

clusions at which observers are apt to arrive through undue confidence in their powers of diagnosis, engendered by an ill-founded faith in the value of those signs. I have, moreover, ventured to suggest that there is in another direction a path of safety, along which we may travel with less chance of blundering, but one less seductive than the other, for it leaves little room for the exercise of the fancy; and less flattering to the vanity, inasmuch as it offers fewer occasions for exhibitions of that minuteness and correctness of observation upon which observers are at times too apt to pride themselves, even when the nature of the subject investigated renders these impossible. And following this path, we shall avoid another error, into which I believe I am correct in stating that auscultators, as such, have a tendency to fall, and that is, into an improper exaltation of the stethoscopic signs over the general symptoms, so that the disease is read and treated by the guidance of the former signs, to the prejudice of, and without due consideration being given to, the general symptoms.

I need scarcely say, in concluding, to those who have paid any attention to the subject, that the ideas of reform herein referred to, are none of my own, but proceed from that German school of which Skoda is the acknowledged head; I have introduced them here in a crude and germinal condition, with the hopes of bringing the subject more positively before the attention of auscultators. Criticism and discussion I am convinced are all they need to demonstrate their value, and it is this criticism and this discussion of the subject which I desire thereby to evoke.

It is surely not as a mere matter of curiosity, or as an interesting episode in the history of auscultation, that I have here introduced the subject, but from a firm conviction that the German method is correct, and the French wrong, in principle; and that by adopting the one, auscultation will be placed upon a higher and firmer position than it can yet boast to have attained; and that by continuing to follow the other, we must be contented still to find its signs very frequently the faithless and erring representatives of diseased conditions of the thoracic organs.

ART. IV.

On some points in the Abnormal Anatomy of the Arm. By JOHN STRUTHERS, F.R.C.S., Lecturer on Anatomy, Edinburgh. ✓

A CONSIDERABLE number of varieties in the anatomy of the brachial region have fallen under my notice in the dissecting-room, and some of these are so rare and interesting, that I have thought it worth while to draw up a systematic account of them, and especially to call the attention of anatomists to the occurrence of the supra-condyloid process on the humerus of man.

I shall arrange my cases and remarks under three heads: Varieties of the Muscles—The Supra-condyloid Process—and Varieties of the Arteries.

I. VARIETIES OF THE MUSCLES IN RELATION TO THE AXILLARY AND BRACHIAL ARTERIES.

1. *The Axillary Artery crossed by a Muscular Band.*

It is noticed by several anatomists that, occasionally, a slip of muscle is prolonged from the latissimus dorsi, across the axilla, to join the tendon of the pectoralis major, the coraco-brachialis, or the fascia over the biceps. This variety has occurred in 8 out of 105 subjects dissected in my rooms

since the first instance was noted. Of these 8, at ages between 3 and 70, 3 were males, and 5 females. In 7, it was present on both sides, of equal size in 5 of these 7, and in 2 of them, broader on the left than on the right side. In 1 it existed on the right side only, and a few scattered fibres were prolonged from the pectoralis major to join it. These fibres were present on the left side also, but not the slip.

This abnormal muscular band usually arises from the upper edge of the latissimus dorsi, about the middle of the posterior fold of the axilla. It is usually, I find, not a direct prolongation from the fibres of the latissimus, but, while the higher fibres may be so, the greater part or whole arises by a tendinous intersection between it and the fleshy fibres of the latissimus, or by a short intervening tendon, which, in one instance, was an inch in length. The muscular band varied from a quarter to three-quarters of an inch in breadth; in one case it was as thick as the pectoralis minor, where this muscle crosses the axillary vessels; and its length varied from three to four inches. It disappears under the tendon of the pectoralis major, and in four of the cases, where it was afterwards traced, it formed a tendinous expansion, and became blended with the tendon of the pectoralis major.*

The point of greatest interest in connexion with this variety is the position of the muscle in relation to the axillary artery, as it might mislead the surgeon in the operation of tying this vessel. It crossed always in front of the axillary vessels and nerves, and usually opposite the upper part of the conjoined tendon of the latissimus dorsi and teres major. It occupied this situation in all of the eight instances, except the one in which it was present on one side only, and, in this instance, it crossed as high up as opposite the tendon of the subscapularis muscle, and an inch higher than the edge of the conjoined tendon. It is usually fleshy where it crosses the vessels; but in one instance was tendinous on its posterior surface at this point.

As the artery in the upper part of the third stage of its course, opposite to, or at the lower edge of, the subscapularis muscle, gives off large branches, the circumflex and subscapular, the part to be chosen for operation is where it lies upon the conjoined tendon;† and, therefore, a little

* This corresponds to the normal arrangement in some animals. It is well seen in the cat. As the latissimus dorsi approaches the axillary vessels it divides, the anterior part, being about a fourth of the entire muscle, passing across or in front of the axillary vessels and nerves, and ends in an expanded tendon, which above joins with the deep part of the pectoral muscle, and below expands as an aponeurosis, binding down the flexor radii muscle, which corresponds to the biceps of man. The great part of the latissimus crosses behind the vessels and nerves with the teres major, and rather higher up than the anterior portion. Both are fleshy where the vessels and nerves lie between them. The whole mouth of the axilla is closed over by a thin muscular layer, continued upwards to the edge of the pectoral muscle from the edge of the anterior part of the latissimus, and also partly from behind from the panniculus muscle. The fleshy fibres forming the anterior part of the latissimus are continued onwards without any intervening tendinous intersection. In the cat, this anterior part of the muscle, as it crosses over the vessels and nerves, is one-third of an inch broad. In the lion, it forms a tendon broader than the conjoined tendon of man, though not so thick; the lower edge continued into the aponeurotic expansion over the brachial region, the upper edge rounded and free, and the tendon, having crossed over the vessels and nerves, runs in underneath the pectoral muscle, to be inserted into the same ridge on the humerus, having formed, at the same time, a large expansion over the flexor radii muscle, which it thus binds down.

† I use the term "conjoined" tendon, as it is a convenient one, in describing the relative anatomy of the parts. Strictly speaking, there is but a very partial insertion of the fibres of the teres major into the tendon of the latissimus; and a little further on, they are altogether separated by a bursa, the teres ending in the internal bicipital ridge, while the latissimus glides over the ridge and bursa, and is inserted in the floor of the bicipital groove.

below where this muscular slip crosses over the vessels. It will, however, be exposed in the operation. In one of the cases, the operation was being practised by one of the pupils, and the ligature had been applied below the muscle on one side, and above it on the other. In another of the cases, I was showing the operation, and the muscle was exposed in the wound, and recognised at a short distance above the point where the artery was tied. The fibres of this unusual muscle are transverse, whilst those of the coraco-brachialis, the only normal muscle which should be seen in the operation, are vertical.

2. *Muscle concealing the Brachial Artery in the Upper Third of the Arm.*

This variety occurred in the right arm of a male subject in 1851. The coraco-brachialis muscle is twice the usual size, and sends a muscular layer over the vessels and median nerve. This muscular covering begins at the lower edge of the conjoined tendon, and reaches down for three inches, near to the insertion of the coraco-brachialis. It is of considerable thickness, passes quite round to the inner side of the vessels, and joins the internal head of the triceps, or a tendinous septum between them. There is thus formed a kind of tunnel, which admits the little finger, and ends below by a distinct tendinous arch, the outer side of which is the ordinary tendon of insertion of the coraco-brachialis. This tunnel encloses the undivided brachial artery, its venæ comites, and the median nerve, in their usual relative position. There is no other variety, except that the posterior circumflex artery arises with the superior profunda, and, as usual when it so arises, courses up behind the conjoined tendon to gain its usual position at the neck of the humerus.

During the present winter, I met with an example of an approach to this variety. The coraco-brachialis sent a thin muscular prolongation inwards over the vessels and nerve, as far as to conceal them partially; but on division of the aponeurosis continued from it, it passed outwards, and left the sheath exposed.

3. *Brachial Artery concealed in the Lower Half of the Arm by a Broad Third Head to the Biceps Muscle.*

This variety occurred in 1848, in the right arm of a male subject. The brachial artery is concealed in the lower half of its course by a broad, thick, muscular layer, extending from the intermuscular septum to the biceps muscle. The artery, its venæ comites, and the median nerve, disappear through a tendinous arch, situated a little above midway between the internal condyle and the lower edge of the tendon of the teres major. This fibrous arch is about an inch in length, extending obliquely downwards and inwards, and is continuous above with the insertion of the coraco-brachialis, and below with the intermuscular septum.

The unusual muscle arises from this arch, and from the intermuscular septum, as far down as to within an inch of the internal condyle, being a length of four inches and a half, leaving only a narrow cellular space between it and the pronator teres. The fibres pass downwards and outwards, approaching and accompanying the inner part of the biceps. About

one half of the muscle ends in the tendon of the biceps, just where that tendon receives the belly of its muscle, and the other half ends in the semi-lunar process from the biceps to the fascia of the forearm. It forms an uninterrupted muscular layer of a thickness between an ordinary sartorius or gracilis muscle, concealing the brachial vessels and median nerve in more than the lower half of their course. As it approaches the biceps, it becomes narrower, from its obliquity, so that where it joins the biceps, it is only two inches in breadth. When the upper part of it is held inwards from the biceps, the upper part of the artery is exposed; but beneath its lower half, the artery could not be exposed without division of the muscle. The radial artery appears as usual between the tendon and semi-lunar process of the biceps.

On raising the biceps and looking under it from the outside, this large unusual third head is seen to be double, or split by the artery, a portion lying underneath the vessel besides that already described. This deeper portion corresponds to the upper half of the superficial portion. At its origin from the intermuscular septum and internal margin of the humerus, it is two inches in breadth, but contracts below to three fourths of an inch, and joins partly the tendon and partly the semi-lunar process of the biceps. The lower edge of this deep portion seemed to twist round or cross over the artery on its outside, to reach the semi-lunar process in front of it. This deep portion was thicker, though narrower, than the superficial. The fibrous arch protected the vessels and nerve from pressure as they entered on the deep part of their course; but it is not easy to see how below this the artery could escape compression, as it lay close between the two layers of muscle.

We have here then an instance of a large third head to the biceps muscle, consisting of a superficial portion, forming a broad continuous muscle concealing the lower half of the brachial artery, and of a deeper portion, lying at first beneath the artery, and about half the breadth of the other.

On the left side of this subject, the biceps had a third head, corresponding to the deep portion of the third head on the right side, and, like it, lying behind the artery. There was no other variety on the left side.

4. *Muscular or Tendinous Slip passing inwards across Brachial Artery in Lower Third of Arm.*

The three following instances have occurred during the present winter session.

(1) *Slip from biceps across brachial artery.*—This fleshy slip is three inches in length, one quarter of an inch in breadth, and one eighth of an inch in thickness, and ends in a broad aponeurotic tendon two inches in length. The muscle separates from the inner edge of the biceps two inches below the lower margin of the teres major. It crosses obliquely over the brachial artery and conceals it for an inch and a half. The belly having just crossed to the inside of the artery, the tendon is placed to the inside, as it passes down to end in an aponeurosis over the pronator teres, close above and to the outer side of the internal condyle. The inner edge of the tendon is joined to the intermuscular septum. Between its outer

margin and the tendon and semi-lunar process of the biceps, there is now a triangular space three quarters of an inch in breadth below, but they appear to have been joined across in front of the artery by a thin portion, although this cannot be determined now. This variety occurred on the left arm of an adult subject, and appears, from the remains of the tendon, to have been present on the other side also.

(2) *Muscular and tendinous slip crossing over brachial artery.*—This variety occurred in the left arm of an adult female subject. The muscle arises from the external bicipital ridge by a long tendon, and again ends in a tendon, which is inserted into the aponeurosis over the pronator teres. The upper tendon arises from the upper part of the bicipital ridge of the humerus close to the great tuberosity, and crosses obliquely behind the long tendon of the biceps in the groove. After a course of two inches and a half it ends in a fleshy belly, which appears on the inside of the arm between the biceps and coraco-brachialis muscles; passes down along the inner edge of the former, and parallel to the outer side of the artery, which it now crosses obliquely, and, after a course of three inches, ends in a narrow flattened tendon, which is three inches in length before it spreads out over the pronator three quarters of an inch below the condyle. The fleshy portion is one sixth of an inch and the lower tendon one twelfth of an inch in breadth as they lie in front of the artery. They cross the artery very obliquely so as to lie in front of it for three inches, one inch of the fleshy and two inches of the tendinous portion. The artery lies in a groove in the brachialis anticus muscle, from the raised portion on the outer side of which is sent off, over the artery, an aponeurosis to join the tendon of this abnormal muscle, which is quite distinct from the intermuscular septum.

(3) *Tendinous slip from pectoralis major to internal condyle, crossing over brachial artery.*—This variety occurred on the right arm only, in an adult female subject. The pectoralis major gave off its usual expansion to the aponeurosis of the arm. The tendinous slip comes from below this, from the deeper part of the tendon of the pectoral, as a cord or tendon about the size of a common probe. It crosses over the brachial artery obliquely, at and below the insertion of the coraco-brachialis. It now lies behind the basilic vein and internal cutaneous nerve, passes to join the true intermuscular septum, and is continued with it to the condyle, an inch above which it also joins with the ligamentous cord behind the septum, from which, above, it is quite distinct. As this long ligamentous arch passes down the arm, its outer or anterior edge is free and rounded, and the posterior edge is continued backwards into the deep fascia of the arm. It lies obliquely over the artery for about an inch, just at, and a little below, the tendon of the coraco-brachialis. In an operation, this slip might mislead from its resemblance to the intermuscular septum.

Remarks.—The two cases first related exceed any that I have read of in the extent to which the artery was concealed by a muscular covering. Mr. Quain* has met with a case in which the artery was covered, for an inch and a half, by a thick muscular slip from the biceps to the inter-

* The Anatomy of the Arteries of the Human Body. London, 1844.

muscular septum (plate 37, fig. 5). He also mentions another in which a third head to the biceps crossed over, instead of under, the artery; and refers to a preparation in Mr. Allan Burns's museum, in which a slip of muscle passed across the brachial artery, and is said to have impaired the activity of the limb during life.

The surgeon should be prepared to meet with these varieties of the muscles. Certainly, the operation of tying the brachial artery in the two cases first related would have been a puzzling one, from the resemblance of the unusual muscle to the natural coraco-brachialis and brachialis anticus. But, seeing that the incisions were well-placed, the nature of the difficulty might be recognised, and the pulsation of the covered artery, and the effect of pressure on it, would probably indicate the position in which it would be found on division of the muscle. If there happened to be a high division, and one of the arteries placed under such a muscle, it could scarcely but be overlooked in the operation.

5. *Brachial or Third Head to Biceps Muscle.*

The occasional occurrence of a third head to the biceps has long been well known to anatomists. Theile* states that it occurs as often as once in eight or nine subjects. In one case there were two additional heads from the humerus. I have noted this variety in four instances during the present session.

(1) Third head arises as upper and inner part of brachialis anticus, with the fibres of which it is here quite continuous. It is half an inch broad and six inches long, and ends in the upper and inner part of a broader than usual semilunar process, and in the contiguous part of the tendon of the biceps. Left arm: no third head on right.

(2) Right arm, none on left side. Arises as highest and most internal part of the brachialis anticus, immediately outside insertion of coraco-brachialis. Is half an inch in breadth and five inches in length. Inserted, fleshy, into deep surface and inner edge of tendon of biceps at its commencement, and a few fibres run into the semi-lunar process.

(3) Both arms. Is small and narrow like a flattened lumbricalis muscle. Arises by a short tendon, as in the preceding cases, and inserted also as in them.

(4) Right arm. Left unascertained. Arises separate from the fibres of the brachialis anticus, for two inches in depth, immediately external to insertion of coraco-brachialis, but reaching an inch above this, and also higher up than the brachialis anticus. Is one inch in breadth and six inches in length. Insertion exactly as in preceding cases. As the third head in all of these cases passed, as usual, behind the brachial artery, this occurrence does not affect the surgical anatomy of that vessel.

6. *Brachial Artery overlapped or covered by a portion of the Brachialis Anticus Muscle.*

Mr. Quain relates two cases in which he saw the principal of two arterial trunks covered by a thin layer of the brachialis anticus muscle

* *Traité de Myologie et d'Angéiologie.* F. G. Theile. *Encyclopédie Anatomique.* Paris, 1843.

(plate 37, figs. 3 and 4), and mentions in connexion with this, that the fibres of the brachialis not unfrequently project at the outer side of the artery, in some cases even overlapping it. This condition I have repeatedly noticed, so often indeed that I gave up noting the individual cases. It occurs more frequently perhaps in the case of two arteries, when the deeper one has this position, but often enough it is seen with the single and otherwise normal artery. It is seen in various degrees. The brachialis presents a raised portion on the outside of the artery, and an aponeurosis, deeper than the common aponeurosis of the arm, is sent inwards from it, over the artery, which is thus closely bound down upon the brachialis, and is as if sunk in a groove in the substance of the muscle. In a further stage, the fleshy fibres overlap the artery from the outside, although not so far but that, on division of the aponeurosis, these overlapping fibres slip outwards off the artery. In one of the cases noted this winter, the artery in both arms of an adult female subject was thus covered for three inches. But what is most commonly seen is a raised portion of the brachialis muscle projecting on the outside of the artery, sending a deep aponeurosis inwards over it, and binding the artery down in a kind of groove in the muscle.

7. *High Origin to Pronator Teres Muscle.*

We not unfrequently meet with the pronator teres muscle arising a little higher than usual above the internal condyle, but without much altering the relative anatomy of the bend of the arm. In the two following instances, however, the muscle arose unusually high, and changed the relative position of the arteries at the bend.

(1) On *left* side pronator teres arises one inch and a half above the condyle. An aponeurosis reaches from it to join brachialis anticus, external to position of artery. There is thus formed a kind of arch or tunnel, under which the principal artery and the median nerve pass, so as to become concealed half an inch above the transverse level of the condyle. Radial artery arises above middle of arm, and passes over this aponeurosis, but lies under the aponeurosis of the arm and semi-lunar process of the biceps.

Right side. No high origin to pronator, but a high division of artery, and the two arteries are separated by a deep layer of aponeurosis at the bend of the arm.

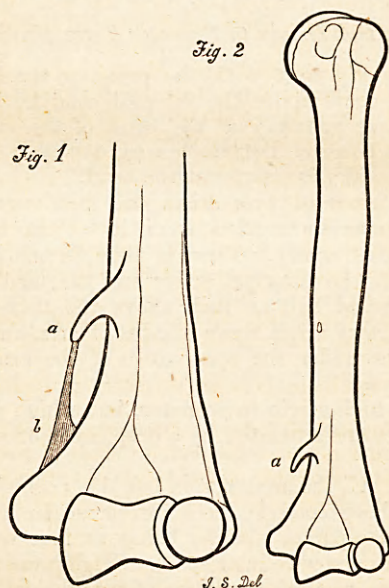
(2) *Right* side. All the anatomy on left side normal. Pronator teres arises two inches above condyle, from intermuscular septum. The high portion is almost a separate muscle, being at first separated from the usual pronator by a narrow cellular space. High pronator is soon joined, by aponeurotic fibres, to a raised portion of the brachialis anticus external to the position of the artery. Radial artery arises in axilla, and is covered by the usual aponeurosis of the arm and the semi-lunar process of the biceps, but the principal artery passes, along with the median nerve, underneath the above-mentioned deep aponeurosis and high pronator, by which they are concealed for an inch and a half above the transverse level of the condyle.

II. ON THE OCCURRENCE OF A SUPRA-CONDYLOID PROCESS IN MAN.

The part so named is a more or less hook-shaped process, which is occasionally developed on the inner surface of the humerus, two inches above the internal condyle. A ligament is continued from it to near the condyle, completing an arch, through which the median nerve and brachial artery pass, after deviating from their usual course; the whole forming an arrangement analogous to that which obtains in many animals, in the passage of the nerve and artery through an opening, the supra-condyloid foramen, in the humerus, in the same situation.

A few instances of this variety had been recorded previous to 1848, when I gave a short account* of several which I had met with in the dissecting-room, and I have now met with the variety so frequently, that I am desirous of noticing it more fully, and of calling the attention of anatomists to it, as a variety which, I believe, will be found to occur not unfrequently, to a more or less marked degree, if this part of the arm be carefully examined.

The accompanying sketches are taken from two of the numerous specimens of this variety now in my collection. In fig. 2, the bone and process



Figs. 1 and 2. Illustrations of the supra-condyloid process in man. *a a* Supra-condyloid process. *b b* Ligament completing the arch.

are represented one-fourth the natural size. In fig. 1, the lower end of the humerus is shown half the natural size. The supra-condyloid process is broader and stronger in this specimen. The bone is seen a little on its

* Edinburgh Monthly Journal, Oct. 1848.

external and inferior aspect, to show the size of the oval space, completed by the ligament, through which the nerve and vessels passed. Fig. 2 is from case No. 4, and Fig. 1 from case No. 8, in the following list.

List of Cases of Supra-condyloid Process, with notes of the peculiarities of each.

1. Left side. Process one-third of an inch in length. Adult female. Nothing known of right side.

2. Both sides. Process broad and long; nerve and artery passed round it on both sides. Adult female.

3. Both sides. Process of moderate length. Nerve and artery passed round on both sides. Adult male.

4. Both sides. Process three-quarters of an inch long on left side, and very short on right. Nerve and artery passed round on left side; on right side, nerve only, accompanied by small muscular arterial twig.

5. On right side only. Process of moderate length, and well-marked groove behind it. Nerve and artery pass round process.—*Left side.* Groove well marked, though process entirely wanting. High division at axilla; both arteries run down inner edge of biceps, radial most external. A small third head to biceps, behind arteries. Female æt. 37.

6. Right side only. Process was of good length, but now partly broken off. Median nerve passed round process, but artery did not. Uncertain whether a small branch did not accompany nerve.—*Left side.* All anatomy normal. Female æt. 4.

7. Right side only. Process moderate. Median nerve passed round process, accompanied by small muscular artery from inferior profunda. Artery did not deviate—was crossed behind by median nerve—divides an inch above elbow, and ulnar passes superficially, close under aponeurosis of forearm.—*Left side.* No process, but a well-marked groove, and slight roughness just where process arises on other side. High division of artery at lower edge of conjoined tendon. Arteries usual in position, separated only by median nerve. Female æt. 50.

8. Left side. Nothing known of right. Process three-quarters of an inch in length. Nerve and artery pass round it. This specimen is from the case related by Dr. Knox,* and came into my possession with his Museum of Human Anatomy. Middle-aged male.

9. Left humerus, in my collection, without any history. Rough ridge a quarter of an inch in length, where process arises in other specimens, and a distinct groove behind it.

The following are specimens in other museums, or from cases described by others.

10. Both sides. Process well formed. Preparation of child, showing arteries, in Barclay collection in museum of Edinburgh College of Surgeons.—*Right side.* Artery passes round process.—*Left.* Radial arises above middle of arm, and keeps by edge of biceps; chief trunk deviates and passes round process. Nerves not preserved.

11. Left side. Nothing known of right. Young child.

12. Left side. Nothing known of right. Nearly full-grown arm. This, and the last, also in Dr. Barclay's collection. In both, process is well developed, and in both there is the same arrangement of arteries as on left side of No. 10.

13. Right side only. Skeleton, also in College museum. Female, and probably æt. about 30. Process moderate on right humerus, with well-marked groove behind it. Left has no process, and only a shallow groove.

14. Case by Tiedemann.† Right side. Nothing said regarding left. Process distinct. Brachial artery usual in position. High interosseous passes round pro-

* Edinburgh Med. and Surg. Journal, 1841.

† Tabulæ Arteriarum, 1822. Plate xv., fig. 3.

cess; nerve not represented. Process designated "an unusual excrecence from the humerus."

15. Case by Mr. Quain.* Right side. No information regarding left. Adult. Nerve and artery pass round process.

The following generalizations may be made with regard to this process, and its relation to the nerve and artery.

As regards Situation, Length, and Form.—The situation is remarkably constant. In the adult bones it is two inches above the internal condyle, measuring from the upper edge of that prominence to the middle of the base of the process. In one it was one-sixth of an inch nearer, and in one a quarter of an inch farther from, the condyle. In case No. 2 only did it lie considerably nearer the condyle, being an inch and a quarter from it, and here the process was long and of unusual breadth.

The length varies from one-tenth of an inch to three-quarters of an inch. It is seen in all stages—as a short rough line, a pointed tubercle rising from a base elongated upwards and downwards, and a hook or spur-like process of greater or less length. I have never seen it longer than three-quarters of an inch. In the specimens figured it is of this length. It begins by a vertical ridge half an inch to an inch in length, gradually rising to the commencement of the process proper. The process projects away from the bone, forwards, downwards, and inwards, is flattened from before backwards, tapers to a blunt point; and, if prolonged for an inch, would form an arch of bone joining the ridge half an inch above the condyle. This is represented by the ligament; and the process and ligament together, inclose between them and the bone an elliptical space, an inch in length and one-third of an inch in breadth, through which the median nerve and the brachial artery, with its venæ comites, passed.

The origin of the process with regard to the borders of the humerus is also constant. It arises from the internal surface of the bone, midway between the internal and anterior borders, or a little nearer to the latter; and behind it there is usually a well-marked groove, to which I shall again allude as existing on many arm bones on which there is no process.

As regards Symmetry.—In 7 of the cases, nothing was known of the other arm. Of these 7, 6 were on the left arm and 1 on the right.

In 4 of the cases it was present on both sides. In 3 of these, it was of equal length on the two sides; in one pair long, in one pair short, and in the third of medium length; and in the fourth they were unequal, the left very long, the right very short.

In 4 cases in which both bones were examined, but in which the process was present on one side only, this side was the right in all; but in the case where it was present on both sides, and unequal, the left was much the longest.

As regards Sex and Age.—The sex was known in 10 of the cases; 3 of these were in males, and 7 in females. In 2 of the 3 males it was present on both sides, and was so in only 1 of the females. The specimens are from subjects of all ages. Three of them were young children, and in all of the three the process is well formed.

As regards the Arteries.—The state of the arteries was known in 12 of

* Op. cit., p. 223. Plate xxxvi, fig. 3.

the subjects, and 4 of these presenting the process on both sides, we have 16 instances in which to notice the relation of the arteries to the process.

Where the artery is affected by the existence of the process, it leaves the biceps near the insertion of the coraco-brachialis, and passes down, with the median nerve, along the internal intermuscular septum, to reach the concavity of the process, underneath which it then passes.

Out of the 16 instances, in 9, the undivided brachial artery deviated and passed round the process; in 4, there was a high division, one of the arteries keeping normally along the edge of the biceps, the other deviating to pass round the process. The vessel which deviated in 3 of these 4 was the principal trunk, the high radial not deviating; in the remaining instance—that by Tiedemann—the deviating vessel was a high interosseous. In the remaining 3, there was no deviation of the artery, although the process was present. In 2 of these, the other arm was in all respects normal; in the third, there was a long process, and the artery deviated.

Relation to Median Nerve.—In all the instances in which the artery deviated, and in which the position of the nerve was known, it also deviated and passed around the process, lying internal to the artery as they entered the arch. In 3 of my cases the nerve deviated without the artery. In at least 2 of these it was accompanied by a small artery derived from the inferior profunda, which ran down with it in the same way as the inferior profunda itself runs down with the ulnar nerve. This, however, was not a leading vessel, but only a muscular branch, not extending beyond the elbow, nor again joining with the brachial or either of its divisions. In every case where there was a process, whether short or long, and the nerve examined, it deviated to pass under the process, whilst in 3 of these instances the artery did not deviate with it. This points to the inference that the supra-condyloid foramen is provided not so much for the artery, as is commonly supposed, but principally for the nerve.

(To be continued.)

ART. V.

On the Existence of Sugar in the Liver and other parts of Hybernating Animals. By Dr. G. VALENTIN, Professor of Physiology in the University of Bern; communicated by WILLIAM BRINTON, M.D., (Joint) Lecturer on Physiology at St. Thomas's Hospital, &c.

THE following is an extract from a letter recently addressed to Dr. Brinton by Professor Valentin:

“As you are desirous of knowing something about my researches on the winter-sleep, I venture to select a point which has lately excited much attention,—viz., the sugary content of the organs.

“You are aware that Bernard discovered the existence of sugar in the liver. His numerous experiments upon this subject were published last year in France and Germany, simultaneously.

“It has hitherto been believed that, in continuous fasting, the hepatic sugar constantly decreases, and at last altogether disappears. Hence it became interesting to determine how it was affected by hybernation.