To J. H. Green Esqr from the Au

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MANUAL

FOR THE

STUDENT 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.

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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PREFACE.

While engaged in assisting the students, in the dissecting-room, I have been in the practice of drawing up short notes, containing rules for the dissection of each part. As I found these to be of much advantage to myself, and of great use to the students, I have been induced, during the leisure of the summer season, to arrange them in a systematic form.

On revising them, however, for the press, I perceive, that I have many apologies to make for the manner in which they are written: but I have some hopes, that the inelegancies of the language, and the carelessness of the style, will be forgotten in the assistance which the young student may derive from the hints contained in them.—He will find, indeed, that I have been indifferent to every other consideration, except that of proving useful to him, in the most difficult period of his anatomical studies.

One object in the following pages has been, to show the readiest methods by which a student may acquire, in the first instance, a general idea of anatomy; and secondly, a minute and practical knowledge, of the manner of exhibiting the structure of each part.

Another, and a still more important object, has been, to direct his attention particularly, to those points of anatomy which are most useful, and the recollection of which, will be of high importance to him, when engaged in the practice of his profession. In this attempt, the student will discover many observations to be those of Mr. Charles Bell: but in excuse for this, he will allow it to be difficult for one, who has either been Mr. Bell's pupil or assistant for many years, to write a work on Surgical Anatomy, without showing a prejudice in favour of his doctrines and manner of teaching.

In giving the description of the more minute parts, I have taken all possible assistance from the best authorities; for although I have spent twelve years in the dissecting-room,—during ten of which, I have prepared the subjects for lecture, and have assisted the students, I still find, that no point of anatomy can be satisfactorily made out, without referring to the labours of former anatomists.

I have made much use of the "System of Dissections," written by Mr. Bell, twenty-two years ago, while a student in Edinburgh, and at a time when the opportunities of studying anatomy were very much restricted.

I may observe, however, that, notwithstanding the book was written under the disadvantages alluded to, it is from it, that the anonymous author of the "London Dissector" has taken all that is good in his compilation. Indeed, both the plan and the object of the "System of Dissections," have been imitated by all who have written for the use of students in the dissecting-room; — I am singular, only in acknowledging, that I have made free use of it.

The observations which are taken from "Pole's Anatomical Instructor," need no apology, since they are my own;—having added them, in the form of notes, to the edition of that book, which was published eight years ago.

Of the merits of this work, in facilitating the removal of the obstacles which students encounter in the commencement of their studies, they will be the best judges.—To their candid examination I leave it, promising, at the same time, should an opportunity occur, that my endeavours shall not be wanting, to clear the obscurities, and supply the deficiencies which they may discover in the present edition.

JOHN SHAW.

Albany, London,
August 1st, 1821.

INTRODUCTION.

As it is allowed that the sciences of Medicine and Surgery, are, and ought to be, founded on Anatomy, there can be no occasion to enforce the necessity of studying Anatomy; still it may be necessary to offer some advice upon the manner, in which a young surgeon should prosecute the acquirement of the knowledge of this important branch of science.

When I entered upon the study of my profession, I was taught, never to lose sight of the chief end of anatomy; and my attention was directed particularly to those parts, the recollection of which, would be of use, when left to my own resources.

This advice I would wish to impress particularly upon those students, who, from circumstances, are not able to remain longer than one or two seasons in London. I shall even venture to advise the student, whose time is limited, not to harass himself in acquiring such a knowledge of anatomy, as consists in a particular description of the seven-and-twenty processes of the sphenoid bone, or the exact origins and insertions of the multifidus spinæ; nor to burthen his memory with certain Latinized names,—at best, but barbarous combinations, which are given by some dissectors, to branches of arteries, in themselves so small, that, if cut, they would not throw out more than one jet of blood; and so irregular, that they are seldom seen twice in the same relative position.

When such a knowledge of anatomy as this, is considered to be of importance, it is not surprising, that the opportunity of studying what is truly useful, should be lost, and that the student should contemn the science altogether, when he becomes a surgeon.— He then finds, or is too apt to consider, that the only advantage which he derived from the study of anatomy, was, that it enabled him to pass certain examinations.

I trust, that the contents of the following pages will prove, that notwithstanding what I have here said, I do not intend to disparage the knowledge of minute anatomy:—on the contrary, I contend, that no man can be a thorough good surgeon, without that knowledge; but it must be a very different "minute anatomy," from that of being able to give the accurate description of the shape and facits of a dry bone; or of the points, from which some deep muscle of the back arises, although expressed even in that technical language, which appears so imposing to a beginner.

To counteract the effect of the long and hard-sounding terms, these "sesquipedalia verba", which unfortunately have the effect of leading a young student to suppose, that the more difficult the name is to recollect, the greater necessity there is, of studying the part which it denominates,—I would advise him, while he is engaged in the dissecting-room, to read those books on medicine and surgery, which are founded on the facts of anatomy. By such a course of study, he will be directed to the proper subjects of inquiry; and he will also have the best chance of becoming so acquainted with the changes produced by disease, that he will not be in danger of being discomposed and alarmed at their appearance,—nor be obliged to stop in the middle of a perilous operation, should he find the parts not exactly in the situation as demonstrated in the dissecting-room, or exhibited on the table of the lecturer.

It would scarcely be believed, that I have occasionally found some difficulty in impressing the importance of such a course of study;—a difficulty originating in an advice which is given by many, to students, viz. "not to read"—and this upon the authority of Mr. Hunter. I shall only ask, What kind of anatomy would nine-tenths of the students, who are to spend only a short time in London, learn? or of what use would it be to them, if their views were not properly directed, by the study of good books? The argument in favour of not reading, is, that the first impressions of a student should be derived from the dissected body. With this opinion, I most cordially agree; but this argument offers no reason, why students should not, at the same time, take advantage of the hints contained in books, written by those who have known how to attach the due degree of importance to each part. Perhaps it will be allowed, that the probable consequence of the advice of not reading, is, that the student never reads a book on the subject, but is apt to become one of those self-taught geniuses, who, throughout his life, is making absurd and fancied *discoveries* in anatomy and surgery.

I have often found, that the same students who have been advised not to read, have also been told, that they should not attend the dissecting-room during the first season of their studies; but, that they should acquire their first ideas of anatomy, from the appearance of the dissected body on the lecturer's table. Surely there is an inconsistency in these two opinions;—the latter can never have been given by those who have had extensive opportunities of seeing the course of a student's progress.

I would advise a student to attend the operations in the dissecting-room, from the first;—for though he should not use the knife himself, until he has a general idea of the structure of the body, he will have an opportunity of correcting the erroneous notions which he necessarily forms, from the exhibition of the parts, as prepared for demonstration on the lecturer's table; for he will discover how much must necessarily be taken away, to make the muscles, arteries, or nerves sufficiently distinct for public demonstration. But the more serious objection is,—that a student who delays commencing dissection until he has attended several courses of lectures on anatomy, never makes much proficiency in it, nor ever goes *con amore* to his task; perhaps there may be a moral cause for this. The student finds, that those who commenced the study of anatomy, at the same time with himself, and who have been, from the first, attending the operations in the dissecting-room, are much farther advanced in the actual knowledge of the parts; he is ashamed to begin, knowing that his old companions are already adroit, and conscious that he must make an awkward exhibition;—indeed, I have frequently found that students so situated, have, in the course of an hour, (to show some dexterity), finished the dissection of a limb; but, of course, in a very imperfect manner.

It is surely needless to impress upon the student, that though he may be able to point out any part of the body which is exposed, he can never be a dexterous, nor even a safe operator, unless he practises dissection: indeed, the question of the propriety of a man attempting to operate, who has never dissected, resolves itself simply into this;—as an operation is only a nice and difficult dissection,—is the first essay to be made on the living body?

I would recommend the student not only to dissect the important vessels, &c. with unwearied diligence; but also to practise himself in removing the cellular membrane from the larger muscles,* as it is the most

* More use should be made of the bodies of animals than is generally done. In a surgical view, the dissection of them can only be of use in giving a degree of familiarity in the management of the knife: but they are of great service in every question regarding the minute structure of a part, or of its function,—and particularly in the investigation of the nervous system, or of the structure of the organs of sense, or of the viscera.

likely way of giving him that peculiar command of the knife, which is so important for a surgeon to possess, and which cannot be attained except by much practice.

In proof of this, we see that when even a man who is naturally dexterous, takes the knife into his hand for the first time, he appears awkward; and the spectators at once perceive, that he is not familiar with the use of the instrument.

Much of the appearance of dexterity, and even real dexterity, being dependant on the manner in which an instrument is held, we ought to study what is the best and neatest mode; taking care, however, to avoid the appearance of affectation.——To perform almost any dissection, or operation, the knife should be held nearly in the same manner as we do a pen; the motions should be executed with the fingers and wrist only,—for in this way, the incisions will be made with more freedom and precision, than they can, when the shoulder, elbow, and hand are moved at each cut; which they must, if the knife be held between the thumb and all the four fingers. It has been said, that Mr. Hunter used to hold his knife in this manner; but on asking an old and favourite pupil of Mr. Hunter, and who is yet famous for his dexterity in operating, and neatness in dissecting, whether this was true, he told me, that it was so; but that the joint of Mr. Hunter's thumb was stiff, in consequence of an accident.

The student will find, that he requires several instruments, besides those generally put into the dissecting case, to enable him to make some of the more difficult dissections.—Thus, for example, he could not dissect the nerves of the spine, nor of the head, without a small saw, two or three chisels of different sizes, a small mallet, and the strong pincers, (that are used to pull out nails); the knife (called a hacking knife), which is used by plumbers to cut lead, will also be found very convenient.* For the more minute dissections, he will require two small hooks, and a sharp steel point;—the etching tools which are used by engravers, are very useful; particularly if the points are bent a little, as we can then easily tear away the cellular membrane from the small nerves.†

It is, perhaps, unnecessary to say, that the student should endeavour to prevent the bad effects of sitting several hours in a cold dissecting-room: the most effectual way, is, to put on an additional flannel jacket, and carpet shoes over his boots. I would moreover advise him, for the comfort of himself and his friends, to make a distinct rule, never to sit in the dissecting-room, with the coat which he wears through the day; but to keep one for the purpose of using while he is there. A cap should be worn, in preference to a hat, which is not only inconvenient, but also very quickly acquires a bad smell.

I think I have observed, that it is necessary for students from the country, to live a little *fuller*, while attending the dissecting-room, than they have been accustomed to do while in the country. If they do this, and, at the same time, take regular exercise, and attend to the state of their bowels, they will generally escape the bad consequences which occasionally occur from a cut on the finger.

The best treatment for the inflamed lymphatics, and the swollen arm, is to apply lint, soaked in the sugar of lead lotion, and tincture of opium, to the arm; and to take calomel purges, and large doses of opium, with plenty of wine and porter.

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* All these things may be got at a carpenter's tool shop;—the chisels, which are used for cutting iron, are the best.

† It is necessary to have one or two coarse cloths, to cover the parts which have been dissected; as they very quickly spoil, when left exposed to the air.

FIRST DISSECTION

OF THE

MUSCLES OF THE ABDOMEN.

IT is not of much consequence what part of the body the student dissects first. I shall here suppose, that he is to commence with the lower half of the body, which includes all the parts below the chest. But as this would be too much for one pupil to accomplish, it should be taken by two, between whom there ought to be a good understanding, as they will necessarily interfere with each other in their operations, and particularly in the dissection of the viscera of the abdomen and of the pelvis.

Before describing the manner of making each dissection, I shall endeavour, in a general way, to point out the best plan of proceeding.

As a student ought to acquire only elementary views of Anatomy at first, he should commence with the dissection of the origins and insertions of the abdominal muscles. After having dissected the muscles, he should examine the viscera. Having removed the viscera, he may dissect the deep muscles of the abdomen.

If the body be a male, he should then dissect the muscles of the perineum; and having made himself acquainted with them, he 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 of 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 course of dissection is to be prosecuted.

Dissection of the Muscles of the Abdomen.

The first observation which I shall make upon this dissection, is, that the student must not be disheartened if in his first attempt he does not make such a display of muscular fibres and glistening tendons, as he may sometimes see exhibited on the table of the lecturer; because it is really very difficult to make a neat and complete dissection of these muscles.

I have already remarked, that the student must, in his first dissection, be content with making himself master of the general connections of the muscles only; for until he has done this, he is not prepared to study the surgical anatomy with advantage.

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

When the body is put in this position, an incision is to be made through the integuments, in the line of the linea alba, extending from an inch above the ensiform cartilage to the symphysis of the pubes. A second cut should commence at the upper part of the first, and be carried in a semicircular direction over the chest to the 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 student should now commence the dissection of the first muscle, (external oblique,) at the cross cut; and as this is supposed to be his first attempt, 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 of the muscle which are between the ribs and the linea semilunaris; but between this line and the umbilicus much caution must be used, as the muscle forms a tendinous expansion here, which is frequently mistaken by the young dissector for cellular membrane, and thus the tendon of the muscle is improperly lifted and cut away In dissecting this 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 then with the finger and thumb of the left hand, the flap of skin should be pulled downwards and outwards, so as to make the fibres of the muscle still more tense. The dissection is to be continued, in the manner already described, down to the ilium. As the cellular membrane becomes denser, as we approach the groin, it may be mistaken for the tendon, but if it is not at once removed with the skin, it will be difficult afterwards to make the muscle clean by dissection with the forceps.

The upper part of the muscle is now to be exposed. It is difficult to do this part of the dissection neatly; we should again commence at the cross cut, and carry the knife in a direction parallel with that incision. The part of the muscle nearest to the ensiform cartilage must be dissected with great care, because it is very thin, and is liable to be raised, so as to expose the origin of the rectus, which confuses the young dissector exceedingly. 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. The method which I have now proposed, is the easiest for the young dissector; but the student who is accustomed to dissection need not make the cross incision from the umbilicus to the semicircular cut, but may commence at the sternum, and carry the flap down towards the ilium.

I shall give the description of the origin and insertion of the abdominal muscles fuller than those of any of the other muscles, because I frequently see the young student experience considerable difficulty in showing them. 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 is united with the muscle of the other side, at the linea alba. 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 two anterior thirds of the outer 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. The spermatic cord in the male, and the round ligament of the uterus in the female, may now be seen passing between the tendinous fibres of the muscle. This opening is called the external abdominal ring. The dissector should not now be particular in his attention to it, but wait until he makes the *surgical view*, which will be afterwards described.

We may now look to the general appearance of the muscle. First, the origins of the muscle from the side of the thorax, come down in thin layers over the ribs; then a stronger and more fleshy part is seen winding round betwixt the false ribs and the ilium; the expanded tendon on the fore part of the belly, is bounded by the linea alba; and the muscular fibres are divided from the tendinous part by the linea semilunaris, which is that tendinous white line which 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.

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, the remains of the umbilical vessels. The peritoneum will afterwards be found firmly attached to this part.

To dissect the next muscle, (internal oblique,) the body should be thrown a little more upon one side. The dissection is to be begun by separating the serrated origins of the obliquus externus from the ribs, and from its connection 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, farther 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. 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 the 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 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 be inserted by fleshy fibres into the three lowest ribs, and by a thin tendinous membrane to the four next ribs. 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 to the whole extent of the linea alba—while the other portion of the tendon, which passes behind the rectus, is not attached to the whole of the linea alba, but is gradually lost about half way between the umbilicus and os pubis; so that the whole of the rectus is not contained in a 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 there is a set of fibres which sometimes confuse the dissector; they are seen distinctly in the male only, for they form the cremaster muscle; they 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.

Unless we are at liberty to put the body into whatever position we please, it will be very difficult to dissect the next muscle; and it will be almost impossible to show all 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; so that, coming from this deep source, they must pass between the quadratus lumborum and sacro lumbalis. Therefore, at present, we can show only the connections which the transversalis has with the muscles on the anterior part of the abdomen. We may commence 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; but it is very 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, for there is a small artery here, which marks the line of division between the muscles. In this dissection we must not expect to make the transversalis appear very clean; for we must carry the knife across the line of the fibres.

It will be difficult to carry 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, and there it passes anterior to the rectus, with the obliquus, and is inserted with it into the os pubis; so that at the lower part of the abdomen both muscles pass anterior to the rectus. It will be afterwards found that there is only a little cellular membrane between this 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 obliquus internus; but 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 are the rectus and pyramidalis. The most important part of the anatomy of the rectus is its sheath. It has already been seen that it is formed by the splitting of the tendon of the internal oblique, 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 oblique 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 linea 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 a distinct muscle, called the pyramidalis. It arises from the symphysis pubis, and is inserted into the linea alba, about two inches above the pubes.

The parts being thus dissected, 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, no one can be at a loss to recapitulate their general character and uses.

It may be observed in the skeleton how great a space there is 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 be led to 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 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 a very important one. When on this subject, 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.

But still, 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 herniæ. 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. However, before describing those parts, I shall here introduce part of a paper which I published some years ago, descriptive of the anatomy of hernia.

Anatomy of Hernia.

It must have been remarked by every one who has been much in the society of students, that there is no subject which they are so anxious to comprehend as the anatomy of hernia. Those who have read much on the question before they have dissected the parts, begin in utter hopelessness 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; but still they will not be 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. They cannot imagine how surgeons can have puzzled themselves, and bewildered their readers, with that which they now think they find perfectly simple. We need not be surprised at this difficulty, since the descriptions which are given by some authors are quite at variance with true anatomy; while those views which are really correct, are given in so complicated and obscure a manner, that it is almost impossible, even for a man who is conversant with the anatomy of the parts, to follow them.

In the best authors there are omissions, which have been in a great measure the cause of the student's difficulty. A principal one is, the forgetting to describe 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, can make out the internal ring, according to the description given by Mr. 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 all the connections of the fasciæ, so as to destroy all resemblance to those views which have been taken by merely detaching the loose cellular membrane and glands with the handle of the knife, while the legs were forcibly separated from each other. We shall endeavour to simplify this piece of anatomy by giving an account of the manner in which the dissection is made in the Dissecting Rooms of Great Windmill Street, and we shall add, in the form of notes, the names which have been given to the several fasciæ by the various authors who have written on the subject.

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; here, the skin only should be raised; 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 superficialis communis, because it is of equal importance to the inguinal and femoral hernia. This fascia † is now to be dissected from the tendon of the external oblique. It has a very slight attachment to the expanded tendon, 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 the connection between the pubic portion of the ligament and the fascia 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 this part of the ligament, but we cannot lift it farther without using the knife; for the fascia becomes intimately united to the inguinal glands and to the fascia lata. Although we have raised this fascia, the accurately defined pillars of the abdominal ring, which

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* Tendon of the external oblique; Fallopian or Poupart's ligament; crural arch; ligament of the thigh; femoral ligament.

† Fascia superficialis of Mr. 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.

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

It is of great importance to make this dissection in the manner that has been pointed out, because much of the pathology of femoral hernia may be explained by it. By looking narrowly into the depression which has been formed by raising the fascia superficialis, 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. The general course of the femoral hernia is either to displace this gland, or to break through the meshes of the net-work; and then it will pass into the hollow which we have just described. The natural course of the hernia would be, to descend upon the thigh; but it is prevented from passing farther down, than about an inch, on account of the close connection which exists between the fascia superficialis and the glands of the groin; but when the hernia increases in size, as it is prevented from descending upon the thigh, it turns up and breaks through the slight connection which there is between the pubic part of the ligament and the fascia superficialis, and thus takes the place of an inguinal hernia. This explains 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 deduce principles upon which we must proceed to attempt the reduction of femoral hernia, when so situated. We must endeavour to bring the base of the sac to a straight line with the neck; and to succeed in doing this, we must first push the tumour downwards.

It has occasionally happened that a femoral hernia has passed up before the surgeon had finished the operation. We have heard the surgeon 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 be even advisable, in some cases, to cut through the fascia superficialis, so as to allow the sac to come to a straight line, rather than to persevere long in the use of the taxis. All who have seen many cases of femoral hernia must allow, that a cut through the skin and fascia, in an early stage, in many cases, 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 having cut through the fascia superficialis, that it never would have been reduced by the taxis; in that case all the steps of the operation must be performed.

We 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; but 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 mnst remove the loose fat with the forceps and scissars from the lower part of the cord; we shall then have such a view as is given in plates as the first stage of the dissection.* This 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, and 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 thus—the inferior pillar is formed by the pubic extremity of Poupart's ligament, which is not a rounded tendon that, viewing it on the outside, we should expect it to be, but it is so formed that part of it passes onwards to be attached to the linea ileo-pectinea by a flat broad horizontal tendon, while its more external part is inserted into the tubercle of the pubes; so that by this form of insertion there is a groove made for the lodgment of the spermatic cord.

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* Inguinal ring; ring of the external oblique; or external abdominal ring. The anatomy of the canal is most accurately described in the folio edition of Mr. Charles Bell's Dissections, published in 1799.

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 of the external oblique is to be carefully separated from the internal oblique, 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, for it certainly varies considerably in the manner in which it takes its origin; the view may be made more distinct by pulling the cord in a direction towards the scrotum, and 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 ileo-pectinea† of the os pubis, so as to assist in closing the space behind the external ring. At the termination of the connection of the internal oblique to Poupart's ligament, the fibres which form the cremaster muscle come off; but as these fibres occasionally arise from Poupart's ligament, the cord sometimes appears to perforate the internal oblique; ‡

* Spine of the os pubis; tuberculum spinosum; tuberosity of the pubes.

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

‡ 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 extensible 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.*"

but 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. The next stage of the dissection is to show the relation of the transversalis to the cord. It will be very difficult to raise the internal oblique from the transversalis, if we commence the separation at the lower edge of the muscle; but by cutting 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 artery called circumflexa ilii, lying upon the transversalis muscle, which will mark the line in which we are to dissect, so as to raise the internal oblique from the transversalis. The internal oblique is to be separated from the transversalis, and from its connection with Poupart's ligament, as far as the origin of the cremaster, and it is then to be turned over towards the linea alba. The whole of the margin of the transversalis will now 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 ileo-pectinea, form the grand protection against hernia taking place through the external abdominal ring; but 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. 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.*

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 Mr. Cooper; but this ring must be *made*. 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. If we cut

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* Fascia transversalis, of Mr. Cooper; fascia longitudinalis, or reflexa, of M. Cloquet; condensed cellular membrane between the peritoneum and transversalis muscle, of many authors.

this membrane from the cord, and push it up, and then let the cord go, there will be a hole, formed in the shape of a ring, but which, on its iliac side only, has a distinct margin, for on its pubic side there is only 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 the cord a flattened form. Having now made an internal ring, we should 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; but 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. Having laid down the transversalis and internal oblique again in their natural situations, if we push the finger from within downwards 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 were to descend as far as into the scrotum, it would be called scrotal hernia. This is the common course of an inguinal hernia, but its relation to the cord occasionally varies. 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 the vessels are more frequently on the fore part of the sac.

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 peritoneum pushes before it, that cellular membrane which has been called part of the transversalis fascia, and which we showed must be separated from the cord before the internal ring can be made; this, when condensed, forms the innermost covering of the sac. The hernia then passes under the transversalis and internal oblique, and 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 the cremaster and the cord; the fibres of the cremaster which lie above the sac will then be separated, by it, from each other, so that the cellular membrane which connects the scattered fibres, will form that which is called the cremastic or spermatic fascia. The hernia then passes through the external ring. In the early part of the dissection, there was a membrane shown passing from the margins of the ring to the cord, so as to make the ring indistinct; this membrane, which is sometimes called fascia propria, must also form one of the coverings. The hernia may now either 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 the peritoneum, which forms the sac, and which, in its natural state, is very thin, would be found very much thickened, and particularly at the neck of the sac; indeed it is occasionally so much thickened, 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, only a little cellular membrane would be seen covering the sac, and the sac itself would be so thin and transparent, that the colour of the gut may be seen shining through it.

The anatomy of the fasciæ in congenital hernia is much the same; but the sac which is formed by the tunica vaginalis, is generally thin at the lower part, but very strong at the neck.

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 patient 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.

The most common seat of stricture in inguinal hernia is the external ring; for 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 cannot deny that 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 internal ring, until it is made by pushing up the cellular membrane which surrounds the cord; and even then, if we try its strength, we find it very weak, and particularly on the inner part; while the neck of the sac is generally 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 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 pubic 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 Mr. Cooper.

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 we are very apt to destroy some of the connections of the fasciæ, 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 connection which there is between the fascia lata and the sheath of the vessels; but by doing so, we would destroy the natural view. This part generally receives the name of *superficial* crescentic arch;* for we shall afterwards see a *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 this part which is called crescentic arch, and above the portion which covers the pectineal muscle.

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 Mr. Cooper; and, as an addition to our stock of names, we have, from M. Cloquet, septum crurale. It must be very carefully examined, for it is the only

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* Femoral ligament, of Mr. Hey; falciform process of the fascia lata, of Mr. Allan Burns. All these parts are accurately described in the folio edition of Mr. Charles Bell's Dissections, published in 1799.—He did not give them names.

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

We 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, without our using the knife at all. At about an inch from the pubes, we see a depression, bounded by the cribriform fascia, through which the lymphatics pass into the pelvis from the thigh. The part of Poupart's ligament which is on the iliac side of this cavity, is very 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 this depression, and force it through the cribriform fascia, it will pass down into that hollow on the fore part of the thigh, which has been already described as the situation in which a femoral hernia lies. The firm connection which there was between the fascia superficialis and the glands of the groin, would have prevented us from passing the finger farther down; but 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 afterwards be found to have been produced by that which is called the deep crescentic arch.

To show this deep arch as a distinct fascia, there is a great deal of dissection required, and it may very justly be criticized 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. It 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 in-

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* 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.

ternal, 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 point of union of the external and internal oblique with it; 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 so completely separated from the parts below, that the ligament will appear to be formed by them only. But if we cut through the attachment of 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 we shall see that the deep crescentic fascia has nearly the same form as the superficial arch. This deep arch may be described as being formed, on the iliac side of the vessels, by a connection between the fascia iliaca and the obliquus internus and transversalis, and part of Poupart's ligament; and on the pubic side, by the fascia transversalis, in union with the insertions of the tendons of the two muscles into the linea ileo-pectinea. But this we shall more fully comprehend 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 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 of this space 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 which is in close connection with the abdominal muscles, and forms part of that which has been called 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 farther down upon the thigh.

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

M. Cloquet gives the description of this part too much in the spirit of a modern discoverer of fasciæ and rings. He 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 connection 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, but M. Cloquet says, that he and M. Beclard have seen many examples of it.

We shall now describe the layers of fasciæ which may be found in a case of 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 when it increases in size, it turns 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

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* There is no crural ring in the natural state of the 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 Mr. Cooper's plates.

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.

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 resemble 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 going 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 Mr. Cooper, fascia propria—a term which is by some objected to, for no such fascia is seen in the dissection of the natural parts; nor 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; and in an operation, 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 envelope 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 it will almost always be necessary to make use of the bistoury. 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 be made sufficiently simple.

In the course of our 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 the part which causes the strangulation, is of a semicircular form, is of great importance in settling the question,—how is the stricture to be cut?

Some authors direct us to cut inwards, some outwards, and others upwards. 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, we ought to follow the advice given by Mr. Charles Bell, to cut a little at different points, for this 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.

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 term, have taken their description of the ligament from that given by Mr. Hey. Mr. Hey describes Gimbernat's ligament to be the "posteror 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 which is generally described as the third attachment of Poupart's ligament, that there still remains that deep crescentic fascia which has been by us, perhaps erroneously, described as the continuation of the fascia transversalis, which is sufficiently strong to produce strangulation. Now, if Mr. Hey's description of Gimbernat's ligament be correct, here is sufficient proof that it 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.

Surely there cannot be any thing worthy of admiration in his manner of operating, for he most awkwardly, with both his hands, introduces his directory and bistoury on 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 had of the parts.

We may say in conclusion, that 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 confused descriptions of the parts which have been given at various times, 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; and though we will confess that it is very difficult for a student to get such opportunities, still we think, that it is in his power, while prosecuting his studies in London, to derive much more benefit by examining the preparations of hernia which are to be found in Anatomical Museums, and by paying attention to the history of cases given by a surgeon well acquainted with anatomy, than by endeavouring to follow all the various descriptions which have been given of the *fasciæ*."

I trust that what I have said in this paper 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 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 recognising 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 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 written by me, in the sixth number of the Quarterly Journal of Foreign Medicine and Surgery, February, 1820. The books on hernia 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 which are related by Mr. Charles Bell.

I shall now proceed to describe the dissection of the viscera of the abdomen, which I have already said ought to be made before the young student can attend, with advantage, to the subject of hernia.

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 is subdivided. 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 each side of this, there is an inguinal region.

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 must be cut through, in the manner best suited for giving a general idea of the anatomy.

Before cutting through the peritoneum, the transversalis, on 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 be able to form some idea of what is meant by the common expression, "that the viscera are behind the 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.

The view of the viscera now before us is most perplexing, and has no resemblance to their situation in the living body; indeed it is impossible to put any one turn of the intestines into the relation which it had to any other, while it was 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 the viscera are at the same time, by their peculiar peristaltic action, propelling their contents from the stomach to the rectum, we may form some idea of what 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, because 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.

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 the peritoneum 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 it is not so; for 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. 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 connections 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, as, of the liver, spleen, colon, small intestines, &c. A student may form a general idea of the inflections of the peritoneum, 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 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, we may trace it, 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". In the female, we may trace the membrane to the uterus, to form the ligaments of this viscus, and then, as the plica semilunaris, to the bladder; from which, as in man, we may again trace the peritoneum to the muscles of the abdomen,—and, so, round to where we began.*

The principal difficulty in following the inflections of the peritoneum, is owing to the great, or gastro-colic, omentum, the laminæ of which have been always matter of great 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, then the omentum would have appeared more simple; for in this case, 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

* I shall here enumerate certain parts of the peritoneum, which have not yet been mentioned; the student will have no difficulty in discovering them, without any further description:—*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 renale.* 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 bladder to the umbilicus, is formed by the part which in the fœtus was called "urachus"; and the two lateral lines are formed by the remains of the umbilical arteries. These parts are external, but adhere so closely to the peritoneum in the adult, as to appear to be produced by a thickening of the membrane.

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.*

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, and as this was described by Glisson as bearing some resemblance to a capsule, it has been called the capsule of Glisson. If the finger be put under these vessels on the right side, 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; but 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, 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

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* 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 which are sometimes called "omentulæ intestini crassi".

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.*

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 then by blowing upwards, the whole of the intestinum tenue, or small intestines, will be distended. The upper part, which will be now easily found, should be tied just before it passes under the mesocolon.

The small intestines are generally divided into five parts, three of which are given to the upper portion, which is 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 to be pulled downwards, and is then 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 the cardiac orifice of the stomach; 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 a thickening of the coats of the stomach, which forms the sphincter of the pylorus, improperly called a valve. Immediately below the sphincter, is the beginning of the duodenum; this gut appears generally so large, as, from its size, to entitle it to the name of ventriculus secundus; it may be traced up towards the gall bladder, and then, 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. The most important parts which we have to attend to in the duodenum are the ducts which pass into it. 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. On holding up the liver in this manner, we shall understand the derivation of the name, *porta*, for the part of the liver into which those vessels are passing, has something of the form of a gateway; whence 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: 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 which 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.

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.

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. In separating the viscera from 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; but it should be tied with a double ligature before it is cut.

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

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 the diaphragm will fall, relaxed. We should 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 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 closely invested by the peritoneum, as the chylopoetic viscera are; and therefore, they are generally described as being situated without the peritoneum. The kidneys may now 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 ilacus 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 by this, we should destroy some of the muscles of the thigh.

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 OR 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 OR 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 part 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.

DISSECTION

OF THE

ARTERIES & 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 of the perineum, if it be a male body. 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 very easily arranged; indeed, the whole anatomy of them is so simple, that it is almost a pity to sacrifice the abdomen for the arteries only; we should therefore 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 also 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 to put a tube into it afterwards for the injection of the lower extremity.

When we inject 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, it can hardly be expected that the vessels of the viscera, or of the limbs, will be fully distended, for 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, to manage the pipe properly, a great part of the thorax must be destroyed.

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, the injection will be easily made.

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.

But to understand the course of the veins which form the vena portæ, and at the same time not to endanger the cutting of them, we should inject them by putting a pipe into the ileo colic vein. This branch is easily found, as it has its name from being subservient to the caput coli and that part of the intestinum ileon which joins the colon; it is only necessary, therefore, to fold back the small intestines from the right os ilium, and to expose the caput coli, and to follow up the veins till they have assumed a size large enough to admit the tube. After puncturing the vein, and fixing the tube, there should be a ligature put upon the part of the vessel behind the tube, that the injection may be prevented from coming round and 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, for 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 dissector very much; but if we wish to fill them, we should put a pipe into the iliac or femoral vein.

When all the vessels are injected, the small intestines should be removed, and the colon blown up according to the description already given 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; 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 appropriated names, but compose one set of innumerable branches, forming, before they reach the small intestines, frequent anastamoses 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.

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 those branches of the superior mesenteric which are distributed to the small intestines in general; and, upon the great intestine, it inosculates with the second colic branch of the superior mesenteric artery, viz.

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, inosculating freely with the last branch, and upwards with

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 such another 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.

The INFERIOR MESENTERIC.—The branches of the inferior mesenteric artery are easily found.—The dissection may be made backwards, from 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, and as it supplies the left side of the colon, it is called the COLICA SINISTRA; it communicates with the median colic branch of the upper mesenteric artery, and completes a great circle of inosculations, reaching all the length of the intestinal canal.*

OF THE ACCOMPANYING VEINS SEEN IN THIS VIEW OF THE INTESTINES.—The branches of the veins run here 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: for all vessels should be named from 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.

Returning, then, upon the demonstration of the arteries—The *hæmorrhoidal vein*, rising from the back of the rectum, may be easily found; the *vena colica sinistra*, coming

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* In the dissection of the lower mesenteric artery, its root is found entangled by the nerves of the lower mesenteric plexus, which is formed by branches from the sympathetic, and by branches from the superior mesenteric plexus, and great cœliac plexus. The lower mesenteric plexus, surrounding the trunk of the artery, sends branches out along the mesentery to the left side of the colon, and to the rectum.

from the left-part of the colon, is united to the last; the *vena colica media*, the *vena colica dextra*, and the *vena ilio colica*, being united, return the blood from the arch of the colon; while one great branch, which is promiscuously divided among the small intestines, carries back their blood 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-ducts, 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.

The cœliac artery 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 distend 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 many branches; and as they depart in different directions from one point, as from a 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, in dissecting it where it goes off from the trunk of the cœliac, it is found to be larger than the other branches, it may be expected to send a branch to the liver, and we should then be more cautious in dissecting in that direction; for the vessel 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, it 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.

The ARTERIA SPLENICA arises from the trunk, or axis of the cœliac artery. It passes under 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 branch to the stomach, which, inosculating with the right gastro-epiploic artery, is called the gastro-epiploica sinistra.

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 branch sent off, is the arteria gastro-epiploica dextra, so named from its chief branch; or sometimes called the duodeno-gastrica, from that branch of it 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 splenic artery. As this gastro-epiploic artery runs across the under side 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 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 distributed to the stomach. From this plexus an immense number of smaller nerves are sent out, forming lesser plexuses, along the mesentery, and to the duodenum, liver, spleen, &c.

Of the VENA PORTÆ.—The vena portæ is formed by the union of the veins from the intestinal canal, and from those of the spleen and pancreas. Near the liver, these veins are collected from three great branches, coresponding to the cœliac, upper and lower mesenteric arteries. The trunk of the vena portæ lies obliquely across the spine, upon the body, and under 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 intestines. Its branches run in company with the extremities of the superior mesenteric artery, which pass from the duodenum, along the track of the intestines, to the middle of the colon. This vein joins the trunk of the vena portæ.

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. As the trunk of the vena portæ runs across the spine towards the liver, 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 of the stomach; then mounting obliquely upwards and towards the right side, it enters the porta of the liver, and dividing into two great branches, forms the great sinus 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 performs the office of an artery in the liver,* by distributing in it that blood which it collects from the arteries of the intestines. But 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.

In dissecting these veins, there is much cellular substance to be cleared away; and it is not easy, if the injection be at all brittle, to dissect upon their thin coats without cutting them, or breaking the injection.

The arteries which run to the kidneys, and the spermatic, may now be seen by lifting up the mesocolon; but in order to show them more distinctly, the chylopoetic viscera should be removed, and then we shall have a more distinct view of the trunk of the aorta, and the large branches going off from it. In order to remove the viscera, we should first cut through the cœliac artery at the part where it is dividing into its branches, and through the superior and inferior mesenteric arteries; leaving small portions of each, by which we may recognise them. The œsophagus is then to be divided; and by 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 fully 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, that 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

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

until it passes through the perforation in the tendon of the diaphragm.

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

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 blow-pipe; 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.

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.

The aorta, passing down towards the pelvis, divides into two great branches—

The Common Iliacs; and from these, all the arteries of the pelvis are given, except those to the rectum from the inferior mesenteric, and 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 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 must 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 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 SUPERIOR 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. Duodeno Gastrica. The lesser branches which come from these are called *Pylorica Inferior—Pancreatica Duodenalis—Gastro Epiploica Dextra—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 shall defer the description of the manner of dissecting them, until we come to the examination of the thorax.

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 connection with each other, from the body, certain parts will be seen more distinctly than when they were in situ. The examination of them 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 muscular coat will be seen, the principal fibres of which may be traced from the œsophagus. Before examining the internal 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; and 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.

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, for a glandular appearance near the pylorus;—and 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 its structure from that of an animal of the class of the mammalia, but there is also much variety in the stomachs of the different classes 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 duct opens 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 enters. A few muscular fibres, resembling those of the muscles of the ureters in the bladder, may be discovered in connection with the opening.

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 more 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 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.

The minute structure of the intestines is more distinctly shown by injecting part of them 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; and by opening one with a lancet, we may distend it with air, or mercury, which perhaps will pass into the glands of the mesentery, and then into the secondary vessels which pass 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 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 meal and milk 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 which is 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 plenty of absorbents; and on the inner surface, that there are few valvulæ conniventes.

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 to that gut which, in horses, is nearly a yard long, but in the human body, it 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 valve between the colon and ileon cannot be well understood except 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.

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, which 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.

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. If the liver has been taken from a young body, then the substance of the round ligament will not be firm, nor completely 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 firm as it is found 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 fetus, 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 portions of the umbilical vein which lie in them.

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

There are generally five lobes of the liver described, but the two great lobes and the lobulus Spigelii are the only important ones ; for, the lobulus quadratus, or anonymous, is only that portion of the liver which is between the gall bladder and the umbilical fissure,—while lobulus, or processus caudatus, is the name given to that part of the right lobe which projects to the lobulus Spigelii.

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 ; and if we make a section of the liver, though we shall see a great number of subdivisions formed by the membrane which supports the various sets of vessels, still they are so bound together, that it is very difficult to ascertain the real structure of the gland. The small round bodies, of which the substance is principally composed, have been called *acini*, and have been supposed to be the terminations of the very minute branches of the vena portæ, which are called *penicilli.* The biliary ducts, which have been described as conveying the secretion from the *acini*, are, at their commencement, called *pori biliarii.*

The examination of the structure of the spleen will be still less satisfactory, for we cannot even discover a duct in it. When the substance is minutely injected, it appears to be made up almost entirely of vessels, the extremities of which appear to communicate with cells, which are connected by cellular membrane that 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.

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

The structure of the kidney is more easily understood than that of any other viscus. The parts may be seen in the uninjected kidney, but much more distinctly in one which has been minutely injected.

Before we can understand the structure of the adult kidney, it is necessary to know, that in the fetal state, it is composed of a number of lobes, which give it, at that age, a lobulated form; but to see the several lobes in the adult kidney, we must make a section of it. Each lobe may be considered to be almost independent of the others; 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.

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: 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 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 to them as running upwards, each part will resemble the calyx of a flower,—but if we take them in another view, they will appear as little funnels.

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

I trust that this short sketch of the manner of investigating the minute structure of the viscera, will be considered as only an endeavour 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 a private 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, beginning a little above the middle of the sternum, down 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 is 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, if I were to take the description of the omentum from the common appearance which it has in bodies after they have been moved, I should have great difficulty in saying what its natural situation really is. I have observed, that if there has been inflammation in any one of the viscera, at any period, that the omentum is found attached to it; thus, the most common appearance of disease in the abdomen of the female, is adhesion of the omentum to the uterus.

It is a very 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 seen upon the gut, like those on the eye in ophthalmia, with a suffusion around them; in the second 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 important subject; but shall refer to a very 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 distention of the stomach and intestines, is also 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.

From the variety of appearances of inflammation,—from the black spots,—and from the ulceration and corrosion, which, in the course of my dissections, 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 those 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 alone, 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 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.

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; but in the child it is seldom the cause of death, while 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 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.

If a patient has long suffered from chronic inflammation of the abdomen, we may expect to find the intestines completely glued together: this is a common appearance in the abdomen of those who have been repeatedly tapped. In the scrophulous child we shall probably find the mesenteric glands enlarged and cheesy; in such a case, the lacteals will be often 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 shall 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 considered only a *lusus*,—it is called diverticulum ilii.

The most common appearance of disease in the liver, is the tubercle; and this 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, for this is a natural consequence of the irritation.

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 softened, in all old subjects. The peritoneal coat is very 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; but I suspect, that, like the other salivary glands, it is very seldom diseased. 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 we should always expect to find it more or less altered in structure, when there has been disease or irritation in the bladder. We should not forget, that there is occasionally a very curious variety in the natural form of the kidney, for, sometimes, the two kidneys are 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.

DISSECTION

OF THE

PARTS IN THE PERINEUM.

After the student has finished the dissection of the muscles and of the 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, that the students who are dissecting the upper half, and to whom all the muscles of the back 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 be made, for the four dissectors must now necessarily interfere very much with each other.

When we consider the operations which we may be called upon to perform on the parts in the perineum, we shall have a just notion of the necessity of the study of the anatomy of this part, to the surgeon who proposes to be an operator. But when it is known, that a common abscess in the perineum has not unfrequently been the cause of death, in consequence of the peculiar formation of these parts, it will be allowed, that the study of the minute anatomy of the perineum, should not be confined to the operating surgeon only. No one will assert that he can safely manage even the slightest obstruction in the urethra, unless he knows every turn of the passage; and if he cannot be confident in his treatment of a most common case, how can he possibly understand the proper and safe treatment of those complicated fistulæ which are now so frequent, and which require such nice operations? It might be thought that such observations were quite unnecessary, were it not a common opinion 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 it is so complicated, that I have found very few students who were capable of making themselves masters of the many points of interest, unless they went through a regular series of dissections. I shall, therefore, endeavour to describe such a course of dissections of the perineum, 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.

In such a complicated structure as the outlet of the pelvis, it will be absolutely necessary to dissect the parts many times; I shall, therefore, in pointing out what I conceive to be the best plan of proceeding, endeavour so to describe it, 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 the student 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.

Position of the Body.

Tie the hands and feet so as to put the body in the same 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.

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, and 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 compare the ramus of the pubes and ischium, and the tuberosity of the ischium, with the same parts in the subject; then make the first 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 ¾ 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.

These incisions will enable us to expose the principal muscles. The cut along the ramus of 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 show 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 on both sides; for I have always found that the student got a very imperfect idea of the anatomy of the perineum, from 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. But we must be particularly careful in dissecting the origin of this muscle, for the transversalis is connected with it. The same dissection should be made on the other side, and then there will be a distinct view of the crura of the penis, and the attachment of the erectors.

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 very liable to be foiled in his first attempt to dissect this muscle, because its fibres are not only frequently very indistinct, but its place is often supplied by a set of fibres from the levator ani. Sometimes, indeed, we may discover two transversales; while in other bodies there is no proper transversalis, but a set of fibres which, though they may have 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 other muscles into the condensed cellular membrane on the lower part of the bulb.

The ejaculator seminis may now be shown by dissecting carefully from the cut in the Raphé, towards the erector penis and crus of each side. After the fibres of this muscle are exposed, the loose skin should be taken off from the penis, so that a more distinct view of the parts may 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, but that 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".

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, without fear, set our knife on the edge of the tuber ischii, and carry it full $\frac{3}{4}$ of an inch inwards and downwards, without the risk of cutting any fibres, except some of the gluteus maximus.

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

It will not be necessary to remove the erectors, for the crura penis are sufficiently distinct while they are attached to them; but the fibres of the ejaculator and of the transversalis, are to be carefully raised, so as 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 triangular, will be seen; or by pushing in the finger, the ligament will be felt.

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.

The penis and bladder should 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.

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 sawed 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 the thighs being forcibly pulled 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 left 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; but in doing it, we must carefully avoid the urethra. By proceeding in this manner, the muscles of the hip will be saved, but still the deep muscles of the back must be cut through by a cross incision; however, these muscles are of little importance, compared to the parts seen in the lateral view of the pelvis: indeed, the body should be divided immediately above the sacrum, before the perpendicular section is made. This last method may be sufficient to give a general idea of the bladder, rectum, and urethra; but 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.

The view which is now given, 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; but if the staff has been passed into the urethra, the bladder 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; but as the surface will still be obscured by the peritoneum which covers a great part of it, it may be useful, even in a first dissection, to pay some attention to the folds of this membrane.

The peritoneum will be seen passing from the muscles of the abdomen to the fundus of the bladder, and from that, continued down upon the 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 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.

The peritoneum may now be raised; it is so loosely connected with the bladder at the fundus, that, with the fingers only, we may tear it from the muscular coat of the bladder; but we must remove it more cautiously from the lower part, or we may destroy the ducts of the testicle, which run on each side of the bladder; but these ducts are so thick and dense, that, though they may not be seen, they will be easily felt. If we put small bougies into the ureters, as a guard against wounding them, we may proceed more boldly in removing the peritoneum from the lower part.

The muscular fibres of the upper part of the bladder will now be seen; but a great deal of dissection is required to make the parts below, distinct. Part of the rectum is still covered by the levator ani, which ought now 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. The bulb should now be made distinct, by removing any muscular fibres that may be attached to it; but we must be very careful in dissecting immediately under it, for the little bodies which are called Cowper's glands, are situated here. These bodies 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.

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

Such a dissection as has been described, will enable the young student to understand the principal parts connected with the passage of the semen, of the urine, and of the fæces; and will enable him to follow the descriptions which are given in the "Systems of Anatomy."

As it will not be possible in this view, to gain more than a general knowledge of the parts which are cut in lithotomy, I shall only remark at present, 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.

Although the parts may not have 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 there is, at this point, a natural pouch, which is called the sinus of the urethra.

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. 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. 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; but if we follow the vasa deferentia quite 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 description 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 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, for there is no direct communication between it and the cavernous body. To distend it, it will be necessary to make a puncture, sufficient to admit a blow-pipe into its substance.

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, so as to avoid injuring the points of demonstration, which 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 proved by Mr. Bell to be small muscles for regulating the opening of the ureters.

By squeezing the vesiculæ, the opening of their ducts, and of the testicle, will be discovered by a brown fluid issuing 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, which projects so as to form a pouch, or sinus, that opens towards the glans. The cavity formed by it has been called sinus Morgagni, or sinus pocularis. By blowing towards the bladder, the membrane will be raised; but the vesiculæ will not be distended, as is generally supposed, for their ducts do not open into the sinus, but on each side of the membrane.

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. By a little care we may pass bristles into the ducts of Cowper's glands; but 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, that are called lacunæ; but the principal one, which is called lacuna magna, is sometimes destroyed in making the section of the urethra,—for it is situated on the upper surface, about an inch from the opening of the glans.

The cellular structure of the cavernous body surrounded by the ligamentous membranes, and divided into two portions by the septum pectiniforme, will now be understood. 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 the membrane in its length,—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, whic passes down to the membranous part of the urethra, and forms even a small bulb there. This I have particularly described in the tenth volume of the Medico-Chirurgical Transactions.

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*, we cannot suppose that any spasmodic affection of such muscles will account for the occasional difficulty of introducing a bougie into the urethra. I suspect that Sir Everard has been mistaken in supposing that there are any muscular fibres in the urethra, for 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.

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 to the entry of the instrument.

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,—more loosely to the parts about the anus, and still less 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.

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 superficialis 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,

* 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.

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. 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.

As the arteries have been injected, we may already see, that if the first incisions be properly made, that there can be no danger of hæmorrhage. The small arteries have been already noticed. The first artery of importance which is found in the perineum, is that of the bulb, and which 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 perineum 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, if he has his wits about him, can be in danger of cutting it, if he performs the operation with the scalpel. When the artery is cut, it must be by a careless introduction of the gorget, or in withdrawing the bistoure cachée through the upper part of the arch. Before we leave this view, it may be remarked, that there is another good reason, besides those already given, for making the incisions low, viz. that the urine will be prevented from lodging, after the operation, and producing abscesses,—which it is very liable to do, when the incisions are made high in the perineum.

It is not easy to pass an instrument into the bladder while the body is in this position, but we ought to try and introduce a catheter; 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 manner of avoiding the sinus at the bulb, was pointed out in the first dissection; but we may still be foiled in the attempt to introduce the instrument, even though we attend to the rule of withdrawing it from the sinus, and elevating its point before we push it on. To discover the cause of our 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.

It will now be evident that there are several causes of difficulty to the introduction of an instrument through this part of the urethra—1st. The natural curve of the canal—2d. The sinus of the bulb—3d. The edge of the triangular ligament: but the principal difficulty is caused by the circular ligament which surrounds the narrow part of the canal.

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 this natural narrowing of the canal having been mistaken for stricture. I am now, 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 before, I beg him to let the urethra 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, so as to lead the patient to believe that the difficulty of introducing the instrument is in consequence of a stricture. But there is another source of error here,—for the end of the bougie may be indented by being pressed against the edge of the ligament, so as to give exactly that appearance which has been considered as 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. 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.—Part of the air and water should be pressed from the bladder, and then its anterior ligaments will be observed.

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, so 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.

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, that if it were possible to perform the operation of lithotomy without cutting this fascia, that there would be no danger of infiltration of urine, after the operation. But, unfortunately, experience proves 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 vesiculæ seminales: here it is called fascia vesiculis. But there is also another portion of fascia, which has a firm attachment to the symphysis pubis, and passes down to the prostate; it 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,—because the fibres of the levator ani are interposed between them.

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

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 connection with the upper part of the ramus of the pubes, we shall see, immediately behind the circular ligament, certain muscular fibres, which are covered by a set of small vessels. These muscular fibres have been described by Mr. Wilson as forming a distinct muscle, which surrounds the

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

membranous part of the urethra. That there are muscular fibres here, no one will deny; but it will be found 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.

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

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* It is to be hoped that the prejudice in favour of the gorget, will now give way to the use of the knife, 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, is admirably shown in the Illustrations of the Great Operations of Surgery, by Mr. Charles Bell. Mr. Bell has, in his Surgical Observations, published some time ago, given proofs of the success attending his mode of operating; but 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 Chirurgical Transactions, of more than eighty cases of lithotomy, in which he performed 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 it is not only a very dangerous, but also a more difficult operation to perform, than the lateral. Although the observations which I have made in that paper, have by some been thought more severe than the occasion called for, yet I have been much gratified and flattered by the manner in which several surgeons of great eminence and learning have spoken of them. But nothing has given me so much pleasure as to find that my opinions coincide with those of Mr. Martineau, who, I have been informed, was pleased to say, " that he was sorry he had not read my observations before he wrote his paper upon lithotomy, as he had taken the same view of the question of the high operation as I had ".

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; but I have since had an opportunity of examining a body upon which the lateral operation had been performed: in the dissection of this body I discovered a good reason for these fears; for *the incision had been begun* importance will be cut. The bleeding which takes place 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 puncture of the bladder is to be made from the rectum.

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

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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 cutting some important arteries.

If this *middle operation* (as it was called by a young friend of mine) were the one generally performed as the *low* operation, it would not then be surprising that some gentlemen should have a desire to change the mode of operating; for instead of the stone being easily extracted, as it may be, when the operation is performed low in the perineum, it will be pulled by the forceps against the rami of the pubes,—so that the patient may be dragged off the table before the stone is extracted. If the stone should be extracted by such an incision, the chances are, that some of the vessels will be cut, and the patient die of hæmorrhage: if he escapes this danger, he may still be in jeopardy in consequence of the urine not having a depending opening by which it may easily pass off after the operation.

When discussing the operation of lithotomy with some of the young students in the dissecting-room, I have very often put this question when the body is before them,—“What is your object in performing the operation of lithotomy?” Though this question is considered rather insulting, still it leads them to form a correct notion of one of the great principles of the operation, viz. to *cut low* in the *perineum*, that the extraction of the stone may not be obstructed by the narrow part of the bony arch.

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, and the bladder is to be again filled with water.

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 attain 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. The finger should be passed into the rectum, and then the stone should be pressed down towards it, so that we may 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, given 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.

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 mechanical difficulty, as in consequence of there being very 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.

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 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. We have only to look to the curve which the rectum makes, to avoid falling into the error of supposing, that the difficulty which is offered by the sacrum to the passing of a bougie, farther than six inches into the rectum, is caused by a stricture in the gut.

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.

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 re-

* 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;—a difficulty, which is completely obviated by the large staff which is used by Mr. Bell.

semble 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.

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 morbid appearances which are found in the urethra and bladder, I dare not enter upon the subject, farther than to point out one or two 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 at the bulb, is produced by a stricture.

There are two circumstances, not hitherto much noticed, to which I would particularly direct the student's attention:—

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, that 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 a severe case of stricture, we ought to be content with so dilating the stricture, as to enable the patient to pass his urine freely,—and that we should not be too anxious to pass an instrument into the bladder, for, 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.

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 book would permit,—I shall only remark, that I think I have proved, by repeated dissections, that the 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 had died of stricture, discover the bladder in this state,—and even having cysts communicating with it; for when the muscular coat is thickened, it very frequently occurs, that a part of the internal coat is 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.

Table of the Muscles.

The muscles which are 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; and by the fibres of both sides uniting, the bulb is completely enclosed.

It is connected behind with the fibres of the sphincter ani and transversalis 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;—sometimes 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 lower set of the muscular fibres on the rectum, have been by some described 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.

USE. To move the os coccygis forwards.

In dissecting the parts exposed by the section of the pelvis, we may observe certain small muscles, the connections 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 which are 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 in 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 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 will be described with the nerves of the abdomen.

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 this, we cannot form a correct opinion upon the varieties of hydrocele and hernia. But as we cannot attain it, 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.

If we examine a fœtus of six months old, we shall discover the testicle lying under the kidney, on the fore part of the psoæ muscles, and 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, which stretches up from the inside of the abdominal ring to the body of the testicle,—this is the GUBERNACULUM TESTIS.

In a fœtus at the eighth month, we shall probably 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 as that 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 in the adult, 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; because the communication with the abdomen is now closed by the adhesion of the peritoneal surfaces.

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 which is called the DARTOS; but although there is an evident power of contraction in the skin of the scrotum, we shall seldom be able to discover muscular fibres under it,—but, instead of them, a quantity of loose cellular membrane, which can easily be inflated with air. In blowing this up, a sort of natural septum will be seen between the two sides of the scrotum. 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, it will be attended with more 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, which are 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.

We may 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, that it does not contain the whole testicle, as in a sheath, but only the two anterior thirds of the body of the gland, which will be seen covered with the dense white glistening coat, which was formed by the adhesion of the peritoneum to it, 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 them to a dense fibrous matter which is under this coat, and immediately invests the testicle. There is, however, some difficulty in determining which is the most proper name; for even Haller is not very distinct in his definition of the two coats; but 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".

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 very 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 which are 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 coats. We can now understand how, in a common hydrocele of the adult, the body of the testicle will be on the back part, and the water which is confined between the tunica vaginalis and albuginea, will form the anterior part of the tumour. We can also comprehend how, in a child, where the connection with the abdomen is not closed, that there may be a hydrocele which may be emptied by pressure and change of position, but which will *again return* when the child is put on its legs. It is also evident, that as long as this communication remains open, that a portion of the intestine may come down into the space between the tunica vaginalis and albuginea, so as to form the 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, but that a species of encysted hydrocele has taken place in it.

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 is the most difficult vessel to discover, as it is very small. 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.

The cord should now be cut through, at its exit from the abdominal canal; but 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, which is called GLOBUS MINOR;—while the part at which the epididymis terminates, 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, which are called *sepimenta*. We may now trace the parts of the seminal duct, from the TUBULI to the vas deferens: by raising the coats towards the epididymis, we may, perhaps, see the vessels called VASA RECTA, which pass from each bundle of the tubuli, to form the intricate plexus called RETE TESTIS,—and which is continued towards the globus major, and gives off, within the cellular membrane covering it, the vessels which are called VASA EFFERENTIA, or VASCULAR CONES. 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, passing off from the vas deferens, and terminating in a cul de sac.

The name of CORPUS HIGHMORIANUM is given to the part of the testicle where the vasa recta unite to the rete testis.

I shall now 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 saw 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 connections with the posterior and lower part of the pelvis,—we may remove the whole of the viscera in connection with the os pubis. By a little care, we may also keep the testicles attached to the bladder, through the medium 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 this vein; but I have seldom seen a good preparation made in this way. I have always found it safer to make another 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 this 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 injecting them, a long iron sound should be passed into the bladder; which will, in some degree, preserve the parts in their natural position. *The white cold injection*, or the 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 he will 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 very 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, for the beauty of such a preparation will depend 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 yet 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; 2d. 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 connections 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 then by pulling the penis from below, it will be easily separated from the loose kin.

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 a phymosis.

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, before the parts are sewed up, 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 which varies 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 part called 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 here, 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 crus of the os ischium internally: 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 one 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 RETEFORMIS,—or sometimes, CORPUS CAVERNOSUM VAGINÆ.

The parts within the pelvis should be examined, before a perpendicular section is made. The peritoneum has been already 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,—for 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 now easily understood. If we lay open the vagina, we shall see the part of the uterus which is called the OS TINCÆ; the portion to which the vagina is attached, being called the CERVIX. Upon the internal fine secreting membranæ 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 the urethra, 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 there is a cyst 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 will be 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 connections 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 connection, so as to make himself master of the surgical anatomy of the lower extremity.

I shall now endeavour to describe the best method of conducting the investigation of the anatomy of the thigh and leg in this order.

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 is commenced at this point, 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 the 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; but I may here remark, that it will be more difficult to make a good exhibition of the fascia in a strong and fat subject, than in a thin one.

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 thigh, is the RECTUS; but before we dissect this, or the VASTUS EXTERNUS, which is situated externally to the rectus, we should expose the fleshy part of the TENSOR VAGINÆ FEMORIS, or 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 connection 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 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 composed of the three which form the TRICEPS OF 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 shall be obliged to remove a number of vessels, glands, &c. by which we shall expose the insertion of the PSOAS MAGNUS and ILIACUS INTERNUS into the trochanter minor. By dissecting between the pectinalis and adductor longus, we shall discover the ADDUCTOR BREVIS, which has very 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 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; for the only guide which we have, is a few vessels which pass between the muscles.

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

The first muscle which is 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, but that part of the spine is occupied by a portion of the GLUTEUS MEDIUS, which 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, leaving it attached, by its insertion, to the linea aspera; and in doing this, we should raise as much of the cellular membrane as we can, along with the muscle. If this has been done carefully, 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 we should, 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.

Before we can dissect these small muscles, we must turn the heel out, by which we shall 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 relaxed, so that it may be held aside. I may also remark, that it will be necessary to turn to the inside of the pelvis, before the obturator internus and pyriformis can be completely dissected; and that before the tendon of the OBTURATOR EXTERNUS can be seen, the quadratus femoris must be raised. To show the whole of the obturator, 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. Before the muscles on the back of the thigh are exposed, the student should refer to the table of origins and insertions, for a description of the muscles which he has just dissected.

The limb is to be then extended, and laid 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 the origin 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, and that the two portions, when united, pass down to the head of the fibula; this is the BICEPS, and is the muscle which forms the outer ham-string. Before removing the fat and the nerve and artery which are in the ham, between the semitendinosus and biceps, we should dissect the muscle that arises from the ischium, below the semitendinosus, 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.

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; and the opening in it through 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 as long as the muscles are covered by the skin, they will keep fresh.

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, which is 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.

We may now proceed to dissect the muscles. The external muscle of the calf, the GASTROCNEMIUS, is very easily shown, for 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 also see the small muscle (PLANTARIS) which arises in union with its external origin, 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.

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, 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; but it will not be possible to trace these muscles to their insertions, until those of the foot are dissected. By cutting away the fascia, and all the vessels and nerves, with their surrounding cellular membrane, the origins of these muscles will be seen, viz. 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.

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 the tibialis anticus, we shall find it pass to the 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 at this part; we should therefore first dissect its tendon, which is inserted into the metatarsal bone of the toe next the little toe.

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 several of the tendons of the muscles on the leg running between them.

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 FLEXOR and ADDUCTOR MINIMI DIGITI on the other. When these are made out, there will only remain the TRANSVERSALIS and the INTEROSSEI.

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

To pull the thigh backwards, there are three muscles, viz. the GLUTEUS MAXIMUS, GLUTEUS MEDIUS, and GLUTEUS MINIMUS, which have, as antagonist muscles, 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.

CLASSIFICATION OF THE MUSCLES OF THE THIGH, LEG, AND FOOT.

MUSCLES OF 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 OF 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 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 the fore part, TIBIALIS ANTICUS, EXTENSOR DIGITORUM COMMUNIS, and EX-

TENSOR POLLICIS PROPRIUS; the six on the back part, may be still more easily subdivided into the three which are inserted into the os calcis, viz. GASTROCNEMIUS, SOLEUS, and PLANTARIS—and into the three deep muscles, TIBIALIS POSTICUS, FLEXOR DIGITORUM LONGUS, and FLEXOR POLLICIS LONGUS.

MUSCLES OF 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 the TRANSVERSALIS and the INTEROSSEI INTERNI, on the sole of the foot; and on the fore part, the EXTENSOR BREVIS DIGITORUM and the INTEROSSEI EXTERNI.

The following table of the origins and insertions 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.

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.

GLUTEUS MINIMUS. OR. A ridge that is continued from the superior 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.

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 page 32.

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 73.

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 outwards round the root of 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 outwards. 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 breadth of the condyle.

IN. Head of the fibula and ligaments.

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 metatarsal 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 cuneiforme 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 and back part of a 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 EXTREMITIES.

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

If the muscles are much decayed, they should be removed, and the pelvis put into water for a day or two. But the best method of proceeding is, either to remove the muscles while they are fresh, and to dissect the ligaments of the pelvis before the muscles below the knee are examined, or to allow the parts to lie in water until the muscles become so soft that they can 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; but all these are of very trifling importance, compared to those which are between the bones at the outlet of the pelvis.

The ligaments which are between the lumbar vertebræ and the sacrum, are so similar to those of the spine, that I shall omit the description of them here. But 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 also 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 connection between the sacrum and ilium, is at the sacro iliac symphysis, through the medium of a fibro cartilaginous structure, which is sometimes called the *Sacro Iliac Ligament;* but this cannot be seen until all the ligaments are cut through, and the bones torn asunder. Some small ligaments will be seen, after the muscles which lie 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 Posticum 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, is that which 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 now be shown, 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, which is 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 oblique 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 abdominal muscles.

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.*

There is very little dissection necessary, to show the ligaments of the hip joint, for if all the muscles * are raised, the only ligament which surrounds the joint will be seen. This is a very strong ligament, and is called the LIGAMENTUM CAPSULARE. It takes an attachment round 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, forming the *Ligamentum Accessorium Anticum.* A similar band may be seen on the posterior part, and which forms 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 hold it in its place, independent of the ligaments; but by pulling a little, the femur will be easily displaced: and now the ligament, which is called by some 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

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* 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.

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.*

The ligaments connecting the femur, tibia, and patella together, are very numerous; for though the motions of the knee joint are very simple, being merely flexion and extension, still many ligaments are necessary, as 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 which are 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 CAPSULARE. It is in itself very thin; but it is strengthened by tendons and ligaments, particularly on the fore and back part. There is only one distinct ligament on the inner side of the knee, 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 which is between the patella and the tubercle of the tibia, is sometimes described as a ligament, and is called 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,—but, by a nice dissection, these may be proved to be also external to the capsular ligament. To show the internal ligaments, we should cut through the capsular ligament, beginning at the upper part.* As the cut is carried past the patella, a duplicature, or tucking in of the ligament, 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 fall, separated from the tibia. We have now finished the examination of the ligaments which unite the femur with the bones of the leg; but there are still some ligaments on the head of the tibia, which form 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 which is 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 which is called *Transversale*; and lastly, we may observe, that the extremities of the two cartilages are attached to the tibia by separate ligaments, each of which is called *Oblique.*

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* 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.*

The Ligaments which are generally enumerated, are:—

(EXTERNALLY.)

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

(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.*

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; but 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* et *Ligamentum Capitulæ Fibulæ Posticum;* at the lower head, they also receive similar names: but we may remark, that in consequence of the inferior ligaments being divided by cellular membrane, and vessels, which pass through the middle of them, 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.

As the ankle joint 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 lateral motion. The ligamentum capsulare is very thin in this joint, but it is strengthened by the ligamentous bands which keep the tendons of the muscles in their proper positions; but 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 *Perpendiculare*, 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. ——————————— *Posticum.*

The ligaments which connect the bones of the foot together, may be exposed by removing the tendons of the muscles. The ligaments 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 very 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 Mr. 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. But if both limbs be injected from their corresponding iliac arteries, the middle sacral artery will be lost. This, however, may also be filled, if the right leg be injected from the aorta, the left iliac having been tied immediately below the point of bifurcation. The other leg may be afterwards injected by putting a pipe into the iliac, below the point where it was tied.

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 in the pelvis very 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.

There are very few directions 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.

But before the student commences the dissection of the arteries, 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 very much in learning the distribution of the arteries, for he will find that the number of branches will very nearly correspond with the number of the more 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*.

The COMMON ILIAC of either side may be very easily exposed, for 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 more generally rises from the internal iliac.

If we trace the common iliac for about an inch and a half, we shall find it divide 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 trace; and were we not to recollect that they formed two distinct classes, it would be difficult to understand them.

The trunk, after leaving the common iliac, is almost concealed by the great veins; but these may be cut away, because, in the present dissection, 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. This will be explained by the dissection of the fœtus, for there we shall find that the internal iliac is continued to the umbilicus as the *hypogastric* or *umbilical* artery, the upper portion of which gradually degenerates into ligament as a person advances in years.

In the adult, small branches, which are 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 passing towards its middle, and which are 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 are very irregular. 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 cannot be seen at present, as they generally arise from the pudic. A section of the pelvis, such as has been described at page 57, 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; and 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 obturator; for it frequently rises from the external iliac, in union with the epigastric.

In dissecting these branches, it will be most convenient to begin with the obturator. This may be very quickly traced; and having finished it, the pudic may be next followed. There is some difficulty in dissecting the first set of arteries which the pudic gives off, for they supply the viscera of the pelvis, and are united with the branches of the inferior mesenteric. In the male, we shall 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)*. But in the female we shall find, besides these, a very large artery passing to the uterus (*the uterina*). We may now trace the trunk 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 74. This description will suffice for only one side of the pelvis; for in the other, the small branches must have been cut across in removing the viscera.

As the ISCHIATIC comes as often from the gluteal as from the pudic, it is difficult to describe the irregular branches which pass from it while it is within the pelvis. But they are generally of little importance, for the artery will be found to pass out of the pelvis, very little diminished 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.

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.

We should, therefore, make such a dissection of the muscles of the hip as is described in p. 88; 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, which are 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.

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; but 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 which 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.

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 *Circumflexa*, *Articular*, *Recurrens*, or *Anastomotic*. But, in making this arrangement, we must, at the same time, recollect, that the vessel which is passing to supply the parts below the knee, is the principal artery in the thigh.

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, and then some small arteries will 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 are then to be held aside, and the trunk is to be 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.

There is here much difficult dissection, and the only rule that can be given for conducting it, is to trace the trunk very cautiously with the forceps and scissars, for large branches will be found passing off from each side of it, 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 all 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.

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 there are only some small branches given 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, and that may now be traced towards the insertions of the triceps, through which they pass to the muscles on the back of the thigh, are, in number, three, four, or five. But before we can see them distinctly, we must make a careful dissection of these muscles, and then many branches will 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; but if, in looking for the trunk, we dissect deeply the edge of the biceps and semitendinosus, we shall be very apt to cut some of the lateral branches. This may be avoided, by commencing the dissection in the middle of the ham; for after raising a very 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 now 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 very 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 which is *Ramus Profundus Popliteæ*;—from the lower part, 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*; but 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 separate 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.

We shall see only a small part of the ANTERIOR TIBIAL, for it almost immediately passes through the interosseus 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 the edge of the popliteus muscle. But 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 popliteal 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; but 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.

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 always depends upon 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,—one to the bone itself; and when about four inches from the ankle, it will be found to divide into two branches, which are 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 first 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.

The manner of dissecting the arteries, which has just been described, should be nearly followed in making a preparation; but the dissection should be prosecuted in a very different manner, in studying the surgical anatomy :

but that, 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 the most important, are 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 that 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. GLUTEA; 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 glutei, 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, 1. Hæmorrhoidales Mediæ; 2. Vesicales Imæ; *while between the ligaments*, 3. to the gemini, obturator, and pyriformis muscles; *on entering the pelvis again*, 4. Hæmorrhoidales Externæ; *in the perineum*, 5. Superficialis Perinei; 6. 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 PENIS.

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, and often 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 this is 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, viz. while concealed in the tendon of the triceps.

POPLITEAL ARTERY.

(Being that part of the trunk which lies in the cavity behind the knee joint.)

I. Ramus Profundus Popliteæ; to the ham-string 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. Branches to the Gastrocnemii Muscles, viz. the Surales.

GREAT DIVISION of the POPLITEAL ARTERY into the ANTERIOR TIBIAL ARTERY and the POSTERIOR TIBIAL ARTERY.

ANTERIOR TIBIAL ARTERY.

Before passing betwixt the bones—1. A small ascending branch, which 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. ——— interosseæ.

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. Interossea 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; for there are only a few branches which pass to the skin, and three great nerves which supply the muscles.

The dissection of these nerves would be very easy, were they all below the fascia; but as the cutaneous nerves are superficial to it, it is very difficult to show them and the deep nerves at the same time. We should, therefore, dissect the cutaneous nerves first; and 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 of the loins, we shall see several small nerves passing across the iliac muscles towards the thigh; these will be afterwards found to be the cutaneous nerves.† One of these may be seen running from the first lumbar, across the psoas magnus and the quadratus lumborum, to the posterior part of the spine of the ilium. From this it may be traced, for some way, in a canal between the transversalis and 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;

* It would, perhaps, have been better to have described the nerves of the viscera before those of the lower extremity, as it will be necessary to remove them, before the origin of several of the nerves which pass to the thigh, can be shown. But as this would have broken in upon the arrangement of the *dissections* of the thigh, the present plan has been followed; the nerves of the viscera will be described with those of the thorax; if the student wishes to dissect them first, he should refer to that part of the work.

† It is difficult to say what names ought to be given to the cutaneous nerves, because there are very few authors who use the same terms; but 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.*

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 labia 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 it gives off several branches; the principal one is that which passes along the crural arch to the upper part of the scrotum. We may now look to the second lumbar nerve, and 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; it will then be found under the fascia lata; here it appears a little enlarged, and immediately divides into two branches, one of which passes to the skin, but the other goes directly downwards for a short distance before it pierces the fascia; it is then distributed to the skin on the outer part of the thigh, nearly as far down as the knee. But the most important branch of all these cutaneous nerves, is that which rises from the first lumbar, and, while it is passing through the substance of the psoas, receives a branch from the second lumbar. This nerve 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 part and middle of the thigh.

Besides the branches which have just been enumerated, three or four nerves will be seen coming through the fascia, 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 arise from the lumbar; on the lower part of the muscle we shall find another set, which arise from the sacro-ischiatic, and the most important branches of which, pass 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; and those on the outside, (the *Posterior External,*) rise from the great nerve, after it has emerged from under the gluteus maximus.

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.

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 connections with the cutaneous nerves on the back of the leg, and with those of the deeper nerves,—which shall be described presently.

In making the dissection of the cutaneous nerves, we should, at the same time, attend to the distribution of the superficial veins, which may be seen, though uninjected. 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.

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 gastrocnemius, 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 notice, 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 loose muscular fibres, being flat reddish lines; being pellucid only when distended with air. When they are blown up, or injected with mercury, they take a very peculiar appearance, for they swell only betwixt their valves. 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 receive the lymphatics from the superficial part of the thigh, the second receive 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. The lymph is then carried from these, 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 57.

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.

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 trace it farther, we should attend to the 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 connection with the anterior crural nerve; for it also arises from a plexus, which is formed by the third and fourth lumbar nerves, and sometimes by a twig from the second.

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.

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 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.

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 ones are one or two which run along the inside of the thigh, to unite with the saphenus longus.

While the SACRO ISCHIATIC NERVE is in the form of a plexus in the pelvis, it gives off several branches, the principal of which is the PUDIC; indeed, this 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 gemini muscles, but it is not unusual to find the pyriformis perforated by the nerve; sometimes, indeed, the nerve is divided, by the tendon, into

* 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.*

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, by which we shall 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 very often appear to go quite into the ham, without dividing; but still we shall find that it may be very easily split, for some way up, into two portions.

The TIBIAL should be traced first. 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; and 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 which are called *Plantar:* to trace these, we must cut through the muscles of the foot.

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 its corresponding muscles,—forms a connection with the internal plantar, and then supplies the little toe, and one side of the fourth toe.

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 tracing the trunk over the fibula, it will be found lying very deep between the muscles, where it immediately divides 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.* 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.

SURGICAL DISSECTION

OF

THE LOWER EXTREMITY.

I shall now endeavour so to describe the manner of making the dissection, as to enable the student to understand the principle points of the anatomy by which he is to be guided in the treatment of many of the most important cases in surgery.

The arteries should not be injected,—nor should the abdomen be opened: and if we wish to examine the parts connected with the subject of hernia, we should not make the deep dissection, until we have seen the relative situations of the great arteries; because, the most important questions which may be understood from the views of the natural state of the parts, relate to the different operations which it may be necessary to perform for the various kinds of aneurism. But here I must beg the student to understand, 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, not only read the histories of all 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. If he does this, he will then be able to assign the great improvements that, of late years, have taken place, to their proper source.

With the hope, that the student will attend to the pathology of aneurism, I shall now confine myself to such points as may be understood by the examination of the parts, in the dead body.

The aorta has been tied for an aneurism of the inguinal artery; but the detail of the operation, and of the cases which were adduced in support of the principle upon which it was done, are sufficient to deter us from ever repeating the experiment. The common iliac has been twice tied; and though the operations were unsuccessful, still the circumstances, in the one which I witnessed, were so far favourable, that we may expect, in certain cases, to tie this vessel with success: but I shall not give a separate description of the manner of dissecting for it, because it may be easily found by making a little variation in the operation for tying the internal iliac.

But the most important operation, because it is the more common, is that upon the external iliac. I shall, therefore, particularly describe the manner in which this artery may be most easily found, and safely tied, for an aneurism at the groin. I shall suppose that the dissection is made on the living body; and, in the description of it, 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. The wound must not be a penetrating wound,—that is, there must be no breach of the investing membrane of the abdomen; or the patient's danger will be increased a hundred fold.

"*Incision.* Having ascertained the middle point betwixt the superior spinous process of the os ilii and the symphisis 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 assistant's finger there,

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* To me, 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 incline, 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

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 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 center 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 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.‡"

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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.

* 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.

‡ 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.

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 was first particularly explained by Mr. Charles Bell; for he showed, that, in the case of spontaneous aneurism, the 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 connections 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:—

"I made an incision, about five inches in length, on the lower and lateral part of the left 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 connection with the iliacus internus and psoas, and then pushed it up towards the division of the common iliac. Here I was able to insinuate my finger behind the internal iliac, and then 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 difficult to suppose 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 natural 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 should be 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, 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.

We may now proceed to the consideration of the most common 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 out of ten cases, is done upon parts which are in their natural state, we can now form very 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, which 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 that 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, vein, and nerve, will now be seen, and when this is opened, it will be easy to pass a blunt needle under the vessels.

The saphena nerve is so far removed from the artery, that it can easily be 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, we may now understand that 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. But there is 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.

Though buboes have been mistaken for hernia, and, what is more serious, hernia has been mistaken for bubo, I hope 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 now 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 expose the course which the lumbar 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.

The lumbar 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. This 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. In the dead body, upon laying open the abscess in the thigh, and freeing it of matter, a new discharge will be seen to come from within the belly. Upon following this sinus, it will be found to run up, behind the psoas muscle, upon the vertebræ of the loins, which are often carious. In some instances, the abscess continues its course by the sacrum and side of the rectum, and points by the side of the anus; and 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.——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, which is 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 vein is very strong in its coats; and perhaps, in an operation, it might be mistaken for the artery, if the surgeon were to judge by the feeling betwixt his fingers,—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 such an interlacing of tendinous filaments, that they form the bottom of a deep groove, in which the artery runs; and here it is covered by that fascia which has in part been cut, to expose the artery, in performing the operation for aneurism.

We may now trace the artery through the sheath formed by the tendon of the adductor magnus; and we should particularly notice a branch which is given off here,—for though it is small, it is of considerable importance in the operation 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: and when this has happened, a dangerous hæmorrhage has been the consequence. The easiest way of managing 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 the branch 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 carefully the course of the artery down the thigh; 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 probability of wounds of the descending branches of the profunda being mistaken for wounds of the femoral artery itself.

As in this dissection we should also preserve the branches of the obturator and anterior crural nerve, we shall be able to comprehend, from the view of them, 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, which occasionally occur;—such as violent burning pain in the sole of the foot. One of the most interesting cases of this kind, is related in Mr. C. Bell's System of Operative Surgery. I have seen a very striking example of it, from a curious cause.—A Russian surgeon thought he might destroy a ball which was lodged in the condyle of the femur, by pouring quicksilver into the wound. Upon amputation of the leg, a tumour was found in the peroneal nerve, with a quantity of quicksilver in it. The patient, who was a Russian General, got well, but suffered long after, from the same nervous feelings which he had had, previous to the operation: the nerve was, in all probability, irritated higher up.

Before dissecting off the skin from the leg, we should examine the parts in the ham; and then we shall be able to form some idea of the benefit which Mr. Hunter conferred upon surgery, in performing the operation for popliteal aneurism, by tying the artery on the fore part of the thigh, 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.

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, and 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. This view will also show us how difficult it will 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. 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 deep, and covered with the vein; and, to tie it separately, it must be disentangled from under the vein.

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 considerably 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 comes more distinctly into view, distending the fascia.

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 give way. If the artery has given way towards the inside, then the tumour will increase in that direction chiefly; 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. But 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. But 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, which was 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, but also as a detail which may, perchance, 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 MM. Leroux, Deschamps, Boyer, Dupuytren, &c. and the account of it is introduced by the following eulogy, by M. Roux :—

"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'attenic*, 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.

In dissecting the veins, we should consider the diseases which they are most liable to,—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; for 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 very free, because the artery lies very deep. 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.

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 extraordinary circumstance, that Mr. Hey, of Leeds, has advised us to cut out a piece of the fibula, in order to get at this artery. I have seen a patient, on whose leg my friend, Mr. Smith, of Leeds, tied the artery, with great ease, nearly in the same manner which 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 which is 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 pollicis magnus 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 of 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.

When we open the joints, we shall be surprised to find the great number of instances in which the cartilages of the heads of the bone appear eroded. I have so frequently seen, in all kinds of subjects, (and even in the joints of animals,) the appearance which is described by Mr. Brodie as ulceration of the cartilage, that I cannot agree with him in supposing that it is the effect of disease. I rather suspect that it is a change which very frequently takes place in the structure of the cartilage, without any symptoms whatever being the consequence of it.

DISSECTION

OF THE

UPPER PART OF THE BODY.

As the upper half of the body includes all the parts which are above the diaphragm, and the muscles of the back, it will be too much for a young student to undertake at once; he should therefore begin with an arm, or one side of the head. But as these two parts are, according to the rules of the dissecting-room, generally taken by the same student, I shall lay down a plan of such a series of dissections as will enable him to make the most of these parts, and which will, at the same time, be practicable while several pupils are engaged in dissecting the same body.

As the student should dissect those parts first, which become soonest putrid, he ought, on the first day, in union with his companion, to attempt to make a dissection of the principal parts of the brain. *

On the second day, he should dissect the superficial muscles of the neck; and on the third day, the muscles of the face. On the fourth day, he may examine the deep muscles of the throat and of the jaw, and the general anatomy of the mouth.

This plan may be very easily followed if the student can turn the body as he pleases; but as I have supposed that there is another pupil engaged in dissecting the opposite side of the head, his operations must also be taken into consideration.

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* Neither the arteries nor the veins should be injected.

As it will be very inconvenient for both students to dissect the neck at the same time, they must either dissect at different hours, or one must pursue the dissection of the arm, while the other is engaged with the neck. But if both are young dissectors, the best plan will be, for the one to assist the other, as the dissection of the neck is very difficult for a beginner.

The muscles on the fore part of the chest should be next dissected, and then the thorax may be opened, so that a general view of the viscera may be given; after which, the heart and lungs, with the larynx, &c. should be removed, and put into water, for future examination.

At this stage of the dissection, the students who are dissecting the lower half, will probably be prepared either to make a section of the body, or to turn it. The superficial muscles of the back are then to be dissected. When these are finished, the arm should be separated from the trunk, by cutting through those muscles of the back and chest, which are inserted into the scapula, and by either dislocating the clavicle from the sternum, or by cutting it through the middle. The arm should be wrapped up in a damp cloth, and laid in a cool place, until the dissection of the other part is finished.

The deep muscles of the back and of the fore part of the neck, should now be dissected. The vertebræ are then to be divided, so that the ligaments may be examined.

If the student does not wish to preserve the scull, he should make such sections of it, as will enable him to show the general anatomy of the nose, ear, &c. But before he examines these, or dissects the ligaments, he should allow them to remain in water for some time: in the mean time he may dissect the muscles of the arm. After the muscles of the arm are dissected, he should examine the ligaments.

In the second dissection of the upper half of the body, the arteries (having been previously injected) should be traced, with some of the principal nerves and veins. During this dissection, the student should attend to the practical points of surgery; but another body, in which the vessels are uninjected, should also be devoted to this examination.

In the third dissection, the brain and nerves should be more particularly studied.

DISSECTION

OF

THE BRAIN.

I shall at present describe only the common method of dissecting the brain; for, whatever changes may take place in our opinions regarding the nervous system, it will be always necessary to be familiar with the natural appearances of the different parts of the brain, when it is dissected from above, downwards,—because this has been the method generally pursued in tracing the effects of disease or injury upon the brain.

I think that the student will derive much advantage by dissecting the brains of the lower animals; because he will not only discover the meaning of certain names which are given to parts of the brain, but he will also find it to be the best and most interesting mode of investigating the anatomy in a physiological point of view. After he is familiar with the dissection of the brain of the pig, sheep, &c. he will be able to make the dissection of the human brain in a variety of ways.

To prepare for the dissection of the brain, the scalp should be cut in the line of the coronal suture, from ear to ear; then the anterior portion is to be raised from the scull, and pulled down upon the face: the posterior part should be carried towards the occiput. It is necessary to follow this plan in a *private* dissection; for, unless we do so, we shall find some difficulty in making the parts appear *decent* after the dissection is finished.

In cutting through the scull, there is some nicety required. It should not be cut lower down, on the anterior part, than half an inch above the frontal sinuses;—but the cut may be carried to a lower level behind. Before the saw is applied, a piece of whip-cord should be tied firmly round the scull, as a mark for the circular incision. The saw should not be carried through all the tables of the scull; but after having cut through the external and middle tables, we should endeavour to break through the tabula vitrea,* with the chissel and mallet;—by proceeding thus, the dura mater will probably not be cut,—which it is very difficult to avoid, if all the tables be sawed through. Although the bone may be completely divided, it will still be very difficult to raise the scull-cap, in consequence of the firm union which there is between it and the DURA MATER. This forms an important point of demonstration,—for it proves, that part of the dura mater is the internal periosteum. This is well exemplified in the scull of a child; for there, it will be found impossible to raise the scull-cap, without, at the same time, cutting the dura mater;—even in the adult, it is necessary to use a lever between the portions of the scull, and then to pull it up, with some violence, before it will separate from the dura mater. When the adhesion is particularly strong, the separation may be facilitated by passing a whale-bone spatula, or the handle of the knife, between the dura mater and the bone.

When the scull-cap is torn off, we shall see pits and furrows upon its inner surface,—and, on the dura mater, little fungous excrescences and vessels, corresponding to the pits and furrows in the bone. The fungi are most numerous on the part opposite to the sagittal suture; they are like soft warts, or pale granulations, and have been called GLANDULÆ PACCHIONI. If the arteries have been injected, the branches of the MENINGEA MEDIA will be seen. The ANTERIOR and POSTERIOR MENINGEAL arteries are so small, that they will not be visible, until the brain is removed.

If we make a puncture with the scissars into the most superior and central part of the dura mater, we shall pierce the LONGITUDINAL SINUS. If we pass a probe into this puncture, it may be pushed towards the occiput, and towards the frontal bone,—thus showing the course of the sinus.

The sinus may be opened, by cutting upon the probe.—The first thing we shall observe in the sinus, is a body, generally of a white colour; but which, we shall find to be only a coagulum, that has taken the form of the sinus. The internal surface of the sinus is irregular, in conse-

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* It is hardly necessary for me to remind the student, that, in the child, the tables of the scull are not developed; and that, in extreme old age, they are all consolidated. It is only in the adult, that the three tables are distinct.

uence of there being frequently many of the glandulæ acchioni in it; and, from its being crossed by a number f small filaments, which, as well as a set of bands that re situated on the outside of the sinus, have been called ie CORDÆ WILLISII. By putting the probe under one of iese cords, we shall probably pass it into the mouth of ne of the veins which enter, in a lateral direction, from ie pia mater.—We cannot prosecute the course of the nuses farther, in this stage of the dissection.

Our next step must be, to raise the dura mater: to do iis, we should cut through it, opposite to the ear, on both des, and, with the scissars, carry the incision forwards early to the spine of the frontal bone,—and on the back art, to the perpendicular ridge of the occipital bone. he lateral parts of the dura mater, may then be turned p towards the longitudinal sinus: this will expose the ibstance of the brain, covered by the TUNICA ARACH-OIDES and PIA MATER. In doing this, no adhesions will e found between the dura mater and the other mem-ranes, except at an inch, or half an inch, from the sinus. his adhesion has a white, granulated appearance, which as often been described as the effect of disease. When e tear this up, we shall see the veins of the brain itering into the sinus; and by breaking down the con-ections on both sides, we may see that prolongation of ie dura mater, which is called the FALX, and which sepa-ates the upper part of the brain into TWO HEMISPHERES; nd by merely pulling aside the masses of the brain, and assing down the handle of a knife between the hemi-pheres, we may expose this septum, in all its length. On its nterior part, we shall see that it is very narrow, and that is attached to the crista galli of the ethmoid bone;—s it passes back, it is seen to increase in depth, until it ecomes attached to the TENTORIUM; but the tentorium annot be seen in this view,—nor until a considerable part f the brain is removed. The scissars should now be assed between the anterior part of the hemispheres, so as divide the connection between the falx and crista galli; e falx may then be pulled towards the occiput, as a few nall vessels are the only means of adhesion between it d the brain. The dura mater having been thus laid wn towards the occiput, we may examine the next embrane—TUNICA ARACHNOIDEA. If there be no effusion f serum on the surface of the brain, it will be difficult to e the membrane, on account of its transparency; but nen there is effusion, the membrane will be apparent, ithout any preparation,—as the membrane will then be generally a little thickened. To show it, in all cases it is only necessary to make such a puncture on the surface, as will admit the point of the blow-pipe,—the air will raise it in the form of vesicles. It is difficult to trace this membrane to all the parts of the brain that it is *said* to go to. It is easy to trace it over the surface, passing from one convolution to another, without dipping between them, as the pia mater will be found to do. But it is said to be reflected on the inner surface of the dura mater, so as to give it its glistening smooth appearance; and it is also, by the French theorists described as passing into the ventricles, so as to cover their internal surface.—When the base of the brain is exposed, the membrane will be seen to be much thicker at that part.

The next membrane, the PIA MATER, is so distinctly seen through the last, that they have often been confounded. We see it loaded with arteries and veins,—and when we pull upon a portion of it, we shall find that it goes down into the substance of the brain, and that it passes between the convolutions.—In the course of our dissection, we shall discover the pia mater in many parts of the interior of the brain,—it being, in fact, the cellular membrane which supports the pulp, and carries the vessels into the several parts.

We should now tear this membrane from one of the hemispheres, so as to show the convolutions. The surface of these convolutions will appear grey; but if we cut a slice off, we shall then see that the interior is of a white colour: from this circumstance, the surface has been called the CINERITIOUS, OF CORTICAL PART,—and the internal, the CENTRAL, or MEDULLARY.

We should now separate the two hemispheres gently from each other, and then, by looking down between them, we shall see a white mass,—and if the arteries have been injected, two arteries will be perceived upon it: this white mass has been called the CORPUS CALLOSUM, or, from the term *commissure* being given to the points of union between the several parts of the brain, it has been called COMMISSURA MAGNA, as being the largest.

As we have nothing particular to remark in the structure of the upper part of the hemispheres, they may be gradually sliced down,* until we reach the level of the corpus callosum. In making these cuts, the relative dis-

* In slicing the brain, we shall find that it will be done with more ease, if we occasionally dip the knife into water

position of the cineritious and medullary matter will be seen to vary: about an inch and a half from the surface of each hemisphere, the medullary matter will have an oval form, and be surrounded by a band of cineritious matter; this is called the CENTRUM OVALE PARVUM of *Vicq-d'Azyr*, and must not be confounded with the proper CENTRUM OVALE of *Vieussens*, which will be seen when both hemispheres are cut down nearly to a level with the corpus callosum,—which we should now do. But we ought not to be too anxious to show this, exactly as an oval; for, in doing so, we may cut so deep, as to open the LATERAL VENTRICLES, if they should be distended with fluid. When this part has assumed the appearance of a large oval of medullary matter, we shall see, in the centre of it, the CORPUS CALLOSUM,—and in the middle of this, there is a little furrow called RAPHE, or SUTURE, which is formed by two longitudinal ridges, running between the anterior and posterior part of the brain. By examining the part closely, we may discover the fibres which run across, and are termed LINEÆ TRANSVERSÆ.

Our next object is, to open the LATERAL VENTRICLES. This may be very easily done, if there be water in them; for we have only to slice down the medullary matter, horizontally, on each side of the corpus callosum, until the water flows out: but we should preserve about a half, or three quarters of an inch in breadth of the corpus callosum, through its whole extent. It will be rather difficult to know when the ventricle is opened, if there be no water in it (and this may be ascertained, by patting, with the finger, on each side of the corpus callosum), because the first part which will be seen, when the ventricle is laid open, is a grey mass; — there being as yet no appearance of a cavity. But by insinuating a probe, or the handle of a knife, between this body (which is the upper part of the CORPUS STRIATUM) and the cut margin of the medullary matter, we shall be able to pass it, towards the frontal bone, into the cavity in the anterior lobe, and then into that in the posterior lobe. If the brain be firm, we may expose the cavities, by cutting upon the probe, or by taking out a piece with the scissars: but the brain, when examined in the dissecting-room, is generally so soft, that a knife, introduced like a bistoury, upon the probe, is sufficient to tear the medullary matter,—still we ought not to do this, if we can avoid it. When both ventricles are opened in the same manner, we can understand how the corpus callosum is said to form the *roof* of the ventricles; for it is now seen to stretch from the anterior to the posterior part, in the form of an arch. If the brain be tolerably firm, we may be able to see the septum of the ventricles, which is formed by a thin lamina of medullary matter that passes down perpendicularly from the lower surface of the corpus callosum, towards the *floor* of the ventricle, and which we shall afterwards find to be formed by the FORNIX. In consequence of this portion of medullary matter forming a transparent septum between the right and left ventricles, it has been called the SEPTUM LUCIDUM. But we shall very seldom get a brain sufficiently firm, to allow of the septum being seen.

A small slip of writing paper should now be cut to the shape of the corpus callosum, and laid on its upper surface; this will give the corpus callosum such a degree of firmness, that, after having cut it through at its anterior part, we shall be enabled to tear it back: in doing this, the septum lucidum is necessarily destroyed,—but we may observe, that, as it is torn, it separates into two laminæ, that appear to have a cavity between them, and which has been called the FIFTH VENTRICLE.

When the corpus callosum is laid back as far as its connection with the medullary matter of the posterior lobe, the FORNIX will be seen, connected to the medullary matter of the anterior lobe, and branching into two portions behind. But, in tearing back the corpus callosum and septum lucidum, in a soft brain, we are very apt to tear up a portion of the fornix, just at the point of its division, and thus to make the appearance of a hole in it.

Before tracing the fornix, we should attend to the general form of the lateral ventricles. The cavities which have been already exposed, are called the ANTERIOR and POSTERIOR HORNS, or SINUSES; but there is yet another sinus, which is called the INFERIOR, or MIDDLE HORN. This last should now be laid open; but as it lies very deep in the middle lobe, it will be necessary to cut away a large quantity of the brain, before we can show it. The knife may be placed on the upper part of the corpus striatum, and carried, in a slanting direction, towards the angle formed by the union of the squamous and petrous portions of the temporal bone; and it may be continued, in the same line, from the anterior to the posterior part of the brain. Even this large cut may not be sufficient to expose the inferior sinus; but, in cutting more, we must proceed cautiously. The POSTERIOR CRUS of the fornix will direct us to the opening of the sinus;—we should pass a probe, or the handle of a knife along the crus, and then cut upon it; but as the sinus takes a sweep like a ram's horn, the turn must be cautiously followed.—When the cavities of both sides are exposed in their full extent, we may make our observations on the several parts which are in the two ventricles.

We at once recognize the CORPORA STRIATA; for the incisions which have been made for the exposure of the inferior horns, exhibit the mixture of cineritious and medullary matter, from which these bodies have got the name of corpora striata. We may now see that the FORNIX is attached to the anterior lobe of the brain, by a part which appears single, but which, we shall afterwards discover to be formed of two cords: however, this is generally called the ANTERIOR CRUS of the FORNIX. If we trace the fornix backwards, we shall see it dividing into two parts, which are called its POSTERIOR CRURA, and which diverge, and descend into the inferior horns. Between the fornix and the corpora striata, a reddish body will be seen; this is part of the PLEXUS CHOROIDES, which may be traced into the posterior horn, and also into the deepest part of the inferior horn; where it will be afterwards found to communicate with the pia mater which covers the base of the brain. If we now look into the posterior horn, we shall see a little medullary eminence, which has been called HIPPOCAMPUS MINOR, to distinguish it from a much larger eminence, of the same kind, which is in the inferior horn, and is called HIPPOCAMPUS MAJOR, from some resemblance which it has to a small marine animal. If we pull up the portion of the plexus which descends into the inferior horn, we shall see, that the hippocampus takes a turn somewhat like a ram's horn, whence it has sometimes received the name of CORNU AMMONIS; its extremity has a bulbous form, like the point of a finger, whence it is occasionally called *Digital Process*, and the extremity of the sinus, the *Digital Cavity*. At the first view, the hippocampus appears to be the continuation of the posterior crus of the fornix; but, by following the crus, we shall find that it terminates in a thin layer of medullary matter, which lies on the hippocampus: as this layer has some resemblance to a tape worm, it has been called *Tænia*, and to distinguish it from another tænia, it is called TÆNIA HIPPOCAMPI, or, from its edge being, when in a fresh state, apparently fringed, it has also got the name of TÆNIA FIMBRIATA.

We should now examine the communication wh ch there is between the two ventricles. If we trace the plexus choroides, we shall find it inclining towards the anterior crus of the fornix: if we then pass a curved probe, or small bougie, along the plexus, and under the anterior crus of the fornix, it will appear in the opposite ventricle. But it may be objected to this,—that the brain is so soft, that the probe would meet with no resistance, were it to be passed through the matter of the fornix. The best proof we have of the existence of a hole here, is, by blowing on one side of the crus of the fornix, for the air will then pass into the other ventricle; or if we open the right ventricle, in a very fresh brain, and lay the head on the same side, the water will flow from the left ventricle through the hole. In cases of hydrocephalus, we shall sometimes find the hole large enough to admit the point of the finger. This opening has been, by some, called the *Foramen* of *Monro;* but it is more generally called the FORAMEN COMMUNE ANTERIUS,—as we shall afterwards find, that it also communicates with the *third ventricle*, and with the *Infundibulum*.

The fornix may now be cut at the point under which the probe has been passed, and may then be turned back; but as the substance of the fornix is very soft, it should be strengthened by putting a piece of paper, of the same shape, upon it. When the fornix is thrown back as far as the point where it diverges, we may perceive upon its lower surface, white lines, something in the form of the strings of a lyre; from this appearance, the lower part has got the name of LYRA.

We shall now have a complete view of the plexus choroides of each side, united together by a membrane which is generally called VELUM INTERPOSITUM, or VELUM VASCULOSUM,—or, from its similarity to the mesentery of the intestines, *mesentery* of the plexus choroides. In the fresh and sound brain, the plexus and its velum will prevent us from seeing any of the THALAMUS which is below it; but it generally happens, that the plexus of each side falls towards the middle, so as to expose a part of both thalami.

If we examine the middle of the plexus, we shall see two veins passing backwards, to unite and form a larger one,—the VENA GALENI. We may trace this vessel back, by making a horizontal cut, on the level of the velum, quite to the occiput, so as to remove all the remaining parts of the fornix and corpus callosum: the vein will then be seen entering into the fourth sinus of the dura mater, or TORCULAR HIEROPHILI, which is just at the union between the falx and tentorium.

We should now raise the plexus choroides and velum from the anterior part, and carry it back; but at first, we should not remove it farther than two inches. This will completely expose the two white bodies which are called THALAMI NERVORUM OPTICORUM. Upon their anterior part, we may see two little eminences, called the MONTICULI; and in the angles of union between the thalami and corpora striata, we shall see a streak of whitish matter, which has somewhat the form of a tape-worm, or piece of tape, whence it is called *Tænia*,—and, from its direction, *semicircularis*,—and, from its connection with the thalami, which are sometimes called gemini, it has the word geminûm added,—TÆNIA SEMICIRCULARIS GEMINUM.

On the anterior part of the thalami, we shall see the opening which has been already described as forming part of the foramen commune anterius. If we direct a probe slantingly forwards, it will pass towards the part called ITER AD INFUNDIBULUM; if pushed on, it would pass through the substance of the infundibulum, and enter the PITUITARY GLAND. If the probe be pulled out, and then passed downwards, and backwards, it will pass into the THIRD VENTRICLE. This opening has sometimes received the *elegant* name of *Vulva;* while the depression which may be now seen at the other extremity of the thalami, has got the name of *Anus*. This latter opening is sometimes called foramen commune posterius;—but it differs from the anterior opening, in this, that it is so covered by the velum interpositum, that there is no opening here, until the velum is torn up.

We may now trace the plexus choroides a little more. We shall find that it dips down behind the *anus;* but we must be careful how we raise it at this part, for here it surrounds the Pineal gland,—therefore, the membrane should not be rudely pulled away, but should be dissected off with the forceps and scissars; by which we shall expose a little reddish grey body, rather larger than a pea, and attached to the posterior part of each thalamus, by a little process, or peduncle: this is the famous PINEAL GLAND. When we take it between our fingers, we must not be surprised to find some gritty particles in it.

We should now separate the thalami gently from each other, and we shall find that they are united by a grey mass, which is called the COMMISSURA MOLLIS. The name implies, that this bond of union will be often dissolved before we reach this part of the dissection.—The chink, or sulcus, which is seen on separating the thalami, is the THIRD VENTRICLE. If we separate the thalami, to some distance from each other, and look towards the anterior part of the cavity, we shall see a white cord passing across it: this is called the COMMISSURA ANTERIOR;—we may see a similar cord on the posterior part, called the COMMISSURA POSTERIOR; but to see these, and the third ventricle, more distinctly, we should now slice away a great part of the thalami and corpora striata.

The next point of demonstration is the NATES and TESTES, or TUBERCULA QUADRAGEMINA. It is rather difficult to expose these, as they are situated in the space between the cerebrum and cerebellum.—All the part of the posterior lobe, which is lying on the tentorium, should be removed, and then the tentorium should be cut through on each side, so as to expose the upper part of the cerebellum,—the projecting part of which, (processus vermiformis superior,) is to be held down; the four little eminences will then be seen; the two superior being called the NATES,—the inferior, the TESTES.

The next stage of the dissection is difficult; for we ought now to expose the cavity of the FOURTH VENTRICLE, which lies between the cerebellum and medulla oblongata. If we pass a probe, slightly curved, from the third ventricle, under the posterior commissure, and give it a direction downwards, and backwards, it will pass into the fourth ventricle, the passage being called ITER A TERTIO AD QUARTUM VENTRICULUM, or, by the old name of AQUÆ DUCTUS SILVII. If we hold back, or slice away, the upper part of the cerebellum, and raise the probe, we may perceive it under a thin lamina of medullary matter, which is the roof of the fourth ventricle, and is sometimes called VALVULA CEREBRI, or VALVULA VIEUSSENII; by cutting through this, we may look into the cavity of the fourth ventricle: and now we may observe, that this valvula cerebri is connected with, or formed of two cords, running from the nates and testes, to the cerebellum; these cords are each called PROCESSUS A CEREBELLO AD TESTES.

There are two or three different modes of exposing the cavity of the fourth ventricle more fully. One way is, to carry the knife down perpendicularly, so as to divide the cerebellum into two portions; but the best way of examining it, is, to cut out a triangular portion of the occipital bone, down to nearly as far as the foramen magnum. When the bone is removed, we shall see the cerebellum connected at the lower part, by the pia mater, to the beginning of the spinal marrow, — this portion of membrane is the only boundary which the fourth ventricle has on its lower part, so that if we tear it, we shall open the cavity.—By lifting the cerebellum, we shall expose the sulcus on the upper part of the spinal marrow, which has been called the CALAMUS SCRIPTORIUS;—then, by dividing the cerebellum vertically into two equal portions, we shall see the whole extent of the fourth ventricle, and also the appearance in the cerebellum which is called ARBOR VITÆ. But before making this section, there are two parts of the cerebellum to attend to; the names are very absurd, but, since they are always mentioned, we must describe them.—PROCESSUS VERMIFORMIS SUPERIOR, is the name given to the little eminence on the highest portion of the cerebellum, as it has some resemblance to a worm coiled up;—this is the same part which we were obliged to hold aside, or cut away, in showing the nates and testes, and valvula cerebri. When we look at the lateral parts of the base of the cerebellum, upon the side of the sulcus which corresponds to the falx cerebelli, (and which has been removed in cutting the occipital bone,) two little convolutions will be seen, which, from some faint resemblance they have to worms, have been called the INFERIOR VERMIFORM PROCESSES.

The method just pointed out, is the best manner of giving an accurate notion of the relation of the fourth ventricle to the other parts of the brain; but if we object to it, in consequence of the scull being hurt by cutting out the portion of the occipital bone, we must raise the base of the brain from the scull, before we can examine the parts in the fourth ventricle. But in doing this, there are several points of anatomy which should be noticed, previous to the examination of the ventricle.

The scull should be allowed to fall back a little, and then, with the handle of the knife we should lift part of the anterior lobe from its position on the frontal bone. In doing so, in a very fresh brain, we may see the OLFACTORY NERVES (I.) passing into the cribriform plate of the ethmoid bone; but this nerve is so soft, that, in general, it is destroyed before we reach this stage of the dissection. In turning the lobes farther back, the OPTIC NERVES, (II.) with the CAROTID ARTERY rising by the side of them, will be distinctly seen. These nerves should be cut across, at their entry into the foramen opticum. The arteries, if injected, should be divided as far down as possible; but if they are not injected, it is not of consequence where they are cut. On cutting through these parts, we should attend to a little red projection, which passes towards the sella turcica; this is the INFUNDIBULUM, which is attached to the PITUITARY GLAND. The next nerve, the MOTOR

OCULI, (III.) will be easily discovered; but the TROCHLEARIS (IV.) is difficult to find; for it is not only very small, but it lies within the fold of the dura mater which passes from the tentorium to the sphenoid bone: when discovered, it should be cut,—not torn. The next nerve, the TRIGEMINUS, (V.) will be easily seen, as it is very large, and goes off in a lateral direction. The ABDUCENS (VI.) will be seen to run in the same direction as (III.) (It generally happens, at this stage of the dissection, that the brain has fallen so far back that it must be supported, or the weight of the anterior part may tear it through.) After observing the (VII.) which is divided into two parts, PORTIO MOLLIS and PORTIO DURA, if we look down towards the foramen magnum, we shall see the scattered fibres coming up to form the (VIII.) which is composed of three nerves, viz. the GLOSSO PHARYNGEAL, PAR VAGUM, and SPINAL ACCESSORY. In cutting them across, we must endeavour to leave the last nerve entire, as it comes up from within the spinal canal, to unite with the other. The fibres forming the LINGUALIS, (IX.) will be easily seen.

The brain will now be held in its place, only by the spinal marrow and the vertebral arteries; the latter are to be snipped across, and then the spinal marrow is to be cut through, as low down as we can carry the knife.

We should now lay the brain on a wet board, and make our observations on its base. The first thing we shall notice, is, its division into lobes, which were not observable on the upper part: the ANTERIOR and MIDDLE lobes being separated from each other by a sulcus, called the FISSURA SILVII. As the POSTERIOR LOBE has been already destroyed, we shall, on the back part, see only the cerebellum. This is divided into two portions, which are called its LOBES, or HEMISPHERES. We may now observe how much thicker the arachnoid membrane is here, than it was on the upper part.

The arachnoid and pia mater should now be dissected off, and then we shall see the two CRURA of the cerebrum and the TWO of the cerebellum uniting, to form the PONS VAROLII, or TUBER ANNULARE, or (a better name still) the NODUS CEREBRI, which is the commencement of the MEDULLA OBLONGATA, or spinal marrow. Immediately below the middle of the nodus cerebri, two pyramidal elevations, called CORPORA PYRAMIDALIA,—and upon the lateral parts, two oval eminences, which are called the CORPORA OLIVARIA, will be seen. Between the corpora pyramidalia and the nodus, there is a little sulcus, which is called FORAMEN CŒCUM. If we look on the brain, anterior to the nodus, we shall see two little white bodies, the CORPORA ALBICANTIA, or CANDICANTIA: these, by further investigation, will be found to be connected with the anterior part of the fornix. Immediately anterior to these, there is a reddish grey body (the INFUNDIBULUM); but it will not be found hollow, as its name would imply. Between this and the optic nerves, a small square portion of grey substance may be observed, which will be found to be the anterior part of the floor of the third ventricle; the remainder of the floor is made by the corpora albicantia and a portion of medullary matter which is between the crura cerebri.

If we now separate the upper part of the spinal marrow from its connection with the cerebellum, we shall see the cavity of the fourth ventricle; and by then making a vertical section of the cerebellum, we shall have a distinct view of the arbor vitæ, and of the sulcus called calamus scriptorius, which, in fœtuses, and in some animals, is continued down, as a canal, through the substance of the spinal marrow. Upon the lateral parts of the fourth ventricle, we shall see little striæ, which are said to be the origins of the portio mollis.

It does not require any particular rules to enable the dissector to trace the nine nerves to the parts of the brain from which they are said to arise; the filaments require only to be followed.

The bulbous part of the OLFACTORY NERVE will still be visible, lying on the anterior lobe; and upon tracing it back, it will be found to arise, by two or three filaments, near the fissura Silvii; these roots may be generally traced to the corpus striatum. In tracing each of the OPTIC NERVES back from their union, we shall see a flattened band, called TRACTUS OPTICUS, turning round the crus cerebri, to take its origin from the thalamus opticus. The MOTOR OCULI requires no dissection; it is seen to arise from between the crus cerebri and nodus cerebri. The TROCHLEARIS is so small, that we frequently destroy it in removing the brain from the scull. When preserved, it may be traced, past the crura cerebri and cerebelli, to arise from the lateral parts of the fourth ventricle. The TRIGEMINUS cannot be mistaken, as it is the only nerve arising at the point of union between the crus cerebri and cerebelli. The ABDUCENS is also easily understood, for it arises from the point of union between the nodus cerebri and the spinal marrow. We may see a number of small vessels entering into the substance of the brain here, which, when pulled out, show why the French anatomists have described this nerve as arising from the *pars perforée.* The seventh is divided, by a small vessel, into two portions; the one (PORTIO DURA) arises from the posterior and lateral parts of the nodus cerebri; the PORTIO MOLLIS, deeper,—probably from the anterior part of the fourth ventricle.

It is difficult to follow the eighth, as it arises by several distinct filaments, but all of which may be traced from the posterior column of the spinal marrow. The first set, forming the filament called GLOSSO PHARYNGEAL, arise from the edge of the corpus olivare: the next, the NERVUS VAGUS, a little lower down; but the third set of fibrils, forming the SPINAL ACCESSORY of the older authors, or the superior external respiratory of Mr. Bell, must be looked for in the dissection of the spinal marrow, as they arise as far down as the fourth cervical vertebra. The next nerve, the LINGUALIS, which is the last of the proper cerebral nerves, is seen arising, by several filaments, from the edge of the corpus pyramidale.

If we examine the nodus cerebri minutely, we shall find that the crura cerebelli unite, and the crura cerebri pass under them; whence the part was called, by VAROLIUS, PONS. Upon the surface of the pons we see a furrow, which is called the RAPHE. If we cut the pons horizontally, so as to cut also the crura cerebri, we shall show the mixture of cineritious and medullary matter, which has been called the LOCUS NIGER; and in the section of the crura cerebelli, we shall find a stain of yellowish matter, which is called CORPUS RHOMBOIDEUM, or *dentatum.* In this view we shall also see the medullary tracts which pass down towards the corpora pyramidalia, and the transverse fibres which run at right angles to them. By separating the two corpora pyramidalia from each other, we may see bands running from one side to the other, so that here the bodies appear to decussate. In the section of the corpus olivare, a regular oval medullary substance is seen, surrounded by cineritious matter, and which is called CORPUS DENTATUM EMINENTIÆ OLIVARIS; small cords also project from the back part of the corpora olivaria, which have received the name of CORPORA RESTIFORMIA.

Having finished this part of the dissection, we may look to the sinuses. In the first stage of the dissection, the LONGITUDINAL SINUS was traced to its division into the two LATERAL SINUSES. In dissecting the velum interpositum, the vein called vena Galeni was seen carrying its blood to a sinus, in the middle of the tentorium, which is called the FOURTH SINUS: this runs to the point of union between the longitudinal and two lateral sinuses—the union forming the TORCULAR HIEROPHILI. On the lower edge of the falx, a very small sinus may be discovered, which is generally called the INFERIOR LONGITUDINAL, or FIFTH SINUS.—By pouring a solution of corrosive sublimate in muriatic acid, diluted with a large quantity of water, upon the base of the scull, the blood in the lesser sinuses will be coagulated, so as to make them apparent. This solution will, at the same time, make the nerves appear more distinct.

The sinuses in the base of the scull are generally named according to the parts on which they are situated, with the exception of the CAVERNOUS SINUS and CIRCULAR SINUS; the first of which is on the lateral part of the sella turcica; the other surrounds it. All the rest are included under the names of SPHENOIDAL, PETROUS, and OCCIPITAL; their particular appellations being given according to the parts of those bones on which they are situated.

As it will be necessary to destroy the muscles of the back before we can examine the spinal marrow, it ought not to be done at present, though the description of the manner of doing it, is introduced here.

The easiest way of opening the spinal canal, is, to cut through the roots of the spinous processes with a saw, or, still better, with a large knife (a plumber's hacking knife) and a mallet, and then to tear up the processes with a pair of pincers. This will expose the sheath of the spinal marrow, which is a continuation of the dura mater. On opening the sheath, we shall see the medullary cord, surrounded by its proper coats, the tunica arachnoides and pia mater: but besides these, there will be also a membranous connection seen between the lateral part of the spinal marrow and the sheath, which is continued, by distinct and pointed slips, from the sub-occipital nerve to the second or third lumbar nerve. This membrane, from having some resemblance to the teeth of a saw, has been called the LIGAMENTUM DENTICULATUM.

The spinal cord, at first view, appears to be uniform; but when we remove the membranes, we shall see a fissure, which, on the posterior part, is continued from the calamus scriptorius; and on the anterior, from the fissure between the corpora pyramidalia; by these, the column is divided into two lateral parts, each of which is subdivided into an anterior and posterior portion. This we can more readily perceive, by examining the origin of one of the spinal nerves; for they have each a distinct root from the anterior and posterior portion. But to follow this subject farther, see the *dissection of the Spinal Nerves.*

MANNER OF EXAMINING THE BRAIN

TO DISCOVER

THE APPEARANCES OF DISEASE.

As I cannot go fully into the description of the morbid anatomy of the brain, I shall only make such remarks, as I hope will induce the student to investigate the subject.

The scull should be opened, nearly in the same manner as described at page 143.

In cutting through the scalp, we ought to calculate how far the degree of fullness of its vessels is attributable to the position of the head after death; and in raising the scull-cap, we should recollect, that the degree of resistance produced by the adhesion of the dura mater to the bone, will depend on the age of the subject, or on a particular form of the scull; the quantity of blood which escapes in tearing up the scull, will generally correspond with the state of the vessels in the scalp.

The appearances of disease on the external part of the dura mater, frequently depend on the state of the scull. Thus, if there has been a puffy tumour of the scalp, in consequence of a blow, and if the bone be dead, there will probably be matter on the corresponding part of the dura mater; but if there has been a venereal caries of the scull, which has made slow process, it is more likely that several layers of lymph will be found upon the dura mater.

If a piece of bone has exfoliated, or if a portion has been removed by the trephine, the hole will be found to be filled up by a fungous growth of the dura mater; but if, instead of this, the dura mater has ulcerated, there will be a protrusion of the brain. As tumours are very seldom found on the dura mater, unless there has been also disease of the bone, we must be cautious in pronouncing the large clusters of glandulæ Pacchioni, which are occasionally lodged in corresponding foveæ in the scull, to be fungous tumours.

The appearances which are said to denote a previous slight degree of inflammation of the dura mater, are very questionable. That red appearance, which is generally described as the effect of inflammation, may be washed off: but after phrenitis, or violent injuries of the head, there will be no difficulty in determining whether there has been inflammation; because the vessels on the external surface of the dura mater, will be as much blood-shot as the vessels of the conjunctiva are in ophthalmia, and there will be even layers of lymph occasionally found on its inner surface. In such cases, the other membranes will be also inflamed.

It is not uncommon, to find deposits of bone in different parts of the dura mater, but particularly in the falx. In three cases, in which these deposits were found in contact with the olfactory nerve, the patients had been, for a considerable time previous to death, very uncomfortable, from the sensation of unpleasant odours.

In cases of apoplexy, or very severe injuries of the head, we shall occasionally find a quantity of blood under the dura mater. It is highly important to observe the manner in which the blood is spread over the surface of the brain; as it will show the inutility of puncturing the dura mater after trepan, with the intention of evacuating blood which may be under it.

We should particularly recollect that there is a natural adhesion between the dura mater and the other membranes in the line of the longitudinal sinus, and that it always has a pocky, granulated appearance, because this has, by many, been ascribed to the effect of disease.

Tunica Arachnoides.—This will be found thickened in all cases where inflammation of the brain has existed for some time, and then there will also generally be effusion of serum under the membrane. It is, perhaps, improper to attach much importance to this effusion, because it is found in almost every case of protracted disease,—as in fever, or in cases where a patient has died in consequence of irritation of any viscus, and particularly after any operation on the bladder, or from retention of urine. When we find this effusion, we may predict that there will be water in the ventricles.

Pia Mater.—The gorged state in which the vessels of the pia mater are frequently found, in consequence of the position of the head after death, is often called inflammation; but in the true inflammation, the vessels of the pia mater will be very numerous, and the membrane will be found thickened.

SUBSTANCE OF THE BRAIN.—In the infant it is very soft; it gradually becomes firmer until extreme old age, and then it is found occasionally softened; though, at the age of ninety-seven, I have seen it as firm as that of a middle-aged person.

It is very difficult to determine whether the great fullness of the vessels is to be taken as denoting that there has been any particular action in them during the life of the patient; because there is frequently an unnatural degree of fullness to be found in the vessels of the brain of persons in whom there were no symptoms of deranged functions during life.—I am, therefore, inclined to consider the fullness of the vessels, in the greater number of cases, to be in a great measure dependant on the position of the head after death, and particularly in those cases of fever, where, in consequence of the blood not coagulating, it flows freely up by the deep veins, in which the valves are generally so imperfect, as to permit the blood to pass. We may often see a proof of this, in the quantity of blood which escapes after the brain is removed, if the head be left in a depending position.

The air which is frequently seen in the vessels, is either generated by putrefaction, or rushes in when the scull is torn up.

The substance of the brain is generally very tough and firm in those who have suffered from mania; and in these cases, the convolutions on the surface are also very distinct.

After epilepsy, we may expect to find solid tubercles in the substance; but I have generally found them near the base of the brain.

If the scull has been diseased, the inflammation may be propagated to the substance of the brain, and abscess may be found in it. In such a case, the disease can be traced from the external to the internal parts; but in a case of abscess without disease of the bone, we may suspect that we are coming upon a diseased portion, when we find a part of the substance of the brain—green, and of a mottled colour.

The fungus, or hernia cerebri, in consequence of fracture of the scull and laceration of the dura mater, will be found to be formed by a protrusion of a part of the brain, on the surface of which, there are several layers of lymph, that give it the appearance of fungus. But if the tumour arise after exfoliation of the bone and sloughing of the dura mater, there will probably be a greater proportion of lymph on the surface; which has led some to doubt the fact, of there ever being a protrusion of the substance of the brain itself. In this latter case, an abscess will generally be found, extending from the fungus to the ventricle.

When a patient dies in a fit of apoplexy, we shall sometimes find only a very small clot,—but occasionally, a mass of firm blood, weighing some ounces. Where there is a large coagulum, the substance of the brain will be firm, and its vessels empty. In the greater number of these apoplectic cases, it is very difficult to discover the source of the bleeding; and it is, with much reason, supposed to be frequently from very small vessels; but if the patient has been suddenly seized while drunk, and struggling, there will probably be rupture of a large vessel. If a patient has survived an attack of apoplexy, we may discover the cavity in which the coagulum lay.—The sides of it will be smooth and tough; and there will be serum, in place of the coagulum, which has been absorbed.

If a man has been suddenly killed, while in a state of health, the ventricles will, on examination, be found to be merely lubricated with a fluid; but in all cases where patients die of protracted disease, more or less water will be found in the ventricles. In the acute hydrocephalus, there is frequently several ounces; but in the chronic hydrocephalus, the quantity of water will correspond to the size of the head,—as in this disease, the mass of the brain forms a mere sac for the water.

The state of the plexus choroides should be compared with the appearance of the pia mater, for it will generally correspond with it.

Small cysts, like hydatids, are so frequently found attached to the plexus choroides, that we can hardly consider them to be of importance; but there are a few examples on record of very large cysts, or hydatids, having been found in the substance of the brain. In the Museum, in Great Windmill Street, there are two very fine specimens; one of them contained four ounces of fluid.

The Pineal gland is sometimes very soft; at other times it appears like a vesicle. I have so frequently found it in both of these states, that I cannot attach more importance to them, than to the gritty matter which is so often found in it.

So far, the examination should be conducted nearly in the same manner as that described for investigating the natural anatomy; but to prosecute it farther, the brain should be raised from the base of the scull.—I shall endeavour to make my remarks correspond with the order in which the parts will be presented when the brain is raised from the anterior, and carried towards the posterior part.—I shall, therefore, first observe, that if there has been disease of the ethmoid bone,—as from polypus of the nose, venereal caries, &c. we may expect to find a corresponding state of the anterior lobes of the brain.

It may be laid down as a general rule, that the carotid and vertebral arteries are always more or less ossified in a person above the age of fifty.

If a person has been blind of one eye, we should examine the corresponding optic nerve, which will probably be small and transparent, and endeavour to trace it to the thalami, so as to assist in deciding whether the nerves always decussate (for it is still a question); though I may here observe, that when the left eye was blind, I have always found the right tractus opticus much smaller and more transparent than the other ; and vice versa.

If there be matter in the cerebellum, we should look to the state of the temporal bone ; for scrophulous caries in this bone will often be the cause of disease in the brain.

When there is water found lodging upon the scull after the brain is removed, we must not suppose that it has existed there during the life of the patient, but that it has escaped from the several cavities during the dissection, and has fallen down to this part.—It may even fall into the sheath of the spinal marrow; but it must be, at the same time, admitted, that when there is water in the ventricles of the brain, there will be generally some found between the spinal marrow and its membranes, and perhaps even without disease, for in the prosecution of experiments on the spinal marrow of the ass, I have had occasion to open the sheath several times between the occiput and atlas; and in every instance, immediately on puncturing it, about two ounces of clear limpid fluid have escaped in a stream. This I have noticed, in a proportionate degree, in other animals.

In consequence of the difficulty in opening the spinal canal, we are frequently unable to ascertain positively, whether the parts within, are diseased or not. Of late years, it has been a common opinion, that the spinal marrow is violently inflamed in cases of tetanus; but I suspect, that in the greater number of the cases which have been related, that the appearance produced by the gravitation of the blood after death, has been mistaken for inflammation: and this I have been more convinced of, since I lately, with a view to ascertain the truth of this, examined the body of a man who had died of tetanus. Immediately on the death of the patient, I got the body laid upon the belly, instead of the common position: upon opening the spine, there was no appearance of that loaded state of the vessels on the posterior column, which has been considered as a proof of the previous existence of inflammation of the spinal marrow; but the anterior portion, which, in this case, had been the most depending part while the blood was gravitating, was covered with a congeries of distended vessels. I may here also observe, that if, in opening the spine, we puncture the membranes of the spinal marrow, that part of the nervous pulp will be forced out in the form of a tumour. This will perhaps account for many of the tumours which are discovered on the spinal marrow. But it is not my intention to deny either the occasional inflammation of the spinal marrow, or the existence of tumours in it; for I have several times seen tumours, of firm consistence, in it, and similar to those which are occasionally found in the brain. I have also, in many instances, seen the membranes highly inflamed,—and even matter on their surface, which has extended down to the cauda equina.

INVESTIGATION OF THE STATE OF THE HEAD IN CASES OF SUDDEN DEATH.

When called upon to investigate the state of the head in cases of sudden death, or of death from injury, we must be particularly guarded in giving an opinion; for it is exceedingly difficult to ascertain, whether many of the appearances are attributable to injury, or to previous disease, or to a change which has taken place after death. Of the difficulty of coming to a decision on this subject, I am the more convinced, the greater number of bodies I examine. But as I cannot enter into the question fully, I shall only give a few hints; which, however, I hope will induce the student to investigate the subject further.

The first thing we should know, is, that there is, very frequently, an appearance of bruises on the scalp; which, however, is only the effect of pressure on a particular part of the head, when the scalp is œdematous and loaded with blood.

The question of whether there has been a fracture previous to death, is sometimes more difficult to decide, than a person, who is not accustomed to dissection, could imagine. If the fracture has occurred immediately before the patient's death, there will be coagulated blood found upon the bone, and in the fissures; but if the patient has survived for some time, there will be marks of inflammation, and perhaps pus in contact with the scull. If a fracture has been produced in making the examination, (which sometimes happens even in a very careful dissector's hands,) the blood in the fracture will not be coagulated, nor will there be any effusion around the portions. If there have been symptoms of fracture after a blow on the upper part, and if we cannot discover one opposite to the part struck, we should look to the temples, or to the base of the scull.

It has been already remarked, that a blow on the scalp may be followed by abscess in the brain; but we ought to recollect, that a blow, which, in a greater number of constitutions, would be a mere trifle, may, in certain habits, be attended by a train of symptoms which may cause death.

If effusion of blood be found between the dura mater and scull, and if a bruise on the scalp corresponds to the part,—we may conclude, that it has been caused by the blow; but if blood is found between the dura mater and the brain, though we should discover the marks of blows, or even fracture of the scull, still the question may be,—might not the patient have been attacked with apoplexy during a struggle? An interesting question of this kind occurred at the York Assizes, in the summer of 1820.—— But I shall here introduce the history of a case which occurred about twelve years ago, and at the dissection of which, I assisted. This case has always made a great impression on my mind, for, as I was then very young, I might have given a very erroneous opinion upon it.

It is related in Dr. Cheyne's Treatise on Apoplexy.

"An industrious man returning home from his work, found his house empty of every thing,—the bed he was to lie upon, and the tools of his trade, sold for gin by his wife, whom he found in a gin-shop, where she had been drinking and dancing. He brought her home, and, in the passage of his house, struck her, and ordered her to go up stairs. She refused to go; he carried her upon his shoulders, and the contention continuing up stairs, he struck her again. There having been no one present, we have only the husband's account of her death. He said, that whilst sitting on her chair, she fell down, upon which he threw her on the bed, conceiving she was in a fit, such as he had seen her in formerly. Some of her neighbours coming in, found her dead. Mr. C. Bell was requested to examine the body of this woman. The man was afterwards tried at the Old Bailey, for murder, and Mr. Bell's deposition was nearly to this effect. In the abdomen and thorax, nothing appeared remarkable, further than that the stomach contained a quantity of gin; and that there was a blush of redness on the lower orifice of the stomach and duodenum. On the head, there were several bruises; but the bone was not at all hurt, and no extravasation appeared under the bone. On exposing the membranes of the brain, the vessels of the pia mater were empty of blood, as if from pressure. There was a serous effusion under the tunica arachnoidea, and in the cavities of the brain, similar to what has been found in those who have died from intoxication. On the surface of the brain, there were what appeared to be spots of extravasated blood; but upon tracing them towards the base, they proved to be streams of blood which had flowed from a vessel ruptured in the base of the brain. The base of the brain was covered with coagulated blood, in which also, all the roots of the nerves were involved. On dissecting the cavities of the brain, the blood was found to have penetrated into the third ventricle, by perforating its floor. Upon taking out the brain, and tracing the vessels in the base, the anterior artery of the cerebrum going off from the internal carotids of the left side, was found torn half way across: from this source came the extravasated blood.

"The cause of this woman's death, was the bursting of the blood from the ruptured vessel, and the pressure on the brain, or, more correctly speaking, on the vessels of the brain. As to the cause of the rupture, Mr. Bell's opinion coincided with the best authorities in pathology, that there is a state of the vessels, in which an external injury or shock is more apt to produce rupture,—and drunkenness may be supposed to be the artificial state of excitement, which most resembles this state of the vessels. Being asked whether the blows were the cause of the rupture? he said he conceived it very likely that a shock would rupture the vessel: and being then asked, whether he conceived that this woman was more likely to have a vessel ruptured, from having been intoxicated? he was of opinion, that intoxication, and the struggle, were likely to produce such a degree of activity of the circulation in the head, that a less violent blow might produce rupture, than what, in other circumstances, would have proved fatal."

The man was acquitted.

DISSECTION

OF

THE MUSCLES

ON THE

FORE PART OF THE NECK.

The PLATYSMA MYOIDES is the first muscle to be dissected. The fibres of this muscle are frequently so thin and indistinct, that a student will find it sometimes difficult to expose them, particularly as they have neither origin nor insertion in *bone*.

A block of wood should be put under the shoulders, and the head should be fixed by a chain-hook to the table, so as to make the fibres of the superficial layer of the muscles tense. * An incision should then be made through the *skin only*, from midway between the chin and the ear, to about three fingers' breadth from the sternal end of the clavicle. This incision will expose the fibres of the platysma, about their middle. The dissection should be continued, by cutting in the same line, first towards the larynx, and then towards the back part of the neck. In dissecting towards the fore part, the fibres of the sterno hyoideus will probably be in part exposed ; and towards the back part, the fibres of the sterno cleido mastoideus will appear under the fascia, or condensed cellular membrane, in which the fibres of the platysma terminate.

The platysma may be cut across, about its middle. The lower half is then to be carried towards the chest, by which we shall expose the fibres of the sterno cleido mastoideus; but in doing this, we should begin at the inner angle of the flap, and dissect in an oblique direction,

* Previous to the dissection of these muscles, the student should particularly examine the os hyoides, and the external cartilages of the larynx.

or we shall be obliged to cut in a line across the fibres of the sterno cleido mastoideus muscle, which will increase the difficulty of raising the cellular membrane. The same thing is to be recollected in lifting the upper portion.

When the platysma is raised, we shall see a number of glands on each side of the sterno cleido mastoideus; but these, we may cut away, without paying particular attention to them in the present dissection.

The muscles which run from the jaw to the os hyoides, and those from the sternum to the same point, will be now partially exposed;—but previous to dissecting either of these sets of muscles, the origins and insertions of the STERNO CLEIDO MASTOIDEUS should be shown, after which, the muscle may be cut through, about the middle; one half of it is then to be carried up towards the occiput, and the other towards the clavicle.

There will now be little difficulty in exposing the small muscles, for the course of the fibres of several of them will be seen under a thin layer of cellular membrane.

The STERNO HYOIDEUS, which is the most superficial, may be shown in its whole extent.—But at present, we cannot exhibit the origin of the next muscle, (the OMO HYOIDEUS,) because it arises from the scapula; but by dissecting towards the shoulder, we shall find a central tendon, which divides this muscle into two parts, whence, besides the common name of omo hyoideus, it has been called DIGASTRICUS,—and the term *inferior* is also added to it, as there is another double bellied muscle situated under the jaw.

The muscle which will be partially seen between the two last, is the STERNO THYROIDEUS. To expose it fully, the sterno hyoideus should be cut through the middle, or held aside. In dissecting the sterno thyroideus, the young student is very apt to raise the origin of the THYREO HYOIDEUS, which runs from the thyroid cartilage to the os hyoides, and thus to give the appearance of two sterno hyoidei muscles. When the sterno thyroid is raised, one half of the THYROID GLAND will be seen; and if it be pulled aside, the small muscle which passes from the cricoid cartilage to the thyroid, (CRICO THYROIDEUS,) may be shown.

The dissection of the muscles which run from the jaw to the os hyoides, should now be made.

As the most superficial muscle, the BIVENTER SUPERIOR, is composed of two parts, it will be necessary to dissect in two different directions, to expose its fibres. The origin of the portion which runs from the mastoid process towards the os hyoides, may be first dissected. To see its origin, we must raise the lobe of the parotid; and in showing the connection of its middle tendon with the os hyoides, (which is only by a ligament,) we must take care that we do not cut through the fibres of the stylo hyoideus, which is perforated by it. The maxillary half of the muscle is to be dissected by carrying the knife in a direction from the chin to the os hyoides.

The next muscle to be dissected, is the MYLO HYOIDEUS. But before its middle fibres can be seen, that part of the submaxillary gland which lies upon it, must be removed;—nor will its attachment to the centre of the jaw, or its connection with its fellow, be seen, until the anterior portion of the biventer is raised.

If the mylo hyoideus be carefully raised from the jaw, and from its connection with the mylo of the opposite side, the GENIO HYOIDEUS will be seen running from the jaw to the os hyoides; but it is so closely attached to its fellow, that the two muscles appear to form only one. There is another set of fibres which take nearly the same origin as the genio hyoideus; but as these fibres run both to the os hyoides and to the tongue, the muscle which they form is called GENIO HYO GLOSSUS. Certain fibres may now be seen passing from the os hyoides to the tongue, to form the HYO GLOSSUS,—on the inside of which, may be found a set of fibres, running from the base to the tip of the tongue, to form the LINGUALIS.

The next object of the dissection should be, to display the lateral muscles—the STYLOID. To do this, the lower portion of the parotid gland should be raised, and the origin of the digastricus should be cut. When this is done, some of the branches of the carotid will be exposed: but these, at present, may be cut through.

Three muscles may now be easily shown, running from the styloid process:—one, to the os hyoides; another, to the tongue; and the third, to the pharynx. As each of these muscles is named according to its origin and insertion, they are called STYLO HYOIDEUS, STYLO GLOSSUS, and STYLO PHARYNGEUS. The dissection of them will be facilitated by pulling the os hyoides downwards, and towards the opposite side.

The dissection of the muscles of the neck should not be prosecuted farther, until those of the face are dissected.

TABLE OF THE SUPERFICIAL MUSCLES OF THE NECK.

LATISSIMUS COLLI, OR PLATYSMA MYOIDES. OR. By many delicate fleshy fibres, from the cellular substance which covers the upper parts of the deltoid and pectoral muscles. They pass over the clavicle adhering to it. They ascend obliquely, to form a thin muscle, which covers all the side of the neck.

IN. 1. The fascia on the base of the lower jaw; 2. the depressor anguli oris, and the fascia on the cheek.

USE. It is said to assist the depressor anguli oris in drawing the skin of the cheek downwards; and, when the mouth is shut, it draws all that part of the skin to which it is connected below the lower jaw, upwards. The true use of the muscle, is, to assist the respiration and circulation.

STERNO CLEIDO MASTOIDEUS. OR. 1. The top of the sternum, near its junction with the clavicle; 2. the upper and anterior part of the clavicle.

IN. The mastoid process of the temporal bone and mastoidean angle.

USE. To turn the head to one side, and bend it forwards.

STERNO HYOIDEUS. OR. 1. The cartilaginous extremity of the first rib; 2. the upper and inner part of the sternum; 3. the clavicle, where it joins with the sternum.

IN. The base of the os hyoides.

USE. To pull the os hyoides downwards.

OMO HYOIDEUS, OR BIVENTER INFERIOR. OR. The superior costa of the scapula, near the semilunar notch, and the ligament that runs across it. Ascending obliquely, it becomes tendinous below the sterno cleido mastoid muscle: it grows fleshy again towards its—

IN. Into the base of the os hyoides.

USE. To assist in pulling down the os hyoides.

STERNO THYROIDEUS. OR. The edge of the triangular portion of the sternum, internally, and from the cartilage of the first rib.

IN. The inferior edge of the thyroid cartilage.

USE. To draw the larynx downwards.

THYREO HYOIDEUS. OR. The lower part of the thyroid cartilage.

IN. Part of the base, and the cornu of the os hyoides.

CRICO THYROIDEUS. OR. The side and fore part of the cricoid cartilage.

IN. The lower part of the thyroid cartilage, and its inferior cornu.

Digastricus. Or. The groove in the mastoid process of the temporal bone; it runs downwards, and forwards. The tendon passes through the stylo hyoideus muscle, and is fixed by a ligament to the os hyoides; then the tendon is reflected forward, and upward, and becoming again muscular, it has an

In. Into a rough part of the lower jaw, behind the chin.

Use. To open the mouth, by pulling the lower jaw downwards;—when the jaws are shut, to raise the larynx, and, consequently, the pharynx, in deglutition.

Mylo Hyoideus. Or. All the inside of the base of the lower jaw.

In. 1. The lower edge of the basis of the os hyoides; 2. into its fellow, of the opposite side.

Use. To pull the os hyoides upwards.

Genio Hyoideus. Or. A rough protuberance within the arch of the lower jaw, which forms the chin.

In. The basis of the os hyoides.

Use. To raise the chin.

Genio Hyo Glossus. Or. The rough protuberance on the inside of the lower jaw.

In. The tip, middle, and root of the tongue, and base of the os hyoides, near its cornu.

Use. According to the direction of its fibres, to move the tongue; to draw its root, and the os hyoides, forwards; and to thrust the tongue out of the month.

Hyo Glossus. Or. The base, cornu, and appendix of the os hyoides.

In. The side of the tongue.

Use. To pull the tongue into the mouth, or to draw it downwards.

Lingualis. Or. Base of the tongue.

In. Tip of the tongue.

Stylo Hyoideus. Or. The middle and inferior part of the styloid process.

In. The os hyoides, at the junction of the base and cornu.

Use. To pull the os hyoides upwards.

Stylo Glossus. Or. The styloid process, and from a ligament that connects that process to the angle of the lower jaw.

In. The root of the tongue, being insensibly lost on the side and tip of the tongue.

Use. To draw the tongue laterally or backwards.

Stylo Pharyngeus. Or. The root of the styloid process.

In. The side of the pharynx and back part of the thyroid cartilage.

DISSECTION

OF THE

MUSCLES OF THE FACE.

If the scull be still entire, an incision should be made, through the skin, from the middle of the parietal bone to the external part of the eye-brow,—and another, from the crown to the tip of the nose. The object of the first incision, is, to expose the muscular fibres of the OCCIPITO FRONTALIS; and that of the second, to show those fibres which pass down on the nose. The next incision is to be made in a semicircular direction over the eye-brow, so as to meet the two first incisions. Another may then be made under the eye-brow, and be continued round the orbit, so that the eye-brow will be left, and the fibres of the ORBICULARIS OCULI be exposed.

After completing the dissection of the occipito frontalis and the orbicularis oculi, with the CORRUGATOR SUPERCILII, which will be exposed by cutting through the nasal fibres of the occipito frontalis, we should pass to the dissection of the muscles of the mouth.

An incision is to be made round the mouth, leaving a small part of the lip: this will expose the ORBICULARIS ORIS, into which the other muscles are inserted. By then carrying an incision from the zygomatic process to this circular cut, the ZYGOMATIC MUSCLES will be exposed; and if another is continued down to the angle of the jaw, from the same point, the fibres of the MASSETER will be seen;—but in doing this, we must take care that we do not wound the *parotid duct*, which crosses the face, nearly in a line drawn from the upper part of the lobe of the ear, to the ala of the nose.

By dissecting down the flap of skin between the two last cuts, the BUCCINATOR will be exposed. A large portion of fat will be generally found running between this muscle and the edge of the masseter, but it is so loosely attached, that it may be pulled away with the fingers.—— As, in this dissection, we do not value the skin, we should make another cut from the angle of the mouth, obliquely, towards the outer part of the jaw, so as to expose the TRIANGULARIS, or DEPRESSOR ANGULI ORIS.

The muscles which have been named, may be fully shown by dissecting in the direction of the incisions pointed out: but the dissection of many of the muscles of the mouth will be found very difficult, and particularly those about the chin, on account of the mixture of their fibres with the integuments into which they are inserted.*

The muscles of the nose and upper lip, may now be dissected.

A cut should be made from the inner angle of the orbit, down to the middle of the circular cut round the mouth: this will expose the fibres of the LEVATOR LABII SUPERIORIS ALÆQUE NASI, between which, and the zygomaticus, the LEVATOR ANGULI ORIS will be found; and if we raise the levator labii superioris alæque nasi, the LEVATOR PROPRIUS will be seen. The COMPRESSOR, or DILATOR NARIS, may be exposed, by dissecting down from the cut that was made from the tip of the nose towards the last incision.

There are still two muscles to be shown, viz. the SUPERBUS, or LEVATOR LABII INFERIORIS, and the DEPRESSOR LABII SUPERIORIS. To show the superbus, we should turn down the lower lip, and dissect the membrane from the root of the incisores.

The DEPRESSOR LABII SUPERIORIS will be found, by lifting the upper lip, and raising the membrane which covers the upper incisores.

TABLE OF THE MUSCLES OF THE FACE.

ARRANGED IN THE ORDER IN WHICH THEY ARE TO BE DISSECTED.

OCCIPITO FRONTALIS. OR. The superior transverse ridge of the occipital bone, and part of the temporal bone. A tendinous web covers the cranium, which terminates forward in a fleshy belly (the frontal portion): this muscular portion covers the frontal bone.

IN. 1. Into the orbicularis palpebrarum; 2. into the skin of the eye-brows. It sends down a fleshy slip upon the nose.

USE. It draws up the skin of the forehead, and raises the eye-brows.

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* The dissection of these muscles will be facilitated by putting a little horse hair into the mouth.

CORRUGATOR SUPERCILII. OR. The internal angular process of the os frontis.

IN. The skin under the eye-brows, near the middle of the arch.

USE. We have no power over the individual muscle. The corrugators knit the eye-brows, and are antagonists of the last muscle.

ORBICULARIS OCULI. OR. 1. By many fibres, from the edge of the orbitary process of the superior maxillary bone; 2. from a tendon near the inner angle of the eye. These run a little downwards, then outwards, over the upper part of the cheek covering the under eye-lid, and surround the external angle. Being loosely connected only to the skin and fat, they run over the superciliary ridge of the os frontis, towards the inner canthus, where they intermix with those of the occipito frontalis and corrugator supercilii; then, covering the upper eye-lid, they descend to the inner angle, opposite to the inferior origin of this muscle, adhering firmly to the internal angular process of the os frontis, and to the short round tendon which serves to fix the palpebræ and muscular fibres arising from it.

IN. The nasal process of the superior maxillary bone, covering a part of the lachrymal sac.

This muscle should be divided into the external and internal muscles,—the internal is the CILIARIS that covers the cartilages of the eye-lids, which are called cilia or tarsi.

ORBICULARIS ORIS. This consists of circular fibres, which surround the mouth, and constitute a great part of the thickness of the lips.

USE. To shut the mouth, and to oppose the muscles which converge to be inserted into the lips.

Part of this is sometimes described as a distinct muscle, viz.

NASALIS LABII SUPERIORIS. OR. The fibres of the orbicularis muscle.

IN. The lower part of the septum nasi.

USE. To draw down the point of the nose, by operating on the elastic septum.

ZYGOMATICUS MAJOR. OR. The zygomatic process of the os malæ.

IN. The angle of the mouth.

USE. To draw the corner of the mouth obliquely upwards.

ZYGOMATICUS MINOR.—(Often wanting.) OR. The upper prominent part of the os malæ, above the origin of the former muscle.

IN. The upper lip, near the corner of the mouth, along with the levator anguli oris.

USE. To draw the corner of the mouth upwards.

DEPRESSOR ANGULI ORIS. OR. The base of the maxillary bone near the chin.

IN. The angle of the mouth, uniting with the zygomaticus major and levator anguli oris.

USE. To pull down the corner of the mouth.

Depressor Labii Inferioris, or Quadratus Genæ. Or. Broad and fleshy, intermixed with fat, from the inferior part of the lower jaw next the chin; runs obliquely upwards, and is

In. Into the edge of the under lip; extends along one half of the lip, and is lost in its red part.

Use. To pull the under lip and the skin of the side of the chin downwards, and a little outwards.

Buccinator. Or. 1. The alveolar part of the lower jaw; 2. the fore part of the root of the coronoid process; 3. the upper jaw; 4. the pterygoid process of the sphenoid bone.

In. The angle of the mouth, within the orbicularis oris.

Use. To draw the angle of the mouth,—to turn the morsel in the mouth, and to place it under the action of the grinding teeth.

Levator Labii Superioris Alæque Nasi. Or. The nasal process of the superior maxillary bone, where it joins the os frontis.

In. 1. The upper lip; 2. the ala nasi.

Use. To raise the upper lip and dilate the nostril.

By some, the next muscle is described as part of this.

Levator Labii Superioris Proprius. Or. The superior jaw bone, above the foramen infra orbitale.

In. The upper lip and orbicularis muscle.

Levator Anguli Oris, or Levator Labiorum Communis. Or. The hollow on the face of the superior maxillary bone, between the root of the socket of the first dens molaris and the foramen infra orbitale.

In. The angle of the mouth.

Use. To draw the corner of the mouth upwards.

Compressor Naris. It consists of a few fibres, which run along the cartilage of the nose, in an oblique direction, towards the dorsum of the nose.

Or. The anterior extremity of the os nasi and nasal process of the superior maxillary bone, where it meets with some of the fibres descending from the occipito frontalis muscle.

In. The root of the ala nasi.

Use. I apprehend this muscle is to expand the nostril. As its name implies, it is supposed to compress the nose.

Levator Labii Inferioris, or Superbus. Or. The lower jaw, at the roots of the alveoli of the two dentes incisivi, and of the caninus.

In. The skin of the chin.

Use. To pull up the chin, and, consequently, to raise and protrude the lip.

Depressor Labii Superioris Alæque Nasi. Or. The superior maxillary bone, immediately above the joining of the gums with the two dentes incisivi and the dens caninus.

In. The upper lip and root of the ala nasi.

Use. To draw the upper lip and ala nasi downwards, and to compress the nostril.

DISSECTION

OF THE

DEEP MUSCLES OF THE NECK.

After dissecting the small muscles of the face, we should remove them, and then examine the muscles of the jaw.

The TEMPORALIS and MASSETER may be easily dissected; but before we can form a correct idea of the other muscles, and of the deep muscles of the throat, we must make a section of the jaw. The most convenient method is, to cut out the portion which is between the symphysis and the insertion of the masseter; if we leave a small portion of the symphysis, we shall still have a very good view of the muscles which run from it to the os hyoides.

If after examining these muscles, we pull the jaw towards the ear, we shall be enabled to dissect part of the PTERYGOIDEUS EXTERNUS, and PTERYGOIDEUS INTERNUS. (Here I may observe, that the young student is often confused in making the dissection of these two muscles, in consequence of the externus being really the most *internal* of the two.) To expose the pterygoidei completely, it will be necessary to cut away the insertion of the temporalis, and the origin of the masseter.

After the origins and insertions of the two pterygoid have been seen, the jaw should be entirely removed, which will be easily done, by forcing the condyle from the glenoid cavity.* The mouth is then to be thoroughly cleaned; and to do this effectually, it will be necessary at the same time, to push pieces of sponge into the larynx, pharynx, and posterior nares, as the secretions are constantly pouring from these cavities. A strong piece of twine should be put through the tongue, by which it may be pulled out and extended.

When we look into the throat, we shall see the SOFT PALATE, or VELUM PENDULUM PALATI. At the posterior

* It will be a great advantage to this view, if both sides of the jaw can be removed.

part of this, we see the UVULA, and on the lateral parts, the two ARCHES,—the ANTERIOR and POSTERIOR. The space which is between the two, being occupied by the TONSIL, or AMYGDALA.

The anterior arch is formed by a fold of the mucous membrane, and a few muscular fibres; these may be now exposed: they form the muscle which is called CONSTRICTOR ISTHMI FAUCIUM. The posterior arch is also formed by a muscle, (the PALATO PHARYNGEUS,) but this should not be dissected yet.

We have now two very difficult muscles to examine, viz. the CIRCUMFLEXUS or TENSOR PALATI, and the LEVATOR PALATI. Before these can be exposed, all the fibres of the pterygoidei must be removed; and as they arise, one from each side of the EUSTACHIAN TUBE, we should pass a probe into it, so as to mark its situation. The tube will be seen by raising the soft palate.

The circumflexus, or tensor will be found arising from the temporal bone, and covering the upper part of the Eustachian tube; its tendon passes towards the internal pterygoid process of the sphenoid bone; and after passing over the hamular, or hook-like process, in the manner of a rope, it is spread upon the soft palate.

The levator arises immediately from the lower edge of the tube, from which it passes directly to the middle of the palate.

The palato pharyngeus, which forms the posterior arch, will be found immediately below the last muscle; it passes down, to unite with the constrictors of the pharynx.

The muscular fibres which are described as forming part of the uvula, and which are called AZYGOS UVULÆ, may be seen by merely raising the mucous membrane.

The next stage of the dissection should be, to display the three constrictors of the pharynx; but previous to commencing the dissection of them, the pharynx should be stuffed with baked horse hair, so as to make the fibres tense.—By then pulling the parts over to one side, the bag of the pharynx may be exposed; but the dissection will be much facilitated, if the trachea and pharynx are cut through, immediately above the sternum, for then the parts may be held up, so that we may easily remove the cellular membrane; and this is all that is necessary to be done, to show the three orders of fibres. Those which are close upon the occiput, form the CONSTRICTOR SUPERIOR; the next, which run obliquely down to the thyroid cartilage, are called the CONSTRICTOR MEDIUS; and the third, which are continued up from the œsophagus to the os hyoides, form the INFERIOR.

As we have now finished the dissection of all the muscles which run to the throat, we may cut out the larynx, and the pharynx, with the tongue; and after removing the muscles which may have been left attached to them, we should lay open the bag of the pharynx.

We may now take a cursory view of the parts which are seen here. (They will be described more particularly afterwards.)

We shall see the termination of the wide part of the PHARYNX in the ŒSOPHAGUS;—the opening of the LARYNX will be also distinct; and we may now understand, that when the tongue is pushed back, this opening will be closed by the EPIGLOTTIS.

If we raise the epiglottis, we shall see the GLOTTIS, which is the space between the two AYRTENOID CARTILAGES. The deepest part of this opening, is called the RIMA GLOTTIDIS, as it appears like a slit formed between the two cords which are called the CORDÆ VOCALES.—On each side of these cords, there is a little cavity, which is called SACCULUS LARYNGIS.

The pharynx and tongue, with the os hyoides, may now be dissected from the larynx.—If the soft mucous coat is then carefully raised with the forceps and scissars, from the back of the larynx, some of the muscles which move the internal cartilages will be exposed;—the first that are seen, will be the two which run from the back part of the cricoid cartilage to the arytenoid cartilages, whence they are called the CRICO ARYTENOIDEI POSTICI. By then pulling the thyroid cartilage a little from the cricoid, a similar set of fibres will be seen on each side, passing from the lateral part of the cricoid to the arytenoid; these are called the CRICO AYRTENOIDEI LATERALES. A considerable mass of fibres may now be observed, passing from one arytenoid cartilage to the other. This is divided into three muscles, there being a TRANSVERSALIS, and two OBLIQUE. The fibres which run directly across, form the transversalis, and may be always easily shown; but the oblique are so small, being merely three or four delicate fibres that pass from the base of the one cartilage, to the tip of the other, that they are often cut away with the mucous membrane.

There are still three other muscles described, as running from one cartilage to the other; but it will be only in the larynx of a very powerful man, that we shall see them distinctly. The names which are given to them, are sufficiently descriptive of their course,—THYREO ARYTENOIDEUS, THYREO EPIGLOTTIDEUS, ARYTENO EPIGLOTTIDEUS. The only muscle which is on the fore part of the larynx, is the crico thyroideus,—which, in the first dissection of the neck, was seen passing from the cricoid to the thyroid cartilage.

We may now remove the small muscles, so as to show the cartilages and their ligaments,—which are named according to the cartilages which they unite together.

TABLE OF THE MUSCLES OF THE JAW, AND OF THE DEEP MUSCLES OF THE THROAT.

TEMPORALIS. OR. The semicircular ridge of the lower and lateral parts of the parietal bone; 2. the pars squamosa of the temporal bone; 3. the external angular process of the os frontis; 4. the temporal process of the sphenoid bone; 5. it is covered by an aponeurosis, from which it also takes an origin. The muscle passing under the jugum, has for its

IN. The coronoid process of the lower jaw, which it grasps with a strong tendon.

USE. To raise the lower jaw.

MASSETER. OR. 1. The superior maxillary bone, where it joins the os malæ; 2. the inferior part of the zygoma, in its whole length.

IN. The outside of the angle of the upright part of the lower jaw.

USE. To pull up the lower jaw, for performing the grinding, or lateral motions there.

PTERYGOIDEUS INTERNUS. OR. 1. The inner and upper part of the internal plate of the pterygoid process of the sphenoid bone; 2. the palatine bone. It fills the space between the two plates of the pterygoid process.

IN. The inside of the angle of the lower jaw.

USE. To move the jaw laterally.

PTERYGOIDEUS EXTERNUS. OR. 1. The outside of the external plate of the pterygoid process of the sphenoid bone; 2. part of the upper maxillary bone adjoining.

IN. The outside of the angle of the upright part of the lower jaw.

USE. To pull up the lower jaw, for performing the grinding, or lateral motions there.

CONSTRICTOR ISTHMI FAUCIUM. OR. The side of the tongue, near its root; from thence running upwards, within the anterior arch of the fauces.

IN. The middle of the velum pendulum palati, at the root of the uvula. It is connected with its fellow.

Tensor, or Circumflexus Palati. Or. 1. The spinous process of the sphenoid bone, behind the foramen ovale; 2. the Eustachian tube. It then runs down along the pterygoideus internus muscle, passes over the hook or internal plate of the pterygoid process, and spreads into a broad membrane.

In. The velum pendulum palati. Some of its posterior fibres join with the constrictor pharyngis superior, and palato-pharyngeus.

Use. To stretch and draw down the velum palati.

Levator Palati. Or. The extremity of the pars petrosa of the temporal bone, near the Eustachian tube, and from the membranous part of the same tube.

In. The velum pendulum palati, and the root of the uvula. It unites with its fellow.

Use. To draw the velum upwards, so as to shut the posterior nares.

Palato-Pharyngeus. Or. The middle of the velum pendulum palati, and from the tendinous expansion of the circumflexus palati. The fibres are collected within the posterior arch behind the amygdala, and run backwards, to the top and lateral part of the pharynx, where the fibres are scattered, and mix with those of the stylo-pharyngeus.

In. The edge of the upper and back part of the thyroid cartilage, some of its fibres being lost between the membrane of the pharynx and the two inferior constrictors.

Use. Draws the uvula and velum downwards, and backwards; and, at the same time, pulls the thyroid cartilage and pharynx upwards. In swallowing, it thrusts the food from the fauces into the pharynx.

N. B. A few of the fibres of this muscle have been called,

Salpingo-Pharyngeus. And supposed to operate on the mouth of the Eustachian tube.

Azygos Uvulæ. Or. The extremity of the suture which joins the palate bones.

In. The tip of the uvula.

Use. Raises the uvula, and shortens it.

MUSCLES ON THE BACK PART OF THE PHARYNX.

Constrictor Pharyngis Inferior. Or. 1. The side of the thyroid cartilage; 2. the cricoid cartilage. This muscle is the largest of the three constrictors.

In. It joins with its fellow, on the back of the pharynx; the superior fibres run upwards, and cover part of the middle constrictor; the inferior fibres run more transversely, and surround the œsophagus.

Use. To compress the pharynx.

Constrictor Pharyngis Medius. Or. The appendix and cornu of the os hyoides, and the ligament which connects the os hyoides and the thyroid cartilage; the fibres of the superior part run upwards, and cover a considerable part of the superior constrictor.

In. The middle of the cuneiform process of the occiput; and it is joined to its fellow at the back of the pharynx.

Use. To compress the pharynx, and draw it upwards.

Constrictor Pharyngis Superior. Or. 1. The cuneiform process of the occiput, near the condyloid foramina; 2. the pterygoid process of the sphenoid bone; 3. alveolar process of the upper jaw; 4. the lower jaw.

In. A white line, in the middle of the pharynx, where it joins with its fellow, and is covered by the constrictor medius.

Use. To compress the upper part of the pharynx, and draw it upwards.

TABLE OF THE MUSCLES WHICH ARE FOUND PASSING BETWEEN THE CARTILAGES OF THE LARYNX.

Crico-Arytænoideus Posticus. Or. Fleshy, from the back part of the cricoid cartilage.

In. The posterior part of the base of the arytænoid cartilage.

Use. To open the rima glottidis a little, and, by pulling back the arytænoid cartilage, to stretch the ligament, so as to make it tense.

Crico-Arytænoideus Lateralis. Or. From the cricoid cartilage, laterally, where it is covered by part of the thyroid.

In. The side of the base of the arytænoid cartilage, near the former.

Use. To open the rima glottidis, by pulling the ligaments from each other.

Arytænoideus Transversus. Passes from the side of one arytænoid cartilage, (its origin extending from near its articulation with the cricoid, to near its tip,) towards the other arytænoid cartilage.

Use. To shut the rima glottidis, by bringing these two cartilages, with their ligaments, nearer to one another.

Arytænoideus Obliquus. Or. The base of one arytænoid cartilage;—crosses its fellow.

In. Near the tip of the other arytænoid cartilage.

Use. When both act, they pull the arytænoid cartilages towards each other.

Very often, one of these is wanting.

THYREO ARYTÆNOIDEUS. OR. The under and back part of the thyroid cartilage.

IN. The arytænoid cartilage, higher up and farther forwards than the crico lateralis.

ARYTÆNO-EPIGLOTTIDEUS. Consisting of a few fibres. OR. From the side of the arytænoid cartilage.

IN. The epiglottis.

USE. To pull down the epiglottis on the glottis.

THYREO-EPIGLOTTIDEUS. OR. The thyroid cartilage.

IN. The side of the epiglottis.

USE. To expand the epiglottis.

N. B. The crico thyroideus is described with those of the throat.

DISSECTION

OF

THE MUSCLES

ON

THE FORE PART OF THE CHEST.

The first muscle which is to be dissected, is the PECTORALIS MAJOR. After the fibres have been made tense, by extending the arm and throwing it out from the body, an incision is to be carried through the skin, from opposite to the union between the bone and cartilage of the fifth rib, to the inside of the arm, at about a hand's breadth below the shoulder. The muscle may be then easily exposed, by dissecting in the line of the fibres, and by carrying the skin first towards the lower part of the chest, and then towards the clavicle; but we must recollect, that the course of the fibres changes a little as we approach the clavicle.

Upon the lower edge of the pectoralis, we shall see part of the SERRATUS MAJOR ANTICUS. The fibres of this muscle are more difficult to dissect than those of the pectoralis, because their course changes according to the ribs from which they arise;—in consequence of this, we shall not be able to make long incisions, as we could in dissecting the last muscle, but we must carry the knife in a sweeping direction along each portion. In tracing the fibres towards their origin, we shall see the slips of the obliquus externus, with which they indigitate; but we shall not yet be able to follow the muscle to its insertion.

Before the insertion of the serratus can be shown, several muscles must be partially dissected, particularly the LATISSIMUS DORSI, the margin of which will be found running across the axilla;—this portion of the latissimus should be exposed as far as its insertion into the humerus, and when this is done, we shall see, that the upper and lower boundaries of the axilla are formed by the pectoralis major and the latissimus dorsi.

A large quantity of fat and glands will be seen between the two muscles, and also many vessels and nerves,—which, though they are very important, may be cut away in the present dissection.

Before tracing the latissimus dorsi, or serratus magnus, farther back, we should dissect upon the lower edge of the pectoralis major, so as to expose the margin of the PECTORALIS MINOR, or SERRATUS MINOR ANTICUS. After a small portion of this is shown, we should raise the pectoralis major. This may be done by cutting its origins from the cartilages of the ribs, and by then carrying it towards the sternum, from which it is also to be separated, as far as to the clavicle. In doing this, we should keep all the cellular membrane attached to its lower surface, by which we shall at once clean the surface of the pectoralis minor, and, at the same time, show a considerable part of the serratus magnus.

The latissimus dorsi may now be followed towards the back part of the chest, and by then removing the fat, &c. from its inner surface, we shall expose the edges of the SUBSCAPULARIS and TERES MAJOR muscles.—These muscles are not yet to be followed to their insertions, but by making their *bellies* distinct, we shall expose the insertion of the serratus magnus into the base of the scapula.

The whole of the pectoralis major may now be cut away, except a small portion, which should be left attached to the deltoid;—this will enable us to see the SUBCLAVIUS, which runs from the first rib to the clavicle.

If we cut through the pectoralis minor, we shall have an opportunity of seeing the two sets of INTERCOSTAL MUSCLES; for both layers are found in the middle of the chest,—the EXTERNAL being deficient on the anterior, and the INTERNAL, on the posterior part of the chest.

The muscle which is called TRIANGULARIS STERNI cannot be seen until the sternum and the cartilages of the ribs are removed. The muscle will then be apparent on the inside of the sternum, without any dissection being necessary to show its fibres.

TABLE OF THE MUSCLES SITUATED ON THE FORE PART OF THE CHEST.

PECTORALIS MAJOR. OR. 1. The cartilages and bodies of the fifth, sixth, and seventh ribs; here it intermixes with the external oblique muscle of the abdomen; 2. almost the whole length of the sternum; 3. the anterior half of the clavicle.

IN. Outside of the groove for lodging the tendon of the long head of the biceps. The tendon is twisted, before it is inserted.

USE. To move the arm forwards, or to draw it down, or to draw it towards the side.

SERRATUS MAGNUS, OR ANTICUS. OR. The nine superior ribs, by digitations, which, resembling the teeth of a saw, the anatomist calls them serrated origins.

IN. The whole base of the scapula, internally, between the insertion of the rhomboid, and the origin of the subscapularis muscles; it is, in a manner, folded about the two angles of the scapula.

USE. To roll the scapula, and raise the arm.

PECTORALIS MINOR. OR. The upper edge of the second, third, and fourth; or the third, fourth, and fifth ribs, near their cartilages.

IN. The coracoid process of the scapula.

USE. To bring the scapula forwards and downwards, or to raise the ribs, when the shoulder is fixed.

SUBCLAVIUS. OR. The cartilage that joins the first rib to the sternum.

IN. Extensively into the lower part of the clavicle.

USE. To pull the clavicle downwards.

INTERCOSTALES EXTERNI. OR. The inferior edge of the rib, the whole length from the spine to near the joining of the ribs with their cartilages. (From this to the sternum, there is only a thin membrane covering the internal intercostal muscle.)

IN. The upper obtuse edge of the rib below, as far back as the spine.

INTERCOSTALES INTERNI. OR. Like the external muscle; the fibres run down, and obliquely backwards.

IN. Into the margin of the rib below. (From the sternum to the angles of the ribs.)

TRIANGULARIS STERNI. OR. From the posterior surface, and lateral edges of the sternum, and from the ensiform cartilage.

IN. Into the posterior surfaces of the cartilages of the third, fourth, fifth, and sixth ribs.

DISSECTION

OF THE

PARTS WITHIN THE THORAX.

When the muscles are removed from the fore part, the chest will appear of a conical shape, for each rib in succession from the first, forms the segment of a larger circle. We shall now see that it is the projection of the bones and muscles of the shoulder, which gives the appearance of breadth to the upper part of the thorax; and this view will also explain, how it may be supposed that a wound has penetrated the chest, when it has only passed under the shoulder.

There are several modes of opening the thorax.—The following method will be found useful, when we wish to acquire a general idea of its contents, and are not anxious to preserve the bones or the small arteries.

The middle of the cartilages of all the seven superior ribs, except the first, are to be cut through with the knife; * the bony parts of the same ribs are then to be sawed through at a point near to their angles, taking care not to encroach upon any of the muscles of the back, except the latissimus dorsi.

The intermediate portions of the ribs may then be removed;—the sternum will remain supported in its natural position, by its union to the first rib and clavicle above, and to the remaining ribs below.

We shall now see, that the cavity of the thorax is di-

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* We shall be generally obliged to use a saw, to cut through the cartilages of a person above the age of forty.

vided into distinct parts, which are separated from each other by the septum which is called MEDIASTINUM. The lungs will be seen lying, collapsed, in each cavity; but this is not the situation in which they would be, in a state of health, in the living body,—for, as there is then a complete vacuum in the chest, the lungs would be distended with air, so as to fill it accurately. The heart, covered with its pericardium, will be seen protruding its apex to the left side.

If there has been no disease in the chest, the serous membrane, which is called PLEURA, and which covers the lungs, and lines the inside of the ribs and diaphragm, will appear of a glistening colour. It is difficult for a student who studies anatomy from books only, to comprehend the folds and duplicatures of this membrane; for he is told, that it forms the *Pleura Pulmonalis*, *Pleura Costalis*, and *Mediastinum*. But, on examination of the body, he will find, that these terms are used, only to denote the several portions of the membrane. Perhaps the following mode of tracing the pleura will be explanatory of its folds, &c.; but the student must first understand, that there is a distinct pleura in each cavity of the chest, i. e. one for each lung.

This membrane may be considered as very similar to the peritoneum; and we may say, here, as in the description of the relation of the viscera of the abdomen to the peritoneum, that the viscera, though they appear to be *within*, are really *external* to the membrane. Taking this, then, for granted, the pleura of each side may be traced in the following manner:—If we pass the hand through the opening which has been made by removing the ribs, we shall feel the glistening surface of the membrane, covering the remaining portions of the ribs (this part of the membrane is called PLEURA COSTALIS). If we then carry the finger along the ribs towards the spine, we shall feel the continuation of the same membrane: but we shall not be able to pass the finger farther in this direction, because the membrane is here connected with the root of the lungs, (forming the LIGAMENT of the LUNGS,) but if we pull up the lungs, we may see the membrane passing from the root to the upper part,—whence we may trace it, over the surface, down into the fissures between the lobes, and at last, to the opposite part of the root;—this portion, which is continued upon the lung, is called PLEURA PULMONALIS. If we still follow the membrane, it will be found to pass up from the root of the lungs, over the pericardium, to the sternum. If we then put our other hand into the opposite side of the chest, we shall feel that the approximation of the two pleuræ forms a septum or MEDIASTINUM. From the inside of the sternum, the membrane may be traced to the part at which we commenced. It may now be recollected, that this mode of tracing the membrane is nearly similar to that by which the peritoneum was traced from one side of the abdomen to the other. Therefore, we have already proved, that the lungs are as much external to the pleura, as the viscera of the abdomen are to the peritoneum. The analogy also holds good in regard to the structure of the two membranes; for if a portion of the pleura be torn off, its external surface will be found to be *cellular*, while its internal is *serous*.

Though, in reality, there is nothing difficult to comprehend in the form of the mediastinum, still students are often much puzzled by it, in consequence of the terms *anterior* and *posterior mediastinum* being occasionally used to denote the *anterior* and *posterior cavities* of the mediastinum.

This confusion between the terms, has arisen in consequence of some anatomists having divided the septum into two portions,—calling that part which is anterior to the heart, the *anterior* or *pectoral* mediastinum, and the portion which is posterior to the heart, the *posterior* mediastinum.

Though there is good authority for describing the septum as divisible into an anterior and posterior portion, still I think that the anatomy of it, will be more intelligible to the young student, if only one mediastinum be described, between the layers of which, there are certain spaces, or, if we will, *cavities*.

With the present view of the parts before us, we may easily comprehend how these cavities are formed. If we pass the hand into each side of the chest, we shall find that our fingers will nearly meet, about three inches below the sternum,—but not above that point, because the two pleuræ separate from each other immediately below the sternum (the space between them here, has been called the ANTERIOR CAVITY). If we push our fingers below the heart, they will again nearly meet; but between this point and the spine, we shall find that the pleuræ do not come into close contact, so that there is a space between them (which is called the posterior cavity). But in the student's anxiety to understand these two cavities, he is apt to omit the most important of all, viz. the middle space, or cavity, in which the heart, and its pericardium, are situated.

To *see* the anterior cavity, we must cut through the lower end of the sternum, and carry it towards the neck; in doing this, the pleura of each side must necessarily be separated from each other, so that the anterior cavity will appear larger than it naturally is. The parts within this cavity, or, in other words, between the two pleuræ, are the remains of the THYMUS GLAND, and some small vessels, particularly a lymphatic trunk, which, however, is not visible unless it be injected.

When the chest is cut perpendicularly through, or when the diaphragm is dissected away, we shall see the POSTERIOR CAVITY,—which is formed by the pleuræ separating from each other, and passing to the sides of the spine, so as to leave a triangular space,—through which the œsophagus, vena azygos, the thoracic duct, par vagum, and some branches of the sympathetic, will afterwards be found to pass. When the upper part of the space is examined, a small portion of the bronchii, and some lymphatic glands will be found;—in the lower part of the cavity, we may perhaps include a portion of the vena cava ascendens; though both this, and the cava descendens, are more properly in the middle space.*

If we now examine the external surface of the pericardium, we shall find that a considerable part of it is covered by the pleura;—but as the lower part of the pericardium always adheres strongly to the tendinous part of the diaphragm, neither this portion of it, nor of the diaphragm, can be lined by the pleura.

When we open the pericardium, we shall find that its internal surface is exactly similar to that of the pleura,—indeed this membrane may be taken as an example of the great serous membranes; for its connections with the heart, are the same as those of the peritoneum with the viscera of the abdomen, or of the pleura with the lungs. There has been a homely simile often given as explanatory of the connection between the pericardium and heart, viz. the double night-cap on the head; but there is no necessity for such an analogy; for, by holding the bag of the pericardium open, we may trace the loose portion down towards the base of the heart, where the great vessels arise; from this, it is reflected upon the anterior surface of the heart, to which it adheres very closely;—if we trace it to the opposite side, we shall find it again reflected from the base, to form the bag.

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* Though these parts have been now described, it will be inconvenient to follow them in the first dissection.

We may now examine the general appearance of the external parts of the heart.

If the pericardium has been slit open on the fore part, the VENTRICLE which is called the RIGHT, though, from its position, we should be more inclined to call it the *anterior*, will be the first part seen. The RIGHT AURICLE will probably be so distended with blood, as to project, even more than the right ventricle.—The LEFT VENTRICLE will not be *seen;* but by taking the heart in the hand, it will be at once distinguished, on the posterior part, by its firm fleshy consistence; for the right is comparatively loose in its texture, and feels as if wrapped round the left. The top of the LEFT AURICLE will be seen lapping round upon the upper part of the left ventricle; and from below it, a branch of the coronary artery, and of the coronary vein, may be traced towards the APEX of the heart. These vessels mark the division of the heart into the two ventricles, as they run nearly parallel, but a little to the left, of the SEPTUM CORDIS.

By cutting away the loose portions of the pericardium, we may show several of the great vessels of the heart. The VENA CAVA SUPERIOR will be most distinctly seen, because it is generally distended with blood.—Only a very small portion of the INFERIOR CAVA can be shown, as the lower part of the right auricle is nearly in contact with the diaphragm. The vessel which arises from the right ventricle, is the PULMONARY ARTERY: but very little more than the origin of this, can be seen, as it is covered by a portion of the ARCH of the AORTA. We cannot see the origin of the aorta at present, as it rises from the posterior part of the heart; nor are the PULMONARY VEINS visible in this view, as they are also situated on the back part.

Before the heart and great vessels are cut out, we should take a general view of the lungs. If there be no preternatural adhesions of the lungs to the pleura, where it lines the ribs, their general figure will be easily understood. It will be seen, that the base of the lungs, or where they rest upon the diaphragm, is concave, answering to the convexity of the diaphragm; that they reach far behind the anterior part of the diaphragm; and that they are pyramidal towards the upper part of the chest, answering to the pyramidal shape of the thorax.

We shall see that the lungs of each side are subdivided into lobes. Those of the right side, generally into three,—two greater ones, and an intermediate lesser lobe; and the left, into two lobes. This, however, is sometimes reversed.

The lobes are again divided into groups of cells; and these again, into a series of smaller vesicles, into which air is admitted, by the minute and less rigid branches of the bronchii.

The lungs are generally of a reddish colour in children,—grey in adults, and whitish in old age.

We shall find it advantageous to examine the minute structure of the lungs in the sheep or ox,—because it is essentially the same as in man. The lungs of those animals can be at any time procured in a healthy state, while, in the greater number of bodies, which we examine in the dissecting-room, the lungs are more or less diseased. The bronchii may be traced to their terminations in the air cells, upon which the branches of the pulmonary arteries and veins are distributed. But it is in the turtle tribe, particularly, that we shall see the air cells, for in these, they are particularly large: they will be most distinctly demonstrated, by distending a portion of the lung with air, and by making various sections of it, when it is dried.

As the larynx and œsophagus have already been cut through, the heart and lungs may now be easily removed from the chest, by pulling them, with their vessels, &c. from their connections to the spine, as far as to the diaphragm; and as the examination of the viscera of the abdomen will probably be finished ere this time, a part of the diaphragm may be cut out along with the heart.

I shall now give only such a discription of the manner of examining the heart, as will enable the dissector to follow the examination of the minute anatomy of it, in his second dissection.*

When the heart is laid with the apex uppermost, the lungs will so fall from it, that the ventricles and vessels will be more distinctly seen, than when the heart was in connection with the other parts of the body.—But when the base of the heart is turned up, the parts will appear very confused, because, not only the bronchii, or divisions of the trachea which pass into the lungs, will be now presented,—but also, the aorta and œsophagus will be seen adhering to the heart. The œsophagus should be entirely removed, and also a considerable portion of the aorta; the divisions of the trachea should then be traced into the lungs; and in doing this, we shall see that the right portion, or bronchus, divides into three branches, corresponding to

* The heart and the great vessels should be completely cleared of their blood, by washing them in water.

the three lobes,—while the left, is divided only into two. By now removing the remaining part of the pericardium, the branches of the pulmonary artery will be seen, and the pulmonary veins may be traced into the left auricle.

The lungs may then be separated from the heart, by cutting through the *four* or *five* pulmonary veins, and the branches of the pulmonary artery.

We may now examine the interior of the heart, following, in our dissection, the course by which the blood passes through the heart.

We should pass a probe, or the handle of a knife, from the inferior into the superior cava; and then lay open the vessels, and the cavity, in the line of the probe:—this will show the meeting of the great veins which form that part of the auricle that is called *sinus*,—to the lateral part of which, the portion properly called *auricle*, will be seen. This latter part is to be opened by the scissars, and then the muscular bands which are called MUSCULI PECTINATI, will be seen.

With this view before us, we cannot avoid seeing the opening into the ventricle, which is called OSTEUM VENOSUM;—if we push our finger into this opening, we shall feel the rough inner surface of the right ventricle. To open this ventricle, we should push the finger as far down as we can, and cut upon it; the opening may be enlarged, by cutting in a direction towards the pulmonary artery. If this does not give sufficient room for seeing the parts within the ventricle, a portion may be cut out. The first thing we shall notice, is, that the interior of the ventricle is very irregular, in consequence of a number of muscular bands running across it, and which are called COLUMNEÆ CARNEÆ. We may observe that they are more numerous towards the osteum venosum, than towards the pulmonary artery;—and when we examine the osteum venosum more minutely, we shall find that there is a set of these fleshy columns united with tendinous bands (CORDÆ TENDINEÆ) which expand into a membrane that is connected with the orifice. This structure forms a sort of valve; for when the ventricle contracts to push the blood into the pulmonary artery, these cords will be pulled so tight, as to prevent the blood from passing back into the auricle. As this apparatus is formed of three distinct sets of *columneæ carneæ* and *cordæ tendineæ*, it is called the TRICUSPID VALVE.

We may now lay open the pulmonary artery, and we shall find that there are three distinct VALVES at its root, which, from their shape, are called SEMILUNAR. As these valves must be thrown down when the vessel contracts upon the blood which is propelled into it by the ventricle, there can be little doubt, that their use is, to prevent the blood from regurgitating into the ventricle, when it relaxes to eceive the blood which is pushed into it from the auricle y the action of the musculi pectinati.

As the lungs have been cut away, we must (following the ourse of the *circulation*) pass to the examination of the eft side of the heart.

The left auricle is to be opened by cutting upon a probe which has been passed into it, from one of the pulmonary eins. When it is fully opened, the same general appearances will be seen, as in the right; the finger is then to be assed into the opening into the left ventricle, which is alled OSTEUM ARTERIOSUM;—the cavity of the ventricle is hen to be opened by following the rules which were precribed for opening the right side.

Every part in this ventricle will be found essentially the ame as in the right,—the only difference in the two ven ricles, being, that all the parts in the left, are much tronger than in the right: the reason of this, would appear o be, that the blood is to be farther propelled by the left, han by the right. As there are only two sets of columns nd cords to form the valve between the left auricle and eft ventricle, and as they have some resemblance to a ishop's mitre, the valve has been called the MITRAL VALVE. he valves at the root of the aorta have certain little minences in their centres, more distinct than those of the ulmonary artery.—These bodies are, in both arteries, generally called CORPORA SESAMOIDEA.

I shall now describe the manner of showing the more inute structure of the heart. But I would not advise e young student to attend particularly to this, in his first issection.

The student may, at any time, have an opportunity of xamining the minute structure of the heart; as the form f the hearts of quadrupeds, and of the greater number of arm-blooded animals, is, in all essential points, the same s that of the human body.

We shall find, by the names which are given to the different parts of the heart, that the older anatomists took dvantage of this; for many of the terms will be much ore readily understood by dissecting the heart of a sheep, r of an ox, than by examining such hearts as are generlly found in those bodies which are brought into the issecting-room.

We shall also derive much assistance in our examination of the structure of the heart, as the principal agent in the circulation of the blood, by dissecting the hearts of the various classes of animals;—for then we shall understand, that the structure of the heart varies according to the different systems of respiration.

The method which has been described for making the *first* dissection of the heart, may be nearly followed in making a more minute examination of it. In removing the heart from the body, we should always take a small portion of the diaphragm with the inferior cava; and in opening the cavities, a little more attention should be paid to certain marks.

To open the auricle, we should introduce a probe, or blow-pipe, into the lower cava, and convey its point to the projecting part of the auricle. If we now cut the auricle in the direction of the probe, the *Eustachian valve*, and every important part, will be avoided. Continuing to hold the heart nearly in the same situation in which it lies when in the body, the *septum* which divides the right from the left auricle, will be seen,—and upon it, the remains of the FORAMEN OVALE. This *fossa ovalis* is an irregular depression, of an oval form, with its border, especially on its upper part, elevated into a ring. Its margin is white, and has somewhat the appearance of tendon. The part in the middle, which performed the office of a valve in the fœtus, is white and firm. This membranous portion seems continuous with the margin upon the lower part,—while, upon the upper part, it goes behind the margin of the fossa.

If the lower cava, where it expands into the auricle, be held open, a membrane will be seen stretching from the inner side of the margin of the foramen ovale, (this portion is sometimes called the *isthmus* of the foramen ovale,) round upon the half of the root of the vein nearest to the opening of the auricle into the ventricle: this is the EUSTACHIAN VALVE: it is like a duplicature of the inner membrane of the auricle.

Behind the Eustachian valve, is the opening of the great coronary vein; which vein, running round the margin of the left auricle, gathers the blood from the smaller coronary veins. The little *semilunar valve*, on the mouth of this vein, was likewise first described by Eustachius. Some small openings, of a size sufficient to admit bristles, may be found in different parts of the auricle. They were at one time supposed to be ducts, and were called *foramina Thebesii*; but they are probably only the openings of some of the small veins of the heart, into the auricle.

The only other part which we have to observe in the auricle, besides the *musculi pectinati*, which was not seen in the first general dissection, is the TUBERCLE of LOWER. But this is one of those parts, the description of which, has been taken from the heart of the lower animals. It is nothing more than an eminence, which is formed by a portion of firm fat, which, in a healthy heart, is situated immediately at the angle where the two venæ cavæ unite, to form the great sinus of the auricle.

The right ventricle is now to be opened, by making an incision from the root of the pulmonary artery to the apex of the heart, and parallel with the right branch of the left coronary artery, but a little to the right of it. By an incision made in this direction, (care being taken to carry it no deeper than the thin sides of the ventricle,) none of the columnæ carneæ will be cut; for the ventricle will be opened exactly to one side of the septum of the heart. The incision may be continued round the base of the heart, by the root of the pulmonic artery and margin of the right auricle: or, the first incision may be continued round the point or apex of the heart, so as to lay the ventricle open, as if it were cleft or split from the apex.

OF THE PARTS SEEN UPON OPENING THE RIGHT VENTRICLE.—First, an irregular column of flesh is seen rising from that part of the ventricle which is laid back, and dividing into seven or eight delicate cordæ tendineæ, which are expanded into a broad tendon that forms the anterior division of the tricuspid valve. From a little mammillary process of flesh, near the valves of the pulmonic artery, and where the surface of the ventricle is smooth, there is sent out, in three divisions, a great number of delicate cordæ tendineæ, which are also connected with the anterior division of the valve. The next division of the origins of the cordæ tendineæ, is from the septum of the two ventricles; from which they arise by separate pillars. And, again, from the back part of the ventricle, there is a strong column, having a double origin from the two opposite sides of the ventricle, and to which the great posterior division of the membranous valve is attached. By the attachment of these three divisions to the tendinous circle which surrounds the opening between the auricle and ventricle, the tricuspid valve is formed.

The smoothness of the ventricle towards the opening into the pulmonic artery, may be observed. When the pulmonic artery is slit up, its three semilunar valves will be seen. These valves are more frequently perforated in the edges, than those of the aorta.

OF OPENING THE LEFT SIDE OF THE HEART.—Introduce the blade of the scissars into one of the pulmonic veins, and, insinuating it into the part of the auricle which projects by the sides of the pulmonic artery, slit it up. There is little to be observed in this auricle: the MUSCULI PECTINATI are not so strong, nor so evident upon its inside, as those of the right auricle. The PULMONIC VEINS pass almost always into the cavity by four openings; those from the right lung, are closer together than the left branches.

To expose the left ventricle, make an incision as far towards the left side of the artery and vein which run down from the left auricle towards the apex, as the incision made to lay open the right ventricle was, to the right of these vessels. In opening this ventricle, there is less fear of cutting upon the columnæ carneæ, or upon the septum; for, as the right ventricle is open, the septum can be seen, and we can cut immediately on the other side of it; while the columnæ are collected in the further side of the ventricle, round the opening of the auricle, and are not much exposed to the knife. Continuing the upper part of the incision round under the projecting auricle, slit up the aorta, to show its valves: in doing which, that branch of the left coronary artery which comes out under the margin of the left auricle, must be cut through. When this ventricle is laid open, that part which is towards the septum, and more particularly, near the artery, will not appear rugged with the interlacements of the columnæ carneæ, or *lacerti*, as they are sometimes called. The columns which are connected with the mitral valve, are thick and short, and confined in a corner of the ventricle; nor do they spread their roots so extensively, as those of the right ventricle.

Turning our attention to the semilunar, or sigmoid valves; we may observe, in the child, that they are delicate and loosely floating membranes, variegated in part by a white opacity; while their edges are at some places so transparent, that there appears often to be deficiencies of the valve near the edge, when there are none.—There are, however, such deficiencies sometimes. In the adult, these valves acquire greater firmness and strength, and are opaque; and there is always on the middle of each valve, a little body, which is called CORPUS SESAMOIDEUM, or CORPUS AURANTII. Behind each of these valves, are seen the LESSER SINUSES OF THE AORTA, or, as they are sometimes called, SINUSES OF MORGAGNI; here the coronary arteries will be seen to arise.

When the heart of the fœtus is examined, we shall find that it differs very essentially from that of the adult. If we lay open the two auricles, we shall see an oval hole (FORAMEN OVALE) in the septum, which, in the adult, separates the one auricle from the other. The ventricles are nearly the same as in the adult; but from the pulmonary artery, a very large vessel passes directly to the aorta. This vessel is called DUCTUS ARTERIOSUS. In the adult, it is found degenerated into a ligament, which is called the *remains* of the ductus arteriosus.

The minute structure of the *walls* of the ventricles may be more easily shown, by plunging the heart into boiling water,—for then we may easily strip off the pericardium from the surface, so as to exhibit the different orders of muscular fibres which compose it.

Part of the aorta should be kept for the examination of the *coats of an artery*. About an inch of it may be distended with a piece of candle or bougie,—and another portion may be laid open: in the distended portion, we may show the coats, beginning at the *external*,—in the other portion, the *internal* may be shown first.

There are generally only three coats described in an artery,—but we may enumerate a fourth, by calling the cellular membrane which is between the muscular and internal coat, a distinct one.

The three proper coats are,—the *first* CELLULAR, VASCULAR, OF TENDINOUS COAT;—the next is the MUSCULAR COAT;—and the third, the INTERNAL.

The outer cellular coat of an artery may be separated into many layers; easily into three layers. These layers are gradually, as they proceed inwards, changed in their nature from that of the general investing cellular membrane by which the vessel is connected to the parts with which it is in contact; they are at last incorporated into a more regular coat, whence this has been called the *tendinous coat;* for it is dense, white, and elastic, and has much more toughness than the inner coats,—but while the inner surface of this layer, viz. that which is contiguous to the muscular coat, is more accurately defined, its outer surface seeming imperceptibly to degenerate into the nature of cellular substance,—whence it has been described as a *cellular coat;* but it has also been called the *vascular coat*, because the small arteries, which ramify upon the larger trunks of arteries, (the VASA VASORUM,) run chiefly in it. These arteries are not, in general, derived from the large vessels on which they lie, but come from some of the smaller branches of arteries. They are, to the great arteries, what the coronary arteries are to the heart. They supply and nourish the coats of the arteries; while the column of blood in their cavities, seems to have no such effect. To prepare these subordinate vessels, they must be injected minutely (before the artery is removed from the body) with size, or fine varnish injection, of a light colour, or of pure white. If, after this minute injection, a coarser, and dark-coloured injection, be thrown into the trunks, the light-coloured, and fine injection, will be pushed onward, while the coarse injection fills only the trunks; making thus a contrast between the large vessels and the ramifications of the vasa vasorum, upon its surface. The artery, when thus injected and prepared, may be dried and varnished, or preserved in spirits.

The MUSCULAR COAT.—Having dissected these outer layers, ~~the muscular coat~~ appears. Its fibres run in circles round the artery;—no fibres run in the length of the artery. The circular fibres of the muscular coat do not all pass round the artery. On attempting to trace any single fibre, it may be found to make a complete circle round the artery; but, on further examination, the circle will be found to be made up of segments of fibres, irregularly combined, the extremities of which are intermixed, and seem lost among each other. When the arteries of a young body are examined, the muscularity of the vessel will be more observable in the arteries of the thigh. In an old body, the muscular coat may be divided into three or four laminæ.

Immediately under the muscular coat, there is a little cellular membrane, which has been sometimes called the *inner cellular coat*,—but it is hardly worthy of this term.

The internal coat is most easily demonstrated by merely laying the artery open. It is very difficult, unless the artery be diseased, to separate this from the other coats.

MANNER OF EXAMINING THE PARTS IN THE THORAX, TO DISCOVER THE SEAT OF DISEASE.

The common method of opening the chest, for the purpose of examining the state of the viscera, is, to make a longitudinal incision through the integuments,—to dissect them and the muscles towards the sides,—and then to cut through the cartilages of the ribs, and remove the sternum. This method has certainly the advantage of making the view of the parts within, more distinct; but it is very difficult to sew the body up afterwards, so as to prevent it from appearing much disfigured. Unless the patient be supposed to have died of aneurism, or some very particular disease, the following method will be found to allow of sufficient room for examining the lungs and heart; and when the examination is finished, the parts may be put together without the body being at all disfigured.

Make an incision from opposite the cricoid cartilage to the umbilicus (if the abdomen is to be examined, the incision may be prolonged to the pubes), and saw through the middle of the sternum. The portions of the sternum are then to be forcibly separated from each other, and a piece of wood is to be placed between them.—To do this, a considerable force is necessary, for the parts must be pulled asunder until the ribs give way at their angles;—it will be most easily done by two persons taking hold of the sides of the sternum, and pulling against each other: their hands should be guarded by putting a cloth between them and the cut portion of the sternum.

The first part which we should examine, is the pleura. As it is a serous membrane, there will always be a certain quantity of fluid within it;—in the healthy state, there is only as much fluid as will moisten the surface of the membrane: but when there has been a general state of weakness, the fluid will be thrown out in greater quantity than the absorbents can take up, and then the disease called *hydrothorax* will be formed. In such a case, we shall occasionally find more than three quarts of water within the pleura. When there is *anasarca* in other parts of the body, a certain quantity of fluid will be found in the chest.—It is also a very common appearance in the greater number of those who have suffered from protracted disease of the viscera, or in children who have died in consequence of *measles*. The cases which have occurred in the cancer ward of the Middlesex Hospital, have been sufficiently numerous, to prove, that this effusion is the most common cause of the death of those who suffer from cancer of the breast. It is also important to know, that this, and a slight degree of inflammation, are very frequently the cause of death in those who have met with severe accidents, or who have undergone a great operation.——This is so important a point in the practice of surgery, that I shall refer the student to a paper which he will find upon the subject, in the Surgical Observations, by Mr. Bell.

The pleura is very subject to inflammation. In the case of common phthisis, it will be found so thickened, and its smooth serous surface will be so altered in structure, that it will be hardly possible to recognize it. This may be considered as a chronic state of the inflammation; but if a patient dies of pneumonia, within a week after the first attack, a quantity of coagulable lymph, or inflammatory crust, will be seen upon the inner surface of the chest, and from which it may be torn, as a tremulous gelatinous layer; or, upon the surface of the lungs, a jelly will be thrown out, which can be wiped away with a cloth. These exudations approach, in their more advanced stages, to the appearance of the natural membranes, and can with difficulty be distinguished from the original membranes. When there is a vacancy in the thorax, from disease, as from the destruction of the lungs of one side, and when pus has been formed, there will generally be layers of coagulable lymph upon the inner surface of the pleura; or, we shall find a serous fluid in the bottom of the chest, with flakes of the coagulable lymph, like membranes, floating in it.

When the pus is in great quantity, the disease is then called *empyema;* and this will also sometimes be found after injuries by falls. The *vomica* is the name given to an abscess in the lung; but if this bursts into the cavity of the chest, it will form the *empyema:* this, however, is not the species of this disease, for which we would propose the operation of *paracentesis thoracis.*

Of Adhesions of the Lungs.—Adhesions of the lungs to the pleura, where it lines the ribs, or where it covers the pericardium, are so frequent, that they need scarcely be considered as a disease,—at least, they are of no account in investigating the cause of death; for it would appear, that the slightest inflammation, during any period of the person's life,—even from colds, which pass unobserved, produces adhesions, which are never afterwards removed.

In examining the state of the *lungs*, it is of much importance to distinguish between the effect of the gravitation of the blood, and the consequence of previous inflammation. From the body's lying in a horizontal posture after death, blood is often accumulated at the posterior part of the lungs,—giving them there, a deeper colour, and rendering them heavier. In this case, there will be found no crowd of fine vessels filled with blood, nor any other mark of inflammation of the pleura. Where blood is accumulated in any part of a lung, after death, from gravitation, it is always of a dark colour; but where blood is accumulated from inflammation, the part will appear florid. The lung which is loaded with blood, from gravitation, may be distinguished from that which is condensed by inflammation, by cutting into it; for then, the blood may be squeezed out, and the lung will regain its natural appearance;—but a diseased portion will feel denser and heavier, and when squeezed, the blood will not escape, nor will there be any of that crackling feel, which is felt in the healthy structure; and the interior of the substance, when it is cut into, will have much resemblance to the liver,—whence it has been called, by the French pathologists, *pulmo hepatizè.*

The most common disease, which we are called upon to examine, is that of *phthisis pulmonalis*, or *consumption.*

When we cut into the lung of a person who has died in the early stage of this disease, we [redacted] find groupes of little white, or variegated bodies, which are called *tubercles.*—They vary in size, from that of a pin's head, to that of a bean. When the disease is farther advanced, the tubercles make the surface of the lung, hard and irregular; and when cut into, they are found to have run into masses, in which there are little abscesses, or *vomicæ*;—some of the tubercles may still be distinct from the others, and, when opened, are found to contain a thick white pus. In those patients who have long borne out against the disease, large abscesses, or vomicæ, are found: in such cases, when the chest is opened, the lungs will be found compressed,—hard coagulable lymph will be exuded upon the surface of the pleura, and partitions will extend from the inner surface of the ribs to the collapsed and indurated lungs: sinuses of matter will be seen running among these irregular adhesions, and the lungs themselves will contain small purulent abscesses, or large vomicæ, and will, in other parts, be full of irregular tumours, in all the various stages of inflammation and suppuration.

The state of the large vessels, in these great abscesses, is very extraordinary; for they will sometimes be found with open mouths, projecting into the sac,—more commonly, however, with their mouths plugged up with coagula, like the arteries of a stump after amputation.

Tumours will sometimes be found projecting from the surface of the lungs, and widely interspersed in their substance, of quite a different texture from tubercles, being of a very vascular and porous, or cellular nature; perhaps these may be called *sanguineous tumours*. Those upon the surface, are of a reddish colour, and are covered with a smooth membrane. These are often found in those subjects, in which there is a similarly diseased structure in the liver and lymphatic glands, and in the substance of the testicle. Indeed, when the lungs are diseased, we generally find that the lymphatic glands, and particularly, the mesenteric glands, are in the same state. There is one species of tubercle that is very rarely seen,—viz. a soft pulpy tubercle, of a light brown colour.

In a *broken-winded* horse, the air cells are sometimes found ruptured, so that several communicate with each other, and form large cysts. Something of the same kind has been found in those who have long suffered from asthma. Such an appearance was found in the lungs of the famous Dr. Samuel Johnson. This has been called *emphysema pulmonum*: it is a very different affection from that of the *air vesicles*, which are occasionally found adherent to the surface of the lungs.

Burst hydatids are occasionally coughed up; but as they are very seldom found in the lungs, it is supposed that they are formed in the liver, and, that by a process of ulceration, a communication is formed between the sac in the liver, containing the hydatids, and the lung.

Earthy concretions are so frequently found at the roots of the lungs, that I am inclined to think they are very common in scrophulous constitutions: they are generally situated near the branching of the bronchii. And here, though the subject is not connected with these concretions, I may remark, that the first appearance of abscess in the lung will generally be found at the upper part,—and I think, more frequently on the left side, than on the right.

If there has been a cancer of the breast, which has extended to the bone, it will generally affect the lung also. I think I have found this happen most frequently in those patients who have had that sort of cancer which has been considered as a species of *fungus hæmatodes*. In examining the body of a person who has died of fungus hæmatodes, we should always attend to the state of the lungs, for they appear to be as frequently affected with this disease, as the liver.

If a patient dies of irritation in the larynx, the lungs will generally be found in a state of congestion, and will not collapse; proving, that the patient has died in consequence of the gradual destruction of the lung, as a respiratory organ, by the extravasation of serum into its cellular membrane.

In those children who die of croup, the *membrane* may be traced into the branches of the bronchii, and the cells will be filled with purulent matter.

In those who die suddenly from the bursting of an aneurism of the aorta, or from *hæmoptysis*, the whole of the bronchii will sometimes be found so distended with blood, that it must have prevented any air from being drawn into the cells.

The first thing we should attend to, in the examination of the heart, is the state of the pericardium. If the patient has suffered from a lingering disease, or if there be water in the pleura, we shall probably find some fluid in the pericardium; but a small quantity of water is so frequently found within this membrane, that we cannot attach much importance to it: indeed, this has been considered so natural a state of the pericardium, that the fluid has been called liquor pericardii;—but the quantity occasionally found, is so great, that it must have impeded the action of the heart.

The pericardium is very frequently found adhering to the heart. If we were to compare the number of cases which are now seen, of this, which appears to be a consequence of violent inflammation of the internal surface of the pericardium, with the importance which the older authors attached to the few cases recorded, we should be inclined to say, that the disease of pericarditis must be much more common now, than formerly. I have frequently found the lymph between the pericardium and the heart, a quarter of an inch in thickness: in such cases, the disease had been evidently chronic; as there were several distinct layers of lymph, the most internal of which, I have been able to inject. But in those cases in which patients die after thirty hours' illness, we shall generally find only a very delicate layer of lymph between the pericardium and the heart.

The surface of the heart which corresponds to the part of the pericardium that adheres to the diaphragm, very often appears of a white colour, one portion, about the size of a shilling, being denser than the rest,—and sometimes a loose portion of membrane is attached to it; but this appearance is so very often found in the hearts of old people, that it cannot be considered of any importance. Ossification of the substance of the heart will be more frequently found, than ossification of the pericardium.

The heart is sometimes monstrously enlarged; but we ought to make a distinction between the cases of enlargement. In a dropsical body, or that of a person who has evidently laboured long under the effects of what is called a broken-down constitution, we shall find a large flabby heart, the walls of which are so soft, that, in examination, the finger will pass through them. If, in such cases, we examine the valves, we shall probably find them in a natural state; but if the heart is large, and if, at the same time, there be marks of long-continued irritation upon its surface, we shall probably find the valves of the aorta so diseased, as to have caused an actual obstruction to the exit of the blood. In such a case, the state of the heart is very analogous to that of a bladder when there has been a stricture in the urethra.

The large flabby heart has been sometimes called *Aneurism*,—but this is a mistake; the true aneurism is very seldom found. In such a case, the heart is not generally enlarged; but, according to the best authorities, there is a projecting tumour from the side of one of the ventricles. But in the only distinct case of aneurism of the heart, which I have examined, there was a cyst formed in the wall of the ventricle, which was not observable until the heart was opened: In this case, there was an opening in the cyst, which admitted a probe; and by this, the blood had escaped into the pericardium.

Rupture of the heart is, certainly, a very rare occurrence, but, during the course of the last ten months, I have met with three examples of it. One, of the *right auricle*, which was in the heart of a young woman, and, from the history given by her friends, appeared to have been produced by a sudden fright. The other two examples were in the ventricles, and in old people, who, from the state of their bodies (which were brought into the dissecting-room), appeared to have been in full health previous to the moment of their death. In each of the three cases, the pericardium was stuffed with blood.

In examining the interior of the heart, we should proceed in the same manner as if we were dissecting it to show the natural anatomy. In the right auricle, we may perhaps find the foramen ovale open; but this is so common, that we cannot attach much importance to it. I have found, in the heart of a strong drayman, who dropped down dead in the streets, in consequence of rupture of the aorta, an opening in the septum auriculorum, which would admit four fingers. It did not appear that this man had ever suffered from any affection that could be referable to the state of the heart. The circumstance of his having died from rupture of the aorta, seems to be an argument against supposing that the action of the heart had been deteriorated by this opening.

The tricuspid valve is very frequently ossified; but unless we find this in the heart of a young person, we should not attach much importance to it. Within the right ventricle, we shall generally find more blood than in the left; and in that state of coagulation, which has, by many, been called *Polypus*.

That these polypi are, for the most part, formed after death, there can be little doubt; but still there are circumstances which have induced many to believe, that they are formed during life. They are often found in layers; and this, it is said, argues a successive formation; or they are attached to the sides of the arteries, where their coats are diseased,—and their attachment does not appear to be accidental, or owing to the simple coagulation of the blood. In many instances, however, when these coagula are remarkably firm, and such as we might suppose were formed during life, we shall find, upon examination, that the extremity, which is loose, lies in a direction contrary to the course of the blood; a direction, in which we must be sensible it could not have remained during life, for it must have been driven in the direction of the current of the blood, while the root was held nearer the heart. In the centre of many of these coagula, there is an oily fluid, so similar to pus, that I have seen such cases exhibited, as examples of abscess in the interior of the heart.

Abscess in the walls of the ventricle, is a very uncommon case; I have only seen one or two examples of it: but I have dissected a heart, in the muscular substance of which, there were tubercles, which, though not in a state of suppuration, might, from their appearance, be called scrophulous.

Malformations of the Heart.—We sometimes see an opening in the septum ventriculorum: several preparations of this kind are preserved in the Museum, in Great Windmill Street,—one of which, was taken from the body of a gentleman, fifty-six years of age, who had, six hours previous to his death, gone through the exercise with the musket, without suffering any inconvenience. In dissecting a *puer cæruleus*, we shall generally find, that the pulmonary artery is very small, or that it passes into the aorta. In several of these cases, there will be a hole found in the septum, so that if a probe be passed from the aorta, it will be found to pass as easily into the right, as into the left ventricle.

The valves of the pulmonary artery are very seldom found diseased. In the left auricle, we seldom see any marks of disease, but the osteum arteriosum is very often contracted; indeed, the whole apparatus of the mitral valve, is more frequently ossified than the tricuspid.

Within the left ventricle, we shall find the same *polypi* as in the right, but not in the same quantity, as the blood is generally propelled from this cavity in the last struggles. The most common appearance of disease in the heart, is, ossification of the valves of the aorta. I am inclined to think, that this is so far a natural consequence of old age, that it does not produce much distress in a person above the age of sixty; but in a young person, whose left ventricle is still in a vigorous state, the consequences are terrible; for, we find the heart sometimes increased to nearly the size of that of a bullock, and bearing evident marks of inflammation.

The disease of *Angina Pectoris* is generally ascribed, and perhaps correctly, to ossification of the coronary arteries; but I am inclined to doubt the correctness of this opinion, when I find, in almost every body above the age of fifty, that these vessels are more or less ossified. In many old people, who I know never had the slightest symptom of *angina*, I have found the coronary arteries like tubes of bone, through their whole course.

When the heart is very large, we shall not find the aorta increased in size, but, on the contrary, smaller than natural.

The aorta is frequently much dilated, immediately after it rises from the heart. This state of the vessel, is generally found in old people; and when such a vessel is opened, there will be, at certain points, white spots below the inner coat,—and, at other parts, distinct *concretions*, which are generally called *ossifications*.

This state of the aorta is so common, that we should not attach much importance to it, in drawing up a report of the dissection of a person advanced in years. In the dissection of those aneurisms which occur so frequently at the arch, we generally find the aorta to be dilated through almost its whole course. We may suspect, that the dilatation which I have just described, as common in old people, may be the primary state of an aneurism; for, if we minutely examine an artery which is dilated, we shall generally find one point thinner than the rest, which, had the patient lived longer, would probably have given way, and then an aneurismal tumour would have been formed at the part.

When a patient dies of a large aneurism which has formed a projecting tumour, we should proceed, in making the examination of it, nearly in the following manner:—

The integuments should be dissected off from the tumour on the breast, and then, after calculating how far the bones are affected, we should endeavour to remove the sternum with the heart, and the aneurism attached to it. We shall then be able to make a more careful examination of the parts. If we make a section of the sternum, and of the aneurismal sac, we shall see the *clot*, probably, in several layers: the effect of the pressure on the bony part of the sternum should also be attended to. The sac itself will appear thick and lamellated, and studded with concretions, which are imbued in a matter resembling pus. The heart will probably be small and firm in its texture, and the valves of the aorta will be thickened, and white with concretions.

The idea that it is necessary to cut through the internal coat of an artery, with the ligature, to ensure the closing of the vessel, is so common, that I think it necessary to entreat the student to attend to this subject, as far as he can, in the dissecting-room.

In preparing to inject a limb where the arteries are in the state in which they are generally found in a patient with aneurism, if we apply the ligature tightly upon the pipe which is in the artery, we shall cut through, not only the internal, but also the muscular coat; so that only the cellular coat shall remain: if we then throw in the injection, it will most probably escape by the side of the ligature.—If we tie the artery in the same manner, at some distance down the limb, the coats will give way, when the injection is pushed, even with a moderate force, against the part tied. Here, then, is sufficient proof that the vessel must be very much weakened, by this mode of applying a ligature. As to the idea that the union of the artery will not take place readily, where the ligature does not cut through the internal coat,—I shall only say, that I have repeated the experiment which was made by Mr. Bell (when the notion of the necessity of cutting the internal coat was first advanced by Dr. Jones), of putting a ligature so loosely round the carotid of an ass, as not even to obstruct the passage of the blood; yet, in due time, a clot was formed, lymph was thrown out, and the sides of the artery were united. I shall not dwell longer on this subject, but refer the student to the paper on the ligature of arteries, in Mr. C. Bell's Surgical Observations.

METHOD OF INJECTING THE HEART AND GREAT VESSELS.

That the description of the manner of examining the heart may be more complete, I shall here show the method of injecting the heart and great vessels, so that they may afterwards be preserved. This, however, is a piece of dissection which a student should not attempt until he is considerably advanced in the knowledge of anatomy.—— I shall presently describe the manner of injecting the great arteries of the chest, for the common dissection of the vessels of the head and arm;—to that part of the work, the student should refer, for the description of the first dissection of the arteries of the chest.

Old subjects should never be taken for the purpose of preparing the arteries of any of the viscera: for, in old age, the fat is accumulated about the viscera both of the abdomen and of the thorax. Nor is the fat here deposited, derived from the extremities; for although, during life, the limbs of old people seem shrivelled and lean,—yet the oil contained in them, makes them also useless for preparing:—for, although dried with the utmost care, the oil will occasionally flow out, and mix with and dissolve the varnish, so that they never are clean nor lasting preparations. If the heart, therefore, has much fat accumulated about it, there should be no hesitation in sacrificing it as a preparation, to the attainment of some other point of inquiry.

If we wish to inject the heart while it is in its natural situation, we must sacrifice almost all the parts of the chest to it; for it is a preparation so difficult to make, and so expensive, that when we undertake it, we must not hesitate to destroy the other parts. The chest, for this purpose, is to be opened by cutting through the sternum in its length, and by bending back the lateral portions, in the manner already described at page 197. The abdomen must also be opened. The viscera are to be pulled down, so that a large pipe may be put into the aorta, where it lies between the crura of the diaphragm. Another pipe is to be put into the vena cava ascendens, below the liver.

We must then make a dissection on each side of the neck, so as to expose the internal jugular veins, into each of which, a pipe should be put. The carotid and vertebral arteries are to be tied; so are the subclavian: or perhaps it will be better to put tight ligatures on the arms, just below the insertion of the pectoralis major.

Previous to the injection of the veins, a quantity of warm water should be thrown into them, so that it may pass into the several cavities of the heart. The water is then to be pressed out along with the coagula which are generally found in the cavities of the heart.—It is principally upon this being carefully done, that a good injection of the heart depends.

When the parts are thoroughly heated, the *red* injection should be thrown into the ascending aorta. An assistant must now be ready to *knead* the injection through the valves of the aorta; (but, if possible, a probe should have been passed from the carotid, before it was tied, to break down these valves;) when the injection once passes the valves, it will quickly distend the left ventricle, which must be supported by the assistant,—the pericardium having been previously opened. By a little pressure, the wax will pass into the left auricle, and, from it, into the pulmonary veins. It will be well to make a small puncture, with a lancet, in the apex of the ventricle, to allow of the escape of any water or blood which may be still in this side of the heart.

The right side of the heart may be filled with blue or yellow injection from the pipes which have been put into the several veins. It will be necessary to make a puncture in the apex of the auricle, to permit the exit of a certain quantity of water which will be left in the heart, even though much care has been taken to squeeze it all out previous to the injection.

Perhaps the vena azygos may be filled, with the other veins; but if it be not, we must put a pipe into it, and inject it separately.

The thoracic duct may also be injected. If sought for in the abdomen, it will be discovered at the root of the mesenteric vessels, or between the right crus of the diaphragm and the aorta. It may be traced up under the diaphragm, along with the aorta, and upon its right side, close to the spine. As it generally lies collapsed and undistinguishable, it may be raised by blowing into some of the glands upon the root of the mesentery, or into those upon the course of the external iliac vessels, or even into those below Poupart's ligament in the groin. It must be injected with a different colour from the veins, that it may not be confounded, in the thorax and at the root of the neck, with their branches.

When the heart only is to be injected, we should cut through the vessels going to the upper parts of the body, as they are emerging from the thorax, and remove the heart and lungs, by tearing them, along with the trachea and œsophagus, from the spine,—making first an incision along the spine, to free the intercostal arteries. We may then cut through the aorta and vena cava, below the diaphragm:—a part of the liver should be left attached to the vessels. It is necessary to remove the heart in this manner, that there may be no danger of cutting any of the great vessels.

We should press out as much blood as possible from the vessels, and then put a pipe into one of the pulmonary veins, and another into the vena cava superior.. Having injected warm water by these tubes, to clear the heart of the masses of coagulated blood which are generally found in it after death, we must tie the lungs at their roots, and the vena cava inferior, and all the divided arteries, except the aorta, into which a pipe must be put. If we throw red injection into the pulmonary vein, it will fill the left auricle, left ventricle, aorta, and coronary vessels; but during this part of the injection, an assistant ought to hold and compress the aorta immediately after its giving off the coronary arteries, so as to press the injection on in them: but as by this, the injection will be prevented from entering the aorta, it must be filled from the pipe which was inserted into it. The injection escaping by the intercostal arteries, may be stopped by an assistant throwing cold water on the wax as it flows from the vessels.—The yellow injection thrown in by the vena cava superior, will fill the right auricle, ventricle, and pulmonary artery. The dissection required, is simply the removing of the soft parts from the injected vessels.

OF THE MAMMA.

The structure of the mamma should be attended to.—Much of its bulk is made up of the fat and cellular membrane surrounding the proper glandular part, which is formed of a congeries of lesser glands, that are connected by their ducts and vessels. The arteries of the gland come from different sources: those from the internal mammary may be traced from betwixt the ribs, and through the pectoral muscles. It has also branches from the external mammary, or thoracic arteries, and from the intercostal,—all of which, become much more important when the gland is secreting milk, or when it is enlarged and diseased. A very remarkable inosculation may be traced between the internal mammary and the epigastric artery, by which the sympathy between the womb and the breast, has been, by some, explained; but this connection depends upon other laws of the economy. The veins are all very large, when the gland is in an active state. The lymphatics pass chiefly towards the glands in the axilla,—but some will be found to pass to the glands above the clavicle.

We should observe the elastic structure of the NIPPLE, or PAPILLA; the glandular structure of the skin around the nipple; the opening of the LACTIFEROUS DUCTS.—When distended, these ducts take an irregular varicose-like form. The ducts are contracted before they terminate on the nipple; and the structure of their orifices is such, as only to allow the milk to pass when the nipple is drawn out by the sucking of the child. The areola, or dark coloured zone surrounding the nipple, will be found of a paler colour in girls; it changes to a darker colour during menstruation, and in women with child, or when giving suck. The glandular structure of the areola and nipple, appears to be, to prevent excoriation: but, like all glandular parts, it is subject to disease.

It must be allowed by every one, that there is no question in pathology more important, than the difference between harmless tumours of the breast, and those, which it may be necessary to extirpate. But, unfortunately, we find great difficulty in preserving the morbid appearances of this gland.

Though we have been unable to preserve the characteristic appearances of the internal structure of the several varieties of tumours of the breast, still, accurate drawings have been taken of the external characters of each species of tumour, and which are used by Mr. Bell, in his Lectures on Cancer. When the age of the patient is also taken into consideration, it would appear, from the immense number of cases that have occurred in the cancer ward of the Middlesex Hospital, that the external appearance of a tumour forms a better criterion for the rule of practice, than any that can be deduced from the section of it; for we not only find, that different tumours, when cut into, resemble each other, but that even a section of the *virgin* breast may be mistaken, by those who are not conversant with the subject, for a scirrhous tumour. When the section of a large healthy breast is put into spirits, and compared with a preparation of a section of a scirrhous breast, that has not run into ulceration,—I believe that even good judges of preparations, may be led to believe, that both specimens are examples of the same disease.

DISSECTION

OF

THE MUSCLES OF THE BACK.

I shall now suppose, that the student who is making the *first* dissection of the upper part of the body, has examined the general anatomy of the viscera of the thorax, and that he is prepared to turn the body, to expose the muscles of the back.

The first muscles which are to be dissected, are those which are connected with the arms. The body must be put into such a position, that the fibres of those muscles may be made tense: this may be done by putting blocks of wood under the chest, so as to elevate it; and then to let the head and arms hang down.

To expose the first layer of muscles which is formed by the LATISSIMUS DORSI and TRAPEZIUS, we should make an incision along the whole length of the spine, and another from the last dorsal vertebra, in an oblique direction, to the spine of the scapula, along which, it is to be continued to the acromion. Another cut is then to be made from the acromion to the tubercle of the occipital bone. These three incisions will nearly mark the boundaries of the *trapezius;* but, as the middle fibres of this muscle pass directly across from the spine to the scapula, the dissection will be much facilitated, if an incision be made through the skin, from the first dorsal vertebra, to the middle of the spine of the scapula. The dissection is to be commenced at this cut, and is to be continued, first, towards the lower oblique incision, and then towards the upper, following the course of the fibres.

Another incision should now be made from the middle of the lumbar vertebræ, to the back part of the insertion of the latissimus dorsi, in the arm. The fibres of this muscle will be easily exposed, by cutting in the direction of this last incision.

The first layer of muscles will now be fully exposed, being almost entirely formed by the trapezius and latissimus; but on the upper and outer part of the trapezius, a small portion of the SPLENIUS will be seen, and, in the space between the trapezius and latissimus dorsi, part of the RHOMBOIDEUS MAJOR will be exposed.

The trapezius should now be raised from its connections with the spine, and be carried towards the scapula. In doing this, we shall, on the upper part of the neck, expose part of the COMPLEXUS, more of the SPLENIUS, and the greater part of the LEVATOR SCAPULÆ; which last muscle passes from the transverse processes of the cervical vertebræ, to the superior angle of the scapula. When the lower part of the trapezius is raised, the greater part of the RHOMBOIDEUS MAJOR and RHOMBOIDEUS MINOR, both of which arise from the spine, and are attached to the scapula, will be exposed.

The muscular part of the latissimus dorsi should now be cut through, at about six or eight inches from the spine. If we divide it nearer to the spine, we shall probably destroy the small muscle—the SERRATUS POSTICUS INFERIOR, which is intimately connected with the tendon of the latissimus. Between the upper margin of this small muscle, and the lower margin of the rhomboideus major, part of the LONGISSIMUS DORSI and SACRO LUMBALIS will be seen.

After dissecting the origins and insertions of the LEVATOR SCAPULÆ, and RHOMBOIDEUS MAJOR and MINOR, these muscles may be cut through; and then, by sawing through the clavicle, or by dislocating it from the sternum, the arm may be removed from the trunk. The arm should be wrapped up in a wet cloth, and laid in a cool place, so that it may be preserved, until the other muscles of the back are dissected.

We must now dissect those muscles which more properly belong to the spine and ribs. When the rhomboidei are thrown back towards the spine, the SERRATUS POSTICUS SUPERIOR will be exposed; and on raising this, the whole of the SPLENIUS may be seen. This muscle is generally divided into two portions,—SPLENIUS CAPITIS and SPLENIUS COLLI: that portion which rises from the cervical vertebræ, and is inserted into the head, being the splenius capitis,—while that which rises from the dorsal vertebræ, and is attached to the transverse processes of the cervical vertebræ, is called splenius colli. The splenius should now be cut through the middle: the upper half is to be reflected towards the occiput, and the lower towards the spine. This will expose the third layer of muscles; the principal ones of which, are the SACRO LUMBALIS and the LONGISSIMUS DORSI.

After showing the insertions of the sacro lumbalis, according to the description given in the annexed table, we may trace a portion of muscle, which appears to be a continuation of it, upon the neck. This, however, is a distinct muscle, and is called the CERVICALIS DESCENDENS. If we follow the longissimus dorsi in the same manner, we shall find a muscle, also connected with its upper part, but not so distinct as the last muscle,—it is the TRANSVERSALIS COLLI; immediately upon the inside of which, and closely connected with it, is a set of fibres, which run from the lateral part of the vertebræ to the mastoid process, whence these fibres are called the TRACHELO MASTOIDEUS; or, sometimes, from their intricacy, the *complexus minor.*

We shall now have a distinct view of the proper COMPLEXUS, which is a very large muscle. That part of it which is near to the spine, has a central tendon, whence this portion has sometimes been described as a separate muscle, under the name of BIVENTER. After showing the numerous attachments of the complexus, it is to be raised from the spinous processes, and from the occiput. The SEMI-SPINALIS COLLI will now be seen lying close upon the vertebræ; and there will also be a set of small muscles exposed, which run between the *vertebra dentata*, the *atlas*, and the *occiput.* The one which runs from the spinous process of the dentata to the occiput, is the RECTUS CAPITIS POSTICUS MAJOR; while the one which runs from the same point, to the transverse process of the atlas, is the OBLIQUUS CAPITIS INFERIOR; and from this transverse process, a set of fibres may be traced to the occiput, forming the muscle called OBLIQUUS CAPITIS SUPERIOR. The last of these muscles is a very short one, which arises from the knob on the back part of the atlas, and is inserted into the edge of the foramen magnum: it is the RECTUS CAPITIS MINOR.

It is not necessary to give any directions for the dissection of the remaining muscles on the back. It only requires that their origins and insertions should be shown, according to the description given in the annexed table.

There are still certain muscles which are connected with the spine and ribs, that have not yet been described, viz. those upon the fore and lateral parts of the neck.

Directly on the fore part of the neck, there is, on each side, a long and thin muscle, which is called LONGUS COLLI. This is sometimes divided into an upper and lower portion: the upper portion runs, *obliquely*, from the transverse processes of the third, fourth, and fifth cervical vertebræ, to the atlas; while the inferior portion runs, *longitudinally*, from the bodies of the three upper dorsal vertebræ, to the bodies of the six lower cervical vertebræ. This lower portion is often destroyed, by the vertebræ having been broken by turning the body in the course of the dissection.

Upon the outer part of the upper portion, there is a small muscle, which runs from the transverse processes of the third, fourth, fifth, and sixth cervical vertebræ, to the basilar process of the occipital bone: it is the RECTUS ANTICUS MAJOR:—the RECTUS ANTICUS MINOR being a very small muscle, which rises from the middle of the atlas, and passes to the edge of the condyle of the occiput. This last is often confounded with another trifling muscle—the RECTUS LATERALIS, which arises from the transverse process of the atlas, and is inserted between the condyle of the occiput, and the mastoid process.

These muscles which have just been described, may be dissected before those of the back; so may also the SCALENI, which are the muscles that run from the transverse processes of the cervical vertebræ, to the first and second rib. These muscles are distinguished from each other, by the terms SCALENUS ANTICUS, SCALENUS MEDIUS, and SCALENUS POSTICUS. We shall have no difficulty in showing the *anticus* as a distinct muscle, but the *medius* and *posticus* are so closely connected, that they are, by many anatomists, described as one muscle.

In the following Table, the muscles are arranged nearly in the order in which they should be dissected.

TABLE OF THE MUSCLES OF THE BACK.

TRAPEZIUS, OR CUCULARIS. OR. 1. The protuberance in the middle of the os occipitis, by a thin membranous tendon, which covers part of the splenius and complexus muscles; 2. from the transverse edge of the occiput, which extends from the protuberance towards the mastoid process of the temporal bone; 3. from the ligamentum nuchæ: below this, the muscle is connected with its fellow; 4. from the spinous processes of the two inferior vertebræ of the neck, and from the spinous processes of all the vertebræ of the back.

In. 1. The outer half of the clavicle; 2. the acromion; 3. the spine of the scapula.

Use. Moves the scapula according to the three different directions of its fibres; for the upper descending fibres may draw it obliquely upwards, the middle, being transverse fibres, directly backwards, and the inferior ascending fibres obliquely downwards and backwards.

Latissimus Dorsi. Or. 1. The posterior part of the spine of the os ilium; 2. all the spinous processes of the os sacrum and vertebræ of the loins; 3. the seven inferior spines of the vertebræ of the back; 4. the extremities of the three or four inferior ribs. The inferior fibres ascend obliquely, and the superior run transversely over the inferior angle of the scapula, towards the axilla, where they are all collected.

In. By a strong thin tendon into the inner edge of the groove for lodging the tendon of the long head of the biceps: sometimes into the tendon of the triceps.

Use. To pull the arm backwards and downwards, and to roll the os humeri.

Serratus Posticus Inferior.—(Lying under the latissimus dorsi.)—Or. In common with that of the latissimus dorsi, from the spinous processes of the two inferior vertebræ of the back, and from the three superior of the loins.

In. The lower edges of the four inferior ribs, by distinct fleshy slips.

Use. To depress the ribs.

Rhomboideus. This muscle is divided into two portions, rhomboideus major and minor.

Rhomboideus Major. Or. The spinous processes of the five superior vertebræ of the back.

In. The basis of the scapula, below its spine.

Use. To draw the scapula obliquely upwards, and backwards.

Rhomboideus Minor. Or. The spinous processes of the three inferior vertebræ of the neck, and from the *ligamentum nuchæ*.

In. The base of the scapulæ, opposite to its spine.

Use. To assist the former.

Levator Scapulæ. Or. The transverse processes of the five superior vertebræ of the neck: the slips unite, to form a muscle, that runs downwards.

In. Near the superior angle of the scapula.

Use. To pull the scapula upwards.

SERRATUS POSTICUS SUPERIOR. OR. The spinous process of the three last vertebræ of the neck, and the two uppermost of the back.

IN. The second, third, fourth, and fifth ribs.

USE. To elevate the ribs and dilate the thorax.

SPLENIUS. OR. 1. The four superior processes of the back; 2. the five inferior of the neck,—adheres to the ligamentum nuchæ. At the third vertebræ of the neck, the splenii recede from each other, so that part of the complexus muscle is seen.

IN. 1. The five superior transverse processes of the vertebræ of the neck; 2. the posterior part of the mastoid process; 3. the os occipitis.

USE. To bring the head and upper vertebræ of the neck backwards and laterally, and, when both act, to pull the head directly backwards.

That portion which *arises* from the five inferior spinous processes of the neck, and is *inserted* into the mastoid process and os occipitis, is called SPLENIUS CAPITIS; and that portion which *arises* from the third and fourth of the back, and is *inserted* into the five superior transverse processes of the neck, is called SPLENIUS COLLI.

SACRO LUMBALIS. OR. In common with the longissimus dorsi.

IN. All the ribs, where they begin to be curved forwards, by long thin tendons.

From the upper part of the six or eight lower ribs, arise bundles of thin fleshy fibres, which soon terminate in the inner side of this muscle, and are named MUSCULI AD SACRO-LUMBALEM ACCESSORII.

USE. To pull the ribs down, and assist to erect the trunk of the body.

LONGISSIMUS DORSI. OR. Tendinous superficially, and fleshy within. 1. From the side, and spines of the os sacrum; 2. from the posterior spine of the os ilii; 3. from all the spinous processes of the loins; 4. the transverse processes of the vertebræ of the loins.

IN. 1. All the transverse processes of the vertebræ of the back, chiefly by small double tendons; 2. by a tendinous and fleshy slip, into the lower edge of all the ribs, except the two inferior, at a little distance from their tubercles.

USE. To raise, and keep the trunk of the body erect.

From the upper part of this muscle, there runs up a round fleshy portion, which joins with the cervicalis descendens.

CERVICALIS DESCENDENS. OR. From the upper edge of the four or five superior ribs, and continued from the sacro lumbalis.

IN. The fourth, fifth, and sixth transverse processes of the vertebræ of the neck, by distinct tendons.

USE. To turn the neck obliquely backwards, and to one side.

TRANSVERSALIS COLLI. OR. The transverse processes of the five uppermost vertebræ of the back, and continued from the longissimus dorsi.

IN. The transverse processes of the cervical vertebræ, from the second to the sixth.

TRACHELO-MASTOIDEUS. OR. The transverse processes of the three uppermost vertebræ of the back, and from the five lowermost of the neck, by thin tendons.

IN. The posterior part of the mastoid process.

USE. To assist the complexus; but it pulls the head more to the side.

COMPLEXUS. OR. 1. The transverse processes of the seven superior vertebræ of the back, and four inferior of the neck; 2. by a fleshy slip from the spinous process of the first vertebra of the back: from these different origins, it runs upwards, and is every where intermixed with tendinous fibres.

IN. The protuberance of the os occipitis, and transverse line.

USE. To draw the head backwards, and to one side, when acting as an individual muscle; and, when both act, to draw the head directly backwards.

N. B.—The long portion of this muscle that is situated next the spinous processes, lies more loose, and has a roundish tendon in the middle of it; for which reason Albinus calls it *biventer cervicis*,—but if this portion should be called biventer, the term "complexus" is quite misapplied to the other portion.

SEMI-SPINALIS COLLI. OR. The transverse processes of the six uppermost vertebræ of the back: it ascends obliquely under the complexus.

IN. The spinous processes of all the vertebræ of the neck, except the first and last.

USE. To move the neck backwards.

RECTUS CAPITIS POSTICUS MAJOR. OR. The spinous process of the second vertebra of the neck.

IN. The os occipitis, near the rectus capitis lateralis, and the insertion of the obliquus capitis superior.

USE. To pull the head backwards, and to assist a little in its rotation.

RECTUS CAPITIS POSTICUS MINOR. OR. The knob in the back part of the first vertebra of the neck.

IN. The os occipitis, near its foramen magnum.

USE. To assist the rectus major in moving the head backwards.

OBLIQUUS CAPITIS SUPERIOR. OR. The transverse process of the first vertebra of the neck.

IN. The os occipitis, near the mastoid process of the temporal bone, and under the insertion of the complexus muscle.

USE. To draw the head backwards.

OBLIQUUS CAPITIS INFERIOR. OR. The spinous process of the second vertebra of the neck.

IN. The transverse process of the first vertebra of the neck.

USE. To turn the head, by moving the atlas on the dentatus.

SEMI-SPINALIS DORSI. OR. The transverse processes of the seventh, eighth, ninth, and tenth vertebræ of the back.

IN. Into the spinous processes of all the vertebræ of the back, above the eighth, and into the two lowermost of the neck.

USE. To poise the spine and support the trunk.

SPINALIS DORSI.—(Lying betwixt the spine and longissimus dorsi.)—OR. The spinous processes of the two uppermost vertebræ of the loins, and the three inferior of the back.

IN. The spinous processes of the vertebræ of the back, from the second to the ninth.

USE. To connect and fix the vertebræ, and to assist in raising the spine.

MULTIFIDUS SPINÆ. OR. 1. The spines of the os sacrum; 2. the part of the os ilium where it joins with the sacrum; 3. the oblique and transverse processes of all the vertebræ of the loins; 4. the transverse processes of all the vertebræ of the back, and those of the neck, except the three first, by distinct tendons, which soon grow fleshy, and run in an oblique direction.

IN. Into the spinous processes of all the vertebræ of the loins and back and neck, except the first.

USE. To support the spine and trunk.

INTERSPINALES DORSI ET LUMBORUM, and the INTERTRANSVERSALES DORSI, are rather small tendons than muscles, serving to connect the spinal and transverse processes.

INTERTRANSVERSALES LUMBORUM. Are four distinct small bundles of flesh, which fill up the spaces between the transverse processes of the vertebræ of the loins, and serve to draw them towards each other.

LEVATORES COSTARUM. Are a set of muscles, each of which arises from the extremity of the transverse process of a dorsal vertebra, and is inserted into the upper border of the rib next to it.

MUSCLES SITUATED ON THE FORE PART OF THE VERTEBRÆ OF THE NECK.

LONGUS COLLI. OR. 1. The bodies of the three superior vertebræ of the back, and lowest of the neck; 2. from the transverse processes of the third, fourth, fifth, and sixth vertebræ of the neck.

IN. The fore part of the bodies of all the vertebræ of the neck.

USE. To bend the neck forwards or to one side.

RECTUS CAPITIS ANTICUS MAJOR. OR. The points of the transverse processes of the third, fourth, fifth, and sixth vertebræ of the neck.

IN. The cuneiform process of the os occipitis, a little before the condyloid process.

USE. To bend the head forwards.

RECTUS CAPITIS ANTICUS MINOR. OR. The fore part of the body of the atlas.

IN. The root of the condyloid process of the os occipitis.

USE. To nod the head forwards.

RECTUS CAPITIS LATERALIS. OR. The point of the transverse process of the atlas.

IN. The os occipitis, opposite to the foramen stylo-mastoideum of the temporal bone.

USE. To move the head a little to one side.

SCALENUS ANTICUS. OR. The transverse processes of the fourth, fifth, and sixth vertebræ of the neck.

IN. The upper side of the first rib, near its cartilage.

SCALENUS MEDIUS. OR. The transverse processes of all the vertebræ of the neck.

(The nerves to the superior extremity, pass between this muscle and the former.)

IN. The upper and outer part of the first rib, extending from its root to within the distance of an inch from its cartilage.

SCALENUS POSTICUS. OR. The transverse processes of the fifth and sixth vertebræ of the neck.

IN. The upper edge of the second rib, near the spine.

These three muscles bend the neck to one side. When the neck is fixed, they elevate the ribs, and dilate the chest.

LIGAMENTS OF THE SPINE.

The ligaments of the spine should be examined after the muscles are dissected.

All the vertebræ, except the two first, (viz. the atlas and dentata,) are connected together, nearly in the same manner. The first set of ligaments to be dissected, are those which may be easily understood, though, from their shortness, it will be difficult to show them, viz. the *capsular ligaments*, which bind the articulating processes together. As each vertebra has four articulating surfaces, there must be as many capsular ligaments, viz. two superior, and two inferior; these will be sufficiently distinctly seen, when the vertebræ are divided from each other.

If we remove the muscles from the anterior part of several of the bodies of the vertebræ, we shall see a dense fascia, which may be traced down the whole length of the fore part of the spine; this is the ligament which is called LIGAMENTUM COMMUNE ANTERIUS, or FASCIA LONGITUDINALIS ANTERIOR;—we may also see between the bodies of the vertebræ, the *matter* which is called INTERVERTEBRAL SUBSTANCE, and, covering this, cross slips of ligament, which run from the body of one vertebra to the other; these are the CRUCIAL LIGAMENTS. By dissecting away the muscles from the back part of a few of the vertebræ, we shall see tendinous ligaments running between the tips of the spinous process; these are principally found in the vertebræ of the back and loins, and are called the FUNICULI LIGAMENTOSI. Between the remaining parts of the spinous processes, an indistinct membranous ligament may be seen, which is sometimes called the MEMBRANA SPINOSA; and between the transverse processes, from the fifth to the tenth dorsal, we shall find ligaments, that are called LIGAMENTA PROCESSUUM TRANSVERSORUM; but both these, and the *membrana spinosa*, are very little more than condensed cellular membrane.

All the ligaments which have already been described, may be found without cutting the vertebræ; but before we can show the ligaments which are situated more deeply, we must take out two or three of the lower dorsal, or lumbar vertebræ, and cut down the spinal canal, so as to separate the bodies of the vertebræ from the processes.

Upon the back part of the body, a fascia, or ligament, will be found, corresponding to that which was seen on the fore part; this is the LIGAMENTUM COMMUNE POSTICUM, or FASCIA LONGITUDINALIS POSTERIOR. If we remove the spinal marrow and its sheath from the part of the canal formed by the processes, and merely rub the parts with the handle of the knife, the ligaments which run from the root of one spinous process to the other, will be exposed; these ligaments have, in their fresh state, a yellowish appearance, whence the name of LIGAMENTA SUBFLAVA has been given to them, and, from their course, the words *Crurum Processuum Spinosorum*, are generally added.

The ligaments which are common to almost all the vertebræ, may now be enumerated.

BEFORE THE VERTEBRÆ ARE CUT.

1. *Ligamenta Capsularia.*
2. ——— *Intervertebralia Cartilaginea.* (Intervertebral substance.)
3. ——— *Crucialia.*
4. *Ligamentum Commune Anterius*, or *Fascia Longitudinalis Anterior.*
5. *Funiculi Ligamentosi*, or *Ligamenta Apicium Processuum Spinosorum.*
6. *Membrana inter Spinalis.*
7. *Ligamenta Processuum Transversorum.*

WHEN THE SECTION OF THE VERTEBRÆ IS MADE.

1. *Ligamentum Commune Posterius*, or *Fascia Longitudinalis Posterior.*
2. *Ligamenta Subflava Crurum Processuum Spinosorum.*

The connection between the occiput, atlas, and dentata, is very different from the other parts of the spine. The capsular ligaments between the atlas and dentata, are looser than between any of the other vertebræ,—there is no intervertebral substance between them; but the fascia longitudinalis anterior is so much stronger at the middle, that it almost forms a distinct ligament. The atlas is attached to the occiput, by distinct capsular ligaments, surrounding each condyle; and there is also a ligament which surrounds the foramen magnum, and is connected to the upper margin of the atlas, which, as it has, on its internal aspect, some resemblance to a funnel, was called by Winslow, the LIGAMENTUM INFUNDIBILIFORME. The middle of this ligament is strengthened, on the anterior part, by a continuation of the fascia longitudinalis anterior,—and on the posterior part, by a ligament something similar to the funiculi ligamentosi. All these connections may be seen by merely dissecting away the muscular fibres which cover them; but to see the deep ligaments, the bones must be cut in a certain manner.

As it is supposed that the brain, &c. have already been examined, we should cut through the spine, at the fifth cervical vertebræ, and then cut through the vertebræ longitudinally, leaving only the transverse processes attached to their bodies. We should then carry the saw in the same line, so as to cut through the occipital bone, immediately posterior to the condyles: as this cut will also go through part of the temporal bones, we must take care to keep to the posterior part of the mastoid processes, that we may not destroy the joint of the jaw.

The first thing which we have to observe, is the firm attachment of the dura mater to the edge of the foramen magnum, and to the upper cervical vertebræ. When we tear off the dura mater, we shall see below it, a set of ligamentous bands, which run from the edge of the foramen magnum,—are then connected to the upper vertebræ, and appear to terminate about the third or fourth vertebra; these bands form the APPARATUS LIGAMENTOSUS. We can now feel the processus dentatus; and by dissecting away some of the *apparatus ligamentosus*, we shall see two portions of ligament, which arise from the front and sides of the process, and proceed upwards, diverging a little, to be attached to the edge of the foramen magnum; these are generally called LIGAMENTA LATERALIA, or *moderatoria:* for that which has been described as a *Perpendicular Ligament*, is nothing more than a few slips of membrane which may be found between these two lateral ligaments. But the principal ligament here, is that which runs across between the two tubercles on the inside of the atlas; it is called LIGAMENTUM TRANSVERSALE, and locks in the processus dentatus. The *Appendices* of this ligament are merely its edges, extending upwards and downwards. The corresponding surfaces of the processus dentatus, and of the atlas, are connected together by a very fine capsular ligament.

There is some difficulty in showing these ligaments distinctly. The dissection will be facilitated by twisting the vertebræ round;—for then the ligaments will be easily distinguished from the cellular membrane which covers them, by the resistance which they offer.

LIGAMENTS BETWEEN THE ATLAS AND OCCIPUT.

1. *Ligamentum Infundibiliforme.*
2. *Ligamenta Capsularia.*
3. *Apparatus Ligamentosus.*

BETWEEN THE DENTATA AND OCCIPUT.

1. *Ligamenta Lateralia.*
2. *Ligamentum Perpendiculare.*

BETWEEN THE ATLAS AND DENTATA.

1. *Ligamenta Capsularia.*
2. *Ligamentum Transversale.*
3. ———— *Capsulare* (of the process).

LIGAMENTS OF THE JAW BONE.

When the muscles are dissected away from below the jaw, the fascia which connects the styloid process to the jaw, being necessarily cut through, the joint will be much weakened.

To understand the structure of this joint, we should compare it with those of the carnivorous and graminivorous animals.——In the carnivorous animal, as, for example, in the badger, the jaw bone is locked into the glenoid cavity, so that it is purely a simple hinge joint; and there are only short *lateral ligaments*. In the graminivorous animal, the cavity in the temporal bone is so shallow, that much lateral motion is allowed; and the lateral ligaments are long. The joint in the human body is of an intermediate form; for the jaw bone is not so nicely adapted to the hollows in the temporal bone,—nor are the ligaments so short, as in the carnivorous animal; but the cavity is deeper, and the condyle is rounder, than in the graminivorous animal.

In the dissection of the external part of the joint, we shall find a ligament running from the lower margin of the zygomatic process,—this may be divided into two portions, one of which runs perpendicularly to the neck, the other to the condyle of the jaw; it is called LIGAMENTUM LATERALE EXTERNUM.

When we look on the inside, we shall see a ligament rising from the edge of the glenoid fissure, and the Eustachian tube, and running to the jaw bone, midway between the angle and the condyle; this is the LIGAMENTUM LATERALE INTERNUM. Both of these ligaments are intimately connected with the LIGAMENTUM CAPSULARE, which arises from the edge of the glenoid cavity, and is attached to the neck of the bone.

When we cut through the capsular ligament, we shall find that the interior of the joint is divided into two parts, by an *interarticular cartilage*, to the edges of which the capsular ligament is attached.

LIGAMENTS OF THE RIBS.

The ligaments which attach the ribs to the spine, are very simple. We may cut out three of the middle vertebræ, with their corresponding ribs, and then cut through the ribs, so as to leave only about three inches attached to the spine. When the pleura is torn off, the head of each rib will be seen to be articulated with the intervertebral substance of two vertebræ. From the head of each rib, we shall see ligamentous bands running to the body of each vertebra, which are called LIGAMENTA CAPITELLI COSTARUM (sometimes called *Ligamenta Antica*). If we cut through these ligaments, we shall find that the two articulating surfaces on the head of the rib, are attached, by separate CAPSULAR ligaments, to the two vertebræ: the back part of the rib is also articulated with the transverse process, by a distinct capsular ligament. From the back part of the transverse process, a ligament will be found running to the tubercle of the rib; this is called the LIGAMENTUM TRANSVERSALE EXTERNUM. If we forcibly separate the ribs from each other, we shall discover two other ligaments, which come from the transverse processes of the vertebræ, and are attached to the neck of the rib. The one which is on the inside, and which comes from the lower part of the transverse process of the vertebra, and is attached to the neck of the rib immediately below it, is the LIGAMENTUM CERVICIS COSTÆ INTERNUM. The other is on the back part: it arises from the root of the transverse process,—crosses the first, and is inserted into the upper edge of the neck of the rib; it is called the LIGAMENTUM CERVICIS COSTÆ EXTERNUM. *

LIGAMENTS BETWEEN EACH RIB AND THE SPINE.

1. *Ligamentum Capitelli Costæ*, or *Ligamentum Anterius.*
2. *Ligamenta Capsularia Capitelli.*
3. *Ligamentum Capsulare.*
   (Of the union with the transverse process.)
4. ———— *Transversale Externum.*
5. ———— *Cervicis Internum.*
6. ———————— *Externum.*

The cartilages of the seven true ribs, are united to the sternum in a simple manner; and to show the connection, very little dissection is necessary. The sternal extremities of the bony part of the rib being *concave*, receive the ends of the cartilages, which are *convex;* the other extremity of each cartilage is implanted into the concavities on the lateral part of the sternum. Surrounding each of these points of union, there are capsular ligaments; and the union to the sternum is strengthened by slips of ligament, running from the rib, upon the sternum: these slips have been named according to the direction they run; those running immediately from the rib to the sternum, are called LIGAMENTA RADIATIM DISJECTA; and some slips,

* When the bones are examined, it is evident that the ligaments of the 1st, 11th, and 12th ribs must be different from the others, since they are each connected with one vertebra only. There is no articulation between the two last, and the transverse processes.

which cross from the cartilage of the one side to that of the other, are called LIGAMENTA TRANSVERSALIA.

Between the first rib and the sternum, the union by cartilage is very complete. The cartilages of the 6th, 7th, 8th, and 9th, are connected by loose capsular ligaments, and by ligamentous slips, which are extended between them, to keep them in their proper position.

LIGAMENTS BETWEEN THE CLAVICLES, STERNUM, AND THE FIRST RIB OF EACH SIDE.

The sternum should be cut through the middle; the clavicles and first ribs should also be cut, about the middle.

The first ligament we perceive, is that running between the heads of the two clavicles, across the sternum; it is called LIGAMENTUM INTERCLAVICULARE.

There may then be observed, slips of ligament running from the heads of the clavicle, upon the sternum; those on the external part, form the LIGAMENTA ANTERIA; and on the internal part, the LIGAMENTA POSTICA. Under these slips, there is a *capsular* ligament; but before examining this particularly, we should attend to the connection which there is between the clavicle and the first rib.—Between the upper part of the rib, and the tubercle on the lower part of the clavicle, close to its connection with the sternum, a strong ligament will be seen, which, from its shape, is called LIGAMENTUM RHOMBOIDES.

The capsular ligament between the clavicle and sternum, may now be opened; and then there will be seen, an *interarticular cartilage*, which is connected to the sternum and clavicle, by portions of the capsular ligament,—so that the capsular ligament may be described here, as in the jaw, as composed of two parts.

DISSECTION

OF THE

ARTERIES AND VEINS

OF

THE CHEST, NECK, AND HEAD.

There is no part more important to the student, than the surgical anatomy of these vessels; but he must restrain his impatience, and be content, in the first dissection, to learn their branches only.

The injection of the vessels of the upper part of an adult, or old body, is generally made in the following manner:—

An incision is to be carried, through the skin, in the length of the sternum; the bone is then to be cut through, in the same line; and the chest is to be forcibly opened, by pulling on the two portions of the sternum. A piece of wood, about four or five inches long, is then to be placed between them. The pericardium is to be opened; and a large pipe (around which a little cloth must be wrapped) is to be put into the aorta, just at its origin from the ventricle. The descending aorta must be tied, about opposite to the fifth dorsal vertebra.—It will easily be found, by tearing up the adhesions of the left lung.

When an injection is made, with the arteries prepared in this manner, only the vessels of the head and arms will be filled. Though this is not so good a method as the following, to enable us to show the origins of the vessels from the aorta; still we are generally obliged to do it, if the body is old, or if the aorta is very much dilated. But when the subject is young, and when we are not anxious to preserve the muscles on the side of the chest, the thorax may be so opened, that a pipe may be put into the aorta, opposite to the sixth dorsal vertebra. The injection must, in this case, be prevented from distending the ventricle, by an assistant holding the root of the aorta; for the valves will very seldom prevent the wax from passing into the ventricle. If the injection be allowed to pass into the heart, the *force* of the syringe will be so taken off, that the extreme branches of the head and arms will not be filled. The manner of injecting the heart, &c. for a *preparation*, has been already described at page 206. If the student wishes to make a very minute injection of wax, of the arteries of the head or arm, he must inject each part separately; for when they are both injected at once from the aorta, the extreme branches are very seldom filled.

In describing the manner of dissecting the great arteries, I shall suppose that the injection has been made from the aorta, opposite to the sixth rib.

Though the ventricle has not been filled, the coronary arteries will;—there is not much dissection required to show them, unless the heart be very fat; in such a case, part of the fat should be removed.*

By raising the pericardium, and the cellular membrane, from the root of the aorta, the ascending part of the ARCH will be exposed; and by cutting a little higher, the great vessels which pass from it, would be seen: but before this is done, we may examine some of the other vessels of the heart, which, though uninjected, may still be easily dissected. First, we may show the origin of the PULMONARY ARTERY, which, as it runs under the aorta, divides into two great branches, which pass into the lungs. The adhesion which is so strong between the lower part of the aorta, and the point of the bifurcation of the pulmonary artery, is produced by the *remains* of the DUCTUS ARTERIOSUS.

On the right side of the ascending aorta, the DESCENDING VENA CAVA is seen; and when the pericardium is completely dissected away, the great veins which form it, will be shown, viz. the union of the LEFT JUGULAR, and LEFT SUBCLAVIAN VEINS,† which form a branch, that passes across, to unite with the RIGHT SUBCLAVIAN, and RIGHT JUGULAR VEINS. The VENA AZYGOS passes into the

* The dissection of the arteries of the brain should be made previous to tracing any of the arteries of the chest; by which the student will have an opportunity of seeing the parts of the brain which he in all probability would lose, if he were to leave the dissection of the branches of the internal carotid, until he has finished those of the chest, and of the external carotid. The manner of dissecting the arteries of the brain, is described a little farther on.

† The thoracic duct will not be seen unless it has been filled from below,—it passes into the angle between the subclavian and jugular veins of the left side.

cava, after it has been formed by the union of the great branches.

Though the lesser veins are not of much importance, and though they will scarcely be seen, unless they are injected or very much distended with blood, still I shall enumerate them. The VENA MAMMARIA INTERNA of the right side, joins the upper part of the superior vena cava; that of the left side, joins the subclavian vein, opposite to the cartilage of the first rib. The DIAPHRAGMATICA SUPERIOR, OF PERICARDIO-DIAPHRAGMATICA, on the right side, joins the upper part of the vena cava; the left joins the subclavian, below the mammaria. The THYMICA, on the right side, sometimes joins the vena cava, but sometimes the gutturalis, or thyroid vein, or some neighbouring branch: on the left side, it empties itself into the subclavian vein. The PERICARDIAC VEIN, on the right side, enters the root of the subclavian vein: on the left side, it joins the subclavian vein, or the diaphragmatica, or the mammaria interna. The THYROID VEIN, OF TRACHEALIS, OF GUTTURALIS of the right side, passes into the upper part of the vena cava: of the left side, into the upper and back part of the left subclavian. The distribution of these veins is described by their names. It is for the most part very regular; but their communications with the larger veins are very inconstant, and differ in each side as the great trunks are different.

The dissection of the arteries is now to be continued. When the whole of the pericardium is removed, the ARCH of the AORTA will be seen, and, arising from it, the ARTERIA INNOMINATA,—the LEFT CAROTID, and the LEFT SUBCLAVIAN. Before these arteries are traced, the left lung may be pulled up, so that the DESCENDING AORTA may be seen; but we should not as yet cut away any of the ribs, to show the small vessels which arise from this part of the aorta.

After making these trunks distinct, we should dissect the origins of the sterno cleido mastoideus; and upon one side, (disregarding the relative situation of the parts,) cut off two inches of the clavicle, and an inch of the first rib, with a small portion of the sternum. But before we do this, we should look under the sternum for the *mammaria interna*, and separate it, so that we may preserve it as a detached vessel. After having made these cuts, which of course must be done carefully, a great many branches will be exposed. The principal ones will be found to come from the subclavian; for if we dissect between the larynx and the sterno cleido mastoideus muscle, we shall find, that the common carotid runs for a considerable distance before it gives off any branches.

The dissection of the branches from the subclavian, must, therefore, be first attended to.

We cannot avoid seeing the MAMMARIA INTERNA, which passes down on the inside of the sternum; and if we look immediately opposite to it, we shall find the VERTEBRAL rising from the upper part of the artery. These two branches are very regular; but all the others are so much the reverse, that the description which I shall now give, will in all probability not correspond with the vessels which are seen in the first dissection. Close by the origin of the mammaria interna, we shall probably find a large trunk, which may be traced towards the larynx, and under the carotid; this will be the INFERIOR THYROID. From the same source, and perhaps in union with it, another branch may be seen crossing the upper part of the neck: this last vessel is to be carefully followed,—for if it is small, it will be distributed on the muscles of the neck only, and be called the TRANSVERSALIS COLLI; but if it be large, it may then be traced over the scapula, and thence be called the SUPRA SCAPULARIS.

There is generally another branch found here, which passes from the same trunk, in the line of the clavicle.—It is called the TRANSVERSALIS HUMERI.

As these vessels are very irregular in their order of coming off from the subclavian, we must, in describing them, give the name to the branches, and, tracing them back, apply it to the trunk from which they arise.

If we now trace the subclavian a little farther, we shall see some small branches lying upon the scalenus: these sometimes arise in a distinct trunk, which is called CERVICALIS SUPERFICIALIS, but this is very frequently a branch of the transversalis colli:—CERVICALIS PROFUNDA is the name which is given to the artery that rises from the subclavian, while it is passing under the scalenus anticus.

When the subclavian has passed about half an inch beyond the scalenus anticus, we shall find that if the transversalis colli has been small, that a large branch will be given off at this point, and which, as it passes to the scapula, is called the SCAPULARIS, or DORSALIS SCAPULÆ.—The student must not call this description incorrect, if he does not find it correspond with the arrangement of the vessels which he discovers in the first body which he dissects,—for he will, in the course of his studies, find that the order of the branches of the subclavian is exceedingly irregular.

The description has hitherto been taken from the left side of the body. The manner in which the small vessels branch off, is not very different in the two sides; but there is a most material difference in the relative position of the great trunks, on the right and left side: this should be particularly noticed in making the surgical dissection.

As we have already loosened the attachments of the sterno cleido muscle, by cutting through the sternum and clavicle, we may now lay it a little to one side. We shall then see the great JUGULAR VEIN, lying almost over the artery, and the great nerve, the PAR VAGUM, by the side of it; but at present, we need not attend particularly to these parts, but pull them to one side, and then trace the common carotid, with the forceps and scissars, from its origin, on the left side, from the arch of the aorta.

The artery will be found to pass up by the side of the larynx, for three or four inches, without giving off any branches: here it is called the COMMON CAROTID. It at once divides into two great trunks, which are called the EXTERNAL and INTERNAL CAROTIDS. The internal will afterwards be found to pass to the foramen caroticum of the temporal bone, without giving off a branch. Hence, all the branches which we have to trace among the muscles of the throat, and on the face and temples, must be from the external carotid.

The first branch which we shall find rising from the EXTERNAL CAROTID, is the SUPERIOR THYROID: this we must trace downwards, towards the thyroid gland, in which we shall find it distributed, and uniting its branches with those of the *Inferior Thyroid*, which we have already seen coming from the subclavian. The next branch which is given off, is the LINGUALIS: we may trace this along the line of the os hyoides, to the muscles of the tongue, where it divides into several branches; but before we can trace these fully out, we must follow some of those of the next artery,—the FACIALIS, or *External Maxillary*. This comes off very often in the same trunk with the lingualis, and if not, it rises immediately after it. It runs first towards the lower part of the jaw, and under the muscles. (But as both this and the lingualis are covered by the digastricus and stylo hyoideus, it will be necessary to make a neat dissection of the muscles, before we can trace them farther.) After the facial emerges from under the muscles, it passes into the substance of the submaxillary gland, through which, the branches must be carefully traced: from these, one branch will be seen to pass on the anterior part of the mylo hyoideus; this is the *submentalis*. The trunk of the artery, after passing through the submaxillary gland, turns over the jaw, to be distributed upon the face;—but the branches which pass to the face, should not be dissected until some of those below the jaw have been traced.

The submaxillary gland should now be raised;—the lingualis may then be traced under the thyreo hyoideus muscle, sending its branches among the muscles of the tongue, which can all be easily followed if we have already made ourselves master of the muscles of the tongue. After having traced the lingual artery to some depth, it will be found to divide into two principal branches, which are the *arteria dorsalis linguæ*, running towards the root, and the *ranina*, running to the tip of the tongue. I shall not here give the names of the smaller branches of the thyroid, facial, and lingual, but refer to the annexed *Table*.

To prosecute the dissection farther, we should carefully raise the skin from over the outer part of the masseter, towards the tube of the ear, and continue the dissection of it round the back of the ear, and over the insertion of the MASTOIDEUS and TRAPEZIUS. In removing the skin from the masseter, we must take care that we do not cut the TRANSVERSALIS FACIEI, which lies immediately under the skin, and generally in a line with the middle of the tube of the ear. Some small branches of the facial, which are called *massetericæ*, will also be seen upon the masseter. In removing the skin from the back of the ear, we must avoid cutting the branches of the POSTERIOR AURIS, which are very superficial. The same care is also to be taken in dissecting towards the occiput, as many of the superficial branches of the OCCIPITAL pass over the MASTOIDEUS and TRAPEZIUS.

The PAROTID GLAND will now be exposed;—but before we trace the branches through it, we should examine the trunks of those branches which are seen on the occiput and ear.

Three arteries generally rise from the carotid, before it enters into the substance of the gland, viz. the OCCIPITAL, the POSTERIOR AURIS, and the PHARYNGEA INFERIOR. The occipital and posterior auris very often come off in one trunk,—and if not, they come close together, and immediately at the outer edge of the digastricus, and stylo hyoideus. The posterior auris may be traced first, as it runs superficially towards the back of the ear. The occipital will be found to run so deep under the insertion of the sterno cleido mastoideus, that, to trace it fully, we shall be obliged to dissect through the substance of this muscle;—we shall then find its branches becoming superficial,—some of which pass to the scalp, and others run to supply the superficial muscles of the back. The pharyngea inferior is not unfrequently the second branch that arises from the external carotid; but, as it rises from the back part of the artery, it cannot be conveniently seen until the branches which have already been described, are partially dissected,—and even in this stage, its trunk only, can be seen: the branches will be seen after those under the jaw are dissected.

The trunk of the carotid is now to be traced into the parotid gland: while here, it gives off a number of small branches, which are to be exposed by carefully cutting away the substance of the gland. The larger branches, which are very superficial, should then be traced, viz. the TEMPORAL and the TRANSVERSALIS FACIEI. These are so immediately under the skin, that there can be no difficulty in finding them.

After exposing these branches, we may return to the dissection of the arteries of the face,—for which there is no farther rule necessary, than merely to follow them from trunk to branch, with the scissars and forceps.—The names of the small branches will be found in the *Table*.

Many of these branches, must now be destroyed, that we may show the arteries which pass into the deep parts of the face,* and particularly the branches of the MAXILLARIS INTERNA.

The dissection of the branches of this artery is very difficult; for we must not only cut through the greater number of the muscles on the side of the face, but we must also remove the greater part of the jaw.

The first thing we should do, is to expose the trunk of the external carotid, until the internal maxillary is seen going off from it,—which it generally does, opposite to the lobe of the ear. The artery is then to be traced as far as possible under the jaw. After which, the jaw bone is to be cut through, just at the point where the facial artery passes over it (in doing this, we should, of course, take care not to injure the arteries of the neck). We may then cut through the insertion of the pterygoideus internus; after which, the knife is to be carried close upon the inside of the bone, so as to separate the buccinator and the

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* Nearly the same rules should be followed in making a preparation of the arteries of the head. The superficial arteries should be preserved on one side,—and on the other, they should be removed, so that the deep ones may be exhibited.

membrane of the mouth from it. When this is done, we shall be enabled to pull the jaw aside, so as to enable us to trace the trunk a little farther, and perhaps to see its first principal branch, viz. the *dental artery*, which passes into the lower jaw;—but in a first dissection, this vessel is to be sacrificed *,—for the whole of the side of the jaw should be removed; but to do this safely, and at the same time to enable us to expose all the branches of the maxillaris interna, we must also remove the whole of the os malæ, and zygomatic process of the temporal bone. This may be done, by first cutting with the saw through the maxillary and frontal process of the os malæ, and the root of the zygomatic process;—and then, with a blow of the chisel and hammer, the parts will be so loosened, that they may be easily dissected off. The insertion of the temporalis should be cut from the coronoid process of the jaw; and by then merely cutting close upon the bone, and using a little force, we may remove the whole of the remaining part of the jaw.

When the bones are removed, the parts will appear in great confusion, as the arteries are buried in the temporal muscle, and part of the two pterygoid; but, as we have no object now in preserving these muscles, we should trace the branches of the great artery through their substance, without fearing to sacrifice their fibres: indeed, to make the branches distinct, we shall at last be obliged to cut the muscular fibres entirely away.

The first branch that comes off from the internal maxillary, is one of little consequence,—but the next, is of the greatest importance, the MENINGEA MEDIA,—for this is the vessel which supplies the principal part of the dura mater: it may be traced into the foramen spinale of the sphenoid bone. The next set of branches will be found passing through the substance of the pterygoid muscles.—We shall then see the stump of the small branch which passes into the spinal hole, to supply the teeth, viz. the *dental*, or *inferior maxillary*. The next branch is, the *temporalis profunda*, or *media*, which passes into the substance of the temporal muscle, and runs close on the bone.

The main trunk of the maxillary now becomes so crooked, that we shall be in danger of cutting it through, if we are not very cautious. It will be found lying on the back part of the superior maxillary bone;—and here it gives off some small branches, which are called *alveolares superiores*, as they pass to the teeth of the upper jaw.

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* In making a preparation, we may preserve the dental artery, by leaving a small portion of the jaw.

The trunk now becomes exceedingly difficult to follow; for it passes into the spheno palatine fissure. From this part, one branch may be traced into the orbit, which we shall afterwards find, passes through the infra orbital canal, with the infra orbital nerve, to the upper part of the superior maxillary bone, where it inosculates with the branches of the facial; this artery is generally called the INFRA ORBITAL. The next branch is also very difficult to follow; for it passes at first directly downwards, through the palatine fissure, into the palatine foramen,—from which, it sends one branch back to the velum, and a larger to the anterior part of the palate: this last branch, the PALATINA, may be considered as the extremity of the internal maxillary artery. There are, however, still two branches to be enumerated; first, one which creeps by the side of the external pterygoid process, and is distributed on the upper part of the pharynx, and is called the *superior pharyngeal*: while another runs into the back part of the nostril, through the spheno palatine hole, and is called the *nasal*: this is distributed on the lower part of the nostrils; and from it, a branch may often be traced, along the lower part, to the foramen incisivum, to inosculate with the palatine.

I have been a little more minute in the description of this artery, than that of the others, for it is one particularly difficult to follow; indeed, in order to see the branches of it distinctly, we must sacrifice every other part. The student, while dissecting this artery, should have the basis of the scull constantly before him, to enable him to understand the different twists of the artery.

We should now turn our attention to the internal carotid. This artery will appear, at the bifurcation, to be more *external* than the external carotid; but it almost immediately becomes more *internal*, and passes deep under the parotid gland, and there it is covered by the great nerve, and lies close upon the rectus capitis anterior. We then lose it; for it passes into the foramen caroticum of the temporal bone. During its whole course, we shall find no branches rising from it, except some very small ones, to the nerves and to the Eustachian tube.

The internal carotid must now be followed through the bone. This may be done, and the branches of the maxillaris interna be still preserved: but we must entirely change our plan of dissection.

If we wish merely to gain a knowledge of the course of the internal carotid, through the brain, we may remove the scull-cap, and proceed to the dissection of the brain.* It is presumed, that the student has already a general knowledge of the parts of the brain. On raising the scull-cap, which is to be done in the manner recommended for examining the brain, at p. 144, the vessels of the dura mater will be the first that will strike the eye. Those on the part opposite to the frontal bone, may belong to the *anterior meningeal*, which rises from the OPHTHALMICA; but this artery is so small, that the large vessel, the MENINGEA MEDIA, which will be seen under the parietal bone, generally gives off all the branches that are seen in the first view. The meningea media may afterwards be traced back to the foramen spinale of the sphenoid bone, through which it comes from the maxillaris interna. Some small twigs from the *posterior meningeal* may be seen, but these are seldom apparent, until the tentorium is raised. The dura mater may now be cut through, along the line of the longitudinal sinus, and on one side only, at present, so that the falx may be left entire. The dura mater is then to be folded over, towards the temple. The vessels on the surface of the brain will now be seen in great numbers; they arise from several sources, which will be discovered, as the dissection is continued, towards the base.

The first arteries (which have distinct names) that can be seen, will be those of the corpus callosum;—the artery of each side may be shown, by merely pulling the hemisphere separate from the falx.

After taking this view, we may cut the dura mater which

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* I have, in a note at page 226, said, that the dissection of the branches of the internal carotid should be made, before any of the others, in a *first dissection;* but if the student wishes to make a preparation of the arteries of the brain, it will be better to delay the dissection of them until all the others are finished, for then, (the brain being putrid,) the branches of the internal carotid may be exposed, by merely washing away the pulpy matter of the brain;—in this instance, the scull should not be opened in the common manner, but a cut should be made through the frontal and parietal bones, in the line of the falx, but a little to one side of it. This incision may extend from above the orbit, to the tubercle of the occipital bone. Another cut may then be made, above the level of the ear, to meet the two extremities of the first: the intermediate portion of bone is then to be entirely removed. By this, we shall have an opportunity when the pulpy matter is washed away, of showing the prolongations of the dura mater.

covers the opposite hemisphere. We should then separate the falx from its connection to the crista galli, and throw it backwards towards the tentorium ; and now we can separate the hemispheres, so as to have a better view of the arteries of the corpus callosum. The whole of each hemisphere is then to be cut down to the level of the corpus callosum ; for it is needless to attempt to trace the arteries which we see on the surface, down to their trunks, as they form a complete net-work in the substance of the brain, which net-work is supported by the pia mater.—We may judge of the number of these vessels, by allowing a stream of water to play upon the mass which has been removed ; for this will wash away the pulp, leaving only the membrane and vessels. By now separating the two anterior lobes, we may trace the arteries of the corpus callosum towards a trunk, which we shall afterwards find to be the ANTERIOR CEREBRI. We may then open the ventricles, and we shall see the choroid plexus loaded with the vessels, which are to supply the most internal parts of the brain.

We must now examine the other branches, by raising the brain from the scull. In lifting up the anterior lobes, we shall see the optic nerves ; and by the side of them, the trunks of the internal carotids. These must be cut across, but we should leave enough of each artery, to show the origin of the OPHTHALMICA, which passes into the orbit. The several nerves are to be cut through, as we carry the brain back. The tentorium is to be divided, by carrying the knife along the line of the petrous portion of the temporal bone. The two VERTEBRAL arteries will then be seen,* coming up from the vertebral canal. When these, and the upper part of the spinal marrow are cut through, the whole mass of the brain may be lifted out. The vessels may be seen on the base, without any dissection, but they will be made more distinct, by removing the tunica arachnoides.—The enumeration which is given in the *Table* will be a sufficient description of them.

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* These arteries are very difficult to trace from their origin from the subclavian, as the greater part of their course is through the canal which is formed in the transverse processes of the cervical vertebræ. The spaces between the vertebræ should be cleared of the muscles, &c. to allow of the artery being seen ; or the processes may be cut through. Several branches will be found passing off from the artery, in its passage upwards, which are enumerated in the *Table*. We must be careful, in dissecting between the atlas and the occiput, as the artery bulges out so, between these bones, that it is very liable to be cut.

TABLE OF THE ARTERIES IN THE THORAX, AND OF THE NECK AND HEAD.

AORTA.

Anterior to the arch — CORONARIA DEXTRA and CORONARIA SINISTRA.

From the arch—INNOMINATA, divided into CAROTIS DEXTRA and SUBCLAVIA DEXTRA: CAROTIS SINISTRA and SUBCLAVIA SINISTRA.

From the descending aorta—a series of small arteries, viz. PERICARDIACA POSTERIOR; PERICARDIACA INFERIOR; BRONCHIALIS DEXTRA; BRONCHIALIS SINISTRA; ŒSOPHAGEÆ; INTERCOSTALES AORTICÆ.

From the SUBCLAVIAN, the principal or primary branches are: I. MAMMARIA INTERNA; II. THYROIDEA INFERIOR; III. INTERCOSTALIS; IV. VERTEBRALIS; V. CERVICALIS PROFUNDA; VI. CERVICALIS SUPERFICIALIS.

I. MAMMARIA INTERNA gives these branches:—1. *Thyroideæ;* 2. *Comes Nervi Phrenici;* 3. *Pericardiaca;* 4. *Mediastinæ;* 5. *Mammariæ;* 6. *Epigastrica Anastomotica.*

II. THYROIDEA INFERIOR *generally sends off*—1. *Transversalis Humeri;* 2. *Transversalis Colli* (either this or the last branch gives off the *scapularis*, though it is often a principal branch of the subclavian; it then rises below the scalenus); 3. *Thyroidea Ascendens;* 4. *Thyroidea Propria.*

III. INTERCOSTALIS: its branches pass irregularly to the two superior intercostal spaces,—to the scalenus and œsophagus. Some branches pass to the muscles of the back.

IV. The VERTEBRALIS, principally to the back part of the brain; but it also gives—1. a *class of small branches* to the muscles attached to the cervical vertebræ; 2. to the *theca* and *spinal marrow;* 3. to the muscles under the occiput; 4. within the scull, to the dura mater, viz. *Meningeæ Posteriores;* 5. *Inferior Cerebelli;* 6. *Spinalis Posterior;* 7. *Spinalis Anterior.* The two vertebral then unite and form the BASILAR. From the BASILAR there are—1. branches to the *Medulla Oblongata*, &c.; 2. *Profunda*, or *Posterior Cerebri;* 3. *Arteriæ Communicantes* (uniting with those of the carotid, to form the CIRCLE of WILLIS).

V. CERVICALIS PROFUNDA; gives branches to the *Scaleni* and *Longus Colli.*

VI. CERVICALIS SUPERFICIALIS; passes to the *Brachial Plexus*, *Scaleni, Trapezius,* &c.

COMMON CAROTID divides into EXTERNAL and INTERNAL; from the EXTERNAL, the principal branches are: I. THYROIDEA SUPERIOR; II. LINGUALIS; III. FACIALIS: IV. PHARYNGEA ASCENDENS; V. OCCIPITALIS; VI. AURICULARIS POSTERIOR; VII. TEMPORALIS; VIII. MAXILLARIS INTERNA.*

I. THYROIDEA SUPERIOR gives off: 1. thyroidea propria; 2. laryngea, to the epiglottis, and muscles of the arytenoid cartilage. Superficiales musculares, viz. to the sternocleido mastoideus, to the sternohyoidei and thyroidei, to the thyreo-hyoideus.

II. LINGUALIS. 1 Sublingualis; 2. dorsalis linguæ; 3. ranina; 4. irregularly to the muscles of the tongue and pharynx.†

III. FACIALIS. 1. Palatina ascendens; 2. to the glands and muscles of the tongue; 3. to the submaxillary glands and the tonsilaris; 4. submentalis; 5. to the masseter and buccinator; 6. coronaria labii inferioris; 7. coronaria labii superioris; [a] nasalis lateralis; [b] angularis.

IV. PHARYNGEA ASCENDENS. 1. Three internal pharyngeæ; 2. Three posterior to the muscles, to the sympathetic nerve and jugular vein, to the glands; enters the foramen lacerum posterius.

V. OCCIPITALIS. 1. To the digastricus, stylo hyoideus, and sterno cleido mastoideus; 2. meningea, viz. with the jugular vein through the foramen; 3. cervicalis descendens: an internal branch inosculates with the vertebralis; 4. auricularis; 5. occipitalis ascendens. The foramen mastoideum posterius receives a branch to the dura mater.

VI. AURICULARIS POSTERIOR. 1. Branches to the parotid gland, biventer, and mastoid muscles; 2. to the meatus externus, and membrane of the tympanum; 3. stylomastoidea, entering the tympanum, supplying the parts there and the mastoid cells; 4. ascending behind the ear to its muscles and cartilages; 5. ascending on the temple.

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* The arrangement of the branches of the external carotid is very simple. We have only to recollect the parts which it passes, and then we shall have the names of the arteries. Thus, it passes the *thyroid* gland; the *tongue*; the *face*; the *pharynx*; the *occiput*; the *ear*; the *inside of the jaw*, and the *temple*.

† These vessels may be divided into three *sets*, of comparative importance in a surgical point of view. In the first set there are, the one to the thyroid gland, that to the tongue, and the artery to the face. In the second set,—the one to the inside of the jaw, and those to the temple. The next set is of very little importance, as they lie deep, and are very small; viz. those to the pharynx, occiput, and ear.

VII. Temporalis. 1. A small deep branch, and a branch to the masseter; 2. transversalis faciei,—comes ductus salivæ; 3. temporalis media profunda; 4. auriculares anteriores: 5. temporalis anterior, or frontalis; 6. temporalis posterior, or occipitalis.

VIII. Maxillaris Interna, (being in the order of the branching.) 1. Auricularis, profunda and tympanica; 2. meningea media; 3. meningea parva, viz. to the pterygoid muscles, and finally piercing the foramen ovale; 4. maxillaris inferior; 5. temporales profundæ maxillares, pterygoideæ, and buccales; 6. alveolaris; 7. infra orbitalis; 8. palatina maxillaris; 9. pharyngea superior; 10. nasalis.

INTERNAL CAROTID.

I. While in its transit through the bones, these branches: to the pterygoid canal and cavity of the tympanum; to the cavernous sinus and pituitary canal; to the fourth, fifth, and sixth pairs of nerves; to the dura mater.

(Within the cranium, and having emerged from the dura mater.)

II. Ophthalmica Cerebralis. Passing into the orbit by the foramen opticum, gives these branches: 1. to the dura mater and sinus; 2. lachrymalis, which goes to the gland, after giving many branches to the periosteum, optic nerve, &c.; 3. ciliares,—three or four arteries dignified with the distinction of *inferiores, anteriores, breves, longiores*; 4. supra orbitalis; 5. centralis retinæ; 6. ethmoidales; 7. palpebrales; 8. nasalis; 9. frontalis.

III. Several lesser branches to the Pituitary Gland, Optic Nerve, Infundibulum, and Plexus Choroides.

IV. Aª Communicans. Constituting part of the circle of Willis.

V. Aª Cerebralis Anterior. 1. Irregular branches to the first and second pair of nerves; 2. lesser irregular branches to the anterior lobe; 3. anterior communicans (completing the circle of Willis anteriorly); 4. arteria corporis callosi.

VI. Aª Cerebralis Media. Entering the fossa Silvii: it is minutely distributed to the substance of the middle lobe.

OF THE VEINS OF THE HEAD.

The veins of the face and neck may be seen without their being injected; indeed, this should never be done, except when we wish to make a preparation of them. For this purpose, a pipe should be placed in the frontal vein, through which a quantity of warm water should be thrown, so as to clear the superficial veins, of their coagula. To distend the deep veins, a pipe should be put into the longitudinal sinus, directed towards the occiput (a portion of the scull having been previously removed): or they may be filled by putting a pipe into each internal jugular vein. The success of the injection will depend very much on the veins being thoroughly cleared of the blood which is coagulated in them.

After they are injected, the dissection will be very easily made; for the veins are so superficial, that, in a thin body, they will be seen under the skin.

The vein which may be traced from the inner angle of the eye, towards the lower jaw, is the *anterior* FACIAL, or the ANGULARIS. This vein receives branches from various parts of the face, which are named according to the points from which they come; as,—*vena frontalis; vena ophthalmica; vena dorsalis nasi, superior et inferior; vena alaris nasi: venæ labiales, magnæ et minores; venæ buccales*, &c. At the angle of the jaw, the FACIAL vein will be found to unite with the TEMPORAL, or, as it is sometimes called, the POSTERIOR FACIAL.—By this union, the EXTERNAL JUGULAR is generally formed.

The temporal vein is formed by branches which come from the temple (generally four in number); by the veins which accompany the branches of the arteria maxillaris interna; by the transversalis faciei; the posterior auris; and sometimes, by branches from those accompanying the arteria meningea media.

The EXTERNAL JUGULAR will be found to be very irregular: sometimes it divides into two branches, the one being called the *anterior*, the other *posterior*. The anterior division generally receives the branches under the chin, and from the tongue, and often joins the great internal jugular vein; while the posterior receives some from the occiput and the back part of the ear, and then passes down to the subclavian,—in its course, receiving veins from the outer part of the neck, and upper part of the shoulder.

The veins from the thyroid, correspond very much with the course of the arteries; the *superior* ones passing into the jugular, and the *inferior* into the subclavian, or the transverse vein, which passes across the great arteries.

The INTERNAL JUGULAR vein is principally formed by the sinuses of the dura mater, which have already been described at p. 156; but in its passage down the neck, it generally receives branches corresponding to the deep arteries.

It will be difficult to trace the branches of the VERTEBRAL VEINS. The basilar sinus generally passes into them; they receive, also, the branches from the upper part of the spinal marrow: but they are principally formed by a net-work of veins, which surround the processes of the spine, and come from the deep arteries which supply the small muscles of the back. The trunk of the vein passes in the same canal with the artery, viz. in the transverse processes, and terminates in the subclavian vein.

DISSECTION

OF THE

NERVES OF THE NECK AND HEAD.

We may begin either with the dissection of the nerves of the face, which are from the Vth and the VIIth, or with the plexus, which is formed immediately under the skin of the neck, by the superficial branches of the cervical nerves and spinal accessory.*

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* In the following description of the manner of dissecting the nerves, I shall introduce, in the form of notes, some of those observations which Mr. Bell has been for many years in the habit of making while delivering his lectures on the nerves;—several of these

I shall suppose that we are to dissect those of the neck, first. If we cut through the skin, about opposite to the middle of the sterno cleido mastoideus, we shall find some branches, which, if patiently followed, will lead to all the others. The nerves on the side of the neck, are so numerous, that it is impossible, in a work of this kind, to particularize them all; but there is one, more distinct than the others, which passes from the third cervical, along the sterno cleido mastoideus muscle, to join the branches of the portio dura. This branch is sometimes called, *nervus communicans*, or *superficialis colli*. When the skin over the parotid is raised, some branches of the PORTIO DURA, or *respiratory nerve of the face*, will be seen. These may be traced into the substance of the parotid gland, by *digging* with the scissars; this is to be done, by putting in the blades, closed, and then opening them, by which the portions of the gland will be torn, rather than cut.

In following the branches of the portio dura, upon the face, we should not remove more of the skin than the cutis vera,—for many of the principal branches lie immediately under it;—these will be found, in their course from the interior of the parotid to the different parts of the face, to be united together by cellular membrane, so as to have some resemblance to the webbed foot of an aquatic bird, whence the name of *pes unserinus*, has been given to the plexus which is formed by them.

The three branches, viz. the SUPRA ORBITAL, SUPERIOR MAXILLARY, and INFERIOR MAXILLARY, of the Vth,* will be easily discovered by recollecting the three foramina through which they pass to the face, viz. the *Superior Orbital*, *Infra Orbital*, and *Mental*. After the trunks are exposed, there will be no difficulty in tracing their branches to their terminations,—and also to show the intimate connection which each of them has with the branches of the portio dura. The dissection will be most easily made, by tearing the cellular membrane from between the nerves,

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will be found in the Edition of the *Plates of the Nerves*, published in 1816.—I shall only hint at certain experiments, which are detailed by Mr. Bell, in a paper in the Transactions of the Royal Society for the present year. The new names which have been given to some of the nerves, will be understood by referring to the Explanation of the Plates.

* See the Notes upon the *deep dissection* of these nerves.

by using the scissars and a small hook, in the manner already described.*

After having seen all the superficial nerves, we may proceed to the dissection of those which lie deeper.

The platisma may now be removed, and the external surface of the sterno cleido mastoideus be dissected clean; so may the digastricus superior, and the mylo hyoideus: but we must not take off all the cellular membrane from the sterno hyoideus and thyroideus muscles, because in doing so, we should cut across some of the branches of the *descendens noni*.

The origins of the sterno cleido mastoideus may now be raised, and the muscle be carried towards its insertion. In doing this, we shall see, at about two inches from the mastoid process, the SUPERIOR RESPIRATORY NERVE, or SPINAL ACCESSORY,† entering into its substance, and perforating it, in an oblique direction. After tracing the branches of this nerve, we should cut through the digastricus superior, so as to expose the stylo hyoideus; immediately below the level of which, we shall discover the IX[th], or LINGUAL NERVE, running towards the os hyoides: if we pull upon it, we shall see a small branch running down the neck, towards the muscles on the larynx;—this twig is the *descendens noni*, which, if followed, will be found to pass along the sheath surrounding the carotid artery and jugular vein, and to form connections with some of the cervical nerves. It is lost upon the sterno hyoideus and thyroideus muscles. ‡

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* When we have finished the dissection for the day, we should either cover the parts with a wet cloth, or put them into water; by this, the nerves will be blanched, and afterwards more distinctly seen. If bougies, or black pins, be put under the nerves which have been dissected, the display will be still more distinct.

† See Note upon this, in the *deep dissection*.

‡ In the connections of the seventh, the ninth, the nervus superficialis cervicalis, the roots of the phrenic, and that which is called the external respiratory,—we see the media of many combinations:—the expression and consent of parts in sneezing, coughing, vomiting; the expressive spasmodic actions during violent passion; the spasms in hydrophobia and tetanus. In the connections of the phrenic nerve with the cervical nerves, we may observe the source of that remarkable sympathy which makes the affection, or wound of the diaphragm, be attended with pain in the shoulders, or convulsive rising and shrugging of the shoulders.

The trunk of the IX[th] may be traced a little forward, but not far, as we shall have a better opportunity of seeing it presently.

The sheath of the vessels may now be opened. Immediately between the artery and vein, the great nerve, the PAR VAGUM, will be seen; and if we lift up the sheath altogether, we shall find the sympathetic, lying close upon the muscles of the spine. These nerves may be exposed for a short distance; but, those below the angle of the jaw, must be dissected, before we can show their connections.

The first nerves which we should dissect under the jaw, are the three which pass to the tongue. We have already seen the IX[th], OR MOTOR LINGUÆ.

If we now hold aside the submaxillary gland, and cut carefully through the mylo hyoideus, we shall see the GUSTATORY; and by lifting up the lobe of the parotid gland, and dissecting along the line of the stylo pharyngeus and glosso pharyngeus muscles, we shall find the GLOSSO PHARYNGEAL, which is the third nerve of the tongue.*

But to facilitate this part of the dissection, and of the other deep nerves, the jaw should be cut through at the symphysis and at the angle; and after the membrane of the mouth has been separated from the bone, the intermediate portion may be removed. A piece of twine is then to be put through the tip of the tongue, by which it may be pulled out.

By holding aside the remaining parts of the jaw, a great nerve will be discovered, emerging from between the two pterygoid muscles; this is third of the V[th], being the trunk of the GUSTATORY, and of the INFERIOR MAXILLARY.

After the inferior maxillary has been traced into the hole in the jaw bone, it should be cut through, and a piece of coloured thread attached to it, by which we may again recognize it. The remaining portion of the jaw may now be removed; but we must be particularly careful in extricating the condyle, or we shall be in danger of cut-

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* The gustatory nerve connects the salivary glands and muscles of mastication.—The ninth is the nerve of speech, and connects the tongue with the muscles of the larynx and trachea.—The glosso pharyngeal nerve associates the tongue and pharynx in the action of deglutition. We may now comprehend how the tongue, being put into action through the intervention of distinct nerves, may be deprived of one faculty, and retain the others.—Thus, affections of the brain, and sometimes the disorders of the bowels, deprive the patient, at one time of taste, at another of speech, or at another of swallowing.

ting a little nerve, which runs backwards from the lower part of the gustatory, just at the point where it separates from the inferior maxillary. This small twig will afterwards be found to pass through a little hole by the side of the glenoid cavity, and then to cross the membrana tympani (whence its name of *corda tympani*); it joins the portio dura, but perhaps it will be more proper to describe it as a branch coming from the portio dura, to unite with the Vth.*

The jaw being now entirely removed, we shall have a beautiful exhibition of the nerves of the tongue; for by merely pulling it out, we may trace the GUSTATORY to the tip,—the lingual to the muscles,—and the glosso pharyngeal to the tongue and pharynx.

We may now dissect away the parotid, and also the styloid muscles, and as many of the branches of the carotid as we can, without injuring the trunk of the portio dura: this will expose what appears at first a very intricate plexus of nerves, but if we put probes under all those which have been already described, we shall find the intricacy to be very much unravelled. If we look towards the tongue, we shall see the LINGUAL, GUSTATORY, and GLOSSO PHARYNGEAL; and towards the back of the ear, the PORTIO DURA and SPINAL ACCESSORY; and downwards, the PAR VAGUM and SYMPATHETIC. These nerves now enumerated, are the only ones to be found in the neck, except those which come direct from the spinal marrow, viz. the CERVICAL NERVES.

We should now trace the PAR VAGUM. It will be found to be swollen into a sort of *ganglion*, where it emerges from the scull, and to be intimately connected with all the other nerves under the angle of the jaw. The first distinct branches which will be found rising from it, are two small nerves, which go to the pharynx;—at about an inch farther down, a large branch will be seen going off from it, obliquely downwards, and across the neck, to pass into the larynx, between the thyroid and cricoid cartilages,—this branch is called the SUPERIOR LARYNGEAL. The trunk of the nerve may then be traced down by the outside of the carotid, giving off no branches which have names, until it passes into the thorax. But as yet, we should not follow the nerve farther than the first rib: however, by looking between the œsophagus and larynx, we

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* See Note upon this, in the *deep dissection*.

shall discover the first branch which it gives off while in the thorax; for it is a RECURRENT nerve, which comes back into the neck, to pass into the larynx, between the lower part of the thyroid and cricoid cartilages;—its branches unite with the superior laryngeal;—it is often called the *inferior laryngeal nerve.**

The SYMPATHETIC is now to be traced. We shall first observe the enlargement of it under the parotid; this is called its superior ganglion, from which it sends off branches to every one of the other nerves. As we trace it down the neck, we shall observe that it sends twigs to the cervical nerves, and also some very soft delicate filaments to the artery, which, from their appearance, have been called *nervi molles.* About the middle of the neck, we generally, but not always, (and oftener on the left, than the right side) find another *ganglion.*—From this, some very delicate nerves will be seen to pass, in a direction more superficial than the others; these may afterwards be traced over the aorta, to assist in forming the *superficial cardiac plexus.* The main branch of the sympathetic continues to pass down, until it comes to opposite the first rib, and there it forms the *lower cervical ganglion*, from which, branches go to encircle the subclavian and lower thyroid arteries. But here, we must for the present give up the pursuit of this nerve. We should now turn to the dissection of the lateral part of the neck.

If we carefully dissect the anterior scalenus muscle, we shall see the PHRENIC, or great internal muscular nerve of respiration, lying upon it: upon tracing this nerve back, it

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* In the distribution of the branches of the eighth nerve to the larynx and glottis, we remark that connection which so intimately unites the larynx and lungs.—We observe how the slighest irritation on the former, calls into activity the whole respiratory system. By its connections with the phrenic and other respiratory nerves, it governs the actions of the muscles in respiration; and being also the nerve of the stomach, by the same connections, it governs the muscles in vomiting, combining them in a different manner, to produce that action.

In vomiting and in respiration, the same muscles are in action, but they are differently combined; and muscles which in respiration are opponents, become coadjutors in vomiting. The variety of combinations, of which these muscles are capable, explains the meaning of that intricacy and minuteness of subdivision, which characterize the nerves of the neck and chest.

will be seen to arise from several of the cervical nerves.* By then dissecting on the lower edge of the scalenus, and by throwing out the arm, we shall see a certain number of these cervical nerves, passing to form the axillary plexus, viz. the four inferior cervical, and the first dorsal. But before we trace these nerves back towards the spinal marrow, we should cut to the depth of a quarter of an inch through the fibres of the scalenus anticus; and then, about opposite to where the phrenic lies, we shall see a nerve, which rises from nearly the same roots as the phrenic, and which runs under the axillary plexus, as a distinct nerve, to the external muscles of respiration: this branch, Mr. Bell has called the *External Nerve* of the muscles of *Respiration.*

As we shall now have exhibited all the principal branches of the neck, we may, after making them more distinct, pass either to the dissection of the deep nerves of the scull, or to those of the thorax and abdomen. If the body is not very fresh, we should first dissect those of the thorax.— The deep nerves of the scull will be more distinctly seen, if the parts have been previously soaked in water.

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* This nerve is generally described as rising from the third and fourth cervical; but by dissecting it carefully, we shall find that it has origins from the portio dura, and from the ninth, and also the spinal accessory.

It is a curious fact, that this is the only nerve which was, previous to the discoveries of Mr. Bell, considered as a respiratory nerve to the muscles. He has called it the *Internal Respiratory* Nerve.

DISSECTION

OF

THE NERVES

IN

THE THORAX AND ABDOMEN.

The viscera of the thorax and of the abdomen, should, in the first dissection of the nerves, be sacrificed to it. But after the nerves have been once fairly seen, there will be no difficulty in exposing them, in union with the arteries, in future dissections.

The thorax is to be opened, by removing the sternum, with the cartilages of the ribs: but in doing this, we should cut very close upon the inside of the upper part of the sternum, as some of the nerves lie very near the inner surface of the bone.

If there be no disease in the viscera of the thorax, the PHRENIC NERVE of the left side will be seen passing over the pericardium, immediately opposite to the apex of the heart; — the one on the right side, is situated rather lower down on the pericardium.—There will be no difficulty in showing the distribution of these nerves upon the diaphragm.

The dissection of the next set of nerves requires great care. If we look to the middle cervical ganglion, or to the point of the sympathetic, where this ganglion is generally found, some very delicate branches will be seen going off; and which, if carefully traced, will be found passing to form the SUPERFICIAL CARDIAC PLEXUS.

The par vagum should be traced into the thorax, before the deeper branches of the SYMPATHETIC.

On the left side, the par vagum will be seen, passing over the aorta, towards the lower part of the heart and the lungs. While it lies on the aorta, it gives off that branch which has already been seen running to the lower part of the larynx, viz. the INFERIOR LARYNGEAL, or RECURRENT; — on the right side, the recurrent passes round the subclavian artery.

The par vagum * will now be found to form intricate plexuses of branches with the sympathetic, for the supply of the back part of the heart, and of the anterior and posterior part of the lungs. These branches form the DEEP CARDIAC PLEXUS, and the anterior and posterior PULMONIC PLEXUSES: but to see them distinctly, we shall be obliged to cut off the ribs at the angles, on one, or both sides. If we then pull up the lung, we shall be able to see not only these plexuses, but also those branches of the par vagum, which encircle, or run in a net-work, on the

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* The par vagum connects the larynx, pharynx, lungs, heart, and stomach; and the sympathies it produces in health and disease, are very many. Disorder of the stomach deranges the secretion of the larynx; a vomit, or nauseating medicine will loosen the viscid secretion of the larynx and pharynx; disorders of the stomach, acting through the pulmonic plexus, will occasion cough; and medicines acting on the stomach will alleviate asthma. Through the plexus of this nerve, the heart and lungs are united, ever corresponding in action. When life seems extinguished by suffocation, (in experiments on animals) pricking the heart will be followed by respiration; and in the apparently drowned, the play of the lungs, in artificial breathing, brings after it the action of the heart. It is well known how disease of the lungs affects the heart; but it is not so generally observed how much disease of the heart resembles pulmonary disease.

Looking to the distribution of the par vagum on the stomach, and the plexus of the nerve, in its course upon the œsophagus, it will not appear surprising, that disorder of the uterine system, affecting the stomach, and also primary disorders of the stomach itself, should produce the *globus hystericus*, or paralysis, or spasms of the pharynx and œsophagus. Although the heart and stomach be separated by the diaphragm, yet through this nervous cord they are united; and this explains why disorder of the stomach should produce such changes on the heart's action. The pause, or intermission of the pulse, which, in many diseases, is a fatal symptom, is often produced in a manner less alarming,—merely by irritation of the stomach. Seeing these many connections of the stomach with the vital parts, through this nerve, our surprise ceases at a blow on the stomach proving instantly fatal.

œsophagus; and which form the ŒSOPHAGEAL PLEXUS.* After these are exposed, if we merely tear up the pleura, we shall see the continuation of the sympathetic upon the inside of the ribs, forming, at each intercostal space, a union with the dorsal or intercostal nerves, through the medium of a small ganglion. If we then trace the sympathetic backwards, we shall find that it encircles the subclavian artery with a plexus of branches, from the anterior part of which, those going to the viscera of the thorax pass off,—while the deeper branch forms a distinct ganglion, and then passes down along the ribs, as that nerve which, according to the old nomenclature, was called the INTERCOSTAL.†

By now tracing the œsophagus through the diaphragm, we shall see the united branches of the par vagum passing upon the cardiac part of the stomach, to form the plexus which has been called the *Corda Ventriculi*. We should then look to the side of the chest, and we shall see three or four branches passing off from the sympathetic, towards the bodies of the vertebræ: there they unite, and form a division, which is called the ANTERIOR SPLANCHNIC, which will be found to perforate the diaphragm. By looking on the abdominal side of the diaphragm, we shall, by pulling upon the nerve within the chest, discover that a large ganglion is formed immediately by the root of the cœliac artery: this, being of a crescentic shape, is called the SEMILUNAR GANGLION; but it has more the appearance of a lymphatic gland, than of any part belonging to the nervous system.

From the ganglion of each side, branches pass off, to unite together, and with those of the par vagum, so as to form a great plexus, which has been called the CŒLIAC PLEXUS, or, more commonly, the SOLAR PLEXUS; from which, we may trace branches to each division of the

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* In the dissection of the camel, we discovered a very beautiful plexus of nerves upon the œsophagus: these were in connection with a set of branches on the upper part of the pharynx. As these were also seen in the calf, and not in the ass,—it is reasonable to suppose, that they are peculiar to the ruminating animals, to combine the actions of the pharynx and stomach.

† In dissecting the deep nerves of the thorax, we should place the body so, that the viscera of the abdomen shall drag down the diaphragm. It will be still better to open the abdomen, and to remove all the small intestines, before the dissection of the nerves of the thorax is completed.

viscera. If we lift up the liver, we shall see a set of nerves passing along the hepatic artery, and which form the HEPATIC PLEXUS. If we dissect in the course of the splenic artery, we shall see the SPLENIC PLEXUS;—and, in the same manner, the RENAL PLEXUS to the kidney; and the SUPERIOR and INFERIOR MESENTERIC PLEXUSES to the small intestines: and also the SPERMATIC PLEXUS to the testicle, and the HYPOGASTRIC PLEXUS to the bladder. In dissecting these plexuses, we should put probes under those which have been exposed, that they may not be lost while we are in search of the others.

If, after these nerves of the viscera have been shown, the peritoneum be lifted up from the spine, the sympathetic will be seen passing from the thorax, along the lumbar vertebræ,* and forming connections with each of the lumbar nerves, by a series of small ganglions: and if we follow it into the pelvis, we shall find that it is connected with the nerves which pass to the leg. The sympathetic of the two sides will at last be found united on the extremity of the sacrum, forming a small ganglion, which is called the COCCYGEAL GANGLION, or GANGLION SINE PARI.

This description is very superficial; but I hope it will be sufficient to enable the dissector to make out what is commonly considered the anatomy of these nerves.† But

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* A small division of the nerve which sometimes comes off from the sympathetic, about opposite to the 11th or 12th rib, and passes to the ganglion, or to the renal plexus, is called the LESSER SPLANCHNIC, or ACCESSORY.

† During the inquiries which have, of late years, been carried on in Windmill Street, into the distinctions in the structure and uses of the several nerves, none of the experiments have been repeated which were instituted by several gentlemen, to discover how far the functions of the stomach are influenced by cutting the par vagum.

It has not been from indolence, that they have been neglected, but from a conviction, that such experiments could not be attended with any satisfactory results. Perhaps it will be allowed, that the conflicting reports, which have lately been drawn up by the gentlemen who have been engaged in these experiments, warrant the opinion which had been previously formed by Mr. Bell, that the par vagum was a bond of connection between the several organs,—and not a source of nervous energy to the stomach. This opinion was founded on the minute examination of the anatomy of the several nerves, and particularly on the fact established by comparative anatomy,—that stomachs

I would advise the student who is anxious to know the subject minutely, to repeat the dissection frequently in the

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of the most powerful digestion, in the lower animals, were independent of the par vagum: which is proved by the very conclusive evidence, that in many of those animals, there is no par vagum.

The use of the nerve, and the phenomena which take place upon cutting it, may, perhaps, be understood by the investigation of comparative anatomy: for by it, we shall find, that the existence of this nerve depends upon the manner in which an animal respires, and upon the connection which there is between the stomach and the organs of respiration. And as, in *complicated animals*, the par vagum passes to the throat, the larynx, the heart, the lungs, and the stomach,—we may be permitted to draw the conclusion, that it is for connecting and combining, into one great system, these several organs,—each of which, has the power of performing, to a certain extent, its own peculiar function: but if it be cut through, then the connection between all the organs, and also with the external muscular apparatus, upon which the *perfection* of the economy of *each* depends, must be destroyed.

From what I have seen in experiments on the portio dura, and other nerves of the neck, I can readily believe in the effects of the galvanic influence on the par vagum, when divided; indeed it would be unwarrantable incredulity to doubt it, after the assertions that have been made. But still the question is open, whether the phenomena are to be explained in the manner proposed by Dr. Philip.

If we pinch the divided portio dura, the muscles to which it goes will be slightly convulsed,—if we touch it with acid, they will be more so,—but when we galvanize the nerve, the muscles will be thrown into full action:—thus, it would appear, that the energies of a nerve are excited in proportion to the degree of stimulus. From these experiments, it would be as just to call a pair of pincers, or an essential oil, or an acid, the *nervous agent*, as the galvanic pile.

Before instituting the experiments with galvanism, the fact was assumed, that by dividing the par vagum in the neck, all connection between the brain and the stomach must be destroyed. This I cannot agree to; for, by a careful dissection of the nerves, I find that, at every point of the abdomen and thorax, the par vagum and sympathetic have intimate connections with the spinal marrow,—and consequently, through it, with the brain.

I trust, that in examining a point of physiology which must depend so much on the facts of anatomy, it will not be considered invidious in me to question how far the anatomy of the nerves has been attended to, in the experiments, and in the discussions which have taken place upon it.

I think it will be admitted, that the greater number of the late experiments appear to have been founded on the views of the anatomy of the ganglionic system of nerves, which were given by Bichat.—Although I will, in common with every one, acknowledge Bichat to have been a man of the most brilliant talents, yet I will venture to lower animals; and then I hope, with the assistance of the hints which are given in the notes, that he will be able to

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assert, that his description of the anatomy of the nerves, as it now stands, is incorrect,—and consequently, all his ideas on the ganglionic system are untenable. If this be granted,—it follows, as a matter of course, that all experiments which have been instituted under the idea that Bichat's anatomical observations were correct, must be liable to objections. However, in justice to the memory of Bichat, I must mention the circumstance told by his biographer:—that he had commenced a review of the anatomy of the nerves; and that he had been actually engaged in examining the cervical ganglions, on the very night in which he met with the accident which led to his death. It would appear from this, that he had some suspicions of the accuracy of his former labours; with which, however, those who have followed him, have been content.

In proof that the anatomy has not been sufficiently attended to, in conducting these experiments, I may remark, that, from the intimate manner in which the sympathetic and par vagum of many animals are united, where they lie by the side of the larynx,—the sympathetic must frequently be divided with the par vagum, when the experimenter has supposed that he has cut only the latter nerve. That this has happened in the experiments on the horse, I have not the slightest doubt: for I have found it very difficult to separate these two nerves from each other, even in the dead animal. If this has taken place, (and which I have every reason to believe,) these experiments have shown, without the operator's appearing to have been aware of it, the very curious fact, that, whether the par vagum be cut singly, or with the sympathetic,—the same consequences follow.

The most extraordinary circumstance, regarding these inquiries, remains to be noticed. The same gentlemen, after having made a great many experiments, have, during their last trials, come to a very unexpected conclusion, and one which they did not contemplate at first; viz. that the powers of the stomach, when cut off by the division of the par vagum, may be restored by the approximation of the divided ends,—and that if a portion of the nerve be removed, the power of digestion will be renewed by forming a chain of connection between the brain and the stomach, by means of galvanism.

The experiments from which these opinions are deduced, and which are, as yet, very few, are founded on the assumption (which has already been denied), that the power of digestion is conveyed from the brain to the stomach, through the par vagum. In the next place, it is assumed, that by cutting out a portion of the par vagum, the connection between the brain and the stomach is cut off. This I must object to, when I see the intimate connection which there is, at every point of the thorax and abdomen, between the par vagum and the spinal marrow, and, of course, with the brain.

We have, in our experiments, found, when the power of a muscle depends on a certain nerve, that by simply cutting the nerve, the make this, which has hitherto been considered a fagging task,—a pleasing and interesting subject of inquiry.

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same effects are produced, as when a portion of it is cut out. In proof of this, I offer the experiment of dividing the portio dura, in the horse or ass. The *zig-zag* structure of the nerve, appears to me to render it almost impossible, when it is cut, that its ends shall remain in contact; at all events, the degree of retraction, that we always see in the portions of a divided nerve, entitles us to call upon the supporters of this new doctrine, to prove, that the ends of the nerves continued in contact in those rabbits in which the nerves were cut, and the digestion went on.

It may also be required of the experimenters, to show, that the functions of the stomach will be restored by bringing the ends of a nerve again into contact, from which a portion has been removed.

If the idea be correct, that there is a great and *immediate* difference between the consequences of simply dividing a nerve, and the removing a portion of it,—will it not follow, that little or no effect would be produced by the application of a ligature on the par vagum, since, by this, the *chain* of connection will not be broken?

DISSECTION

OF

THE DEEP NERVES OF THE HEAD.

Before the student commences this dissection, he should furnish himself with a mallet and chisels, small saws, pincers, delicate hooks, and a magnifying glass. He should also have the base of a scull always lying before him.

The manner in which the nerves arise from the brain, has been pointed out at page 144.

The I[st], or OLFACTORY, passes into the cribriform plate of the ethmoid bone,—but its structure is generally so soft, that we cannot trace its filaments.

The II[d], or OPTIC, we see entering into the foramen opticum. We shall afterwards, in the dissection of the eye, find that it passes forward, without giving off any branches;—but to be expanded, as the RETINA, in the interior of the eye.* We should now take hold of the dura mater which lies upon the frontal bone, with the pincers, or strong hook, and pull it off, towards the temporal and sphenoid bones. This requires some force,—but it must, at the same time, be carefully done, particularly near the edges of the foramen lacerum, or we shall tear off some of the small nerves which pass into the orbit. Indeed, the third, and the fourth (which lies in the sphenoidal fold) should be partly exposed before the dura mater is torn down.

When the membrane is torn from the sphenoid and temporal bones, the CASSERIAN GANGLION of the V^{th} will be seen,—from which there pass off the three grand divisions, viz. the OPHTHALMIC, passing through the foramen lacerum, into the orbit,—the SUPERIOR MAXILLARY, through the foramen rotundum, to the upper part of the face,—and the INFERIOR MAXILLARY, (which is divided into the *dental* and *gustatory*,) through the foramen ovale.

The first nerves to be followed, are those which pass through the foramen lacerum into the orbit, viz. the *third*—the *fourth*,—the *first division* of the *fifth*—and the *sixth*.

Before we can trace these nerves, the orbit must be opened, by carrying the saw through the orbitary plate, in a line drawn from the middle of the foramen opticum, to the inner angle of the superciliary ridge, keeping about half an inch to the temporal side of the crista galli.† The os malæ is then to be cut to the depth of three-quarters of an inch, on a level with the zygomatic process. The saw is then to be carried through the temporal process of the sphenoid bone, and the squamous part of the temporal nearly to a level with the sella turcica. By a smart blow with the mallet, the roof of the orbit will now be so loosened, that by cutting close upon the bone, it may be entirely detached from the soft parts.

We shall now have so exposed the orbit, that we may make the dissection of the nerves in it.

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* Before exposing the course of the nerves which pass through the several foramina, we should attach coloured threads to them by which we shall easily find them, during the course of the dissection.

† It is presumed, that the dissection of all the superficial nerves has already been made; and that, therefore, there can be no hesitation in cutting through some of the superficial branches of the V^{th} and of the VII^{th}.

The first nerve which will be seen, is a branch of the ophthalmic division of the V[th]. It is the same which, in the dissection of the face, was found coming through the superciliary hole, to be distributed on the forehead. A *black hair pin* should be put under it, to mark its situation. In tracing it, we shall find that it gives off two principal branches,—one to the *lachrymal gland*, and the other to the *nose*. This last one, should be marked by a bristle, or pin, as it must afterwards be minutely traced.

As the IV[th] is very small, we should first look for the trochlearis muscle, upon which, it is distributed,—and then we shall see some of its fibres. By tracing them back, we shall discover the trunk of the nerve, which is not larger than a thread. The THIRD will be found at its entry into the orbit, lying very close on the optic nerve. It almost immediately divides into several branches, one of which, in its course towards the obliquus,—and at about three-quarters of an inch from the foramen opticum,—and on the temporal side of the optic nerve, will be found to form a union with the *nasal* branch of the V[th], (already described,) through the medium of a small ganglion which is called the LENTICULAR. From this ganglion, a number of small nerves pass into the coats of the eye:—these are called the *ciliary nerves*.

The SIXTH is the last nerve of the orbit, to be dissected. It enters upon a lower level than any of the others;—as it passes through that spongy structure of the dura mater, which is called the cavernous sinus, there is an intimate connection between it and the sympathetic,—but this union will be more particularly described presently. The trunk of the nerve will be found to be almost entirely distributed upon the rectus externus muscle.*

We must now follow the other branches of the V[th] pair. This we shall find to be a most difficult dissection,—and one, in which we are often, after much labour, foiled, by an unlucky blow of the mallet and chisel.†

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* In dissecting the nerves of the orbit, we should disturb the natural situation of the parts as little as possible; and after the dissection of each twig, we should mark it, by putting a black pin, or bristle, under it.

† Mr. Bell has, in his late lectures on the nervous system, shown, that all the spinal nerves, the suboccipital and the V[th], have several essential circumstances, in common:—that they have, each, two distinct roots,—that they have, each, a ganglion on one of their roots,—that they are all exquisitely sensible,—that they are all distributed to the muscular frame, for locomotion and action, — that each

The eye, with its muscles, nerves, &c. may be removed, or drawn aside.

The zygomatic process of the temporal bone is to be cut through at its root,—so is the malar process of the superior maxillary. When the intermediate portion of bone is removed, we may easily trace the *superior maxillary* of the Vth, across the spheno palatine fissure, to the orbital canal of the superior maxillary bone,—from which it emerges, at the infra orbital foramen, upon the face.

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nerve is distributed to its corresponding division of the bodily frame, without ever taking a longitudinal course on the body,—and finally, that these nerves are common to all animals which have a symmetrical body and a regular nervous system. This view will more easily be understood, by referring to the Plan in plate 1.

When we examine the origin of the nerves minutely, we shall find, that the Vth is the only nerve of the scull, which comes off in such critical circumstances, as to have a root from the crus cerebri, and another from the crus cerebelli,—which parts may, by comparative anatomy, be proved to be the continuations of the anterior and posterior divisions of the spinal marrow. The Vth will also be found to be the only nerve within the scull, which has a ganglion at its roots. Those who have dissected the deep nerves of the head, or who have attempted to demonstrate the branches of the Vth pair to students, will be able to estimate the value of this view.

I have examined the nerve repeatedly, in its whole course, in man, in the horse, the ass, the calf, and the dog. By these dissections, I have been convinced, that, in every respect, the Vth pair resembles the spinal nerves, even in the peculiar form of its ganglion and plexus. In the horse, there is as distinct a plexus formed by the branches of this nerve which go to the different parts of the head, as there is formed by those which go from the axilla, or loins, to supply the limbs. I conceive, also, that the form of the part from which this nerve arises, is analogous to that of the spinal marrow where the axillary nerves take their origin. If this be correct, it will be another proof of the similarity of the Vth nerve to the spinal nerves.

In this investigation, I have been able to correct the very common mistake, that the sympathetic nerve has its principal connection with the nerves of the head, through the VIth nerve.

The branches of the sympathetic, which *appear* to go to the VIth, go to the ganglionic portion of the Vth.

By the establishment of this fact, it is proved, that even the connection between the sympathetic and the Vth, is similar to the union of the sympathetic with the ganglionic roots of the spinal nerves.

For an account of the experiments by which the similarity of the Vth and spinal nerves is further proved, I must refer to a paper in the Philosophical Transactions of the present year.

In its passage across the spheno palatine fissure, it gives off some important twigs:—but before we can show these, we must remove a great deal of the pterygoid muscles.— By then looking close upon the bone, we shall see a confused plexus; which, however, will be found to be principally made by the branches of the internal maxillary artery; therefore, as many as possible of these vessels, are to be removed: we shall then discover two twigs, passing down to the narrowest part of the fissure, to be united with a small ganglion, which, from the name of the German Professor who first described it, is called the ganglion of *Meckel;* or, from its situation, the *spheno palatine* ganglion.

When this ganglion is carefully examined, some branches will be seen passing off from it, towards the palate and nose; and, from its back part, a nerve may—but with some trouble, be seen passing into the pterygoid, or Vidian hole of the sphenoid bone. This nerve (the *Vidian*) passes to unite with branches of the sympathetic, and with the portio dura;* but it cannot be traced, until those of the other division of the Vth are examined.

The third division of the Vth is so large, that we shall at once see it, by looking to the foramen ovale. To make it distinct, after it has passed through the hole, it is only necessary to dissect carefully in the remaining part of the pterygoid muscles. The branches which pass to the supply of these muscles, and to the temporal muscles, will then be seen.—It is presumed that the jaw bone has been removed in the first dissection, and that the dental branch is marked by a thread being attached to it.—The only particular branch of this nerve that remains to be shown, is that which passes back from the gustatory, towards the glenoid fissure (the *corda tympani*†). This nerve may, with some care, be traced through a small hole into the cavity of the tympanum; but in breaking up the bone,—which it is necessary to do, to expose its course,— it is generally torn. Its track across the membrane of the tympanum, may be easily shown, by breaking up the cavity, in the manner recommended in the dissection of the ear.

The foregoing is but a very slight sketch of the manner of dissecting the branches of the Vth pair; but I hope the hints will be sufficient to enable an ingenious dissector to follow the branches to their termination.

The VIIth pair will be seen passing into the foramen

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* See what is said on the portio dura, p. 258.

† See the note upon the portio dura.

auditorium internum,—where it almost immediately divides into the two divisions, PORTIO MOLLIS and PORTIO DURA. The portio mollis is distributed entirely upon the *organ* of the ear.

As the portio dura passes through the very dense part of the petrous portion of the temporal bone, it is exceedingly difficult to follow; but, with some care, it may be done,—and then we shall find the union between it and the Vidian, and also with that which is called the corda tympani.* The

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* In the investigation of the minute anatomy of the portio dura, or, as it is called by Mr. Bell, the *respiratory nerve of the face*, we have been induced to consider the *Vidian* as that branch of the portio dura, which passes to the respiratory muscles in the back part of the palate, and to the membrane of the nose; and the *corda tympani*, as the twig which supplies the levator and tensor palati muscles:—I think we may now be permitted to say, that these two nerves have hitherto been traced back from the Vth, only in consequence of their forming a union with the deep branches of the VIIth, similar to that which is formed by the superficial branches of the same nerves on the face.

The dissection of the nerves in the horse, would lead us to believe, that branches from the sympathetic pass into the ear, along the Vidian; and that branches from the Vth, enter along with the corda tympani.

The portio dura will be found to be one of the most interesting n the nervous system; for, by comparative anatomy, we are able to prove, that it exists, only where there is a particular respiratory apparatus; and, by experiments, it has been most distinctly shown, that when this nerve is cut, the muscles to which it goes, are paralyzed, as muscles of respiration. If the late discoveries by Mr. Bell, had done nothing more, than to show the use of this nerve,—they would still have constituted the greatest advance which physiology has made in the present day.

The very curious experiments which were instituted by him to investigate the use of this nerve, will be found in the Philosophical Transactions.

The comparative anatomy of the portio dura is very interesting; but I cannot enter into it. However, I shall introduce the following observations on its distribution in the elephant:—

During the last winter, when engaged in assisting Mr. Bell in the investigation of the nervous system, I often visited the menagerie in Exeter 'Change, to study the motions and uses of the proboscis of the elephant; and this I had a good opportunity of doing, for the small elephant was so very gentle, that he permitted me to handle his trunk freely. From the great power which the elephant has over his trunk, as a machine, I was satisfied that there must be large nerves running to it, similar to those which supply the fingers in man; but as the proboscis forms an important part in the respiratory system of this animal, I thought that in the dissection of it, there would be the most distinct proof of the accuracy, or fallacy, of Mr. Bell's opinions on the nerve will be found to emerge from the stylo mastoid foramen,—and be distributed on the face, as has already been described.

The upper part of the spinal marrow should now be exposed, so that we may distinctly see all the branches of the VIIIth pair. This may be done by carrying the saw down behind the mastoid processes of the temporal bone,—and then by cutting through the transverse processes of the cervical vertebræ, with a mallet and a *plumber's hacking knife*:—the broken processes are to be torn off with a strong pair of nippers.

The sheath of the spinal marrow will then be exposed. When it is opened, we shall see the origins of the SPINAL

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portio dura. The animal died in the month of May; and, through the kindness of my friend, Mr. Mayo, who purchased its body, for the purpose of dissection, I was enabled to make an examination of the nerves of the trunk. The dissection was most satisfactory; for the trunk was found to be supplied, not only by branches of the Vth pair, as described by Cuvier, but also by an immense branch from the portio dura.

The portio dura, in this elephant, was found emerging from the parotid gland, as in other mammalia. It gave off some descending branches to the neck, while in the parotid; but it passed from behind the jaw to the proboscis, almost as an entire nerve, and of the size of the sciatic nerve in man: for in its course, it had given only some small branches to the muscles of the eye,—to those of the ear,—and to a small muscle which corresponds with the platysma.

Before it passed into the substance of the proboscis, it united with the second division of the Vth pair, which comes out from the infra orbital hole, in two large branches. The two nerves being then closely united, passed between the layers of muscles which form the greater part of the trunk. The portio dura became quickly diminished in size, for it gave off its branches in great profusion to the muscles; but the Vth was continued down, as a very large nerve, to nearly the extremity of the trunk,—in this respect, resembling the nerves to the fingers in man. On making sections of the proboscis, near its extremity, a great number of these nerves were seen in its substance.

A few branches of the portio dura ran to the valvular apparatus in the upper part of the trunk; but this peculiar structure was supplied principally by a branch from the Vth pair, which was about the size of the radial nerve, and winded round under the orbit, from the main branch.

The examination of the nerves of some animal whose proboscis is a feeler, and not, at the same time, a respiratory organ, would now be very interesting;—perhaps the nervous system of the extremity of the bill of the duck, may at present be taken as a proof, that where the part is not used as an organ of respiration, there will be no portio dura.

ACCESSORY ;* and the trunk, passing up, to unite with the fibres of the par vagum and glosso pharyngeal, which have their origin from the corpus olivare. The three

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* This is a very remarkable nerve. In all animals in which it is found, it is intimately connected with the respiratory nerves.

If an animal does not perform part of the act of respiration by muscles which run from the scull to the chest, no spinal accessory, or *superior external respiratory*, as it is called by Mr Bell, will be found. A common example of this may be seen, in any of the larger birds, as the swan, &c. By experiments on the ass, we have proved, that, by cutting this nerve, we can paralyze the muscles to which it goes, as muscles of respiration,—though the same muscles, being still supplied by other nerves, will retain their powers of raising the head, &c.

During the month of April last, there was an excellent opportunity afforded of corroborating the opinions which Mr. Bell has formed on the use of this nerve, by the dissection of the Courier Camel, or Maherry, which was brought from the interior of Africa by Captain Lyon, as a present to his Majesty. In the dissection of this animal, we noticed many interesting facts, which have been overlooked by comparative anatomists,—and particularly the distribution of the nerves of the neck and stomach. The arrangement of the nerves which combine the muscles of the throat and stomach, in the act of rumination, is very beautiful. But at present I shall confine my remarks to the spinal accessory, or superior respiratory nerve.

The structure of the neck of the camel is very different from that of the horse or bullock.—It more nearly resembles that of a large bird, such as the swan, to which, in the slow and successive motions of the head, it has a great resemblance. Although we discovered, by dissection, that there was a great similarity in the muscular apparatus of the neck, to that of birds, we did not expect to find, that the arrangement of certain nerves would also correspond; and, at first, we were rather surprised that we could not find a spinal accessory nerve in union with the VIIIth, under the jaw, as we had found in all the other quadrupeds which we had examined. However, on comparing the muscles of the neck, with those of the horse, a great difference was found; for, although there was the sterno maxillaris, which, in the horse, receives the greater part of the spinal accessory, yet it was so small, that it could have no power over the motions of the chest, as it has in the horse, ass, &c. In the lower part of the neck, there are several muscles corresponding to the scaleni, which, besides the common cervical nerves, receive a branch which arises in common with the phrenic.—By this nerve, these muscles are probably combined in action with the other muscles of respiration; while the muscles on the upper part of the neck, from their comparative size, appear to be of as little use in producing respiratory motions of the chest, as those of a bird; and this, we may be allowed to presume, is the reason, why there is no spinal accessory, or superior respiratory nerve,—but only a branch, rising in union with the phrenic, to supply the respiratory muscles on the lower part of the neck.

united nerves may be traced through the foramen lacerum, with the internal jugular vein.—As soon as they emerge from the scull, they separate. The par vagum will be found to form a sort of ganglion, just at its exit from the scull.

The IXth pair will be found to come, by a single set of filaments, from the corpus pyramidale,—and to pass through the foramen condyloideum, direct to the muscles of the tongue.

We may now examine the manner in which each cervical nerve arises from the spinal marrow. We shall find that each nerve has a double root, i. e. one from the anterior, and the other from the posterior column of the spinal marrow;—that the one from the *posterior*, has, immediately before it joins with the *anterior*, a ganglion formed upon it;* and if we carefully examine this, we shall find that, from each ganglion, a small nerve is sent off, to unite with the sympathetic.†

To trace the sympathetic through the foramen caroticum,—and to show its connections with the nerves within the scull, it will be necessary to sacrifice the greater number of the other branches. When the foramen caroticum is opened, a plexus of nerves will be found, surrounding the carotid artery, which appear to be united with the VIth, but which, when carefully traced, will be found to pass over the VIth, to the Casserian ganglion of the Vth.‡

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* Some curious experiments have been made in Windmill Street, on the comparative degree of sensibility of the two origins of these nerves. Though in these experiments there was sufficient observed, to induce us to believe, that there is much difference between the two sets of fibrils,—yet, from the difficulty of making them, the facts are not yet so distinct, as to permit us to mention them.

† This union, or origin, of the sympathetic, appears to have been entirely overlooked by Bichat. He has described the ganglion, but not the nerve of communication. Had he lived, in all probability he would have investigated the anatomy farther,—and then he might, perhaps, have given up the idea of considering the sympathetic as a part entirely distinct from the system of the spinal nerves. It is a striking and curious fact, that, in the edition of his *Anatomie Descriptife*, published in 1802, the editor says, "Nous reprenions ensemble le systeme nerveux des ganglions et c'étoit le soir même ou nous avions commencé le ganglion cervical superieur, que Bichat-fit cette funeste chute qui determina sa derniere maladie."

‡ Professor Böch, of Leipsic, and M. Cloquet, of Paris, have, in prosecuting the minute anatomy of the sympathetic nerves, discovered a small ganglion in the cavernous sinus. This I have often seen; but I think I have also shown, by the dissection of these nerves in the

There will also be branches seen passing along the Vidian nerve, towards the ganglion of Meckel.

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larger animals, that it is quite an error to suppose, that the principal connection between the sympathetic and the nerves of the head, is through the VI[th] pair. By an attentive examination, it will be found, that the branches of the sympathetic, which *appear* to unite with the VI[th], pass along it, and unite with the ganglionic portion of the V[th]. The branches of the sympathetic, which actually unite with the VI[th], are very small.

DISSECTION

OF THE

PARTS OF THE NOSE AND OF THE EAR.

After having finished the dissection of the nerves, the scull should be divided, so that we may have an opportunity of examining the nose, and some parts of the ear.

The section of the scull may be made by carrying the saw through the remaining part of the bones of the head and face, in a perpendicular line,—but a little to one side of the septum narium.—The soft palate, &c. is to be cut in the same direction. Each of the sections will afford us some very useful views,—particularly if the pharynx and larynx be left attached to one of them. Indeed the anatomy of the posterior nares, &c. is so important, that the student should always examine it, even though he should destroy many of the small muscles.

The cavities of the nose will be made more distinct, by cutting (in one of the sections) through the superior maxillary bone, immediately below the orbital plate, and by continuing the cut, in the same line, through the ethmoid and sphenoid bones.

We may then see the mucous membrane which lines all the interior parts of the nose, viz. the *Schneiderian membrane;* the *inferior spongy* bone; the *labyrinth* formed by the ethmoid bone; the *communication* between the *cells* of the frontal, ethmoid, and sphenoid bones: immediately above the inferior spongy bone, we shall see the opening into the *antrum* of *Highmore;* and below the bone, the *passage* to the *lachrymal sac.* On the other section, the *septum narium* will be seen to be formed by the union of the perpendicular plate of the ethmoid with the vomer, through the medium of a cartilage. By looking to the posterior part, we can understand the relation of the passage between the back part of the nostrils and the throat—the *posterior nares;* and, with a little care, we may discover the *Eustachian tube*, which leads into the cavity of the TYMPANUM.

We may now take an opportunity of examining the general anatomy of the ear.

The following description of the manner of dissecting the ear, will perhaps enable a young student to acquire a general idea of the relative position of the parts composing the organ.—To comprehend the minute anatomy, requires more opportunities than a dissecting-room generally affords.

The muscles of the cartilages of the external ear, are generally so small, that unless the dissection be made in a very fleshy ear, as in that of a negro, it will be impossible to find them; but those running from the head to the ear, may always be easily found.*

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* The following table of these muscles is added :—

MUSCLES LYING ON THE CARTILAGES OF THE EXTERNAL EAR.

HELICIS MAJOR. OR. The upper and acute part of the helix, anteriorly.

IN. Into its cartilage, a little above the tragus.

HELICIS MINOR. OR. The inferior and anterior part of the helix.

IN. The crus of the helix, near the fissure in the cartilage, opposite to the concha.

TRAGICUS. OR. The middle and outer parts of the concha, at the root of the tragus.

IN. The point of the tragus.

The several *cartilages* may be exposed by merely removing the skin, &c. which covers them. The *cartilaginous tube* should be followed down to the bone.—The squamous part of the temporal bone should then be cut, down to the level of the pars petrosa; and we should proceed to lay open the different cavities of the internal ear.

The bone immediately behind the squamous portion, and in a line with the posterior part of the tube, is so very thin, that the slightest blow with a small chisel will break it: if the fracture be made posterior to the line of the *meatus externus*, the *mastoid cells* will be opened. After having done this, it is very easy to expose the whole cavity of the *tympanum*, by breaking up the thin bone, in the direction towards the foramen spinale of the sphenoid bone.

The *membrane* of the *tympanum*, with the *chain of bones*, will now be seen, and also the *communication* of the *tympanum* with the *mastoid cells*; and if a fine probe be

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ANTITRAGICUS. OR. The internal part of the cartilage that supports the antitragus.

IN. The tip of the antitragus, as far as the inferior part of the antihelix, where there is a fissure in the cartilage.

TRANSVERSUS AURIS. OR. The prominent part of the concha on the dorsum of the ear.

IN. Opposite to the outer side of the antihelix.

These muscles are for the most part scarcely discernible: they are, no doubt, for giving rigidity to the ear, the better to enable it to collect the sound.

MUSCLES OF THE EXTERNAL EAR.

ATTOLENS AURIS.—A thin and almost tendinous sheet. OR. The tendon of the occipito-frontalis, where it covers the aponeurosis of the temporal muscle.

IN. The upper part of the ear, opposite to the antihelix.

ANTERIOR AURIS.—A membranous muscle also. OR. Back part of the zygomatic process of the temporal bone.

IN. The back of the helix, near the concha.

RETRAHENTES AURIS.—Two delicate membranous muscles. OR. The mastoid process, above the insertion of the sterno cleido mastoideus.

IN. That part of the back of the ear which is opposite to the septum that divides the scapha and concha.

These muscles, in a state of nature, are designed to give tension to the ear; to make it more capable of receiving sounds, and especially to bring us acquainted with the direction of sounds; but their use is, in general, almost entirely lost.

pushed towards the fore part of the cavity, it will pass into the *Eustachian tube:* but it will not be possible to push the probe into the throat, without injuring the little bones in the tympanum,—the tube, therefore, should be examined in the throat.

* As we have determined to sacrifice the bones, for the purpose of examining the eye, nose, and ear, the following cuts should be made:—The lower jaw having been removed, the saw should be carried in a line parallel with the cavity of the tympanum, cutting through the glenoid cavity, and terminating in the foramen ovale of the sphenoid bone;—another cut (if the orbit has not yet been opened) should pass through the os malæ, at its union with the superior maxillary bone, and be carried in a line through the frontal and sphenoid bones, so as to meet the first cut into the foramen ovale: when the triangular piece of bone which is included between these cuts, is removed, it will be easy to show the whole extent of the Eustachian tube; and if one half of the soft palate be cut away, the trumpet mouth of the tube will be exposed;—and now a small probe (for, at one point, the tube is very narrow) may be passed into the tympanum;—the tube may be laid open, through its whole length, with a pair of strong scissars. We shall now be convinced of the impracticability of passing a probe into the ear from the mouth.—The mere possibility of doing it from the nostril, will be seen.

It is now easy to understand, that if the Eustachian tube be closed, after an ulcerated sore throat, deafness may be the consequence; or how temporary deafness is frequently occasioned by catarrh. In proof of the cause of this, we shall find, that in children who die of cynanche, the tube is generally full of purulent matter. It must also be evident, that, in those people who can throw smoke from the mouth, out by the ear, the membrana tympani must be in part destroyed.

Besides the *bones*, (the MALLEUS, INCUS, ORBICULARE, and STAPES,) there are certain small muscles within the cavity of the tympanum; but these are very difficult to show. On the upper part of the Eustachian tube, a muscle lies, partly in a cavity, which, in the dry bone, being something like a marrow-spoon, has been called the

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* The following directions for cutting the bone, were written under the idea, that the dissection of the ear was to be the principal object:—it will be easy to vary the cuts a little, if the posterior nares, &c. have already been examined.

Spoon-like Cavity; upon the extremity of which, the tendon of the muscle is reflected, and then runs to the long process of the malleus. This muscle is called the TENSOR TYMPANI. From the opposite side of the Eustachian tube and glenoid fissure, another muscle passes, to be inserted into the malleus: it is the LAXATOR TYMPANI. From the upper part of the tympanum, there is a third muscle, which runs to the short process, and is called the SUPERIOR, or EXTERNAL muscle;—but this last, is denied by many to be of the nature of muscle. There is still a very small muscle attached to the stapes,—it is called STAPEDIUS, and takes an origin from the interior of a little eminence, absurdly called *pyramid*. The *corda tympani nerve*, which has already been described at page 257, will be seen running across the membrane of the tympanum, and over the long process of the malleus.

Although these muscles are now mentioned, it is not possible to see them all in this stage of the dissection, as the tympanum has not yet been sufficiently opened; but to expose it more, at present, for the purpose of exhibiting these muscles, would endanger the parts composing the labyrinth.

It is almost impossible for any one but an experienced dissector, to exhibit all the parts of the labyrinth in one view. To do this, he must have a knowledge of each part; and to expose them, he requires a variety of little instruments, as small chisels, files, and saws; but it is possible for any one to make such a dissection, as will give a general idea of the relative situation of the parts. About a quarter of an inch posterior to the meatus internus, a *ridge* will be seen crossing the petrous portion: if this surface be filed down, a cavity will be opened; viz. the SUPERIOR SEMICIRCULAR CANAL. This canal may be easily followed, by putting an awl into its cavity, and then, as with a lever, breaking up the bone: by tracing it towards the cavity of the tympanum, we shall show its communication with the HORIZONTAL CANAL; by tracing its other end, we shall open the INTERNAL CANAL: but it is very difficult to follow these two last canals through their whole extent. The VESTIBULE may be opened by breaking the bone with a small chisel, immediately anterior to the union of the superior and external semicircular canals,—or a better mark, is the base of the stapes;—but in making the cut, we are very apt to break up the foramen ovale. To show the COCHLEA, a slanting cut should be made across the meatus internus, towards the Eustachian tube. If this be done with a very fine saw, it will probably pass through the MODIOLUS, so as to give a view of all the parts of the cochlea; but in making the cut, the saw-dust will so fill the SCALÆ COCHLEÆ, that it will be impossible to see them until they are cleaned; but we must not put any instrument into the cochlea to clean it: it should be done by dipping the preparation into water, and blowing forcibly into the scalæ with a blow-pipe. We may then, perhaps, make the MODIOLUS and LAMINA SPIRALIS, with the INFUNDIBULUM, distinct. I shall not enter into a more minute description of the parts, but shall refer the student to good books of Anatomy: he will find great assistance in the Plan of the Ear, published by Burgess and Hill, and which is copied from the drawing used in Windmill Street, for the demonstration of the internal structure of the ear.

DISSECTION

OF

THE EYE.

As the parts of the human eye are not only on a small scale, but as we can seldom procure them sufficiently fresh for the dissection of the minute parts, we should have much difficulty in acquiring a knowledge of the structure of the eye, as an organ of vision, were it not, that we have it always in our power to get the eyes of sheep, pigs, or oxen, in a perfectly fresh state. Indeed, we shall find it advantageous to dissect the eyes of some of those animals, before we examine the human eye; because, in them, the important parts of the organ are not only the same, but they have this great superiority over human eyes, for dissection,—the being much larger. But to understand the eye, as a part upon which surgical operations are to be performed, we must carefully examine the human eye, and accurately mark the proportionate size and relative position of each part.

It need hardly be said, that the eye-lids, and the lachrymatory apparatus, muscles, &c. must all be studied on the human body.

The eye of a sheep is a very good subject for dissection; but the eye of a pig, in some respects, more nearly resembles the human eye. The dissection of the eye of the horse or ox will be found very useful when we wish to examine some of the minute parts.

Before endeavouring to discover the minute structure .f the eye, we should make several sections, to acquire a general knowledge of its parts. We may commence by dissecting away the muscles, &c. which are attached to the ball of the eye. When this is done, the SCLEROTIC will be seen, with the transparent CORNEA attached to its anterior, and the NERVE perforating its posterior part.

If we puncture the cornea, the AQUEOUS HUMOUR will escape: if we cut out a portion of the cornea, we shall see the IRIS, with its central hole, called the PUPIL. By now pressing on the ball of the eye, the LENS will be pushed forward into the pupil: by scratching with the point of the knife, we shall open the *capsule* of the lens; by increasing the pressure on the ball, the lens will start through the pupil, and then the VITREOUS HUMOUR will appear pushed forward into the pupil. But as the capsule of the vitreous humour (tunica hyaloidea) is very different from that of the lens, the mere scratching of its anterior part will not be sufficient to evacuate the humour; but to do this, the instrument must be plunged deep into it, and be moved in several directions: by then squeezing the ball, an *aqueous humour* will exude.

Another eye may now be cut through, at half an inch posterior to the edge of the cornea. On the anterior section, we shall see the back part of the iris, of a deep black colour: the transparent lens will be seen lying upon it. On the posterior half, we shall see the transparent vitreous humour; and looking through it, we shall probably see the inner surface of the CHOROID, because, in a very fresh eye, the RETINA, which is interposed between the vitreous humour and the choroid, is generally transparent; but perhaps some of the vessels of the tunica vasculosa retinæ, may be seen, *apparently* on the back part of the vitreous humour. When we hold up this portion of the globe, and invert it, the vitreous humour will fall out; and then the nervous matter of the retina, being exposed to the air, will become opaque, and consequently, visible: but it will not keep its proper position;—it will fall back towards the bottom of the eye, so as to expose the whole of the inner part of the choroid, which, in the sheep, is black and green. The choroid may now be easily separated, with the handle of the knife, from the sclerotic.

Before we commence the examination of the minute structure, we ought to fix the eye; and this should be done in such a manner, that we may, in the course of the dissection, be enabled to put the eye into water,—for there are some parts too delicate to be dissected, unless they are, at the same time, supported in a fluid. Any thing in the form of a small egg-cup, or pill-box, will hold the eye sufficiently steady to enable us to examine the principal parts; but we should at once so fix it, that we may continue the dissection through the whole organ. The most convenient mode of doing this, is to attach the ball of the eye, with a few pins, to a piece of cork, about an inch in diameter, and half an inch in depth, which has been previously hollowed out, and fixed to a saucer with sealing-wax. The pins may be pushed through the coats; or it will be better to put the pins into the cork, and then to pass three or four threads, at different points, through the sclerotic, about half an inch from the nerve; the threads are then to be fixed to the pins. If it be too much trouble to make this apparatus, two small nails, slightly bent, may be laid across each other, and fixed to a saucer with sealing-wax; the eye may then be easily attached to them. In addition to the saucer, we should have a glass globe, one third of which has been cut off; for after the parts have been dissected, they will be seen to great advantage by filling this globe with water, and then inverting it over the saucer: the manner of doing this, does not require much ingenuity to discover.

We may now proceed to make a very minute examination of all the parts already mentioned.

The transparent cornea, and the sclerotic, are so intimately connected, that, on the first examination, they will appear to be parts of the same coat; indeed, we cannot separate them; yet by maceration, the connection between them, will become so completely loosened, that the cornea will fall from the sclerotic, like a glass from its frame. Even in the fresh state, we can show that they are of different textures. To do this, the cornea must be cut from the sclerotic by a pair of sharp scissars (in doing which, the aqueous humour will escape), and then by taking the cornea betwixt the finger and thumb, we shall feel that it is composed of several laminæ, between which, there is a cellular structure, filled with a pellucid fluid.

If we squeeze the ball of the eye, before the cornea is cut off, it will appear opaque,—probably in consequence of the relative position of the cells being changed. When the pressure is taken off, the eye will again appear clear; this explains the immediate good effect of puncturing the cornea, when there is effusion into the anterior chamber.—This operation is frequently performed on horses. The cornea may be separated into distinct laminæ; but this will be more easily done after it has been macerated some time;—we shall then be able to discover, besides the proper laminæ, a coat, upon the external surface of the cornea, which appears to be the continuation of the *tunica conjunctiva*,—and another, on the inner surface, which has sometimes been described as a *capsule* of the *aqueous humour*. This last is sometimes called, from its discoverer, *Tunica Wrisbergii*.

It would be inconvenient to examine the structure of the sclerotic, at present: we may defer it until we finish the other parts, or examine it, in another eye. We shall find that it is not *lamellated*, but *fibrous*.

The cornea being removed, the iris will be seen.—It is almost needless to remark, that the shape of the iris in the sheep, is very different from that of man.

The cut edge of the sclerotic should now be seized with the forceps. The point of the scissars is then to be gently insinuated under it,—or it will be better to pass an ivory or silver probe under the edge of the sclerotic, to the extent of a quarter of an inch, and then to gently move it round the circle; this will separate the connections between the sclerotic and LIGAMENTUM CILIARE, which is the name given to the part which connects the choroid and iris.

The sclerotic may then be cut, so as to expose the outer part of the choroid: this is to be done, by first passing one blade of the scissars cautiously between the two coats, and then inclining the eye to one side, that the weight of the humours may so drag on the choroid, as to facilitate the separation. After having removed a small portion of the sclerotic, it will be well to put the saucer into a flat basin, or dish, with as much water in it, as will cover the eye. The whole of the sclerotic need not be removed, but only as much as will exhibit the external appearance of the choroid. A number of small nerves and vessels will be found running between the sclerotic and choroid, which ought to be cut,—not torn. The choroid will now appear to be of a jet black colour, which is owing to a black secretion; yet if we scrape the membrane with the finger, very little colouring matter will come off. But although this secretion is on its inner surface, still a little exudes through the coat; for even in a very fresh eye, the surface of the sclerotic, in contact with the choroid, will be slightly discoloured.

The iris will now be more distinctly seen, and, between it and the choroid, the white ring, which has received many names, viz. *ligamentum ciliare; corpus ciliare; annulus ligamentosus; annulus gangliformis tunicæ choroideæ:* but the name most commonly given to it, is LIGAMENTUM CILIARE.

The choroid consists of two laminæ:—by cutting very carefully, with a small scalpel, through one half of the membrane about the middle of the eye, and by pulling upon the divided portion with the forceps, we may show both of the laminæ; but it is difficult to do this nicely: however, we shall at once be able to understand the difference between the two laminæ, when the choroid is separated from the retina; for then, the internal surface will appear of a bright colour, and *villous*,—while the external, will be dull, and *cellular*.

The external part is called the *true choroid*, from its resemblance to the chorion of the fœtus,—the inner part has, in honour of the discoverer, been called *Tunica Ruyschiana*. The variegated colour of the internal surface, in some animals, having some resemblance to the colour of fine tapestry, has induced the Parisian dissectors to give it the name of *tapetum*.*

Though we cannot make the following dissection on the same eye on which the internal part of the choroid has been examined, yet the description may now be given. The cornea, and half an inch of the anterior part of the sclerotic, is to be carefully removed from the choroid:—

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* The pigment, upon the surface of the tapetum, is generally black in men, but the secretion is of various colours, in different animals; sometimes it is deficient, and this gives the appearance of the red eye, as in the white rabbit, cream coloured horse, or albino; for in them, the blood circulating in the choroid, is seen through the pupil, while in the common eye, the vessels are obscured by the *pigmentum nigrum*.

this will show the iris in union with the choroid, through the medium of the white body called ligamentum ciliare.

It must be evident, at first view, that the iris is of a very different structure from the choroid. On the latter, we see a number of small veins, disposed in whirls or vortices, whence the name *vasa vorticosa*; while on the iris, we cannot see any thing resembling them. There is not any appearance in the choroid, of fibres; but in the iris, we see both *radiated* and *circular*,—which have been, by the best authorities, supposed to be muscular.

The colour of the two parts, anteriorly, is also very different; for the name of *iris* has been given, from the variety of colours seen upon it. When the anterior surface is examined with the microscope, a number of *villi* will be seen, which are said to secrete the different coloured matters; but when the back of the iris is examined, it will be found to be covered with the pigmentum nigrum, whence, from its black appearance, it has sometimes been called *uvea*.

So far, it is sufficiently clear, that the choroid and iris are very different from each other; but many authors have said, that the anterior part of the choroid is divided into two portions, viz. into the *Iris* and *Ciliary Processes*. But I think those authors must have come to this conclusion, in consequence of having made the dissection in rather a superficial manner. To understand the true anatomy of the part, we must first examine the ligament by which the iris is connected to the choroid.—In the fresh eye, it is so firm, that it is difficult to detach the iris; but after the eye has been macerated for some time, the iris may easily be separated from the choroid, and then the ciliary processes will be seen. This dissection may be made in two ways; the first may be done in an eye nearly quite fresh.—After the iris and part of the choroid have been exposed, we should introduce one blade of the scissars into the pupil, and cut across the iris, (but not quite to its root,) at two sides of the circle. If we then tear one half of the iris back towards the choroid, we shall expose the black circle of ciliary processes, lying loose on the margin of the capsule of the lens: by tearing away this portion of the iris, altogether from the ligament, we shall see that these processes are the termination of the choroid.—To expose them in another manner, the eye should be two days old.—We should not now cut the cornea, but through the circle of the sclerotic, about a quarter of an inch from the margin of the cornea.—We must not injure the choroid, but separate the sclerotic from it. In separating these two coats, the iris will probably adhere to the sclerotic and cornea, so that when it is torn up, the ciliary ligament will be divided into two portions: the ciliary processes will be seen projecting from that part of the ligament which remains attached to the choroid. At the first view, the apices of the processes will appear to adhere to the capsule of the lens,—and so they have been described by many; but that they do not, may be proved, by blowing a little air between them and the lens: this will also show, that, at their bases, they appear to adhere to the capsule,—but they do not actually touch it, for there is interposed between them and the capsule, a membrane, presently to be described *(Tunica Vasculosa Retinæ)*. This part of the dissection is very difficult, and ought to be done while the parts are under water. There is still another method of giving a view of the ciliary processes.—This is, to make a section of the anterior part only of the eye, at the distance of half an inch posterior to the margin of the cornea. The lens will be seen lying on the iris, and beneath its transparent margin, a black circle, which is formed by the ciliary processes.

To examine the processes still farther in this section, the lens may be removed, by cutting the posterior part of its capsule. If the parts be now put in water, and the processes be scraped with the handle of the knife, the pigment which covers them will be washed away, and then they will have the form of a circle of white striæ, projecting from the choroid, and passing behind the iris.

As the retina is a very delicate part, considerable care is requisite in preparing it for demonstration. An eye should be properly fixed in the saucer, and the choroid prepared as has already been described; then, while the eye is under water, a part of the choroid should be torn off,—the white opaque retina will then be seen. But there is another coat between this and the choroid, which, however, is so delicate a membrane, that it is almost impossible to see it with the naked eye; but when the glass globe is inverted over the dissection, we shall then see it, floating between the choroid and nervous pulp of the retina: this is the membrane described by Dr. Jacob, of Dublin.*

* This membrane was shown to me by Dr. Jacob, while I was on a visit to Dublin, in 1818.—Since that time, I have always demonstrated it by the name of *Tunica Jacobi*, in honour of my friend, who discovered it.

Having seen this membrane, the choroid may be stripped farther off, and then the termination of the nervous matter of the retina will be seen, marked by a vessel, running about the eighth of an inch from the margin of the lens.* Some vessels will be seen under the nervous matter; they are on the TUNICA VASCULOSA RETINÆ. It may now be understood, that the nervous pulp of the retina, is contained between the *membrane of Jacob* and the *tunica vasculosa.*

The transparent coats which contain the humours, may now be examined.

If we make a puncture in the angle between the margin of the lens and the vitreous humour, and then blow into the puncture, we shall distend the cavity that is called the PETITIAN CANAL, and which surrounds the lens. When it is distended with air, or size injection, it has a plaited appearance, whence it was called by the French anatomists, *Canal Godronnée.* Different modes of showing this part, will be described presently. On the plaits, we shall see black striæ, which have erroneously been called the ciliary processes of the retinæ; they are nothing more than marks left by the ciliary processes;—this appearance, however, gives a good idea of the shape and situation of these processes.†

If we make a puncture on the anterior part of the lens, and blow into it, its capsule will be raised; in doing this, a small quantity of fluid, which is called the *Liquor Morgagni,* will escape.

By pushing the blow-pipe into the vitreous humour, we may distend the *tunica hyaloidea,* or capsule of the vitreous humour; this is not a regular sac, similar to the capsule of the lens, but has more of a cellular structure, and contains the humour in the cells. This capsule is supposed, by many, to split at the anterior part; one portion is said to go anterior to the lens,—the other, posterior to it; and that, in this manner, the Petitian canal is formed. Mr. Charles Bell, however, has said, in his Description of the Eye, that the canal is formed by the splitting of the tunica vasculosa retinæ; and this

* By dropping a little weak acid on the retina, the nervous matter will become more distinct; but if we wash the surface with an alkaline solution, the nervous matter will be destroyed, and then the tunica vasculosa will be seen.

† By Winslow, these marks are called *Sulci Ciliares;* by Zinn, *Corona Ciliaris;* by C. Bell, *Halo Signatus.*

he deduces from the examination of the fœtal eye, for in it, may be proved, that the vessels of the tunica vasculosa retinæ, are continued on the back part of the capsule of the lens. But as all these membranes are exceedingly delicate and transparent, in the adult,—the manner in which they are connected together, will always continue to be a matter of dispute.

If an eye be now so cut, as to allow the lens and vitreous humour to fall out, in connection with each other, we may again have a good opportunity of showing the Petitian canal; for if we make a puncture in the angle between the two humours, we may distend the canal with any coloured fluid, as red ink: if it be done with size and vermilion, it may be kept as a preparation. The easiest way of doing this, is to suck up a little of the fluid with a glass tube which has been *drawn* to a point sufficiently fine to enter the puncture,—by blowing a very little, the injection will fill the canal.

This part may also be easily demonstrated when the eye is slightly putrid, by cutting off the cornea, and about a *line* of the sclerotic;—we should then tear up the iris, which will separate easily from the ciliary processes; by then pushing the processes back with the probe, we shall be enabled to make a puncture by the side of the lens, into which the blow-pipe is to be introduced;—but if we have not made the puncture in the right place, the capsule of the lens, or the capsule of the vitreous humour, will be distended.

There is still another transparent membrane, viz. that of the aqueous humour: in some animals, as in the hare, and rabbit, it is very easy to demonstrate it; but the human eye, and that of the sheep, must be macerated, almost to putrefaction, before this delicate membrane will separate from the inside of the cornea.

We have now to examine the humours. The AQUEOUS HUMOUR is seen, on puncturing the cornea: it is described as having two chambers; one, anterior to the iris,—the other, posterior to it; but when we cut off the cornea, we shall see that the lens lies almost close upon the iris,—so that the space behind the iris, (the *Posterior Chamber*,) is almost ideal.*

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* The size of the two chambers may be shown, by freezing the eye,—a thin pellicle only, of ice, will be found between the lens and the iris.

When we take the LENS between our fingers, we shall find, that it is much denser in its centre, than in its circumference;—if we boil it, or put it into acid, we shall see this, still more distinctly. When it is boiled, it will have a laminated form,—and when pressed upon, in the centre, it will generally break into three portions. The VITREOUS HUMOUR will be found to be a viscid watery humour, contained in a transparent cellular membrane, which gives it the appearance of solid jelly. If we put this humour on a piece of card, and then make two or three holes in the bottom of the card, and, through them, puncture the membrane, the water will escape: then, with a little management, we may blow into the capsule, so as to distend and dry it.——The parts already described, are the principal points of the anatomy to be attended to; but if we can procure a very fresh *human eye*,—by making a simple section of it, at half an inch posterior to the cornea, we may discover, near the optic nerve, on the temporal side, the spot described by *Sommering*,—it has the appearance of a hole, with a yellow border surrounding it. But I believe this should rather be considered as a part of the retina, upon which the nervous matter is deficient, than a foramen. If we take the posterior half of the sclerotic, and look upon its inner surface, we shall see the entry of the optic nerve: if we rub the nervous matter off, we shall see a black hole, this is called the *porus opticus*,—however, it is only the part at which the arteria centralis retinæ enters. By squeezing the nerve from behind, we shall see the pulpy matter oozing at many points,—proving, that the nervous matter comes through several foramina, which form what is called the cribriform part of the sclerotic, *Lamina Cribrosa*.

In the fœtal eye, there are some peculiarities, which may be shown by injecting a fœtal calf; the *arteria centralis retinæ* will be seen passing through the centre of the nerve, and through the vitreous humour, to the back part of the capsule of the lens,—upon which, the vessels run in the form of a spider's web, whence the capsule is sometimes called *Tunica Aranea*. When the capsule is injected, the vessels of the iris will also be filled. Four distinct arteries pass to the iris; from the branches of which, vessels may be seen shooting across the pupil, in that membrane which is most perfect in the fœtus of seven months, and which is called MEMBRANA PUPILLARIS.

DISSECTION

OF

THE MUSCLES

AND

LACHRYMAL APPARATUS OF THE EYE.

The parts external to the ball of the eye, may be examined on the body in which the muscles of the face have been dissected.

By cutting off the orbicularis muscle, and a little cellular membrane which is under it, the cartilages of the eye-lids (TARSI) will be exposed. In doing this, we must not lay the upper cartilage quite bare, or we shall be in danger of cutting the tendon of the muscle which raises it,—LEVATOR PALPEBRÆ. By pulling the eye-lids towards the temple, the ligament which connects them to the superior maxillary bone, will be seen. In dissecting this ligament, we must keep close upon it, or we shall open the lachrymal sac. The external ligament by which the eye-lids are attached to the os malæ, may be shown, by pulling the lids towards the nose.—The names of EXTERNAL and INTERNAL CANTHUS, are given to these angles of union.

Between the union of the eye-lids on the nasal side, there is a little projection called CARUNCULA LACHRYMALIS.—It is a prolongation of a fold of this kind, which forms the *membrana nictitans* in some animals.

The eye-lids are lined by a vascular membrane, which, when the eye-lids are everted, will be seen to be continued over the anterior part of the eye, whence it is named CONJUNCTIVA, or ADNATA.

We may now examine the apparatus for the secretion of the tears, and for their passage into the nose.

If we pull down the upper eye-lid, and cut the cellular connection between it and the frontal bone, we shall discover the lachrymal gland. It will be found very difficult to inject the ducts by which the tears pass from this gland into the space between the eye-lids; but by a careful examination, we may find eight or ten, which open upon the inner surface of the upper eye-lid. When the eye-lids are closed, a little gutter is formed, which conveys the tears to the PUNCTA, which are small openings in each eye-lid, on little eminences at the nasal extremities of the cartilages. It is possible to pass bristles into these openings; and, by a little management, they may be so directed, as to pass into the sac which lies in the groove in the os unguis.

If this groove be cut upon, the LACHRYMAL SAC (in which the bristles should be seen) will be opened. It will be found lined with a mucous membrane, and so large, that it will admit a common probe, and which, when slightly curved, may be passed from the sac, into the *duct* which carries the tears into the nose.

There is still another secreting apparatus upon the cartilages: it is composed of a series of small glands, which are named, in compliment to the anatomist who first described them, *Meibomean*. When the eye-lids are everted, the glands will be seen in parallel rows, like a number of small ascarides, on the surface of the cartilages, and under the conjunctiva.—Each of them opens on the margin of the eye-lid, by a separate duct. It is the inflammation of one of these small glands, which causes the common disease called *Stye*.

In making the dissection of the eye-lids, we can easily understand the two common diseases, ectropion and entropion. In the worst case of ectropion, it is necessary to cut out a portion, and unite the edges of the incision, so as to make the lid shorter. In the entropion, an operation must be performed that will make the lid longer;—a simple snip through the lid, which will be filled up by granulation, will sometimes be sufficient for this. The necessity of great care in removing small tumours from the eye-lid, must be evident, when we examine the cartilages. I have seen a patient, on whom the operation of ectropian had been performed, by extracting the cartilage; the consequence was, that the eye was nearly destroyed by the constant pressure of the orbicularis muscle.

The muscles of the eye should now be dissected. We should cut through the eye-lids at their two points of union, and then separate the lower eye-lid from the ball of the eye, by dissecting the conjunctiva from its union to the ball ; — we may then cut off this eye-lid. We should separate the upper eye-lid in the same manner ; but we must not cut it away, as the levator palpebræ must yet be dissected.

It is difficult to dissect all the muscles without cutting part of the frontal and malar bones ; but if we are desirous of preserving the scull, we must do as well as we can in the narrow space. To make a fine display of the muscles (if the scull has not been opened), we should cut through the ascending orbital process of the os malæ, to the depth of an inch, in a line with the floor of the orbit, and then cut the external angular process of the frontal bone, commencing in the superciliary ridge, and carrying the cut down, so as to meet that on the os malæ.

If the scull-cap has been removed, the dissection may be made still more easy by cutting away the roof of the orbit : but in doing this, we must not come upon the foramen,—nor nearer to the internal angular process, than the superciliary hole : for if we break up the optic foramen, we shall destroy the origin of the muscles ; and if we cut down the internal angular process, we shall cut through the pully of the trochlearis.

The first muscle to be dissected, is the only one which does not arise from the foramen opticum,—the OBLIQUUS INFERIOR, OF EXTERNUS. To stretch its fibres, we should pull the ball of the eye towards the temple,—for this muscle arises from the bone, above the inferior orbital foramen, and is inserted into the outer part of the ball of the eye.

Before dissecting the muscles which pass from the foramen opticum to the ball of the eye, we should pull down the remaining part of the upper eye-lid, and dissect the muscle which lies immediately under the roof of the orbit, viz. the LEVATOR PALPEBRÆ. Having dissected this, the eye-lid and muscle should be removed.

The whole of the dissection now consists in removing the loose fat which is between the muscles. We shall find the SUPERIOR OBLIQUE, OR TROCHLEARIS, lying upon the os planum : its tendon, after running through a small ligamentous and cartilaginous band (which is attached to the lower part of the internal angular process), passes backwards, below the rectus superior, and is inserted into the ball of the eye, about its middle and upper part.

There are no particular directions necessary, to enable the student to dissect the four recti muscles ; for they run direct, from around the foramen opticum, to the ball of the eye,—their combined tendons forming, on the anterior part of the ball, an expansion of tendinous membrane, which is described as a coat, common to the ball of the eye and to the muscles;—it is called the TUNICA ALBUGINEA.

The muscles of the eye may easily be recollected, for there are only seven in all; of which six belong to the ball of the eye, and one belongs to the upper eye-lid. The muscle of the eye-lid is called LEVATOR PALPEBRÆ SUPERIORIS.—It arises from the upper edge of the foramen opticum, and is inserted into the cartilage of the eye-lid. The six muscles are divided into the FOUR RECTI and the TWO OBLIQUE. The four recti are distinguished from each other, by the terms LEVATOR, DEPRESSOR, ABDUCTOR, and ADDUCTOR: while the two oblique are named,—the one, EXTERNAL, or INFERIOR; the other, INTERNAL, or SUPERIOR; or, from its passing through the pully, TROCHLEARIS.

All the four recti arise from around the foramen opticum, and are inserted into the sclerotic, at nearly equal distances from the cornea. The internal oblique also arises from the edge of the foramen opticum;—its course and its insertion have already been described.

The external oblique cannot be forgotten, as it is the only muscle, which arises from the outer edge of the orbit.

The dissection of the nerves of the orbit, has already been described at page 255.

The dissection of the arteries may be made at the same time that those of the brain are examined; and as the dissection consists in merely following them from trunk to branch, I shall give only a *Table* of them.—

OPHTHALMICA CEREBRALIS. Passing into the orbit, by the foramen opticum, gives these branches:—1. To the dura mater and sinus; 2. lachrymalis, which goes to the gland, after giving many branches to the periosteum, optic nerve, &c.; 3. ciliares: three or four arteries, dignified with the distinction of *inferiores, anteriores, breves, longiores;* 4. supra orbitalis; 5. centralis retinæ; 6. æthmoidales; 7. palbebrales; 8. nasalis; 9. frontalis.

METHOD OF MAKING CERTAIN PREPARATIONS OF THE EYE.

It will be very useful to preserve some human eyes, to show the relative situation of the parts: for this purpose, the eyes must be very fresh.

A student will find it difficult to imitate some of the preparations which are preserved in anatomical museums; but any one may make such dissections, as will give a general idea of the anatomy of the parts, and be of use in planning operations on the eye. If we remove all the muscles, &c. from the eye-ball, and cut off about one-third of the cornea, and then insinuate the blade of the scissars between the ciliary ligament and the sclerotic, that we may cut off about a third of the sclerotic, the choroid, and its connection with the iris, will be shown: this forms a very good preparation. Another eye may be prepared, so far in the same manner;—it is to be completed, by cutting away the portion of the choroid corresponding to the sclerotic, so as to expose the retina; but in attempting to do this, we shall often be foiled. A third preparation may be made, nearly in the same manner; but in it, we should remove the retina.

This last preparation will be very useful; for not only will *one half of the cornea*,—the *size of the anterior chamber*,—*the ligamentum ciliare*,—the *iris*,—and the *pupil*, be shown, but also the *situation* of the *lens* and *ciliary processes*, and the *vitreous humour*, will all be distinctly seen. As soon as such a dissection is made, the eye should be put into proof spirit. By this, however, both the lens and the capsule of the vitreous humour, will be made opaque.

The view of the parts in this section, will prove, that occulists who say they have put the cataract into the posterior chamber, must be ignorant of anatomy.—The proper place for the introduction of the needle, in couching, so as to avoid the ciliary processes, will be evident. In considering the subject of couching, there is a point of great importance, which may be understood in the dissection of even a sheep's eye; viz. the possibility of the lens and vitreous humour being both turned round in the attempt to couch. When this happens, total blindness may be the consequence, as the nervous matter of the retina may be destroyed by the displacement of the vitreous humour.

SURGICAL DISSECTION

OF

THE NECK AND HEAD.

There are so many important questions connected with the Surgical Anatomy of the neck and head, that it would be impossible for me to enter fully into any one;—all that the limits of a book of this kind will permit, is, to make such remarks, as will rouse the student's attention to the importance of the subject.

I shall suppose that the student has made himself master of all the muscles, arteries, nerves, &c. and that he is now about to make a dissection of the neck, as a part upon which he may be called on to operate, or to give an opinion as to the nature and connections of a tumour.—The vessels should not be injected.*

Previous to beginning the dissection, the student should mark all the prominent points with ink;—he should then vary the position of the head and neck, and compare the changes which take place in the points which he has marked. In examining the neck, he should not only note the appearance, but also the *feel* of the parts.—It is a good exercise to examine one's own neck in this manner, before a looking-glass.

It is not now necessary to give any rules for the dissection of each part. As soon as we raise the skin, we shall observe, that there is no fascia under it, as in the limbs, but a thin muscle (the platysma): we shall naturally pause,

* Perhaps it may be advantageous to inject the arteries with a strong solution of glue, coloured with vermilion: in this case, but a very small quantity should be thrown in, as the injection easily passes into the veins.

and consider, whether we can assign any reason for this difference. But the important question will be,—of what consequence is the recollection of this muscle, in operations on the neck?—If it be forgotten, even in the simple operation of opening the external jugular vein, the surgeon may be foiled; for as the vein is under the muscle, the fibres will close, and prevent the flow of blood, if the incision be not made obliquely. Those who have once dissected a tumour from under this muscle, will never forget the strength of these fibres in the living body, though they appear so trifling on the dead subject. We can now understand, why tumours of the neck, when they are enlarged, are pushed inwards; and that they may be larger, than what a superficial examination would lead us to suppose.

If the body be thin and anasarcous,—instead of the fibres of the platysma being distinct and connected, they will appear scattered; and the cellular membrane between, and under them, will have the form of a fascia.—It is this appearance, which has led some surgeons to attach more importance to what they call the fascia of the neck, than to the platysma. Yet I must admit, that though the cellular membrane will not resemble *fascia*, in a body where the muscles, &c. are plump,—still, it will generally be so thickened, in consequence of the pressure of a tumour, that it will, in certain cases, be almost as strong as a distinct fascia: it is important to recollect this, in performing operations on tumours of the neck.

The branches of nerves which are seen when the integuments only, are taken off, are not of much importance in a surgical view.

The dissection of the skin should now be carried up to a line drawn from the tube of the ear to the nose. We shall then see, that there are no muscular fibres on the parotid, but that it is covered by a dense layer of fascia. This fascia will in some degree account for the violent pain which attends cynanche parotidea; for not only will the nerves be compressed by the fascia, but it will also form a natural obstacle to the free exit of matter.—I have seen a patient actually delirious from the pain he suffered from inflammation of the parotid. Under this fascia, several branches of the portio dura will be seen: these must not be forgotten; because, in the very simple operation of taking out a small tumour from this part of the face, we may, by cutting these nerves, cause a degree of distortion in the lips of the patient.—The risk of producing a certain degree of paralysis, ought to be explained to the patient, before we commence any operation on this part.

We should now raise the platysma, by cutting it through in the middle, and then dissecting one portion towards the clavicle, and the other to the base of the jaw. We shall now have exposed the sterno cleido mastoideus, and the superficial muscles which are connected with the larynx. There is much to study in this view. The first question that will strike us, is, where ought the operation of laryngotomy to be performed?—The nature of the case will have much influence on our decision: but looking to the parts, as they now appear, we should decidedly fix upon the space between the thyroid and cricoid cartilages, because it is the most superficial, and there are very few vessels upon it;—but we ought to know, that a portion of the thyroid gland very often crosses this part, to pass up to the os hyoides. If the case be such, that we cannot operate at this point (but luckily, this does not occur once in ten times), then the operation must be performed lower down. This will be very difficult; for we must not only go below the thyroid gland, but to a great depth between the muscles, to reach the trachea. However, this is not all the difficulty;—if we put our finger upon our own larynx, and then breathe, as a patient does, who is suffocating, we shall be able to form some idea of the tension of the muscles, of the distended state of the small veins, and of the frequent change in the position of the larynx.—We must not, at the same time, forget, that the patient must be sitting almost upright. These considerations will give us some notion of the difficulty of performing the operation of tracheotomy.

The histories of the operations on the larynx, are most important; because, by them only, can we judge of the difficulties. Some excellent cases and remarks will be found in Mr. Charles Bell's Surgical Observations, and in the Medico Chirurgical Transactions. There is also a case related by Dr. Johnson in the Medico Chirurgical Journal, which is highly descriptive of what really takes place during the operation of laryngotomy.—This case is also remarkable, as the patient was still, at the end of three years, obliged, and *able*, to wear a tube in the larynx.

If we should be called upon to perform an operation, to relieve a child which has sucked a pebble or pea into the larynx,—the space between the two cartilages will probably be the most proper part in which to open the larynx. I have dissected a child whose death was occasioned by a pebble sticking exactly opposite to this part:—had assistance been brought sufficiently early, the child might have been saved by a cut with the lancet.

The success attending a case which is related by M. Chevalier, would induce us to open the larynx at this part, when a child is dying of croup.

We may now consider the Surgery of the Arteries.

We now know that if we were to turn up the edge of the sterno cleido mastoideus, that we should come upon the sheath of the carotid artery; but before we expose it, we should think of all the diseases and accidents to which the artery is liable.

The cases already recorded of aneurism of the carotid artery, prove, that it generally takes place at the bifurcation. Seeing the proximity of this, to the sensible part of the larynx, we can understand how the aneurismal tumour may be pressed in upon it, by the platysma, and thus produce irritable cough, and symptoms referable to pressure on the nerves of the larynx. This irritation has been the cause of the death of some patients, upon whom, even the operation of tying the carotid was performed; but this is no reason against the operation; on the contrary, it is a motive for its early performance, and before the tumour is much enlarged.

Before an operation is decided on, we should carefully weigh all the circumstances of the case. It is important to recollect, that a small tumour situated over the artery, so as to be moved at each pulsation, has been occasionally mistaken for aneurism. I have not only heard of such instances, but I have even been consulted in a case of enlargement of one lobe of the thyroid gland, for which the patient was sent a journey of forty miles, that the carotid artery might be tied, to cure the supposed aneurism.

The question will force itself upon us, Where is the artery to be tied? If the aneurismal tumour be lower down than the bifurcation of the carotid, then it will be very difficult to decide, and probably the operation will be unsuccessful, as we must either come too close on the tumour, or too near the origin of the carotid; however, if we may judge from the cases already recorded, the tumour will generally be formed at the bifurcation,—and when it is so, the most advisable point to tie the carotid, will be, where it is crossed by the omo hyoideus.

When the edge of the sterno cleido mastoideus is raised in a strong man, neither the artery, vein, nerve, nor even the sheath of the vessels will be seen, but only the omo hyoideus, covered with a broad and smooth membrane.

If we mark the lower edge of this muscle, and cut the membranous expansion, and then draw the muscle towards the ear, we shall expose the sterno thyroideus, and the general sheath of the vessels and nerve.* If we open the sheath, by scratching upon it close to the edge of the sterno thyroideus, we shall then open only that division of it, which contains the artery ; so that neither the jugular vein nor the par vagum will be exposed, nor will the recurrent nerve be endangered; but if we draw the omo hyoideus towards the trachea, then we shall be obliged to cut upon the middle of the sheath, by which we shall come on the great vein and nerve, and perhaps on branches of the superior thyroid artery, which will make it more difficult to tie the carotid neatly. It will now be evident, that the great vein will be less endangered if the ligature be introduced between the vein and artery.—It need hardly be mentioned, that the sympathetic nerve lies close on the spine, and quite separated from the general sheath of the vessels.

In making this dissection, we must not forget that the head is lying in a very different position from that of a patient on whom an operation is to be performed. As the patient will probably be sitting, with his head reclining on a pillow, we ought to elevate the neck of the subject into that position.——The manner in which the artery is here advised to be tied, is nearly the same as that which is given, in the Illustrations of the Grand Operations of Surgery, by Mr. Charles Bell. It differs considerably from the manner of operating recommended by Mr. Cooper, and by several other Surgeons. But before such a serious operation is performed, I would recommend the operator to read every thing that has been written on the question, and to compare the several modes proposed. Many interesting cases will be found in the Medico-Chirurgical Transactions, related by Mr. Cooper, Mr. Dalrymple, Mr. Vincent, and Mr. Coates; and also many excellent remarks on the principle of the operation, in the Illustrations of Surgery, by Mr. Bell.

At the place just pointed out, the artery may be cut down upon, so as to be compressed between the finger and thumb, or tied, when a very severe operation is to be performed below the angle of the jaw.

It is hardly necessary to consider how the carotid should

* Some branches of the descendens noni, will be seen upon the sheath and the muscle.

be tied, when cut by the suicide; for when it is opened by a large incision, the patient will probably be dead before the surgeon is brought to him; but still, such a question may offer. Mr. John Bell tied it in one case, with success; but the circumstances were peculiar, for the unfortunate person was so cool, and so determined to commit suicide, that after having read the description of the artery, in Mr. Bell's Work on Anatomy, he stood before a mirror, and calculated the situation of the carotid so nicely, as to pierce it with a pen-knife; but in consequence of the small size of the external orifice, the hæmorrhage was not very great,—the external wound closed, and an aneurism formed, for which, Mr. Bell performed the common operation.

The necessity of making ourselves intimately acquainted with the bearings of this artery, was strongly impressed upon me, some years ago, by a surgeon relating a case to me, where, after a stab in the neck, there was repeated hæmorrhage: on saying to him, Why did you not tie the carotid? with a most significant shake of his head, he replied, "Catch me at the carotid!" But the times are now altered; for, that it is not *now* considered a difficult operation to tie this artery, is proved, by some surgeons having even tried the experiment of tying it for head-ache, and for tumours, &c.: but it is to be hoped, that even the great ease with which the artery may be found, will not induce us to repeat any of those experiments.

We may now prosecute the dissection towards the angle of the jaw, and consider the manner of securing the vessels, when cut at the root of the tongue, by the suicide.

We see that the larynx and the sterno cleido mastoideus protect the carotid, and that the branches most exposed, are those of the lingual and facial arteries. The cornu of the os hyoides should be carefully marked; for this is the part which we should feel for, as a guide, by which we shall easily find the lingual and facial arteries. The vessels will generally be easily secured in the wound made by the suicide; for, there will be a large open incision, and before we are brought to him, the quantity of blood lost, will have diminished the arterial force. In some cases, it may be difficult to tie the arteries neatly.—I have been obliged, in secondary hæmorrhage under the tongue, to pass a needle and thread coarsely round a bleeding surface. This was against all rule; but I was forced to do it,—because the state of the parts was such, that I could not discover the bleeding vessel,—and as the source of the hæmorrhage was exactly in the middle of the throat, I was afraid, that if I tied one carotid, I should be obliged to tie the other also; and that, even if I tied the carotid from which the vessel arose, there would still, from the anastomosing vessels, be bleeding sufficient to destroy a patient who had already, for the second time in six days, lost two pounds of arterial blood. The patient did well.

We have now brought the dissection up to the angle of the jaw; and here comes the very important question of extirpation of tumours.

In dissecting up the platysma, we exposed parts of the submaxillary, and parotid glands; under the margin of the submaxillary, and sometimes within its substance, we shall find a small lymphatic gland,—when this becomes diseased, and grows large and hard, it presses up the submaxillary gland, so as to give it the appearance of being affected; and thus we have narratives of the extirpation of the submaxillary, when, most probably, the disease has been only in the lymphatic gland; for the salivary glands are very seldom scirrhous. The dissection will show, that an encysted tumour may sometimes be taken out, without much hæmorrhage.—In such a case, we should first mark the situation of the facial artery and vein, and, avoiding them, make an incision on the edge of the submaxillary gland, so that we may lift up its edge, and scoop out the tumour; but if it be very hard, and adhering to the gland, then we may have considerable bleeding, but not necessarily dangerous; for it will probably be from the facial, or lingual artery,—and either of these arteries may be tied, the cornu of the os hyoides being the principal guide; for the lingual artery lies above it, and the facial a little higher. We must not forget that the lingual nerve is situated between these vessels.

These remarks upon the liability of a scirrhous lymphatic being mistaken for disease of the salivary gland, apply more forcibly to the tumours which are connected with the parotid. Every student who examines the anatomy of the parotid gland, and, particularly when it is injected with quicksilver, will suspect that the histories of operations, in which a diseased parotid is said to have been wholly extirpated, are erroneous. The external carotid artery passes through the substance of the gland,—but this is no objection to the accuracy of the report; for it may be tied both above and below; but, is there no danger of cutting the internal carotid, or the internal jugular, or the par vagum, in the attempt to extirpate those parts of the gland which are situated so deep as the space between the occiput and atlas? These considerations induce me to believe, that we cannot *extirpate* the parotid gland.

It is frequently necessary to cut off a portion of the parotid, when a scirrhous tumour is imbedded in it: in these operations, the blood issues as from a sponge, so that it is very difficult to find all the vessels; but in the greater number of cases, the graduated compress will restrain the bleeding from the smaller arteries. If we must tie the external carotid, previous to such an operation, we may proceed thus:—If we cut through the skin, from the lobe of the ear, towards the cornu of the os hyoides, and then dissect through the platysma myoides, we shall come upon the digastric; and if we then dissect along the upper edge of this muscle, we shall expose the stylo hyoideus,—by forcing this last muscle downwards, we shall find the continued trunk of the external carotid.

In extirpating tumours from this part, we must cut across many branches of the portio dura,* which will cause partial paralysis of the face.

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* Since the use of the portio dura has been illustrated by the facts of comparative anatomy, and by various experiments instituted by Mr. Bell, we have been able to explain many symptoms of disease, which have hitherto puzzled surgeons.

That I may direct the student's attention more particularly to this subject, I shall mention one or two cases, which are illustrative of the consequence of an injury to this nerve.—In a case of cynanche parotidea, where suppuration took place, every muscle to which the portio dura went, was paralyzed in the act of respiration, or expression; but the same muscles were still efficient in the act of mastication: thus, when the patient attempted to whistle, or when he was made to sneeze, the muscles of only one side acted, but when he chewed his food, the muscles of both sides were in full action. This paralysis continued for a considerable time after the sinuses were healed; I then lost sight of the patient.

A slight degree of paralysis of one side of the face, is often seen in young people.—Such cases we have generally been able to trace to an inflamed gland, below the ear. I was lately consulted in a very interesting case, nearly of a similar nature. A young lady, had, for several years, a distinct twist of one side of her mouth, particularly when she smiled; but of late, she has had an affection of her eyelid. As she was under the care of a gentleman who was acquainted with the experiments which we had been making in Windmill-street, the cause of the twist of the mouth, was, by him, correctly referred to a severe attack of inflammation, which the lady had had, some years

The dissection of the duct of the parotid should now be made, and its situation accurately marked, that we may

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ago; but as he found it difficult to understand why the eye should be also *now* affected, he begged that I would see the patient with him.

On noticing the action of the muscles, which I did while the lady was sitting at luncheon, I observed that no *action* was deficient while she was eating, but that there was a distinct paralysis when she smiled, or laughed; however, I was a little puzzled, to see the muscles of the mouth so distinctly affected, and not those of the eye; because I had found in all the experiments, in which the portio dura was cut, and in the cases where the paralysis had been produced by an inflamed gland under the ear, that both the muscles of the eye and of the mouth were affected at the same moment. But on farther inquiry, the cause of the difference in this case, was explained; for I found, that the inflammation which had been the original source of the injury to the nerve, was confined to the space above the molar teeth, so that the branches of the nerve which go to the muscles round the eye, were not included in the disease. The twitching of the eye-lid, was quite different from that of the muscles of the mouth. It was only that slight spasmodic affection, which is so common in hysterical girls, and would not have been noticed, had it not been supposed to have some connection with the state of the mouth. This young lady told me, that, to a certain degree, she could command the action of the muscles; but, that she found it impossible to overcome it, on her entry into a room where she was obliged to accost strangers.

There are certain tumours under the ear, which are of so dangerous a nature, that it is necessary to remove them, without taking into account the paralysis consequent upon cutting the branches of the portio dura; still, there may be cases, where the patient will not thank the surgeon for ridding him of a trifling tumour, at the expense of having, ever after, a ludicrous twist of the face.

Very lately, a gentleman wished me to cut out a small harmless tumour, which was situated immediately upon the branch of the nerve which goes to the side of the mouth. But on putting the question to him, whether he would run the risk of having the side of his mouth paralyzed, or retain the small tumour, which might almost be concealed by his whisker,—he chose to submit to the disfigurement produced by the tumour, as probably the lesser of the two.

The ridiculous effect which is produced on the expression of a monkey, by cutting its portio dura, would almost induce one to recommend the operation to some of our comedians,—particularly after the extraordinary success of one actor, who, from the peculiar twist of his mouth and eye, appears to have a paralysis of the portio dura of one side.

I think it is hardly possible for surgeons, now, to propose to cut the branches of the Vth or the VIIth, indiscriminately, for the disease called *Tic Douloureux.*——There is reason to believe, that the disease is seldom or ever in the portio dura,—and the question of the propriety of cutting the Vth, is very doubtful.

avoid it during operations on the face. We shall find that a line, drawn from the middle of the tube of the ear, to the opening of the nostril, will generally be immediately over the duct; but though we may mark its situation pretty accurately, we shall proceed with less dread in removing a tumour that is situated near it, if, instead of trusting to our recollection of the situation of the duct, we pass a fistula lachrymalis probe into it:—this may be easily done by everting the cheek; for the opening of the duct will be found opposite to the second molaris.

The bleeding, in most operations on the face, will be commanded by the assistant pressing on the facial artery, where it passes over the jaw. After the removal of a tumour, the vessel may be secured by the twisted suture, which will, at the same time, hold the lips of the wound together. In this view, we shall see the danger of opening the temporal artery very low on the head.

We should now return to the examination of the lower part of the neck.

Before we divide the sterno cleido mastoideus, we should calculate the place that it may be necessary to cut this muscle, for the disease of wry neck. But this disease is generally either in the sternal or clavicular portion only. By now laying the lower half of this muscle on the chest, and by detaching the sterno hyoideus and thyroideus muscles, we shall expose the thyroid gland.* If we make a slight cut into the gland, we shall form an idea of its vascularity, and consequently of the troublesome hæmorrhage which may ensue from its being wounded. I have, by injecting the carotids of a suicide, after death, proved that the wounding of the gland, even without opening the trunks of the arteries which pass to it, is sufficient to cause a fatal hæmorrhage. This should make us suspect, that there may be some danger in passing setons through the gland, especially as the trunk of the carotid has been found in it.

When the four arteries of the thyroid are dissected, and their connections with the sympathetic and par vagum are displayed, we shall be convinced, that the surgeon who at-

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* In this dissection, the anatomy of the salivary glands should be attended to. The duct of the submaxillary gland of each side, will be found by the side of the frenum linguæ.—Those of the sublingual glands, open in rows on each side of the tongue. The situation of the duct of the parotid, has been already pointed out. Each of the glands, which are called *buccales,—labiales,* &c. opens by distinct ducts on the inside of the cheeks and lips.

tempts to extirpate this gland, must be a bold one. But the greatest objection to attempting such an operation, is, that the gland is seldom in such a state as to require removal, without the larynx being also involved in the disease.

The deep dissection may be continued up to the space behind the jaw, and then we shall discover a portion of fascia which runs from the angle of the jaw towards the styloid process and the os hyoides. This may encumber us much, in extirpating tumours from this part. We should now particularly mark the situation and appearance of the stylo hyoideus muscle, as it is a boundary,—beyond which, we should carry a scalpel with great hesitation. When we extirpate tumours that are under this muscle, the operation should rather be, by scooping, and tearing with the handle of the knife, than by cutting with a sharp blade.

We may now cut across the masseter muscle, and saw through the jaw, near the mental foramen, and remove one side of it. We shall then see the nerve enter into the jaw; which will explain the reason of the violent pain that is sometimes felt after fracture of the jaw, or where we attempt to pull away a piece of carious bone. We shall also see the artery entering into the foramen; this is sometimes torn in pulling the last tooth, and it then bleeds violently.*

After the mouth has been thoroughly cleansed, the ranina artery, by the side of the frenum, may be exposed.—This is the vessel which has been cut in those children who have died of bleeding in consequence of dividing the frenum linguæ. We are sometimes obliged, even against our judgment, to perform this operation.—I have always done it safely, while the child was crying; for then the mouth is wide open, and the tongue is turned up: it is only necessary to make such a scratch as will draw blood,—for that will satisfy the mother.

By the side of the frenum, we shall find the ducts of the submaxillary gland: to these we should look, when there

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* We have been told, on good authority, that patients have even died in consequence of this. An anecdote was related to me by an Irish surgeon, which may afford a useful hint:—During the time that several surgeons were consulting on the propriety of tying the carotid! for hæmorrhage from this artery, one of the students asked the patient for the tooth which had been extracted; he then very coolly pushed it into its place again,—and there was no more hæmorrhage.

is a swelling of the gland; for they are sometimes obstructed by a small calculus.

If we could trace the lymphatics which pass from the parts within the mouth, we might be able to detect the source of many of the swellings in the neck, as easily as we do those of a bubo in the groin: in the one case, a sore on the penis is generally the cause of the tumour,—and in the other, an ulcer on the gum, or a spoiled tooth.

We should now examine the natural state of the tonsil.—We shall very often find that its appearance resembles ulceration. It is highly important to recollect, that, in consequence of a little irritation, such as that produced by taking mercury, the ducts of this salivary gland will have so much resemblance to an ulcerated surface, that they may be mistaken for venereal ulcers. I have known several patients put upon a second, and severer course of mercury, in consequence of the surgeon not having been aware of this fact.

As we may sometimes be called upon to scarify the enlarged tonsil, we should recollect that a small artery passes into it: the wounding of this, however, would perhaps do good; but such a case has happened, as the wounding of the internal carotid, in this operation.—The artery will be found very close to the gland.

We should now examine the pharynx and larynx.

Before making a lateral view of the pharynx, we should introduce a probang into the œsophagus. In doing this, we shall see how much danger there will be of passing it into the larynx, if, in the introduction of it, we pull out the tongue.

We should now cut through one side of the pharynx.—An accurate knowledge of the natural form of the pharynx, and of the beginning of the œsophagus, is even more important to the surgeon, than a knowledge of the anatomy of the urethra; because, persons of a particular constitution, have very frequently symptoms, which might lead a surgeon to suspect that they arose from stricture in the œsophagus.

If with this suspicion, a surgeon who has not an accurate knowledge of the structure of the part, introduces a bougie, he will probably be led into the idea, that there is stricture, by the very sudden narrowing of the tube opposite to the cricoid cartilage, and particularly if there should be at the same time a spasmodic affection of the parts, which is very common, in consequence of an attempt to pass a bougie.

If he now perseveres in the use of instruments, to cure the supposed stricture, he may produce such a state of the parts as will most certainly be followed by a stricture, which is generally the cause of a horrible and lingering death. This subject should be studied by reading all the best authors who have written on it.

The question of œsophagotomy may now be considered. The appearance of the natural parts will prove, that this is one of those operations in which there will be more difficulty in deciding upon the propriety, than on the manner, of performing it.

I have once assisted in opening the œsophagus, to relieve a stricture by which the patient would have been destroyed in two or three days:—though the case terminated fatally, I saw no reason for being afraid to repeat the operation, should a patient offer, whose stricture has become so narrow as to make death, from starvation, inevitable.

If we make a section of the scull, such as is described at page 262, we may understand how a tube may be passed from the nose into the larynx;—how a polypus hanging down from the posterior nostril, may produce suffocation;—how it may be possible to restrain a violent hæmorrhage from the nose, by plugging up the posterior nostrils.

We may now understand how much the ethmoid bone, and even the brain, may be endangered by the forcible extraction of polypi.—The principles upon which the different operations of fistula lachrymalis are to be performed, may be seen. We shall also be able to determine upon the most favourable position of the head, in cases where there is a collection of matter in the antrum;—and by pulling the second molaris, we shall see that a free exit might be given to matter collected in that cavity.

We may perform the operation of trephine upon the subject, with much advantage; for we may make examples of the various fractures which require operation, and at the same time see the greater number of difficulties which may occur during the operation on a patient.

If we allow the head to fall on the ground, we shall probably produce *simple fracture*, with extensive fissure; if we strike it a smart blow with a hammer, we shall perhaps produce a *stellated fracture*;—in such a case as this, we may, with small levers and forceps, pick away the pieces of bone, without using the trephine. When the scull is struck with a sharp point, though there will be only a depression or hole in the external tables, yet there will probably be an extensive fracture of the tabula vitrea;—this, it is evident, will require a large trephine. If the head be allowed to fall on the vertex,--or if it be struck with a heavy body, as when a brick-bat falls from a building on the top of the head,—we may find that the fracture has taken place at one, or both, of the temples.

In performing the operation, we should pay particular attention to the various degrees of thickness in the different parts of the scull. In a rickety person, we may expect that, at certain points, the scull will be very thick.—— As we shall find that, in the greater number of sculls, there are no marks by which we can be guided in judging of the thickness,—we shall be satisfied of the justness of the rule, that, the operation of trephine should always be very cautiously performed.

There are certain points, which a dissector, who had not seen much practice in surgery, would be afraid to set his trephine upon,—as, for example, in the course of the longitudinal sinus; but experience shows, that there is no danger in opening the scull here. The manner in which the meningea media frequently runs in the substance of the bone, will prove to us, that, in the greater number of cases where the trephine is applied over its course, it must be cut; but this should not alarm us,—for when the artery is cut, the bleeding can be easily stopped.

The practical surgeon will agree with the dissector, in considering it very difficult to apply the trephine over the frontal sinuses, or in the line of the spine of the os frontis.—When the external table of the frontal sinus is removed, we can understand how the membrane lining it, has, in some operations, been mistaken for the dura mater.

By striking the scull smartly with a mallet, the dura mater will be detached from the bone, at the part struck: if the head be afterwards injected with size, a coagulum will be found at this part. This experiment would lead us to doubt the accuracy of Mr. Abernethy's explanation of the cause of effusion of blood between the dura mater and the bone.

While the student has these parts before him, he should read the Works of Pott, John Bell, and Abernethy, and of Charles Bell;—in the Fourth Number of the Surgical Observations, by Charles Bell, he will find many remarks applicable to the question of the varieties of fracture.

DISSECTION

OF

THE ARM,

AFTER IT IS SEPARATED FROM THE BODY.

The dissection of the muscles by which the arm is attached to the body, is described at pages 181 and 210.

The first muscles to be dissected, are those surrounding the shoulder joint.* A *block* should be put under the joint, so as to make the fibres of the principal muscle,—the DELTOID, tense. We shall find that the cellular membrane and fat pass to such a depth between the fibres of this muscle, that the knife must be set on very boldly, before we can make it appear clean. After the origins and insertion of the muscle have been shown, the tendinous fascia by which it is connected to the base of the scapula, is to be dissected up, so as to expose the muscles which are *below* the spine of the scapula. This mass appears at first to be formed by one muscle only; but by looking near to the lower costa of the scapula, a line of division will be seen in it, which separates the TERES MINOR from the INFRA SPINATUS,—both of which may be traced to the great tubercle on the head of the humerus. On the lower edge of the teres minor, a distinct and large muscle, viz. the TERES MAJOR, will be seen running, from the inferior angle of the scapula, to the humerus, to be inserted along with the latissimus dorsi.

The origins of the deltoid, from the clavicle, acromion, and spine of the scapula, must now be raised.—A small part of the muscle may be left attached to the humerus.

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* In the first dissection, every thing is to be cut away, except the muscles.

A set of fibres will now be seen, occupying the space which is above the spine of the scapula,* and which pass under the acromion, to the great tubercle on the head of the humerus: these form the SUPRA SPINATUS muscle. At the edge of the notch, we may observe the origin of the small muscle which passes to the neck, viz. the *omo hyoideus*.

We may now turn to the lower surface of the scapula. The loose portion, which will probably appear ragged and slightly putrid, is a part of the serratus major anticus: when this, with the cellular membrane which is below it, is dissected off towards the base of the scapula, the SUBSCAPULARIS will be exposed. This muscle will be found to occupy all the concave surface of the scapula, and to be inserted into the lesser tubercle of the humerus.

We may now pass to the dissection of the muscles which lie on the humerus. The first muscle to be dissected on the fore part, is, the CORACO BRACHIALIS; the fibres of which, run, in a straight line, from the coracoid process to the inside of the humerus. In exposing the fibres of this muscle, those of the *short head* of the biceps will also be shown. The belly of the BICEPS is covered by a thin fascia, which is to be raised, by cutting in the direction of the fibres.—When near the bend of the arm, we must be careful not to cut through the band of fascia which passes off from the edge of the biceps; for this is an attachment which the muscle has with the fascia that covers those of the fore arm. The insertion of the biceps into the tubercle of the radius, cannot be shown until the muscles of the fore arm are dissected; nor should we, at present, cut the capsular ligament of the shoulder joint, to expose the origin of the *long head* of the biceps from the glenoid cavity.

The BRACHIALIS INTERNUS may be seen under the biceps. As the fibres of this muscle run nearly parallel to the bone, there can be no difficulty in showing them in their whole extent, from their origin on the humerus to their insertion into the coronoid process of the ulna.

The large mass of muscle which is on the back part of the arm, forms the TRICEPS EXTENSOR: it is merely necessary to look to the direction of the fibres of the three different heads, to enable us to dissect them down to their union and insertion into the olecranon; but in dissecting

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* Perhaps a part of the trapezius may still be attached to the clavicle and spine of the scapula;—this should be removed.

the lower part of this muscle, we must not confound it with the ANCONEUS, which passes from the external condyle to the ulna.

Before dissecting the muscles of the fore arm, the fascia which binds them together, should be exposed: this is most easily done, by commencing the dissection at the outer part of the arm, and carrying it towards the inner.—The dissection should be continued to the wrist; and then the several muscles which compose the first layer, may be seen through the transparent fascia. The only rule necessary to be recollected in the dissection of these muscles, is, to remove the cellular membrane in the direction of the fibres.—For their arrangement, and their origins and insertions, see page 301.

The muscles of the hand are rather difficult to dissect, in consequence of their connection with the palmar aponeurosis. This fascia ought to be exposed, before we begin to dissect the muscles.—The incision should be made in the middle of the hand, from the annular ligament to the middle finger.—The skin is to be carried towards the thumb, and towards the ulnar side of the hand. But in cutting in the last direction, we must take care that we do not dissect off the little muscle, PALMARIS BREVIS, which is attached to the skin for about an inch below the pisiform bone: indeed this muscle should be exposed before the fascia is dissected.

CLASSIFICATION OF THE MUSCLES OF THE ARM.

It is hardly possible to arrange the muscles moving the humerus, into classes which shall have each a distinct action to perform,—in consequence of the motions of the humerus, on the scapula, being so varied. Perhaps the following enumeration will assist the student in recollecting them :—

The muscles which are inserted into the upper part, must raise the arm ; thus the *supra spinatus*, *infra spinatus*, and *teres minor*, being inserted into the great tubercle, are of this class : so is the *deltoides*, which is also inserted into the upper part of the arm,—but farther from the head.

There is only one muscle inserted into the lesser tubercle,—the *subscapularis*, and which must pull the arm backwards and downwards.

Two muscles are inserted into the outer edge of the bicipital groove,—the *pectoralis major* and *coraco brachialis;* and these must pull the arm inwards and forwards.

The two muscles which are inserted into the outer part of the bicipital groove, will pull the arm backwards;—viz. the *latissimus dorsi* and *teres major*.

TABLE OF THE ORIGINS AND INSERTIONS OF THE MUSCLES MOVING THE HUMERUS.*

MUSCLES OF THE SHOULDER LYING ON THE SCAPULA

SUBSCAPULARIS. OR. 1. All the base and hollow of the scapula internally. 2. Its superior and inferior costæ.

IN. The upper part of the internal or lesser protuberance on the head of the humerus.

SUPRA SPINATUS. OR. 1. From all that part of the base of the scapula which is above its spine. 2. From the spine and superior costa. 3. From the fascia of the scapula.

IN. The part of the larger protuberance on the head of the os humeri that is next the groove.

INFRA SPINATUS. OR. 1. All that part of the base of the scapula which is between its spine and inferior angle. 2. The spine, as far as the cervix of the scapula. 3. The fascia of the scapula.

IN. The upper and middle part of the large protuberance on the head of the os humeri.

TERES MINOR. OR. From the inferior costa of the scapula, extending from the neck to an inch and a half from the inferior angle.

IN. The back part of the large protuberance on the head of the os humeri.

TERES MAJOR. OR. 1. The inferior angle. 2. Inferior costa of the scapula.

IN. The ridge at the inner side of the groove for lodging the tendon of the long head of the biceps (along with the tendon of the latissimus dorsi).

DELTOIDES. OR. 1. From the outer part of the clavicle. 2. From the acromion. 3. From the lower margin of almost the whole spine of the scapula opposite to the insertion of the cucullaris muscle.

IN. A rough protuberance in the outer side of the os humeri, near its middle.

USE. Its centre raises the humerus, the lateral portions sustain the shoulder joint.

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* The origins and insertions of the latissimus dorsi and pectoralis, are described at pages 183 and 214.

Coraco Brachialis. Or. The coracoid process of the scapula, adhering in its descent to the short head of the biceps.

In. The middle of the internal part of the os humeri, near the origin of the third head of the triceps.

Use. To raise the arm upwards and forwards.

The muscles which move the fore arm, are exceedingly simple; as the form of the joint between the humerus and bones of the arm, is such, as to admit only of two motions, viz. *flexion* and *extension*. The Flexor muscles are two,—*Biceps* and *Brachialis Internus*: the Extensors are also two,—*Triceps* and *Anconeus*.

TABLE OF THE MUSCLES WHICH MOVE THE FORE ARM ON THE HUMERUS.

Flexors.—Biceps Flexor Cubiti. Or. By two heads: 1. Tendinous, from the upper edge of the glenoid cavity of the scapula. This tendon passes over the head of the os humeri within the capsule, and, in its descent without the joint, runs in a groove on the head of the os humeri, and covered by a membranous ligament that proceeds from the capsule and adjacent tendons. 2. The *second*, and shorter head, arises from the coracoid process of the scapula, in common with the coraco brachialis muscle.

In. 1. By a strong round tendon, into the tubercle near the upper end of the radius; 2. and, by a lateral slip of fascia, into the sheath of the fore arm.

Brachialis Internus. Or. The middle of the os humeri, at each side of the insertion of the deltoid muscle, covering all the inferior and fore part of this bone; adheres to the ligament of the joint.

In. The coronoid process of the ulna.

Extensors.—Triceps Extensor Cubiti. Or. By three heads; the first and longest, from the inferior costa of the scapula, near its cervix. The second head, from the back part of the os humeri, under the great tubercle. The third* arises by an acute beginning from the back and inner part of the humerus, and continues its origin all down the bone. These three heads unite lower than the insertion of the teres major, and cover the whole posterior part of the humerus; from which, they receive additional origins in their descent.

In. The *olecranon*, and partly into the condyles of the os humeri, adhering to the ligament.

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* The third head is sometimes called *brachialis externus*, and then the two first heads are described as forming a *biceps extensor*.

Anconeus. Or. From the back part of the external condyle of the os humeri; it soon grows fleshy.

In. A ridge on the outer and posterior edge of the ulna, being continued some way below the olecranon. It is covered with a strong fascia.

The muscles lying on the fore arm, are generally considered very difficult for a student to understand;—perhaps the following plan of arranging them in numbers, will obviate some of the difficulties. If we take the biceps flexor as a supinator, which it truly is, and the mass of the flexor muscles (on the fore arm) as one great pronator, for such is their conjoint operation, then the muscles will go in threes—thus:

For the motion of the wrist, three flexors, the *ulnaris*, *radialis*, and *medius* (commonly called palmaris longus); three extensors—*ulnaris*, *radialis longior*, and *brevior*; three pronators,—the *teres*, *quadratus*, and the *mass of the flexor muscles*; three supinators,—the *supinator longus*, *brevis*, and *biceps cubiti*.

There are three extensors of the fingers, viz. *extensor communis digitorum*, *extensor primi digiti*, and *extensor minimi digiti*; three extensors of the thumb,—*extensor primus*, *secundus*, and *tertius*; three flexors of the fingers and thumb,—*flexor digitorum sublimis*, *flexor digitorum profundus*, *flexor pollicis longus*.

In describing the muscles of the fore arm, it is nearly correct to say, that the *flexors* and *pronators* arise from the *inner condyle*, and the *extensors* and *supinators* from the *outer condyle*: but the *supinators* and *pronators* will be more properly distinguished by their insertions, as all muscles which turn the hand must be inserted into the radius; as for example,—the *supinator longus*, the *supinator brevis*, the *pronator teres*, the *pronator quadratus*.

TABLE OF THE MUSCLES LYING ON THE FORE ARM.

FLEXORS OF THE WRIST.

Flexor Carpi Radialis. Or. The internal condyle of the os humeri, and from the fore and upper part of the ulna.

In. The fore and upper part of the metacarpal bone that sustains the fore finger,—runs over the os trapezium.

Flexor Carpi Ulnaris. Or. The internal condyle of the os humeri, and side of the olecranon, and from the fascia.

In. The os pisiform, and ligament of the wrist.

Flexor Carpi Medius, or Palmaris Longus. Or. The internal condyle of the os humeri, from the intermuscular ligament: it forms a neat small belly, and by a long slender tendon, has—

In. Into the annular ligament of the wrist, and palmar aponeurosis.

EXTENSORS OF THE WRIST.

Extensor Carpi Radialis Longior. Or. From the lower part of the external ridge of the os humeri, above its external condyle, and below the supinator radii longus.

In. The back and upper part of the metacarpal bone that sustains the fore finger.

Extensor Carpi Radialis Brevior. Or. 1. The external condyle of the os humeri; 2. the ligament that connects the radius to it.

In. The upper and back part of the metacarpal bone that sustains the middle finger.

Extensor Carpi Ulnaris. Or. 1. The external condyle of the os humeri; 2. the ulna, from its posterior border.

In. The posterior and upper part of the metacarpal bone that sustains the little finger.

MUSCLES OF SUPINATION AND PRONATION.

Proper Supinators; that is, those which turn the palm of the hand upward, and have no other office.

Supinator Radii Longus. Or. The external ridge of the os humeri, nearly as far up as the middle of that bone.

In. The lower end of the radius, on its outer side.

Supinator Radii Brevis. Or. 1. From the external condyle of the os humeri; 2. from the external, and upper part of the ulna; 3. the ligament which joins these two bones.

In. The neck and tubercle of the radius, and ridge running downwards from the tubercle.

Pronators; that is, which throw the palm of the hand prone to the ground.

Pronator Radii Teres. Or. 1. The internal condyle of the humerus; 2. tendinous from the coronoid process of the ulna.

In. The outside of the radius, about the middle of the bone.

Pronator Radii Quadratus. Or. The lower part of the ulna: the belly of the muscle runs transversely.

In. The lower and outer part of the radius.

MUSCLES MOVING THE FINGERS, LYING ON THE FORE ARM.

FLEXORS.

FLEXOR SUBLIMIS PERFORATUS. OR. 1. The internal condyle of the os humeri; 2. the coronoid process of the ulna; 3. the tubercle of the radius; 4. the middle of the fore part of the radius, where the flexor pollicis longus arises. The tendons pass under the ligament of the wrist.

IN. The second bone of each finger, being, near its extremity, divided for the passage of the tendons of the perforans, or profundus.

FLEXOR PROFUNDUS PERFORANS. OR. 1. The side and upper part of the ulna; 2. from a large share of the interosseous ligament, and remotely through the fascia from the inner condyle; its tendons pass under the annular ligament of the wrist, and then pass through the slits in the tendons of the flexor sublimis.

IN. Last bones of the four fingers.

FLEXOR LONGUS POLLICIS MANUS. OR. 1. The side of the coronoid process of the ulna; 2. the radius, immediately below its tubercle; it is continued down for some space on the fore part of the bone; 3. the interosseous ligament: its tendon passes under the ligament of the wrist. It has an origin, frequently, from the internal condyle of the os humeri.

IN. The last bone of the thumb.

EXTENSORS, MUSCLES OF THE FINGERS AND THUMB.

EXTENSOR DIGITORUM COMMUNIS. OR. 1. From the external condyle of the os humeri, where it adheres to the supinator radii brevis. Before it passes under the ligamentum carpi annulare externum, it splits into four tendons, some of which may be divided into several smaller. On the back of the hand, the tendons are often united by interchange of tendinous filaments.

IN. The posterior part of the bones of the fingers, by a tendinous expansion.

USE. To extend all the fingers.

EXTENSOR MINIMI DIGITI. OR. The external condyle: the fascia of it adheres to the common extensor.

IN. The last bone of the little finger.

INDICATOR, OR EXTENSOR PRIMI DIGITI. OR. The middle of the back part of the ulna; its tendon passes under the same ligament with the extensor digitorum communis, with part of which it is—

IN. Into the posterior part of the fore finger.

EXTENSOR PRIMI INTERNODII POLLICIS MANUS, VEL OSSIS METACARPI POLLICIS. OR. 1. The middle and posterior part of the ulna, immediately below the insertion of the anconeus muscle;

2. the back part of the middle of the radius; 3. the interosseous ligament.

IN. (By two tendons) into the os trapezium, and upper back part of the metacarpal bone of the thumb, and often joins with the abductor pollicis.

USE. To draw the metacarpal bone of the thumb outwardly.

EXTENSOR SECUNDI INTERNODII. OR. 1. The back part of the ulna, near the former muscle; 2. the interosseous ligament.

IN. The posterior part of the first bone of the thumb: part of it may be traced as far as the second bone.

USE. To extend and draw the second bone of the thumb outwards.

EXTENSOR TERTII INTERNODII. OR. 1. The middle and back part of the ulna; 2. from the interosseous ligament: its tendon runs through a small groove, at the inner and back part of the lower end of the radius.

IN. The last bone of the thumb.

USE. To extend the last joint of the thumb.

The variety of motions which we are enabled to execute with the fingers, is sufficient evidence of the complication of the small muscles which lie on the hand. If we first make an arrangement of the muscles which move the thumb, and those which move the little finger, there will not be much difficulty in recollecting the other muscles.

We find a muscle for pulling the thumb from the fingers, ABDUCTOR POLLICIS: one for drawing the thumb towards the fingers, ADDUCTOR POLLICIS: and to bend the thumb, FLEXOR BREVIS:—with this muscle may be classed the one called OPPONENS, or FLEXOR OSSIS METACARPI POLLICIS.

For the little finger we have an ABDUCTOR, ADDUCTOR, and FLEXOR. There still remain the small muscles which bend all the fingers, viz. the LUMBRICALES. There is also a set of muscles which lie between the metacarpal bones; these are called INTEROSSEI EXTERNI and INTERNI; the use of which, is, to draw the fingers separate: with this class may be arranged the muscle called ABDUCTOR INDICIS; as it lies between the metacarpal bone of the fore finger, and that of the thumb.

There is one muscle omitted in this arrangement, because it stands by itself,—the PALMARIS BREVIS; being the set of fibres which were seen on the palmar aponeurosis, and covering the muscles of the little finger.

TABLE OF THE MUSCLES OF THE HAND.

PALMARIS BREVIS. OR. The ligamentum carpi annulare, and tendinous membrane that is expanded on the palm of the hand.

IN. Into the skin and fat that cover the abductor minimi digiti, and into the os pisiforme.

USE. To assist in contracting the palm of the hand: to sustain the grasp of the hand.

MUSCLES WHICH FORM THE BALL OF THE THUMB.

ABDUCTOR POLLICIS. OR. The os trapezium and ligament of the carpus.

IN. Root of the second bone of the thumb.

USE. To separate the thumb from the fingers.

OPPONENS POLLICIS. (Under the last.) OR. Os trapezium, and ligament of the carpus.

IN. First bone of the thumb, or, metacarpal of the thumb, as it is sometimes called.

USE. To bring the thumb towards the palm and fingers.

FLEXOR BREVIS POLLICIS. (Divided by the tendon of the long flexor.) OR. 1. Os trapezoides; 2. os magnum; 3. os unciforme.

IN. Ossa sesamoidea, and second bone of the thumb.

USE. To bend the thumb.

ADDUCTOR POLLICIS. OR. From the metacarpal bone of the middle finger.

IN. First phalanx of the thumb, at its carpal extremity.

MUSCLES OF THE LITTLE FINGER.

ABDUCTOR MINIMI DIGITI. OR. Os pisiforme and ligament of the carpus.

IN. The side of the first bone of the little finger.

FLEXOR PARVUS MINIMI DIGITI. OR. The ulnar side of the os unciforme and ligament of the wrist.

IN. First bone of the little finger.

USE. It is an assisting flexor of the little finger.

ADDUCTOR MINIMI DIGITI. OR. Edge of the os unciforme, and ligament of the wrist.

IN. The side of the metacarpal bone of the little finger.

USE. To draw the little finger towards the others.

LUMBRICALES. These are four muscles, lying in the palm of the hand, thin and fleshy, so as to resemble earth worms. Each of these muscles may thus be described:—OR. One of the tendons of the flexor profundus digitorum.

IN. The sheath on the back of the fingers, along with the interossei.

USE. To move the finger on the metacarpal bone.

ABDUCTOR INDICIS. OR. Os trapezium, and metacarpal bone of the thumb.

IN. The first bone of the fore finger.

USE. To bring the fore finger towards the thumb.

INTEROSSEI INTERNI. These are muscles lying deep betwixt the metacarpal bones, each having its origin thus:—OR. By one head, from a metacarpal bone.

IN. Into the sheath of the extensor muscles on the back of the first phalanx.

INTEROSSEI EXTERNI. These are bicipites, and lie on the back of the hand, but betwixt the metacarpal bones. OR. The roots of the metacarpal bones.

IN. The tendinous expansion of the extensor communis.

The PRIOR INDICIS is a muscle of the same character with the former, only that, lying on the radial edge of the metacarpal of the fore finger, it cannot be so properly palled an interosseous, as those which are seated betwixt the metacarpal bones.

USE OF THE INTEROSSII. While there seems much reason in the supposition, that the lumbricales, being small muscles, are better calculated for the quick movements of the fingers (whence they have been called fidicinales); the interossei interni, and externi, are for the lateral movements of the fingers, or the adduction, and abduction of the fingers, and are of the same class with the adductors and abductors of the thumb and little finger.

DISSECTION

OF THE

LIGAMENTS OF THE ARM.

After having completed the dissection of the muscles of the arm, we should remove them, that we may examine the ligaments; and in doing this, we should take the opportunity of again comparing their origins and insertions with the description in the *Table.* We should not remove every part of the tendons of the muscles which are attached to the head of the humerus; for they are so intimately connected with the capsular ligament, that we shall destroy it, in the attempt.

The ligaments about the shoulder may be divided into three sets:—1. into those which connect the clavicle and scapula; 2. the ligaments which pass from one point of the scapula to the other; 3. the ligaments connecting the humerus and scapula.

When the fibres of the deltoid are removed, slips of ligament will be seen passing from the clavicle upon the acromion; these are called *Ligamenta Radiata.* There is also a proper *capsular ligament,* and occasionally an intermediate cartilage between the acromion and clavicle; but the principal ligaments pass between the coracoid process and the clavicle: one will be found running from the root of the process up to the tubercle on the lower part of the clavicle, and, from its round shape, it is called *ligamentum conoides;* another, but of a more square form, runs from the root to the lower part of the clavicle, extending from the last ligament to near the acromial end of the clavicle; this is called *ligamentum trapezoides.*

The ligaments which run between the points of the scapula, are very simple: one, of a triangular form, will be found attached to almost the whole length of the coracoid process, from which it passes to the tip of the acromion (it is sometimes divided into two portions, by a little cellular membrane): this, from its shape, is called *ligamentum triangulare*, or *deltoides*. By removing the fibres of the supra spinatus muscle, we shall discover a small ligament running from the root of the coracoid process across the notch; this is the *ligamentum posticum* (the supra scapular nerve almost always passes under the ligament, and the artery generally over it). The ligaments which run between the points of the scapula, are called the *proper* ligaments; while those which connect the clavicle and scapula, are called the *common*.

In dissecting the muscles which pass from the scapula to the head of the head of the humerus, we saw the supra spinatus, the infra spinatus, and teres minor, all spreading their tendons upon the upper surface of the thin capsule; and on the lower part, we might have seen the ligament strengthened by the tendon of the subscapularis. If we now dissect away all these tendons, the capsule will appear as a transparent membrane, rising from the edge of the glenoid cavity, and passing down to surround the neck of the humerus.

This view must prove to us, that the strength of this joint does not consist in its capsular ligament, but in the tendons of the muscles which surround it.

In examining the capsule, in a superficial manner, it appears to be perforated by the tendon of the long head of the biceps; but when the capsule is opened, we shall find that a very thin portion of the membrane passes down into the bicipital groove, and is then reflected on the tendon of the biceps,—so that the tendon is actually external to the ligament.

When we cut open the joint, we shall see that the *glenoid cavity* is deepened by a ring of fibrous cartilaginous ligament, surrounding its edge.—We should not omit to look for the large *bursa*, which is between the deltoid and the capsular ligament.

The ligaments of the elbow-joint are a little complicated, in consequence of the head of the radius entering into the articulation; but still, as the joint is nearly a simple hinge, the principal ligaments will be *lateral*. We shall find here, as in all other joints, a capsular ligament; but its appearance is not that of a thin membrane, except at the posterior part, in consequence of its being covered, both on the fore and lateral parts, by slips of ligament from the tendons of the muscles: those on the fore part, are called *accessoria antica;* while those on the sides, are described as distinct *lateral ligaments.*

The *external lateral* runs from the external condyle to the *internal*, and may be divided into two parts, which we shall easily distinguish; for one portion restrains the joint, when it is bent to a certain extent; and the other checks it, when it is too much extended.

The radius is articulated with the external condyle; but by rolling it, we shall see that it is also connected with the ulna, by a thickening of the general capsular ligament, which is called *ligamentum coronarium.* In taking off the muscles, to show the *interosseous ligament*, we must take care that we do not cut the *ligamentum obliquum*, or *transversale*, which runs from the ulna to a point of the radius, below the tubercle.

The wrist is rather a complicated joint; but as the movements between the bones of the carpus and bones of the fore arm, are principally flexion and extension, we shall have, on the inside and outside, *lateral ligaments;*—these ligaments are very loose and much connected with the general capsule,—which will be found to be very strong, in consequence of the many slips which cross it. The capsular ligament does not bind the bones very closely together, but allows of a very considerable degree of lateral motion.

When we open the capsular ligament, we shall find that the end of the ulna does not correspond exactly to the cuneiform and lunar bones, but that there is a portion of cartilage interposed between them. We may now separate the carpus from the radius and ulna, and then examine the connection which is between these two bones. The convexity of the head of the ulna will be found attached to the concavity on the radius, by a coronary ligament, which, however, is called *ligamentum sacciforme*, or *membrana sacciformis.*

The carpal, and the heads of the metacarpal bones, are connected together by *capsular ligaments* and by *accessory slips*, which are easily dissected: it would be needless to give them separate names. The metacarpal bones, and the several phalanges of the fingers, are united by *capsular* and *lateral ligaments*, which, though very simple, ought to be carefully studied,—as the dislocations of the finger, and particularly of the thumb, are sometimes very troublesome.

DISSECTION

OF

THE ARTERIES

OF

THE SHOULDER AND ARM.

In the first dissection of these arteries, they should be injected; and, that all the vessels of the shoulder may be seen, the injection should be made in the same manner as that described at p. 225. It may be done from the subclavian artery; or from the axillary, after the arm is removed from the body: but in either of these methods, a great many vessels must necessarily be destroyed.

The manner of dissecting the arteries which arise from the subclavian, has already been described at page 228; so we may now pass to the description of the branches which arise from the artery, after it has passed under the clavicle;—and first, of that division of the artery, which is called the AXILLARY.

The pectoralis major, the deltoid, and the latissimus dorsi, should be dissected in the manner recommended in the dissection of the muscles, at page 181; but in doing this, we must take care to avoid the small branches, which will be found on removing the cellular membrane. If we are dissecting a female subject, in which the breasts are enlarged, or where milk has lately been secreted, we shall find upon the surface of the pectoralis major, a great many arteries passing to the mamma.

Between the deltoid and pectoralis, we shall see arteries running down, and a vein passing up;—the arteries are branches of the THORACICA HUMERARIA; the vein is the CEPHALIC. On the lower edge of the pectoralis, and upper edge of the latissimus dorsi, branches of the THORACICA ALARIS and of the SUBSCAPULAR, will be found. By dissecting between the two muscles, we shall expose the axilla, in which we shall see a net-work of vessels and nerves, complicated with many lymphatic glands.—In considering the *surgical anatomy*, all the parts of the axilla will excite much interest; but at present we should trace the branches of the arteries only, through it.

That we may follow the arteries more easily, we should now raise part of the pectoralis major from its origins. In doing this, we shall be obliged to cut through many branches: some of these come, through the intercostal muscles, from the mammaria interna; but the principal ones, are branches of the THORACICA LONGIOR, or MAMMARIA EXTERNA, which, when the muscle is farther raised, will be seen rising in common with the THORACICA HUMERARIA, or ACROMIALIS; the branches of which, have already been observed passing between the deltoid and pectoralis major.

The muscle may now be completely thrown back, and then the pectoralis minor will be exposed. A small artery will now be seen, passing into the space between the first and second ribs;—this is called the THORACICA PRIMA, or SUPERIOR. On the lower edge of the pectoralis minor, some branches will be seen running into the fat and glands of the axilla,—which must be carefully followed, by dissecting them with the forceps and scissars. These branches are described as coming from one trunk, which is called the THORACICA ALARIS; but they generally arise in two or three small branches.

The trunk of the artery may now be fully exposed. It will be found covered by the veins, but lying below the level of the axillary nerves. Until it has fairly passed under the pectoralis minor, there will be no difficulty in separating it from the plexus of nerves; but immediately after it passes this muscle, it will be found to be completely enveloped in the plexus. The arm must then be bent; which will relax the plexus, and enable us to dissect the cellular membrane from between the artery and nerves.

When the artery comes opposite to the upper part of the insertion of the latissimus dorsi, it gives off the SUBSCAPULAR artery; which will be found to pass under the scapula, and to give off numerous branches to the serratus magnus, subscapularis, latissimus dorsi, &c.; and frequently to the axillary glands. We should now observe the beginning of a branch, which we cannot follow to its termination, until the body is turned, or the arm separated. This will afterwards be found to run to the dorsum of the scapula; whence it is called the DORSALIS SCAPULÆ.

As the main trunk is so covered by the plexus, at the point where it gives off the subscapularis, we shall probably not at once discover the POSTERIOR CIRCUMFLEX; which rises close to the trunk of the subscapularis, and sometimes in union with it. After we have found this artery, we shall not be able to follow it far, in the present position of the limb; as it passes between the long head of the biceps and humerus, to be distributed on the deltoid. Its branches will be seen, on dissecting the back part of the arm.

We generally find another artery, which passes to the anterior part of the joint, rising immediately opposite to the last; it is called the ANTERIOR CIRCUMFLEX.—The plexus of nerves must be pulled down, to expose it. It is a small vessel, and generally runs between the tendons of the pectoralis major and the capsular ligament.

We shall now have traced the main trunk fairly past the insertion of the pectoralis major and latissimus dorsi; and here its name is changed to HUMERAL, or BRACHIAL, which it retains until it reaches the elbow.

The dissection of the portion between the scapula and elbow is very easy.—If we do not wish to keep the arm and chest connected, we may now, without hurting any vessels, separate the arm from the body.

Before following the trunk of the artery, we should turn the arm round, and make a superficial dissection of the muscles lying on the scapula.* In dissecting the deltoid, several of the branches of the thoracica humeraria, and of the circumflexa posterior, will be found. There will also, perhaps, be several branches of the *supra scapularis* (which is sometimes a prolongation of the TRANSVERSALIS COLLI, described at page 228), passing into the substance of the supra spinatus muscle.† On the muscles below the spine, many branches of the *dorsalis scapulæ*, and of the subscapularis, will be found. All those arteries which

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* This may be done, without separating the arm from the body, by throwing the arm over the chest.

† When there is this arrangement of the artery, it very seldom passes *under* the ligamentum posticum.—It appears to pass under the ligament, only when it arises from the subclavian, as a distinct branch, and low down.

pass to the muscles of the scapula, are distributed so much on the surface of the bone, that, before we can show them, it will be necessary to remove the muscular fibres.

The superficial dissection which has been begun on the deltoid, may be continued down upon the triceps. As we approach the elbow, we must carefully avoid the superficial branches, for they form inosculations with those of the fore arm. Those on the *external* part, are branches from the circumflexa posterior, and the profunda superior; while those on the inside, are from the profunda inferior, and the anastomotica.

We may now turn the arm, and continue the dissection of the trunk. An incision is to be made, down to the elbow, in the course of the artery: when the skin is dissected off, a thin facia will be seen to pass from the inside of the triceps to the biceps; when this is opened, the trunk will be seen on the inside of the biceps,—not now enveloped in a plexus of nerves, but with the radial, or median nerve, lying close upon the inner side of it.

The first branch (which has a name) we shall find, by looking for the muscular spiral nerve, or between the heads of the triceps.—The artery is called the PROFUNDA SUPERIOR; we may trace it into the deep parts of the arm, by following it along with the nerve.

We may now for a moment disregard the branches, and trace the trunk to the elbow, taking care not to cut any vessels. On the side of the artery next to the biceps, we shall see a great number of branches going off; these, however, are merely muscular branches, and there are no particular names for them. The only one of these, which we should particularly observe, is a trunk, passing off at the lower part of the coraco brachialis to the bone: it is called NUTRITIA MAGNA HUMERI. On the side of the artery nearest to the brachialis internus, we shall find three, four, or five branches, all taking nearly the same course towards the inside of the elbow, and to communicate with the recurrent arteries of the fore arm. The upper one is generally called the PROFUNDA INFERIOR; while the largest of those below, is the ANASTOMOTICUS MAGNUS,—and the next in size, the ANASTOMOTICUS MINOR.

We shall now have traced the main trunk to the bend of the arm, where it generally divides into the RADIAL and ULNAR.*

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* The bifurcation occasionally takes place higher up on the arm; but in what proportion of instances, I have a difficulty of determin-

The trunk will be found lying close by the edge of the biceps, and passing under the portion of its tendon which is inserted into the fascia of the fore arm. Before following the trunk, we should make a dissection of the fascia of the fore arm: this may quickly be done, by making a cut through the skin, from the elbow to the wrist, and by then dissecting the skin off from all around the arm. We need not preserve the small branches which perforate the fascia to supply the skin; but we must take care of branches which run around the elbow, and of any small branches which may be found near the wrist; for the arteries there, are very irregular.

In following the trunk, and the commencement of the radial and ulnar arteries, we must be very careful; as there is always a quantity of fat and cellular membrane interposed between the tendons of the biceps, and the insertion of the brachialis internus,—in which space, the artery generally divides: to see it distinctly, we must cut through the tendinous membrane which passes from the biceps to the fascia of the fore arm.

As the RADIAL lies more superficial than the ulnar, we should first trace it to the wrist. This will be very easy; for by merely cutting through the fascia, we may follow the artery over the tendon of the pronator teres, towards the radius, and then it runs down parallel with the bone, lying on the flexor pollicis longus, and between the supinator longus and the flexor carpi radialis. We need not here enumerate the several branches which are going to the muscle; for they are very irregular; but we should particularly mark the branch which turns back, and round the tendon of the biceps, to pass on the elbow: this is the RECURRENS RADIALIS. The only other branch of importance, is that which is given off at the point where we generally feel the pulse; viz. the SUPERFICIALIS VOLÆ: but this branch is very irregular in its size.—We should not now trace the radial farther, but return to the ulnar.

The ulnar passes much deeper than the radial; consequently, it is more difficult to trace its branches. It will be found running at once deep into the arm, to pass under the pronator teres. While the artery is under this muscle

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ing; during some seasons I have observed it, in nearly every third body. I think, however, it may be said to occur in a proportion, of about one to ten.

we shall often find a branch pass off, which is nearly as large as the ulnar itself; viz. the INTEROSSEA INTERNA. But before this great trunk is given off, we shall generally find a branch running back to the elbow; viz. the RECURRENS ULNARIS. After these two branches are seen, the trunk may be traced down to the wrist, between the superficial and deep layer of the muscles: in its course, it gives off many branches,—the most important of which, will be enumerated in the *Table*.

We should now trace the branches of the interossea, for it is the vessel which supplies the principal parts of the fore arm.

The trunk has already been seen, coming off from the ulnar, under the pronator teres,—from which, we may now trace it, along the interosseous ligament, and between the flexor digitorum profundus and flexor pollicis. But we shall generally find, that almost immediately on its rising from the ulnar, it gives off a large branch, which may be traced, through the ligament, to the supinators and extensors, and is lost, at last, on the back of the hand. But before this (the INTEROSSEA EXTERNA) arises from it, there is generally a *recurrent* sent off, to inosculate with the anastomotici upon the elbow.

When we have followed the internal artery as far down as to the pronator quadratus, we shall find it divide into two vessels; one of which may be traced, through the interosseous ligament, to the back of the wrist,—while a smaller branch is continued down to the fore part of the bones of the carpus.

The arteries of the hand are very numerous, and very complicated and difficult to dissect; but still the small branches will easily be understood after a general arrangement is made. We should commence the dissection, by raising the skin from the palm of the hand, so as to expose the palmar aponeurosis. On removing the skin, a number of small branches will be seen;—those on the middle and outer part, come from the ulnar; while those which are on the inside, and on the muscles of the thumb, are from the radial: but here, we shall probably find one larger than the others, viz. the SUPERFICIALIS VOLÆ. When the skin is dissected from the back of the hand, the main trunk of the radial will be found passing between the tendons of the extensors of the thumb; from which, it passes deep between the abductor indicis and adductor pollicis, to form the deep arch.

There are no directions required, for tracing either the ulnar or the radial artery; farther than that of following them patiently from trunk to branch, with the forceps and scissars.—In the first dissection, every thing is to be cut away, except the arteries and the tendons.

We should first expose the SUPERFICIAL ARCH, which is formed by the ulnar; and then the DEEP ARCH, formed by the radial: but this, we shall find to be very difficult. The arteries which are seen on the back of the wrist, and on the thumb, are generally from the external interosseal, and the radial.

TABLE OF THE ARTERIES OF THE SHOULDER AND ARM.

It is agreed by all authors (who have taken the description of the arteries from the dissection of many bodies,) that there are no vessels more irregular, than those which rise from the subclavian. But the general arrangement is very simple; for we have here, as in the study of the arteries of the leg, only to recollect, that the names of the branches correspond to the parts which the trunk passes.

The following sketch will be found to agree, in most respects, with the description of Haller; and I have attempted to make the arrangement correspond with what I think is most commonly seen:—

The great trunk, in its course from the aorta to the fingers, receives names corresponding to the parts which it passes. From its branching off from the aorta, until it passes under the clavicle, it is called SUBCLAVIAN. From the upper edge of the pectoralis minor, until it passes the insertion of the latissimus dorsi and pectoralis major,—AXILLARY. From this point, until the division at the bend of the arm,—HUMERAL, or BRACHIAL. From the bend of the arm to the wrist,—RADIAL, ULNAR, and INTEROSSEA. From the wrist to the fingers,—SUPERFICIAL ARCH, DEEP ARCH, and POSTERIOR ARTERIES.

The names which are given to the branches, refer to each division of the trunk.

The branches of the subclavian have already been enumerated at page 228.

The next division of the artery is the AXILLARY: from it, we have,—*thoracica superior; thoracica longior*, or *mammaria externa; thoracica humeraria*, or *acromialis; thoracica alaris; subscapularis; circumflexa posterior; circumflexa anterior.*

Thoracica Superior, gives branches between the first and second ribs.

Thoracica Longior, — to the pectoralis major and mamma.

Thoracica Humeraria, — branches between the pectoralis major and deltoid.

Thoracica Alaris, — to the fat, glands, pectoralis minor, &c.

Subscapularis,—1. to the axilla and glands; 2. to the subscapular muscle; 3. infra scapular branch to the muscles of the back; 4. dorsalis, or circumflexa subscapularis, to the muscles on the back of the scapula.

Circumflexa Posterior,—branches to the heads of the triceps, coraco brachialis, deltoid, and capsule.

Circumflexa Anterior,—to the periosteum and capsule.

The third division of the artery is the HUMERAL, or BRACHIAL: gives, — 1. a set of small branches to the muscles; 2. *profunda humeri superior*; 3. *profunda humeri inferior*; 4. *anastomotica magna.*

From the *Set of small Branches*, twigs go off to the biceps and brachialis internus, and also the arteria nutritia humeri.

Profunda Superior,—1. to the muscles; 2. radialis communicans, to the external condyle; 3. branches to the back of the elbow, to unite with the recurrens interossea and radialis.

Profunda Inferior,—1. to the brachialis internus and biceps; 2. to the external condyle and supinator; 3. to the ulnar nerve and back of the elbow joint.

Anastomotica Magna,—1. branch communicating with the profunda; 2. descending superficial branch; 3. descending deep branch: these two form, with the recurrents of the arteries of the fore arm, the *arcus anterior*; 4. transverse branch which goes behind, forming, with the profunda and recurrents, the *arcus posterior.*

The fourth division of the great artery is into the RADIAL and ULNAR.

The RADIAL gives off: 1. to the *supinator; 2. recurrens radialis; 3. in succession to the supinator, pronator, and flexor muscles; 4. superficialis volæ; 5. irregular branches to the wrist; 6. dorsalis pollicis; 7. dorsalis carpi; 8. dorsalis metacarpi; 9. magna pollicis; 10. radialis indicis;* 11.

deep palmar arch, which inosculates with the superficial arch from the ulnar, and gives off the *interossea* to the metacarpal spaces.

Ulnaris,—gives off the interosseal artery: but before it does so, it sends off some smaller ones.—1. To the *pronator*; 2. *perforans*, through the interosseous ligament to the back of the joint; 3. *recurrens ulnaris*, which has a superficial and deep branch; 4. *arteria nutritia*; 5. *interossea communis* (this will afterwards be considered as a principal branch); 6. *irregular branches to the muscles*; 7. *dorsalis manus*; 8. *to the muscles of the little finger*; 9. *palmaris profunda*, which, uniting with the radial, forms the deep arch; 10. *superficial palmar arch*, giving off volans ulnaris, minimi digiti, digitalis volans prima, digitalis volans secunda, digitalis volans tertia; these are the vessels to the fingers; 11. *communicans*, joining the radial, on the thumb.

Interossea Communis: 1. to the muscles and ligaments of the joint: 2. perforans superior, which gives off ramus descendens, and recurrens interossea; 3. irregular branches to the flexor muscles; 4. perforans inferior; passes through the upper edge of the pronator quadratus, and gives branches to the back of the wrist; 5. interossea volans anterior, or anterior articular artery of the wrist.

DISSECTION

OF

THE VEINS OF THE ARM.

It is almost needless to inject the veins of the arm, unless it be for the purpose of making a preparation; for a much better knowledge is gained of the course of the superficial veins, by putting a ligature round the arm of a thin muscular man, than is ever done by injecting, or dissecting them. As the deep veins all accompany the arteries, their course may also be easily understood; but in making the *surgical dissection* at the bend of the arm, it will be useful to have some of the veins filled. Though I do not think it necessary for the dissection, I shall here describe the manner of injecting the veins, that they may be preserved:—

In consequence of the numerous valves which are in the veins, it will be impossible to inject them from the subclavian: — the injection must be thrown in, from one of the vessels on the hand. Those on the palm are so small, that it will be needless to try to introduce a pipe into them.—We must look for a vein on the back of the hand. That vein which runs up from the fore finger, or the one between the little and ring finger, will generally be found to be the best. After we have introduced the pipe, a piece of the skin over the vein, should be included in the ligature; or we shall be in danger of tearing the coats of the vein, while we are injecting it.

The blood is to be first thoroughly pushed out of the veins, by injecting warm water into them, and allowing it to escape by the subclavian. This injection of warm water, should be repeated several times; and previous to the injection with the wax, the water should be forced out, by holding the arm, with the hand, perpendicular to the body, and rubbing the vessels, down towards the axilla. A ligature may be put round the subclavian vein: but it should not be tied until the injection is thrown in from below; so that any water which may not have been forced out, may be pushed before the injection:—as soon as the wax appears at the subclavian, an assistant should tie the ligature. The injection made from a single vein, will very seldom be successful,—we may, therefore, be obliged to put the pipe into one or two different veins; but if, in cleansing the veins of blood, the valves be much broken, the injection may pass easily from one vein to the other.

The dissection of the veins is very simple; for all the cutaneous veins, when distended with wax, will be visible:—and to expose them, it will be only necessary to remove the skin.—As the deep veins follow the course of the several arteries, they require no further description.

If the injection has been successful, it will have filled the veins of the hand below the part into which the pipe was put;—a plexus will be found running between the knuckles, and forming an arch on the back of the hand; this has been called the PLEXUS DORSALIS MANUS, — and the arch, the ARCUS VENOSUS DORSALIS. From the part of the arch nearest to the thumb, and from a vein on the thumb, there is a trunk rises, which is called VENA CEPHALICA POLLICIS; this name having been given to it by the Arabian anatomists, from the idea that opening it, was useful in diseases of the head;—this vessel, when joined by other veins of the arch, forms a trunk, that runs up the radial edge of the arm, and is called VENA CEPHALICA MINOR, or RADIALIS EXTERNA: at the bend of the arm, this is joined by the MEDIAN CEPHALIC; and by this union, the GREAT CEPHALIC is formed, which passes up, first between the tendons of the biceps and triceps, and then between the tendons of the pectoralis major and deltoid, to dip into the axillary vein. The large vein, which is on the ulnar side of the arm, is called BASILICA, from a strange fancy of the ancients, that bleeding from this, was a sovereign remedy for many diseases; and they moreover conceived, that the vein of the right arm belonged to the liver, and that of the left, to the spleen. This vein is formed by the vessels of the arch nearest the little finger, and by the vein that is between the little and ring finger; which has, from the same conceit, been called SALVATELLA. From this source, we may trace the basilic; sometimes in one or two branches, or as a plexus, to the ulnar side of the arm,—and here it is sometimes called ULNARIS SUPERFICIALIS, or CUBITALIS INTERNA.—It passes up by the inside of the tendon of the biceps; there it receives the median basilic. It then passes deep by the side of the artery. It is sometimes found joined to the venæ comites; or it passes singly to the outside of the tendon of the pectoralis, and then falls into the axillary vein.

On the fore part of the wrist, we see a plexus coming from the thumb and palm. This plexus is frequently continued for a considerable way up the arm, before it forms a trunk; which gives out branches, both to the basilic and cephalic;—the trunk is called MEDIAN, or VENA SUPERFICIALIS COMMUNIS. Near the bend of the arm, it generally divides; one branch goes to the basilic, and is called MEDIAN BASILIC,—and the other to the cephalic, and is called MEDIAN CEPHALIC.

It is needless to describe the deep veins of the arm, as they accompany the arteries,—whence they receive the names COMITES, or SATELLITES: there are generally two, accompanying each of the principal arteries.

We have now traced the veins up into the axilla; here the trunk is called AXILLARIS: and at this part, we may trace branches into it from the shoulder, from the scapula (the EXTERNAL and INTERNAL SCAPULAR), and some from the side (the THORACIC VEINS). We may then trace the vein under the clavicle; and there it is called SUBCLAVIAN. If we have injected the great veins, we shall see the union, on the left side, with the INTERNAL JUGULAR;—at this angle, the thoracic duct enters. The great trunk may be traced across the chest, to unite with those of the opposite side, to form the vena cava descendens; but the manner of showing these, is described more fully at page 226.

DISSECTION

OF THE

NERVES OF THE ARM.

The dissection of the nerves of the arm may be made on the same limb in which the arteries are traced.

The nerves which form the AXILLARY PLEXUS, viz. the FOUR LOWER CERVICAL, and FIRST DORSAL, will be found coming from the spine, between the scalenus anticus and scalenus medius. These may be dissected with the branches of the subclavian artery.—It is from this plexus that all the nerves pass to the arm. But in dissecting the external part of the axilla, we shall discover certain small nerves passing towards the pectoralis major, and latissimus dorsi,—these are called the *Thoracic Nerves*: they are rather irregular in their course, as they occasionally come from the intercostal nerves. By dissecting deeper, we shall expose the great plexus.—By examining the upper part of the plexus, we shall see a nerve passing towards the root of the coracoid process, viz. the SUPRA SCAPULAR NERVE; which may be traced through the notch, to the supra spinatus muscle. Another nerve, the INFRASCAPULARIS, will be found passing from the posterior part of the plexus: it lies upon the subscapularis, and sends its branches between this muscle, and the latissimus dorsi; but its branches must not be confounded with those of the *external respiratory*,—which cross under the plexus, to the serratus and intercostal muscles.

If we now pull out the plexus, and look to the back of it, and immediately above the insertion of the latissimus dorsi, we shall find the nerve, which, from its encircling the joint, is called the ARTICULAR; it rises very frequently in common with the infra scapular.

The other nerves which pass out from the axillary plexus, will easily be recollected; for there are only three which go to the integuments, and three which supply the muscles and tips of the fingers.

The cutaneous nerves must necessarily be traced, before the deep ones. An incision may be made through the skin only, in the line of the biceps muscle, down to the middle of the fore arm. In dissecting the flap, towards the chest, small nerves will be found coming through the interstices of the ribs; some of which, may perhaps be traced near to the elbow; but these intercostal branches generally terminate on the skin, a little below the axilla:—and for the supply of the skin, immediately below this point, we shall find a nerve that rises from the most superficial part of the inner side of the plexus. As this nerve was particularly described by Wrisberg, it is called the CUTANEOUS of WRISBERG. There is, however, some difficulty in determining, whether this should be considered as a distinct nerve, or as only a branch of the INTERNAL CUTANEOUS; which will now be seen rising from the ulnar side of the plexus.—The branches of this last nerve, will afterwards be found to be continued to the skin on the inside of the fore arm.

We may now dissect off the other flap of the skin.—We shall find no branches upon it, until we come opposite to the head of the brachialis internus; and there, we shall discover some considerable branches passing into the skin. If we trace these back towards their origin, we shall find that they have come from between the brachialis and biceps, having perforated the coraco brachialis; and that they arise from the radial, or upper side of the plexus. The principal branch, having been described by Casserius as the nerve which perforated the coraco brachialis muscle, has been called the PERFORANS CASSERII; but, from its giving branches to the coraco brachialis and biceps, as well as to the skin, it is sometimes called the MUSCULO-CUTANEOUS: however, from its relative situation on the skin, it has got, more commonly, the name of EXTERNAL CUTANEOUS.

The branches of the external and internal cutaneous, should now be traced to their terminations. The external, as soon as it passes from below the biceps muscle, divides into three branches upon the skin: two of which, are distributed over the supinators,—while the other passes down to the wrist. The branches of the internal cutaneous may be traced in connection with the basilic vein;

along the course of which, they pass, in three or four branches, towards the wrist. The connection of the branches of both these nerves with the veins at the bend of the arm, will be fully described in the *Surgical Dissection* of that part.

The three great nerves,—the RADIAL, or MEDIAN, the ULNAR, and the MUSCULAR SPIRAL, may easily be traced at the same time with the branches of the arteries. The MEDIAN, or RADIAL, will be found to rise from that division of the plexus which surrounds the artery, and to be often connected with the perforans Casserii.—It may be traced along the inside of the artery, and closely connected with it. When at the bend of the arm, it gives off three branches, which supply the muscles of the fore arm. But the principal nerve does not now run in the course of either of the great arteries, but will be found to pass in the middle of the fore arm, between the flexor sublimis and flexor profundus; whence it is more properly called *Median*, than *Radial*. It then passes under the annular ligament; but previous to this, it generally gives off some small branches to the integuments upon the inside of the thumb. In the palm of the hand, it will generally be found to divide into five branches,—one of which, may be traced to the abductor and flexor pollicis brevis; another, to the adductor and side of the thumb; a third, to the fore-finger; the fourth passes to one side of the fore and middle fingers; and the fifth, to the other side of the middle, and to one side of the ring finger:—besides these branches, lesser ones will be found passing into the small muscles in the palm of the hand.

The ULNAR rises from the lower and inner part of the plexus.—The *Internal* cutaneous will often be found to be the first branch which it gives off. It may then be traced down behind the inner condyle of the humerus; but before it reaches this point, some branches will be seen going from it, to the skin and triceps muscle. Immediately after passing the condyle, it gives a branch to the flexor muscles;—it then passes between the flexor carpi ulnaris and flexor digitorum sublimis: here it will be found to join the ulnar artery, along which, it may be traced to the wrist. In this course, it gives off a few muscular branches; but when near the wrist, a branch will be found, which passes under the flexor carpi ulnaris, and over the lower end of the ulna, to be distributed on the back of the hand, and on the little and ring fingers: this is the *Ramus Posticus*.

The trunk of the nerve passes under the annular ligament, into the palm,—and there, it will be found to divide into two principal branches, which are sometimes called the *Sublimis* and *Profundus*. The sublimis may be traced to the integuments on the ulnar side of the hand, and to the small muscles of the little finger; then, to the sides of the little finger, and one side of the ring finger. The profundus forms a sort of *deep palmar arch*, to supply the muscles.

The MUSCULAR SPIRAL nerve will be found lying quite behind the artery, and rising from the lower and back part of the plexus. It will be seen to give off many branches, almost at its origin, to the muscles contiguous to it. The trunk may be traced along with the profunda superior artery; but we may generally observe a large branch rising from it, before it perforates the triceps;—this branch accompanies the nerve and the artery, for a short distance; it will then be found to pass directly through the triceps, and to emerge upon the skin, by the side of the supinator longus, from whence it passes, to be distributed nearly in the same manner as the branches of the external cutaneous.

The principal nerve may be traced between the brachialis internus and supinator longus; it there gives off a branch to the elbow, and it then divides into the *profundus* and *superficialis*. The profundus may be traced through the supinator brevis; it will then be found to twist round the radius, and to divide into branches, for the supply of the muscles on the back part of the arm. But the other division—the *superficialis*, is by far the most important: it lies between the supinator longus and pronator teres,—from whence it may be traced between the supinator and flexor carpi radialis, and so close upon the radial artery, that it might be called a *radial nerve:* when near the wrist, it passes under the tendon of the supinator longus, and there it lies directly over the radial artery, viz. between the extensor muscles of the thumb. The nerve is finally distributed on the back of the hand,—on the back of the thumb,—fore, middle, and ring fingers.

In recapitulation of the nerves which arise from the axillary plexus, they may be arranged thus:—Three to the shoulder; viz. SUPRA SCAPULAR, INFRA SCAPULAR, and ARTICULAR. Three to the skin;—EXTERNAL CUTANEOUS, INTERNAL CUTANEOUS, and CUTANEOUS of WRISBERG. Three to the muscles;—RADIAL or MEDIAN, ULNAR, and MUSCULAR SPIRAL.

SURGICAL DISSECTION

OF

THE ARM.

The most important part of this dissection, is, that of the vessels about the elbow and wrist; for they are liable to be opened by accidents, which may appear trifling, but, if neglected, or if treated by a surgeon who is not fully master of the anatomy, may be followed by the most serious consequences;—sometimes by the loss of the limb, or even by death.

The dissection of the subclavian artery, above the clavicle, should also be most carefully made; for though it is very improbable that an operation on the artery itself, will be followed by success, still we ought to know accurately the connections which it has with the parts in its vicinity,—that we may be enabled to avoid it, in extirpating tumours, or even to take it up for a case of aneurism. The question of the rule of practice, in aneurism of the subclavian, is very difficult to determine. We shall find, by the history of the cases of aneurism of this artery, that the relative position of the parts connected with it, are so changed by the aneurismal tumour, that even though we may have a very accurate knowledge of them in their natural state, still we may be foiled in the attempt to take up the artery when an aneurism has formed.—When it is known, that even Sir Astley Cooper has been obliged to stop in the middle of such an operation, we may be satisfied that it is not a very practicable one: his words are,—"The clavicle was thrust upwards by the tumour, so as to make it impossible to pass a ligature under the artery, without incurring a risk of including some of the nerves of the axillary plexus: the attempt was therefore abandoned."

The same histories will also lead us to doubt the propriety of *ever* attempting this operation; for, in the greater number of cases, where even the artery has been neatly tied, the vessel has ulcerated above the ligature,—and this, most probably, in consequence of the very short distance that there is between the large trunks, as the passage of the blood through them, will necessarily prevent the formation of a *clot* behind the ligature,—which appears to be the principal source of the great success attending operations on the external iliac and carotid arteries. I cannot enter into the discussion of what should be done, in aneurism of the subclavian; but I shall merely hint to the student, to inquire into the propriety of the proposal to remove the arm.—To comprehend the rationale of this proposal, he must take into consideration the effect which amputation of a limb, has upon the great artery.

The anatomy of the artery *below* the clavicle, should be more interesting to the student; for the tying of it, is a more practicable operation, and has occasionally been attended with success.——I shall here introduce the description, which my friend, Mr. Smith, of the Leeds hospital, has given of the operation, which he performed on a young girl who had secondary hæmorrhage from the stump, after the arm had been torn off by machinery:—"One assistant compressed the artery, above the clavicle; another, with the hand upon the acromion process, depressed the shoulder; and a third pressed a dossil of lint in the stump, to restrain the hæmorrhage. I then made an incision, from three to four inches in length, beginning about half an inch from the sternal extremity of the clavicle, and half an inch below it, following the course of that bone towards the shoulder. By the first incision, I divided the integuments; and by the second, the clavicular portion of the pectoralis major: when this retracted, the edge of the pectoralis minor was seen. Several small arteries and veins were now visible, crossing the course of the artery: these were tied, above and below, before they were divided,—as the blood issuing from them, would have retarded the operation. The great vein was then seen,—and with an appearance of pulsation, caused by the artery below it. The artery was carefully separated from it, for about the third of an inch, by the handle of a scalpel; the vein was drawn to one side, by a curved probe; a directory was then placed under the artery, to raise it a little, and a silk ligature was passed along the groove of the directory, by means of an eyed probe: the ligature was divided, and the probe withdrawn; the upper ligature was then tied as high as possible, and the other as low,—but there was, still, just as much space left, between the ligatures, as to allow of the artery being divided with safety." On my questioning the utility of dividing the artery between the ligatures,—my friend agreed to my objections; saying, that he had done it, in compliance with the opinion of his senior, as he did not conceive any harm could result from it.

The patient lived sufficiently long, to show, that the calibre of the artery was properly obliterated by the ligature: she died in consequence of hæmorrhage from the face of the stump,—which, on dissection, was discovered to have come from the subclavian, above the ligature, through the supra scapular branch of the inferior thyroid. This is highly important to recollect; because it is a proof that, in a case of axillary aneurism, even though the subclavian has been tied, still the aneurismal tumour may be supplied with blood from the anastomosing branches, and may at last burst, even though the main trunk may be obliterated above the aneurism.

We should now examine the parts in the axilla. These parts are so exceedingly complicated, that no surgeon should venture to operate upon them, unless he has such a knowledge, as will give him boldness and decision. In making the dissection, we should endeavour to keep the parts as much in their natural situation as possible.

After laying bare the tendons of the pectoralis major, and of the latissimus dorsi, we have to observe the place of the axillary glands,—the size of the branches of the thoracic arteries, and of the scapular,—and also the nerves which come from the intercostal spaces, to pass amongst them. The whole plexus of nerves, and the axillary artery, will be found to be braced down by a web of aponeurosis.—When this is lifted, we shall find that the nerves closely surround the artery; which shows, that the artery, when wounded, must not be secured by diving with a needle: by such an operation, the nerves would be included,—and the ligature would not come away until it was cut from the bundle of nerves. When the nerves and artery are disentangled, and the divisions of the plexus are traced, we may recognize the radial nerve running upon the fore part of the humeral artery; the ulnar nerve taking its course towards the inner condyle of the humerus; the muscular spiral nerve passing through the triceps, and behind the bone; the external cutaneous nerve passing before the humerus, and through the coraco brachialis. We should then turn our attention to the circumstance of wounds penetrating the axilla; for, often, when a ball has passed through the arm-pit, or when it lodges, the track, or seat of it, may be discovered by the numbness in the part of the arm supplied by the extremities of the nerve. Thus, if there should happen to be a wound of the axilla, attended with great hæmorrhage, and yet it is not evident whether the axillary artery or the subscapular artery be wounded,—if we find the muscles supplied by the radial nerve, to be paralytic, and the sensibility of the thumb and fore and middle fingers, lost, the ball, most probably, will have passed through the main artery, since the radial nerve clings around it. We may also consider how the head of the humerus being dislocated, may press on the plexus of nerves, or the artery, and cause one symptom announcing dislocation. The question may pass through our minds,—Does a punctured wound of the axillary artery call for amputation?—Does a wound, where the artery and the whole plexus of nerves are cut through, require amputation? We should likewise consider the parts in the axilla, and the muscles of the shoulder, in relation to the amputation of the arm at the shoulder-joint. We ought to observe the great group of lymphatic, or absorbent glands of the axilla,—for these, when diseased, and clustering together, form a tumour, which it is dangerous to extirpate.

The most important tumour, is that which is caused by the irritation proceeding from the cancerous breast. But we should recollect, that, if morbid matter be absorbed in the hand, buboes may be formed here, as in the lymphatic glands of the groin. These cases are so common, that we may occasionally have opportunities, in the dissecting-room, of examining them. We shall find that, when the glands are not far advanced in disease,—only feeling hard and enlarged, if a small incision be made over them, there is danger of their escaping, by slipping amongst the loose cellular substance.—They should be firmly fixed with the two fingers, so that when the incision is made, they may start out; or the fingers should not be removed from them, when small and moveable, until they are taken up by the assistant's hook.

If the glands have become much enlarged, they will form adhesions with the surrounding cellular membrane; and they will group together, forming a fixed indurated mass. In such cases, we often find numbness of the arm, and œdematous swelling. The numbness, we may understand to be a consequence of the pressure on the nerves: the swelling is produced by the disturbance of the absorbents.

The dissection may now be prosecuted by taking the integuments off the inside of the arm. After recognizing the muscles in this more partial view, we should trace the branches of the humeral artery ;—we shall find the radial nerve in company with the main artery ; the ulnar nerve accompanied by the profunda inferior ; and the profunda superior, and muscular spiral nerve, passing together between the heads of the triceps.

We should now observe the manner in which the humeral artery, and radial nerve, and venæ comites, are involved in a sheath, and bound down by a membrane ; and particularly, how they pass under the stronger fascia near the bend of the arm. We may see, that, to cut for the humeral artery, we have only to lay bare the edge of the biceps flexor cubiti, to open the sheath, and avoid the radial nerve ;—that, high in the arm, the nerve is superficial to the artery ;—that, towards the bend of the arm, it is on the inside of the artery.

The FULL ANATOMY OF THE BEND OF THE ARM is very important. The following are the chief circumstances to be noticed* :—

On the fore part of the arm, we should save the superficial veins ; viz. the cephalic vein, which is coming upon the radial edge ; the basilic, on the ulnar edge ; the median, in the centre. We should particularly attend to the divisions of the median vein, which are commonly selected for bleeding ;—and to the manner in which they are connected with the two superficial, or cutaneous nerves. Betwixt the supinator longus, and the outer edge of the biceps muscle, we shall find the external cutaneous nerve : we may trace its branches under the cephalic, and median cephalic veins. The internal cutaneous nerve will be found coming directly down from the inside of the arm, over the fascia : the principal branch goes under the vein ; but sometimes a small filament passes over it. We may now lift the fascia covering the humeral artery, and observe how thin, but, at the same time, how strong it is.

If, in bleeding in the median basilic, the lancet transfixes the vein and the fascia, the artery may be opened. The consequence of such an accident will most probably be, an aneurism,—the operation for which, must be done by tying the artery above and below the puncture. The cases

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* If a little size injection be thrown into the veins, the dissection will more easily be made.

which have of late occurred, establish the propriety of this operation, instead of that, of only tying the artery above the wound. This same accident has occasionally produced the *varicose aneurism*, but not so frequently as the common aneurism; the progress and appearance of which, nearly corresponds with the following description:—

When the young surgeon opens the artery,* he, in great alarm, applies a firm compress and roller; by which, the external wound, and that of the fascia, soon heal: but the artery will continue to bleed, though not outwardly; the blood will be impelled under the fascia; the connections of the fascia will be torn up; a regular tumour will be formed, occupying the bend of the arm: and this tumour, stretching the fascia, will contract the fingers, and keep the fore arm at a right angle with the arm, as in other diseases in which the fascia is contracted, or the muscles under the fascia inflamed.

By observing the anatomy of the parts here, we shall see the danger of tying the median nerve along with the artery; and the difficulty there would be, in separating the nerve from the artery, if the arm be kept extended. We shall also see the danger of cutting off either the radial or ulnar artery, if, in operating here, we dissect too boldly.—The question of the inosculations between these several vessels, should now pass through our minds. Nor should we forget the irregularities, that must occur in the vessels here, when there is a high bifurcation of the humeral artery.

A very serious accident sometimes occurs in bleeding, which our knowledge of anatomy will hardly enable us to avoid,—the puncture of one of the cutaneous nerves. When we examine the connections of the internal cutaneous nerve with the median basilic, we shall see, that the principal branches pass under the vein; but if we look to the median, and cephalic, we shall find several large branches from the external cutaneous, passing over them. This view should induce us to prefer performing the operation of bleeding in the median basilic vein,—for, with a little care, and a sharp lancet, the artery (which is immediately below it) may be avoided: but the most dexterous surgeon may

* The superficial seat of the artery, and its contiguity to the vein, causes the blood to flow sometimes from the vein, per saltum; which circumstance has given a pale face to many a youth, conceiving it to be the blood leaping from a wound of the artery.—The pulsation ceases upon bending the arm a little.

prick one of the nerves;—the consequences of this, are sometimes terrible.

We should now pay particular attention to the relative position of the arteries and nerves in the middle of the fore arm; for the arteries are of such a size, that, when wounded, they will in general require to be tied.

The *radial* artery, at about one-third down the arm, may be sought for, by first cutting through the thin fascia. By then raising the edge of the supinator longus, a second fascia will be seen, covering the artery as it passes over the tendon of the pronator teres. The same artery, near the wrist, will be found between the flexor carpi radialis and the supinator longus; it is covered by a fascia: a considerable branch of the muscular spiral nerve will be seen on its radial side; and a smaller one, from the external cutaneous, almost immediately over it:—both of these nerves, are superficial to the fascia. The artery will be found on the back of the hand, between the extensor muscles of the thumb,—but here it lies deep: a branch of the muscular spiral nerve crosses it.

The *ulnar* artery, about the middle of the fore arm, will be found between the flexor carpi ulnaris and flexor digitorum sublimis, but rather under the flexor sublimis.—The ulnar nerve lies on the ulnar side of the artery. In looking for the artery, near the wrist, we should raise the fascia which binds down the tendon of the flexor carpi ulnaris: on holding aside the tendon, we shall see another fascia,—and upon cutting through this, we shall find the artery. The nerve is rather more under the tendon, but still very close to the artery.

These are very important points to attend to,—for I have seen a great deal of mischief arise in consequence of an attempt to stop the bleeding, of even the *superficialis volæ*, by compression. Two cases, in which this small artery was wounded, I well remember. A drunken fellow, in fighting, drove his arm through a pane of glass; the superficialis volæ was cut, and so near to the main trunk, that it was impossible to tie the *stump* of the artery. The radial was tied; but, in consequence of the many ineffectual attempts, which had been made in chemist's shops, by compression, applications of turpentine, &c. the wound did not heal kindly; and the man being of a dissolute habit, gradually sunk.——About twelve months ago, I was called to the daughter of a respectable tradesman, who, in cutting bread, wounded the superficialis volæ. It would appear, that the artery had bled violently; as she had been, during the course of two hours, sent from shop to shop,—until at last, after having lost about two pints of blood, she found one druggist bolder than the others; who, however, to stop the hæmorrhage, resorted to such means as injured the arm so much, that I found great difficulty in saving it.*

To impress upon the student the importance of the study of the surgical anatomy of the fore arm, I shall here introduce what Mr. Charles Bell has said, in his System of Dissections:—

"OF THE ULNAR AND RADIAL ARTERIES AT THE WRIST— There is no part of the body, in which it is more necessary to connect the anatomy with the accidents, than here at the wrist; for, from apparently slight accidental wounds of these arteries, there come great pain, inflammation, deep driving of the blood, unskilful operations, and bad surgery, and danger of losing the arm, and even the life of the patient. The danger is from these vessels,—the ULNAR ARTERY, as it turns over the wrist, and the RADIAL, as it turns over the root of the thumb, or the PALMAR ARCH in the hand, not being neatly tied at first. The consideration of this department of surgery would lead us too far; I only say, look to it now, when the parts are before you. I would beg you also, to look to the peculiar appearance of the fat, and the aponeurosis on the palm.

"In a wound of the artery in the palm, we put in a large pad, or compress, and close the hand, and bind it firmly; but if the arch of the palm be cut, this does not completely stem the blood,—or the pain and inflammation are such, as will not allow the bandage to be drawn sufficiently tight; we must then undo the bandage, and endeavour to find the artery; but the appearance of the wound is changed; it is tumid, and the cellular membrane

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* A surgeon in the country will find, that an arm, which has been only partially dissected, if preserved in spirits, (and so, that it may be taken out of the jar for examination,) will be much more useful to him, than the finest display of the minute branches of the arteries. Such a preparation will not be very expensive, nor will it be difficult to preserve. After the blood has been pushed out of the vessels, a mixture of proof spirit, saturated with alum, should be injected into them. A liquid, composed of two-thirds of proof spirit to one of distilled water, saturated with alum, will then be sufficiently strong to preserve the arm;—it may be cut through at the middle of the biceps, and at the middle of the fore arm.

stuffed with blood, so that, from the confusion, we probably cannot see the mouth of the artery. In this state of things, the patient getting weak from loss of blood, and the vessels perversely bleeding, only when the dressings are applied, and stopping when they are undone, the surgeon is tempted to follow the artery with incisions, fruitless perhaps, because he is still amongst the disordered parts. He is at last tempted to dive for the roots of those vessels with his needle. And now let us observe the consequence of this: Suppose that a surgeon does not dissect neatly for the radial or ulnar artery at the wrist, but plunges for it with his needle, the skin, tendons, and nerves, are included, and the ligature is drawn tight upon them; there may be most dangerous nervous symptoms from the including of the nerve, or, more certainly, the next day, by the fading of the parts, the ligature slackens, and the artery bleeds again.

"When the student, then, is studying this part of the anatomy, let him not run with too much rapidity over this important lesson. I would recommend it to him to read Mr. John Bell's Principles of Surgery, upon this point, where he will find surgical cases so pictured and represented to him, that he will not quickly forget them; let him return then again to his subject; let him examine the fascia at the fore part of the wrist, and the manner in which it covers the artery; let him observe the palmar aponeurosis, and mark accurately, the place at which the arteries turn over the wrist; let him mark the connection of the ulnar artery and nerve, where they lie connected, and observe the radial nerve free from the arteries, passing under the ligament of the wrist, and then he will not be guilty of seeking the radial nerve, in order to separate it from the radial artery."

The situation of the nerves should be accurately marked; for cases occasionally occur, which may induce us to cut the branch of one of the nerves; but the propriety of such an operation, is very questionable. We must not do it in a person who has the slightest symptoms of hysteria, as such cases will probably be very much aggravated by the operation.—I was lately induced, by certain very distressing symptoms, which were distinctly referable to a small tumour in a branch of the radial nerve, to extirpate the tumour; but though the local symptoms were removed by the operation, still I would not like to repeat it; for though my patient had never previously been hysterical, she was affected, for several days succeeding the operation, by a set of symptoms, which, though not actually alarming, were very unpleasant.

After removing the muscles, the joints should be particularly examined, with reference to the subject of dislocation. In this inquiry, the student will find much assistance in the Plans of the different dislocations, which are given in the Operative Surgery, by Mr. Charles Bell.

DISSECTION

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 Practical Anatomy.

We require for it very delicate instruments;—those which are sold in the shops, and which are depicted in Sheldon's Work on the Absorbents, are better than the *fine drawn* glass, which is 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 ; 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, about half an hour previous to its death, upon meal and milk :—there is no necessity for the cruel experiment of tying the duct, and opening the animal, while alive; for, as the action of the absorbents continues for a short time after the animal is deprived of sensibility,—if the duct be then tied, the lacteals will become distended.

In the injection of the lymphatics, for a preparation, our success depends, perhaps, more on the body we choose, that on any other circumstance. It has commonly been said, that dropsical bodies are the best for making lymphatic preparations from; but it will be found, that bodies only slightly anasarcous, if they be emaciated, are much better. In a patient dying of consumption, or of any disease by which the fat of the body has been absorbed, we shall perhaps 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; but we need never expect to 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. It is advised, by some, to make use of magnifying glasses; but these will be found of little or no service, as 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 the 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, for the assistant to see that there are, within his 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 the assistant or the operator to take his eye for a moment off the vessel, without losing it.—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 once we have 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 scissars make a better kind of cut than the lancet; though there is a great deal of nicety required in using them, as they are liable to cut the vessel completely through. 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,—which will regulate the force of the injection. The mouth of the vessel ought to be moistened at intervals, to prevent its getting dry, which impedes the flow of the mercury.

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; as 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 generally appears to be one vessel which fills the gland more quickly than the others; and 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; as 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 inject 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 preserving them in spirits of turpentine, we shall not only avoid the changes of temperature, and the destruction by insects, but add much to the beauty of the preparations.

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, by 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 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. These are distinguished by a simple fasciculus, or single root; that is, a root from one column. These are *imperfect* 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 III^{d}, 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.

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.

FINIS.

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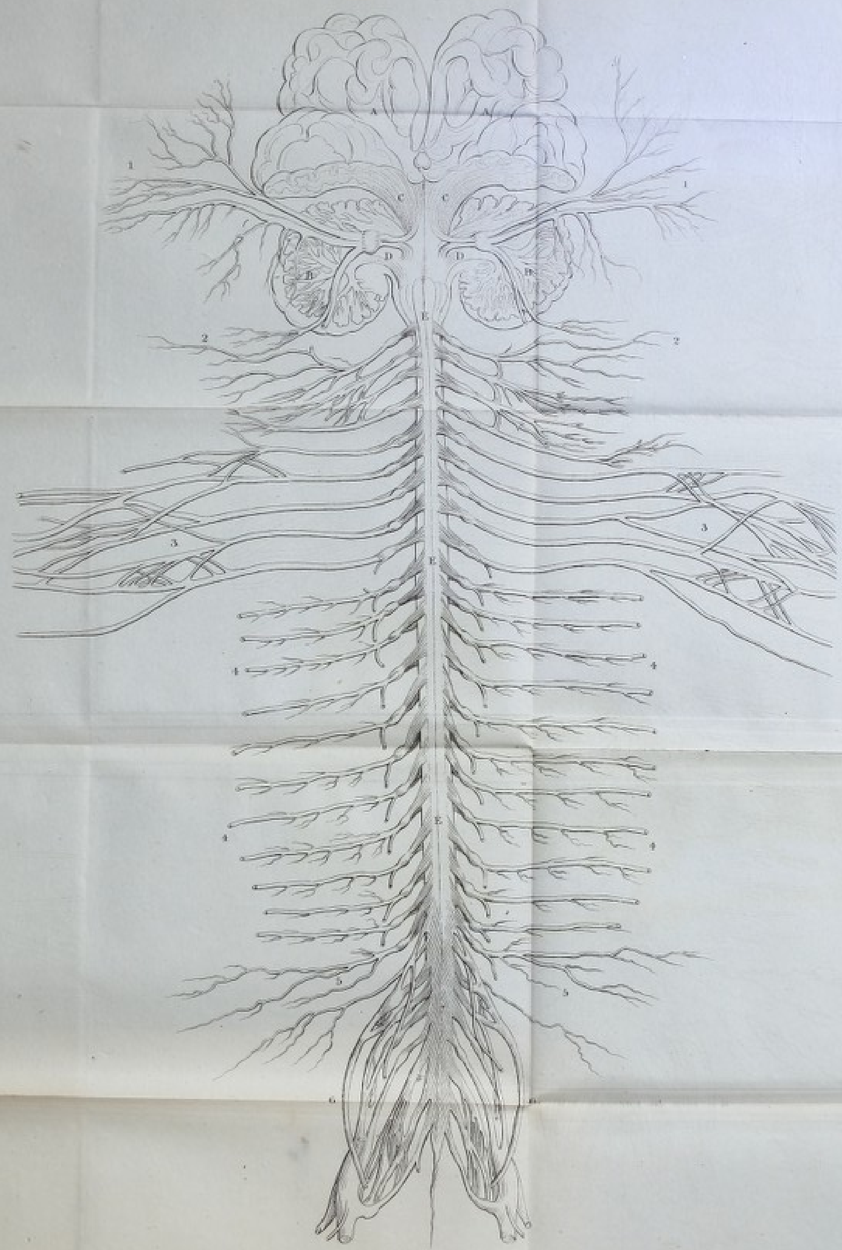

PLATE II.