparent, we must remove the loose fat from the lower part of the cord with the forceps and scissars; we shall then have such a view, as is represented by many authors in their plates of the Anatomy of Hernia, as the first stage of dissection.* This

Fascia Propria.

External Ring.

* Inguinal ring; ring of the external oblique; or external abdominal ring. The anatomy of the canal is most

opening has been called a *ring*, but it might with more reason be described as a *triangle*, the *base* of which is the os pubis, and the *apex* the splitting of the tendinous fibres of the external oblique, which is rounded off by a set of cross fibres. The superior side, or *pillar*, is simply inserted into the symphysis pubis; but in the attachment and form of the lower pillar, there is a provision to prevent the compression of the spermatic cord, during the contraction of the muscles, and it is this—the inferior pillar is formed by the pubic extremity of Poupart's ligament, which, however, is not a round tendon, such as it appears when viewed from the outside, but, is so formed, that part passes onwards to be attached to the linea ileo-pectinea, by a flat broad horizontal tendon, while the more external portion is inserted into the tubercle of the pubes; by this form of insertion there is a groove made for the lodgment of the spermatic cord.

Pillars or Sides of the Ring.

The tendon of the external oblique is now to be cut through in two directions; one in a line drawn from the superior anterior spinous process of the ilium to the linea alba, and the other in the linea alba to the pubes. The tendon is to be carefully separated from the internal ob-

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accurately described in the folio edition of Mr. Charles Bell's Dissections, published in 1799.

Inguinal Canal.

lique, and is to be fastened by a hook to the fore part of the thigh. This will give us a view of a great part of the inguinal canal. The cord will be seen lying under the lower margin of the internal oblique, and so connected by cellular membrane to the edge of the muscle, that it is difficult for a student, in his first dissection, to tell what is muscle and what is cord; this is in a great measure owing to the cremaster muscle, which varies considerably in the manner it takes its origin. The view may be made more distinct by pulling the cord in a direction towards the scrotum, and by taking off the cellular membrane from it, and from the margin of the internal oblique. By doing so, we shall see that the internal oblique is not attached to the whole extent of Poupart's ligament, but that, at two inches and a half from the symphysis pubis, its attachment to the ligament ceases; it then passes, in the form of an arch, to the tubercle,* and to the linea ileopectinea† of the os pubis, so as to assist in closing the space behind the external ring. At the termination of the connexion of the internal oblique to Poupart's ligament, the fibres which form the cremaster

Internal Oblique.

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* Spine of the os pubis; Tuberculum Spinosum; Tuberosity of the pubes.

† Linea ileo-pectinea; Linea Innominata, continuous with the crista.

muscle come off; but, as these fibres occasionally arise from Poupart's ligament, the cord sometimes appears as if it perforated the internal oblique;* still, in the greater number of cases, it is sufficiently clear, that the cord passes under the internal oblique, not through it. In this part of the dissection we may observe a nerve running through the internal oblique to pass on the cord,—it is the spermaticus superficialis. Cremaster.

The next stage of the dissection is to show the relation of the transversalis to the cord. It will be difficult to raise the internal oblique from the transversalis, if we commence the separation at the lower edge of the muscle; but, by cutting

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* M. Cloquet describes the cremaster as formed by some fibres of the obliquus internus, which are pulled down by the testicle and gubernaculum, during the descent. He says, that these fibres have two distinct attachments, one to the belly of the obliquus internus, and the other to the os pubis; so that each fibre forms a loop *(des anses,)* similar to extensive cords, which, when fixed at their two extremities, are drawn down in the middle. He also says, that the testicle occasionally passes through the substance of the internal oblique, and then, the same appearance of fibres is found both before and behind the testicle; and that an inguinal hernia in a female frequently pushes down some of the fibres of the internal oblique before it, so as to form "*un muscle cremaster accidentel.*" Cremaster.

through those fibres of the internal oblique, which are connected with the superior anterior spinous process of the ilium, we shall find some cellular membrane, and a branch of the arteria circumflexa ilii, lying upon the transversalis muscle, that will mark the line in which we ought to dissect, so as to raise the oblique. The oblique is to be separated from the transversalis, and from its connexion with Poupart's ligament, as far as the origin of the cremaster, and is then to be turned over, towards the linea alba. The whole of the margin of the transversalis will then be seen, and we may observe that its relation to the cord is very nearly the same as that of the internal oblique; indeed, the tendons of the two muscles are so closely connected with each other, that it is almost impossible to separate them. It will be also apparent, that the united tendons of these muscles, by their insertion into the linea ileopectinea, form the grand protection against hernia taking place directly through the external abdominal ring. When this part is weak, in consequence of the deficiency of the tendons, that hernia which, is called *direct*, or *ventro inguinal*, may take place.

Transversalis

Cause of direct Hernia.

The muscular fibres of the transversalis are now to be very carefully detached from Poupart's ligament, and then they are to be *scraped*, not cut, from the layer of condensed cellular

membrane, which is called the fascia transversalis.* Fascia Transversalis.

We have seen the cord pass through the external oblique, and under the margins of the internal oblique and transversalis,—and we should now see the internal ring, described by Sir A. Cooper; but this ring must be *made*, and in the following manner. When we pull the cord towards the groin, we see part of the cellular membrane, which lies under the transversalis muscle, passing down upon it in a conical form, whence it has been called Membrana, or Fascia Infundibiliformis. If we cut this membrane from the cord, and push it up, there will be a hole, formed in the shape of a ring, which, though quite apparent when the cord is allowed to retract, has a distinct margin only on its iliac side, for its pubic or internal boundary is formed only by the cellular membrane surrounding the epigastric artery and veins. We may observe, also, that the cord at this point has lost its rounded form—that the vessels are not bound together, as they are at the external ring, but that the component parts, separating from each other, give it a flattened form.

Internal Ring.

Fascia Infundibiliformis.

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* Fascia Transversalis, of Sir A. Cooper; Fascia Longitudinalis, or Reflexa, of M. Cloquet; condensed cellular membrane, between the peritoneum and transversalis muscle, of many authors.

Situation of the Epigastric Artery.

We should now attend to the situation of the epigastric artery. It generally arises from the pubic side of the external iliac artery, just before it passes under Poupart's ligament. It will be found to descend a little, and then to proceed upwards towards the rectus, passing upon the pubic edge of the spermatic cord, and between the fascia transversalis and the peritoneum; it then enters the substance of the rectus, about midway between the pubes and umbilicus. As this artery is always on the pubic side of the spermatic cord, it follows, that when the inguinal hernia passes along the spermatic passage, (which it does in nine out of ten cases,) the epigastric artery will be on the pubic side of the hernia; while in the direct or ventro inguinal hernia, the artery will probably be on the iliac side.

Let us now trace the course of a common hernia to the scrotum, and show what coverings it may have, and what are the probable causes of stricture.

The muscles and the peritoneum may be cut through in the usual way of exposing the viscera, and the flap held out, so that the inside of the peritoneum, and the depression which is found at the part where the cord passes into the canal, may be seen. In the greater proportion of cases, it is at this point that hernia takes place. If, after having laid down the transversalis and

internal oblique in their natural situations, we push the finger from within, into the depression of the peritoneum, we shall exhibit in appearance, the first stage of the descent of a hernia. The finger is as the sac would be, above the cord, and on the iliac side of the epigastric artery: by pressing forward the finger, and through the peritoneum, it will appear under the margins of the transversalis and internal oblique; and if pushed farther, it will pass through the external ring. A hernia lying at this point, would be called inguinal hernia; but if it descends into the scrotum, it will be called, scrotal hernia. This is the common course of an inguinal hernia, but its relation to the cord occasionally varies; it may occasionally pass under it, and when we look to the flattened and dispersed state of the cord, at its upper part, we can understand how it may be split by the descent of a herniary tumour. In such a case, the vas deferens is sometimes found on the anterior part, and the vessels behind; but this order is frequently reversed.

Course of an Inguinal Hernia.

We may now show what coverings the sac of a hernia would receive in its passage to the scrotum.

In the common inguinal hernia, the peritoneal sac pushes before it, that cellular membrane which has been called the Fascia Infundibiliformis, but which in truth, is only a con-

Fasciæ covering a Hernia.

tinuation of the condensed cellular membrane, which has of late years been known by the name of Fascia Transversalis; it is the same membrane which we shewed must be separated from the cord before the internal ring can be made; this, when condensed, will form the innermost covering of the sac. The hernia then passes under the transversalis and internal oblique; as the cremaster muscle runs from the internal oblique to the cord, it follows, that if the hernia lies above the cord, the sac must be between it and the cremaster; the fibres of the cremaster which lie above the sac will then be separated from each other, so that the cellular membrane which connects them with the membrane that involves the cord, and which is sometimes called Tunica Vaginalis Communis, will form the covering which is called the Cremaster or Spermatic Fascia. The hernia then passes through the external ring. In the early part of the dissection, a membrane, which is sometimes called Fascia Propria, was shewn to pass from the margins of the ring to the cord; this must also form one of the coverings. The hernia may now lie in the groin, or pass into the scrotum, and in either case it will be covered by the condensed cellular membrane, called Fascia Superficialis.

If a patient had worn a truss for some time, all these fasciæ might be distinctly seen in an

operation; but it is of more importance to recollect, that under such circumstances, the peritoneum, which forms the sac, and which in its natural state, is very thin, would be very much thickened, and particularly at the neck of the sack; indeed it is occasionally so much so, that it may be separated into a dozen layers. But if it were necessary to perform an operation for a hernia which had come down, only a few hours before,—after having cut through the skin and fat, instead of finding distinct fasciæ, such as have been described, a little cellular membrane only, would be seen covering the sac, and the sac itself, would be so thin and transparent, that the colour of the gut might be seen shining through it.

Fasciæ and Peritoneum in old and recent Hernia.

In the congenital hernia, the anatomy of the fasciæ is more simple than in the hernia of the adult, nor is the gut included in a distinct peritoneal sac, but it slips down along the spermatic passage, and lies in contact with the body of the testicle, the tunica vaginalis forming the sac.

Fasciæ in Congenital Herniæ.

Before describing what are the probable causes of stricture, there are some circumstances to be recollected. To produce strangulation, the gut must be compressed in the whole circle;—strangulation cannot be produced by the muscular fibres which stretch over the gut, for they relax occasionally; as, for example, when a pa-

Strangulation.

tient faints.—The hole through which the gut is pushed, is passive; its diameter is never diminished, but the protruded gut swells and is increased in size.

Seat of Stricture.

The most common seat of stricture in inguinal hernia, is the external ring; though we do not see the ring until we have dissected the parts, still we can feel it, even before the skin is removed, by pushing the finger up along the cord. If the sac has been opened, if the external ring has been cut, and the stricture still continues, what is the cause of stricture? It cannot be produced by the margins of the internal oblique or transversalis muscles, for they will relax. Since we are told by high authority, that the stricture, in such a case, is caused by the internal ring, we are bound to suppose it may occasionally happen; but we should be more inclined to say, that the stricture is not caused by the internal ring itself, but by the neck of the sac, which is situated at that part. Our reasons for supposing so, are the following: In the dissection of the parts, in their natural or ruptured state, there is no appearance of an internal ring, until it is *made* by pushing up the cellular membrane which surrounds the cord; and even then, if we try the strength of the margin of this artificial opening, we shall find it to be very weak, and particularly on the inner part; while the neck of the sac is gene-

Objections to the Stricture being caused by the Internal Ring.

rally so strong, that we might as easily break a circle of whip cord, as tear it. The external ring, and the neck of the sac, may therefore be considered as the most common seats of stricture; but there are varieties, into the consideration of which, it would be impossible to enter at present.

There is a species of inguinal hernia called the *direct* or *ventro inguinal*, which has been already mentioned as having the epigastric artery on its iliac side; in several other respects, it differs from the common inguinal hernia. It does not come along the inguinal canal, but passes directly through the external ring; it is not covered by the cremaster or any part of the fascia transversalis, but only by the fascia propria and superficialis. The peritoneum is as liable to be thickened in this species as in the other. We have seen in operation, the sac a quarter of an inch in thickness. This kind of hernia does not take place often, but, in proportion to our limited opportunities, it has occurred to us more frequently, than it appears to have done to Sir A. Cooper.*

Direct or Ventro Inguinal Hernia

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* Since I wrote the first Edition, I have had the pleasure of forming an acquaintance with M. Cloquet, who has, perhaps more than any other man, investigated the nature of the varieties of hernia by dissection.—He shewed me notes of the cases of direct hernia which he had found.

Femoral Hernia.

The dissection of the parts connected with femoral hernia may now be made. We have already described the first steps of the dissection. It is absolutely necessary that the limbs be kept forcibly separated from each other, and that the handle of the knife only, should be used in removing the glands, as some of the connexions of the fasciæ are in danger of being cut, if we use a sharp knife, while the limbs are lying straight. When the glands are removed, we may see the manner in which the fascia lata is connected to the Poupart ligament; how it dips down towards the femoral vessels, and how it mounts up again to cover the pectinalis muscle. The part of the fascia lata which dips down towards the femoral vessels, will have a crescentic form; but this will not be so distinct as is represented in many plates, particularly in those of Mr. Hey, unless we cut through the connexion which there is between the fascia lata and the sheath of the vessels; but by doing so, the natural view would be destroyed. This part generally receives the name of *superficial* Crescentic Arch;* we shall afterwards see a

Arch formed by the Fascia Lata.

Superficial Crescentic Arch.

The number, compared to those of common herniæ, was much larger than I could have expected, from the records kept in this country.

* Femoral ligament, of Mr. Hey; falciform process of the fascia lata, of Mr. Allan Burns. All these parts are

deep one. It is in this stage of the dissection that we can understand, how some surgeons have described the femoral hernia as situated under the fascia lata, while others have described it as lying above the same fascia; in truth, the femoral hernia is above one portion of the fascia lata and below another, for it is under the part which is called crescentic arch, and above the portion which covers the pectineal muscle.

Relative posi- of the Femo ral Hernia to the Fascia Lata.

If we pull away the lymphatics, which are passing from the inguinal glands to those of the pelvis, we shall see a number of holes in a membrane which connects the lower edge of the Poupart ligament to the pectineal portion of the fascia lata: this part we have already noticed. Though it will not appear as a distinct fascia in our dissection, still it has received the name of fascia cribriformis from Sir A. Cooper; and from M. Cloquet, Septum Crurale. It must be very carefully examined, as it is the only weak part of the boundary between the pelvis and the thigh; for on the iliac side of this fascia cribriformis, Poupart's ligament is firmly attached to the fascia lata, and on its pubic side there is a firm union

Fascia Cribri- formis.

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accurately described in the folio edition of Mr. Charles Bell's Dissections, published in 1799.—He did not give them names.

between the edge of the third insertion of the Poupart ligament and the portion of fascia lata which covers the pectinalis muscle.*

Internal View of Poupart's Ligament.

We may now proceed to the examination of the internal view. The flap of the abdominal muscles is to be held up, and the peritoneum is to be carefully torn from it; by which a useful view will be given.

We may now perceive, at about an inch from the pubes, a depression, bounded by the cribriform fascia, through which the lymphatics from the thigh, pass into the pelvis. The part of Poupart's ligament that is on the iliac side of this cavity, is firmly connected with the fascia which covers the iliacus internus muscle; and on its pubic side, the united tendons of the internal oblique and transversalis muscles are inserted into the linea ileo-pectinea. If we push our finger into the depression, and force it through the cribriform fascia, it will pass into that hollow on the fore part of the thigh, which has been already described as the situation in which a femoral hernia lies; and if the connexion between the fascia superficialis and the glands of the groin be still entire, it will prevent the finger from being passed farther

* While at this stage of the dissection, the leg should be moved in different directions, to show the effect of the various positions in relaxing or tightening the fasciæ.

down. If we turn up the finger as a hernia does, when it increases in size, we shall find that it not only presses against the superficial arch, but that there is also a resistance to it, caused by a part more deeply situated; this will be afterwards found to have been produced by that which is called the Deep Crescentic Arch.

Deep Crescentic Arch.

There is a great deal of dissection required, to show this deep arch, as a distinct fascia, and it may very justly be criticised as one of the tricks of the dissector; but as it is a point of anatomy which is often talked of, we shall describe what appears to us, to be the easiest mode of displaying it.

The Deep Arch may be shown on the same limb, in which the anatomy of inguinal hernia has been seen, but it would be better to have another, and then we may proceed thus: after having made the dissection of the external oblique, and of the superficial crescentic arch, in the manner already described; we should hold up the flap of the external oblique, and dissect between it and the internal, 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 a knife between the external and internal oblique muscles, where they are attached to the ligament; by pushing the knife towards the thigh, it will pass under the fascia

lata; then, by moving it in a horizontal direction, between the pubes and ilium, the external oblique and fascia lata, which are connected together through the medium of the superficial part of Poupart's ligament, will be completely separated from the parts below, so that the ligament will appear to be formed by them only. If we now cut through the attachment of the tendon and the ligament to the superior anterior spinous process of the ilium, and through the fascia lata, as far down as the crescentic arch (to save the parts below, it is useful to keep the handle of the knife under the fascia, as a directory to cut upon,) we shall then have a view, very similar to that we have just destroyed, for the deep crescentic fascia has nearly the same form as the superficial arch.

Formation of the Deep Arch

This deep arch may be described as formed, on the iliac side of the vessels, by a connexion between the fascia transversalis and the obliquus internus and transveralis, with part of Poupart's ligament; and on the pubic side, by the same fascia, in union with the insertions of the tendons of the two muscles into the linea ileo-pectinea. Perhaps we shall comprehend this more easily by examining the parts from within. On looking into the pelvis, we see the artery and vein, surrounded by a proper sheath, lying upon the iliac fascia, (which is the name

given to that membrane which covers the iliacus internus and psoas magnus.) If we hold up the part of the abdominal muscles which has been left, and look under them towards the thigh, we shall see an opening, like the mouth of a funnel, into which the vessels, surrounded by their sheath, pass. The posterior boundary may be described as formed by a prolongation from the fascia iliaca, and from which, for a certain space, the vessels can be easily separated. The anterior boundary *may* be traced from the fascia transversalis; being in fact that membrane which is in close connexion with the abdominal muscles, and forms the upper margin of the deep crescentic arch. At a short distance below Poupart's ligament, the fascia iliaca and transversalis become so closely connected with each other, and with the cellular membrane which forms the sheath of the vessels, that they cannot be traced as distinct fasciæ, farther down upon the thigh.

Connexion of the Fasciæ with the Sheath of the Vessels.

The space which has just been described as bounded by the fascia iliaca and fascia transversalis, has received various names; by many surgeons it has been called the crural sheath,* by others, the sheath of the vessels; and, consequently, when the latter describe femoral

Crural Sheath

* There is no crural ring in the natural state of the

hernia, they say that it passes along the sheath of the vessels; but this language is incorrect, and leads to great confusion, for the proper sheath is a distinct part, formed by cellular membrane, which surrounds the vessels, through their whole course, from the sacrum to the point where the profunda is given off.

Sheath of the Vessels.

M. Cloquet says, that we have here a part analogous to the inguinal canal; that this (the crural canal) "has a superior and inferior opening. The inferior is the opening by which the saphæna passes through the fascia lata to enter the femoral vein." Although this opening is represented in all the plates of the anatomy of the groin, given by our own authors, yet we have not described it, because we think that it is not of importance in considering femoral hernia—not on account of its situation, but because the connexion which there is between the fascia superficialis and the lymphatic glands, prevents a femoral hernia from passing so low down. There are no cases given, by English authors, of herniæ protruding through this hole. M. Cloquet has, in his Essay on Hernia, des-

Crural Canal

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parts, but it may be *felt* during an operation; and a distinct ring may be shown in a preparation, by removing the whole of the herniary sac. Such an appearance is very well shown in Sir A. Cooper's plates.

cribed several cases of this kind, which occurred to him and his friend M. Beclard; but, on conversing with him lately on the subject, he acknowledged that such a case was very rare.

We shall now describe the layers of fasciæ which may be found in a femoral hernia, and what are the most probable causes of strangulation.

The sac of a femoral hernia passes into the depression, which, in the natural state of the parts, is closed by the cribriform fascia. We have seen that there are a number of holes in this fascia. One of these holes may be enlarged, several may be thrown into one, or, what is more common, a small gland, which is partly within, and partly without the pelvis, may be pushed forward by the hernia. The hernia will be then lodged in the hollow below the crescentic arch; if small, it may continue there, but if it increases in size, it will turn up upon Poupart's ligament. The cause of this, we have already shown. In its passage from the abdomen, the hernia will have the epigastric artery on its iliac side, and if the obturator be given off by the epigastric, the probability is, that in its course towards the thyroid hole, it will pass over the neck of the sac. The spermatic cord is so far removed, that we have no fears for it, in operation, except in the superficial incisions.

Course of Femoral Hernia

Relation of the Epigastric to the Hernia.

Fasciæ, &c. seen during an Operation

We shall now suppose that we are operating for femoral hernia: the skin is cut through, and probably some branches of the pudicæ externæ are cut; we then come upon the fascia superficialis communis, but we shall be very much mistaken, if we expect to see this in any way resembling a distinct fascia. From the intimate manner in which the glands are united with the fascia, it will appear more like a solid mass, covering the sac, than a fascia; and to add to the difficulty, at every scratch of the knife, branches of the inguinales which go to the glands may bleed. If the hernia be recent, no distinct fascia will be seen; but if it has existed for some time, the cellular membrane, which has been pushed down before the sac, will be condensed into a fascia, or rather a bag. This has been called by Sir A. Cooper, Fascia Propria—a term which is by some objected to, as no such fascia is seen in the dissection of the natural parts; nor, when it is found in an operation, has it ever the appearance which we generally suppose a fascia to have, for it not only covers the sac, but contains it, as in a bag; indeed, it has so much the appearance of a sac, that we have cases given as examples, of one portion of peritoneum within the other; for the surgeon has supposed that the true sac, which he finds on opening this bag, was a second sac. It is called by Scarpa, the proper cellular en-

Objection to the Fascia Propria.

velope of the herniary sac, and by Mr. Charles Bell, the outer or false sac.

When the true sac is opened, it will be possible to bring the hernia into a straight line, and by thus doing away the acute angle, perhaps the difficulty of reducing the gut may be obviated; but this is very rarely the case; it will almost always be necessary to make use of the bistoury.

Cause of the Stricture in Femoral Hernia.

If we were now to consider the question of the seat of stricture, as a mere dissector would, we should make it appear very complicated; but by taking it practically, and as it is found during operation, it will appear sufficiently simple.

In the course of the dissection, we saw two crescentic arches, but in a case of hernia they will be so pressed together as to appear only one. Whatever names we choose to give to these fasciæ, is of little consequence in practice, but the recollection that they are of a semicircular form, is of great importance in settling—how the stricture is to be cut.

Some authors direct us to cut inwards, some outwards, and others upwards, which last is certainly the best as a general rule. It is seldom necessary to cut more than a very small part of both the fasciæ which we have just mentioned, but if it be necessary to cut more, it ought to be a little at different points, for this

Direction in which the Stricture is to be cut.

will be as effectual in relaxing a circle, as one long cut in any one direction, and will not be attended with the same danger.

Objection to Gimbernat's Ligament.

Students have been led into great confusion by the use of the term "Gimbernat's ligament." It would appear that the greater number of surgeons, who make use of this name, have taken their description of the ligament, from that given by Mr. Hey. Mr. Hey describes Gimbernat's ligament to be the "posterior attachment of the aponeurosis of the external oblique muscle." The common expression in London, is, that "Gimbernat's ligament is the third insertion of Poupart's ligament." Now, it has already been shown, that after the whole of the tendon of the external oblique has been cut through, and, consequently, after that connexion between the tendon and the os pubis, which is generally described as the third attachment of Poupart's ligament, is also relaxed, there still remains that deep crescentic fascia which has been by us, perhaps erroneously, described as the continuation of the fascia transversalis, but which, however, is sufficiently strong to produce strangulation. Now, if Mr. Hey's description be correct, here is sufficient proof, that Gimbernat's Ligament cannot be the part which actually causes the stricture.

It would be much better if we were to lay aside the use of Gimbernat's name, for he has

no right, from the merits of his publication, to be considered as an authority. Though some of his remarks are very good, still we cannot have much respect for the anatomical acquirements of a man, who says,—" Were it not an expansion of the *fascia lata*, which unites firmly with the bands of the external abdominal ring, and strengthens their junction, they would separate, on the application of the slightest force, as far as the spine of the ilium;" and in discussing an operation for femoral hernia, by Baudou, in the Hotel Dieu, he says, " The *spermatic* artery, when divided *within the abdomen*, occasions a hæmorrhage very difficult to stop."

The operation of Gimbernat appears to have been suggested by speculations upon the view of the parts in their natural state, and not from any observation of the difficulties which embarrass the surgeon in his operation. In his manner of operating he seems to have been most awkward, for, with both his hands, he introduces his directory and bistoury on the the side of the sac next the pubes, and runs them inwards, so as to cut up the attachment of the Poupart ligament to the os pubis. He does not describe the danger which the obturator artery would be in from this cut, but he warns us to take care that we do not wound the uterus or bladder: by this last advice he clearly shows to what a depth he would pass his knife;

and what a confused idea he must have had of the real cause of stricture.

Although the study of the anatomy of the groin must always be considered as a principal part of the surgical education of a student, still, after he has made himself master, not only of the simple anatomy, but also of the various descriptions of the parts which have been given, he has much to learn, to make himself competent to undertake an operation for femoral hernia. Those who have seen many operations for femoral hernia, must allow, that they hardly ever saw the appearances exactly similar in two cases. The knowledge of all the circumstances is only to be attained by watching the operations of a skilful surgeon; and by examining the diseased parts either in the body, or when preserved in Anatomical Museums. If the pupil at the same time takes notes of cases detailed by surgeons, who are good Anatomists and Pathologists, he will find such a course of study more advantageous to him, as a practical surgeon, than spending his time in endeavouring to understand many of the complicated and erroneous descriptions, which have been given of the *fasciæ*.

I trust, that what I have just said, will not be misconstrued, for no one can have a stronger

conviction than I have, of the absolute necessity of attending to the natural anatomy of the parts connected with hernia. But while students, in consequence of reading what they consider to be the best authors on this subject, are led to think only of the direction in which the stricture is to be divided, so as to avoid wounding the epigastric artery or the spermatic cord, they are, for these supposed dangers, (for there is hardly a case on record of the wound of either of those parts,) neglecting the consideration of questions, which will be forced upon them, in almost every operation. For instance, the changes which take place in the parts superficial to the sac, and in the sac itself—the difficulty of recognizing the true peritoneal sac,—the stricture produced by the neck of the sac, —the danger of reducing the serum in the sac, and leaving the intestine still strangulated,—those changes which take place in the gut itself, producing strangulation,—the difference between strangulation and incarceration,—the circumstances which render an artificial anus necessary,—or what is to be done for the renewal of the course of the fæces. Some examples, illustrative of these questions, will be found in a paper of mine, in the sixth number of the Quarterly Journal of Foreign Medicine and Surgery, February, 1820, in which there is a short account of some excellent observations

Necessity of Studying the Subject Pathologically.

published by M. Breschet, in the *concour* for the place of "Chef des Travaux Anatomiques," in the Ecole de Medecine of Paris. The works on hernia, by Scarpa, Sir A. Cooper, and others, I need hardly point out; but prejudice in favour of the history of operations, in which I have personally assisted, leads me to direct the student's attention particularly to the cases related by Mr. Charles Bell.

DISSECTION

OF THE

PARTS IN THE PERINEUM.

AFTER the student has finished the dissection of the muscles and viscera of the abdomen, he should, in union with his companion, dissect the parts in the perineum; but if the body be that of a female, he had better proceed to the dissection of the muscles of the thigh.

It is almost needless to remark, that before the muscles of the perineum can be shown, the students who are dissecting the upper half, and to whom all the muscles of the back, according to the common arrangement belong, must either permit the body to be cut through, at the loins, or to be put into a certain position. Although some of the muscles of the back must be cut, in dividing the body, still it will be to the advantage of all parties that the division should now be made, as the four dissectors will necessarily interfere with each other.

When we consider the operations which we may be called upon to perform, on the perineum, we shall have a just notion of the neces-

Importance of the Study.

sity of the study of the anatomy, to the surgeon who proposes to be an operator. But when it is known, that, in consequence of the peculiar formation of the part, a common abscess in the perineum has not unfrequently been the cause of death, it will be allowed, that the study should not be confined to the operating surgeon only. Indeed, unless we be quite conversant with every natural turn and irregularity of the urethra, we shall not only be unable to understand how to manage a fistula in perineo, but even in the treatment of a slight stricture we may mistake the natural obstructions for the effect of disease, and if, with this idea, we persevere in the use of instruments, to remove the supposed impediment, we may cause such mischief as will render the patient uncomfortable for life. It might be thought that such observations were now quite unnecessary, but it is still an opinion common among students, that even the operation of lithotomy may be performed, by one who is not conversant with the anatomy of the parts, if he makes use of instruments which are nicely adapted to each other.

Though much has been written on the perineum, and though many valuable observations have been made on particular parts, still the anatomy of the whole is so complicated, that very few students are capable of making themselves masters of the many points of interest,

unless they go through a regular series of dissections. I shall, therefore, describe such a course of dissections as will enable the student to comprehend the simple anatomy, and also the manner of examining the parts, so as to discover the causes of difficulty in the several operations.

As it will be absolutely necessary to dissect the perineum many times, I shall, in pointing out what I conceive to be the best plan of proceeding, endeavour to describe it so, that the student may make the most of each body which he dissects.

I shall first show the method of performing the dissection, so as to enable him to acquire a general idea of the muscles, and of those parts which are connected with the passage of the semen, the urine, and the fæces.

Tie the hands and feet, so as to put the body in the position in which a patient is placed, for the operation of lithotomy; then put a block under the sacrum—introduce a sound into the bladder—tie the glans penis to the upper part of the sound, and then fix it in the centre, by tying it to both knees.* Position of the Body.

* When the body is cut through at the loins, there is some difficulty in fixing the Pelvis in a proper position. It may be done, by passing a running noose in the middle of a long cord, around the two last lumbar vertebræ, and

Before commencing the dissection, the rectum should be cleared of its contents, by throwing in water forcibly with a syringe; a little baked hair is then to be pushed into the rectum; a round cork, with a string attached to it, should be passed just within the sphincter: this will be found useful in bringing the sphincter forwards.

Place a pelvis in the same position as the body, and after comparing the ramus of the pubes and ischium, and the tuberosity of the ischium, with the same parts in the subject, make an incision along the ramus of the pubes and ischium, down to the tuberosity of the ischium. Make a second through the skin only, along the Raphé, in the middle of the penis, to within three-quarters of an inch of the anus; and then a third, from the one on the tuberosity of the ischium, to the termination of the cut on the Raphé. Make still another incision through the skin round the anus, beginning at the union of the cross and longitudinal incisions; and lastly, feel for the os coccygis, and make a cut from it, to the circular one around the anus.

First Incision.

These incisions will enable us to expose the principal muscles. The cut along the ramus of

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after tying the cord under the table so as to fix the Pelvis firmly, the ends are to be brought up, and passed round the feet, to keep them in the proper position.

the pubes and ischium, will show the course of the *Erector Penis;* the cross cut, that of the *Transversalis;* the incision along the Raphé will expose the union of the two *Ejaculators;* and the circular cut will be in the line of the fibres of the *Sphincter Ani.* It is better to make these incisions in the first dissection on both sides; for only a very imperfect idea of the anatomy of the perineum is acquired, by the examination of one side only.

The dissection is to be begun, by cutting on the line of the ramus of the pubes and ischium, so as to expose the fibres of the erector, which will be found to form a tendinous expansion, that spreads upon the crus of the penis. We must be particularly careful in dissecting the origin of the muscle, as the transversalis is connected with it. After the same dissection is made on the other side, there will be a distinct view of the crura of the penis, and of the attachment of the erectors. Erector.

The next step will be, to dissect, in the line of the cross cut, as far as to the union with that in the line of the Raphé, with the intention of laying bare the fibres of the transversalis. But the student is liable to be foiled in his first attempt to dissect this muscle, as its fibres are not only frequently indistinct, but its place is often supplied by a set of fibres from the levator ani. Sometimes, indeed, we may Transversalis

discover two transversales; while in other bodies there is no proper transversalis, but a set of fibres which, though they have generally the same origin, take a direction obliquely upwards. This slip of fibres has been called the transversalis alter. The transversalis is considered regular, when it is inserted, with the muscle of the opposite side, into the condensed cellular membrane on the lower part of the bulb.

Ejaculator Seminis.

The ejaculator seminis may now be shown by dissecting carefully from the cut in the Raphé, towards the erector penis and crus. After the fibres of both ejaculators are exposed, the loose skin should be taken off from the penis, by which a more distinct view of the parts will be given.

We may now proceed with the dissection of the lower part, by cutting in the line of the incision which has been made round the verge of the anus, so as to expose the fibres of the sphincter. In doing this, the dissector will discover, that the most superficial set of fibres is attached to the skin in the line of the Raphé, while the greater mass of the muscle is inserted into that point at which the two transversales and ejaculators unite; indeed, this point is often called the "common centre of union."

Of the Sphincter Ani.

When the dissection of the sphincter is continued up for about an inch upon the rectum, some of the fibres of the levator ani will be seen;

but, to expose the whole of this muscle, it will be necessary to remove a large quantity of fat and cellular membrane from the side of the rectum. This may be done very boldly, if we keep below the level of the transversalis, for we may set our knife on the edge of the tuber ischii, and carry it full three-quarters of an inch inwards and downwards, without the risk of cutting any fibres, except some of the gluteus maximus. Levator Ani.

The object of this first dissection being only to acquire a general knowledge of the relative situation of the principal parts, we must not at present attend to the vessels, but proceed to remove the superficial muscles.

It will not be necessary to remove the erectors, to enable us to see the *Crura Penis* as they are sufficiently distinct, while the muscles are attached to them; but the fibres of the ejaculators, and of the transversalis, are to be carefully raised, to expose the *Spongy Body* and its *Bulb*. After removing the fibres of the ejaculator, which arise from between the erector and bulb, the fascia, or ligament, which is called *Ligamentum Triangulare*, will be seen; or, by pushing in the finger, it may be felt. Crura Penis. Spongy Body. Ligamentum Triangulare.

After studying the appearance of the parts now presented, a section of the pelvis should be made, so as to show the penis, bladder, &c. in their mutual relation to each other.

Section of the Pelvis.

The penis and bladder are to be left attached to the *right* limb, that there may be a view of that side which is cut in the operation of lithotomy. The first step, in making the section, is to cut the left crus of the corpus cavernosum from the ramus of the pubes and ischium, and then through the skin of the pubes and muscles of the abdomen; taking care to avoid the spermatic cord and testicle. The body is then to be untied, and laid upon its back, the staff is to be taken out of the bladder, and the hair from the rectum. The hand is to be introduced into the pelvis (it is presumed that the muscles of the abdomen are already dissected, and all the viscera, except the rectum and bladder, removed,) and the rectum and bladder are to be pulled over towards the right side; taking care that the peritoneum be not torn from them, nor the ureter injured.

Manner of making the Section.

The division of the bones is now to be made, by cutting with the saw,—not exactly through the symphysis, but rather to the left of it; but in doing this, we must take care that we do not cut the origin of the gracilis muscle, on the inside of the thigh.

The bone having been cut through, and the viscera of the pelvis held aside,—and the fibres

of the levator ani being carefully cut, the knife (without regarding the pyriformis, great nerve, &c.) is to be carried through the parts, up to the notch of the ilium; and then, by pulling the thighs forcibly asunder, the left leg will be separated from the trunk, at its union with the sacrum. The muscles on the back part are then to be cut, and the limb removed.

In making this section, some of the arteries and nerves, with certain muscles of the left side, will be necessarily destroyed; but they may be preserved, if we make the division more in the middle of the pelvis: to do this, we must pull the viscera quite over to the right side, so that we may saw through the middle of the sacrum and the symphysis of the pubes; carefully avoiding the urethra. This last method may be sufficient to give a general idea of the bladder, rectum, and urethra; but to enable us to form an accurate notion of the relation of these viscera to each other, we must make the section according to the manner first described.

Another Manner of making the Section.

The view which is now presented, will seem somewhat confused to a dissector, in his first essay; for he will not, as yet, be able to distinguish the bladder or rectum; but to make them distinct, it is only necessary to distend them. By introducing a blow-pipe into the urethra, the bladder may be blown up; or if the staff has been passed into the urethra, the blad-

der may be distended, by blowing into one of the ureters. A small quantity of hair is again to be put into the rectum. The form and situation of the bladder will now be distinct.

Folds of the Peritoneum.

Previous to examining the bladder, we should trace the folds of the peritoneum; it will be seen to pass from the muscles of the abdomen to the fundus of the bladder, from which it is continued down upon its back and lateral parts. It then rises on the front of the rectum, so as to form a bag or pouch, between the bladder and the rectum; the lateral boundaries of which, are sometimes called the posterior ligaments of the bladder. If the lower part of the muscles of the abdomen be still entire, we may see the *Remains* of the *Umbilical Arteries* running up along the lateral parts of the bladder to the umbilicus,—and, between them, the *Urachus* passing from the fundus. These parts will appear like three thickened lines upon the peritoneum.

Remains of Umbilical Arteries and Urachus.

The peritoneum may now be raised; it is so loosely connected with the bladder at the fundus, that, with the fingers only, it may be torn from the muscular coat; but we must remove it cautiously from the lower part, or we may destroy the Vasa Deferentia, or ducts of the testicle, which run on each side of the bladder; however, these are so thick and dense, that, though they may not be seen, they will be easily

Vas Deferens and Ureters.

felt, and if we put small bougies into the ureters, we may proceed without fear in removing the peritoneum.

The muscular fibres of the upper part of the bladder will now be seen; but a great deal of dissection will be required to make the parts below, distinct. The portion of the levator ani, which is still covering the rectum, ought to be dissected away, and then a quantity of cellular membrane will be seen between the rectum and bladder. In removing this, the knife must be used cautiously, until a portion of the vesicula seminalis, which lies between the rectum and bladder, is exposed;—it will be known by its dark glistening appearance. If we follow the vesicula forwards, we shall discover the lateral part of the prostate gland.

Vesicula Seminalis.

Prostate.

The bulb should now be made distinct, by removing any muscular fibres that may be attached to it; but we must be careful in dissecting immediately under it, as the little bodies called Cowper's glands, are situated there.— These glands are not very easily shown; but by taking the bulb between the finger and thumb, we shall readily discover them; although they will have rather the feel of condensed cellular membrane than of glands.

Cowper's Glands.

After having made the prostate and bulb distinct, the portion of the urethra which is between them, and which is called the membran-

Membranous Part of the Urethra.

ous part, is to be examined. The staff may be felt in it; but the muscular fibres and ligaments which surround it, give it a very different appearance to what we should have expected to find, from the description there is of it, in the greater number of books on anatomy.

Reference to Lithotomy.

As the manner of dissecting the perineum, so as to illustrate the anatomy of the parts, cut in the operation of lithotomy, will be shewn presently, I shall now only remark, that in this operation, after the external muscles are cut through, the knife is introduced into the membranous part of the urethra, and is carried on, so as to cut the lateral part of the prostate; the level of the incision being sufficiently high to avoid the vesicula seminalis.

To passing a Catheter.

Although the parts have not been dissected in the manner best adapted for showing the causes which prevent the introduction of the catheter, yet it may be well to remove the staff, and again to introduce it.—In doing this, we cannot avoid observing, how liable the instrument is to be caught at the bulb, and the danger there would be of forming a false passage, if we force it on. When we open the urethra, we shall find that, at this point, there is a natural pouch, which is called the sinus of the urethra; this subject will be fully entered into, in the description of the next dissection.

By putting the hand on the bladder, and

pushing it towards the rectum, we shall see the attachments which it has to the os pubis, and which are called its *Anterior Ligaments.* Between these, we may see a number of holes, which form the *Labyrinth* through which the veins of the penis pass.

Ligaments of the Bladder.

The rectum should now be taken away, so that we may get a better view of the *Vesiculæ*, *Vasa Deferentia*, and *Ureters.* After these parts have been examined in their relative situation to each other, the bladder and penis should be removed from the pubes. To do this, it is only necessary to separate the right crus of the penis from the bone, and to cut through the ligaments of the bladder, and the vasa deferentia and ureters. The bladder, when detached, is again to be distended, and a straight staff is to be passed into the urethra. The cellular membrane may then be removed more carefully from the lower part of the bladder, so that the vesiculæ seminales and vasa deferentia shall be still more distinctly seen.

Removal of the Bladder, &c.

To show the *Lateral Lobes* of the prostate, it will be only necessary to remove the cellular membrane, and the large veins that are upon it; if we trace the vasa deferentia into the prostate, and then separate them from each other, we shall see the little projection of the gland that has been called the *Middle Lobe*, and which, in consequence of a mistake, made in the descrip-

Lateral Lobes of the Prostate.

Middle Lobe.

tion of the morbid anatomy of the prostate, has, of late years, been considered of much more importance than it deserves. We may now take off the muscular fibres, &c. from that portion of the urethra which is between the prostate and the bulb, so as to give it more resemblance to a *membranous part*, as it is generally described: the staff, being still in the urethra, will prevent us from cutting it. The bulb and Cowper's glands should also be made more distinct.

Before examining the internal structure of the cavernous and spongy bodies, they should be distended. One of the crura of the corpus cavernosum is to be tied, and a blow-pipe fixed into the other. Though this body may be fully distended, the spongy body will still remain flaccid, as there is no *direct* communication between it and the cavernous body. To distend the spongy body, it will be necessary to make a puncture, sufficient to admit a blow-pipe into its substance.

Cavernous and Spongy Bodies.

A bougie, or straight staff, being still in the canal, the bladder, prostate, and urethra are to be laid open, by cutting them through on the upper part, by which we shall avoid injuring the points of demonstration, as they are all on the lower surface.

The *Mucous Coat* of the bladder will be seen to extend along the urethra to the glans. In the lower part of the bladder, we may perceive the

entry of the ureters, and those little eminences which pass from them towards the prostate; and which have been shewn by Mr. Bell to be small muscles, for regulating the opening of the ureters. Muscles of the Ureters.

By squeezing the vesiculæ, the opening of the ducts, and those of the testicle, will be discovered, by a brown fluid issued from an eminence on the anterior part of the prostate, which though called the *Verumontanum*, or *Caput Gallinaginis*, is only a loose portion of the internal membrane of the urethra, which projects so as to form a pouch, or sinus, that opens towards the glans. The cavity has been called *Sinus Morgagni*, or *Sinus Pocularis;* by blowing towards the bladder, the membrane will be raised; but the vesiculæ will not at the same time be necessarily distended, as is generally supposed, for their ducts do not open into the sinus, but on each side of it. Verumontanum, or Caput Gallinaginis. Sinus Pocularis or Sinus Morgagni.

By squeezing the body of the prostate, we shall see its white secretion issuing by a number of ducts on each side of the verumontanum. Ducts of the Prostate.

By a little care we may pass bristles into the ducts of Cowper's glands; they are very small, and are situated about half an inch anterior to the bulb.

On the surface of the urethra, we shall discover many small openings, called *Lacunæ;* the principal one, called *Lacuna Magna*, is Lacunæ.

sometimes destroyed in making the section of the urethra; it is situated on the upper surface, about an inch from the opening of the glans.

Septum Pectiniforme.

The cellular structure of the cavernous body, surrounded by ligamentous membrane, and divided into two portions by the *Septum Pectiniforme*, will now be understood.

Urethra, not Muscular.

No muscular fibres will be seen in the membrane of the urethra; but the appearance which has been described as muscular, may be easily understood, by pulling it in a longitudinal direction,—for then the inner membrane will be thrown into folds, having the appearance of fibres. There is, likewise, a set of vessels immediately below the membrane, which, when empty, are very similar in appearance to muscular fibres. I have discovered that these vessels form an *Internal Spongy Body*, which passes down to the membranous part of the uretha, and forms even a small bulb there. This I have particularly described in the tenth volume of the Medico-Chirurgical Transactions.

Internal Spongy Body

Sir Everard Home has lately given an account, in the Transactions of the Royal Society, of certain muscular fibres, which he thinks he has discovered in the urethra, by the aid of a very powerful microscope; but, as he has described them as muscles, the *tendons* of which are of the consistence of *mucus*, I may be permitted to imagine, that their existence is only

ideal. Indeed, I suspect that Sir Everard has mistaken the small vessels, which form the Internal Spongy Body, for muscular fibres, as he does not seem to have been acquainted with my discovery, although it was published two years previous to his paper being read to the Royal Society. Since I described the minute structure of the urethra in man, in the horse, and in the bull, I have had an opportunity of verifying my opinions, by the dissection of the same part, in the elephant and camel.

SURGICAL DISSECTION

OF THE

PARTS IN THE PERINEUM AND PELVIS.

I SHALL now describe the manner, in which the more advanced student should make the dissection of the parts in the perineum, so as to enable him to understand their pathology, and the operations which it may be necessary to perform upon them.

The arteries of the pelvis are to be injected. The body is to be put into the same position as that for the first dissection; but before this is done, the student may try to introduce the catheter into the bladder,—taking care to do it lightly, so that he may not break through any of the natural obstructions.

The body being put into the proper position, a single cut is to be made in the line of the Raphé, and the skin only is to be dissected off, towards each ramus of the pubes and ischium, so as to expose the *Superficial Fascia* of the perineum, which is strongly united, by firm cellular membrane, to the fascia that covers the gracilis and adductor muscles of the thigh,—

Superficial Fascia.

more loosely to the parts about the anus, and, still more so, to the cellular membrane of the scrotum.* The first circumstance that will naturally excite the attention of the surgical student, is, that if matter should form under this fascia, it will with difficulty gain an exit;—but his interest will be increased, when he recollects the quantity of loose cellular membrane which he found among the muscles of the perineum, in his first dissection; for he will see, that if an abscess under this fascia is not freely opened, the matter may work its way backwards into the cellular membrane, so as to do irreparable mischief to the parts within. But the most important view in which this fascia is to be considered, is in the case, where, after rupture of the urethra, the urine is effused into the parts of the perineum. As the urine cannot, in such a case, force a passage through the fascia, it will be driven up among the loose cellular membrane of the penis and scrotum: and here it will very quickly produce gangrene, unless a free incision is made through the fascia.

Matter or Urine under this Fascia.

There are very few vessels seen in this stage of the dissection; but after part of the fascia is cut through, the arteries, which are called Su-

* The observations which were made on *fasciæ* at the groin, are also applicable to this fascia. If the subject be fat, the fascia will be very indistinct.

Superficial Vessels.

perficialis Perinei and Transversalis, will be seen, the first passing up between the ejaculator and the erector,—the other running in the line of the transversalis muscle. Both of these vessels must be cut, in the operation of lithotomy; but the bleeding from these small arteries may be of service after such an operation.

The superficial fascia may now be raised, and then the muscles, which were described in the first dissection, will be seen.

After the muscles and arteries have been dissected, the parts should be studied, with reference to the operation of lithotomy. In doing this, it is, above all things, necessary, that we should observe in the skeleton, the form of the arch which is made by the rami of the pubes and ischium, and examine its width,—and then calculate the space which would be occupied by the common sized forceps, with only a small stone between the blades. It will at once be evident, that an incision made high in the arch must be useless,—for the upper part of the arch is not only too narrow to permit the forceps to be extracted with a stone within their grasp, but, in the living body, it is filled up by a strong ligament. This view of the bony arch will prove, that the upper part of the incision need not be higher than through the transversalis muscle; and, consequently, that neither the ejaculator nor the erector should be cut.

Incisions in Lithotomy.

The first incision of a good lithotomist extends from the upper edge of the transversalis to below the anus. If we examine the parts in the line of such an incision, we shall see that the greater part of it may be made very boldly, for it must pass through the mass of fat that is between the rectum and ischium, and in which there are no vessels of importance. If we remove this fat, we shall see, that, in the second incision, the levator ani must be freely cut, before a stone can be easily and safely extracted.

First Incision

As the arteries have been injected, we may already see, that if the first incisions be properly made, there can be little danger of hæmorrhage. The small arteries have been already noticed. The first artery of importance found in the perineum, is that of the bulb; it may be discovered by dissecting above the transversalis muscle. For the reasons already given, this artery ought never to be cut: it is too high up. If we trace this artery back towards the ramus of the pubes, we shall discover the PUDICA INTERNA, from which, all the arteries of the perinæum arise. When we examine the manner in which this vessel is bound by a strong fascia, to the ramus of the ischium, it will be evident, that no surgeon can be in danger of cutting it, if he performs the operation carefully. When the artery is cut, it must be by a careless introduction of the gorget, or in withdrawing

Arteries in danger.

the bistoure cachée through the upper part of the arch. Before we leave this view, it may be observed, that, by making the incisions low, the urine will be less liable to lodge after the operation, and to produce abscesses, which often happens, when the incisions are made high in the perineum.

Passing the Catheter.

It is not easy to pass the catheter into the bladder, while the body is in this position, but still we ought to try to do it; for there are certain points of the anatomy, that may be more easily demonstrated now, than when the body is laid upon its back. The danger of passing the instrument into the sinus at the bulb, was pointed out in the first dissection; this is to be avoided by withdrawing it from the sinus, and elevating its point, before we push it on. Though we shall avoid the sinus, by following this rule, we may still be foiled in the attempt to pass the instrument farther on;—to discover the cause of this difficulty, we should remove all the muscular fibres which surround the bulb, and then we shall see, that the instrument may not only have struck against the edge of the triangular ligament, by being elevated too much, but that the urethra becomes very much narrowed at this part, and passes through a circular ligament, which is formed by a fascia that descends from the triangular ligament to the rectum.

Circular Ligament.

It will now be evident that there are several

causes of difficulty to the introduetion of an instrument through this part of the urethra—the natural curve of the canal—the sinus of the bulb—the edge of the triangular ligament: but, most of all, the circular ligament which surrounds the narrow part of the canal.

Causes of Obstruction to the Catheter.

It requires so much management, and such a knowledge of the structure of this part, to pass an instrument nicely through it, that I can now, with confidence, assert, that nine cases out of ten, of the strictures that are said to exist here, are a consequence of the natural narrowing of the canal being mistaken for stricture. Indeed, I am, by experience, so satisfied of this, that when a patient comes to me, complaining of stricture *only at this part*,—if he has been examined by another surgeon, a short time previously, I beg him to let the uretha have some days rest, before I sound him; for this part of the canal is so irritable, that if there has been the slightest injury done to the membrane, there will be a spasmodic affection produced, the moment the bougie touches it, and hence both the patient and the surgeon are led to believe that the difficulty of introducing the instrument, is in consequence of a stricture. There is also another source of error here,—the end of the bougie, by being pressed against the edge of the ligament, may be indented, so as to give exactly that appearance which has been considered to

Narrowing of the Canal mistaken for Stricture.

be an unequivocal proof of the existence of stricture.—When the body is untied, we should again examine these causes of obstruction.

Before making the section of the pelvis, we should observe the relation of the bladder to the parietes of the abdomen. If the muscles of the abdomen are still entire, we should distend the bladder, so as to make it project above the pubes, as it does in a case of retention of urine: then, by making an incision, two inches in length, upwards from the pubes, we shall see the space in which we ought to enter our trochar, in puncturing the bladder;—here also is the place, in which the cut is to be made, for extracting a stone by the high operation, if it should be deemed necessary.

Relation of the Bladder to the Abdominal Muscles.

We may now cut through the muscles of the abdomen, at the umbilicus, and then we shall see that the peritoneum, when the bladder is distended, is removed to a considerable distance from the pubes. I have already, in the dissection of the abdomen, described the inflections of the peritoneum; but before removing any part, the hand may be passed down between the bladder and rectum,—and then it may be understood how a hernia may take place there. The peritoneum is then to be stripped from the anterior and upper part of the bladder, on both sides: the vasa deferentia may be cut, or left, as we choose.—If part of the air and water be

Inflections of the Peritoneum.

pressed from the bladder, its anterior ligaments will be seen.

The obturator muscles will now be brought into view, covered by a fascia, which may be traced towards the bladder. But this will be more distinctly seen, when we have made the vertical section of the pelvis.

In making this section, we should cut through the parts in the perineum, nearly in the same manner as described in the first dissection; but we must now take care to preserve as many of the arteries as we can, and to make our incisions towards the left side, that we may not endanger any of the ligaments of the urethra. The bone is to be sawed through, at a little to the left of the symphysis pubis. The peritoneum is then to be stripped from the left side of the pelvis, so as to completely expose the fascia which covers the levator ani, and obturator internus. After these muscles and the pyriformis, &c. are cut through, in the manner which is described in the first dissection, the left leg is to be pulled off, at the sacro-iliac symphysis.

Section of the Pelvis.

While making this section, we should particularly observe the manner, in which the fascia passes from the obturator muscle to the neck of the bladder; for, as it forms a sort of natural division between the external and internal parts of the pelvis, it has been imagined by some,

Fascia from the Obturator Muscle.

that if it were possible to perform the operation of lithotomy without cutting this fascia, there would be no danger of infiltration of urine, after the operation. But, unfortunately, experience has proved to us, that it is impossible to perform the operation without cutting it.* When the section is completed, this fascia may be traced to the surface of the lateral part of the bladder, and to the vesicula seminalis: here it is called fascia vesicalis. There is another portion of fascia, which has a firm attachment to the symphysis pubis, and passes down to the prostate; this latter will be made more distinct, by depressing the prostate, towards the rectum, with the staff. It will then appear to form a ligament to the prostate; for it surrounds, or rather is perforated by, the prostatic part of the urethra,—from which it may be traced down to the verge of the anus. This fascia cannot be confounded with the one which passes from the obturator muscle, as the fibres of the levator ani are interposed between them.

Fascia Vesicalis.

Fascia, or Ligament of the Prostate.

Before making any further dissection, we should again practise the introduction of the

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* In a paper printed in the Quarterly Journal of Foreign Medicine and Surgery, in January, 1821, I have endeavoured to show the true cause of the infiltration of urine into the cellular membrane, after the operation of lithotomy.

catheter. We have already noticed the difficulty which was produced by the point of the instrument falling into the sinus, at the bulb; and we have also understood, why it is obstructed immediately behind the bulb. After having passed these two impediments, the instrument will enter easily, for three-quarters or half an inch,—but there, it may be obstructed by the fascia of the prostate, just described. This difficulty may be overcome by raising the point a little, and by pushing the instrument forwards, recollecting, at the same time, the axis of the pelvis. The point may still be struck against the edge of the sphincter of the bladder. This is the last cause of obstruction in a sound urethra, and will be easily overcome, by depressing the handle of the instrument a little.

Obstructions to the Catheter.

The catheter may be left in the urethra. As the fibres of the ejaculator have been already removed, very little dissection will now be required to show the Artery passing into the bulb,—the Cowper's Glands, and the Ligament, through which the urethra passes. If, after examining those parts, we remove the levator ani from its connexion with the upper part of the ramus of the pubes, we shall see, immediately behind the circular ligament, certain muscular fibres, covered by a set of small vessels. These muscular fibres were described by the late Mr. Wilson, as forming a distinct muscle, surround-

Muscle described by Mr. Wilson.

ing the membranous part of the urethra. That there are muscular fibres here, none will deny; but it is very difficult to give them the appearance of a neat small muscle, such as has been described by him, and at the same time to preserve the ligaments of the urethra and of the prostate, and also the levator prostatæ muscle.

Internal Incisions in Lithotomy.

There is not any farther dissection required, to enable us to comprehend the incisions which are made through the internal parts, in the operation of lithotomy. The cut which is made by the best operators, begins about the middle of the membranous part of the urethra, and is continued, in a lateral direction, through the prostate and the sphincter of the bladder, above the level of the vesicula seminalis. By the view of the parts before us, we may be convinced, that in such an incision* no arteries of importance will be cut. The bleeding which takes place

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* It is to be hoped, that the gorget will now be laid aside in the operation of lithotomy. The ease and safety with which the operation with the scalpel may be performed, in comparison with that by the gorget, are admirably shown in the Illustrations of the Great Operations of Surgery, by Mr. Charles Bell. Mr. Bell had, in his Surgical Observations, published some time ago, given proofs of the success attending his mode of operating; they have been lately corroborated, in an extraordinary degree, by the history which that excellent surgeon, Mr. Martineau, of Norwich, has given, in the Medico

in an operation that has been well performed, will be principally from the large veins which may be seen surrounding the prostate and neck of the bladder.

The next practical question, founded directly on the anatomy, is the point, through which the bladder is to be punctured from the rectum.

After the bladder has been fully distended with water, the finger should be passed into the

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Chirurgical Transactions, of more than eighty cases of lithotomy, from which it appears, that he performs the operation nearly in the same manner.

As to the question of the *High Operation*, I shall refer to the remarks which I have made upon it, in the Journal of Foreign Medicine and Surgery, where I hope I have proved, that in almost every case, it is not only a very dangerous, but also a more difficult operation to perform, than the *lateral.*

In the same paper I have dwelt at some length on the question of hæmorrhage, after the common lateral operation. At the time I wrote that paper, I thought that the fears of hæmorrhage, which are entertained by some surgeons, were groundless, and that the patients died from another cause; but I have since had an opportunity of examining a body upon which the operation had been performed; in the dissection of this body, I discovered a good reason for these fears; for *the incision had been begun immediately below the arch of the pubes, and had not been continued farther down, than the upper part of the transversalis muscle,—and even this muscle had not been cut through.* Now, it is easy to understand, that by such an operation, it must be almost impossible to avoid

Puncture of the Bladder.

rectum, that we may form some idea of the *feel* of a distended bladder. It is very difficult, even in the healthy state of the parts, to distinguish between the prostate, the vesiculæ, and the muscular coat of the bladder; but if there be much cellular membrane interposed between the bladder and rectum,—and if the coats of the bladder be thickened, as they generally are in those cases which require the bladder to be punctured,—I believe that it will be found almost impossible to recognize the different parts,

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cutting some important arteries—that there will also be great difficulty in extracting the stone, for it must be impeded by the Rami of the Pubes and Ischium. Neither will there be a good chance of the patient's recovery, even though the stone should be extracted without much loss of blood or difficulty, as the wound will not be sufficiently dependent to allow of a free passage for the urine.

It appears to be the same fears of Hæmorrhage, and of difficulty of extracting the stone, that have induced some continental surgeons to perform lithotomy, by cutting through the rectum. It will be evident, from the view of the section of the pelvis, if the incisions are made *low, by the side of the rectum,* there will be as little danger of hæmorrhage, and as much space afforded for the extraction of the stone, as if the gut itself had been laid open. The stercoraceous fistula caused, by cutting the rectum, is treated very lightly of by the continental authors; but when, in this country, the rectum has by chance been wounded, and even at the verge, it has generally been the source of much misery to the patient for the remainder of his days.

so as to mark the boundaries of *that triangle*, which is described as having the peritoneum for its base, the vasa deferentia for its sides, and the prostate for its apex. When I have made this examination in a patient labouring under retention of urine, I confess that my impressions have been, that it must be by chance only, that all these parts can be avoided in puncturing the bladder: however, it is some relief to know, that in such a case, the peritoneum will be removed to a greater distance, than we would venture to push our instrument in.

The peritoneum and the vasa deferentia may be considered as the only parts, which it is of much importance to avoid in this operation; for it is only by those dissectors, who have not attended to the practice of surgery, that much importance can be attached to the wounding of the prostate.

We should now take the opportunity of practising the operation of sounding. A stone may be put into the bladder, through an opening in the fundus, which is to be closed; the bladder is then to be filled with water. Sounding for Stone.

When the sound is in the bladder, we should try to pass it in several directions, as round the stone, and over it, and below it, so that we may obtain some idea of the sensation which is given to the hand, by a stone of a particular shape, and in the different parts of the bladder. If

the finger be passed into the rectum, and the stone pressed down towards it, we shall see the possibility of estimating the size of a stone in the living body, by having it between the sound and the finger. The operation of sounding is so important a step, previous to performing the operation of lithotomy, that we should pay particular attention to it.—Indeed, by a good surgeon, this is always considered as the most important part of the operation. There is an excellent plate, demonstrative of the various positions which the stone may take in the bladder, in the Illustrations of the Great Operations of Surgery.

Before we open the urethra, to examine the several points at which the catheter has been obstructed, we should pass one down to the sinus of the bulb. While it is held there by an assistant, the urethra is to be opened, and then the point of the instrument will be seen lodged in the sinus. In this view, we shall see that the part of the urethra which is surrounded by the circular ligament, has so much resemblance to a stricture, that we can now easily comprehend how it may be mistaken for one in the living body.

Sources of Obstruction to the Catheter.

If, in pushing the instrument towards the bladder, we depress its point, it will again be impeded: if we lay open the urethra, up to the

point of obstruction,* we shall find that it is caused by the fascia of the prostate. By now carrying the catheter forwards, it will fall into the sulcus, which is by the side of the verumontanum, and anterior to the sphincter of the bladder.

These are all the obstructions to the passage of the catheter, which will be found in the dead body; but in the living body, it is a very common occurrence for the surgeon to be foiled in his attempt to introduce the catheter through the part behind the bulb,—not so much on account of the difficulty caused by the form of the part, as in consequence of there being frequently a spasmodic action of the muscles which surround this portion,—for it is not only the narrowest, but also the most irritable part of the canal.

The knowledge of the changes which take place in the urethra and bladder, in consequence of disease, is most important; but, as it would require a volume to detail all the mor-

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* The great size of the cavity of the urethra, posterior to the ligament of the bulb, will explain to us the difficulty often experienced in the attempt to introduce the beak of the gorget into the groove of a small staff. It is evident, that the sides of the urethra must fall together, when cut, if the instrument be small; which is completely obviated by the large staff, invented by Mr. Bell.

bid appearances which are found in the urethra and bladder, I dare not enter upon the subject, farther than to point out one or two important circumstances, which have been proved by the dissection of the bodies of those, who have died in consequence of stricture. I confine myself to this, the more willingly, because I can, conscientiously recommend to the student, the perusal of the observations which have been made on the morbid anatomy of the urethra and bladder, in that edition of the work on Stricture, by Mr. Bell, of which I was the editor.

Stricture may take place at any part of the urethra, anterior to the circular ligament, but in general it occurs at two points :—at an inch and a half from the glans, and at six or seven inches down, *i. e.* near the bulb. But I have already given sufficient reasons for our being guarded, in supposing that an obstruction to the passage of an instrument beyond the bulb is produced by a stricture.

Situations of stricture.

I would particularly direct the student's attention to the following facts, which have not hitherto been much noticed.

1st. That there is not one example in a hundred, of stricture occurring farther back, than immediately behind the ligament of the bulb.

2d. That the ducts of the prostate, which are

naturally very small, are always more or less enlarged in cases of severe stricture.

It must be evident that certain practical rules are to be deduced from these facts. 1st. If an instrument is obstructed posterior to the ligament of the bulb, we may suspect that the cause of the obstruction, is not such as will be overcome by the same means as a stricture would; and 2d. We can now understand why, in the treatment of a severe case, we ought to be content with so dilating the stricture, as to enable the patient to pass his urine freely,—that we should not be too anxious to pass an instrument into the bladder, as, in the attempt, the point may enter into one of the enlarged ducts of the prostate, and consequently produce great irritation, and even lead us to suspect that there is still another stricture: if, with this idea, we persevere in pushing the instrument on, we shall certainly do irreparable mischief to the patient.

Stricture never posterior to the Ligament of the Bulb.

The urine is very often obstructed in old men, either by general or partial enlargement of the prostate. But as this disease cannot be understood by the appearance of the natural parts, and as it is too important a subject to be treated of, in so short a manner as the limits of this work would permit,—I shall refer to those books which treat of the diseases of the urethra; but here I may be allowed to remark, that I think I have proved, by repeated dissections, that the

Disease of the Third Lobe, a mistake.

obstruction is seldom, or never, produced by the enlargement of the third lobe, as is generally supposed. Some years ago I wrote a paper on this question, which is published in Mr. Bell's Surgical Observations.

As in all cases of irritation of the urethra, or bladder, the muscular coat of the latter becomes thickened, we must not be surprised if we should, in the dissection of the body of a person who has died of stricture, discover the bladder in this state,—and even having cysts communicating with it; for when the muscular coat is thickened, a part of the internal coat is very frequently protruded between the fibres, and sometimes to such an extent, as to give the appearance of a second bladder. I may also observe that, in the examination of such bodies, we must not express astonishment, if we discover the ureters to be thickened and inflamed, and the kidneys to be lobulated and full of matter; for it follows, almost invariably, that, when the bladder is inflamed, the kidneys and ureters become also affected.

Consequences of Stricture.

While the view of the section of the pelvis is before us, we should also take into consideration the operations to be performed upon the *Rectum*. If the gut be cut in the operation for fistula in ano, as far up as the finger will reach, we cannot be surprised that, after such an operation, a patient should die of hæmorrhage; because, by

Fistula in Ano.

such a cut, not only very large branches of the pudic, but even of the lower mesenteric artery, may be divided. But, luckily, experience has taught us, that it is very seldom necessary to cut more than the sphincter ani, in this operation.

If we examine the rectum with the finger, we shall find that there is a natural constriction about half an inch above the verge of the anus, here the cuticle appears to terminate, and the mucous coat of the intestine to commence. This is the part where stricture of the rectum generally begins. We have only to look to the curve which the rectum makes, to avoid falling into the error of mistaking the difficulty which is offered by the sacrum to the passing of a bougie, farther than six inches into the rectum, for a stricture or tumour in the gut. Stricture of the Rectum.

If we inject the lower mesenteric veins with size, we shall be able to form some idea of the nature of *piles:* for, in the greater number of bodies, the vein will appear constricted at the point of union between the mucous coat and the cuticle, and distended below it, so as to resemble piles in an early stage of their formation. Immediately above this point, the gut becomes more dilatable: and here it is, that fish bones, or the stones of fruit, after having passed easily through the whole intestinal canal, are liable to lodge, and occasionally to cause abscess and fistula. Piles.

TABLE OF THE MUSCLES.

THE muscles seen in the first dissection of the perineum, are—

ERECTOR PENIS. OR. The tuberosity of the os ischium: running upwards, it embraces the crus of the penis.

IN. The sheath of the crus penis.

EJACULATOR. OR. The crura penis and body of the penis, and the triangular ligament: the inferior fibres run more transversely, and the superior descend in an oblique direction.

IN. In the middle of the bulb and spongy body of the urethra; by the fibres of both sides uniting, the bulb is completely enclosed.

It is connected behind, with the fibres of the sphincter ani and transversales muscles; these accordingly co-operate in their action.

TRANSVERSALIS PERINEI. OR. The tuberosity of the os ischium, below the origin of the erector: it runs transversely.

IN. The ejaculator seminis, and fore part of the sphincter ani.

TRANSVERSALIS ALTER PERINEI, OR OBLIQUUS. OR. From the tuberosity of the ischium, behind the former: it runs more obliquely forwards.

IN. The side of the ejaculator seminis.

We do not always find both these muscles;—some-

times the one, and not the other. There is occasionally another portion found, which has been described as a TRANSVERSALIS PROFUNDUS; but it runs so deep under the others, as to be generally described as a part of the *levator ani.*

SPHINCTER ANI. This muscle consists of fibres, which encircle the verge of the anus. It may be said to have neither origin, nor insertion into any particular point; but we may observe, that certain superficial fibres, after encircling the anus, are attached, about an inch above the bulb, to the union of the ejaculator muscles, while a deeper set of fibres are inserted into the union between the transversalis and ejaculator: sometimes a slip runs distinctly to this last muscle, and is called MUSCULUS LATERALIS URETHRÆ. The fibres posterior to the anus are attached, by a distinct tendon, to the os coccygis. The inner set of muscular fibres on the rectum, have been described by some, as forming an *internal* sphincter.

LEVATOR ANI. OR. 1. Os pubis and os ischium, within the pelvis, as far as the upper edge of the foramen thyroideum; 2. from the thin tendinous membrane that covers the obturator internus and coccygeus muscles; 3. from the spinous process of the os ischium. Its fibres run down converging.

IN. The sphincter ani, and verge of the anus, and anterior part of the two last bones of the coccyx. It surrounds the extremity of the rectum, neck of the bladder, prostate gland, and part of the vesiculæ seminales.

USE. To sustain the contents of the pelvis, and to help in ejecting the semen and contents of the rectum;

to restrain the protrusion of the anus in evacuation of the fæces.

I shall describe the coccygeus here, though it cannot properly be considered a muscle of the perineum :—

Coccygeus. Or. Tendinous and fleshy, from the spinous process of the os ischium, and the inside of the posterior sacro-ischiatic ligament. From this narrow beginning, it gradually increases, to form a thin fleshy belly, interspersed with tendinous fibres.

In. Into the extremity of the os sacrum, and nearly into the whole length of the os coccygis forward.

Use. To move the os coccygis.

In dissecting the parts exposed by the section of the pelvis, we may observe certain small muscles, the connexions of which are so difficult to show, that there are hardly two authorities who describe them in the same manner,—so that they have been frequently a subject of dispute: they are, the compressor prostatæ and the compressor, or levator urethræ. According to the best authorities, the compressor prostatæ arises, in loose fibres, from between the symphysis pubis and the membrana obturans; it then runs backwards, to the prostate gland and vesiculæ seminales. The compressor, or levator urethræ, according to Mr. Wilson, rises more under the arch of the pubes, and sends its fibres downwards, and under the membranous part of the urethra, so as to encircle it. It is easy to show, that the fibres of the levator urethræ are distinct from those of the levator ani; but their origin

is so connected with the ligament of the urethra, that it is very difficult to give the muscle the form depicted by Mr. Wilson, and at the same time to show the ligament of the urethra.

Though the attachments of the bladder to the os pubis, are called the tendons of the bladder,—it is not correct to describe them as the origins or insertions of the *detrusor urinæ*, which is the name given to the muscular coat of the bladder.

The arteries seen in the perineum, are almost all branches of the *pudic:* the greater number of them have been already mentioned,—but I shall recapitulate them, in the order to which they appear on dissection. The *hæmorrhoidales externæ* are those branches which encircle the anus; the *transversalis perinei* is the name given to that branch which runs across the perineum; the *superficialis perinei* passes up from the last, along the side of the erector muscle. In the second stage of the dissection, we shall discover the *artery of the bulb;* and by feeling close on the bone, we shall find the continued trunk of the pudic, which is here called *arteria communis penis:* this trunk divides into the *arteria profunda propria,*—which enters into the cavernous body, and into the *arteria dorsalis,* or *superficialis penis,*—which passes towards the glans.

The deeper arteries, which are seen in the lateral section, will be described with those of the pelvis.

The veins are here, as in the other parts, named according to the arteries which they accompany. The

venous labyrinth formed by those coming from the cavernous body, and the plexus of veins which surround the prostate gland, should be more particularly attended to, than the superficial ones.

The nerves which are seen in the first dissection of the perineum, are branches of the pudic. The principal branch is found either above or below the transversalis muscle: several smaller twigs are sent to the other muscles,—while the trunk of the nerve passes, along with the pudic artery, into the penis.

The parts within the pelvis are supplied with nerves principally from the hypogastric plexus, which is continued from the Solar Plexus, and with branches from the Lumbar and Sacral nerves.

DISSECTION

OF

THE TESTICLE.

IT is more important to have an accurate idea of the formation of the coats of the testicle, than of the structure of the gland; because, without it, we cannot form a correct opinion upon the varieties of hydrocele and hernia. But as we cannot attain this knowledge without examining the testicle in its descent in the fœtus, I shall, before describing its structure in the adult, point out some of the changes which take place in its coverings, during the existence of the fœtus.

Descent of the Testicle.

If we examine a fœtus of six months, we shall discover the testicle lying under the kidney, on the fore part of the psoæ muscles, covered by the peritoneum, which adheres to it, in the same manner as to the viscera of the abdomen: we may also observe a ligamentous, or cellular cord, stretching up from the inside of the abdominal ring to the body of the testicle,—this is the GUBERNACULUM TESTIS.

Gubernaculum Testis.

In a fœtus at the eighth month, we shall pro-

bably find the testicle lying in the inguinal canal, and a small portion of peritoneum projecting before it, towards the scrotum. But if we examine a child at the period of birth, or a short time after it, the testicle will be found in the scrotum, and covered by two portions of peritoneum; the most superficial, is the same, which, in the fœtus of eight months, projected into the inguinal canal,—the other, which adheres to the body of the gland, is the same which covered the testicle while it lay in the loin. If, at this period, a probe be pushed upwards between the two portions of the peritoneum, it will pass into the abdomen; but, it is not so in the adult, for though the two portions of the peritoneum are still distinct from each other, we shall not be able to pass a probe farther than the upper part of the scrotum, as the communication with the abdomen is closed by the adhesion of the peritoneal surfaces.

Coats at Birth

I shall now suppose that we are to make a dissection of the testicle, scrotum, &c. in an adult. We are told, that, on cutting through the skin, we shall see the muscle, called the *Dartos;* but, although there be an evident power of contraction in the skin of the scrotum, we shall seldom be able to discover muscular fibres under it,—instead of them, a quantity of loose cellular membrane, which can easily be inflated with air will be found. In blowing this

Dartos.

up, a sort of natural septum will be seen between the two sides of the scrotum. Septum Scroti.

This cellular structure is very often distended in general anasarca, or in emphysema.—The distention of it in either of these cases, is comparatively harmless: but, if it be filled with urine, after the bursting of the urethra, there will be much danger; for if the urine be allowed to lodge, the membrane will become quickly gangrenous.

The scrotum may now be dissected off, so as to show the testicle and its cord. The *cord* is composed of a number of different vessels and nerves, surrounded by a tissue of cellular membrane, called the *Tunica Vaginalis Communis.* —Upon the upper surface of this, are the scattered fibres of the cremaster muscle. Tunica Vaginalis Communis.

We should now take the testicle in our hand; and if there has been no inflammation of the parts during life, we shall feel the body of the gland slipping about, as if it were contained within a sac. By dissecting on the fore part, we may open this *sac*, so as to show the gland lying within it.—It is called the TUNICA VAGINALIS; being the same portion of peritoneum, which we saw projecting into the scrotum before the descent of the testicle. But we shall now find, that though this is called a sac, it does not contain the whole testicle, as in a sheath, but only the two anterior thirds of the Tunica Vaginalis.

body of the gland, which are covered by a dense white glistening coat, which was formed by the adhesion of the peritoneum to the testicle, while it was within the abdomen. This latter coat has, by the best authorities, been named "Tunica Albuginea," but by others, "Tunica Vaginalis Reflexa;" the name "Albuginea" being given by the latter to a dense fibrous matter, which is under this coat, and immediately invests the testicle. There is some difficulty in determining which is the most proper name; for even Haller is not very distinct in his definition of the two coats; I am inclined to call the peritoneal covering, the TUNICA ALBUGINEA,—because the name seems to have been originally a surgical term, used in describing the white dense appearance of the peritoneal coat of the testicle, when the sac of a hydrocele was opened. It is observed in Warner's Treatise on the Testicle, that the "tunica albuginea, so named from its complexion, is a compact, firm, white, strong, and smoothly polished membrane, having a tendinous appearance;" and Pott, in speaking of hydrocele, says, "this fluid, in a natural and small quantity, serves to keep the tunica albuginea moist, and to prevent a cohesion between it and the tunica vaginalis."

Tunica Albuginea.

Objection to the Term Vaginalis Reflexa.

The term "tunica vaginalis reflexa" is very objectionable,—because, as it is not used by any surgical writers, in the description of hydrocele,

or of congenital hernia, it is liable to lead a student into great difficulties; and, moreover, it is given to a part which covered the testicle, while it was yet within the abdomen, and, consequently, before that which is called "tunica vaginalis" was formed. If we wish to distinguish the two portions of the peritoneum within the scrotum, we may call that one in contact with the body of the testicle, the Peritoneal covering, and the other, the Reflected Peritoneal Coat of the testicle,—as we distinguish the part of the peritoneum which covers the intestines, from that which lines the abdominal muscles.

By maceration, we may show the fibrous texture which is under the peritoneal covering; but, by this process of dissection, we shall destroy all resemblance to a coat which we would call "*albuginea.*"

Before dissecting farther, we should consider the surgical anatomy of these parts. We can now understand, that, in the common hydrocele in the adult, the body of the testicle will be on the back part, and the water which is confined between the tunica vaginalis and the albuginea, will form the anterior part of the tumour. We can also comprehend, that, in a child, where the connexion with the abdomen is not closed, a hydrocele may be emptied by pressure and change of position, but *again return* when the child is put on its legs. It is also evident, that as long as this communication remains open, a

Hydrocele.

Hernia Congenita.

portion of the intestine may come down into the space between the tunica vaginalis and albuginea, so as to form that species of inguinal hernia, which is called congenital.

In dissecting the cord, we shall sometimes discover, that part of the peritoneal surface has not united firmly; this will explain the cause of the formation of that kind of hydrocele, which is called *Encysted* hydrocele of the cord.

Structure of the Cord.

We should now proceed to examine the structure of the testicle, as a gland. The Cord is composed of *arteries, veins, absorbents,* and the *excretory duct of the testicle,*—which are all bound together, by cellular membrane and the fibres of the *Cremaster.* The *Spermatic Artery,* being very small, is the most difficult to discover. The veins are very numerous, and easily seen. The manner of showing the absorbents will be described presently. As the VAS DEFERENS feels like a piece of whip-cord, compared to the other parts, there will be no difficulty in finding it.

Vas Deferens

The cord should now be cut through, at its exit from the abdominal canal. Before we attempt to demonstrate the course of the vessels which convey the semen, we should inject some mercury into the vas deferens. The quicksilver will very seldom pass into the tubuli testis, but will generally reach as far as the rete testis. After the injection is made, we may remove all

the parts of the cord, except the vas deferens. In cutting away the veins from the body of the testicle, we may observe, that they have a peculiar form, somewhat resembling the tendrils of a vine,—whence they have been described as forming a *Corpus Pampiniforme;* and which is, from its pyramidal form, sometimes called *Corpus Pyramidale:* but this is more distinct in the testicle of the bull or ram. We shall now see, that the vas deferens, as it passes downwards, becomes very much convoluted; and that its convolutions lie on the body of the gland, in such a manner, as, by the ancients, to have been described as a distinct body, under the name *Epididymis*—(didymi, or twins, being the name given to the testicles.) The first distinct turn which the epididymis takes, is on the lower part of the testicle: and here it forms a little eminence, called *Globus Minor;* while the part at which the epididymis terminates on the upper part of the gland is called the *Globus Major.* We should now put the body of the testicle into water, and then, by cutting through the tunica albuginea, we shall see that the gland is composed of a mass—which, though apparently fibrous, may be proved, by a successful injection, to be composed of tubes. These tubuli are divided into sets, by portions of cellular membrane, called *sepimenta.*

Corpus Pampiniforme.

Epididymis.

Globus Major and Minor.

We may now trace the seminal ducts from

Tubuli. the *Tubuli* in the body of the testicle to the *Vas Deferens*: by raising the coats towards the epididymis, we may, perhaps, see the vessels called Vasa Recta. *Vasa Recta*, which pass from each bundle of the Rete Testis. tubuli, to form the intricate plexus, called *Rete Testis*,—and which is continued towards the *Globus Major*, and gives off, within the cellular Vasa Efferentia. membrane covering it, the vessels called *Vasa Efferentia*, or *Vascular Cones*, which latter name was given by the older anatomists under an erroneous idea of their use. The union of these vessels may be considered as the beginning of the *Epididymis;* which may now be traced backwards to the *Globus Minor*, as a duct very much convoluted. As it rises from the globus minor, it is called the *Vas Deferens*, which name it retains, until it terminates in the urethra. We very frequently find a vessel called Vas Aberrans *Vas Aberrans*, passing off from the vas deferens, and terminating in a cul de sac.

The name of *Corpus Highmorianum* is given to the thickening produced by the condensed cellular membrane, connected with the union of the Vasa Recta and Rete Testis, it having been particularly described by Highmore.

PREPARATIONS

OF THE

VISCERA OF THE PELVIS.

I SHALL describe the manner of making a few preparations of the viscera of the pelvis, that may be useful to the surgeon;—some of them may be made from the same body in which the parts in the perineum have been examined.

If, after dissecting the muscles, we cut through the rami of the pubes and ischium, below the part where the crura penis arise,—and then detach the bladder, &c. with the rectum, from their connexions with the posterior and lower part of the pelvis,—we may remove the whole of the viscera in connexion with the os pubis. By a little care, we may also keep the testicles attached to the bladder, through the media of the vasa deferentia. The bladder is then to be emptied, and the vesiculæ and prostate are to be squeezed, so that all their secretions shall be pressed out. The lower part of each crus of the penis is to be opened;—a small pipe is to be fixed into one of them, through which a quantity of warm water is to be injected. The water,

passing through the cellular structure, and septum pectiniforme of the cavernous body, will carry the blood with it, and escape by the hole which has been made in the other crus. A probe is to be passed along the vena dorsalis penis, towards the glans, so as to break down all the valves; and a pipe is then to be fixed into the vein, by which warm water is to be injected, so as to wash the blood out of the spongy body.

It has generally been supposed, that to distend the spongy body, it will be sufficient to inject from the vein on the back of the penis; but I have seldom seen a good preparation made in this way. I have always found it safer to make an opening into the back part of the glans, of sufficient size to admit a small pipe; so that, if the injection from the vein does not succeed, the glans and spongy body may be easily filled from the opening. After the cavernous and spongy bodies have been completely freed of the blood and water, by being repeatedly squeezed, they are in a fit state to be injected; but previous to doing this, a long iron sound should be passed into the bladder, that the parts may be afterwards preserved in their natural position. *The white cold injection*, or plaster of Paris, may be injected into the cavernous body, by the pipe in its crus; an assistant being prepared with a twisted suture, to close the opening in

the other crus, as soon as he perceives that all the blood and water have been pushed out by the injection. When the cavernous body is sufficiently filled, the *cold red injection* is to be thrown into the vein on the dorsum of the penis. The assistant must be very active in pushing the injection along the spongy body; but as we shall seldom succeed in filling the bulb from this source, we should be prepared to inject, also, through the pipe in the glans.

As soon as the injection in the penis has become hard, the bladder should be filled with plaster of Paris; but as the plaster would spoil a common syringe, we should make an apparatus for the purpose: this is easily done, by tying a stop-cock to an ox's bladder, into which an opening has been made in the fundus, so that a quantity of plaster may be put into it. The stop-cock being then passed into a pipe, which has been previously fixed in the ureter, the plaster may be pushed on so as to fill the bladder.

The vesiculæ seminales may now be filled with mercury, by making an opening into each vas deferens, as it passes over the fundus of the bladder. We may also try to inject the testicles, by throwing the quicksilver in the opposite direction. The parts require very little dissection; but it is necessary to watch them carefully while they are drying, so that they shall keep

their natural position. After they have been thoroughly dried, they must be well varnished.

It will be useful to have a wax model, or cast, of the urethra and bladder, in their natural situation. For this purpose, we should choose a subject in which the bladder is very much contracted. After the parts have been removed, with a small portion of the bone, in the same manner as the last preparation, and a rough dissection of the penis and bladder has been made, —some very hard and tough wax injection should be thrown into the urethra, by the opening in the glans,—and into the bladder, by the ureters. When the injection is cold, the bladder is to be opened, so that we may remove the cast.

If the cavernous and spongy bodies have been previously well cleaned, we may put the penis and bladder into a strong aluminous spirit before cutting out the cast, so that when the cast is removed, the urethra and bladder shall preserve their natural shape. But to make a good preparation of this kind, we should not take a cast at the same time; because the injection is not only liable to discolour the internal coat of the bladder, but the process of injecting will probably hurt the appearance of the parts, as the beauty of such a preparation depends very much on its being cleanly and carefully macerated.

When the parts have been sufficiently macerated, some strong aluminous spirit is to be thrown into the cavernous and spongy bodies; the urethra and bladder are also to be filled with the same fluid. The parts are then to be put, as nearly as possible in their natural relation to each other, into a glass jar full of spirits, and to remain in it until they are sufficiently hardened. The preparation is then to be taken out of the jar, and the external parts of the penis and bladder are to be more neatly dissected; the lateral part of the urethra and bladder is then to be opened, so as to give a distinct view of the course of the canal;—bristles should be put into the several ducts. This preparation, though it may not give a very accurate idea of the size of the canal, will still be very valuable, and should be put up neatly in a jar of spirits.

I may here observe, that when we wish to preserve the bladder, &c. either in their natural or morbid state, that we should attend to the following general rules: 1st. previous to putting the part into maceration, we should dissect off all the muscles, &c. which we do not intend to preserve; 2nd. free the cavernous and spongy bodies, of blood, by repeatedly injecting them with water; 3d. empty the vesiculæ and the prostate, by gently squeezing them; 4th. before the part is put into the macerating pot, we should fill the bladder and the cavernous and spongy

bodies with clean water; lastly, the preparation should be suspended near the top of the jar, and the water changed twice a day.

A preparation of a diseased penis and bladder may be removed, without even opening the body; for if we make a long cut in the perineum, we may dissect the penis from the rami and arch of the pubes; and then, by passing a knife directed by the finger, into the pelvis, we may carry it round the bladder, so as to separate it from its connexions internally; and then, by cutting the body of the penis across, all the parts may be easily pulled out. But if we are desirous of preserving the whole of the body of the penis, we ought to cut the attachment of the prepuce to the corona glandis, and, by then pulling the penis from below, it will be easily separated from the loose skin. If the penis has been cut through, below the scrotum, it will be only necessary to sew up the cut in the perineum; but if the whole has been removed, then we must stuff the skin of the penis with tow,—having first passed a fine thread through the inside of the prepuce, so as to give it the appearance of phimosis.

When we cut out a fine example of stricture, &c. we should always endeavour to take a piece of the os pubis with the bladder. It is rather difficult to do this, unless we are at the same time permitted to open the abdomen; but an

expert dissector will be able to effect it, by making a large incision below. Whenever a portion of bone is removed, a strong cord should be passed through the obturator holes, so as to hold the two sides of the pelvis together; for if this is not done, the body will appear very much disfigured.

DISSECTION

OF THE

PARTS IN THE PELVIS

OF THE FEMALE.

ALTHOUGH the dissection of the parts in the female perineum is not very interesting, in a surgical view, still it is necessary to make it; and at the same time to attend to the names which have been given to the several parts.

The *Mons Veneris* will be found to be only an accumulation of adipose substance under the integuments, and varying in size, according to the general state of the individual. The cavity which begins, as a fissure, under the mons veneris, and extends to within an inch of the anus, is called the *Vulva*, being the name given to the opening of the vagina and urethra generally. The thick folds of integument which are continued down from the lateral parts of the mons veneris, are the *Labia Externa*, or *Alæ Majores;* their union, at the lower part of the vulva, being called the *Frenum Labiorum*, or *Fourchette*: the little cavity, above this angle

of union, is sometimes called *Fossa Navicularis.* The skin which is between the fourchette and anus, is called the *Anterior Perineum;* while the part between the anus and os coccygis, is the *Posterior.*

If we separate the labia, we shall see, immediately under the mons veneris, a little projecting red body, with some loose skin covering it; this is the *Glans* and *Prepuce* of the *Clitoris.* The two thin folds of membrane which may be traced downwards from the prepuce, are the *Nymphæ,* or *Alæ Minores,*—between which, and about three quarters of an inch below the clitoris, we shall discover the prominent opening of the urethra. The upper part of the vulva is called the *Vestibulum;* and below the level of the urethra, it is called *Orificium Vaginæ,* which, in the virgin, is bounded by two folds of membrane, that nearly meet in the middle, and form the *Hymen:* when this is ruptured, there are little fleshy eminences seen on the lateral parts of the vagina, which are generally supposed to be the remains of the hymen, and are called *Carunculæ Myrtiformes.*

As the dissection of the muscles is not of much importance to the student, I shall give only a table of their origins and insertions.

The muscles of the female perineum, are—

Erector Clitoridis. Or. From the ramus of the

os ischium : in its ascent it covers the crus of the clitoris, as far up as the os pubis.

In. Into the upper part of the crus, and body of the clitoris.

Use. To erect the clitoris, by pushing the blood into its cavernous substance.

Sphincter Vaginæ. Or. From the sphincter ani, and from the posterior side of the vagina, near the perineum ; from thence it runs up the side of the vagina, near its external orifice, opposite to the nymphæ, and covers the corpus cavernosum vaginæ.

In. Into the body, or union of the crura clitoridis.

Use Contracts the mouth of the vagina, and by compressing the corpus cavernosum, pushes the blood into the clitoris and nymphæ.

Transversalis Perinei. Or. As in the male, from the fatty cellular membrane which covers the tuberosity of the os ischium.

In. The upper part of the sphincter ani,—and into a white tough substance in the perineum, between the lower part of the pudendum and anus.

Use. To sustain the perineum.

Sphincter Ani. Or. As in the male, from the skin and fat surrounding the extremity of the rectum.

In. Into the white tough substance in the perineum, —and below, into the front of the os coccygis.

Levator Ani. Or. As in the male, within the pelvis. It descends along the inferior part of the vagina and rectum.

In. Into the perineum and sphincter ani.

After having dissected the muscles, we may remove them, so as to expose the *Crura* of the *Clitoris*,—which are attached to the rami of the os pubis, nearly in the same manner as the crura of the corpus cavernosum are, in the male; by opening the crus we may distend the clitoris. We shall find no spongy body in the clitoris; but there is something analogous to it, surrounding the orifice of the vagina; it is called *Rete Vasculosum*, or *Plexus Retiformis*,—or sometimes, *Corpus Cavernosum Vaginæ*.

The parts within the pelvis should be examined, before a perpendicular section is made. The peritoneum has already been described as passing from the rectum to the uterus, and from the uterus to the bladder. If we pull up the uterus from between the bladder and rectum, we shall see the folds of the peritoneum, which form the *Broad Ligaments* of the uterus; between the duplicatures of which, we may feel the *Round Ligaments* which pass to the abdominal rings. The *Ovaria* will be seen in the broad part of the ligament; and, anterior to them, the *Fallopian Tubes*, each of which has a floating fringed extremity, called the *Morsus Diaboli*. These parts are very seldom found in a natural state,—as the uterus and its appendages are so prone to inflammation, that there are generally adhesions between them: there are also very frequently,

small tumours or hydatids attached to the ovarium.

The section of the pelvis is to be made nearly in the same manner, as it is directed to be made in the male. The structure and form of the clitoris, the course of the urethra and of the vagina, will be all easily understood.

If we lay open the vagina, we shall see the part of the uterus, called the *Os Tincæ;* the portion to which the vagina is attached, being called the *Cervix*. Upon the internal fine secreting membrane of the vagina many mucous folicles, or lacunæ, will be seen.

The urethra is very short, and very simple in its structure, compared with that of the male. We cannot discover any glands in it, similar to those which are connected with the neck of the bladder in the male; but, on opening it, we shall see several lacunæ. The internal membrane is not muscular, but has many longitudinal folds, which permit of its being dilated to a great extent.

The uterus and ovaria may now be dissected from the other parts. When the cellular membrane is removed from the uterus, we can comprehend how the names of *Cervix, Body,* and *Fundus,* have been given to its several parts. When the uterus is opened, we shall see that it has, internally, a fleecy, secreting surface; and on each side of the upper part of the cavity, we

shall discover an opening, by which we may pass bristles into the Fallopian tubes. If we make a section of the ovarium of a young person, several small transparent vesicles, which are supposed to be the *Ova*, will be seen; they are often called *Corpora Graafiana.* In an older person, and particularly in one who has been pregnant, small cysts are generally found in the ovarium; they are supposed to correspond to the number of ova which have escaped. Immediately after conception, the cyst is of a yellow colour,—whence it has been called *Corpus Luteum.*

The vessels in the pelvis of the female, differ considerably from those in the male,—principally in there being four additional arteries of importance, viz. the two SPERMATIC ARTERIES, which run to the ovaria and to the fundus, and to the body of the uterus; and the two UTERINE ARTERIES, which arise from the internal iliacs, and pass to the lower part of the uterus, and inosculate freely with the spermatic arteries. Each of these vessels has a corresponding vein.

The arteries to the external parts, nearly correspond with those in the male.

The nerves are described with those of the abdomen.

DISSECTION

OF

THE THIGH.

THE object of the student, in his first dissection of the thigh, should be to acquire a general idea of the connexions of the muscles and of the ligaments. In his second dissection, he should trace the injected arteries; and in the third, the nerves, with the arteries uninjected: he will then be prepared to study the parts in connexion, so as to make himself master of the surgical anatomy of the lower extremity.

FIRST DISSECTION.

THE fascia which covers the muscles should be exposed, before they are dissected: but some care is requisite to do this neatly, as the fascia is very thin at certain points. Indeed, it is so thin on the fore and inner part of the thigh, that if the dissection be commenced there, it will be very difficult to avoid cutting the fascia. The leg ought, therefore, to be thrown over the other,

so that an incision may be made through the skin, from the point over the trochanter major, where the fascia is strong, to the head of the fibula. The skin is then to be separated from the fascia, by carrying the edge of the knife in a slanting direction. After a little of the fascia has been exposed through the whole extent of incision, a cut is to be made through the skin only, across the lower part of the patella, and another from the trochanter to the pubes. The dissection is then to be continued, by raising the skin very carefully towards the fore and inner part of the thigh. If any muscular fibres be exposed, the dissector may be sure that he is doing wrong; and if he looks at the inner surface of the skin, he will probably see a portion of the fascia adhering to it. As the fascia is very strong on the back part of the thigh, it will be very easily exposed there; however, I should remark, that it is more difficult to make a good exhibition of the fascia in a strong and fat subject, than in a thin one.

Fascia Lata.

After the skin is removed, we shall be able to see the muscles which are immediately under the fascia. The first muscle that will catch our eye is the *Sartorius*, the fibres of which should be now exposed, by carrying the knife in the direction of them, from the ilium to the tibia. The muscle which is crossed by the sartorius, and runs down directly in the middle of the

Sartorius.

Rectus. thigh, is the *Rectus;* but before we dissect this, Vastus Externus. or the *Vastus Externus,* which is situated externally to the rectus, we should expose the fleshy part of the *Tensor Vaginæ Femoris,* or Fascialis. *Fascialis,* and then cut a slip of the fascia as far as to the fibula, so that it may be as a tendon to this muscle; the rest of the fascia may be then cut away, by which we shall be enabled to expose, more easily, the fibres of the rectus and vastus externus. It is difficult to dissect this last muscle neatly, on account of the firm connexion which the cellular membrane has with its lower semicircular fibres.

We may now dissect the muscles which are on the inside of the thigh. But, before beginning, we should separate the thighs a little, by Gracilis. which the thin muscle (the *Gracilis)* that passes from the pubes to the leg will be more easily dissected. Upon the inside of the gracilis, we shall see a mass of muscles passing from the pubes to the linea aspera; this is principally Triceps. composed of the three which form the *Triceps* or *Adductor.* To dissect the first of these,—the *Adductor Longus,* we have only to follow its fibres from the pubes to the linea aspera; but in doing this, we shall be obliged to cut through the great vessels, nerves, &c. which are passing from the pelvis to the leg: this, however, ought to be considered of no consequence; for in the first dissection, every thing should be sacrificed

to the muscles. If we continue the dissection towards the union of the os pubis and ilium, we shall expose the fibres of the muscle called *Pectinalis.* In tracing it down to its insertion, we should remove a number of the deeper vessels, so as, at the same time, to expose the insertion of the *Psoas Magnus* and *Iliacus Internus* into the trochanter minor. By dissecting between the pectinalis and abductor longus, we shall discover the *Adductor Brevis,* which has nearly the same form as the pectinalis. After this, we may dissect part of the *Adductor Magnus;* but before we can expose all the fibres of this muscle, we must turn the leg: however, this is not to be done yet, for while the leg is in the present position, we should dissect the *Vastus Internus,* which arises from the greater extent of the inner part of the thigh bone, and is inserted into the patella. When the dissection of this muscle is finished, the rectus may be raised and held aside, so that the *Cruræus,* which is between the vasti, may be seen. It is difficult to separate the vasti neatly from the cruræus; as the only guide we have, is a few vessels passing between the muscles.

Pectinalis.

Adductors.

Vastus Internus.

Cruræus.

After having made the origins and insertions of these muscles distinct, (for a description of which see the annexed table,) the leg should be turned, and the muscles on the back part dissected.

The first muscle to be dissected is the *Gluteus Maximus.* Before commencing, we should endeavour to make its fibres tense, by putting a block under the pelvis, and throwing the leg over the table and fixing it there, with the toes turned inwards. An incision is then to be made round the spine of the ilium, and another from the middle of the spine of the sacrum to opposite the trochanter major,—this last incision should be slightly semicircular, with its concavity towards the anus. As there is no fascia covering this muscle, the fibres will now be seen, and may be fully exposed, by cutting boldly in the whole extent of the line of the semicircular cut, first in a direction towards the anus, and then towards the ilium. We shall find that the muscle does not arise from the whole extent of the spine of the ilium, as part of the spine is occupied by a portion of the *Gluteus Medius,* which, however, is covered by a strong fascia. This fascia, which runs between the two muscles (and is united to the fascia lata,) is now to be divided, from the spine of the ilium to near the trochanter. By then cutting through the origin of the gluteus maximus, from the ilium and sacrum, it may be easily separated from the medius, and thrown down upon the thigh; it may be left attached, by its insertion, to the linea aspera; in doing this, we should raise as

Gluteus Maximus.

Gluteus Medius.

much of the cellular membrane as we can, along with the muscle. We shall find one very large bursa between the tendon and the trochanter, and two smaller ones between it and the linea aspera,—in carrying the muscle farther down we shall discover another large bursa between it and the vastus externus.

It will now be only necessary to dissect off the fascia from the upper and outer part of the gluteus medius, to make it distinct. When we wish to raise the gluteus medius, we should commence at the notch of the ilium, and remove the fibres from the dorsum of the ilium, as far as the anterior spinous process,—by commencing at the notch, we shall not endanger the *Gluteus Minimus* so much as if we were to begin the separation at the upper and outer part. When the muscle is thrown down to its insertion, the *Gluteus Minimus, Pyriformis,* (part of which might be seen before the medius was lifted,) *Gemellus Superior, Obturator Internus, Gemellus Inferior,* and *Quadratus Femoris,* will be all partially seen. Gluteus Minimus.

Before we can dissect these small muscles, we must turn the heel out, so as to stretch their fibres, which arise from the pelvis, and are inserted into the head of the femur. The great nerve which crosses the small muscles may be cut across; or by bending the knee, it will be Small Muscles.

relaxed, so that it may be held aside. It will be necessary to turn to the inside of the pelvis, before the obturator internus and pyriformis can be completely dissected. To show the *Obturator Externus*, it will be necessary to remove the muscles which lie on the fore part; but this should not be done, until all the other muscles are fully examined; at present we may see the insertion of its tendon by raising the edge of the quadratus femoris.

Obturator Externus.

The limb is now to be laid extended on its fore part. The dissection should be begun on the inner part, by dissecting behind the gracilis, by which we shall come upon the *Semitendinosus* that runs from the ischium to the inside of the tibia; between it and the gracilis, we shall find some fibres of the adductor magnus; these, however, at present, we should neglect. In dissecting the origin of the semitendinosus, we shall discover that of another muscle, which passes towards the outer part of the leg; and if we follow it, we shall find that it is united with a set of fibres, which arise from the back part of the linea aspera; the two portions, when united, pass down to the head of the fibula, as the *Biceps*, which forms the outer hamstring. Before removing the fat, and the nerve and artery, which are before the semitendinosus and biceps, in the ham, we should dissect

Semitendinosus.

Biceps.

the muscle that arises below the semitendinosus, from the ischium, and is inserted into the head of the tibia. This muscle is distinguished from the semitendinosus by the name of *Semimembranosus*, which is given to it, from its membranous appearance. These two last muscles form the inner ham-string. Semimembranosus.

After removing all the vessels, nerves, &c. from the ham, the back part of the adductor magnus may be easily exposed through its whole extent; the opening through it, by which the artery passes from the fore part of the thigh into the ham, will be also seen.

In making this last dissection, we shall necessarily expose the origins of the *Gastrocnemius;* but the muscles of the leg should not be traced, until we have made ourselves completely master of the anatomy of the muscles of the thigh,—nor should the skin be raised, for when the muscles are covered by the skin, they do not putrify so quickly. Gastrocnemius.

The dissection of the muscles of the leg is to be begun by making an incision from below the patella, along the spine of the tibia, to the great toe, and another along the middle of the back of the leg, from the knee to the heel;—the skin only, is then to be removed. This will expose a fascia, which, though very strong on the fore part of the leg, becomes still so much stronger at the ankle, in consequence of additional cross

slips of fascia, that it is there described as forming particular ligaments, which are called *Annular Ligaments.* The fascia upon the fore part of the foot is very thin, being little more than cellular membrane.

When the skin is taken off from the back part, very little fascia will be seen covering the large muscle, the gastrocnemius; but by continuing the incision from the heel along the sole of the foot, we shall discover a very strong fascia, called the *Plantar Aponeurosis.* To dissect this neatly, we should pull the thick skin of the foot forcibly to each side, and carry the knife, in a slanting direction, close upon the fascia.

Plantar Aponeurosis.

We may now proceed to dissect the muscles. The external muscle of the calf, the *Gastrocnemius,* is easily shown, as we have only to carry the knife in the direction of its fibres. In dissecting this, the edge of the next muscle, the *Soleus,* will be exposed; but before it can be fairly seen, the origin of the gastrocnemius, from the internal condyle, must be raised, and then we shall see the small muscle *(Plantaris)* which arises in union with the external origin of the gastrocnemius, and runs down to the inside of the os calcis. In this view, the *Popliteus,* which arises from the lower part of the external condyle, and runs to the tibia, will also be exposed.

Soleus.

Plantaris.

To show the tendo Achillis, which is formed by the *Gastrocnemius*, *Soleus*, and *Plantaris*, we must remove a large quantity of fat, which is situated between it and the next layer of muscles. The soleus may then be raised from its origins and from the tibia and fibula, and turned down with the gastrocnemius and plantaris, to their attachment to the os calcis. This will enable us to see the deep layer of muscles, which are covered by a strong fascia; we shall also expose the origins of the following muscles.

Tendo Achillis.

By cutting away the fascia, and the vessels and nerves, with their surrounding cellular membrane, there will be seen the origins of the *Flexor Pollicis Longus*, principally from the fibula—the *Flexor Longus Digitorum*, from the tibia—and, between the two, the *Tibialis Posticus*, which has an extensive origin from both bones. Each of these muscles passes behind the inner ankle, and is bound down by distinct annular ligaments; but, before tracing them farther, we must dissect the muscles on the fore part of the leg.

Muscles on Back Part of Tibia.

The fascia adheres very strongly to the muscles which arise from the tibia, and particularly to the *Tibialis Anticus*, so that it is rather difficult to take it off neatly. In removing it, we must take care that we do not cut through the annular ligaments at the ankle. If we trace e tibialis anticus, we shall find it pass to the

On the Fore Part.

internal cuneiform bone. The muscle which lies close upon it, and arises principally from the fibula, is the *Extensor Communis Digitorum*, which passes to all the toes, except the great toe. The separate extensor for the great toe *(Extensor Pollicis Proprius)* arises between the two last muscles.

Upon the outer edge of the extensor communis digitorum, there are three muscles, which, as they rise from the fibula, are called peronei: the first is called *Peroneus Longus*, and may be traced down, under the outer ankle, as far as the os cuboides, but here its tendon passes into a groove, and then across the sole of the foot, to the cuneiforme internum: this will be seen when the muscles of the foot are dissected.* The *Peroneus Secundus or Brevis* runs in the same line along the fibula, but is inserted into the metatarsal bone of the little toe. The *Peroneus Tertius* is generally so much connected with the fleshy part of the extensor communis digitorum, that it is difficult to separate them; we should therefore first dissect its tendon, which is inserted into the metatarsal bone of the toe, next the little toe.

On the Lateral Part.

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* In dissecting the tendon of this muscle and of the Tibialis Posticus in the sole of the foot, a bursa will be found connected with each tendon. There are also bursæ attached to the tendons of the flexor digitorum communis.

As there is only one muscle on the fore part of the foot, (the *Extensor Brevis Digitorum*,) there can be no difficulty in dissecting it; but it is not so with those in the sole of the foot,—for the muscles there, are not only particularly complicated, but the difficulty is increased in consequence of the tendons of several of the muscles on the leg running between them. On the Fore Part of the Foot.

The plantar fascia is to be first cut through, about the middle, and then the one half is to be raised towards the heel, and the other towards the toes; but, in removing it, we must carefully avoid lifting the origin and insertions of the *Flexor Digitorum Brevis*, which arises, in part, from the fascia. After this muscle is dissected, the *Abductor Pollicis*, and *Abductor Minimi Digiti*, which are on each side of the foot, are to be exposed; then the flexor digitorum brevis is to be cut through at its origin, and is to be carried towards the toes; this will expose the tendon of the long flexor, to which the *Flexor Accessorius*, which arises from the os calcis, is attached. From the fore part of the same tendon, the *Lumbricales* will be seen passing to the toes. When these tendons are cut, and turned with the lumbricales, towards the toes, the tendons of the tibialis posticus, and of the peroneus longus, will be seen crossing the foot. We may now easily dissect the *Flexor Brevis* and *Adductor Pollicis* on the one side, and the On the Sole.

other. When these are made out, there will only remain the *Transversalis* and the *Interossei.*

It will, perhaps, assist us in recollecting muscles of the thigh and leg, if we arrange them into classes. This may be done in several ways, but to all of them there are many objections. The following plan is offered, although it is also very faulty.

CLASSIFICATION OF THE MUSCLES

ON THE HIP.

To pull the thigh backwards, there are three muscles, viz. the *Gluteus Maximus, Gluteus Medius,* and *Gluteus Minimus,* which have, as antagonists, the *Psoas Magnus* and *Iliacus Internus.*

The class of muscles which more particularly roll the thigh, is composed of the *Pyriformis, Gemellus Superior, Obturator Internus, Gemellus Inferior, Obturator Externus,* and *Quadratus Femoris.*

MUSCLES ON THE THIGH.

The three superficial muscles, *Fascialis, Sartorius,* and *Gracilis,* may be classed together.

If these three are removed, twelve muscles will remain on the thigh; of which *Four* are inserted into the patella, and extend the leg, viz. the *Rectus*, *Vastus Externus*, *Vastus Internus*, and *Cruræus*. *Four* bend the leg, and are inserted into the tibia and fibula, viz. *Semitendinosus*, *Semimembranosus*, *Biceps*, and *Popliteus*. And *Four*, which pull the thighs together (adductors,) are inserted into the linea aspera, viz. *Pectinalis*, *Adductor Longus*, *Adductor Brevis*, and *Adductor Magnus*.

MUSCLES ON THE LEG.

As the muscles which *bend* the *toes* are situated on the back part of the leg, and those which *bend* the *foot* are on the fore part, it is not possible to make a good arrangement, according to the uses of the muscles; therefore, in the following plan, the *use* of the muscles is entirely neglected, the arrangement being made according to their relative situations.

There are twelve muscles on the leg, which may be divided into two great classes, viz. into six on the the fore part, and the same number behind,—both of which may be subdivided: the six on the fore part, into three on the fibula, viz. *Peroneus Longus*, *Peroneus Brevis*, and *Peroneus Tertius*—and three, more directly on *Flexor* and *Adductor Minimi Digiti* on the

the fore part, *Tibialis Anticus*, *Extensor Digitorum Communis*, and *Extensor Pollicis Proprius;* the six on the back part, may be still more easily subdivided into three which are inserted into the os calcis, viz. *Gastrocnemius*, *Soleus*, and *Plantaris*—and into three deep muscles, *Tibialis Posticus*, *Flexor Digitorum Longus*, and *Flexor Pollicis Longus*.

MUSCLES ON THE FOOT.

As the muscles which are on the sole of the foot are so difficult to remember, any arrangement which will facilitate the recollection of them, must be acceptable. I have classed the three muscles belonging to the great toe, together, viz. the *Abductor*, *Flexor Brevis*, and the *Adductor Pollicis;* then the three belonging to the little toe—the *Abductor*, *Flexor Parvus*, and *Adductor Minimi Digiti;* in the middle of the sole of the foot, there are the *Flexor Brevis Digitorum*, the *Flexor Accessorius*, and the *Lumbricales* (as one muscle.) After these nine muscles are removed, there are only on the sole of the foot, the *Tranversalis* and the *Interossei Interni*, and on the fore part, the *Extensor Brevis Digitorum* and the *Interossei Externi*.

The following table of the origins and inser-

tions of the muscles, is given nearly in the same order in which the muscles have been arranged.

Gluteus Maximus. Or. 1. The posterior part of the spine of the os ilium, near the sacrum. 2. From the convexity of the os sacrum. 3. From the sacro-ischiatic ligament. 4. From the os coccygis.

In. By a strong broad tendon, under which is a large bursa, into the upper and outer part of the linea aspera.

Use. To carry forward the trunk upon the thigh, and to draw the thigh backwards and outwards.

Gluteus Medius. Or. 1. The anterior superior spinous process of the os ilium. 2. The edge of the spine of the ilium. 3. From the back part of the dorsum of the ilium.

This muscle is covered by a strong fascia, from which many of its fleshy fibres arise.

In. By a broad tendon into the trochanter major.

Use. To draw the thigh bone outwards, and a little backwards; to roll the thigh bone outwards, especially when it is bended; to assist the former muscle. Under the tendon of this muscle there is a small bursa.

Gluteus Minimus. Or. A ridge that is continued from the inferior anterior spinous process of the os ilium, and from the middle of the dorsum of that bone, as far back as its great notch.

In. Into the fore and upper part of the trochanter major, between which and the tendon there is a bursa.

Use. These two last muscles assist the maximus,

and, as their size indicate, they are muscles of the trunk. They move the trunk forward by a succession of actions.

N. B. The Psoas and Iliacus have been described at pages 29 and 30.

Pyriformis. Or. From the 2d, 3d, and 4th portions of the sacrum. A few fleshy fibres from the os ilium. It passes out of the pelvis along with the posterior crural nerve.

In. By a round tendon, into the root of the trochanter major.

Use. To roll the thigh, and twist the body forward, on the ball of *the great toe.*

N. B. The Coccygeus has been described with the muscles of the perineum, at page 142.

Obturator Internus. Or. The os pubis and ischium, where they form the foramen thyroideum, and from the obturator ligament; a flattened tendon passes out of the pelvis, between the posterior sacro-ischiatic ligament and tuberosity of the os ischium; it passes over the capsular ligament of the thigh bone, where it is enclosed, as in a sheath, by the gemini muscles.

In. The pit at the root of the trochanter major.

Use. To roll the thigh bone outwards.

Gemini, or Gemellus Superior and Inferior. Or. The Superior, from the spinous process; the Inferior, from the tuberosity of the os ischium; and from the sacro-ischiatic ligament. (They are united by a tendinous and fleshy membrane, over which the tendon of the obturator internus muscle plays,)

In. The cavity at the root of the trochanter major, on each side of the tendon of the obturator internus, to which they adhere.

Use. The same as the last.

Quadratus Femoris. Or. The outside of the tuberosity of the os ischium, (runs transversely,)

In. The intertrochanteral line or ridge.

Use. To roll the thigh outwards.

Obturator Externus. Or. Fleshy, from the lower part of the os pubis and ischium; surrounds the foramen thyroideum. A number of its fibres, arising from the membrane which fills up that foramen, are collected, like rays, towards a centre, and pass towards the cervix of the os femoris.

In. By a strong tendon, into the cavity at the root of the trochanter major.

Use. To roll the thigh bone obliquely outwards.

MUSCLES ON THE FORE PART OF THE THIGH.

Tensor Vaginæ Femoris, or Fascialis. Or. The external part of the anterior superior spinous process of the os ilium.

In. Into the fascia which covers the outside of the thigh, and through it, into the outside of the knee.

Use. It is an abductor.

Sartorius. Or. The anterior superior spinous process of the os ilium; soon grows fleshy, runs down

for some space upon the rectus, and going obliquely inwards, it passes over the vastus internus, and, about the middle of the os femoris, over part of the triceps; it runs down further between the tendon of the adductor magnus and that of the gracilis muscle.

In. By a broad and thin tendon, into the inner side of the tibia, near the inferior part of its tubercle.

Use. To draw the leg inward, and to bend the knee joint.

Gracilis. Or. By a thin tendon, from the os pubis, near the symphysis of these two bones; soon grows fleshy, and, descending by the inside of the thigh, is

In. Inner and fore part of the tibia, under the sheath of the sartorius.

Use. It is an adductor and flexor.

Under the name of the Triceps Adductor Femoris, are comprehended three distinct muscles, viz.

Adductor Longus Femoris. Or. On the inside of the pectinalis, from the upper and fore part of the os pubis, and ligament of the symphysis.

In. The upper third of the linea aspera.

Adductor Brevis Femoris. Or. The os pubis, near the symphysis, and lower than the last muscle.

In. The inner and upper part of the linea aspera, from a little below the trochanter minor, to the beginning of the insertion of the adductor longus.

Adductor Magnus Femoris. Or. 1. From the ramus of the os pubis; 2. from the ramus and the

tuberosity of the os ischium, as low down as the tuberosity.

In. 1. The whole length of the linea aspera; 2. into a ridge above the internal condyle of the os femoris; 3. by a long round tendon (which is united to the vastus internus) into the upper part of the condyle.

Use of these three muscles, or Triceps, to bring the thigh inwards and forwards, as in clinging to the saddle; and, in some degree, to roll the toe inwards. The pectinalis, which lies between the adductor longus and brevis, may be classed with them.

Pectinalis. Or. Broad and fleshy from the upper and anterior part of the os pubis, immediately above the foramen thyroideum.

In. Into the anterior and upper part of the linea aspera of the os femoris, a little below the trochanter minor, by a flat and short tendon.

Use. To bring the thigh upwards and inwards.

Quadriceps Extensor Cruris, is composed of the four following muscles:—

Rectus. Or. 1. The lower and anterior spinous process of the os ilium; 2. tendinous from the dorsum of the ilium, a little above the acetabulum.

In. The upper part of the patella, and through the medium of the patella, and its ligament, into the anterior tubercle of the tibia.

Use. To extend the leg, or raise the body.

Vastus Externus. Or. 1. The root of the trochanter major; 2. the whole length of the linea aspera,

by fleshy fibres which run obliquely forwards to a middle tendon, where they terminate.

In. The patella; part of the muscle ends in an aponeurosis, which is continued down on the leg, and is firmly fixed to the head of the tibia.

Use. To extend the leg, or raise the body from the seat.

Vastus Internus. Or. 1. The fore part of the os femoris; 2. root of the trochanter minor; 3. almost all the inside of the linea aspera; the fibres run obliquely forwards and downwards, and it is fleshy considerably lower than the last.

In. The patella; part of this also ends in an aponeurosis, which is continued down the leg.

Use. To extend the leg, or raise the body.

Cruræus. Or. 1. From between the two trochanters of the os femoris; 2. it adheres firmly to all the fore part of the os femoris, and joins the vasti muscles.

In. The patella, (behind the rectus.)

Use. To assist the three last muscles.

MUSCLES LYING ON THE BACK OF THE THIGH.

FLEXORS OF THE LEG.

Semitendinosus. Or. The posterior part of the tuberosity of the os ischium, in common with the long head of the biceps, to which it is connected by fleshy fibres to the extent of two or three inches.

In. The ridge, and inside of the tibia, a little below its tubercle.

Use. To bend the leg.

Semimembranosus. Or. By a strong tendon, from the upper and backmost part of the tuberosity of the os ischium.

In. The inner and back part of the head of the tibia.

Use. To bend the leg.

N. B. The two last form the inner ham-string.

Biceps Flexor Cruris. Or. (Two distinct heads,) the first, *longus*, in common with the semitendinosus, from the back and outer part of the tuberosity of the ischium; the second, *brevis*, from the linea aspera,—beginning a little below the insertion of the gluteus maximus, it continues to take its attachment, till within a hand's breadth of the condyle.

In. Head of the fibula.

Use. To bend the leg.

Popliteus. Or. The lower and back part of the external condyle of the os femoris, on the back of the joint.

In. The ridge on the inside of the tibia, a little below its head.

Use. To assist in bending the leg.

MUSCLES LYING ON THE BACK OF THE LEG.

Gastrocnemius Externus, or Gemellus. Or. 1. The upper and back part of the internal condyle of

the femur, and from that bone, a little above its condyle: 2. the second head arises tendinous from the upper and back part of the external condyle of the femur. After forming two beautiful bellies, which are united by a middle tendon, the muscle terminates in the tendo Achillis.

Soleus, or Gastrocnemius Internus. Or. (Two origins.) 1. The upper and back part of the head of the fibula, continuing to receive many of its fleshy fibres from the posterior part of that bone, for some space below its head. 2. From the back part of the tibia, lower down than the insertion of the popliteus. The flesh of this muscle, covered by the tendon of the gemellus, runs down, nearly to the lower end of the tibia,—by the tendo Achillis.

In. Into the backmost part of the os calcis, by the projection of which, these muscles gain a considerable lever power.

Use. To extend the foot.

Plantaris. Or. The upper and back part of the external condyle of the femur; it adheres to the ligament of the joint. It passes under the gastrocnemius, and, forming a long slender tendon, then runs down by the inside of the tendo Achillis.

In. The inside of the os calcis.

Use. From its delicacy, and insufficiency to assist the last muscles, it is supposed to have a use in pulling the capsular ligament of the knee from between the bones.

THE THREE DEEP MUSCLES, ARE THE

Tibialis Posticus. Or. 1. The fore and upper part of the tibia, just under the process which joins it to the fibula. 2. Then passing through a perforation in the upper part of the interosseous ligament, it continues its origin from the back part of the fibula next the tibia. 3. From near one half of the upper and back part of the tibia. 4. From the interosseous ligament,—the tendon passes behind the malleolus internus.

In. Spreads wide in the bottom of the foot, and is inserted into the os cuneiforme internum and medium; and also to the os calcis, os cuboides, and to the root of the metatarsal bone that sustains the middle toe.

Use. To extend the foot, and to turn the toes inwards.

Flexor Longus Digitorum Pedis Perforans. Or. The back part of the tibia, some way below its head, and near the entry of the medullary artery; from this, it is continued down the inner edge of the bone; also, by tendinous and fleshy fibres, from the outer edge of the tibia; between this double order of fibres the tibialis posticus muscle lies enclosed. Having passed under two annular ligaments, it then passes through a sinuosity at the inside of the os calcis, and, about the middle of the sole of the foot, divides into four tendons, which pass through the slits in the perforatus. Just before its division, it receives a considerable tendon from that of the flexor pollicis longus.

In. Into the extremity of the last joint of the four lesser toes.

Use. To bend the last joint of the toes.

This muscle is assisted by the accessorius. See dissection of the sole of the foot.

Flexor Longus Pollicis Pedis. Or. By an acute tendinous, and fleshy beginning from the posterior part of the fibula, some way below its head, being continued down the same bone, almost to its inferior extremity, by a double order of oblique fleshy fibres; its tendon passes under an annular ligament at the inner ankle.

In. Into the last joint of the great toe. It generally sends a small tendon to the os calcis.

Use. To bend the last joint of this toe.

MUSCLES ON THE FORE PART OF THE LEG.

Peroneus Longus. Or. From the head, and whole length of the fibula, as far down as to within a hand's breadth of the ankle. The tendon passes through a channel at the outer ankle, at the back of the lower head of the fibula; it then runs along a groove in the os cuboides, across the sole of the foot.

In. The root of the metatarsal bone that sustains the great toe, and the os cuneiforme internum.

Use. To move the foot outwards, and to press down the ball of the great toe.

Peroneus Brevis. Or. From the middle and lower part of the fibula; from the fibula, above the

middle; from the outer side of the anterior spine of this bone; and also from its round edge externally, the fibres running obliquely outwards, towards a tendon on its external side. It sends off a round tendon, which passes through the groove at the outer ankle, being there included under the same ligament with that of the preceding muscle; and a little farther, it runs through an appropriate sheath.

In. The root and external part of the metatarsal bone that sustains the little toe.

Use. To direct the foot outwards, and by pressing the ball of the great toe to the ground, to assist in carrying forwards the whole body.

Peroneus Tertius. Or. The middle of the fibula, down to near its inferior extremity; the tendon passes under the annular ligament.

In. The root of the metatarsal bone that sustains the little toe.

Use. To assist the other peronei muscles.

N. B. The belly of this muscle is united to the extensor digitorum.

Tibialis Anticus. Or. 1. The process of the tibia, to which the fibula is connected above. 2. The outside of the tibia. 3. The upper part of the interosseous ligament.

In. The inside of the os cuneiforme internum, and nearer extremity of the metarsal bone that sustains the great toe.

Use. To bring the foot to right angles with the leg.

Extensor Longus Digitorum Pedis. Or. 1. The outside of the head of the tibia. 2. The head of the fibula, where it joins with the tibia, and spine of the fibula. 3. From the interosseous ligament. 4. From the tendinous fascia which covers the outside of the leg.

In. The root of the first bone of each of the four small toes, and is expanded over the upper side of the toes, as far as the root of the last bone.

Use. To extend the four lesser toes.

Extensor Proprius Pollicis Pedis. Or. Beginning some way below the head and anterior part of the fibula, along which it runs to near its lower extremity, connected to it by a number of fleshy fibres, which descend obliquely towards a tendon.

In. The first and last joint of the great toe.

Use. To extend the great toe.

MUSCLES OF THE SOLE OF THE FOOT, AFTER DISSECTING THE PLANTAR APONEUROSIS.

SHORT MUSCLES OF THE GREAT TOE.

Abductor Pollicis Pedis. Or. The inside of the protuberance of the os calcis, where it forms the heel; and from the same bone, where it joins with the os naviculare.

In. The internal os sesamoideum, and root of the first joint of the great toe.

Use. To pull the great toe from the rest; but its power is lost by the use of shoes.

Flexor Brevis Pollicis Pedis. Or. 1. The under and fore part of the os calcis, where it joins with the os cuboides. 2. From the os cuneiform externum; it is inseparably united with the abductor and adductor pollicis.

In. The external sesamoid bone, and root of the first bone of the great toe.

Adductor Pollicis Pedis. Or. 1. The os calcis. 2. The os cuboides. 3. The os cuneiforme externum, from the root of the metatarsal bone of the second toe.

In. The external os sesamoideum, and root of the metatarsal bone of the great toe.

Use. To bring this toe nearer the rest; but by the pressure of the shoe, its power is much reduced.

MUSCLES OF THE LITTLE TOE.

Abductor Minimi Digiti Pedis. Or. Side of the protuberance of the os calcis, and from the root of the metatarsal bone of the little toe.

In. The root of the first bone of the little toe.

Use. To draw the little toe outwards from the rest; and also to bend the toe.

Flexor Brevis Minimi Digiti Pedis. Or. 1. The os cuboides, near the furrow for the tendon of the peroneus longus. 2. The outside of the metatarsal bone that sustains this toe.

In. The first bone of this toe.

Use. To bend the toe.

N. B. There is no proper Adductor Minimi Digiti, but we may class one of the Internal Interossei as an Adductor.

Flexor Brevis Digitorum Pedis, Perforatus. Or. The inferior aud back part of the protuberance of the os calcis (between the abductor of the great and little toes.) It sends off four tendons, which split, for the transmission of the tendons of the flexor longus.

In. The second phalanx of the four lesser toes. (The tendon of the little toe is often wanting.)

Use. To bend the second joint of the toes.

Flexor Digitorum Accessorius, or Massa Carnea Jacobi Sylvii. Or. The sinuosity at the inside of the os calcis, the fore part of the bone.

In. The tendon of the flexor longus, just at its division into four tendons.

Use. To assist the flexor longus, and to change the direction of its operation.

Lumbricales Pedis. Are four in number. Each has its origin thus: Or. The tendon of the flexor profundus, just before its division, and near the insertion of the massa carnea.

In. The inside of the first joint of the toe. It is lost in the tendinous expansion that is sent from the extensor tendon to cover the upper part of the toe.

Use. *Flexors.*

Transversalis Pedis. Or. The extremity of the metatarsal bone of the great toe; the internal os sesamoideum of the first joint (adheres to the adductor pollicis.)

In. The anterior extremity of the metatarsal bone of the little toe, and ligament of the next toe.

Use. To contract the foot, by bringing the great toe and the two outermost toes nearer each other, and to support the lateral arch of the foot.

Interossei Pedis Interni. The first, which is called *Adductor Medii Digiti Pedis*, arises from the inside of the root of the metatarsal bone of the middle toe, and is inserted into the inside of the root of the first joint of the middle toe; the two others, which are called *Adductor Tertii Digiti Pedis*, and *Adductor Minimi Digiti*, rise in the same manner.

MUSCLES SITUATED ON THE FORE PART OF THE FOOT.

Extensor Brevis Digitorum Pedis. Or. The fore and upper part of the os calcis; it divides into four portions, which send tendons that pass over the upper part of the foot, under the tendons of the former.

In. The tendinous expansion which covers the toes, except the little one.

Use. To assist in extending the toes, and somewhat change the direction of the force of the long extensor.

Interossei Pedis Externi Bicipites. There are four of these muscles, each of which arises, by two origins, from the metatarsal bones, between which they lie. The following names have been given to them:—*Abductor Indicis Pedis;—Adductor Indicis Pedis;—Abductor Medii Digiti Pedis;—Abductor Tertii Digiti Pedis.*

DISSECTION

OF THE

LIGAMENTS OF THE PELVIS.

AND OF

THE JOINTS OF THE LOWER EXTREMITY.

THE dissection of the ligaments of the upper part of the pelvis is generally a very unpleasant task for the young student, as it is seldom made until the parts are almost putrid.

The best method is, to remove the muscles while they are fresh, and to dissect the ligaments, before the muscles below the knee are examined; but if the muscles are much decayed, we should let the pelvis lie in water until the muscles become quite soft; they can then be easily separated from the ligaments.

The ligaments of the pelvis may be divided into several distinct sets:—1st. those which unite the vertebræ and the sacrum; 2d. the ligaments which run from the ilium to the vertebræ; 3d. those which are between the ilium and the sacrum. The ligaments which are upon

the upper part, are all of trifling importance, compared to those at the outlet of the pelvis.

The ligaments between the lumbar vertebræ and the sacrum, are so similar to those of the spine, that I shall omit the description of them here.

If we pull the spine from the ilium, before we remove the muscles which lie between the ilium and the last vertebræ, we shall find that the bones are held together by two ligaments—one of which passes from the crest of the ilium to the transverse process and body of the last lumbar vertebra, and is called *Ligamentum Anticum Superius.* This ligament is often of a triangular form, in consequence of a small portion of it passing to the fourth vertebra. The *Ligamentum Anticum Inferius* runs from the same point as the other, towards the union of the last vertebra with the sacrum.

The principal connexion between the sacrum and ilium, is at the sacro iliac symphysis, through the medium of a fibro cartilaginous structure, sometimes called the *Sacro Iliac Ligament;* but this cannot be seen until all the ligaments are cut through, and the bones torn asunder; however, some small ligaments will be seen, after the muscles between the sacrum and ilium are removed. These ligaments have been commonly called *Ligamenta Dorsalia Vaga;* but by WEITBRECHT, that indefatigable

dissector of ligaments, they have been divided into three distinct portions,—and if we have patience enough, we may do the same. We shall find one portion passing from the superior posterior spinous process of the ilium, to the transverse process of the fourth bone of the sacrum; this, Weitbrecht has called the *Ligamentum Longum Ossis Ilii.* By raising this ligament, the *Ligamentum Posticum Breve Ossis Ilii* will be found running from the same point to the third bone; and from the internal part of the same spine, the *Ligamentum Laterale* passes to the inferior margin of the first bone of the sacrum.

The most important ligaments are those situated at the outlet of the pelvis: to dissect these, it is only necessary to remove the muscles. We shall first expose the SACRO ISCHIATICUM MAJUS, or POSTERIUS, which arises from the posterior part of the crest of the ilium, and from the sides and posterior part of the sacrum and os coccygis, and is attached to the tuberosity of the ischium. The portion of this ligament which runs up towards the superior posterior spinous process of the ilium, is called the *Superior Appendix;* but a more important portion may be traced from the tuberosity of the ischium, towards the ramus of the pubes. It is called the *Productio Falciformis* of *Winslow.*

The LIGAMENTUM SACRO ISCHIATICUM MINUS,

or ANTERIUS, will be seen above the last, rising from the sides of the sacrum and os coccygis, and attached to the spine of the ischium.

The os coccygis is united, in early life, to the sacrum, by ligaments analogous to those of the bodies of the vertebræ; but no distinct ligaments can be shown in the adult, for the bands covering the anterior and posterior parts of the bone, are merely continuations from the *Ligamenta Vaga*, which connect the bones of the sacrum.

The ossa pubis are united together by an intermediate cartilage, which has a considerable similarity to the intervertebral substance. It has been called the *Commissura Ossium Pubis*, and is strengthened by a ligament, to which the name of *Annulus Ligamentosus* has been given.

The obturator foramen is all closed by the *Membrana Obturans*, except a small portion at the upper part, for the transmission of the obturator artery and nerve.

The POUPART'S LIGAMENT is sometimes described as one holding the bones of the pelvis together. It is curious that Weitbrecht calls this the "VEXATISSIMUM LIGAMENTUM." It may be, truly, so called still. Poupart first described it, from the dissection of a goat; and since his time, up to this day, there has always been a dispute, whether it is a distinct ligament, or only part of the tendon of the external ob-

lique muscle. Weitbrecht considers it as a separate ligament; and this is probably the most correct view. But we shall not say more upon it, as it has been already sufficiently dwelt upon, in the description of the anatomy of hernia.

TABLE OF THE LIGAMENTS OF THE PELVIS.

(ON THE UPPER PART.)

1. *Ligamentum Anticum Superius.*
2. ——————— *Inferius.*
3. ——————— *Sacro Iliacum.*
4. *Ligamenta Dorsalia Vaga,*—divided into—
   a. *Ligamentum Longum Ossis Ilii.*
   b. ——————*Breve.*
   c. ——————*Laterale.*

(ON THE LOWER PART.)

1. *Ligamentum Sacro Ischiaticum Majus,*—with its two appendages.
   Appendix Superior, and *Productio Falciformis* of Winslow.
2. *Ligamentum Sacro Ischiaticum Minus.*
3. *Ligamenta Vaga.*
   (On the inside of the sacrum.)
4. *Commissura Ossium Pubis.*
5. *Annulus Ligamentosus.*
6. *Membrana Obturans.*
7. *Ligamentum Poupartii.*

LIGAMENTS OF THE HIP JOINT.

THERE is little dissection necessary, to show the ligaments of the hip joint, for if the muscles only,* be raised, the ligament which surrounds the joint will be seen. This is very strong, and is called the LIGAMENTUM CAPSULARE. It is attached to the margin of the acetabulum, and descends to the line between the trochanters, in front, and to the same extent on the back part, so as to embrace the whole of the head and neck of the bone. The ligament is strengthened, on the anterior part, by a band of fibres which run from the anterior inferior spinous process of the ilium, to form the *Ligamentum Accessorium Anticum.* A similar band may be seen on the posterior part, forming the *Ligamentum Accessorium Posticum.* By cutting through the capsular ligament, which is in some parts very strong, we shall expose the edge of the acetabulum; but the bones will not yet fall separate, because the form of the acetabulum is such, that it surrounds part of the head, so as to

* A large bursa will be seen, in cutting away the tendon of the gluteus maximus; and generally another, under the tendons of the iliacus internus, and psoas magnus.

hold it in its place, independent of the ligaments; but, by pulling a little, the femur will be displaced: and now the ligament, which is by some called, LIGAMENTUM TERES, by others LIGAMENTUM TRIANGULARE, will be seen rising from the bottom of the acetabulum, and passing to the head of the femur. With a very slight jerk, this ligament may be torn: and then we shall see a fatty substance at the bottom of the acetabulum, which has been called the *Apparatus Mucosus*. There are some little bands connected with it, which are called *Ligamentulæ Adiposæ*.

The femur being removed, we should now compare the size of the acetabulum, with that in the skeleton. We shall see that it is much deepened by the addition of a ring of ligamentous cartilage, which surrounds its edge. On the inner part, where the bone is deficient, a distinct portion of ligament will be seen, running across the lower part of the acetabulum; this has been called the *Ligamentum Transversale*, while the portion which encircles the edge of the acetabulum, is called the *Ligamentum Labri Cartilagineum*. When we examine the neck of the femur, we may see some small slips of ligament passing from the internal edge of the capsular ligament, towards the head of the bone: these slips have been called *Retinacula*,—but they are of no importance.

TABLE OF THE LIGAMENTS OF THE HIP JOINT.

1. *Ligamentum Capsulare.*
2. ——————*Accessorium Anticum.*
3. ——————————— *Posticum.*
4. ——————*Teres.*
5. ——————*Labri Cartilagineum.*
6. ——————*Transversale.*

LIGAMENTS OF THE KNEE JOINT.

The ligaments connecting the femur, tibia, and patella, are very numerous; for though the motions of the knee joint are simple, being merely flexion and extension, still many ligaments are necessary, since the form of the bones is not at all adapted to restrain the joint from being either too much bent, or too much extended; but many of the ligaments enumerated, are so trifling, that they cannot be considered, as in any way adding to the strength of the joint.

The first ligament to be dissected in this joint, as in almost all others, is the capsular. It is in itself, very thin; but it is strengthened by tendons and ligaments, particularly on the fore and back part. On the inner side of the knee, there is only one distinct ligament which, from

its situation, is called the LIGAMENTUM LATERALE INTERNUM; but on the outside, two lateral ligaments are described, viz. LONGUM and BREVE. There is no difficulty in finding the *Longum*, but the *Breve* is very indistinct, being little more than some scattered fibres, which run from the outer condyle to the tibia. When we examine the posterior part of the joint, we shall find a complicated set of ligaments running between the tibia and femur. They are sometimes described separately; but they are more generally classed together, under the name of LIGAMENTUM POPLITALE, or LIGAMENTUM POSTICUM WINSLOWII. The tendon between the patella and the tubercle of the tibia, is sometimes described as the LIGAMENTUM PATELLÆ.*

These ligaments, which are all external to the capsular ligament, may be each considered as important. We should now examine those which *appear* to be internal to the capsular ligament. They are very numerous; but of the whole, there are only two, which can be considered of much importance, viz. the two crucial ligaments.

To show the deep ligaments, we should cut through the capsular ligament, beginning at the

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* There is a small bursa between this ligament and the tubercle of the Patella.

upper part.* As the cut is carried past the patella, a duplicature, or tucking in of the liga ment, will be seen on each side: the one on the outside, is called the *Ligamentum Alare Externum;* the other, the *Ligamentum Alare Internum.* When we cut through these portions of the capsular ligament, and pull down the patella, we shall see a ligamentous band running towards the fatty matter which lies between the condyles: this is the *Ligamentum Mucosum.* When this is cut through or broken, the ANTERIOR CRUCIAL LIGAMENT will be seen; but to make it more distinct, we should cut through the lateral ligaments, and the ligamentum poplitale,—we shall then find, that although all the external ligaments are cut, that the femur and the tibia still keep their relative position to each other. If we bend the femur to the utmost on the tibia, the ANTERIOR crucial ligament will be distinctly seen; if we extend it fully, then the POSTERIOR will be stretched; —and if we twist the femur on the tibia, we shall comprehend why these ligaments are called CRUCIAL. On cutting through these two ligaments, the femur will be separated from the tibia. There are still some ligaments on the

* In cutting through the insertion of the muscles, to the patella, we shall open a large bursa, which is often connected with the *capsular ligament.*

head of the tibia, for connecting part of the apparatus of the joint.

The SEMILUNAR CARTILAGES, which, by their peculiar form, deepen the concavity for the lodgement of the condyles, will be seen lying on the upper part of the tibia. If we put the handle of the knife under them, and push it towards the edge of the tibia, the ligament called *Coronarium*, and which attaches the cartilages to the rim of the tibia, will be seen,—(there is only one described for both cartilages.) If we look on the anterior part, between the cartilages, we shall see the ligament called *Transversale;* and lastly, we may observe, that the extremities of the two cartilages are attached to the tibia by four separate ligaments, each of which is called *Oblique.*

The Ligaments generally enumerated, are:—

(EXTERNALLY.)

1. *Ligamentum Capsulare.*
2. ———— *Patellæ.*
3. ———— *Laterale Externum Longum.*
4. ———————————— *Breve.*
5. ———————— *Internum.*
6. ———— *Poplitale, or Winslowii.*

(INTERNALLY.)

1. *Ligamentum Alare Externum.*
2. ——————— *Internum.*
3. ——————— *Mucosum.*
4. ——————— *Cruciale Anticum.*
5. ——————— *Posticum.*

(When the bones are separated.)

6. ——————— *Coronarium.*
7. ——————— *Transversale.*
8. 9. 10. 11. *The four Oblique.*

LIGAMENTS BETWEEN THE TIBIA AND FIBULA.

When we remove the muscles of the leg, we shall find, that the tibia and fibula are bound very strongly together by the INTEROSSEOUS LIGAMENT; and at the upper and lower heads, we shall also find regular capsules, and strengthening ligaments. At the upper head, there are two accessory ligaments, one of which is on the fore part, the other behind; they are called *Ligamentum Capitulæ Fibulæ Anticum*, and *Ligamentum Capitulæ Fibulæ Posticum;* at the lower head, they also receive similar names: but we may remark, that in consequence of some cellular membrane and vessels, passing through the middle of the inferior ligaments,

some authors have been induced to describe two before, and two behind,—thus, there would be a *Ligamentum Anticum* SUPERIUS, and *Ligamentum Anticum* INFERIUS,—and on the back part, *Ligamentum Posticum* SUPERIUS, and *Ligamentum Posticum* INFERIUS.

LIGAMENTS OF THE ANKLE JOINT.

As the ankle is nearly a simple hinge joint, the principal ligaments must be lateral; but, as in this joint, the form of the bones is not very well adapted for checking its motions of flexion and extension, there is a necessity for more ligaments, than those merely for the purpose of binding the lateral parts of the bones together.

The *Ligamentum Capsulare* is very thin in this joint, but is strengthened by the ligamentous bands which keep the tendons of the muscles in their proper positions; both these and the capsular ligament must be removed, before we can see the proper ligaments. We shall then find, on the inside of the joint, a very strong ligament running from the point of the tibia to the astragalus and naviculare; this ligament, from its shape, is called *Deltoides*, or *Triangulare*. From the tip of the fibula, three portions of ligament will be seen to pass off; one runs perpendicularly from the middle part, to the os calcis, whence it has received the name of *Per-*

pendiculare, or *Medium;* another runs to the anterior part of the astragalus, and is called *Ligamentum inter Fibulam et Astragalum Anticum;* while the third passes from the back of the fibula to the posterior part of the astragalus, and this is also named, according to its situation and course, *Ligamentum inter Fibulam et Astragalum Posticum.* Both of these ligaments may occasionally be divided into two portions; but they are not named differently on that account.

LIGAMENTS BETWEEN THE TIBIA AND FIBULA.

(ON THE UPPER PART.)

1. *Ligamentum Capsulare.*
2. ——————— *Capitulæ Fibulæ Anticum.*
3. ——————————————— *Posticum.*
4. ——————— *Interosseum.*

(AT THE LOWER PART.)

1. *Ligamentum Anticum Superius.*
2. ——————————— *Inferius.*
3. ——————— *Posticum Superius.*
4. ——————————— *Inferius.*

LIGAMENTS BETWEEN THE TIBIA, FIBULA AND BONES OF THE TARSUS.

1. *Ligamentum Capsulare.*
2. ——————— *Deltoides,* or *Triangulare.*
3. ——————— *Perpendiculare.*
4. ——————— *Inter Fibulam et Astragalum Anticum.*
5. ——————— *Inter Fibulam et Astragalum Posticum.*

LIGAMENTS OF THE FOOT.

The ligaments which connect the bones of the foot together, may be exposed by removing the tendons of the muscles. They are very numerous, but not of much importance. The names which are given to them, are generally descriptive of the bones between which they run, and the direction their fibres take.

Upon the upper part of the foot, there are no ligaments which we would particularly notice. They are called *Ligamenta Dorsalia,* with the addition of the names of the bones between which they run, and the terms *Recta, Obliqua,* &c. In the middle of the sole of the foot, the bands are so numerous, that we never think of particularizing them; but on the inner and outer part, the ligaments are more distinct. On

the inside a strong band of fibres may be traced from the os calcis to the naviculare: in the upper and middle part of this, a cartilage, somewhat resembling a small patella, will be found, under which is the projecting point of the astragalus: this portion of the ligament is called the *Trochlea Cartilaginea*, the other part being called the *Ligamentum Plantare* MAJUS, the MINUS being a more internal portion of the same band. On the outside of the foot, we shall find a strong ligament passing from the os calcis to the os cuboides: this is also, by Weitbrecht, divided into two ligaments, viz. *Ligamentum inter Os Calcis et Cuboides* LONGUM, and *Lig:* BREVE.

It is quite needless to enumerate the small ligaments which bind the metatarsal bones together.

The phalanges of the toes are connected together by strong CAPSULAR and LATERAL ligaments, as the joints permit only of FLEXION and EXTENSION.

The student will naturally direct his attention to the question of Dislocation and Fracture of the several bones, while the parts are before him. I cannot enter upon the subject, but must refer him to the Essays by Sir A. Cooper, and the System of Operative Surgery by Mr. Charles Bell, where he will find plans illustrative of the several dislocations and fractures.

DISSECTION

OF THE

ARTERIES OF THE LOWER EXTREMITY.

AS the object of the student, in his first dissection of the arteries, should be, to learn the course of the trunks, and their principal branches,—the limb ought to be injected.

If the subject be young, the injection of the arteries of both legs may be made at once from the aorta; but if the body be old, it will be necessary to inject each limb separately, because, in such a subject, we shall seldom succeed in pushing the injection from the aorta to the extremities of the arteries. If both limbs be injected from their corresponding iliac arteries, the middle sacral artery will be lost, we should therefore put the pipe for the injection of one of the legs, into the aorta, and tie the iliac of the other side immediately below the point of bifurcation—a tube may afterwards be fixed into this iliac for the injection of the corresponding leg. Injection the Limb.

As the dissection of the arteries of the leg is

very tedious, we should not spend much time in examining the abdominal muscles. We should merely dissect the inguinal canal, and then cut through the muscles below the umbilicus. The viscera should also be removed.

The arteries of the pelvis should be dissected before those of the thigh; because the parts quickly become putrid, and when in this state, if there be any *lead* in the composition forming the injection, the vessels will appear of a black colour.

Few directions are necessary to be given for the dissection of arteries that have been injected. They are to be traced from trunk to branch: and to do this, it is only requisite to raise the cellular membrane, &c. with the forceps and scissars.

Before the student commences the dissection, he ought to consider what are the most important parts of that division of the body, which he is about to examine. This will assist him in learning the distribution of the arteries, for he will find that the number of branches will nearly correspond with the number of the important parts. He will find, for example, that the arteries which go off from the lower part of the aorta may be divided into three classes:

1. The arteries which pass down to supply the thigh and leg.

2. Those which supply the muscles on the pelvis.

3. The branches which are distributed to the viscera of the pelvis.

Those which pass to the thigh and leg will be afterwards subdivided. I shall now proceed to describe the manner in which those that supply the pelvis are to be traced.

After the cellular membrane and peritoneum are removed from the AORTA, it will be seen to divide into two great branches, viz. the COMMON ILIACS. From the point of bifurcation there is likewise a small vessel passing off, which is called the *Sacra Media.* Common Iliacs. Sacra Media.

The COMMON ILIAC of either side may be easily exposed, as there are seldom any branches given off by it: if there be one, it will probably be that, which passes between the vertebræ and the ilium, and is called the *ilio lumbalis.*—But this artery generally rises from the internal iliac.

If we trace the common iliac for about an inch and a half, we shall find it dividing into two branches,—the EXTERNAL and INTERNAL ILIACS. The *external iliac* is the vessel which supplies the branches of the first class enumerated; but at present we should not trace it farther than to the ligament of Poupart.

We may now return to the *internal iliac,* from which the two next classes of branches are given off. These are particularly difficult to Internal Iliac

trace; and unless we divide them into two distinct classes, it will be difficult to understand them.

The trunk, after leaving the common iliac, is almost concealed by the great veins; these, however, may be cut away, in the present dissection, as every thing should be removed that impedes our view of the arteries. The first branch that is seen, will probably be that which has been already described as coming occasionally from the common iliac, viz. the *ilio lumbalis*. If the subject be very young, we shall find that the trunk of the internal iliac is continued up on the side of the bladder, and then becomes a ligamentous cord, which may be traced towards the umbilicus; but in the adult, or old subject, we shall find the artery stop rather abruptly before it reaches the bladder. It is however quite different in the fœtus, for there we shall find that the internal iliac is continued to the umbilicus as the *hypogastric* or *umbilical* artery; it is this vessel which gradually degenerates into ligament, as a person advances in years.

Ilio Lumbalis

Hypogastric, or umbilical.

In the adult, small branches, called *vesicales superiores*, are sent to the fundus of the bladder, from the termination of the artery: they will be seen more distinctly if the bladder be distended. If we hold aside the bladder, we shall probably see certain other branches pas-

Vesicales.

sing towards its middle, and called *vesicales mediæ*. These come off generally from the artery, just as it is turning up from the trunk of the internal iliac; but they also frequently rise from the pudic. If we now pull up the bladder, and separate it a little from the rectum, we shall see branches passing towards the prostate and the vesiculæ seminales. The origin of these, however, cannot be seen at present. A section of the pelvis, such as has been described at page 110 must be made, before we can trace these branches, or the continued trunk of the iliac.

After having made the section, and partially distended the bladder with air, the dissection of the internal iliac may be resumed. The branches of this artery are so irregular in their manner of coming off, that we should trace them for some distance before we attempt to name them. If we should find one going towards the obturator muscle, it will be the OBTURATOR;—if we see another large artery passing down towards the outlet of the pelvis, and dividing into two branches, it will probably be the common trunk of the ISCHIATIC and PUDIC. The large vessel, which runs in the angle between the sacrum and the ilium, and appears like the continued trunk of the iliac, will be the GLUTEAL. But the vessels do not always come off in this order. The most irregular is the ob-

turator; for it frequently rises from the external iliac, in union with the epigastric.

Obturator. In dissecting these branches, it will be most convenient to begin with the OBTURATOR. This artery may be very quickly traced; the PUDIC may be next followed.

There is some difficulty in dissecting the first set of arteries which the pudic gives off, as they supply the viscera of the pelvis, and are united with the branches of the inferior mesenteric. In the male, we shall often find branches passing to the middle of the bladder *(vesicales mediæ,)* to the rectum *(hæmorrhoidales,)* and to the lower part of the bladder *(vesicales imæ.)* In the female we shall find, besides these, a very large artery passing to the uterus *(the uterina.)* We may now trace the trunk of the pudic to the space between the sacro ischiatic ligaments. While here, it gives off some muscular branches, but it almost immediately passes again into the pelvis, and is then distributed to the parts in the perineum, in the manner described at page 122 and 144.

Pudic within the Pelvis.

As the ISCHIATIC comes as often from the gluteal as with the pudic, it is difficult to describe the irregular branches which pass from it while it is within the pelvis. They are generally of little importance. The artery will be found to pass out of the pelvis, very little dimi-

Ischiatic.

nished in size, to supply the muscles of the hip, in the manner described in the *table.*

In tracing the GLUTEAL, while yet within the pelvis, we shall find a set of arteries passing off from it to the lateral parts of the sacrum, viz. *sacræ laterales.* These vessels sometimes arise in one common trunk, but more generally in three or four distinct branches, each of which inosculates with the sacra media, in its course along the middle of the sacrum.

Gluteal within the Pelvis

Before we can trace the external branches of the gluteal and ischiatic, we must make a superficial dissection of the muscles of the hip. If our object were to keep the arteries after they are dissected, we ought to preserve all the branches which go to these muscles; but as at present we wish only to acquire a general knowledge of the vessels, we should not attempt to dissect all the small muscular twigs.

Gluteal and Ischiatic without.

We should, therefore, make such a dissection of the muscles of the hip as is described in page 170: in doing this, some small arteries passing to the skin and ramifying upon the fascia of the gluteus medius, will be seen. In separating the gluteus maximus from the gluteus medius, we shall be obliged to cut a large branch,—the *superficialis,* which passes into the substance of the gluteus maximus. If we then raise the gluteus medius, we shall discover an artery passing under it, and dividing into two branches, called

Ascendens and *Transversalis.* At this stage of the dissection, we shall also see some of the branches of the ischiatic artery forming inosculations with those of the gluteal, and with the branches from the pudic; but the principal branches of the ischiatic will be afterwards seen passing over the small muscles, along with the great nerve, to form inosculations with the branches of the external iliac.

External Iliac.

We may now return to the dissection of the EXTERNAL ILIAC, which has been already traced as far as the edge of the Poupart ligament. If we hold up the flap of the abdominal muscles, and strip the peritoneum from it, we shall see the first branch, the EPIGASTRIC, passing from the trunk towards the rectus muscle; the next, CIRCUMFLEXA ILII, rises about half an inch below the epigastric, and on the iliac edge of the artery; the OBTURATOR will be also found coming from the external iliac, in union with the epigastric, in the proportion of one in four, to the number of times that it rises from the internal iliac. The main artery, after giving off these branches, passes under the ligament of Poupart; and here, instead of the name of "external iliac," it receives that of INGUINAL, or COMMON FEMORAL.

Common Femoral.

We shall find the arrangement of the branches which are given off from this artery before it becomes popliteal, to be very simple; for there

is only one series of branches to supply the great muscles, and another to encircle the joints and to form inosculations with the other arteries. The branches which supply the muscles, are either called *Perforantes* or *Muscular;* while those which surround the joints are called *Circumflex, Articular, Recurrent,* or *Anastomotic.* But, in making this arrangement, we must, at the same time, recollect, that the principal artery in the thigh, is the vessel which is passing to supply the parts below the knee.

The dissection is not to be begun in the same manner as that for the muscles :—the skin only, is to be carefully removed from the groin; some small arteries will then be seen passing into the glands of the groin, to the scrotum, to the skin of the penis, and to the superficial parts of the abdominal muscles. Those going to the glands are called *Inguinales;* those to the skin of the penis and scrotum, *Pudendæ Externæ;* and those which pass back to the abdominal muscles, *Epigastrica Superficialis* and *Reflexa Ilii.* These small vessels may now be held aside, and the trunk exposed, by removing the cellular membrane with the forceps and scissars. The artery will be found lying upon the psoas muscle, with the great vein on its pubic side. The anterior crural nerve lies upon the iliac side of the artery, but not close upon it.

Small Branches.

There is here much difficult dissection, and

the only rule that can be given for conducting it, is to trace the trunk with the forceps and scissars, but very cautiously, as large branches will be found passing off from each side, and principally from its iliac side: these branches are intimately connected with those of the great vein and the anterior crural nerve, which, however, in this first dissection, may be removed.

The order in which the great branches arise, is so very irregular, that it is absolutely necessary here, as in many other parts of the body, to name the branches according to the parts to which they are going,—not by the order of their coming off from the main trunk.

At about two inches from the edge of Poupart's ligament, we shall probably find the great artery dividing into two large branches. The one which passes deep, and rather to the outside, is the vessel which generally gives off the principal branches to the thigh; it is called the PROPER FEMORAL, or the PROFUNDA. The other is the continued trunk of the FEMORAL, which, after giving off a very few branches, passes into the ham, and there divides into the arteries, for the supply of the parts below the knee.

Profunda and Superficial Femoral.

The dissection of the superficial artery should be made first. It may be traced as far down as the part, where it perforates the tendon of the adductor magnus; in this course it gives only some small branches to the muscles which are

close to it; but while it is perforating the tendon of the triceps, it gives off an artery, which, though not large, is very important in a surgical view,—the ANASTOMOTICUS MAGNUS.

We may now return to the dissection of the branches of the PROFUNDA. And here I can only repeat, that to expose these branches, we must remove the parts that are closely connected to them, with the forceps and scissars.

The two first arteries which we should look for, are the CIRCUMFLEXA EXTERNA and CIRCUMFLEXA INTERNA. The first will be generally found going off from the upper and outer part of the profunda, or from the main trunk, immediately before it divides: it then passes under the rectus muscle, towards the outside of the hip: while passing under the rectus, it generally gives off a branch which runs along the vastus externus to the outside of the knee,—this is the *Ramus Externus Descendens Longus.* The internal circumflex passes off opposite to this, and immediately dips under the pectinalis, to supply the heads of the deep muscles at the joint, and to inosculate with the branches of the obturator artery. This is more properly the artery of the joint, than the external circumflex. The branches of the profunda, which are called PERFORANTES, may now be traced towards the insertions of the triceps, through which they pass to the muscles on the

Branches of Profunda.

back of the thigh; they are, in number, three, four, or five. But before we can see them distinctly, we must make a careful dissection of the posterior muscles; many branches will then be found going to inosculate with the gluteal and ischiatic arteries, and also with the two circumflex.

The dissection of the two ham-string muscles should now be continued down to the knee. Very few arteries will be seen in the superficial dissection; for the branches are buried in the fat which lies between the muscles. If in looking for the trunk, we dissect close upon the edge of the muscles, we shall probably cut some of the lateral branches; this may be avoided, by commencing the dissection in the middle of the ham. After raising a little cellular membrane, we shall expose the great nerve; and then, by drawing it aside, or cutting it through, we shall, at about half an inch deeper, find the vein,—and immediately under it, and close upon the bone, the continued trunk of the femoral artery, which is now called POPLITEAL. If we remove the fat, &c. from the artery, as far up as the point where it perforates the triceps, and as far down as we can, without cutting through the gastrocnemius muscle, we shall discover a regular series of branches:—from the upper part of the artery, there are several sent back to inosculate with the perforantes, the principal one of

Popliteal and its Branches.

which is *Ramus Profundus Popliteæ;*—below the joint, two or three arteries, which are called *Surales,* pass to supply the gastrocnemius and soleus. The intermediate branches are called *Articular,* as they encircle the knee joint: two of these pass towards the inner condyle, and are thence named *Articularis Superior Interna,* and *Articularis Inferior Interna.* The two which arise on the outer edge of the artery, are called *Articularis Superior Externa,* and *Articularis Inferior Externa.* There is still a fifth articular artery, which passes through the ligamentum posticum Winslowii, and supplies the inner part of the joint, and is called, from its being a single branch, *Articularis Azyga,* or *Media.*

We must now detach the origin of the gastrocnemius from the condyles, and the origin of the soleus from the tibia, in order to show the POPLITEAL dividing into the ANTERIOR and POSTERIOR TIBIAL ARTERIES. Arteries of the Leg.

We shall see only a small part of the ANTERIOR TIBIAL, for it almost immediately passes through the interosseous ligament; but by raising the fascia which covers the deep layer of muscles, we shall see the POSTERIOR TIBIAL, through almost its whole course. This artery generally gives off the PERONEAL, or FIBULAR ARTERY, about half an inch, or an inch, below Posterior Tibial.

the edge of the popliteus muscle; the fibular is very irregular; indeed it is described, by many, as rising more frequently from the anterior, than the posterior tibial. While the posterior tibial is passing the insertion of the popliteus muscle, it gives off a branch, which, passing into the bone, is called the *Nutritia Tibiæ.* The artery may then be traced, under the fascia, to below the inner ankle, without our seeing any branch of importance; here it sends some branches to the heel, which are called *Calcaneæ*, and then divides into the PLANTARIS EXTERNA and PLANTARIS INTERNA,—which are to be carefully traced between the muscles in the sole of the foot: in doing this, we shall be obliged to cut many of the muscles. The plantar arteries will be seen to form inosculations with those branches of the anterior tibial, which perforate the spaces between the metatarsal bones.

Plantar Arteries.

We should now return to the dissection of the branches of the FIBULAR ARTERY. This vessel is not only very irregular in its origin, but also in its size; for it is always in proportion to the magnitude of the anterior and posterior tibial arteries. In its course towards the ankle, it gives off small branches to the muscles rising from the fibula, and one to the bone itself; when about four inches from the ankle, it will

Fibular Artery.

be found to divide into two branches, called *Anterior Fibular* and *Posterior Fibular*. The anterior inosculates with the branches from the *Tarseal* of the anterior tibial, while the posterior inosculates with the *Calcaneæ* of the posterior tibial.

We may now make the dissection of the ANTERIOR TIBIAL. To find it, we should expose the muscles on the fore part. In doing this, we shall see the RECURRENS passing back upon the knee; then, by dissecting between the tibialis anticus and extensor communis digitorum, we shall discover the main artery, lying close upon the interosseous ligament. It may then be easily traced to the great toe, giving off branches in its course, the names of which are descriptive of the parts which they supply. Anterior Tibial.

The manner of dissecting the arteries, which has just been described, should be nearly followed in making a preparation; but the dissection must be prosecuted in a very different manner, in studying the surgical anatomy: that, however, I shall not describe, until the dissection of the nerves is finished.

VEINS OF THE LOWER EXTREMITY.

THE DEEP VEINS of the lower extremity are so easily understood, that it is not necessary to

make a separate dissection, nor even to inject them, to enable us to trace them. The SUPERFICIAL VEINS, which are most important, will be described with the cutaneous nerves. With regard to the deep veins, or *venæ comites*, it is only necessary to say, that they accompany the arteries, and are named according to them.—We shall find many of the arteries have a vena comes on each side.

TABLE OF THE ARTERIES OF THE PELVIS, OF THE THIGH, AND OF THE LEG AND FOOT.

ARTERIES OF THE PELVIS,

ILIACA COMMUNIS, into the ILIACA INTERNA and ILIACA EXTERNA.

ILIACA INTERNA gives off—

I. Ilio Lumbalis; to supply the Iliacus Internus and Psoas Magnus.

II. Sacræ Laterales, three or four in number, to the lateral part of the sacrum.

III. Umbilicalis, or Hypogastrica; gives off branches to the upper part of the bladder, viz. Vesicales Superiores.

IV. Obturator:—1. *within the pelvis*, muscular branches to the psoas and obturator internus; 2. a branch to the back of the pubes; 3. *in the thigh*, branches to the obturator externus, pectinalis, and triceps.

V. Glutæa; passes out of the pelvis over the edge of the pyriformis, and betwixt two of the roots of the great ischiatic nerve. *Within the pelvis*, 1. muscular branches—(sometimes the sacræ laterales;) *after it passes out*, 2. Ramus Superficialis, viz. under the gluteus maximus; 3. Ramus Ascendens,

viz. under the gluteus medius; 4. Ramus Transversus, viz. under the gluteus *medius*, and forward.

VI. Ischiatica;—*within the pelvis, and in its passage out*, branches to the bladder, rectum, and neighbouring muscles; *on the back of the pelvis*, to the glutæi, to the great nerve, to the lesser muscles of the thigh bone, in many profuse branches.

VII. Pudica Interna;—*before it passes out of the pelvis*, it gives off (in the female, the uterina;) 1. Vesicales Mediæ; 2. Hæmorrhoidales Mediæ; 3. Vesicales Imæ; *while between the ligaments*, 4. to the gemini, obturator, and pyriformis muscles; *on entering the pelvis again*, 5. Hæmorrhoidales Externæ; *in the perineum*, 6. Superficialis Perinei, 7. Transversalis Perinei; *then we find the three important arteries continued from the trunk* (arteria communis penis,) 1. artery of the bulb, 2. arteria profunda propria, 3. arteria superficialis, or dorsalis.

ARTERIES OF THE THIGH.

ILIACA EXTERNA.

(within the abdomen.)

I. Irregular branches to the muscles.

II. Arteria Epigastrica; 1. to the cord and

cremaster muscle; 2. towards the back of the os pubis; 3. principal branch ascending upon the rectus; 4. sometimes the obturator.

III. Arteria Circumflexa Ilii; to the iliacus internus, to the abdominal muscles, anastomosing with the ilio lumbalis; it often gives a branch to the spermatic cord.

FEMORAL ARTERY.

I. Rami Inguinales; 1. to the glands, fat, and integuments; 2. Ramus Major, sometimes called Reflexa Ilii; 3. Epigastrica Superficialis,—but these are very irregular.

II. Arteriæ Pudendæ, viz. 1. pudenda superior; 2. pudenda media, 3. pudenda inferior.

III. Circumflexa Externa;—(sometimes from the femoral, but most commonly from the profunda;) 1. muscular branches; 2. transverse branch to the muscles; 3. the proper branch to the joint communicating with the circumflexa interna; 4. Ramus Externus Descendens, passing between the vastus externus and rectus, and inosculating with the articular arteries of the knee.

IV. Circumflexa Interna;—(often from the profunda;) 1. branches to the triceps; 2. branches to inosculate with the obturator; 3. branches to the capsule of the joint.

V. Profunda: 1. irregular branches; 2. great descending internal branch—1. ramus perforans primus, 2. ramus perforans secundus, 3. ramus perforans tertius, and, sometimes, 4. ramus perforans quartus.

SUPERFICIAL FEMORAL ARTERY

I. Irregular branches to the muscles which it passes.

II. Ramus Anastomoticus Magnus. This is the first considerable branch which the femoral artery gives off: it rises from the trunk, while it is concealed in the tendon of the triceps.

POPLITEAL ARTERY.

(Being the part of the trunk which lies in the cavity behind the knee joint.)

I. Ramus Profundus Popliteæ; to the hamstring muscles, &c.

II. Arteria Articularis Superior Externa; 1. Ramus Profundus; 2. Superficialis.

III. Arteria Articularis Superior Interna; 1. Ramus Profundus; 2. Superficialis.

IV. Arteria Articularis Media. A branch enters under the ligament of Winslow.

V. Arteria Articularis Inferior Externa; 1. to the muscles; 2. deep, and passing above the head of the fibula.

VI. Arteria Articularis Inferior Interna; chiefly superficial, and beautifully encircling the head of the tibia.

VII. Surales, viz. the Branches to the Gastrocnemii Muscles.

GREAT DIVISION of the POPLITEAL ARTERY into the ANTERIOR TIBIAL ANARTERY and the POSTERIOR TIBIAL ARTERY.

ANTERIOR TIBIAL ARTERY.

Before passing betwixt the bones—1. A small ascending branch, may be called Articularis Tibialis.

As it escapes from the interosseous ligament—2. Recurrens Tibialis.

Upon the ligament—3. Successive muscular branches. 4. Malleolaris Interna. 5. Malleolaris Externa.

Before the ankle—6. Tarsea. 7.———interossæ.

On the foot—8. Metatarsea. Dorsales Digitorum. 9. Dorsalis Halucis. 10. Ramus Profundus Anastomoticus.

POSTERIOR TIBIAL ARTERY.

I. Muscular branches, and the Nutritia Tibiæ.

II. Fibular Artery; 1. numerous muscular branches; 2. posterior fibular artery; 3. anterior fibular artery.

(near the ankle.)

III. Calcaneæ.

IV. Plantaris Externa; 1. Transversus Anastomoticus; 2. Profundæ; 3. Digitales, quartæ; 4. Interosseæ Profundæ; 5. Anastomotica, viz. with the anterior tibial artery.

V. Plantaris Interna; 1. branches to the flexor tendons, and to the abductor and flexor pollicis; 2. Profundæ, viz. interior, middle, exterior; 3. Ramus Externus.

DISSECTION

OF THE

NERVES OF THE THIGH AND LEG.

THE arrangement of the nervous system of the lower extremity is very simple, as only a few branches pass to the skin, and three great nerves supply the muscles.

Were all these nerves below the fascia, the dissection of them would be very easy; but as the cutaneous nerves are superficial to the fascia, it is difficult to show them and the deep nerves at the same time. We should dissect the cutaneous nerves first; after having examined them, we may cut them through, or hold them aside, that we may make the dissection of the deep branches.

If we tear the peritoneum from the lower part of the muscles of the abdomen, and from the loins, we shall see several small nerves passing across the iliac muscles towards the thigh; these will be afterwards found to be cutaneous nerves.* One may be seen running from the Cutaneous Nerves.

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* It is difficult to say what names ought to be given to the cutaneous nerves, as few authors use the same terms;

first lumbar, across the psoas magnus and the quadratus lumborum, to the superior part of the spine of the ilium; it then pierces the transversalis, and while lying between it and the internal oblique, divides into two branches—one of which supplies the abdominal muscles and integuments; the other may be traced between the two muscles, and along Poupart's ligament, as far as the external abdominal ring; it then perforates the aponeurosis of the external oblique, and is lost upon the skin and scrotum in the male, and upon the labium in the female.

Another nerve may also be traced from the first lumbar, across the psoas and iliacus internus; it pierces the transversalis and internal oblique, and then gives off several branches; the principal one passes along the crural arch to the upper part of the scrotum. We may now look to the second lumbar nerve; from it, we may generally trace a nerve which pierces the psoas, and crosses the iliacus internus, to pass out of the pelvis, between the two anterior spinous processes of the ilium; the same branch will be found under the fascia lata; here it appears a little enlarged, and immediately divides

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the most common plan is to give them such names as are descriptive of their situation—thus we have the terms *External Cutaneous, Internal Cutaneous, Middle Cutaneous, External Spermatic,* and *External Pudic.*

into two branches, one of which passes to the skin, while the other goes directly downwards for a short distance before it pierces the fascia, and is then distributed to the skin on the outer part of the thigh, nearly as far down as the knee. The most important branch of all these cutaneous nerves, is that which rises from the first lumbar, and, while passing through the substance of the psoas, receives a branch from the second lumbar. It passes along the fore part of the psoas, and, when near the crural arch divides into two branches, the largest of which follows the course of the spermatic cord, and is distributed on the scrotum and coats of the testicle; the other branch passes under the great vessels, and after giving twigs to the inguinal glands, sends a number of branches, through the fascia, to the skin on the fore and middle part of the thigh.

Besides the branches which have just been enumerated, three or four nerves will be seen coming through the fascia, one of which occasionally perforates the sartorius, to be distributed upon the skin on the fore part of the thigh. These will be afterwards found to arise from the anterior crural.

We should now trace the cutaneous nerves on the hip. In raising the skin from the gluteus maximus, we shall discover, upon its upper part, a set of nerves which may be traced back

to the lumbar; on the lower part of the muscle we shall find another set, which arise from the sacro-schiatic; the most important of which are those passing to the skin of the perineum and anus. On removing the skin from the hamstring muscles, several cutaneous branches will be seen passing down on the outer and inner edges of the thigh. Those which are on the inside, (called the *Posterior Internal,)* may be traced from the sacro-ischiatic, as it passes over the quadratus femoris; those on the outside, (the *Posterior External)* rise from the great nerve, after it has emerged from under the gluteus maximus.

Posterior Cutaneous Nerves.

If we now continue the dissection along the superficial part of the leg, we shall discover two branches, which unite nearly opposite to the middle of the gastrocnemius; one of these, will be found to arise from the tibial portion of the sacro-ischiatic,—the other, from the peroneal division; they may be traced to the outer part of the tendo Achillis, where they unite with nerves from the anterior part of the foot,—whence the nerve formed by the union has received the name of COMMUNICANS TIBIALIS.

Communicans Tibialis.

To discover the origin of the cutaneous nerves which supply the fore part of the leg, it will be necessary to open the sheath of the femoral artery, immediately before it pierces the adductor magnus; there, we shall see the nerve which

is called SAPHENUS LONGUS. This may be traced under the fascia, to the inside of the knee; here it joins the saphena vein, which it accompanies to the inner ankle. In its course, it forms connexions with the cutaneous nerves on the back of the leg, and with those of the deeper nerves,—which shall be described presently. Saphenus Longus.

While making the dissection of the cutaneous nerves, we should attend to the distribution of the superficial veins, which, though uninjected, may be seen.

All the cutaneous veins of the leg are described as forming only two trunks, viz. SAPHENA MAJOR, or INTERNA, and SAPHENA MINOR, or EXTERNA.

The saphena major may be traced from a plexus of veins on the inside and fore part of the foot; from this it passes over the inner ankle, up to the inside of the knee; it then passes upon the fascia lata to within a hand's breadth of Poupart's ligament; here it perforates the fascia, and unites with the great femoral vein. We shall sometimes find it divided into two branches above the knee; but these generally join, before the vein perforates the fascia. Superficial Veins.

The saphena minor rises from the plexus on the back and outer part of the foot, from which it may be traced, along the middle of the gas-

trocnemius, to the ham; here it terminates, by uniting with the popliteal vein.

Some of the superficial lymphatics may be seen in this stage of the dissection, but to an inexperienced eye, it will be very difficult to discover them. The manner of injecting them, will be described in a separate article; at present, I shall only remark, that these lymphatics are immediately under the true skin; that they are more superficial than the veins and nerves; that they run in straight lines, and are only partially seen, or seem to be abruptly broken off, by the intervening pellicles of fat. They appear very large and varicose, when distended, especially in the course of the saphena vein; and they are more numerous upon the middle part of the thigh, than upon the outer part. In colour and appearance, when in their natural state, and collapsed, they resemble pale muscular fibres; being pellucid only when distended with air. When they are blown up, or injected with mercury, they take a very peculiar appearance, as they swell only betwixt their valves.

Lymphatics.

The lymphatics of the thigh, pass into the glands at the groin,—but we must particularly notice that there are three sets of glands here—the first receives the lymphatics from the superficial part of the thigh—the second receives the lymphatics of the skin of the penis and scrotum,

and perineum, while a deeper set are formed by the lymphatics which accompany the great arteries of the leg.

When the glands are injected, *secondary lymphatics* may be traced from them into another set of glands. From these, the lymph is carried by a third set of vessels, to glands which have a direct communication with the thoracic duct.—The superficial lymphatics on the back of the leg, may be traced into a gland in the ham.

Previous to the dissection of the deep nerves of the thigh, a section of the pelvis should be made, according to the *second* method described at page 111.

As it is supposed that all the nerves of the viscera, and the cutaneous nerves of the thigh, have been already traced, we have now to attend only to the origins of the ANTERIOR CRURAL, OBTURATOR, and ISCHIATIC NERVES. Anterior Crural.

The fibres of the psoas muscle must be freely cut, so that we may expose the plexus of nerves which gives origin to the ANTERIOR CRURAL. This plexus is generally formed by the second, third, and fourth lumbar, and the first sacral.

The anterior crural may be traced in the angle between the psoas and iliacus, as far as the edge of Poupart's ligament; but, before we follow it farther, we should attend to the OBTURATOR,

Obturator.

which is seen passing across the pelvis, towards the thyroid hole. If we trace this nerve back towards the loins, we shall find it in close connexion with the anterior crural nerve; for it also arises from a plexus, formed by the third and fourth lumbar nerves, and sometimes by a twig from the second.

Sacro Sciatic

By a very little dissection, we may now expose the great plexus of the SACRO-SCIATIC NERVE. When this is traced backward, it will be found to be formed by the fourth and fifth lumbar, and by the first, second, and third sacral nerves.*

The three great nerves, viz. ANTERIOR CRURAL, OBTURATOR, and SACRO ISCHIATIC, may now be traced to their final distribution.

Branches of Anterior Crural.

The ANTERIOR CRURAL, having passed under Poupart's ligament, immediately splits into a great number of branches, many of which may be traced into the muscles at the upper part of the thigh; while others, which have been already described, go to the skin.

Of the muscular branches, there are only two which it is of much importance to trace, and

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* These lumbar and sacral nerves may be more easily counted by looking into the section of the spinal canal. When the nerves of both sides are preserved, and pulled out from the spinal canal, there is the appearance produced, which has been called *Cauda Equina*.

both of these run parallel to the femoral artery. The most external one does not run close upon the artery, but inclines towards the vastus internus, upon which it is distributed; while the internal, (which is called the saphenus longus,) passes almost in the proper sheath, until the artery perforates the triceps. The nerve may then be traced to the inside of the knee, to become the cutaneous nerve, which has been already seen going to the inner ankle, along with the saphena vein.

Branches of the Obturator

To show the branches of the OBTURATOR, we must dissect between the heads of the triceps: here we shall find many twigs, but of these, the only important branches are one or two which run along the inside of the thigh, to unite with the saphenus longus.

Pudic.

While the SACRO SCIATIC NERVE is in the form of a plexus in the pelvis, it gives off several branches, the principal of which is the PUDIC; indeed, the pudic may be considered a separate nerve, as it arises from the third, fourth, and fifth sacral nerves. It may be traced by the side of the tuber ischii, along with the arteries, to the muscles of the perineum, and to the penis. In the female, it is distributed on the vagina and clitoris.

The trunk of the ischiatic, after giving off the pudic, passes to the outer part of the pelvis; it generally lies between the pyriformis and ge-

Branches of the Ischiatic.

mini muscles, but the pyriformis is occasionally perforated by the nerve; sometimes, indeed, the nerve is divided, by the tendon, into two branches, which, however, soon again unite. While the nerve lies here, it gives several small twigs to the muscles and to the skin. The two great gluteal muscles should now be raised so as to expose the nerve where it passes betwixt the tuberosity of the ischium and great trochanter; the two ham-string muscles must then be dissected, to show the course of the nerve between them.

About the middle of the thigh, the sciatic nerve will be found to divide into two great branches, the TIBIAL and FIBULAR. The trunk, however, will often, before it divides, pass into the ham; but still we shall find that it may be easily split, for some way up, into two portions.

Tibial.

The TIBIAL should be first traced. The first branch of importance, is that which has been already seen in the dissection of the cutaneous nerves *(Nervus Communicans Tibialis.)* After having given off this branch, the trunk passes through the popliteal space, giving off small branches to the back of the joint, and to the muscles.

The internal heads of the gastrocnemius and soleus should now be divided, so that we may exhibit the nerve in its course under the fascia which covers the deep muscles. As it passes

to the ankle, it gives off several branches,—the principal one of which passes between the bones, to supply the muscles on the fore and upper part of the interosseous ligament. At the internal ankle, the trunk will be found lying close upon the posterior tibial artery; while here, it gives off a cutaneous branch to the inside of the foot. The trunk of the nerve then divides into the two branches called *Plantar:* to trace these, we must cut through the muscles of the foot.

External and Internal Plantar.

The *Internal Plantar*, which is the largest, after giving off several branches to the muscles, is finally distributed to the great toe, second, third, and one side of the fourth toe.

The *External* supplies the corresponding muscles,—forms a connexion with the internal plantar, and then passes to the little toe, and one side of the fourth toe.

Fibular.

The FIBULAR DIVISION of the great sciatic may now be traced. Before it passes round the head of the fibula, it gives off the cutaneous branch which has been described as connected with the communicans tibialis. After the trunk has been traced over the fibula, it will be found lying very deep between the muscles, and divided into two nerves. The most superficial should be traced first: it generally sends one branch into the muscles, and then, passing under the head of the peroneus longus, may be traced, under the aponeurosis, to the skin on the

fore part of the foot, where it unites on the outer part, with the communicans tibialis, and, on the inner part, with the internal plantar branches. Those branches on the fore part of the foot, are sometimes called *Metatarsal Nerves.*

Metatarsal.

We may now return to the dissection of the deep nerve, which is sometimes called the *Anterior Tibial Nerve,* as it accompanies the artery. It runs almost close upon the interosseous ligament, between the deep muscles, as far as the ankle,—there it divides into two branches, which are called *Ramus Dorsalis Pedis Profundus,* and *Superficialis.* The profundus may be traced, under the extensor brevis, to the outside of the tarsus. The superficialis, though so called, runs deep under the tendons, and at last comes out betwixt the great and second toe.

Anterior Tibial.

SURGICAL DISSECTION

OF

THE LOWER EXTREMITY.

I SHALL now endeavour to describe the manner of making the dissection, so as to enable the student to understand the principle points of anatomy, by which he is to be guided in the treatment of many important cases in surgery.

The arteries should not be injected,—nor should the abdomen be opened, until we have examined the relative situation of the great vessels, and compared them with the external views of the parts, for it is in this way, that we shall most easily comprehend the different operations, which it is necessary to perform for the various kinds of aneurism. But here I must remind the student, that he will be sadly disappointed, if he expects to see the parts appear, as distinctly in an operation, as he will now see them, on dissection. He should, therefore, at the time he is investigating the anatomy, read not only the histories of the cases and

operations which have been published, but also those works in which the principles that are to guide us in determining on the mode of operating, are discussed. He will then be able to assign to their proper source, the great improvements that have taken place of late years.

With the hope, that the student will attend to the pathology of aneurism, I shall confine my observations to such points, as may be understood by the examination of the parts, in the dead body.

Aorta tied for Aneurism.

The Aorta has been tied for an aneurism of the inguinal artery; but the detail of the operation, and of the cases adduced in support of the principle upon which it was done, are sufficient to deter us from ever repeating the experiment.

Common Iliac.

The Common Iliac has been twice tied; and though the operations were unsuccessful, still the circumstances, in one which I witnessed, were so far favorable, that we may expect, in certain cases, to tie this vessel with success. I shall not give a separate description of the manner of dissecting for it, as the artery may be easily found, by making a little variation in the operation for tying the internal iliac.

Since it is often necessary to tie the external iliac artery for an aneurism at the groin, I shall particularly describe the manner in which it may be most easily found, and safely tied. I

shall suppose that the dissection is made on the living body; in the description, I shall nearly follow that given by Mr. C. Bell, in the ILLUSTRATIONS OF THE GREAT OPERATIONS OF SURGERY.

"The object of this operation is, to tie the external iliac artery, so high, that the wound shall not interfere with the tumour of the aneurism, nor open the coagulated blood to the influence of the air, nor excite inflammation in the sac, by its contiguity. There must be no breach of the investing membrane of the abdomen; or the patient's danger will be increased a hundred fold. Operation on the External Iliac.

"*Incision.* Having ascertained the middle point betwixt the superior spinous process of the os ilii and the symphysis pubis, you feel there, the pulsation of the artery. Next feel the spermatic cord, and trace it backwards into the abdominal ring; and mark where it disappears. You have now got two points to direct your incision; make another, by drawing a line from the superior spinous process of the os ilii to the umbilicus; mark a point upon this line, two fingers' breadth from the process. Begin the incision opposite the outer margin of the abdominal ring; carry it over the point where you felt the artery beating, in a direction outward and upward, and let it terminate at the point you have marked, at two fingers' breadth

from the spinous process of the os ilii, measured in a direction towards the umbilicus.

"*Second Incision.* Having exposed the aponeurosis, or tendon of the external oblique muscle, and observed the direction of its fibres, pass the directory into the ring, and into the spermatic passage; taking care that the instrument is directly close under the tendon, and consequently, external to the cord: slit up the tendon in the direction of its fibres.

"*The Cord.* The spermatic cord is now exposed. With the blunt hook, and the handle of the knife, the cord is to be raised and pressed upward and inward. In doing this, you will necessarily raise the lower edge of the obliquus internus muscle. If the patient be fat, or the aneurism prominent and high, the wound, in this state, will be too confined; and it will be necessary first to pass the directory, and then the point of the finger, under the edge of the muscles, and to divide them in a direction upwards. The condensed cellular membrane, or fascia, which is on the lower surface of the transversalis, will generally yield to the finger.

"There will be found a soft mass, just within the Poupart ligament; it may be mistaken for a vessel; the more especially, as the pulsation may be felt on pressing it. It is a lymphatic gland. This gland is to be left in its place. Above this, there is a soft, fatty substance,

which is to be put aside with the finger and the handle of the knife ; and now, upon putting in the finger, the artery will be distinctly felt.

" The space where you feel the artery, is thus defined : 1. Below, towards the thigh, there is the Poupart ligament, and the internal inguinal gland. 2. On the inside, towards the pubes, you have the epigastric artery. 3. Above, and towards the ilium, there is the edge of the oblique and transversalis muscle. 4. And above, and towards the rectus, you have the spermatic cord.

" You should now push up the spermatic cord and cellular membrane,* and you place an assitant's finger there, to guard the peritoneum ; you have the epigastric artery on the inside, still involved in its cellular membrane : you may now expose the artery.

" Feeling the artery full, and pulsating under

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* It appears that there are good reasons for pushing up the spermatic cord. First, you get much easier at the artery. Secondly, you have the spermatic cord betwixt you and the peritoneum. Thirdly, if you choose, you may, in this direction, push the peritoneum very high, and expose the external iliac artery at its highest point : whereas, if you go above the spermatic cord, and keep it in its place, you must be entangled in the reflection of the vas deferens, and you will make the peritoneum thin as a cobweb, by separating the cellular tissue of the cord from it.

your finger, you think it bare; when a little consideration should remind you, that it is not.* It is still covered with its sheath, and filaments of the fascia strengthen that sheath: and here I must again observe, that the safest way is, to scratch the sheath, directly over the centre of the artery; to cut at the side of the artery is dangerous. The vein lies close by the inside of the artery, and, in some measure, below it. The vein is on the inside, the anterior crural nerve on the outside.† Therefore, I advise you to scratch, until you can pass your probe, or blunt hook, through the sheath and ligamentous fibres which directly cover the artery.

"When you have exposed the proper coat of the artery, make the assistant raise the thigh as

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* Mr. Abernethy says, "The pulsation of the artery made it clearly distinguishable from the contiguous parts, but I could not get my finger round it with the facility which I expected." "After ineffectual trials to pass my finger beneath the artery, I was obliged to make a slight incision on either side of it, in the same manner as is necessary when it is taken up in the thigh, where the fascia which binds it down in its situation is strong." This double incision is not necessary in either of these cases; and, I apprehend, very dangerous in the present instance.

† The external iliac vein is close to the inside of the artery. The anterior crural nerve is quite removed from the artery.

much as the circumstances of the tumour will admit; then you will be able to grasp the artery betwixt the thumb and the fore-finger; you will find it so loose, that you will experience no difficulty in passing the needle under it. It is struggling to thrust the blunt needle through the sheath and fibres of the fascia, and neglecting to raise the limb, that makes this part of the operation tedious.

"One firm ligature of four threads, waxed and oiled, will be sufficient; it is not necessary to tie the artery twice, nor, consequently, to cut it across."*

The operation of tying the external iliac artery, has been very successful, when performed for spontaneous aneurism of the inguinal artery, but not for the aneurism that rises in consequence of a wound of this vessel. It is, therefore, of the greatest importance to attend to the distinction of these cases. This difference, though alluded to by Saviard and other French writers, was first particularly explained by Mr. Charles Bell; for he showed, that, in the case of spontaneous aneurism, the

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* Mr. John Bell and Mr. Abernethy, and Mr. Maunoir of Geneva, have been advocates for tying the artery twice, and cutting it betwixt the ligatures. It is a practice which may have advantages; but the idea that they thereby made the artery as secure as when tied in amputation, was undoubtedly a great mistake.

tying of the artery at a certain distance above the aneurism, would generally be successful; but that the artery *must* be tied above and below an aneurism which has arisen in consequence of a wound. As it is not possible to guess where it may be necessary to perform such an operation, we ought to make ourselves acquainted with all the connexions of the artery through its whole course, that we may feel confident when called upon to take it up, at any point, in the living body.*

The operation of tying the internal iliac artery, has been performed for an aneurism of the gluteal artery, with success. The operation was thus described to me by Dr. Stevens :—

On the Internal Iliac.

"I made an incision, about five inches in length, on the lower and lateral part of the left

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* Mr. Soden, of Bath, had lately the kindness to shew me a very beautiful specimen of the state of an aneurismal sac, taken from a man who died suddenly, two years after the external iliac had been tied. I hope Mr. Soden will be induced to publish the history of this case, as the preparation is almost unique, and forms an excellent proof that the sac of an aneurism is not necessarily obliterated by the tying of the artery above it, and that the disease may be considered as cured although a certain quantity of blood may continue to flow through the sac. I should mention that an account of the case previous to the performance of the operation, is given by Mr. Soden in the Medico Chirurgical Transactions.

side of the abdomen, nearly half an inch to the outside of the epigastric artery, and parallel to that vessel. After dividing the skin and the three abdominal muscles, successively, I separated the peritoneum from its connexion with the iliacus internus and psoas, and then pushed it towards the division of the common iliac. Here I was able to insinuate my finger behind the internal iliac, and to compress it between my finger and thumb; I then passed a ligature below the artery, with a blunt needle, and tied it with a single ligature, about half an inch from its origin." The pulsation in the aneurism immediately stopped, and the patient got well.

Though it is very unlikely that such a case will occur, as would make it necessary to tie the gluteal or ischiatic arteries, where the parts surrounding them are, at the same time, in a sound state, still I shall describe the manner in which these arteries may be found, where the pressure of the blood has not destroyed the tissue of the muscles.

For the Gluteal. The body should be laid flat on the belly, and the foot turned inwards. The incision should begin at two fingers' breadth below the posterior spinous process of the ilium, and be continued towards the upper part of the trochanter major. The fibres of the gluteus maximus and medius, are then to be divided, On the Gluteal.

to the lower edge of the ilium, and *there*, at the notch, and immediately above the pyriformis muscle, the artery will be found. In making these incisions, we must necessarily cut through several very large arteries.

The incision for the ISCHIATIC artery is to be begun at the side of the sacrum, at about three inches from the posterior spinous process of the ilium, and is to be carried in the length of the fibres of the gluteus maximus, to the outside of the tuberosity of the ischium; by pushing in the finger, we shall feel the external sacro sciatic ligament, along which, and immediately under the margin of the pyriformis, the artery passes. The great nerve is about an inch to the iliac side of the artery.

On the Ischiatic.

We may now proceed to the consideration of the most common, and consequently the most important operation, which is performed on the arteries of the lower extremity,—the ligature of the superficial femoral artery, for Popliteal Aneurism.

As this operation, in nine of ten cases, is done upon parts in their natural state, we may now be able to form nearly an accurate idea of the steps of an operation, which is little more than a simple dissection, made upon the living body.

The limb should be laid rather on the side;

a point is then to be marked on the groin, equidistant from the symphysis of the pubes and the superior spinous process of the ilium. Here the artery will be felt. A cord may be fixed at that point, and stretched to the patella; an assistant should then stretch another cord between the superior spinous process of the ilium and the inner condyle of the femur. The centre of the incision should be about an inch above the point where these lines cross; it should be made about three inches long,—not in the line of the fibres of the sartorius, but rather across them. The skin is to be divided in the first incision; and in the second, the thin superficial fascia should be cut to the full extent of the incision through the skin. As the cut is made in a line across the sartorius, there will be little difficulty in recognizing this muscle. (And here I may remark, that none, except those who have witnessed the exhibition, can imagine the difficulties which have ensued, in consequence of the edge of the triceps having been mistaken for the sartorius.) The lower edge of the sartorius is now to be raised,—this will expose the fascia which passes from the triceps to the vastus internus; a little perforation is then to be made into the fascia, and a directory is to be passed under it, so that it may be slit up. The sheath which surrounds the artery and vein will now be seen, and when this is opened, it

On the superficial Femoral.

will be easy to pass a blunt needle under the vessels.

The Saphena Nerve is very close upon the artery, but still it can be easily avoided; if it be tied, the patient will, as long as he lives, be a reproach to the surgeon, for he will complain of a pain, so distinctly in the course of the nerve, that there never will be a doubt as to whom he owes it. The Internal Saphena Vein is quite out of the line of the incision that has been recommended; but as it is irregular in its course, its situation should be marked, previous to commencing the operation, by compressing it high up. (The anatomy of Popliteal Aneurism will be described when we come to the dissection of the ham.)

We may now open the abdomen, and examine the relative position of the parts connected with the arteries which we have tied. The internal iliac vein and the ureter will be looked to with interest, in considering the operation of tying the internal iliac artery.

After having fully investigated the subject of the operation for aneurism, in all its bearings, we should make a superficial dissection of the fascia of the thigh,—preserving the veins, nerves, and glands. The lymphatics, of course, cannot be seen.

The first thing we should attend to, is the

anatomy of the glands. As the lymphatics pass from several sources into the glands, there may be many different causes for bubo. If there be a deep swelling in the groin, it may be in consequence of some irritation on the internal parts of the limb,—as, after compound fracture, diseased joint or bone. If the swelling be more superficial, it may arise from irritation of the superficial lymphatics in some part of their course,—as that produced by a blister on the knee, or by a sore on the toe. If the tumour be high up in the groin, it will probably be from irritation on some part of the penis or scrotum. There is yet another cause of bubo, which, on account of the difficulty of tracing the lymphatics, is not generally known, viz. irritation about the anus,—as piles, &c.

Different kinds of Buboes.

Though buboes have been mistaken for hernia, and, what is more serious, hernia has been mistaken for bubo, I hope that it is not now necessary to say any thing on the manner of distinguishing the two diseases.

When we recollect the origin of the small nerves, which we see on the thigh and hip, we cannot wonder, that painful sensations in the thighs, should be occasionally relieved by such purges as will completely empty the colon and rectum.

By now making a very little dissection over the outer edge of the psoas muscle, we shall ex-

pose the course which the psoas abscess generally takes; and when we recollect the relations of the fascia iliaca, we shall understand why this abscess seldom or never points at the same part that femoral hernia protrudes.

Psoas Abscess. The psoas abscess appears in the groin, commonly upon the outside of the femoral artery, under the stronger part of the fascia, and near the os ilium. When the tumour forms slowly and regularly, the fascia can be plainly felt; but when it is far advanced, the fascia generally gives way. The abscess, however, does not always point thus regularly, but is sometimes more extensively diffused in the groin,—even surrounding and including the femoral vessels; or it runs so deeply among the muscles, that the lancet or trochar cannot reach it with safety.

If in the dead body, we lay open the abscess in the thigh, and free it of matter, a new discharge will be seen to come from within the belly. If we follow this sinus, we shall probably find it run up, behind the psoas muscle, upon the vertebræ of the loins, which are often carious. In some intances, the abscess continues its course by the sacrum and side of the rectum, and points by the side of the anus; sometimes it takes quite a different course, for it has even made its way into the thorax. With this view of the fascia before us, we at once comprehend

the importance of making free incisions, when matter is collected below it after an injury.

We may now make the dissection of the deep parts of the thigh. When the fascia is cut through below the groin, we shall see the vessels connected together by a separate fascia, called the sheath; the great vein is here on the inside of the artery, but it turns more and more under the artery as it descends to pass through the triceps muscle. The coats of the vein are very strong; indeed, they are sometimes so thick, as, in an operation, to be mistaken for the artery, if the surgeon judges only by the feel of the parts,—which in many cases, is a good criterion.

The Femoral artery, as it descends from the groin, gets betwixt the tendinous insertions of the triceps and the origin of the vastus internus muscles. Betwixt these two muscles, there is an interlacing of tendinous filaments that forms the bottom of a deep groove, in which the artery runs; and here it was covered by that fascia, which, in performing the operation for aneurism, has in part been cut, to expose the sheath of the vessels.

We may now trace the artery through the sheath formed by the tendon of the adductor magnus; we should particularly notice a branch that is given off here,—though this be small, it is of considerable importance after the operation

The Anastomoticus Magnus.

of amputation of a diseased knee; for as this is the part, at which the great artery will be generally cut, there is some chance of this branch being overlooked in the securing of the vessels: when this has happened, a dangerous hæmorrhage has been the consequence. The easiest way of securing this small vessel, will be, to pull the main artery out of its sheath, so that we may apply a ligature above the point where it is given off.

Having completed the dissection of the deep parts of the thigh, we should retire a step from the body, and look to the general figure of the limb, and notice the course of the artery down the thigh, then consider the probability of its being wounded by stabs in such and such places and directions;—the situation of the trunk of the profunda, as distinguished from the great artery, and the liability of wounds of the descending branches of the profunda being mistaken for wounds of the femoral artery itself.

Irritation of the Nerves.

If, in this dissection, we have preserved the branches of the obturator and anterior crural nerves, we shall be able to comprehend, why patients frequently suffer pain in the inside of the knee, in the primary stages of disease of the hip joint. The course of the deep nerves may also explain to us the cause of some very odd symptoms;—such as violent burning pain in the sole of the foot. One of the most interest-

ing cases of this kind, is related in Mr. C. Bell's System of Operative Surgery. The nerve, with the tumour, which was the source of the suffering in this patient's case, is preserved in our Museum. There is also another preparation of a tumour, nearly of the same kind. This last case was rather curious—a Russian General was wounded at the battle of Borodino—the ball struck the condyle of the femur, and there it lay for two years. A surgeon, in St. Petersburgh, imagined, that, by forming an amalgan, he could destroy the ball: he therefore poured quicksilver into the wound; but, during the prosecution of this plan, the General suffered horrible pain in the sole of his foot. He then came over in great alarm to this country; the pain was so excessive, that it was necessary to amputate the limb; we then found a tumour in the peroneal nerve, with quicksilver in it. The General got well, but suffered long after, from the same nervous feelings which he had previous to the operation: the nerve was, in all probability, irritated higher up. I have seen patients suffer excessively from gun-shot wounds of the ham. Many knee joints, which had been perforated by balls, were, by active treatment, saved, by the Russians, after the battle of Paris, in 1814—but the painful sensations in the course of the nerves of the leg, seemed to leave most of the

patients in a more miserable state than if they had lost their legs.

Before dissecting off the skin from the leg, we should examine the parts in the ham; we shall then be able to form some idea of the benefit which Mr. Hunter conferred upon surgery, by tying the artery on the fore part of the thigh, for the cure of popliteal aneurism, instead of persevering in the old method of tying it in the ham: a plan, which was followed by some of the first surgeons in France, up to the year 1814.

Popliteal Aneurism.

Upon removing the skin and superficial cellular membrane from the back part of the knee joint, we shall observe the strong fascia which covers the muscles and great vessels and nerves. Upon slitting up, and dissecting back the fascia, the great nerve will be seen. Below the nerve there is much cellular membrane and fat: under this fat, and close to the bone, lie the popliteal artery and vein. They are imbedded in this tissue, and are intimately connected together; the vein more external, and in its uninjected state, clinging round the artery. If the parts be accurately retained in their natural situation, during dissection, it will be seen, that in order to find the artery, in operation, our incision should be made rather towards the outer ham-string, than immediately in the middle. By this means, we keep to the outside of the ischiatic nerve. We shall find the artery lying

To find the Popliteal Artery.

deep, and covered with the vein; and, to tie it separately, it must be disentangled from under the vein.

This view will show us how difficult it must be, in the greater number of cases, to compress the artery in the ham, when there is to be an amputation below the knee; and will prove the necessity of applying the tourniquet on the fore part of the thigh.

It will perhaps be interesting to consider the change which these parts undergo, in a case of popliteal aneurism.

The limb is generally œdematous; sometimes so much so, as to make the pulse, at the inner ankle, to be felt with difficulty, independent of its faintness, from the aneurism. The limb is often consiberably bent. Round the whole knee joint, there is much swelling; so that the tumour in the ham is not very distinct, but has more the feeling of general tension. Upon laying open the integuments, the tumour distending the fascia comes more distinctly into view.

Changes produced by Popliteal Aneurism.

The appearance and situation of the parts, particularly of the nerve and great vein, and lesser saphena, will depend upon the direction in which the coats of the artery first yielded. If the artery has given way towards the inside, then the tumour will increase chiefly in that direction, while the artery itself will, in some degree, be pushed in the opposite direction, and

the nerve and the vein will be crowded towards the outer ham-string.

We can now easily understand how difficult it must have been, to secure the ends of the artery, at the bottom of such a tumour. We can also imagine the risk of secondary hæmorrhage, and the danger of violent inflammation of the great nerve, in consequence of the extensive suppuration which must follow such an operation. Even when the operation succeeded, the limb was liable to remain contracted, in consequence of the adhesion of the parts.

When these dangers are compared with the consequences that generally follow the modern operation,—we cannot doubt, as to which we should choose. The advantages of the modern operation, in *almost* every case, over the old method, will be more distinctly shown, by the relation of the following case, published in 1809, by M. Roux, in his "Melanges de Chirurgie et de Physiologie." I introduce it here, not only to lead the student to compare the simplicity of the operations on the arteries, as performed by the English surgeons, with those by the French at that time; but also as a detail which may, perhaps, be useful,—as I have seen a case of popliteal aneurism, in which the artery should have been tied in the ham. The operation was performed in the presence of M. M. Leroux, Deschamps, Boyer, Dupuytren, &c. and the ac-

count of it is introduced by the following eulogy, by M. Roux:—

Old Operation for Pop. Aneurism.

"Could we unite and examine all the cases in which the operations for aneurism have been successfully performed, either by the ordinary method, or by that of Hunter, we should find few, where the operation has been attended with results more simple, or success more remarkable.

"A tourniquet was placed on the middle of the thigh, over the course of the femoral artery, and a stout assistant compressed the artery at the groin. I made the first incision of the integuments about seven inches long. The second incision, through the aponeurosis, exposed the sciatic nerve, which, though immediately attached to the aneurismal tumour, was not degenerated or flattened as it frequently is. It was easy to pull the nerve aside, and to keep it under the external edge of the incision. I then opened the tumour parallel to the course of the popliteal artery, and on the inner side of the sciatic nerve. It contained a quantity of liquid blood, and of dense clots, which adhered firmly to the walls of the cyst, notwithstanding the short duration of the disease. These clots being removed, I made the interior of the cyst perfectly dry. We could then discover, at the bottom of

the wound, the opening of the artery, or rather, the blood flowing from it, when the tourniquet was relaxed; for the opening itself, was not very apparent, which was a source of some difficulty in the succeeding steps of the operation. It was not, indeed, until after several ineffectual efforts, that I was enabled to pass a female sound into the opening, with the intention of lifting the artery, and facilitating the application of the ligatures. This instrument was directed towards the superior part, that I might apply the two upper ligatures; after which, I introduced it into the lower part, as far as the bifurcation of the popliteal artery, and passed under it, two other ligatures; both the superior and inferior ligatures were introduced by the assistance of the needle of M. Deschamps. The artery was tied above and below the opening, by the two nearest ligatures; the inferior was done in the common way, by two knots, but for the superior, I made use of another instrument of M. Deschamps, known by the name of the *Presse Artère;* by the aid of which, the artery was not puckered, as it must always be by the circular ligature, but it was flattened by the little plate which forms the end of the instrument. I took care to moderate still more the pressure upon the artery, by putting under the plate a small piece of agaric, secured by a thread.—After the superior and inferior ligatures were

applied, the tourniquet was relaxed: the blood did not flow from the opening in the artery. I then proceeded to the application of the dressing. The *ligatures d'attente*, being each enveloped in a piece of fine linen, were placed at the angles of the wound; the wound was filled lightly with charpie, so as to avoid the slightest pressure, and at the same time to preserve the vertical position of the *presse artère*," &c.

We may now remove the skin from the parts below the knee, leaving the veins and small nerves upon it.

Varicose Veins.

In dissecting the veins, we should consider the diseases to which they are most liable,—particularly their varicose state. In the dissecting-room we shall find many opportunities of examining varicose veins, and proving that the common ideas upon this disease are erroneous; we shall find, that the *valves are not destroyed*, but that the coats of the veins are thickened, so as to prevent the valves from doing their office. I may here remark, that a practice, which, *a priori*, would not be considered good, will be of great service in relieving the varicose state of the veins, and the ulcers that are a consequence of it,—that of applying a spring compress over the trunk of the varicose vein.

In dissecting these veins, we should pay particular attention to their relation to the fasciæ,

—that we may not be foiled in finding them at once, when we wish to cut them across.

We should now consider what will be the best method of dissecting for the Anterior and Posterior Tibial Arteries, if it should be necessary to tie them.

If the anterior Tibial is to be tied high in the leg, the incision through the fascia, which covers the muscles, must be free, because the artery lies very deep: indeed, a small transverse cut may be made through the fascia. By then dissecting between the tibialis anticus and the extensor communis digitorum, the artery will be found lying upon the interosseous ligament, accompanied by the venæ comites, and almost covered by the nerve. The artery, about four inches from the ankle, will be found between the tibialis anticus and extensor longus pollicis; and, on the anterior part of the foot, between the extensor communis digitorum and the extensor longus pollicis.

Anterior Tibial.

The Posterior Tibial may be found about the middle of the leg, by first detaching part of the origin of the soleus from the tibia, and then by freely cutting through the fascia which covers the deep muscles; the artery will then be seen, accompanied by a vein on each side, and with the nerve on its fibular edge. It is an extraor-

Posterior Tibial.

dinary circumstance, that Mr. Hey, of Leeds, has advised us to cut out a piece of the fibula, to get at this artery. I have seen a patient, on whose leg, my friend, Mr. Smith, surgeon of the Leeds hospital, tied the artery, with great ease, nearly in the manner I have now described.—When there is a deep wound in the sole of the foot, it may be necessary to tie this artery. In such a case, we should dissect for it, behind the inner ankle. The artery will be found under the fascia, and in the same relation to the nerve, as it is higher up; but the quantity of fatty substance here, will make it rather difficult to expose the vessel.

The Fibular Artery may be found at two hands' breadth from the heel, by cutting on the outside of the gastrocnemius, where it is becoming tendinous. By turning up the edge of the tendon, the flexor longus pollicis will be exposed. If the fascia which covers this muscle be not opened, we may perhaps come upon the Posterior Tibial; but by opening the fascia, and detaching the fibrous origins of the flexor from the fibula, we shall find the artery under the acute margin of the bone, accompanied only by its venæ comites.

After having attended to all the surgical questions connected with the anatomy of the

arteries, we should consider what are the most eligible positions for the relaxation of the muscles, in the different kinds of fracture; and also the manner of distinguishing fractures from dislocations.

Disease of the Joints.

In examining the joints, we shall be surprised to find the great number of instances in which the cartilages of the heads of the bone seem to be eroded. In some cases the cartilage is so completely removed, that the heads of the bones appear as if capped with ivory, but the most common change is an appearance very much resembling ulceration; and this having been occasionally found in patients who have suffered much pain in the joint, has lately been considered as a distinct disease to which the name of ulceration of the cartilages has been given. But I have so frequently seen, in all kinds of subjects, (and even in the joints of animals,) the appearance which is described as ulceration of the cartilage, that I cannot agree with those who suppose that it is the effect of disease. I suspect, that it is a change, which frequently occurs in the structure of the cartilage, without being necessarily followed by any symptoms that could lead us to suspect its having taken place. —I lately found this appearance of ulceration in almost all the joints of a camel; but the most conclusive evidence I can offer of such a state of

the cartilage, not being necessarily accompanied by lameness, is the account given to me, by a very intelligent student, of the condition of the joints of a horse which dropped down from exhaustion, after having been galloped forty miles in four hours. The animal was quite sound before starting, and did not shew any symptoms of lameness during the race, although, on dissection, the same appearance as that which has been considered as denoting previous ulceration of the cartilages was found in every joint, both of the hind and fore legs.

END OF VOL. II.

APPENDIX.

I SHALL add a few observations on the art of making Preparations. I hope they will assist the Student, but I must remind him, that the *art* is one, which, like many others, can only be attained by experience. This experience is often dearly bought, for we must expect to be repeatedly disappointed in our hopes—and we are not only in constant danger of burning our fingers, and spoiling our clothes, but even of setting the house on fire, unless we are particularly careful.

ON INJECTING THE BODY.

We have two distinct objects in filling the vessels with coloured fluids, either to distend them, so that we may exhibit their course through the body, or to demonstrate the degree of vascularity of each part.

For the first object, we require a fluid which shall become hard, and be durable if exposed to the air, and shall, at the same time, be possessed of such a degree of pliability and tenacity, as will bear the motion necessarily given to it, while we are dissecting the vessels;—for the second object, the fluid must be so subtle that it shall pervade the smallest vessels visible to the eye, and at the same time be of a certain consistence, when coagulated.

The composition for the first injection, is generally called COARSE Injection. The second is named FINE Injection.

The coarse is prepared in several different manners, so is the fine: formulæ for each will be given presently.

As, in the body of the work, the manner of injecting each particular part is described along with the dissection, I shall now confine myself to such general observations as are applicable to the injection of every part; and first of the circumstances necessary to be attended to, in filling the vessels of a limb with the *coarse* injection, for the purpose of shewing their distribution.

After a student has once assisted in injecting the vessels of the body, he will be convinced, that the trouble of making fine preparations of the arteries, does not consist in sitting comfor-

tably at a table, picking away the fat and cellular membrane, which invests the vessels; but in the attention to many little circumstances, which none, except those, who are much interested in the success of the preparation, will give; therefore, if he expects to possess a fine preparation, he must not trust to the porter of a dissecting room making the injection, but he must attend to every particular himself.

So much of the success in making preparations of the arteries, depends on the state of the subject, that we should be particular in chusing a young and thin body, before we go to the expense and trouble of attempting to make a fine injection of the vessels;—indeed, our labour will almost to a certainty, be lost, if we attempt to inject an old subject; for the arteries, being generally ossified, are so inelastic and brittle, that some of them will probably burst, and then the injection will be extravasated among the muscles;—or, if this accident should not happen, the injection will likely be stopped, in some of the trunks, by the clots of blood which lodge in them. Occasionally, however, the injection may run very minutely—but still, there will be little chance of our making a fine preparation of the limb, because, although all the *visible* fat may be removed, the oily matter, which is in the substance of the muscles and in the bones,

will ooze out during the summer, and will not only hurt the appearance of the preparation, but will also dissolve the varnish.

It is, however, possible to fill the arteries of an old body, without any danger of producing a rupture, if we use the *cold injection :* the manner of making it, will be described presently.

A subject intended for a preparation of the arteries of a young body, being strong and elastic, will bear the application of a much greater force than the inelastic vessels of an old subject; and when they are fully distended, there is an elastic resistance offered to the piston of the syringe, which is never felt in injecting an old body. In the latter, we find a sudden opposition to the flow of injection, and if, after this, the piston be pushed down, the artery will certainly be ruptured.

The attempt to fill the arteries with the *hot injection* will never be successful, unless the body be previously heated to the temperature, to which it is necessary to raise the injection, to keep it quite fluid. But, in doing this, we must be careful not to make the water so hot as to corrugate the vessels. It should never be at a higher temperature than the hand will bear, when immersed into it.

If the composition, forming the injection, be very hot, it will corrugate and weaken the coats

of the vessels.—The bursting of a vessel generally takes place near the point where the injection is thrown in, and not in the small vessels, because the temperature of the composition is much diminished before it reaches the latter. When rupture takes place, the large trunks will appear small and collapsed, while the smaller vessels, from being imperfectly filled, will appear broken. The test which I generally use, for proving the heat of the injection, is, to dip my finger into it. If I can keep it there for a few seconds, I consider the injection to be of a proper temperature.

The most troublesome, and most tedious part of the operation of filling the vessels with hot injection, is keeping the body at a proper temperature. The common method is simply to immerse the body in hot water, but this is very tedious, particularly if the body has been previously frozen.

The trunk of the body may be very quickly heated, by filling the chest, the stomach, and the intestines, with hot water;—it is, indeed, advantageous to distend the viscera, as the injection then flows more freely into their arteries. If the bladder and rectum be also filled with warm water, the parts in the pelvis will be quickly heated. If the veins of the limbs are not to be injected, they may be filled with hot

water or, still better, with a solution of corrosive sublimate, in hot water. This will assist in heating the deeper parts of the limb, and will also tend, not only to preserve the body, during the time of preparing it, but also to protect it from the attacks of insects, after it is dried.

The composition for the hot injection being formed of very inflammable ingredients, ought to be melted with great care. When the injection is melted in earthen pots, set upon the fire, there is not only great danger of its boiling over, and thus setting the chimney on fire, but the colour is also liable to be destroyed by too great a degree of heat—the injection ought therefore, to be always melted in pots, immersed in hot water; the heat of boiling water is quite sufficient to melt the ingredients, and there is no danger of wax or oil boiling over, at a temperature of 212.

Where many injections are made, the following plan will be found very useful, both in preventing any accidents by fire, and the destruction of the colours by two great a degree of heat.

Upon the boiler of a small still, which is attached to a furnace, a long pan is fixed and secured by luting. The pan has three or four sockets, in which are placed the small pots, containing the different coloured injections. Into the opening (which is generally left in the boiler

to pour in the liquor to be distilled) a leaden pipe is fixed, which is carried into the bottom of a large tub of water. The steam playing in the large pan is sufficient to melt the injection, and the steam which escapes by the pipe heats the water, to warm the body which is to be injected.

For common occasions—a flat tin cover may be fitted to a small fish kettle. In the cover, there should be two circular openings, each of a size sufficient to admit a pint gallypot.

There are many formulæ for the composition of the *coarse* injection:—they are all however, in some respects similar; the most material point of difference is, in the expense of the ingredients.

The following is very good for common purposes: tallow, ℥xvi. resin, ℥xvi. wax, ℥jii. venice turpentine, ℥ji. spirit of turpentine, ℥j. colouring matter, q. s.

Many anatomists have an objection to the mixture of tallow, and prefer the following: wax, ℥xvi. resin, ℥vjii. turpentine varnish, ℥vj. This last is much more expensive than the first, or the following, with which, many very fine preparations have been made,—tallow, three parts, resin, two parts, venice turpentine, one.

The great secret, however, appears to consist in putting in a large proportion of turpentine varnish, and little or no tallow, because, though

the injection may be very soft, when it is thrown in, still, by exposure to the air, the varnish hardens, and makes the external layer of the injection very hard. Injection, made with a large proportion of the turpentine varnish, is very pliable, so that there is not much danger of the arteries being broken during the dissection.

The following injection keeps very well;—two parts of bees wax, one of resin, and one of turpentine varnish.

The coloring matters for these injections are, for the red, vermillion—for the yellow, King's yellow—for the white, flake white—for the blue, blue smalt, or blue verditer. The colours should be mixed with the turpentine varnish, and be added to the wax and resin, when they are melted.

As the coarse injection seldom runs into the extreme branches, it is a common practice, to first throw in a small quantity of fine injection, which, by the coarse injection, will be pushed out of the trunks into the extreme branches. The composition for this, is equal parts of brown and white spirit varnish, and one fourth of the quantity, of turpentine varnish. As this composition is very volatile and inflammable, the colour should be added to it before it is heated, which must be done by placing the pot containing it in hot water, immediately before it is used.

The compositions above described, are for the injection of parts which are intended to be preserved as dry preparations.—To succeed in filling any set of vessels, with either of them, requires a great deal of care and attention—much more than can be afforded, when the object is only to distend the vessels, that their course may be traced through the body,—and unless that attention be given, the injection will probably fail. The body may not be sufficiently heated, or the composition may cool, and become hard in the pipe, or it may be used too hot, and corrugate the vessels, so that they burst—besides a number of lesser accidents, which all who have made many preparations, must have met with.

It is, therefore, a great desideratum to find an injection which is not liable to all these difficulties. This is attained in a composition, which has been much used in our dissecting rooms. It is made, by mixing together certain ingredients, without the application of heat, and may be thrown into the vessels, without the body being previously heated.

By these properties, there is not only a great deal of time and trouble saved; but this *cold* injection has other good qualities, for, as it does not become hard so soon as the wax composition, we can easily remedy any accident that

may happen during the injection of it, as for example, the bursting of an artery.

Every anatomist knows that is is almost impossible to fill the arteries of a very old subject with the wax injection, in consequence of the liability of the vessels to burst; but, with this cold injection, the arteries of such a body may be minutely injected, without any danger of this accident happening.

This injection is not, however, so well adapted as the wax, for preparations, for we have not succeeded in making it sufficiently pliable, but it has this advantage, that parts injected with it, are much more durable than those prepared with hot injection, as the degree of heat which destroys wax injection has no effect on it. It is, therefore, peculiarly well adapted for preparations intended to be carried into a warm climate. But its chief superiority over the wax injection, for the common purposes of the dissecting-room, consists in our being able to fill the vessels of *any* body in ten minutes with it, while for the hot injection, we must have a *young* body, and spend several hours in hard labour before we can effect our purpose. The composition is made in the following manner:—A quantity of red lead is to be mixed up with *boiled* linseed oil, to a consistence thicker than is generally used for painting, it may be nearly that of *pre-*

pared white lead. To this mixture of red lead and oil, turpentine varnish is to be added, till the composition is about the consistence of common thick oil—in this state it is to be injected. It is not possible to give the proportions accurately in which the ingredients are to be mixed, as the degree of fluidity of the turpentine varnish often varies in different shops, but the injection is so easily made, that there is no danger of any mistake, if the varnish be well mixed with the oil and lead. It is occasionally some hours in hardening, but it always *sets* in the course of a day.

An injection made of the white lead and turpentine varnish will run more minutely, in consequence of the white lead being better mixed up, than the red can be; it is possible to make this any colour, by adding the colouring matter to the varnish, before it is mixed with the white lead, but it requires a great proportion to overcome the strong white colour of the lead.

Circumstances to be recollected in injecting any part of the body.

An opening, sufficient to admit a tube into the principal artery of the part to be injected, is to be made, by cutting in the length of the vessel with a pair of sharp scissars.

Before the tube is introduced, we should pass a probe into the vessel, and endeavour to with-

draw any coagula that may be lodged in it.—We should then pass a ligature under the artery, and leave it loose.

In introducing the tube into the artery, we must take care, that we do not push the internal coat of the vessel before the edge of the tube; this is very liable to happen in an old subject.

If the vessel to be injected, is large (the aorta for example) some rag or tow should be wrapped round the tube before it is introduced into the vessel. This will prevent the artery from being thrown into folds.

The ligature to fix the tube, is not to be pulled too tight upon the vessel, or the internal coat of the artery will be cut, by which the vessel will be weakened, and hence, there will be danger of extravasation.

After the ligature is tied on the part of the tube within the artery, the ends of it are to be brought up and fixed upon the wings of the tube; in this way, the ligature will be prevented from slipping off.

Previous to throwing in the injection, all the vessels which have been cut, are to be secured, either individually with ligatures, or large portions of muscle are to be surrounded by pieces of whip-cord, and tied very tight.

When the vessels are very small and numerous, they may be stopped, by searing the cut surface with a hot iron.

Parts which are liable to be extended during the dissection of the vessels, are to be put on the full stretch, before the injection is finished.—If the carotids be filled, while the chin is lying on the sternum, the injection will appear broken during the dissection.

Before the injection is taken up, we must see that the body is sufficiently heated, that the syringe is air tight, and works easily, that it fits the tubes—that it is of a temperature equal to the injection, (it may be made so by sucking in some warm water, but if the water be very hot, the leather of the valves will be corrugated and spoiled; to protect the hand, a calico roller should be wrapped round the lower part of the syringe.) It is particularly necessary that the assistants know their duty, and that they have forceps and ligatures, to tie any vessels which burst, and cold water, to throw upon any injection which may escape. If we do not use a stop-cock, we must have corks ready to put into the tubes, when the vessels are filled.

When every thing is prepared—the fine injection, being at a proper temperature, is to be taken up with a four ounce syringe; the injection should be sucked up, and thrown out of the syringe three or four times, so as to mix it well with the colouring matter, which often falls to the bottom of the pot: it is then to be taken up,

rather slowly, so as to avoid sucking in any bubbles of air.

Before the syringe is introduced into the tube, it should be held up, and the piston pressed, till the injection appears, by which, any air that may be mixed with the injection, will be allowed to escape.

The wings of the tube are to be taken between the fore and middle fingers of the left hand; and the nozzle of the syringe being introduced into the tube, the piston is to be pushed down slowly and gradually with the right hand.—When the syringe is withdrawn, the tube is to be closed by the thumb of the left hand, and the coarse injection is to be taken up as quickly as possible, by an assistant, with a larger syringe; the same precautions of mixing up the colouring matter, and avoiding the introduction of air, being attended to, as in using the fine injection; this composition must be thrown in rather more quickly than the fine, for it very soon hardens, but it is dangerous to push it in, by forcing with the chest against the piston.—We should always push with our hand, that we may be aware of the degree of resistance, and when it is such as to force the piston back, we should rest a little, and then repeat the force,—but it will be unsafe to do so, more than twice.—Though there are many little circumstances to

be attended to, there must be no loitering, for if there be, the probability is, that the injection will harden in the pipe, by which all will be spoiled; though, by heating the part very much again, there may be some chance of our being still able to force the injection into the vessels.

I must observe, that if the assistant be not very dexterous and alert, the injection will probably be spoiled, for our success depends much, on the assistant knowing his duty, and being perfectly willing to do it.

As soon as the vessels are filled, the body should be put into cold water, where it should lie for a few hours.

The dissection consists in tracing the vessels from trunk to branch, so as to expose them; as many of the muscles as possible are to to be preserved, but it will be necessary to destroy those which are very large, and through the substance of which important vessels pass.

When the limb is dissected, it may be laid in a solution of corrosive sublimate in spirits and water for two days; it is then to be put into a frame; the muscles are to be held asunder by pieces of wood and baked horse-hair, that the vessels may be exhibited. The preparation is then to be exposed to a current of air. When thoroughly dried, it is to be covered, first with a coating of spirit varnish, and then with quick drying oil varnish.

In making preparations of the veins, it is necessary to inject them from the extreme branches towards the trunks, on account of the valves. The success, however, depends much upon their being previously well washed with warm water, and repeatedly dilated, as they are for the most part foul with coagulated blood, and especially in old people; although, in other respects, the veins of old subjects are in the best state for injection, being enlarged and varicose. The coagula may frequently be drawn out of the mouths of the larger veins before introducing the tube. If the veins of the thigh and leg are to be injected, the tube should be fixed in a small vein upon the fore part of the foot, near to the great toe; and a stop-cock should be fixed into the external iliac vein, within Poupart's ligament. The blood must then be washed out, by throwing in tepid water from the tube at the toe; first, with the stop-cock open; when the veins are a little cleared, the stop-cock on the top of the thigh is to be stopped, that the veins may be a little distended. The limb may then be immersed in warm water. Before injecting, the veins must be completely emptied, by opening the stop-cock, and stroking up the thigh. The coarse injection should be thrown in, while the limb is thus completely warm, and without any fine injection being thrown in before. During the injec-

tion, the stop-cock at the groin should be kept open, and some one placed to turn it when the injection appears at the mouth of the vein. In this way, the air or water will be driven freely before the injection; and veins which would otherwise remain empty, will be filled; for by the dilatation, the valves lose their power, become too small for the diameter of the vessels, and allow the injection to go backwards into the branches.

MINUTE INJECTIONS.

When we wish to shew the vascularity of a natural or diseased part—the *size injection* is used; this injection is very easily made.—The matter, which is sold under the name of pale double size, is to be melted in a water bath; it is then to be strained, and to be highly coloured with vermillion. The body or part is to be heated, as for wax injections; but here I should observe, that this injection runs so minutely, that we should never attempt to inject a whole subject with it, at least, not larger than a fœtus. Preparations made with this injection, are to be preserved in spirits, as it putrifies, instead of hardening, when exposed to the air, except in the very minute branches. It is sometimes, however, thrown in before the coarse injection; but if any of the large vessels be filled with it,

they will be lost in consequence of the size putrifying; it also passes so easily from the arteries into the great veins, that the dissection is much more difficult, when it is used, instead of the varnishes, as a fine injection, to fill the minute branches.

Some very beautiful preparations may be made with the size injection—all the mucous surfaces, and particularly the internal surface of the intestines are so vascular, that they appear of a bright scarlet colour when this injection is used. In the attempt to prepare any of the viscera of the adult, the injection of each viscus should be made separately; thus a portion of the intestine is to be filled from branches of the mesenteric artery; the kidney from the emulgent; the testicle from the spermatic, &c. The nose and eyes must be injected from the common carotids.

Even the bones may be minutely injected with size and vermillion—but, to do this, we must bandage the limb to prevent the injection from distending the vessels of the muscles; the bandage must not be applied too tight or it will obstruct the injection passing through the great vessels; it is to be only so firm as to prevent the enlargement of the muscles and cellular membrane by the force of the injection,—even into a diseased bone, with an ulcerated surface,

the injection may be forced, if the limb has been previously bandaged.

Parts which have been injected with size, are to be preserved either in spirits of wine or in spirits of turpentine.—The parts are to be immersed into the spirit of wine after they have been cleaned, without being dried; but those which are to be preserved in turpentine, must be first thoroughly dried.—If a bone has been minutely injected, and subjected to the action of a weak acid for some time, and dried, and put into spirits of turpentine, it will appear quite transparent, and the vessels will be seen branching in its substance;—sections of the growing bone are very beautiful, when prepared in this manner, for the cartilage becomes quite transparent, and only the vessels are seen, shooting across towards the nucleus of bone.

CORROSIONS.

Corroded Preparations are made by injecting the vessels of a part with hard coarse injection, and then submitting it to the action of an acid, which will destroy the animal part, leaving only the wax, with which the vessels were filled. They are generally made of the solid viscera—as the heart, lungs, liver, kidney, spleen. After the injection is made, we must place the part, while yet warm, in the position

it is to remain in, and then it is to be covered with three parts of muriatic or nitric acid, with one of water. The preparation is to lie in this mixture until the animal matter is dissolved. I shall here insert the directions which are given by Pole, in the ANATOMICAL INSTRUCTOR, which is a little book I would recommend to all, who are anxious to make preparations.

"Preparations, injected for the purpose of corrosion, should always be carefully handled, lest the injection be incautiously broke, which, in their finished state, having no support from the surrounding vessels, will fall to pieces; this would be an unpleasing circumstance, after every thing else has been successfully conducted. The part, when injected, should be immersed in an acid liquor,* composed of three parts of muriatic acid, and one of water, in a glass vessel of suitable construction, for about three, four, or six weeks, as may be required, until its texture be entirely destroyed, and reduced to a soft pulpy state; it is then to be removed from the acid, by taking hold of the strongest part of the injection in the largest vessels, and lay it in a bason, filled with clean water; in that situation, direct a gentle stream of water upon it, sufficient to wash away the pulpy substance;

* Nitric Acid is recommended by Sue, the French anatomist.

when it is nearly cleansed in that way, take it out, and hold it by the large trunk under the stream, by which it will have a better opportunity of passing through the interstices than before; but this should not be done until it be tolerably cleared from the pulpy part, as the weight of it would be in danger of breaking off the vessels by which it was held, especially with the additional weight and pressure of the water falling on it.

"The stream, for washing Corroded Prepations, should always pass through a cock, as by that means it can be exactly regulated, to what size or force we please; a stream formed in almost any other way, is liable to variations, and a sudden unexpected increase of water would also greatly endanger the preparation. The injecting syringe, with a small pipe, may be used for this purpose, where a stream cannot be obtained through a cock, and in some respects will answer better, as, by that, a small stream may be directed to any part particularly requiring it. If the pulp does not readily wash away, it should be laid in the acid liquor again for a week or ten days more, and the washing repeated. When it is perfectly clean, it should be suffered to lay in water for a few hours, to take off all the acid which may adhere to it, and afterwards suspended in the air to dry; for this purpose, always avoid using thread, or any thing

of that kind likely to cut through the vessels, especially if the preparation is of considerable weight, or the injection soft; for many valuable preparations have been lost by their falling, when suspended by such means: for this purpose then, tape is preferable, or a slip of soft cloth passed through a division of the largest trunk of the veins or arteries, most likely to sustain its weight. When there are no strong vessels favourable for this purpose, it may be carefully laid on a bed of wool, covered with a piece of fine soft linen, to prevent the wool entangling with the extremities of the vessels; on this it is to remain till perfectly dry, then varnished, according to the directions, to be given in their proper place.

"These preparations require great care and much time to complete them, and when finished, are of all others most liable to be demolished by trivial accidents; it is therefore expedient to defend them as much as possible from injuries; for this purpose they are to be fixed upon pedestals of Plaster of Paris; a hole is to be made in the top of the pedestal, large enough to receive the trunks which ramify through the gland, or other part prepared; then this hole should have a proper quantity of fluid plaster poured into it, the preparation immediately placed in the pedestal, and held in a proper position until the plaster has become hard enough to support

it. These pedestals are then commonly fixed with glue on a mahogany stand, and covered with a glass vessel; but this method is not a sufficient security, unless the glass cover is cemented down, as its occasional removal will endanger the preparation: for persons who have not made them are not always satisfied with looking, but, every now and then trying their strength by the finger, at the expense of destroying its most beautiful parts; neither does the moveable cover sufficiently exclude the dust. The most effectual method of preserving them from accidents, dust, and officious hands, is, to fix them in box frames, which may be oval or square; the ovals are the neatest but the most expensive, they may be glazed in front, or front and back. The glass should be let in upon an outside rabbet,* and confined by slips of paper being pasted along the outside of the same rabbet, extending over the edge of the glass. These frames should be lined with white paper, or any coloured paper, if necessary, to be contrasted with the colour of the Injection; the outside is generally blacked.

"These preparations, when thus finished, should be kept from the rays of the sun, and heat of the fire; which, if the Injection is not

* A term used among mechanics, to imply a channel in the edge of a board, &c.

very hard, will be likely to soften it, so that the branches will become flexible, and bend by their own weight."

INJECTIONS WITH QUICKSILVER.

These injections are very splendid, and some of them are easily made,—but others, such as the injection of the vessels of the testicle, depend so much on the state of the gland, that when they are successful, the preparation is invaluable. To inject such glands as the parotid or testicle, it is only necessary to put the pipe of the mercurial apparatus into the duct. But the most difficult injection, is that of the vessels which are called absorbents. I shall therefore, give a particular description of the manner of preparing these vessels.

INJECTION OF THE LYMPHATICS.

The dissection of the lymphatics is very easily made, when they are injected; but to do this, is, perhaps, one of the most difficult operations of Anatomy.

We require for it, very delicate instruments; —those sold in the shops, and depicted in Sheldon's Work on the Absorbents, are better than the *fine drawn* glass, recommended by the

continental anatomists; for though the glass tube may be made very small, still it is so liable to break, that it is a constant source of vexation.

Professor Dumeril has proposed to show the lacteals, by injecting them with milk, and then putting the injected portion of intestine into a weak acid, by which the milk will be coagulated; this is very simple and ingenious, but the best view of these vessels may be given by a method, which a man may be permitted to do for once, viz. that of tying the thoracic duct of an animal which has been fed upon meal and milk, about half an hour previous to its death:—there is no necessity for the cruel experiment of tying the duct, and opening the animal, while alive, as the action of the absorbents continues for a short time after the animal is deprived of sensibility.

In the injection of the lymphatics, for a preparation, our success depends, perhaps, more on the body we choose, than on any other circumstance. It has commonly been said, that dropsical bodies are the best for lymphatic preparations; but it will be found, that bodies only slightly anasarcous, if they be emaciated, are much better. In the body of a person who has died of consumption, or of any disease by which the fat has been absorbed, we shall succeed better than in any other. It is not merely on finding

the lymphatics, and filling them with mercury, (for this may be done in almost any body,) that the success of the preparation depends, but also on the quickness with which the parts can be dried, after the vessels are injected.

In consequence of the valvular structure of the lymphatics, it is necessary to inject from the extremities, towards the trunk. In injecting an arm, or leg, we ought to begin as near the fingers, or toes, as possible; it is needless to expect that we shall ever inject the lymphatics as low down, as they are represented in some anatomical plates.

The difficulty of discovering lymphatics, is owing to several causes. Though they are very small, still that does not so much constitute the difficulty, as their being generally empty and transparent. We are advised, by some, to make use of magnifying glasses; but these will be found of little or no service, since it is the transparency of the vessels that is the cause of their obscurity. Small branches of nerves, and small veins, are very often mistaken for lymphatics:—even a person, of the most experienced eye, will not always discover his mistake, until he attempts to fill them with mercury.

It is almost in vain for any one to attempt injecting lymphatics, without an assistant; for there are so many things requisite, besides merely the holding of the tube in the vessel,

that he will find he can make but little progress by himself.

It is necessary, before beginning, to see that there are, within reach, sharp pointed scissars, knives, forceps, lancets, pokers (for tubes,) needles, and waxed thread, so arranged, that they can be used instantly: for it will often happen, that it will be almost impossible for either assistant or operator to take his eye for a moment off the vessel.—It is requisite, also, that the assistant be very dexterous; as his office is often one of greater difficulty, than that of the principal operator.

Every thing being arranged, the foot or hand is to be placed in a tray, that the mercury which falls, may be caught.—The foot ought to be a little more elevated than the groin, to assist the flow of the mercury towards that part. With a sharp scalpel, a portion of the skin is to be cut off horizontally, so as to expose the loose cellular texture; for in this texture, are the superficial lymphatics generally situated. If we cannot find one near the toes (which is very often the case,) we shall probably discover one running across the saphena magna, on the instep. We must then take hold of it with the forceps, and dissect it from the surrounding substance (to secure the keeping of it, we should put a needle with a fine waxed thread under it.) Having still hold of the vessel with the forceps,

we should snip it half across with fine scissars, —and into the cut made by the scissars, introduce the fine poker, which is made for clearing the pipes. We should now take, from the assistant's hand, the tube containing the mercury, with the stop-cock already turned, and let the stream of mercury play on the side of the poker; which will generally so direct the stream, that it will enter the vessel. When we have once succeeded in getting a few drops of mercury into the lymphatic, it will be easy to get the pipe into the open mouth of the vessel, and then the poker may be withdrawn.

There is an apparent clumsiness in this method of filling the vessels: but in this manner, the smallest vessels may be injected, when it will be found quite impossible to inject them in the old way, of puncturing the lymphatic with a lancet, and introducing the point of the tube into it. The poker is of very great service, as by it, it is always possible to know, whether it is a lymphatic or a small nerve that we have got: if it be a lymphatic, the poker will pass on smoothly; if a nerve, it will tear it into fibres.—When introduced into a lymphatic, it holds aside the lips of the cut, so that the mercury passes into the vessel, by the side of it.

If the vessel into which the pipe is introduced, be large, it ought to be tied, round the pipe, with the thread which was previously put

under it. The mercury is to be pressed on, by the assistant, with the handle of the knife; for the injector ought never to take his eye off the pipe, but he should, according to the direction of his assistant, elevate or depress the tube containing the mercury, as in this way we shall regulate the force of the injection. The mouth of the vessel ought to be moistened at intervals, to prevent its getting dry, by which the flow of the mercury would be impeded.

If the lymphatic into which we have introduced the pipe, has filled a considerable number of vessels on the thigh, the mercury is then to be pressed on to the glands in the groin, taking care that the foot is not too much elevated; for by that, the column of mercury would be raised higher than the vessels in the glands could bear, especially as the lymphatics there, seem to be more easily burst, than at any other part.

We should now withdraw the pipe, and look for other lymphatics on the ancle, and proceed with them in the same manner.

If the glands are not completely filled, we ought to endeavour to find the vessel that has the most influence in filling each gland,—for there is generally one vessel which fills the gland more quickly than the others; after securing the other vessels, we should fill the gland from it. If we wish to make a good display of the glands at the groin, we ought to tie the

secondary vessels arising from them; for the mercury often passes into the secondary vessels, before it fills the gland itself.

The vessels ought to be dissected and dried as quickly as possible; for if the limb becomes putrid, the mercury in the lymphatics is liable to become black. After exposing them, and before they are dried, they ought to be tied at regular intervals;—they should always be kept in the horizontal position, as they are liable to burst when dry, if held perpendicularly.

We may generally succeed in injecting the lymphatics of the liver, or the lacteals of the intestines, by merely puncturing the vessels with the lancet; for there is here, a surface opposed to the vessels, which keeps them more steady, than those in the limbs.

By blowing air into the lymphatics, we may open them more easily; but, there is always the disadvantage attending this method, that the air prevents the flow of the mercury into the glands.

These preparations are attended with so much trouble in the making, that it is of some consequence to be able to preserve them. If we endeavour to do this, by merely varnishing and drying them, we shall soon see our labour defeated; for the change from the horizontal position, or a change of temperature, will, in all probability, burst the vessels.—By preserv-

ing them in spirits of turpentine, we shall not only avoid the changes of temperature, and the destruction of insects, but add much to the beauty of the preparation.

WET PREPARATIONS.

To shew the natural structure, and to preserve the morbid appearances,—the parts are generally kept in spirits of wine.

It is impossible to preserve the natural colours, because the blood, though it may be coagulated by the spirit, changes its colour very quickly, therefore the object generally desired is either to imitate the natural colours by injections, or to preserve the parts, *white.* What has been already said on minute injections will be sufficient for the description of the management of coloured preparations;—but the white preparations, though not the most splendid at first, are more valuable than the injected ones, for they are much more durable. In a pure white preparation there is no blood, which is the most putrescent part; while in an injected preparation, there is not only blood remaining in it, but there is also a quantity of size which is very liable to putrefaction. Every anatomist has been often vexed, by seeing a finely injected preparation, becoming gradually of a black colour in the course of a few years, or suddenly

so, after the spirits, in which it had been kept for some time, are renewed.

In preparing a part which is to be preserved *white*,—1st. We should, previous to putting it into maceration, cut away every thing we do not intend to preserve.—2d. We should then, with a syringe, throw warm water through the vessels, that as much of the blood as possible may be forced out.—3d. If it be a glandular part, or if there be any matter effused, it is to be gently squeezed until the fluids are evacuated.—4th. The preparation is to be suspended in water, near the top of a jar, and the water is to be changed twice a-day, and at each time the part is to be gently squeezed.—5th. Whenever the preparation floats to the top of the jar, or when the surface is becoming of a brownish colour, it should be put into spirits. The fluid which I find to be the best for preserving preparations, is—about equal parts of distilled water, saturated with alum, and alcohol; but in thick fleshy parts, or when they have been injected with size, the proportion of Alcohol must be greater.

The preparation, on being taken out of the water, should be put into a mixture, not so strong as to corrugate the membranes, and there it may lie for a few days,—after this it may, with horse hair, weights, &c. be put into proper shape, and then be immersed into a

much stronger mixture, where, in the course of a week, it will become quite firm; the stuffing may then be taken out, and the preparation put into the spirits, in which it is intended to remain. During all these processes, we must be particularly careful to keep the preparation clean, and free from dust.*

There has been always a great difficulty in preventing the spirits from evaporating:—the method which I have found to be the best, is the following:—a piece of whalebone, such as is used by the umbrella makers, is to be cut to the diameter of the jar, the two ends are then to be nicely filed down to the shape of the convex surface of the inside of the rim, so that they may rest upon the rim of the bottle, but not project over the edge;—to *nicks* in this whale-bone the different threads, or still better, horse hairs, supporting the preparation, are to be attached. The jar being now filled to the

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* A solution of corrosive sublimate in distilled water, or a saturated solution of alum, with a small proportion of spirit, are useful for preserving parts which require a long time for dissection; but I would never *put up* a valuable preparation in either of these mixtures, nor in the solution of muriate of soda, because a change always takes place in the appearance of the preparation, in the course of a few months. A solution of nitre and alum in water, has been lately recommended as preferable to the solution of any of the other salts for preserving parts.

top,—the rim is to be dried, and then smeared with a weak glue. A portion of an ox's bladder, which has been soaked in water for two days, is to be immediately put over the mouth of the jar, and is to be bound firmly with twine, which is to be applied in a quantity sufficient to press the bladder tightly upon the lower part of the rim. The jar is then to be exposed to a current of air, that the bladder may dry quickly; the following day a piece of the sheet lead, which is used to line liqueur chests, is to be cut to the size of the top of the bottle, so as to lap over the margin of the rim,—it is to be fixed on with glue; and on the succeeding day, the twine by which the first bladder was fixed, is to be taken off; all the surface of the lead, and the portion of the first bladder surrounding the neck, are to be rubbed with a thin glue, and then a second piece of bladder is to be applied, and secured in the same manner as the first; the preparation may then be set aside, and in a few days the twine is to be taken off, and the two portions of bladder are to be neatly cut, about a quarter of an inch from the rim; the twine is then to be waxed, and again applied over the bladder. The top and neck of the jar may be covered with a coating of black varnish, which is made by mixing a little lamp black with the *black japan* used by coach painters.

EXPLANATION

OF

THE PLATES.

INDEPENDENTLY of the truth or philosophy of Mr. Bell's observations on the nervous system, we have at present to consider it as an arrangement merely,—as a plan for facilitating the acquirement of a knowledge of the nerves.

When we contemplate the dissection which we have made of the nerves of the face, neck, and chest, and are lost in the confusion of the VIIth, VIIIth, and IXth,—of the branches of the cervical nerves, and of the sympathetic,—of the diaphragmatic and spinal accessory nerves, we shall be prepared to see the advantages of the Plans which are annexed. I think the student will soon discover, that the system, of which the Plans may give him some idea, is not only a most remarkable improvement in the knowledge of the structure and functions of animal bodies, but is of the greatest use in

practical anatomy, in facilitating the comprehension of a very useful department.

The principal arrangement is this :—there is an obvious division of the medulla spinalis, corresponding to the cerebrum and cerebellum :—every REGULAR NERVE has two roots, one from the anterior of these columns, and another from the posterior. Such are the Vth pair; the SUBOCCIPITAL; the SEVEN CERVICAL; the TWELVE DORSAL; the FIVE LUMBAR; and the SIX SACRAL; viz. thirty-two PERFECT, REGULAR, or DOUBLE NERVES.—These are laid down in the first Plan. They are common to all animals, from the worm up to the man; and are for the purposes of common sensation and motion, or volition. They run out laterally to the regular divisions of the body, and never take a course longitudinal to the body.

For the sake of arrangement (although the term be not correct where every thing is perfect,) the remaining nerves are called IRREGULAR NERVES. Those are distinguished by a simple fasciculus, or single root; that is, a root from one column. These are *simple* in their origins, *irregular* in their distribution, and *deficient* in that symmetry which characterizes the first class.—They are superadded to the original class, and correspond to the number and complication of the superadded organs. Of these, there are—the IIId, IVth, and VIth, to the eye;

the VIIth, to the face; the IXth, to the tongue; the GLOSSO PHARYNGEAL, to the pharynx; the VAGUS, to the larynx, heart, lungs, and stomach; the PHRENIC, to the diaphragm; the SPINAL ACCESSORY, to the muscles of the shoulder; the EXTERNAL RESPIRATORY, to the outside of the chest.

If we inquire into the reason of this seeming confusion in the *second class*, or *irregular nerves*, we shall perceive, that it is owing to the complication of the superadded apparatus of respiration, and the variety of offices which this apparatus has to perform in the higher animals. To explain this, the second Plan is given.—It presents, in one view, the nerves destined to move the muscles in all the varieties of respiration, speech, and expression.

We may now see how confounding the *numbering* of the nerves, according to the system of Willis, is; and how impossible it is to make a natural arrangement, while the nerves are so numbered.

PLATE I.

A. A. Cerebrum.

B.B. Cerebellum.

C.C. Crura Cerebri.

D.D. Crura Cerebelli.

E.E.E. Spinal Marrow.

1.1. Branches of the Vth Pair, or Trigeminus, which are seen to arise from the union of the Crura Cerebri and Crura Cerebelli, and to have a ganglion at the roots.

2.2. Branches of the Suboccipital Nerves, which have double origins and a ganglion.

3.3. The Branches of the four Inferior Cervical Nerves, and of the first Dorsal, forming the Axillary Plexus: the origins of these Nerves are similar to those of the Vth and the Suboccipital.

4.4.4.4. Branches of the Dorsal Nerves, which also arise in the same manner.

5.5. The Lumbar Nerves.

6.6. The Sacral Nerves.

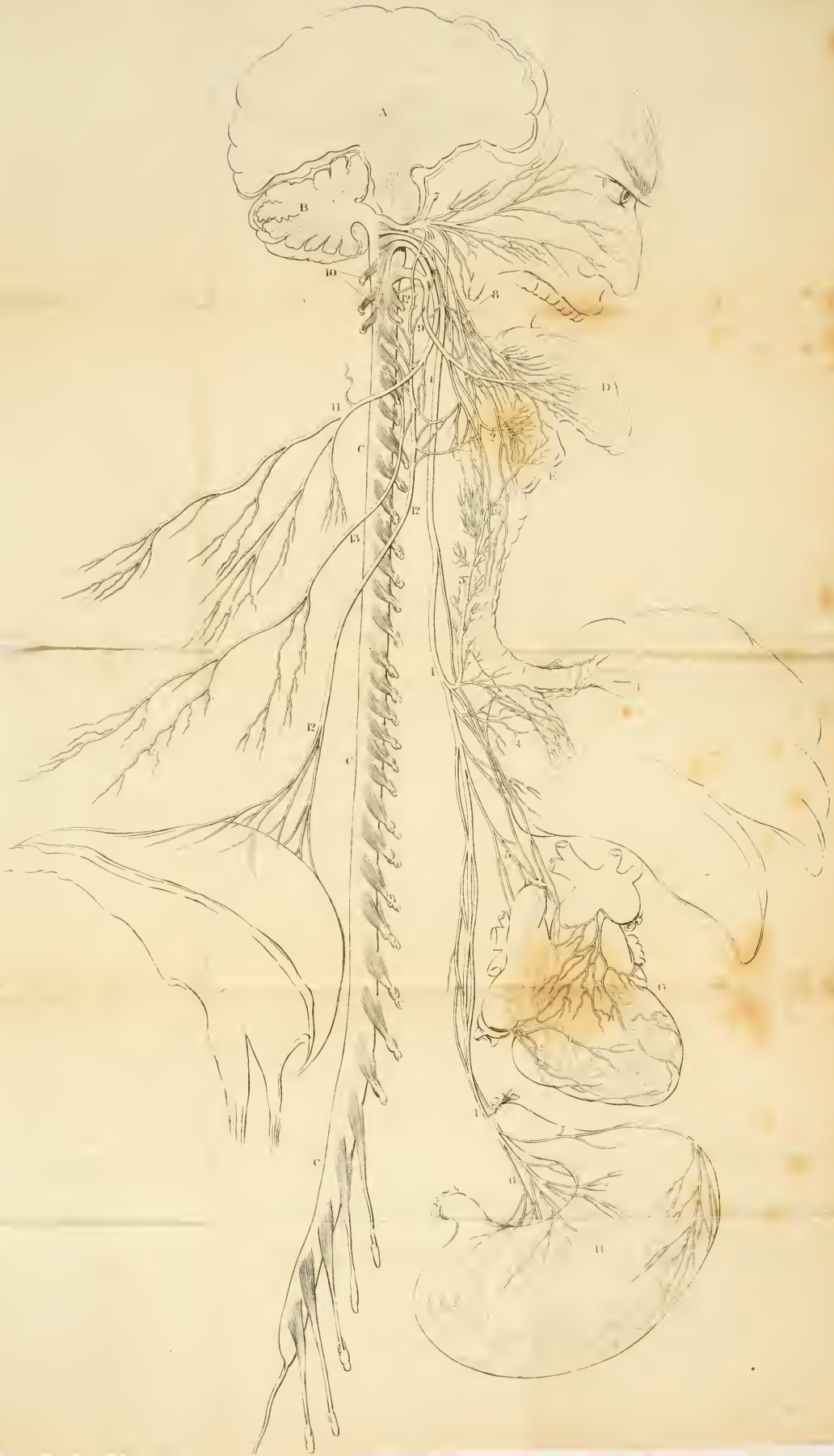
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PLATE II.

A. Cerebrum.

B. Cerebellum.

C.C.C. Spinal Marrow.

D. Tongue.

E. Larynx.

F. Lungs.

G. Heart.

H. Stomach.

I. Diaphragm.

1.1.1. Par Vagum, arising by a single set of roots, and passing to the larynx, the lungs, heart, and stomach.

2. *Superior Laryngeal* Branches of the Par Vagum.

3. *Recurrent*, or *Inferior Laryngeal* of the Par Vagum.

4. *Pulmonic Plexus* of the Par Vagum.

5. *Cardiac Plexus* of the Par Vagum.

6. *Gastric Plexus*, or *Corda Ventriculi* of the Par Vagum.

7. Respiratory Nerve, or *Portio Dura*, to the Muscles of the Face; arising by a series of single roots.

8. Branches of the Glosso Pharyngeal.

9. Lingualis, sending Branches to the Tongue and to the Muscles on the fore part of the larynx.

10. Origins of the Superior External Respiratory, or *Spinal Accessory*.

11. Branches of the last Nerve, to the Muscles of the Shoulder.

12.12.12. Internal Respiratory, or the *Phrenic*, to the Diaphragm. The origins of this nerve may be seen to pass much higher up than they are generally described.

13. Inferior External Respiratory, to the muscles on the side of the Chest.

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