LECTURES ON THE VARIETIES IN THE MUSCLES OF MAN.

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THE MUSCLES OF THE UPPER LIMB.

THE MUSCLES OF THE SHOULDER.

In the preceding lecture, I endeavoured to show that the varieties in the muscles of the trunk and neck are, for the most part, due partly to a want of proper segmentation from the simple undivided form which they present in certain of the lower animals, and partly to a want of proper concentration of the segmented portions or individual muscles into the forms which they should attain, and upon the parts into which they should be inserted, in the well developed human frame. In the present lecture, I propose to indicate that the varieties in the muscles of the upper limb, or most of them, are to be explained in the same way.

The muscles which connect the upper limb with the trunk—the superior ventro-appendicular muscles—are in two sheets, derived from the two strata of the brachio-cephalic extension of the ventral muscle. The superficial sheet consists of the pectorals, the latissimus dorsi, and the trapezius, with the deltoid, which converge from a wide area upon the upper part of the humerus. The deeper sheet consists of the subclavius, the omo-hyoid, the levator scapulae, and the serratus magnus.

In the primitive form—that is to say, in the lower animals—the components of the superficial sheet, or some of them, extend further upon the limb, and are more blended with the several muscles of the limb, and the several component muscles of the sheet are less segmented from one another, and are more blended with the circumferential muscles, than is the case in higher animals. The sheet, indeed, in some lower animals, is a simple funnel-like expansion of the outer stratum of the ventral muscle upon the limb, extending upon the whole limb, or, at any rate, presenting no definite boundary. We are, therefore, not surprised to find that the most important and most frequent varieties in, and in connexion with, the muscles of this sheet, are in the direction, more or less distinctly, of an approach to that simple and less segmented plan. The best examples of this—and they are also those of most frequent occurrence—are the muscular additions which exhibit a tendency to fill up the axillary interval, and to connect the margins of the pectoralis and latissimus dorsi; though the continuity of the two muscles is rarely, if ever, so far preserved as we find it to be in *Lepidosiren*.* The tendency is exhibited in a variety of ways. Sometimes the range of origin of one or both muscles is extended upon the thorax, so as to approximate their edges and nearly cover the axilla. Such extension is most frequent in the case of the latissimus dorsi; and this is the normal disposition in many of the lower mammals. The fibres arising from this preternaturally extended area, or part of them, or, it may be, bundles of the muscle having the usual origin, often pass to the pectoral side of the axilla, constituting the “axillary muscles”, or the “achsel-bogen” of the Germans. As many as three of these have been found in the same limb.† They may blend with the pectoralis major or minor; or they may be inserted, independently of those muscles, into the coracoid, into the outer bicipital ridge of the humerus, or into the fascia over the coraco-brachial muscle or over the biceps. Sometimes there is merely a slip from the edge of the latissimus dorsi, crossing the axilla and the axillary vessels, and passing to the edge of the pectoralis major. In such a case, the fibres may usually be traced, in company with the deeper or sternal fibres of the pectoralis, to the humerus. Sometimes these slips are attached above to the coracoid or to the humerus, and radiate below upon the surface, rather than blend with the substance, of the latissimus dorsi. They then resemble the parts of the pannicle which in Rats, Rodents, and many animals, have connections with the coracoid, the humerus, or the pectoral muscle, and expand upon the side of the trunk. Sometimes a slip from the pectoral joins the latissimus dorsi, though this is much more rare than the converse; or slips from both these muscles meet and are inserted into the humerus, or into the coraco-brachial fascia or the coracoid.

* *Journal of Anatomy*, vi, 259; and *Observations in Myology*, p. 71.

† Wood, *Proceedings of the Royal Society*, 1867, p. 524. One such slip is found in at least five per cent. of bodies examined.

The detached portions from the extended edge of either of these muscles, which are inserted into the coracoid, have been named “costo-coracoid” or “chondro-coracoid”; and those inserted into the humerus have been named “costo-humeral”.

Other examples of imperfect segmentation are afforded by the blending of the pectoral with the deltoid. This is sometimes so complete that no areolar interval exists between them; and the line between the two is indicated only by a small aperture for the cephalic vein; and even that guide may be wanting. There is also occasional fusion of the trapezius and deltoid over the spine of the scapula; and intercommunicating slips sometimes pass between the pectoralis major and the pectoralis minor.

As examples of the preternatural widening or imperfect limitation of these ventro-brachial muscles at the base of their cone, in addition to the extension of the costal origins of the pectoral and latissimus dorsi just mentioned, may be adduced the increase, not unfrequently observed, of that blending which ordinarily remains between the pectoralis and the external oblique. In several instances, the continuity of the pectoral fibres has been traced from the humerus to the linea alba; or epigastric slips may arise from the surface of the external oblique or its aponeurosis, resembling the pannicular slips from the surface of the latissimus dorsi just mentioned, and passing into the tendon of the pectoralis major, usually into its deeper surface; or to the humerus, or to the coracoid or the coraco-brachial fascia. In like manner, the latissimus dorsi has been found extending as high as the fourth dorsal vertebra; but I have not found any notice of its blending in this situation with the trapezius or with the rhomboid.

The trapezius sometimes retains its continuity with the sterno-cleido-mastoid near the skull; or it is connected with it by slips, as mentioned in my last lecture; and slips occasionally pass from it, beneath the sterno-mastoid, to the sternal end of the clavicle. Moreover, there are frequently detached slips, resembling the costal slips which are often found related to the axillary parts of the pectoral and the latissimus dorsi. Such slips may lie parallel with the anterior edge of the trapezius, and pass from the occiput to the clavicle. These may be called “cephalo-humeral”, to distinguish them from the closely allied and closely located slips which occupy the interval between the trapezius and the sterno-cleido-mastoid, but which are rather allied to the latter muscle, and to which the name “cleido-occipital” is given. The latter term might, indeed, be well applied to both; but the name “cephalo-humeral” has been applied to corresponding muscles which are often present in the lower animals, and which in them sometimes extend to the humerus. This name also connects them with another similar series of slips—the “cervico-humeral”—which are associated with the deeper surface of the trapezius, and which are also often present in lower animals, and often, especially when the clavicle is abortive, run on to the humerus. The cervico-humeral slips (levator claviculae of Wood) pass from one or more of the cervical transverse processes to the scapular end of the clavicle beneath the trapezius, and are more or less blended with it.* They too are to be regarded as resulting from an imperfect limitation of the trapezius, so that through them its range of origin is extended to the transverse processes of the cervical vertebrae, as is the case in *Lepidosiren* and some other animals.† When the origin of this segment of the trapezius is limited to the transverse process of the atlas, the muscle is sometimes called “atlanto-humeral”. I may here remark that the cephalo-humerals occasionally extend, like the cervico-humerals, beneath the trapezius to the scapular end of the clavicle. Wood found a slip passing from one of these muscles (a levator claviculae) to the sterno-mastoid. In two instances, he found slips from the third cervical transverse process, which failed to reach the clavicle, and were lost in the fascia; and in one case a levator claviculae was present on the one side and a cleido-occipital on the other. These adjuncts to the trapezius—these resultants of the imperfect limitation of that muscle, as I regard them—are of very frequent occurrence as anomalies in Man, and are very common as regular formations in other mammals.

The fibres of the trapezius sometimes blend with those of the deltoid; and in one instance, observed by Wood, a strong aponeurotic slip was given off from near the spine of the scapula, downwards and outwards, to the lower end of the scapula.‡

* The levator claviculae sometimes passes from the transverse cervical processes nearer to the sternal end of the clavicle, immediately external to the sterno-cleido-mastoid.—*Medical Times and Gazette*, December 7th, 1872.

† See my *Observations on Myology*, pp. 30, 72; and *Journal of Anatomy*, vi, 30, 264.

‡ *Proceedings of the Royal Society*, 1867, p. 522. I have observed that in the foetal state the fibres of the trapezius and the deltoid present more continuity, are less interrupted, that is, by the spine of the scapula and the clavicle, than they subsequently become. I noted in the last lecture a similar continuity in the foetal state between the fibres of the sterno-thyroid and the thyro-hyoid.

An analogous segmentation from the deep surface of the trapezius is presented by the "occipito-scapular" of Wood,* which consisted of a muscular band passing from the occiput beneath the junction of the trapezius and the cleido-occipital, this latter muscle being also present. It was inserted into the base of the scapula opposite the spine. Wood found the exact similitude to it in a Rabbit, and I have described a similar muscle in Manis.†

These last mentioned muscles possess an additional interest from their alliance to the rhomboids, which, like them, may be regarded as segments from the under surface of the trapezius. They form, indeed, fragments of a deep trapezius; and in Manis the rhomboid, the occipito-scapular, and the masto-scapular, which is a continuation of the same series forwards, constitute an almost continuous sheet extending along the whole length of the hinder border and the spine of the scapula, and blended posteriorly with the latissimus dorsi.

The absence of the members of the fore part of the subtrapezius sheet, as a rule, in Man, and their presence, as a rule, in other mammals, especially in the non-clavicated mammals, together with the fuller development of the fore part of the trapezius in those animals, has relation to the movement of the scapula to and from the head in them, being freer in Man. In him, the free swing of the limb depends upon the movement of the humerus upon the scapula, rather than upon the movement of the scapula upon the trunk. Still the direction and action of the muscles in question so closely resemble those of the trapezius, that their presence can scarcely be attended with any decided disadvantage to Man; and their frequent appearance in him shows that the disadvantage is not sufficient to enforce rigidly the specialisation which is peculiar to him, and to overcome the tendencies in the developmental processes to conform to the disposition which is generally advantageous in other animals.

The imperfection of limitation at the opposite—that is, the distal or apical—part of the superficial ventro-appendicular cone, is equally common, and appears in a variety of ways. Very frequently the costal slips or detached extensions of the latissimus dorsi, or of the pectoralis major, or of both, instead of following the direction of those muscles to the humerus or to the coracoid, are reflected upon the arm, and descend upon the coraco-brachialis, the biceps, the brachialis anticus, the intermuscular septum, or the internal condyle; thus resembling more or less closely the costo-alaris of the Bird, and forming, when they reach the internal condyle of the humerus, the muscle which has been called "chondro- or costo-epitrochlearis". The extensions of the pectoralis are usually upon the fore part of the arm; whereas the bundles associated with the latissimus dorsi usually take their course behind the intermuscular septum, and fall into relation with the triceps. They thus constitute what has been named, in Man and in lower animals in which it is often present, the "dorso-epitrochlien". It should, however, be remarked that detached or semi-detached portions of the pectoralis have been seen by Hallett and others descending over the biceps and the brachial vessels to the intermuscular septum and the inner condyle, giving origin to some of the fibres of the triceps.

Other parts of these two muscles (pectoralis and latissimus dorsi), besides the detached or semi-detached costal slips just referred to as situated near the axillary margins, may also be continued upon the limb beyond the usual range. Thus the clavicular part of the pectoralis occasionally sends an epitrochlear prolongation along the inner side of the arm; and the tendon of the same muscle often ranges above and below the ordinary space of its insertion.‡ Fibres of the latissimus dorsi are often continued upon or into the long head of the triceps, or, extending to the inner condyle, as I have just said, form, or contribute to form, the dorso-epitrochlien. More rarely, a slip can be traced to the olecranon. The frequent occurrence of a more or less distinct dorso-epitrochlien in Man—it is found in six or seven per cent.—and its presence as a normal feature in Quadrumana, have not failed to attract attention. We must not, however, forget that it is a common muscle in other Mammals as well as in Quadrumana. Indeed, the segmentation of the latissimus dorsi from the triceps, which is at its minimum in the Cryptobranch, and increases as we ascend, is scarcely attained even in the normal anatomy of Man; for in him a tendinous slip may commonly be traced, as stated by Henle, from the tendon of the latissimus dorsi to the long head of the triceps. Moreover, a slip from the upper edge of its tendon sometimes ascends to the capsule of the joint; and one from the lower edge has been traced over the brachial artery to the coraco-brachial muscle.§ Further, the tendon,

or part of it, sometimes crosses the bicipital groove to the pectoral ridge of the humerus.

In the trapezio-deltoid sector of the ventro-appendicular sheet, an imperfection of limitation towards the distal angle is sometimes evinced by the connection of the deltoid, through slips, with the infraspinatus or the fascia covering it; or there may be slips to the deltoid from the inferior margin of the scapula between the infraspinatus and the teres minor.* The deltoid also sometimes retains a connection with the muscles lower down. Thus Macalister found it blended with the supinator longus in such a manner that a thick band passed from the acromion to the styloid process of the radius, therein imitating the arrangement in Manis.†

Varieties also occur in the muscles of this layer from deficiency of development and from over-segmentation. Thus the cleft is sometimes preternaturally wide between the clavicular and the sternal portions of the pectoralis; and the sternal portion has been found subdivided. Also the pectoral muscle has been in two planes, reminding us of its disposition in the two-toed Anteater.‡ The cervical and dorsal portions of the trapezius have been found separate;§ and the clavicular and scapular parts of the deltoid have been quite separate. Henle mentions the absence of the clavicular part of the pectoral, and the same of the sternal part. Hallett notes the occasional absence of the upper part of the trapezius, as is the case in Bats, and also of the lower part; and it often does not descend below the ninth or tenth dorsal spine, and occasionally not below the eighth. Henle mentions the absence of the clavicular part of the deltoid.

The pectoralis minor, the rhomboidei, and the scapular part of the latissimus dorsi, are deeper segments of the several muscles of this superficial brachio-cephalic sheet, after the manner of the occipito- and the cervico-humeral and the occipito-scapular segments just mentioned. The rhomboids are liable to vary somewhat in the range of their attachment; and they have occasionally been found divided into two planes. The scapular part of the latissimus dorsi is often absent. The variations in the pectoralis minor are of greater interest.

I have shown|| that this subpectoralis segment is the mammalian representative of muscles which, in the more primitive batrachian, reptilian, avian, and monotremic forms, pass from the coracoid in front of the biceps brachii, are more or less blended with the pectoralis major and the supraspinatus, and are inserted with them, or near them, into the outer bicipital or radial ridge and tubercle of the humerus. In some animals they extend upon the thorax, acquiring origin from the sternum and ribs; and thus in birds they form what is called the "pectoralis secundus" or "levator humeri". In Mammals above Monotremes, the thoracic attachment constitutes the origin of this deep pectoral series, which is now concentrated into the pectoralis minor; and the coracoid process of the scapula, which is distanced from the thorax, becomes in part the seat of its insertion. I say in part, for the muscle very commonly retains, in whole¶ or in part, its primitive connexion with the radial tubercle and ridge of the humerus. In some animals, it blends with the supraspinatus tendon and the capsule of the shoulder-joint, or with the pectoralis major, on its way to the humerus.** In Man, its segmentation is more complete than in other animals; and, in its normal condition, it forms a separate muscle, extending simply from the third, fourth, and fifth ribs to the coracoid. It thus acquires the one function of moving the scapula upon the thorax, and so presents an illustration of the principle of subdivision of function which is observable in the muscular system of the human body even more than in that of other animals. We, however, may frequently find that the boundaries of the pectoralis minor are not thus defined, but that, as we should expect, prolongations of it extend over the coracoid to the radial tubercle and ridge of the humerus; and sometimes they blend with the supraspinatus and the capsule of the shoulder-joint. In some cases the entire muscle, in others only separate slips, take this course. It is worthy of remark, that the upper surface of the coracoid is often grooved by the portion of the muscle which thus passes over it; and it may even be provided with a bursa here, affording an additional evidence that such portion is the homologue of the levator humeri of Birds. In some cases, the whole of the pectoralis minor was

* Henle, *Anat. Muskelehre*, s. 168.

† *Journal of Anatomy*, iv, 40.

‡ *Journal of Anatomy*, p. 25.

§ Wood (*Proceedings of the Royal Society*, 1868, p. 487) remarks that this is so more or less, in the Mole, Echidna, and Agouti.

|| *Observations in Myology*, p. 157.

¶ In Carnivora, it runs entirely to the radial tubercle of the humerus.

** It may pierce the capsule of the shoulder, and join the glenoid ligament. Mr. Perrin (*Medical Times and Gazette*, June 7th, 1873) gives an instance in which part of the pectoralis minor in one arm was prolonged to the acromion, joining the coraco-acromial ligament, and in the other arm perforated the capsule, and joined the tendon of the long head of the biceps. This arm had been the seat of injury and rupture of the biceps tendon.

* *Proceedings of the Royal Society*, 1867, p. 520.

† *Journal of Anatomy*, iv, 31.

‡ J. Beswick-Perrin (*Medical Times and Gazette*, December 14th, 1872) mentions a slip to the coracoid process and the fascia over the coraco-brachialis; and deep slips to the capsule [of the shoulder-joint (*tensores articuli humeri*)] have been described by Gruber and others.

§ Macalister, *Proceedings of the Royal Irish Academy*, ix.

inserted into the capsule of the shoulder-joint.* Occasionally some of the fibres are inserted into the coraco-acromial ligament, or pierce it.

The fibres of the pectoralis minor sometimes also range at a higher level in their origin or insertion, or both; arising, for instance, from the second rib, and being inserted into the costo-coracoid membrane or the clavicle, so forming a "costo-clavicular muscle".† They may also lie in a lower level than usual. They may arise from the sixth rib; and they may join the coraco-brachial muscle or the fascia of the arm.‡ The pectoralis minor is sometimes connected by slips with the pectoralis major, and, like it, is sometimes segmented longitudinally, or has supplementary slips. These may lie beneath it,§ or may be situated above or below it.

I have spoken of the subclavius as a member of a deeper layer of the brachio-cephalic stratum, thus classing it with the omo-hyoid, the levator scapulæ, and the serratus magnus. The forward position of the clavicle throws it, however, into the same level with the pectoralis minor, with which, indeed, it is continuous in some animals, as the two-toed Anteater, though separated from it in Man by the costo-clavicular fascia. It sometimes ranges towards the coracoid or the upper costa of the scapula, so constituting one of the varieties to which the name sterno- or costo- or sterno-costo-scapularis has been applied. The last mentioned anomalous muscle appears sometimes to be a derivative from the subclavius, and sometimes from the pectoralis minor. Its actual relations are, however, not always quite clearly given in the published reports of the instances in which it has been found. In the best marked and most fully described cases, it has been situated above the costo-clavicular fascia, and has appertained to the subclavius rather than to the pectoralis minor. The subclavius is sometimes simply double, the two parts being separated by the cephalic vein or by one of the thoracic veins.||

The comparatively unimportant function of the omo-hyoid, and its frequent absence in Mammals, prepare us for its instability, and for its often recurring varieties in Man. It is an outlying segment of the deep part of the ventral muscle, which has become separated from its next neighbours of the same layer—the sterno-hyoid and sterno-thyroid—with which in some lower animals, as Cryptobranch, it is more continuous, by the out-thrust of the scapula. We found in the last lecture that these muscles sometimes show a tendency to approach to the omo-hyoid, by spreading outwardly along the clavicle; and some of the most frequently recurring varieties of the omo-hyoid indicate the manifestation of a reciprocation of that tendency, forasmuch as they consist in an unusually definite and extensive attachment to the clavicle, on the sternal side of that part of the bone with which the muscle ordinarily has a fascial connection, and in other ways. Thus the anterior belly is sometimes in part, or in the whole of its length, confluent with the sterno-hyoid,¶ or some of its fibres pass beneath the sterno-mastoid to the sterno-hyoid. Sometimes it is attached to the middle, and sometimes, though more rarely, to the sternal end of the clavicle. Hallett also found that in two cases in which the anterior belly of the omo-hyoid was absent, the sterno-hyoid was broad and attached to the clavicle behind the sterno-mastoid. The omo-hyoid is sometimes directly attached to the clavicle without any intermediate tendon, the posterior belly being in such cases liable to be absent. Again, the gap between the omo-hyoid and the sterno-hyoid is not unfrequently in part occupied by an additional anterior belly, which passes from the hyoid bone to the clavicle, and which may be more or less confluent with the sterno-hyoid, as mentioned by Henle. Wood** found the anterior belly

in one case receiving a slip from, and in another contributing a slip to, the sterno-hyoid. In a third case, there were two anterior bellies; the upper being attached by fascia to the stylo-hyoid muscle which did not reach the hyoid bone, thus affording an example of the persistent connection of the pre- and post-hyoidean muscles, which is rarely met with in Man. In a fourth case, the anterior belly was triple, the middle portion having the normal insertion, the anterior being inserted into the cervical fascia, and the hinder being implanted into the upper horn of the thyroid cartilage.

The varieties in the posterior belly of the omo-hyoid resemble those in the anterior, in being for the most part remnants of a more extensive connection of the ventral sheet with the shoulder-girdle; and they are remarked by Turner to be more numerous than those in the anterior belly. The fibres are sometimes attached directly to the clavicle; or there is an additional belly which is attached directly to the clavicle, and which diminishes or obliterates the posterior inferior triangle of the neck. The additional posterior belly may be associated with an additional anterior belly, both being directly attached to the clavicle. The fibres sometimes spread along the whole superior costa of the scapula, and may extend upon the coracoid. In some instances the posterior belly is in great part tendinous. The following accidental slips, mentioned by Hallett as arising from the scapula in contact with the omo-hyoid, are curious instances of the retention of the primitive connection of the posterior belly with surrounding muscles and parts. One ran to the upper part of the sterno-clavicular articulation; another, observed by Soemmering, fell short of this point, but crossed in front of the brachial plexus and the subclavian artery, to the cartilage of the first rib; another blended with the fibres of the sterno-mastoid; in a fourth instance, the fasciculus was partly attached to the transverse process of the sixth cervical vertebra, and was partly lost in the substance of the serratus anticus muscle.

In some instances, the two bellies have been more or less confluent, owing to the partial or complete absence of the intermediate tendon; and in some, one or both bellies have been absent on one or both sides. When the posterior belly is absent, the anterior commonly runs directly to the clavicle; and in like manner, in the case of absence of the anterior belly, the posterior usually attaches itself to the clavicle. The latter has, however, been found in some such cases radiating into the fascia, or attaching itself to the first rib. The omo-hyoid thus furnishes a good illustration of the observation, that the opposite kinds of irregularity—those, viz., of exceeding, and those of not attaining to, the normal standard, the irregularities from multiplication and those from deficiency, are liable to affect the same muscle. It may be further observed, that neither of these forms of irregularity—neither the total absence of the muscle nor its existence in a greatly enlarged or in a multiplied condition—are attended with any perceptible impairment of the movements of the shoulder or neck.

Of the other two deep ventro-appendicular muscles connecting the trunk with the scapula—the serratus and the levator anguli scapulæ—the irregularities in the former consist chiefly in preternatural divisions between different parts of it, or deficiencies of certain parts of it. Thus the portion derived from the first rib has been wanting. The absence has also been observed of the lower part,* and still more frequently of the middle part. On the other hand, the insertion of the serratus is sometimes extended upon the upper border of the scapula beneath the omo-hyoid; and it sometimes acquires additional slips from the ribs which join its deeper surface. Such slips occasionally retain their individuality up to their insertion into the scapula.

In the levator scapulæ, imperfection of concentration is shown by occasional blending with some of the surrounding muscles, and by an extension of its area of attachment. Thus it may be united with the serratus magnus, with which muscle it retains its continuity as a normal condition in so many animals. The union in Man is commonly effected by slips passing from the one to the other. It sometimes derives slips from the trapezius, or from the upper dorsal spine beneath the trapezius;† and the cervico-humeral bands, described in the last lecture as passing from the cervical transverse processes to the trapezius and the clavicle, constitute another link of connection between the two muscles. Intercommunicating bands are also not unfrequent between the levator scapulæ and the scaleni; and the former muscle is also sometimes connected in this way with the splenius capitis, with the serratus posticus superior, with the rhomboidei, and with the transversalis colli.‡ A slip has also been found passing from it across the subclavian artery to the subclavius muscle;§ and

* De Souza, *Gazette Médicale*, 1855, No. 12; and Benson, *Cyclopaedia of Anatomy*, i, 359.

† Wood, *Proceedings of the Royal Society*, 1866, p. 231; 1867, p. 524. An extension of this muscle towards the sternum, at the one end, and towards the coracoid or the upper costa of the scapula, at the other, constitutes one of the varieties which have been called sterno- or sterno-costo-scapularis.

J. Beswick Perrin (*Medical Times and Gazette*, December 14th, 1872) describes a prolongation of the pectoralis minor over the coracoid, dividing into two tendons: one joining the coraco-acromial ligament, and the other inserted into the outer extremity of the clavicle. In a second case, a partial prolongation pierced the capsular ligament of the shoulder, and was inserted into the summit of the glenoid cavity.

‡ *Guy's Hospital Reports*, xiv.

§ Meckel's *Archiv*, v, 119.

¶ A muscle, described and figured in *Guy's Hospital Reports*, xvi, passing from the coracoid to the clavicle, may be regarded as a derivative from one or other of the pectorals; or as an intermediate between the pectoralis minor and the subclavius, which latter was absent. The description, however (p. 151), appears not quite to agree with the representation in the plate.

** Turner (*Edinburgh Medical and Surgical Journal*, 1861) found this in four cases, the inscription in the sterno-hyoid being continued into the omo-hyoid. He found irregularities in this muscle in twenty out of three hundred and seventy-three subjects. Wood met them in five out of seventy.

† *Proceedings of the Royal Society*, 1867, p. 519; *ib.*, 1864, p. 300. He mentions a "double omo-hyoid; the upper one digastric, the lower uninterrupted by tendon attached to base of coracoid process."

* Hallett noticed this in two cases.

† Meckel, *Archiv*, v, 115.

‡ Wood, *Proceedings of the Royal Society*, 1868, p. 487; and *Transactions of the Royal Society*, 1869. Also Perrin, *Medical Times and Gazette*, June 7th, 1873; and Curnow, *Journal of Anatomy*, vii, 304.

§ *Guy's Hospital Reports*, xiv.

Kelch saw a slip passing to the fascia upon the thorax. Its origin has ranged as low as the transverse process of the seventh cervical vertebra, and as high as that of the atlas. The origin from the atlas corresponds with the most common origin of the cervico-humeral bands just referred to; the difference being, that the muscular fibres in that instance take the course of the trapezius, whereas in this case they take that of the levator scapulae. The insertion of the levator scapulae sometimes encroaches upon the upper border of the scapula; and it occasionally advances upon, or sends a slip to, the spine of the scapula. It may also be segmented into separate pieces corresponding in number with that of the vertebrae from which it arises.

In the deep muscles passing over the shoulder, the varieties are few and unimportant. The infraspinatus is sometimes blended with the teres minor, as it is in some Mammals, or partially with the deltoid, as it is in the Pig. The teres major has been wanting.* The subscapularis is not unfrequently divided into two or more parts; or segmented slips pass from the inferior costa of the scapula to the capsule of the shoulder-joint, forming the coraco-scapularis, as it has been called, or they pass over the capsule to the humerus between the subscapularis and the teres major. Such segments extending upon the base of the coracoid process, or arising from it, are mementoes of the primitive junction of the coraco-brachialis and the subscapularis, which is retained in some Reptiles.†

THE MUSCLES OF THE ARM.

This leads me on to say that the adducto-flexor mass of the arm and fore-arm, which is represented in Man by the coraco-brachialis, the biceps, and the brachialis anticus, is in the primitive state, as just mentioned, less segmented. In that state it forms a more connected mass, extending from the coracoid, where it involves the subscapularis, along the ulnar side of the humerus, to the bones of the forearm: and in the irregularities or varieties which have been met with in the muscles of this region in Man, some of which are of frequent occurrence, may often be recognised evidences of a retention of the primitive blended condition. This will be seen as we proceed.

In the normal condition of Man, the coraco-brachialis consists of two parts, with the musculo-cutaneous nerve passing between them; and the two parts are combined into the one muscle, which is inserted into a narrow space on the humerus. The most simple variety is presented when this concentration is less complete—when, for instance, the lower part of the muscle extends further downwards than usual along the shaft of the humerus, connecting itself with the internal intermuscular septum, and perhaps extending as low as the internal condyle, like the coraco-brachialis longus of a Reptile or a Monotreme. In some of these cases a supracondylar process was present, and the muscle was inserted into it; or the upper part of the muscle may extend upwards towards the ulnar tubercle of the humerus, so forming a coraco-brachialis superior; and the two parts may be more separate than is usually the case. Further, an additional muscle may be present, passing, as I have just mentioned when speaking of the subscapularis, from the coracoid near its root, to the ulnar tubercle of the humerus, or close to it, above the teres major and latissimus dorsi, and forming a coraco-brachialis brevis. This wider range of insertion and more distinct division into two or more muscles is common in Quadrumana and some other Mammals; it is also prevalent in Monotremes and Reptiles, where the coracoid is large and reaches to the sternum. It represents, indeed, merely an early or simple stage of coraco-brachial segmentation from the primary adducto-flexor mass.‡ In some instances, the coraco-brachialis has presented a still simpler, though more extended, condition; forasmuch as the divisions into parts was indistinct, and the muscle was inserted into a continuous line along the ulnar side of the humerus, nearly from the tubercle to the condyle, bridging over the tendons of the teres major and latissimus dorsi.

The lower part of the coraco-brachial muscle is more variable than the upper. Sometimes it is nearly or quite absent; and the musculo-cutaneous nerve passes in front of, or superficial to, the entire muscle. Sometimes the lower part of the muscle extends over the brachial artery and median nerve, which pass through an aperture in its muscular or

aponeurotic extension; and sometimes, as just said, it reaches the internal condyle. The descending muscular or aponeurotic extension does not always blend with the intermuscular septum, but may, as described by Struthers and others, remain distinct from it, and be situated behind it, covering the ulnar nerve.* The imperfect limitation of this lower part of the coraco-brachialis is also sometimes evidenced by a larger or smaller portion of it being continued into the brachialis anticus.

Great as are some of these deviations from the normal contracted form of the muscle, yet it is evident that they would not much modify its action as an adductor of the arm; they would simply increase its power. I have not found any instances of absence of the muscle, or any in which the variation was in the direction of deficiency; though in some Mammals, as Manis, where the coracoid is abortive, the coraco-brachial muscle is absent.

The continuity of the humeral adductor with the prebrachial flexors is to some extent maintained in the normal condition by the intimate relations of the short head of the biceps with the coraco-brachialis; and a still closer connection is not unfrequently retained by means of slips passing from the coraco-brachial itself, or more frequently by slips arising from the humerus near to the insertion of the coraco-brachial, and to some extent continuous with it, and joining the biceps. Such slips or portions constitute what is usually called the third head of the biceps. They lie commonly on the lateral aspect of the brachial artery, but have been seen crossing over it. The fibres may run into either or into both of the regular parts of the biceps; and they may often be traced on into the bicipital adjunct to the fascia of the forearm. Hallett in one case observed them passing directly into this fascia. They are not unfrequently also connected with the brachialis anticus at their origin, and thus the union of the three adducto-flexor muscles is preserved: or the union between the brachialis anticus and the biceps only may be retained by slips passing from the former to the latter, and more rarely by slips passing from the biceps to the brachialis anticus.

The biceps has also occasionally other connections with the humerus. An additional slip, coincidently with the third head or without it, may arise from the neighbourhood of the ulnar tubercle, and less frequently from the radial tubercle; or it may arise from the proximity of the insertion of the pectoralis or of the deltoid.† Meckel records an instance in which the biceps had five heads—that is, three in addition to those usually present; viz., one from near the coraco-brachialis, a second from the capsule of the shoulder-joint,‡ and a third from near the insertion of the deltoid.§ I have not met with the account of any case in which fibres of the deltoid were continued into the biceps as they are in *Orycteropus*. That this is not the case, or is so rare, and that the biceps seldom derives fibres from the pectoralis,|| is no doubt due partly to the fact, that it harmonises in its action with these muscles less than it does with the coraco-brachialis and the brachialis anticus, and that it is less associated with them in the direction of its fibres and in its development. It may seem not a little remarkable that it now and then receives a slip from the supinator longus. It must, however, be remembered, that both this muscle and the biceps act as flexors as well as supinators of the radius; and the supinator longus, though appertaining to the dorsal series of the arm, yet is so much inclined upon the palmar aspect as to acquire flexor relations as well as a flexor action.

Other varieties of the biceps have been observed which cannot quite be classed with those just mentioned: thus Dursy found the two bellies with two distinct tendons, and only connected by an intermediate fleshy mass.¶ Macalister and Otto noticed the absence of the long head; the latter remarking that the bicipital groove was faint and without cartilage, and that there was no aperture in the capsule; and Macalister found the long head passing between the tendons of the sternal and the

* See Wood, *Journal of Anatomy*, i, 46.

† Wood found one of these having a separate insertion into the radius, and so forming a "brachio-radial."

‡ Mr. J. Beswick Perrin notes a third head from the capsule of the shoulder-joint. It was small, and joined the coracoid factor. (*Medical Times and Gazette*, December 7th, 1872.) Dr. Curnow (*Journal of Anatomy*, vii, 306) gives an example of four origins, short, long, humeral, and an extra-coracoidal, with a few fibres from the capsular and coraco-acromial ligaments. The last joined the humeral head. This biceps muscle gave off a tendinous slip, which divided to the radial origin of the flexor sublimis, to the condyloid origin of the pronator teres, and was a substitute for the coronoid origin of that muscle.

§ Henle also saw five heads: one from the inner edge of the bicipital groove, another from near the insertion of the coraco-brachialis, which joined the inner side of the regular short head, and a third from near the insertion of the deltoid, which joined the outer side of the regular long head.

¶ Macalister mentions its receiving fibres from the pectoralis major, as in *Hylabates*: Gruber (*Mélanges Biol. de l'Acad. des Sc. de St. Petersburg*, 1848, p. 426) found a third head arising from capsule and under surface of pectoralis major, and a fourth head from pectoralis major and deltoid.

¶ *Journal of Anatomy*, iii, 196.

* Dr. Curnow (*Journal of Anatomy*, vii, 305) gives an instance in which the latissimus dorsi did not extend to the bicipital groove, but was attached to a prominent tubercle, three-quarters of an inch long, just internal to its upper lip; a tendinous band ran upwards from it, in front of the triceps tendon to the axillary margin of the scapula. Into this band and into the long head of the triceps, the teres major was inserted. The specimen thus furnishes another variety of persistent blending of the latissimus dorsi and teres major with the triceps.

† *Observations on Myology*, pp. 34, 155; *Journal of Anatomy*, vi, 34, 343.

‡ The approximation of these varieties to the normal form of the adductor parts of the adducto-flexor in the lower limb has not escaped attention; and it affords an additional evidence in support of the view which I have given in the *Observations on Myology*, pp. 155, 158, that the coraco-brachial is the concentrated serial representative of the adductores femoris.

clavicular fibres of the pectoral muscle.* Meckel notes an instance in which the short head was absent. Although in lower animals the tendon of insertion of the biceps is in many instances implanted into the ulna as well as into the radius, its action as a supinator of the radius prevents this diversion of a part to the ulna from taking place as a frequent variety in Man.† It is, however, sometimes connected with the pronator teres and with the flexor carpi radialis; and Gruber saw a slip detached from the short head, accompanying the brachialis anticus, and inserted into the capsule of the elbow-joint and into the ulna, as well as blended with the ulnar origin of the pronator teres. Henle traced a slip from the same part into the fascia over the brachial vessel; and Theile traced a slip from the long head into the capsule of the elbow-joint.

The instances of imperfect segmentation of the brachialis anticus from the coraco-brachialis and the biceps I have already noticed. The blending of the fibres of the brachialis anticus with those of the supinator longus,‡ with those of the pronator teres, and with those of the flexor digitorum sublimis, is also not unfrequently observed; but not, so far as I know, with those of the deltoid, although the origin of the brachialis anticus stands in such close relation to the insertion of that muscle: neither have I found any mention of the blending of the brachialis anticus with the triceps. The brachialis anticus is sometimes divided into two parts, both inserted into the coronoid process, as in the Rabbit and the Agouti;§ or a separate piece may arise from the middle of the anterior surface of the humerus. The imperfection of concentration of the muscle is further shown by the occasional passage of slips from it to the elbow-joint, the radius, the semilunar fascia, or the fascia on the outer as well as on the inner side of the arm; also by slips crossing over the brachial artery and median nerve, and rejoining the muscle. Gruber|| found a separate slip passing, from the humerus below the deltoid, to below the tubercle of the radius and to the pronator teres; also a slip from the inner side of the brachialis anticus to the radius, the ulna, and the pronator teres. He describes, also, instances of supernumerary muscles. In one such, a muscle arose from the intermuscular septum and from a tendinous arch passing from the septum over the brachial vessel and nerve.

The simple function and disposition of the triceps and its comparative uniformity in different animals prepare us for the fact, that the varieties of this muscle are few. The long head may range to a greater extent than normal upon the inferior costa of the scapula; or it may be here supplemented by an additional tendinous origin, and it may have more extensive connections than usual with the latissimus dorsi. The humeral origins may be more separate or more blended than usual, and there may be a separate fourth origin from the inner side of the humerus near its head, or from the capsule of the shoulder-joint, or from near the insertion of the subscapularis. An internal anconeus, or anconeus epitrochlearis, bridging over the ulnar nerve from the internal condyle to the ulna and olecranon, is said by Wood and Gruber to be present in a tenth or more of the subjects examined. Branches of the ulnar nerve were traced into this muscle by Gruber, which is a point of some interest, forasmuch as all the remainder of the triceps is supplied by the radial nerve. It is one of the many instances indicating that nerve-supply is regulated chiefly by convenience in the distribution of nerve-branches.¶

[To be continued.]

PENSIONS TO MEDICAL MEN AND THEIR WIDOWS: A PROPOSITION.

By E. C. GARLAND, L.R.C.P. Ed., President of the West Somerset Branch.

THE following memorandum I intended to read at our last annual meeting of the West Somerset Branch, but there was no time. The importance of the subject treated may render it worthy of insertion in the JOURNAL.

In common with several other members of the British Medical

* In a similar case observed by Louth, the absence of the long head was compensated for by the thickness of the short head, and in another by an accessory origin from the humerus. In a case related by Moser, the short head was double, there was a third head arising at the usual seat of the third head, and a fourth head from the radial tubercle.—Henle, *Muskellehre*, 177.

† In *Guy's Hospital Reports*, xvi, a slip is described arising from the deep and internal aspect of the biceps near its middle, and inserted into the coronoid process of the ulna.

‡ Found by Wood in six out of one hundred and two.

§ Wood, *Proceedings of the Royal Society*, 1868, p. 497.

|| *Mélanges Biologiques de l'Acad. des Sc. de St. Petersburg*, 1867, vi, p. 389. The author gives a résumé of the varieties of this muscle, with additional observations by himself. See also by the same anatomist in *Muller's Archiv*, 1848, p. 428.

¶ See remarks on this in my *Observations in Myology*, p. 56.

Association, I have long felt that there ought to be, in connection with our profession, some plan of providing pensions to widows of medical men, and to medical men themselves after a certain time of life. Various suggestions and experiments have been made with a view to establishing a fund or club for this purpose, but hitherto without any permanent result; so that at the present moment there are many members of this Association who are not in position to contemplate with complacency the circumstances in which they would leave their widows were they to die soon, nor what their own circumstances may be in the later years of life. After giving the subject some attention, and after some correspondence with a gentleman in London experienced in such matters, I am desirous of inviting attention to this widely felt want.

I apprehend that, in order to be satisfactory to the profession, any plan proposed would need to be somewhat as follows.

1. A purely business arrangement, dependent entirely on the payments of the members, and independent of the irregular and uncertain aid of benevolent persons outside.

2. Definite benefits to be guaranteed for definite payments, so that no one, after paying for a number of years, during which large pensions have been given to other persons, may find that, through an excess of claims, the pensions have to be reduced at the time when he begins to receive his.

3. The number of members and the invested fund would need to be sufficiently large—the former to yield an average duration of life, the latter to command confidence, and both to secure a moderate rate of expense of management.

I find that if several thousands of healthy persons of the age, say, of thirty, were each to pay £30 yearly into a common fund, those payments, with accumulations of compound interest, would suffice to yield £1,000 at each death before the age of sixty, and eventually £1,000 to each who lived to the age of sixty.

Suppose that one of those persons dies at the age of 50, leaving a widow of the same age: if she be a delicate person, she will rather take the £1,000 in cash, than a pension which will terminate with her life; if she be healthy, she may choose to exchange the £1,000 for a life income, in which case she may have £65 yearly while she lives.

Should the husband live to sixty, he may similarly either take the £1,000 in cash, or exchange it for a yearly income of £96 during his own life, or of £83 during his wife's life, or of £70 as long as either of them is alive.

Such is the plan I would recommend for adoption. It is extremely simple, and adapts itself to all circumstances. The medical man may be married or not at the time of joining; his wife may be any number of years older or younger than himself, or he may never marry at all; his wife may die before him and he may not marry again, or he may marry a lady of a different age; none of these circumstances entails a loss.

Whatever plan be decided upon, the important question remains, How the fund is to be organised, the selection of healthy members made, the funds invested safely and profitably, the contributions received from members, and the payments made to them. It is clear to me that it would be extremely hazardous to have a separate organisation at the outset. The time and expense necessary to secure a sufficiently large constituency would be so great, that I believe it would be better to attach ourselves at first to an established institution, from which we could withdraw if eventually we were strong enough to form a separate fund. At the same time it would be of advantage to act as a body in treating with an established institution, in order to secure the discount obtained now-a-days by co-operation. With reference to this point, I have much satisfaction in stating that I find, on inquiry, that the Edinburgh Life Office is open to make special terms with this Association, provided that each gentleman, on wishing to avail himself of the plan, communicates direct with the office in London, so as to avoid agency expenses. The Edinburgh Life Office is one of the various first-class companies; it is fifty years old, and has over £1,130,000 of cash invested. Its business has reference to human lives only, and does not comprise fire, marine, or fidelity guarantee risks.

I have no less satisfaction in intimating that provision would be made for the cases of gentlemen who from any cause were unable to continue their contributions until death or the age of sixty. It would be matter of regret if any member who could not keep up his payments were to feel that he had lost what he had paid; and, accordingly, I have had some calculations specially made by the actuary, and have elicited that the Edinburgh office will meet such cases as follows.

Should a member at any time cease paying, the result will be that a larger sum than he has paid will be returned by the office when he reaches the age of sixty, or at his death, should he die before sixty. Thus taking as before the case of a member joining at the age of thirty, in seven years he will have paid £212 12s. 6d. Supposing he does not