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PART I.

ORIGINAL COMMUNICATIONS.

ART. I.—*An Account of the Anomalies of the Muscular System, met with in the Dissecting-room of the University during the years* 1846–1847; *with general Remarks.* By C. H. HALLETT, Surgeon, Demonstrator of Anatomy in the University of Edinburgh.

IN giving the following account of the various irregularities of the muscular system that have been noticed in the dissecting-room of the University during this and the preceding year, it is incumbent on me to state that I have been actuated not so much by the desire of describing some anomalies, which would appear to have hitherto escaped the notice of anatomists, as by the wish to increase the number of facts already recorded concerning those which are better known, and at the same time to draw the attention of those who have opportunities of making similar observations to the interest attached to the subject, not only in a teratological, but also in a physiological and practical point of view.

Musc. Retrahens Aurem.—In three subjects* a remarkable

* As frequent mention will be made of the number of times that certain anomalies were observed, and of the relative frequency of some others, it may be as well to mention that the number of subjects actually dissected in the rooms, from May 1846 to July 1847,—the time over which my observations extend—was one hundred and five.

development of this muscle has been observed. The lower fasciculi, generally attached to the base of the mastoid process, had united into a round-bellied muscle, which was attached to the occipital protuberance, and to the inner part of the superior curved line of the occipital bone, on the one hand, and to the *concha auris*, distinct from the upper fasciculus, on the other. It lay in a sheath formed of condensed cellular membrane between the tendons of the occipito-frontalis and the sterno-cleido-mastoid muscles, and was supplied by the same branch of the posterior auricular nerve that is furnished to the former muscle.

In many other subjects a tendency to the formation of this abnormal muscle has been indicated, by some of the lower fibres of the *retrahens aurem* passing on to the occipital bone,—a slight form of the anomaly noticed by most anatomists.

Musc. Depressor Anguli oris.—This muscle was frequently anomalous. In several instances the more superficial fibres of this muscle, on both sides of the face, were not attached to the lower jaw, but arched inwards, downwards, and forwards, beneath the chin, and became continuous with each other in the mesial line immediately below and behind the *symphysis menti*. Where this anomaly existed, the two muscles in unison seemed to form a sling which supported the chin.

The abnormal fibres were always interlaced with the innermost fibres of the *platysma myoides*, and in such a manner that, without dissection, they might be mistaken for fibres uniting the *platysma myoides* of opposite sides. Fleischmann,* Gautzer,† Meckel,‡ and others, have noticed and described such fibres; but I have no doubt, from my own dissections, that they constituted the anomaly just described, especially as they make no mention of it in their works. Cast, No. 1.§

Musc. Digastricus.—This muscle presented very frequently—about once in every fifteen subjects—a third belly, and that always on both sides of the neck. The belly commenced by a short flattened tendon at the anterior part of the reflection of the tendon, between the two normal bellies. The muscular fibres fixed to this tendon spread out into a pretty thick fan-shaped muscle, passed obliquely forwards, inwards, and upwards, and terminated by uniting, in the mesial line of the neck, with the corresponding fibres of the opposite side. The superior fibres

* Erlangen Abhandlung, vol. i. p. 28.

† Dissertatio anatomica musculorum varietates sistens, page 6.

‡ Handbuch der Menschlichen Anatomie, translated by Jourdan and Breschet. Myologie, artic. iii.

§ I have thought proper to notice those varieties of which casts have been taken. The casts are placed in the Museum of the University, where they may be inspected by those who have an interest in the subject. The numbers refer to the numbers on the casts.

were always the longest, and in one instance ascended to within a line or two of the *symphysis menti.* I have succeeded, on several occasions, in tracing filaments from the mylo-hyoid nerve into this abnormal belly.

This anomaly has been noticed by many anatomists; is said by Meckel to represent the normal condition of the muscle in many of the mammalia; and there can be no doubt that it—the muscle—occupies the place of the supra-hyoid aponeurosis. Cast, No. 2.

Musc. Stylo-Hyoideus. — The insertion of this muscle was found on two occasions to deviate from the normal state. The muscle, near the place where it usually divides to allow the tendon of the digastricus to pass through it, separated into two portions, the lower of which was inserted into the body of the hyoid bone, while the upper was firmly and inseparably united to the intermediate tendon of the digastricus.

Musc. Omo-Hyoideus.—The varieties in the attachment, the position, and the number of bellies of the omo-hyoid muscle, were frequently met with in various grades of complexity, the simplest as well as the most complicated being of the greatest importance to the surgeon, in consequence of the material alterations induced by them in the boundaries and relations of the principal surgical regions of the neck.

The first variety, one affecting the position of the posterior belly, was caused not by any fault in the muscle itself, but in the layer of the deep cervical fascia which ties the intermediate tendon down and preserves the angular direction of the muscle. The variety in question was very frequently met with, being found about once in every five subjects, and consisted merely in the posterior belly of the muscle being brought nearly, if not in contact, with the clavicle, by the layer of the cervical fascia just alluded to. It of course entirely did away with the posterior inferior triangle of the neck, and it appeared to form the transition between the normal state of the muscle and the next variety.

The second variety, the first of those causing an alteration in the attachment of the posterior belly, although more rare than the preceding, was far from being uncommon, inasmuch as it was met with about once in every fifteen subjects. The posterior belly in those cases had a direct attachment to the posterior face of the middle part of the clavicle, by means of muscular fibres distinct from those coming from the scapula, and in some cases forming a distinct belly, the fibres of which, however, mingled with the proper fibres of the posterior belly, before the intermediate tendon was produced. In the latter case an additional belly appeared to be superadded, but in all, the posterior inferior triangle of the neck either did not exist, or its appearance was very mate-

rially altered. Albinus* has described this variety. Kelch† has also noticed it, with this modification, that the portion attached to the clavicle was intermixed with tendinous fibres.

The preceding variety would appear to be a transition from the first to another still more grave, in which the posterior belly of the muscle is attached to the clavicle, and not to the scapula. In such anomalies it was observed that no intermediate tendon existed, but that the muscle consisted of a single broad and flattened belly, passing obliquely from the middle of the clavicle to the hyoid bone, or uniting with the fibres of the sterno-hyoid muscle about midway between the hyoid bone and the sternum. In either case the subclavian artery was entirely concealed. This variety was but rarely seen. It has been noticed by Albinus‡ and others. Cast, No. 3.

All the varieties just described affected only the boundaries of the posterior triangle of the neck. There were others, however, which altered the boundaries of and the relations of the parts in the anterior triangle. These consisted in the total deficiency of the anterior belly of the muscle, or in the absence of the muscle, the former having been seen twice, the latter once, and then only on one side of the neck. In both varieties the sterno-hyoid muscle was always much broader and thicker than usual, and appeared to supply the place of the omo-hyoid or its anterior belly, by sometimes being attached to the clavicle behind the sterno-mastoid. The first of these varieties consisted in the posterior belly terminating in the cervical fascia, near the place where the intermediate tendon usually exists; and the muscle in such cases has been called, I believe by Krause, the coraco-cervical.

Besides these, others were seen, in which the omo-hyoid, while apparently normal, sent off or was connected with accidental slips of muscle. One of these, which has been seen and described by Soemmering,§ was a considerable slip of muscle connected to the omo-hyoid at its origin from the scapula by a short thick tendon, and which, after traversing the subclavian space in contact with and anterior to the brachial plexus and the subclavian artery, was attached by its other extremity, also by means of a short tendon, to the cartilage of the first rib. Another consisted in a very slight modification of the median attachment of the preceding, which, instead of going to the first rib, was fixed to the upper part of the sterno-clavicular articulation. In its course it ran through the very centre of the posterior inferior triangle. In one subject, the posterior belly sent off a slip of muscle which was intimately

* Historia Musculorum Hominis, caput xxxviii. De coraco-hyoides.

† Beitraege zur pathologischen Anatomie, p. 81. See also Winslow's Exposition anatomique de la structure du corps humain.

‡ Loc. cit.

§ De Corporis Humani Fabrica, Vol. iii. p. 113.

blended with the fibres of the sterno-mastoid; and in another, a fasciculus which was partly attached to the transverse process of the sixth cervical vertebra, and partly lost in the substance of the *scalenus anticus.*

Of the numerous varieties in the extent of the attachment of the different bellies, in the size and development of the intermediary tendon, and in the dimensions of muscle, it is unnecessary to say anything, inasmuch as they are of no importance.

Musc. Sterno-Hyoideus.—In describing the varieties of the omo-hyoid, it has been stated that conjointly with deficiency wholly or in part of that muscle there was an anomaly in the attachment of the sterno-hyoid. This anomaly in the attachment of the sterno-thyroid was observed in two instances to be carried to a much greater extent without any abnormal condition of the omo-hyoid, showing, in fact, that although sometimes associated, the anomalies may be independent of each other. In the two instances just mentioned, the muscle on both sides of the neck, instead of being attached to the sternum and first rib, was fixed to near the middle of the clavicle. The direction of the muscle was consequently altered considerably; it was more oblique than usual; and in consequence of this, the common carotid artery and the internal jugular vein were completely concealed by muscle until they had emerged from behind the omo-hyoid. Kelch* has also noticed this remarkable and important anomaly. Cast, No. 4.

This muscle was observed on several occasions to be intersected by one or more tendons, either partial or complete.

Musc. Sterno-Thyroideus.—This muscle, like the preceding, was occasionally intersected by partial or complete tendons. The principal anomaly, however, was found in a subject in which the greater part of the muscles had been transformed into fat. The muscle in it was double throughout its whole extent—the abnormal one being smaller and superimposed on the other—a complete cellular interval separating the two. A tendency to this was observed on two other occasions; the muscle being double below, but single above. The muscle also presented a fissure in its lower part, exhibiting a tendency to the formation of a double muscle, by splitting in the direction of its length.

The former of these anomalies has been noticed by Gunz.† The latter is described with some others by Soemmering.‡

Musc. Glandulæ Thyroideæ.—This muscle, which is not always described in works on anatomy, and appears to have escaped the notice of Albinus, must be considered an abnormal development, inasmuch as it is but seldom met with, and even then is extremely variable. The most usual form in which it presented

* Loc. cit. page 32.

† Mem. de l'Academie des Sciences, vol. i. page 286.

‡ Op. cit. page 116.

itself was as a fasciculus of muscular fibres placed in the mesial line of the neck, and stretching between the hyoid bone and the isthmus of the thyroid gland. It appeared as an unsymmetrical muscle; but that it is to be considered as a double muscle in which the line of separation cannot always be distinguished, appears to be proven by some of its varieties. Thus, in some subjects it was completely double, each half being in close apposition and mixed up with the fibres of the hyo-thyroid muscle—a circumstance which shows that it is an offset of that muscle. In others, the two portions were more closely approximated, either above or below; or again, it was single above and bifid below; or was single below and bifid above. It was sometimes present only on one side; or was fully developed on the one side, but rudimentary on the other.

Musc. Mylo-Hyoideus.—Most anatomists have remarked the occasional intimate connection of this muscle to the intermediate tendon of the digastricus. It was observed by myself to happen about once in every five subjects. An uncommon anomaly of this muscle consisted in its almost total absence, when it was replaced by an increased breadth and thickness of the anterior belly of the digastricus.

Musc. Genio-Hyoideus.—The genio-hyoids had in some subjects become so intimately blended, and the usual cellular interval between them so completely removed, that they appeared as one muscle. This was by no means an unfrequent anomaly, but was only seen in very muscular subjects. The very opposite state of matters was presented by two subjects, also remarkable for the development of the muscular system. In these, the muscle on both sides was double, so that there were four genio-hyoids in all, and neither of these were much, if anything, smaller than the muscle in its normal state. Meyer* has particularly noticed this anomaly.

Musc. Sterno-cleido-Mastoid.—The anomalies of this muscle presented no great variety, but they were far from being uncommon. The most frequent anomaly was an increase in the attachment of the sterno-cleido-mastoid to the clavicle, the fibres extending outwards to near the middle of the clavicle, and in one instance, where it was very thin and broad, to near the commencement of the outer third of that bone. The proportion of this anomaly to the normal state was as one to eight, and in one-half of these, the clavicular portion of the trapezius was also extended so as to meet the sterno-cleido-mastoid, and with it almost entirely concealed the posterior inferior triangle of the neck. In three of these instances, the presence of a third head appeared to have been the cause of this increased attachment. This third

* Beschreibung des Menschlichen Korpers, vol. iii. p. 547.

head was small, and placed between the normal sternal and clavicular heads, and blended with these at variable distances from the mastoid attachment of the muscle.

In some few instances, the sternal and clavicular heads were intimately united at their commencement. In others, they were separated much farther up than ordinary—sometimes to within an inch of the mastoid process.

Rarely, the sternal head, instead of being attached to the sternum, was continuous with the uppermost tendon of a remarkable anomalous muscle, the *musculus sternalis* or *rectus brutarum*, of which particular mention will be made hereafter.

Musc. Trapezius.—This muscle was frequently found deficient either above or below, and in one instance was observed almost altogether absent. In almost all these cases the deficiency was only on one side, and that generally the left. When deficient below, the muscle was attached to eight, nine, or even ten dorsal vertebræ, but sometimes only to three or four. When the deficiency was above, the muscle seldom ascended higher than opposite the spinous process of the second cervical vertebra.

In the subject where it was almost entirely deficient, the trapezius of the left side descended as far as the third dorsal vertebra, terminating on a line drawn from it to the spine of the scapula. From that point a thin but firm fascia was prolonged downwards, which appeared to represent the lower portion of the muscle. Superiorly, the muscular fibres were deficient above the spinous process of the third cervical vertebra.* The trapezius of the right side was also deficient to the same extent above, but descended as far as the spinous process of the tenth dorsal vertebra below. The muscle on both sides was remarkably thin, more especially the left, the fibres of which were scarcely discernible.† Cast, No. 5.

Where the superior portion of the muscle was deficient, the clavicular attachment was always less than usual. Some subjects, however, in which the muscle was remarkably strong, presented a greater clavicular attachment than ordinary, so much so, indeed, in some, as to occupy the middle as well as the outer third of the clavicle, and to come in contact with the outer head of the sterno-cleido-mastoideus.

On two occasions, a large fasciculus was detached from the anterior border of the muscle near its lower attachment, which passed over the posterior inferior triangle, and was attached to the sternal end of the clavicle immediately behind the sterno-cleido-

* Described also by M'Whinnie.—Varieties in the muscular system of the human body.—London Medical Gazette, No. 948. January 30, 1846.

† The trapezius in this condition resembles the trapezius of the Sapajous, in which it scarcely ever descends beyond the second dorsal vertebra.

mastoideus.* It is scarcely necessary to mention that both this and the preceding anomaly cause a marked alteration in the surgical region of which the trapezius forms a boundary.

Musc. Latissimus Dorsi.—The attachment of this muscle to the inferior angle of the scapula was seldom seen, not oftener than once in every four subjects, so that when present it ought to be considered as an abnormal attachment. Its origin from the lower ribs was also variable as regards number. The number of fasciculi attached to the ribs was usually three, in some cases only two, but oftener four. In some of those subjects where it was attached only to the two last ribs, it was attached to the four lower dorsal vertebræ; this variety, however, sometimes existed where the attachment to the ribs was normal. The muscle was observed on three occasions to be fixed to the spinous processes of the eight inferior dorsal vertebræ, but this occurred on one side only.

Besides receiving abnormal bundles of muscle from the *pectoralis major*, of which mention will be made hereafter, it occasionally sent off fasciculi to that muscle. Such fasciculi generally passed off from it near its humeral attachment, and arching forwards over the axillary vessels and nerves, terminated in the tendon of the *pectoralis major.* Meckel† describes this as the normal state of the muscle in the mole and in birds; and Dr Ramsay‡ presumed that it might compress the arteries and nerves during violent exertion, and might account for the liability to swelling of the axillary glands (?) on such occasions in some people.

M. Rhomboideus Major.—The origin of this muscle was observed about once in every thirty subjects to be less than ordinary—the attachment to the spinous processes of the third and fourth dorsal vertebræ being deficient. It was seen in one subject to overlap the origin of the *rhomboideus minor* on both sides of the back, and to be fixed to the spinous process of the seventh cervical vertebra and a small portion of the *ligamentum nuchæ.*

M. Sternalis Brutorum.—The *sternalis brutorum, rectus sternalis*, or thoracicus, as it has been variously denominated by different anatomists, has been seen from its lowest to its highest grade of development. Of all the abnormal muscles in the human body, this is probably the most interesting, on account of its occasional large size, its position and attachments, its general anatomical relations, and its use, and therefore I shall describe at some length those examples of it which have fallen under my notice.

In many subjects a tendency to the formation of this muscle

* This anomaly is figured in Quain's plates of the arteries, plate 25.

† Op. cit., "grand dorsal."

‡ Account of Unusual Conformation of some Muscles and Vessels.—Edin. Med. and Surg. Journal, vol. viii. p. 281. The relative frequency of this variety is stated both by Ramsay and Meckel to be one in thirty, which is pretty correct.

was exhibited by the existence of a firm band of fascia stretching obliquely from the cartilage of the third rib to the sheath of the rectus.* About one in every fifteen subjects presented this band of fascia developed into muscle, which, usually stretching between the points just stated, or being placed more external, and then passing between the second and the fourth costal cartilages superficial to the *pectoralis major*, between it and the fascia, was the lowest grade of development of the muscle seen by myself, and I believe by others.†

The next stage observed by myself was as follows:—The muscle commenced by a strong round tendon attached to the upper and right side of the manubrium, and by muscular fibres which were blended with those of the *pectoralis major* of the same side. The strong tendon soon terminated in a thick muscular belly, which united with the other muscular fibres coming from over the *pectoralis major*, and the whole then passed obliquely downwards and outwards, and to the left side. Having descended as low as the four costal cartilages, the muscle sent off three tendons, which severally attached themselves to the fourth and fifth costal cartilages, and to the extremity of the sixth rib between the attachments of the *pectoralis major* and the *rectus abdominis*, with which some of the muscular fibres were directly continuous. The length of this muscle was above four inches, and its breadth about an inch and a half.‡

Another subject presented the largest and most striking example of this remarkable muscle that has probably ever been observed. The muscle extended from the upper border of the sternum to the ensiform cartilage and sixth rib, and caused a considerable projection on the right side of the chest, visible before the skin was removed, and rendered more apparent by a depression of the lower part of the sternum and a twisting forwards of the ensiform cartilage. It was about six inches long, two inches broad, and half an inch thick.

The muscle arose by three distinct heads. The first or superior head was the largest; it commenced by a rounded tendon continuous with the tendons of the sternal heads of both sterno-cleido-mastoid muscles. The tendon of the left sterno-cleido-mastoid was directly continuous with it, in fact no line of demarcation could be drawn between them; it had but a slight attachment to the sternum, and that only by means of a short thin ten-

* Other anatomists have seen it represented by a thin band of tendon passing between the sterno-cleido-mastoid and abdominal aponeurosis. See Meckel, op. cit. and others.

† An engraving of the muscle at this stage will be found in Haller, Icones Anatom. Fasc. vi. Tab. 1, N.

‡ Wilde in Commen ariis Petropolitanis, vol. xii. Tab. 8, fig. 5, delineates the muscle at this stage.

dinous band which passed outwards, and seemed to belong as much to the *sternalis brutorum* as to it. The attachment of the right sterno-cleido-mastoid to the sternum was more complete, although its appearance was similar to the left; its continuity with the tendon of the *sternalis brutorum* was not so easily demonstrated as that of the left, but was shown by pulling either tendon. The second or middle head arose tendinous from the upper part of the manubrium to the left of the mesial line, and was connected by slips of tendon to some fibres of the *pectoralis major* of the left side, and also to the superior head. The third or inferior head, also tendinous, arose from the sternum opposite to the third costal cartilage, the fibres of the tendon interlacing with the fibres of the anterior chondro-sternal ligaments, which were unusually well developed.

The muscular bundles attached to these tendons formed a large mass of muscle which passed obliquely downwards and outwards for some distance, and then suddenly turned inwards towards the mesial line. The muscle was inserted by numerous fasciculi into the lower costal cartilages, into the abdominal aponeurosis, the ensiform cartilage and the costo-ziphoid ligaments, all the fasciculi passing off from its posterior aspect. The muscular fibres connected with the middle head attached themselves principally to the third costal cartilage, but were also prolonged over it to the fourth costal cartilage. The fibres belonging to the superior head fixed themselves to the fourth, fifth, and sixth costal cartilages, each fasciculus sending off a tendinous prolongation to the cartilage immediately below. The remainder of the muscle was attached to the sheath of the rectus, which in this instance was strengthened by an arched band of tendinous fibres crossing it transversely to the fifth and sixth anterior chondro-sternal ligaments, to the costo-ziphoid ligament and to the ziphoid cartilage, the fasciculi attached to these parts severally passing over and external to each other, and being arranged like a series of steps.

The third, fourth, and fifth intercostal nerves supplied the muscle with nervous influence. They entered it by its posterior surface. The intercostal and mammary arteries supplied it with blood.* Cast, No. 6.

The smaller muscles have been seen several times double on

* There are many other modifications of this muscle which have not come under my notice, and which I have, therefore, abstained from mentioning. Those who are desirous of knowing more concerning it will find notices of it by Sandifort—de musculis nonnullis qui rarius occurrunt, in the Exerc. Acad. vol. i. cap. 6, page 82–88; by Meckel—De monstrosa duplicitate, 1815, page 38–40; by Kelch—op. cit. page 33; and besides those already mentioned, they will find engravings in Novi. Comment. Petroph. vol. ii. tab. 2, fig. 11; and tab. 12; by Abr. Kaau-Boerhaave; and by Rosenmuller, in Neuflamm and Rosenmuller's Beitrage fur die Zergliederungskunst.

one side, and sometimes on both sides, but I have never met with more than one of the larger muscles in the same subject.

The *sternalis brutorum* is presumed to be a more or less perfect repetition of the *rectus abdominis* and of the sterno-cleido-mastoideus, with both of which muscles it is, as just shown, sometimes continuous. The analogy is most striking in some cases where the muscle prevents tendinous intersections, as observed by Meckel,* and seen once by myself. It is also supposed to establish a relation between man and animals where the *rectus abdominis* is sometimes prolonged upwards.

When fully developed, it can aet as an elevator of the ribs, and, as I shall show when I come to speak of the use of supernumerary muscles in general, may be of great service under certain circumstances, by acting as a muscle of inspiration.

Musc. Pectoralis Major.—Besides having an abnormal attachment to the *latissimus dorsi* by means of fasciculi detached from the latter muscle, the *pectoralis major* occasionally sent off slips of muscle to the *latissimus dorsi.* These were for the most part small, and undeserving of any particular notice; some, however, were large and remarkable.

In one subject the greater part of the base of the axilla was floored with muscular fibres, part of which belonged apparently to the *pectoralis major*, and part to the *latissimus dorsi.* A large and broad fasciculus of muscular fibre arose from the anterior extremity of the sixth and seventh ribs, and from the intercostal space between, and ran outwards across the axilla, immediately behind the *pectoralis major*, of which it appeared to be a part, and from which it was separated by a cellular interval. Near the middle of the axilla it was joined by a larger and broader mass of muscle detached from the *latissimus dorsi,* which being about two inches broad and three inches in length, came partly from the tendinous, partly from the muscular portion of the *latissimus dorsi.* The muscular fibres, however, were not continuous, for short tendinous fibres intervened between them. The two having united, an aponeurotic tendon was formed, which passed under the *pectoralis major*, and attached itself to the tendon of that muscle and to the fascia of the arm. It may be as well to mention that the *latissimus dorsi* in this subject arose from a rib more than ordinary, and that it was to that portion attached to the ninth rib that the accessory slip was united. Cast, No. 7.

A detached portion of the *pectoralis major* in another subject took the following remarkable course. It came off from the fifth and sixth ribs, immediately behind the *pectoralis major*, to which it sent several small fasciculi, and with the axillary border of which it was confounded. Coursing across the axilla behind and

* Loc. cit.

below the *pectoralis major*, it at length reached the bicipital groove, where the muscular fibres terminated in a flat arched tendon, which immediately divided into three portions. One of these united with the tendon of the *pectoralis major*, at its insertion into the anterior bicipital ridge. Another ascended for a short distance, and then subdividing into several small slips, was inserted into the greater and lesser tuberosities of the humerus, and into the upper part of the bicipital ridges. The third portion passed downwards and inwards over the biceps flexor cubiti, the brachial artery, and median nerve, and behind the basilic vein and internal cutaneous nerve, became slightly confounded with the aponeurosis of the arm, and was ultimately inserted into the internal condyle of the humerus. It was connected with the internal intermuscular septum, immediately after it had passed over the brachial artery and the median nerve, and the two united produced a semilunar border, the concavity of which looked upwards and embraced the artery and nerve. A great number of large fasciculi of the internal head of the biceps extensor, which was much larger than usual, arose from the tendon, from the point of union between it and the internal intermuscular septum to its attachment to the internal condyle of the humerus.* Cast, No. 8.

Both this and the preceding anomaly altered the relations of the parts connected with the surgical anatomy of the axilla, and there is no doubt that the former, under certain circumstances, must have impeded the circulation through the limb. The lower tendon, or at least a part of it, represents the humeral foramen, seen in the carnivora and sometimes in man.

Musc. Serratus Magnus.—This muscle in one subject presented a marked deficiency of some of the middle fibres, whereby the upper and lower portions of the muscle were separated from each other by a considerable interval. The portion deficient was that normally attached to the fourth and fifth ribs. The deficiency of the digitations attached to the ninth and tenth ribs was observed in two subjects on both sides of the body.

Musc. Biceps Flexor Cubiti.—Strange as the statement may seem, it was by no means an uncommon thing to meet with a biceps having three heads. Thiele† remarks that a third head is found once in every eight or nine subjects, but this does not coincide with my observations which give the proportion of one in fifteen. All the examples of it that I have seen have been remarkably regular in their attachments, considering the variations

* This variety is noticed by Thiele, Encyclopedia Anatomie, vol. iii. p. 302. By Cruveilhier, Anatomie Descriptive, translated by Madden, vol. i. note, p. 285, in a modified form.

† Op. cit. vol. iii. p. 217.

to which it appears liable, according to the observations of the continental anatomists.

The third head in every instance arose from the middle of the humerus on the outer side of the *coraco-brachialis* muscle, between its insertion and the origin of the inner head of the *brachialis anticus.** It was usually broad, thick, and fleshy, but seldom equalled the other heads in bulk, although in more than one instance it was so large as nearly to equal the two normal heads combined. Passing down the arm, it united with one of the normal heads, sometimes with the long, sometimes with the short head, and the three combined were inserted in the usual manner. Cast, No. 9.

In one subject an abnormal muscle was met with, which appearing to me to be a modification of the anomaly just described, I shall describe in this place. The muscle arose from the same place as the third head of the biceps sometimes does, namely, from the outer border of the *coraco-brachial* ridge on the humerus. It is broad and thick, but did not unite with either of the heads of the biceps. Descending to the fore-arm, it was inserted into the aponeurosis of the fore-arm by means of a thick tendon, which crossed over the brachial artery and median nerve about half an inch above the tendon of the biceps, and which, before blending with the antibrachial aponeurosis, had spread out into a thin semilunar band, similar to and above that of the biceps, which was of its usual size and in its normal position. Although this muscle was distinct from the biceps throughout its whole extent, yet its attachments proved it to be a third head of that muscle. The upper attachment, as before stated, was that of the third head; and the lower, although different from that usually seen, yet coincided with one of the normal insertions of the biceps. The anomaly represents that unfrequent variety in the biceps where the long and short heads, instead of uniting, pass separately to their insertion. Cast, No. 10.

It may not be uninteresting to mention, that when a third head exists it is supplied by a distinct twig from the musculo-cutaneous nerve. The muscle just described received the twig supplied to a third of the biceps, thus establishing a further analogy between them. And it may further be mentioned, that the anomaly is a repetition in the arm of the small head which properly belongs to the *biceps flexor cruris*, and that it represents, in some respects, the normal state of the muscle in birds.†

Meckel has remarked that the biceps sometimes has as many as five heads, and this anomaly, though somewhat different from

* Since this paragraph was written, I have observed the third head arising on the inner side of the *coraco-brachialis*.

† Meckel, op. cit. muscle biceps brachial.

that noticed by him, was observed in both arms of a subject remarkable for the number of irregularities in the muscular system. The two normal heads were in every respect regular. The third head, though somewhat smaller than usual, arose from the same part of the humerus as those already described, and terminated in the short head a little above the bend of the elbow. The fourth head arose by a long thin tendon from the capsular ligament of the shoulder-joint, and descending the arm between the long and the short head, blended its fibres partly with the one, partly with the other. The fifth head was of smaller size than the rest; it arose from the outer surface of the humerus beneath the deltoid, and between the long head of the biceps and the outer head of the triceps, and soon became lost in the long head. Each of these heads received a twig from the muscular division of the musculo-cutaneous nerve, with the exception of the fifth, the fibres of which were supplied with nerves immediately after they had joined those of the long head. Cast, No. 11.

Palmaris longus.—This is one of the most irregular muscles in the human body, and consequently numerous abnormal conditions of it were observed. The most common of these was its total deficiency. It was deficient in both extremities once in every three subjects, and in a considerable moiety of the remainder it was deficient in one or other of the extremities. In some of the subjects, in which the muscle could not be said to exist, its place was filled up by slips from other muscles. The *flexor sublimis digitorum* often detached a slip of muscle, sometimes of large, sometimes of small size, to which a thin, long tendon passed on to the annular ligament and palmar aponeurosis. This, indeed, was the most frequent way in which the *palmaris longus* was replaced, but not the only one. Sometimes the *flexor carpi ulnaris* detached the slip of muscle and tendon; and sometimes, but more rarely, this was done by the *flexor carpi radialis.* The most remarkable arrangement, however, was the following:—A small tendon was attached to the outer surface of the anti-brachial aponeurosis about midway down the fore-arm; to this a fusiform mass of muscle succeeded, which again becoming tendinous as it approached the annular ligament, was fixed to the palmar aponeurosis. This was seen only in one subject, but in both arms. Cast, No. 12.

In some few instances where the muscle was more highly developed than usual, it exhibited a tendency to divide in the longitudinal direction into two. This was evinced by the tendon being double, one portion being attached normally, the other being fixed either into the *os pisiforme*, or blended with a part of the tendon of the *extensor ossis metacarpi pollicis.* In one instance the separation was complete throughout the whole extent of the muscle, a process of the fascia of the fore-arm intervening between them

above; both muscles, however, were inserted into the annular ligament and palmar aponeurosis.

Another subject presented the *palmaris longus* divided into three separate muscles. The central muscle, the largest of the three, passed into the annular ligament; the internal one was inserted into the *palmar aponeurosis*, and the external one into the base of the metacarpal bone of the thumb.

Flexor sublimis digitorum.—Besides occasionally replacing the *palmaris longus* when absent, and sending slips to the deep flexors of the fingers, this muscle on three occasions was found to be deficient in a slight degree, namely, in the tendon to the little finger; it was not, however, replaced by the *flexor profundus*, as noticed by many anatomists.

Many other minor anomalies of this muscle were observed, but require no mention.

Flexor longus pollicis.—An anomaly of this muscle very frequently observed was the existence of a second head, if the term may be used, fixed to the internal condyle of the humerus, which was sometimes fleshy at one end and tendinous at the other, or tendinous at both ends and fleshy at the middle, and sometimes altogether tendinous. Another not unfrequent anomaly was the receipt of fibres from the *flexor profundis digitorum*, and from the *flexor sublimis* also. In one subject this muscle appeared to arise by three distinct heads, each of considerable size. The first of these was the normal one; the second came from the internal condyle of the humerus; and the third consisted of a short, thick, fusiform muscular bundle, which came from the posterior surface of the *flexor sublimis*, and joining with the second head, united with the first. The appearance and arrangement of the muscle in this subject was very remarkable. Cast, No. 13.

Pronator quadratus.—In one subject the *pronator quadratus* not only had its usual attachments, but also sent off a considerable fasciculus from its lower border, which ran over the carpus behind the flexor tendons, and terminated in a tendon to which a considerable number of the fibres of the deep head of the *flexor brevis pollicis manus* were attached.

Another subject presented the muscle divided into two in the direction of its fibres. The superior portion was attached normally to the radius and the ulna, but the lower portion arising from the ulna, coursed under the annular ligament, where it became tendinous. The tendon, on gaining the palm of the hand, passed between the tendon of the long flexor and the deep head of the short flexor of the thumb, a bursa intervening, and was inserted into the base of the metacarpal bone of the thumb. There can be little doubt that this abnormal fasciculus must have been a very efficient adductor of the thumb.

Extensor Carpi Radialis Brevior.—This muscle occasionally

exhibited a tendency to split in its longitudinal direction, the tendon being double. In those instances the two tendons were both inserted into the metacarpal bone of the third or middle finger, the one a little in advance of the other. In one subject this tendency was carried to a much greater extent, so much so as to separate nearly the whole of the muscle into two unequal parts.

Entensor Communis Digitorum.—The anomalies of this muscle were very numerous, and all related to the number of tendons supplied to the fingers, there being sometimes a deficiency, but more frequently a redundancy. Whenever a tendon was deficient, it was invariably found to be that normally furnished to the little finger, and was in some cases partially replaced by fasciculi detached from the *flexor carpi ulnaris*, or by the larger size or even duplicity of the proper extensor of that finger.

When supernumerary tendons existed, it appeared to be in consequence of the splitting of the innermost tendon, and sometimes even part of the muscle; the supernumerary tendon being united to the extensor tendon of the ring finger, and sometimes sending a slip to the extensor tendon of the middle finger, in which case the tendons on the back of the hand were doubled, as they are on the foot.

Extensor Minimi Digiti.—The *extensor minimi digiti* was occasionally deficient, and in those cases was replaced by an additional tendon from the *extensor communis*, or more rarely by fasciculi from the *flexor carpi ulnaris*. More frequently, however, this muscle presented two tendons, or was even divided into two completely distinct muscles, excepting that they were not separated from each other by an aponeurotic septum. In either case the insertion of the tendons was the same, one of them passing to the little finger and uniting with the tendon of the common extensor, the other being especially devoted to the ring finger. This anomaly is stated by Meckel to establish an analogy with many of the mammalia.

Extensor ossis Metacarpi pollicis.—This muscle generally presents a tendency to divide into two parts near its insertion, one part of its tendon being inserted into the base of the metacarpal bone of the thumb, while the other is continuous with the fibres of the short flexor of the same bone; an arrangement which, from its frequency, I believe, with many anatomists, is the normal mode of insertion of the muscle.

This division in the tendon sometimes extended throughout its whole length, and sometimes throughout the muscular portion, so as to divide it into two muscles, the tendon of the innermost being inserted into the base of the metacarpal bone of the thumb, and that of the outermost into the *flexor ossis metacarpi pollicis*. A simple modification of this was observed in one or two subjects, the tendons differing somewhat from the preceding in their mode

of attachment. In these the innermost tendon was inserted normally, but the outermost diverging from the other at the wrist joint, passing superficial to the muscles of the thumb, and gaining the palm of the hand, was lost in the outer border of the *palmar fascia.**

Extensor Indicis.—A very common anomaly of this muscle was its division into two distinct muscles, one of which passed to the index finger and united with the common extensor tendon, while the other went to the middle finger, which was therefore provided with a proper extensor muscle. The muscle destined for the middle finger was always smaller than the proper *extensor indicis.*

This irregularity was the most complete one met with; many minor grades of it were noticed, which owe their interest chiefly to the circumstance that they show the exact nature of the higher anomaly. These irregularities were similar to those already described in the case of the other extensors of the fingers, and were simply division of the tendon into two, both of which passed to the index finger, or one to the index, the other to the middle finger; or, again, partial division of the belly of the muscle as well as the tendon.

The proper extensor of the middle finger is, therefore, in all subjects in which it exists, merely an offset from the proper extensor of the index finger. The muscle, on such occasions, may have an attachment to either of the bones of the fore arm, that most usual being to the ulna. It was seen once to arise from the radius.† This proper extensor of the middle finger was seen to subdivide into two, the second passing to the ring finger, so that each finger in the hand had a proper extensor, and the arrangement of the extensor tendons in the hand became nearly the same as that of the extensor tendons in the foot.—Casts, Nos. 14, 15.

These anomalies are interesting, inasmuch as they represent the normal state of the muscle in many of the mammalia, especially the apes.‡

Adductor Pollicis.—This muscle in one in every thirty subjects was divided into two unequal portions. The superior division was attached to the *os magnum*, and also to the base of the metacarpal bone of the third finger. The inferior division quite distinct, and removed at a distance from the superior, arose from the distal extremities of the third, fourth, and, in two instances, from the fifth metacarpal bones, passed across the palm of the hand in

* This anomaly resembles the normal state in the beavers, which have the muscle double.

† Meckel has also seen this attachment to the radius, and Soemmering mentions it.

‡ The opossum, the seals, the loris, and the makis, also present a more or less complete division of the *extensor indicis* into two, one part going to the index finger, the other to the middle finger.

a transverse direction, and was inserted into the internal sesamoid bone on the first phalanx of the thumb. So complete was the division of this muscle, and so great was the space intervening between the two portions, that they appeared to be separate and distinct muscles, the one being the proper adductor of the thumb, the other a *transversus manus*, the analogue, as it most assuredly is, of the *transversus pedis*.—Cast, No. 16.

That the *transversus manus*, where it exists, is a mere offset of the *adductor pollicis* was shown by the muscle in one instance, arising near the centre of the metacarpal bones; and in another by its being separated from the *adductor pollicis* by a very slight cellular interval.

Flexor brevis minimi digiti.—The short flexor of the little finger arose in one subject by two distinct heads. The first or short head was the normal one, and arose from the unciform bone, as usual. The second or long head was situated principally in the fore arm. It arose from the commencement of the lower third of the inner border of the ulna, by means of a short tendon, to which a long fusiform muscular belly succeeded. This belly coursed over the *flexor carpi ulnaris*, the ulnar artery and nerve, passed beneath the annular ligament, and then turning outwards, united with the short head midway between the unciform bone and the first phalanx.—Cast, No. 17.

Palmaris brevis.—This muscle is said to be frequently deficient, but I believe erroneously. Whenever it was looked for, it was invariably found, although not so highly developed in some cases as in others, for it often consisted of but one or two small fasciculi of fibres mixed up with and concealed by the fatty tissue of the hypothenar eminence.

Triangularis sterni.—This was a most irregular muscle. In several subjects the whole muscle was deficient on one and sometimes on both sides. In others the upper part was wanting, and in a few the lower fasciculi could not be found. A large proportion of the subjects, about one in four, presented the usual tendinous attachment between it and the *transversalis abdominis*, transformed into muscle, so that the fibres of the two were directly continuous, and no line of demarcation could be drawn between them. So common is this anomaly, that it has been proposed to call this muscle with the *transversalis abdominis* the *sterno-abdominalis*,* but this could not be permitted, since the connection between them must be considered an irregularity.

The irregularity shows that the *triangularis sterni* is a repetition of the *transversalis abdominis* in the chest, and that the usual mode of describing its attachments should be reversed.

* Rosenmuller. De nonnullis musc. corp. hum. varietatibus.

Obliquus internus abdominis.—Complete or incomplete tendinous intersections of this muscle were not unfrequently observed. In one subject, in which they were remarkably well developed on both sides,* there were three of them, one opposite the ninth rib, another opposite the eleventh, and the third opposite the twelfth. They were all continuous with the anterior extremities of these ribs.

These intersections afford additional evidence in favour of the very general opinion that the internal oblique muscle corresponds to, and is a repetition of, the internal intercostal muscles, since the intersections are representatives of abdominal ribs.

Pyramidalis.—This muscle was deficient on both sides once in every four subjects,† and was wanting on one side in a moiety of the remainder. In these cases the *rectus abdominis* was always broader on one or both sides. One muscle was found to be always longer than the other, and this was most frequently the case with the right. It was observed once to be double on both sides, but all four muscles were very small, although distinct.‡

Psoas Parvus.—The most contradictory statements are made with regard to the frequency of anomalies of this muscle. Thus Soemmering§ states that it is often absent; Thiele‖ believes that its absence should be considered the normal state; and Meckel¶ remarks, on the contrary, that it is rarely wanting. I have carefully examined all the subjects dissected in the rooms, and found that the *psoas parvus* was more frequently present than absent, although the proportion was very nearly as one to one, the numbers being 61 to 54.

The sex of the subject has been presumed to exercise an influence over the presence of this muscle, but here the most opposite statements have been made. Winslow** and John Bell†† both state that they have met with it more frequently in females than in males; whilst Riolan‡‡ asserts that he has never seen it in females. My own observations show that the sex has nothing whatever to do with its presence or absence, for it was as often deficient in the female as in the male.

Pyriformis.—About one in every twenty subjects presented this muscle divided into two unequal portions, a superior and an inferior, between which the peroneal division of the great sciatic nerve passed. In one subject it was divided into three portions, the sciatic nerve being also divided into three fasciculi, two of which passed between the divisions of the pyriformis.

* Soemmering states that he has only met with them on the left side in man. Op. cit. p. 146.

† This muscle is generally considered to be rarely abnormal.

‡ This is a very rare anomaly; it is mentioned by Sabatier, Traité complet d'Anatomie, Vol. i. p. 263.

§ Op. cit. p. 291. ‖ Op. cit. p. 284. ¶ Op. cit. m. petit psoas.

** Exposition anat. struct. corp. hum., Vol. ii. p. 211.

†† Anatomy of the bones, p. 341. ‡‡ Anthropographia, Vol. v. p. 508.

I may mention here, that the origin of this muscle from the upper part of the sciatic notch (posterior inferior spinous process of the ilium) has been described as an anomaly. If it were such, I should have to state that it was frequently met with, but I believe with the greater number of anatomists that this attachment is normal, it being more common to find it present than absent.* This portion of the muscle was sometimes unusally large, and was, in such instances, generally united with the *glutæus medius*, and then the two appeared to be one muscle.

Gemelli.—The superior gemellus was often found deficient; and, more rarely, was of larger size than usual. The inferior gemellus was observed to be deficient on two occasions. It was more frequently increased in size. The former of these anomalies is stated by Vicq d'Azyr,† to establish an analogy with the apes.

Quadratus Femoris.—This muscle, which is generally supposed to be often deficient, was only found so once; and, in that instance, was associated with an unusual development of the two gemelli and the *obturator internus*. It may be interesting to remark that this anomaly represents the normal state in the Cheiroptera and in the Myrmecophaga.—Cast, No. 18.

Sartorius.—The sartorius was observed to have a tendency to divide into two muscles in the direction of its length on two different occasions. On one of these, the lower half of the muscle was divided into two parts, an anterior and a posterior, both of which were inserted into the inner tuberosity of the tibia, one above the other. The other was a modification of this, the posterior portion being inserted normally, while the anterior was inserted into the *fascia lata*, over the lower part of the *vastus internus*, and into the *ligamentum patellæ*. It may be stated that the muscle in both instances was unusually broad, and that the long saphenus nerve passed from the thigh into the leg between the two portions of the muscle.

Biceps Flexor Cruris.—No anomalies proper to this muscle were noticed, but the following supernumerary muscle having a connection with it, I have thought proper to describe it in this place. The muscle in question consisted of a band of fibres about three quarters of an inch broad, which passed from the middle part of the short head of the *biceps flexor cruris*, over the commencement of the middle third of the popliteal artery and vein, between them and the popliteal near to the inner and posterior side of the rounded tendon of the *adductor magnus*, to which it was attached. The relation of this muscle to the popliteal vessels is interesting, in consequence of its passing over and concealing that part of the artery to which a ligature is generally applied.

* This attachment was seen in nine out of every ten subjects.

† Ency. meth. syst. des quadrup., p. 29.

Peroneus tertius.—This muscle is one of those which present every gradation of size, being sometimes of great strength, at other times altogether absent. The only instance I have met with in which the latter anomaly existed, was in a subject remarkable for the great number of anomalies by excess in the muscular system, amongst which were a three-headed biceps, a *sternalis brutorum*, a double extensor of the metacarpal bone of the thumb, and a proper extensor for the middle and another for the ring finger. I mention this circumstance because I shall have to refer to it hereafter. Thiele,* in noticing an anomaly of this muscle, remarks, that the muscle seems sometimes wanting, because we do not perceive a special tendon for the posterior part of the metatarsus; and, moreover, that the muscular fibres are then not less dispersed than ordinary, only they unite with the external tendons of the long common extensor of the toes;—a remark which applies not only to deficiency of the muscle, but in a minor degree to all other anomalies of this muscle.—Cast, No. 19.

Peroneus Brevis.—Before describing the anomalies of this muscle, it will be necessary for me to make a few remarks concerning what I conceive to be a part of the normal insertion of this muscle. Thiele† has enumerated, amongst the anomalies of the *peroneus brevis*, a tendinous slip passing from behind forwards along the dorsum of the foot, covered by the tendon of the third peroneal muscle, to gain the little toe. Now this slip of tendon, detached from that of the *peroneus brevis*, I have found in a modified form in four out of every five subjects; if, therefore, we are to take the comparative frequency of its presence as evidence, it must be allowed to be normal. The modification to which I allude is, that it does not pass into the toe itself, but is united to the outermost tendon of *extensor longus digitorum pedis* over the metarso-phalangeal articulation.‡

This tendinous slip was observed to be occasionally converted into muscle at its posterior part, and was then found to be of larger size than ordinary. In one instance the tendinous slip came off from the *peroneus brevis* near the middle third of the leg, and presented in its centre a long fusiform muscular belly, which extended from opposite the ankle joint to the middle of the fifth metatarsal bone, the tendon terminating as usual in the long extensor tendon of the little toe. In another instance of the anomaly, the muscular portion commenced directly from the tendon

* Op. cit. p. 311. † Op. cit. p. 326.

‡ I find in my note-book the following extract, but from what work I took it I cannot say, but I believe it to be from Meckel's Anatomie Compàree. "Chez l'homme, le tendon du court peronier se divise *communement* en deux, dout l'un se fixè à la tubèrositè du cinquieme mètatarsien, l'autre au bord externe du quatrième tendon du long extenseur des orteils et au quatrième muscle interosseux superieur." A remark which closely coincides with my own observations.

of the *peroneus longus* at the ankle joint, and, proceeding forwards for about two inches, gave rise to the tendon, which terminated in the ordinary manner.—Cast, Nos. 20, 21.

In more than one subject the tendinous slip was seen to divide into three distinct portions; one portion being inserted into the distal extremity of the fourth metatarsal bone; another into the proximal extremity of the fifth metatarsal bone; and the third into the long extensor tendon of the little toe.

It is interesting to observe, that the development of the supernumerary muscle described above causes the *peroneus brevis* muscle in the human body to resemble in some degree the normal state of the muscle in the bear, where it consists of two portions, one passing into the fifth metatarsal bone, the other into the extensor tendon of the little toe.*

Plantaris.—In two subjects the following anomaly of the plantaris muscle was observed. The muscle arose from the femur in the ordinary manner, and then descended for about an inch and a half, where the tendon commenced. The tendon departed from the normal state, for, instead of being a long, thin, and slender tendon, it spread out into a broad aponeurosis about three inches in length, which attached itself to the tendon of the gastrocnemius muscle a little above where its tendon unites with that of the soleus to produce the *tendo Achillis.*

Most anatomists, following Meckel, have stated that the plantaris muscle is very frequently deficient, and that it is more often so than its analogue the *plamaris longus.* Now, strange as it may appear, not one subject out of the whole one hundred and five dissected wanted this muscle either on one or both sides, while, as already shown, the *palmaris longus* was often absent. I am therefore inclined to believe that Meckel† must have been mistaken, and that Gantzer‡ was correct when he stated that the plantaris was more constant than the *palmaris longus*, although Meckel§ contradicts the statement in a note.

Soleus.—A double soleus muscle was observed in a subject remarkable for the development of the muscular system. The ordinary soleus muscle was attached in the usual manner, and the only peculiarity noticed was a diminution in point of thickness. The duplicate muscle separated throughout its whole extent from its fellow by means of a large quantity of adipose tissue, arose from the tibia and fibula, and from the deep fascia of the leg by the ordinary attachments of the soleus. The fleshy portion of

* The anomaly also gives the little toe a proper extensor, and causes the hand and foot to resemble each other more closely.

† Op. cit. muscle plantaire grele.

‡ Dissertatio Anatomica Musculorum Varietates Sistens, p. 4.

§ Op. cit. ibid.

this abnormal muscle was well developed and was much larger than the belly of the muscle superimposed on it. The tendon proceeding from its lower extremity was entirely unconnected with the *Tendo Achillis*, was broad, flat, and firm, and was inserted into the upper and inner part of the posterior tuberosity of the *os calcis*, about half an inch anterior to the place of attachment of the *Tendo Achillis*.

A modification of this curious anomaly was met with in two other subjects, the modification resulting from the incomplete separation of the two muscles at their upper part. The duplicate muscle had the same attachments as in the preceding subject, with this addition, the greater number of the superficial fibres of the upper half of the muscle were attached to the deep aponeurosis of the normal soleus. The attachment to the *os calcis* was also slightly different, the tendon being inserted more internally into the posterior tuberosity of that bone. Cast, No. 22.

The duplicate muscle, although not possessing any actual representative in the lower animals, yet seems to have some relation to the normal state of the muscle in the bears and amongst the ferrets, which have the soleus entirely separate from the *Tendo Achillis* and inserted by a tendon distinct from the gastrocnemius into the *os calcis*.

Flexor accessorius longus digitorum pedis.—I thus denominate an anomalous muscle occasionally met with seated deeply amongst the structures at the ankle joint, the back of the leg and the sole of the foot. It was observed to be remarkably regular as regards its general characters, so that the description of one will serve to point out the appearance, direction, and attachments of this muscle.

It arose by a small pointed tendon from the posterior border of the fibula between the *peroneus brevis* and the *flexor longus pollicis pedis* about two inches above the ankle joint. The small tendon soon after expanded into a somewhat broad aponeurosis, which afforded attachment to a considerable number of muscular fibres. These fibres were all connected with the internal surface of the aponeurosis and were soon collected into a long fusiform mass, which passed obliquely inwards and downwards over the peroneal artery to the ankle joint, and then curving forwards over the inner side of the *os calcis*, where it was placed between the posterior tibial vessels and the tendon of the long flexor of the toes, and superficial to the vessels reached the foot. As soon as it had gained the sole of the foot, it terminated in a long rounded tendon, which ultimately attached itself to the tendon of the long flexor of the toes. The *flexor accessorius*, which I have remarked, is more than usually large where this muscle exists, was attached to its tendon before it united with the long flexor.

This muscle was observed to terminate in one subject at the ankle joint, by joining with the long flexor of the toes, but the mode of attachment most frequently met with is that described above.

Transversus Pedis.—This muscle, which, as we have already seen, has no analogue in the hand, except when the *adductor pollicis manus* is abnormally divided into two, often causes the muscles of the thumb and of the great toe to correspond by being deficient. The nature and mode of origin of the "*transversus manus*," as pointed out in a former part of this notice, would appear to indicate that the "*transversus pedis*" is properly an offset of the *adductor pollicis pedis.*

Besides the irregularities just described, many others were noticed, especially amongst the deep-seated muscles of the back; these, however, I have not thought it necessary to mention, since they were for the most part mere variations, dependent on the number of spinous or transverse processes of the vertebræ to which they were attached, and these so variable that it would be difficult to state what was normal what abnormal.

General Remarks.—In the preceding pages a great number of anomalies of the muscular system have been described, many of them being exceedingly common, and some being apparently very rare, yet, in all probability, they do not constitute one tithe part of the irregularities to which the muscular system is liable. Indeed, so common are these irregularities, and so frequently are some of them met with, that a subject in which the muscular system does not deviate in one or more of its parts from what we are pleased to term the normal state is very rarely seen. If we leave out of consideration the *psoas parvus* and the *palmaris longus*, one or other of which are almost always absent where no other anomaly exists, the relation of the normal state to the abnormal would be, according to my own observations, as one to two, or, in other words, only one subject in three would present the muscular system in a perfect state—a circumstance which alone renders an inquiry into the nature of the irregularities one of deep interest.

It is a very uncommon thing to meet with but one irregularity of the muscular system in a subject. Most generally there are three or four of them situated in different parts of the body; and occasionally a much larger number are found. One subject presented no less than seventeen, namely, one in the neck, three in the trunk, eight in the upper extremity, and the remainder in the lower. The general rule, therefore, would appear to be that two or more irregularities in the muscular systems are associated together in the same individual.

That the muscles in the different regions of the human body

are not equally liable to deviate from the normal type will have been noticed during the perusal of the individual anomalies. The muscles of the trunk, excepting those of the back and the *psoas parvus*, appear the least variable, next those of the head and neck, then those of the inferior extremity, and, lastly, the muscles of the superior extremity, the irregularities of which are very numerous and very common. A more attentive examination of them will also show that the conclusions drawn by M'Whinnie* are correct, namely, that those muscles whose functions are the most uniform throughout the animal kingdom are the least liable to deviate, as for instance the muscles of mastication, deglutition, &c. while those which enable the extremities to perform actions peculiar to the different species of animals—as prehension, flying, swimming, burrowing, and so on—constantly vary, amongst which we may mention the *pectoralis major*, the biceps, and the extensor muscles of the fingers in the upper extremity; and the external rotator muscles in the lower. The reason why the muscles of the lower extremity are not so liable to deviate as those of the upper, irrespective of number, is also explained by the law just established, since the former do not undergo such extensive changes amongst the lower animals as the latter;—an explanation which is greatly supported by the difference in the frequency of anomalies in the vascular system and in the osseous system also in the two extremities.

Anomalies of the muscular system may result from many different causes, those of which we have to speak at present being, displacement of one or other extremity of a muscle, an augmentation or a diminution in the number of the muscles, or of the component parts of the muscles, all of which may, in some few instances, be met with in the same individual. Thus, in the subject already mentioned, in which there were no less than seventeen different anomalies, there was one by displacement, namely, the attachment of the sterno-thyroideus to the clavicle and not to the sternum; four by defect, viz. the deficiency of the *palmaris longus*, the *psoas parvus*, the *peroneus tertius*, and the *transversus pedis;* the rest were all anomalies, consisting in an increase of the usual number of muscles, or in an augmentation of the parts of muscles. The association of anomalies by defect with anomalies by redundance in the same individual is, however, not confined to the muscular only, but may be observed in numerous instances of the higher deviations, as in monsters with eventration and in double monsters, in all the other systems of the body. This, as I have pointed out elsewhere,† is one of the most paradoxical as

* Loc. cit. p. 184.

† Observations illustrating the Anatomical Structure and Physiological History of Monsters with Eventration.—Edin. Med. and Surg. Journal, vol. lxviii. p. 303.

well as remarkable circumstances connected with the history of aberrations from the normal state. In the case of the muscular system, there can be no doubt that they result from one and the same cause, namely, some vicious conformation of the ovum; and there is no reason why this should not be the case with all other irregularities, whether slight or grave. I believe it to be an unrefutable argument in favour of the original production of some monsters, which are now generally supposed to arise from mechanical causes supervening during development, although those who believe it cannot produce sufficient proofs in its favour.

These anomalies may be either symmetrical or unsymmetrical, that is, may be present on both sides or only on one side of the body. It will have been noticed, that, in describing the anomalies, I have not always stated whether they are single or double. I considered it unnecessary to do so in all cases, and I therefore state here that those which have come under my notice have been more frequently symmetrical than unsymmetrical. It may be remarked, however, that some anatomists have found the reverse to be the rule.

Displacement of the muscles is by no means of frequent occurrence, and is, as far as my observations will permit me to state, principally confined to those in the neck. The most remarkable, because the most unlooked for of these, is the displacement of the lower attachment of the sterno-thyroid, but the most important is that of the posterior belly of the omo-hyoid. It is impossible to explain how the displacement should occur in the case of the sterno-thyroid; but in that of the omo-hyoid we are enabled to trace it, in the first instance, not to any fault in the muscle, but to the cervical fascia, which, as already shown, often binds the muscle closely down to the clavicle.

Deficiency in the number of parts of muscles or in the number of muscles themselves is of common occurrence. The deficiency is usually confined to a certain class of muscles whose use in the economy of the human body is very slight, and which may be dispensed with without any detriment to the function of the parts in which they are usually found, or be easily performed by others; we need only instance the *palmaris longus*, the *pyramidalis*, the *extensor minimi digiti*, and the *gemellus superior* in support of this statement. Some of these anomalies by defect appear to result from the fusion of the deficient muscle with that to which it has the closest relation. If I am correct in my supposition that the *levator glandulæ thyroideæ* is a double muscle, of which the two parts are sometimes separate, sometimes united, it would afford us one of the most striking proofs in favour of the hypothesis. That the deficiency of the *peroneus tertius* arises from this cause is very apparent, inasmuch as the muscular fibres to which its ten-

don is usually attached are not deficient, but unite with the outermost tendon of the *extensor communis digitorum pedis*, as remarked by Thiele. The same may be said of the *pyramidalis*, which is replaced by the *rectus*. But this does not apply to all, as, for instance, to deficiency of the *palmaris longus* and of the *psoas parvus*, of which no other explanation can be given than that the germs of these muscles are not produced during development.

Increase in the number of the muscles or of the parts of muscles is also of frequent occurrence. In the generality of instances, it is accompanied by a more marked development of the whole muscular system, but that it is not dependent on this is proved by the fact, that supernumerary muscles or slips of muscle are also met with in thin subjects. The manner in which the number of muscles or slips of muscles is augmented appears to originate in various ways.

1. The splitting of a muscle in the longitudinal direction may give rise to it. This is clearly demonstrated by numerous instances recorded in the preceding pages. The doubling of the *extensor ossis metacarpi pollicis* and the production of a proper extensor of the middle finger are good examples. The first stage is generally a mere division of the tendon, which may be normal. To this succeeds a partial division of the muscle, which, when carried to its full extent, causes complete division of the muscle into two, a distinct cellular interval intervening between them. These stages have been observed not in the same, but in different subjects. Amongst the supernumerary or double muscles which originate in this manner may be mentioned the quadruple geniohyoids and pyramidales, the double sartorius, the double and treble palmaris longus, the "transversus manus," and many others.

2. The augmentation many originate in a transverse splitting of the muscle, or, in other words, by a division in the direction of the thickness of the muscle. That a muscle may be doubled in this manner appears certain from the observations I have made on the irregularities of the solæus. The stages in this process appear to be the same as mentioned for the preceding. The double poplitæus seen by Fabricius,* the double *pectoralis major* and *glutæus maximus* noticed by Tiedemann,† and some few others of the same kind, are examples of double muscles originating in this manner. It seems probable that the slips of muscle passing across the axilla, which we have described, originate in a modification of the same action, a small portion of the muscle being separated wholly or partially from the rest, and having attachments somewhat different from those which the portion of muscle would have had, had the muscle been normal.

* Ab. Aquapendente. De motu locali animalium. In operæ, p. 359.
† Deutsches Archives für die Physiologie, vol. iv. p. 412.

3. Another portion of the supernumerary muscles arise from the development of muscular fibres in normal tendinous structures; those tendinous structures being at the same time more highly developed than ordinary. This is not a common mode of origin of supernumerary muscles, although we might naturally have expected to meet with it very often. The most common examples of it are in the third belly of the digastricus, which is evidently a development of muscular fibre within, and in the place of, the supra-hyoid aponeurosis, and in the proper extensor of the little toe, which, as already shown, consists in the development of muscle in the upper and posterior part, or in the centre of the slip of tendon sent off from the *peroneus brevis* to the long extensor tendon of the little toe.

4. Another mode of origin of supernumerary muscles is to be found in the development of the cuticular muscle, of which the *platysma myoides* and the *palmaris brevis* are the only remains to be seen in man. The cuticular muscle here referred to is the *panniculus carnosus* of animals, and one of the muscles which I presume to originate in a much higher development of it in man than ordinary, is the *rectus sternalis* or *sternalis brutorum.* If we directed our attention to the *sternalis brutorum* only in its highest degree of development, it would be difficult to discover its relation in point of position to the integument, and therefore to the *panniculus carnosus;* but if we trace it through its various grades of size from the small indistinct trace of muscular fibre to the large, robust, and firmly attached muscle, it will be seen that it belongs to the same class of muscles as the *platysma myoides* and the *palmaris brevis*, and is consequently a development of the cuticular muscle, of which but a small portion can be traced in man. The muscle in its imperfect, as well as in its perfect state, is always situated superficial to the *pectoralis major* and its proper cellular covering, and, moreover, in that state is not attached to the bones, but its two extremities are either blended with the fibres of the *pectoralis major*, or are lost in the fascia superimposed on it.

5. The origin of some of the supernumerary muscles cannot be explained by any of the foregoing laws, and can only be referred to the evolution of germs which do not exist in the greater proportion of embryoes. The slips of muscle passing transversely across the axilla, between the tendons of the *latissimus dorsi* and *pectoralis major* do not appear to be offsets from either of these muscles, but to originate independent of both. The same appears to be the case with the long accessory flexor of the toes before described, for, as far as I could determine, it had no connection either real or apparent with the long flexor of the great toe, from which it might have been supposed to proceed. The third,

fourth, and fifth heads of the *biceps cubiti* seem to originate in the same way. Meckel and others have seen the third head consisting of a detached portion of the *brachialis anticus*, so that even when highly developed, and the connection not apparent, it may be considered as an offset of the *brachialis anticus*. The fourth and fifth heads have certainly no connection with any other muscle, and therefore must originate from supernumerary germs.

It is a remarkable circumstance in connection with the development of additional muscles, that, when non-symmetrical, they will be most frequently met with on the right side of the body, inasmuch as in this, as in most other respects, the muscular system coincides with the vascular and osseous systems, and supports the opinion that the right half of the body is more highly developed than the left.

Supernumerary muscles, or parts of muscles, when attached to parts capable of being moved, must necessarily give rise to a greater extent, and it may be freedom of motion, than ordinary. Thus, when the ring finger is provided with a proper extensor, that finger must be more perfectly under command of the will than when it has merely the tendon of the common extensor, and that bound to the tendons of the adjoining fingers. It is even possible that, in some cases, additional strength is given to an individual by the possession of numerous additional heads or parts of muscles. Tiedemann found the *pectoralis major* and *minor*, the *trapezii* and *glutæi maximi* muscles double in the same subject, and inferred from this that great power in man is not always the result of exercise, but sometimes depends on the congenital redundancy of numerous large muscles. Meckel having seen another instance of the same kind, was led to form the same opinion. And I am inclined to support this important physiological deduction, from having noticed that while the smaller muscles may be doubled in spare subjects, the larger muscles are seldom found to have a redundancy of heads except where the whole muscular system is remarkably well developed.

There are many of the supernumerary muscles which are useless, and there are some which may be even injurious. In one instance I noticed that the tendinous slip, prolonged from an offset of the *pectoralis major* to the internal condyle of the humerus, had tied the brachial artery and median nerve so tightly down, as to cause a considerable constriction in both of them. Some of the slips of muscle crossing the axilla appear to cause occasional compression of the axillary artery, as already stated. In both these instances, therefore, there is sufficient reason for supposing that the circulation of the limb was interfered with.

That supernumerary muscles are sometimes of great use to the economy, the following case will, I think, sufficiently testify.

W. S., aged 78, died of apoplexy in December 1846. On examining the body after death, it was found that the greater part of the muscles in the body had been wholly or partially converted into fat. Amongst those which had been completely transformed into fat, where all the muscles of inspiration, without exception, none of them, indeed, could be detected by their colour; the striated fibrous character of some structures composed almost entirely of fat, together with the direction of the striæ, alone indicated their position and previous existence. How, then, did this individual inspire? The *sternalis brutorum* existed in its highest state of development, was robust, and of a deep red colour, contrasting strongly with the pale fatty appearance of all around it. It was this muscle, then, which elevated the ribs on one side of the chest, and increased the capacity of the chest to some extent. Considering the state of the muscular system, there could have been but little demand for oxygen. But whatever the quantity demanded, the *sternalis brutorum*, by contracting, and thereby increasing the capacity of the chest, must alone have caused to enter the lung.*

The abnormal arrangement of the muscles in the two extremities, the pectoral and the pelvic, render their similitude much more perfect than it is when the arrangement is normal. This circumstance, which has been noticed by Meckel and others, causes the muscular system to come under the same general law as the vascular and osseous systems.† The two extremities in their normal state correspond, yet differ. They correspond very closely in the number of parts, and in the arrangement of those parts; but they differ somewhat in detail, in consequence of the difference in their use in the economy. The pectoral extremity being principally adapted for prehension, and being required to execute the most varied movements with the greatest precision and delicacy, has all its parts endowed with the greatest freedom of motion: the pelvic extremity, on the other hand, being required to support the weight of the body in the erect posture, and during progression, has all its parts more solidly constructed.

* This interesting case will be noticed at full length, and in all its bearings, at some future period.

† The law referred to is a mere repetition of the words employed in the text. It has long been known in regard to the muscular and osseous systems, but has not been fully established until lately in regard to the vascular system. Dr Knox (Engravings of varieties in the origin, course, and distribution of the arteries; fasciculus II. 1836,) pointed out the occurrence of a variety in the division of the axillary artery, which afforded "an additional proof of the close analogy existing between the pectoral and pelvic extremities." This variety has occurred to me during the last year on three several occasions. I have also noticed varieties in the arteries of the foot and hand closely resembling each other, and bringing those parts into more close analogy than they have normally. Indeed, it would not be difficult to show that all the parts of the arterial system in the extremities, when abnormal, are *precisely* similar. The veins conform to the same law (see a Memoir on Anomalies of the Nervous System in the Medical Times for November 1847).

These differences in function and construction of the limbs taken as a whole, necessarily give rise to differences in the arrangement of the individual parts entering into their formation; but these differences are rendered very slight by the numerous and frequent aberrations of the muscles from their normal state. It is needless for me to particularize the anomalies which cause the general arrangement of the muscles in the two extremities to be so similar, as most of them have been noticed whilst describing the individual anomalies, to which I therefore refer.

Is the study of the anomalies of the muscular system of any use to the practical surgeon? I am led to believe that it is; and furthermore, consider that the surgeon ought to be equally conversant with the more important anomalous distributions of the muscles as with anomalous distributions of the vessels. My reasons for believing this are threefold; first, anomalies of the muscles are of more frequent occurrence than those of the arteries; secondly, they often alter most materially the boundaries of regions and the landmarks, if they may so be called, by which the surgeon is accustomed to guide himself in performing operations on the more important parts of the body; and thirdly, they often alter the relations of the larger arteries and other important structures. Whether any difficulties in performing an operation on the living body have been hitherto met with in consequence of an abnormal development or attachment of muscle, is a point I am unable to determine; but there can be little doubt that they may arise, as the following circumstance will clearly show. Some naval surgeons, in pursuance of the regulations of the naval medical board, were engaged during last autumn in performing the usual course of operations on the dead body. They wished to place a ligature on the posterior tibial artery near the centre of the leg, according to the method recommended by Mr Guthrie, but after cutting through the structures usually overlying that vessel, and searching for some time, were unable to find it, and therefore discontinued their efforts. Happening to enter the rooms shortly, and being informed of their failure, I examined the parts, and it having occurred to me that the soleus muscle might be double in this instance, the dissection was carried deeper through a muscle nearly half an inch in thickness, and the artery was ultimately secured. A further dissection was subsequently made, and the soleus was found completely double, as described in the former part of this memoir. The same circumstance MIGHT occur in the living body, and unless the individual operating happened to be acquainted with the fact that such an anomaly sometimes exists, what would be the result? Other regions of the body are equally liable to have their relations altered, and, consequently, I may be allowed to infer, that similar difficulties might be met with in operating on those regions from similar causes.

The continental anatomists have studied the anomalies of the muscular system, because they have been found of some value to physiology, and more especially to that division of the science which has for its purpose the investigation and determination of the laws of formation, both normal and abnormal. I have studied them with the same purpose, but have always considered they might be of some practical value, and consequently have noticed, as far as the comparatively limited number of my observations will permit, the changes in the boundaries and relations of certain regions and parts which result from the abnormal development and attachment of some muscles. In my future notices, I intend to enlarge more particularly on this point, merely desiring for the present to draw attention to the general bearings of the subject.

ART. II.—*Observations on the Climate of Largs, with Notices of the other principal Watering-places on the Clyde, and their general Characteristics.* By WILLIAM DAVIDSON, M. D., formerly Physician to the Glasgow Royal Infirmary.

LARGS.

THE parish of Largs is situated on the Frith of Clyde, along which it extends about nine miles from north to south, and is stated to be in latitude 55° 49′.30 north, longitude 4° 52′ west. It consists chiefly of a stripe of level rich land bordering the sea, narrow at many points, particularly towards the north, with a range of hills behind, one of these being nearly 1700 feet above the level of the sea. The town is situated on a small plain towards the southern end, the distance from the shore to the base of the mountains being from half a mile to a mile. Part of Bute and the whole of the larger island of Cumbray lie on the opposite side of the Frith, while the picturesque and irregular peaks of Arran are seen in the same direction and at a few miles greater distance. The sea view from some of the heights above Largs is magnificent, and many interesting objects arrest the attention, such as the Rock of Ailsa, the Arran mountains, the green island of Cumbray, the peculiar promontory named Port Crawford, and the apparently boundless Atlantic Ocean. Before the establishment of steam-vessels, the parish was rather a sequestered spot, being partially cut off from communication with the interior of Ayrshire by the high land to the east, and by the circuitous road along the coast from the towns of Renfrewshire. It would probably strike a stranger on viewing the town of Largs, its situation on a level plain, with a high range of hills behind, and flanked to