Muscles and regions of the neck / by John Simon.

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Simon, Sir John, 1816-1904.
Royal College of Surgeons of England

Publication/Creation

London : Marchant, Singer, & Smith, printers, 1843.

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MUSCLES AND REGIONS

OF

THE NECK.

BY

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From the Cyclopædia of Anatomy and Physiology.

LONDON:

MARCHANT, SINGER, & SMITH, PRINTERS, INGRAM-COURT.

1843.

NECK. Gr. τραχηλος; Lat. *collum, cervix;* Fr. *le cou;* Ital. *il collo;* Ger. *der Hals.* This word denotes that contracted, ribless portion of the trunk or column of support, which, in vertebrate animals, immediately sustains the head. Disease and accidental lesions so frequently submit it to surgical examinations and operative treatment, that familiar acquaintance with its intricate anatomy is of indispensable necessity to the practitioner.

The order which I shall adopt in the ensuing article is, first, to describe fully and in order the muscles and fasciæ of the neck, and subsequently the various regions into which it may be divided with the parts contained in them; the earlier portion giving, as it were, a mere skeleton view or diagram of the anatomy; the latter presenting the organs in their more natural, or regional arrangement, and treating of them in their living relations to disease, casualty, and surgical operation. I should recommend the student of this important part to pursue a similar plan; first, namely, thoroughly to impress on his mind those relatively firm and fixed textures which admit of practical use as landmarks, and not, till this task is completed and these anatomical boundary lines are vividly and individually before him, to fill up his sketch with important organs, or perplex his mind with their surgical relations.

I. The muscles.

The muscles of the posterior region of the neck and those of the shoulder having been described in a previous article (see Back), the remainder may be considered in three classes—1. those which most nearly cleave to the vertebræ, are attached to their processes, and principally affect their motions; 2. those, chiefly in or near the median plane, which belong to the cervical portions of the respiratory and digestive apparatus, to the pharynx, larynx, tongue, and os hyoides; 3. the superficial muscles of the side of the neck, the sterno-cleido-mastoideus, and the platysma myoides. The *first class* includes—1. *anteriorly*, the longus colli and rectus capitis anticus major; 2. *laterally*, the scalenus anticus, scalenus posticus, and inter-transversales, with which may be reckoned the rectus capitis lateralis and rectus capitis anticus minor.

1. *Anterior vertebral muscles.*—*M. longus colli (Pre-dorso-atloidien:* Chauss.) is a thin elongated muscle, which occupies an extent in the pre-vertebral region, corresponding to the three upper dorsal and to all the cervical vertebræ. In form it is triangular, having its base at the bodies of these vertebræ, and its truncated apex at the middle transverse processes of the cervical region, and consists of three distinct, though united, parts, which would be represented by the three sides of such a triangle. One portion, the largest, is nearly vertical, next to the median line, and a direct flexor of the spine: it originates from the bodies of the three upper dorsal and four lower cervical vertebræ, as also from the intervening fibro-cartilages, and, ascending, is inserted by two slips into the anterior surface of the bodies of the second and third vertebræ. The second part is directed from the transverse processes of the third, fourth, and fifth cervical vertebræ, at which it arisesby tendinous slips,—upward and inward to be inserted into the anterior tubercle of the atlas, and it so continues to that bone the previous insertion of the muscle. The remaining part detaches itself from the main body of the muscle at the bottom of the neck, and ascends obliquely outward, to infix itself by small tendons at the anterior tubercles of the transverse processes of the third and fourth cervical vertebræ. The muscle may, in short, be described as passing from the bodies of the three upper dorsal and four lower to those of the three remaining cervical vertebræ, receiving above an oblique reinforcement from the middle transverse processes of the neck, to which it has likewise below detached slips of insertion.

M. rectus capitis anticus major (Grand-trachelo-basilaire: Dumas) lies closely on the vertebræ in the upper part of the neck, to the outside of the preceding muscle. It is an elongated, but thickish, muscle, arising by tendinous slips from the anterior tubercles of the transverse processes of the third, fourth, and fifth cervical vertebræ. These become fleshy, unite as they ascend, and are inserted into the under surface of the basilar process of the occipital bone, beside the median line, and just behind the spine, which attaches the raphe of the pharynx. Its inner edge overlaps the longus colli. These muscles correspond anteriorly to the great vessels of the neck, to the nerves which accompany them, and to the cervical portions of the respiratory and digestive tubes, but are separated by their own dense fascia from immediate relation to these parts. Their deep surface is in intimate connection with all the vertebræ and intervertebral discs, to which they correspond. Their action is inconsiderable; the rectus will slightly rotate and bend the head to its own side, or in conjunction with its fellow directly flex it. The longus colli, cooperating with its fellow, bends the cervical spine; or, acting singly, can slightly rotate by its higher fibres toward, by its lower fibres away from, the side on which the contraction occurs.

2. *Lateral vertebral muscles.*—*The inter-transversales colli* are almost described by their name. They form, on each side, a double series of small square muscles, occupying the spaces between the adjoining transverse processes, which afford them attachment by both borders of their surface. Arising from the lips, which the channelled upper surface of each transverse process presents, they ascend in each space to the borders of the process immediately above, and are there inserted. Between the inter-transversales antici and postici the spinal nerves of the region emerge, and the vertebral artery ascends.

Strictly analogous to these are the two small muscles which pass to the occiput from the transverse process of the atlas, the *rectus capitis lateralis* and *rectus capitis anticus minor.* The former would represent a posterior, the latter an anterior inter-transversalis. The former

passes from the upper edge of the transverse process of the atlas to the transverse or jugular process of the occiput: the latter, on a plane anterior to this, from the anterior root of the transverse process and side of the anterior arch, inclines upward and a little inward, to be inserted into the basilar process of the occipital bone behind the rectus capitis anticus major, between its outer edge and the foramen magnum. The rectus capitis lateralis separates the vertebral artery from the jugular vein.

These muscles in approximating their points of attachment can give lateral flexion to the neck and to the head.

The *scaleni (Costo-trachelien:* Chauss.*)* are situated at the lower lateral part of the neck, extending from the transverse processes to the first two ribs, and are of triangular form. They have been variously described by different anatomists, some considering their fleshy mass as a single muscle, others distinguishing in it two, three, and even five parts. I shall adopt the more usual modern division, which recognises two muscles, *scalenus anticus* and *scalenus posticus.*

Scalenus anticus arises from the third, fourth, and fifth cervical vertebræ, at the anterior tubercles and notched extremities of their transverse processes, by slips of tendon, to which muscular fibres directly succeed, and descends with an inclination outward and forward to be inserted by a flat strong tendon into a roughness about the middle of the anterior third of the first rib. This insertion is important as affording a guide to the position of the subclavian artery, which, in arching over the rib, lies behind this tendon and separates it from the insertion of the scalenus posticus. It is triangular in shape and fleshy in nearly its whole extent: *externally* it presents a free border, from behind which emerge the elements of the brachial plexus and the subclavian artery; *internally* its origin adjoins that of the rectus capitis anticus major, from which it is demarked by the arteria cervicalis ascendens, and toward its insertion is separated from the longus colli by a space in which the vertebral artery ascends; its *anterior* surface is crossed from above by the phrenic nerve, and transversely by branches of the thyroid axis; its *deep* surface is separated from the scalenus posticus by the emerging trunks of the nerves, and the space between them, broadening towards the first rib, includes there the brachial plexus and subclavian artery—the latter being below and in front of the former, and in immediate contact with the rib.

Scalenus posticus, larger than the preceding, behind which it is situated, arises by six tendons, to which muscular fibres directly succeed, from the posterior tubercles of the transverse processes of the six last cervical vertebræ. The first slip (often partly derived from the atlas) is joined, as it descends, by the others in succession, and a large triangular muscle results, which has its base at the transverse processes and its apex at the second rib. It is inserted, first, by an anterior broad slip into the outer edge of the first rib, from the tubercle behind as far forward as the arterial impression in front; secondly, by a smaller slip, which is prolonged from the posterior surface of the muscle to the upper edge of the second rib near its tuberosity. This muscle corresponds *anteriorly* to the scalenus anticus, from which it is separated by the brachial plexus and subclavian artery; *posteriorly* to the levator anguli scapulæ; by its *inner* edge to its points of origin; by its *outer* edge to the serratus magnus and transversalis colli artery, to branches of the cervical and brachial plexus of nerves, and to the sterno-mastoid muscle; lastly, by its *inferior-internal* edge to the longus colli, from which it is divided by the anterior branch of the first dorsal nerve, and by the (generally) common trunk of the deep cervical and first intercostal arteries.

The action of the scaleni, as of the muscles previously described, consists rather in maintaining steadiness and resisting lateralisation of the neck, than in effecting any considerable movement. They may, however, in a slight degree, bend the neck laterally. The vertebræ being fixed, their muscles by acting together may elevate the first two ribs and so assist in inspiration. The scalenus anticus can, from its advanced insertion, act more effectually thus. This action is illustrated in all deeper inspirations; for these differ from ordinary breathing therein, that the chest is expanded by the elevation of the ribs and sternum, in its antero-posterior and transverse diameters, in addition to the ordinary increase of capacity which it gains by the descent of the diaphragm; and in order to the effective action of the intercostals, the first rib must be rendered immoveable. The scaleni, in raising the anterior extremity of the first ribs, favour the advance of the sternum, and then rigidly fixing these bones enable the intercostal muscles to give to the ribs beneath that slight axial rotation by which the transverse diameter of the chest is increased.*

The intrinsic muscles of the larynx having already been described (see LARYNX), and those of the pharynx being for future description (see PHARYNX), our *second class* will comprise only the muscles of the os hyoides and tongue, viz. depressors of the os hoides, the *sterno-hyoid*, *omo-hyoid*, and *sterno-thyroid*, with its continuation the *thyro-hyoid;* its elevators, the *digastric*, *stylo-hyoid*, *mylo-hyoid*, *genio-hyoid;* muscles of the tongue, *hyo-glossus*, *genio-hyo-glossus*, and *lingualis.*

The *sterno-hyoid* and *sterno-thyroid* are two riband-like muscles, having respectively the attachments denoted by their names,—situated beside the median line, so as to be divided

* Within the last year I have observed in two subjects an importantly anomalous insertion of the scalenus anticus. Its main bulk of tendon passed on both sides to an insertion *behind* the artery, a very small slip only taking the usual course. The strong flat tendon, which is usually so trustworthy a guide to the artery, would in these cases have involved an operator in the misfortune of surrounding the nerves with his ligature; and the circumstance illustrates the necessity of trying the effect of temporary pressure on a supposed arterial trunk, before conclusively tightening the ligature around it.

from their fellows on the opposite side only by the mesial raphe of the cervical fascia,—covering the trachea, thyroid body, with a portion of the larynx, and overlapping the sheath of the carotid vessels. They are isolated from each other, and from the other muscles of their neighbourhood, by processes of the cervical aponeurosis. The *sterno-hyoid* arises just within the thorax from the deep surface of the manubrium sterni, from the cartilage of the first rib, and from the ligament of the sterno-clavicular joint, and is separated from that of the opposite side by nearly the whole breadth of the sternum. As it ascends, it more nearly approaches its fellow, and the two are inserted side by side into the under surface of the body of the os hyoides, in close connexion, by their outer edges, with the omo-hyoid muscles, which are inserted beside them. The sterno-hyoid lies in its whole length on the sterno-thyroid muscle and its prolongation the thyro-hyoid, and these separate it from immediate contact with the important organs to which it is related.

The *sterno-thyroid* is broader and rises lower within the chest,—from the cartilage of the second rib, and from the adjoining surface of the sternum, on which it extends almost to the median line: its fibres ascend nearly vertically, and terminate at an oblique fibrous arch on the ala of the thyroid cartilage, and at the tubercles, to which this arch is attached; hence a muscle of similar volume is prolonged, (which may be described as rising from the oblique cord and from its points of attachment, but which, in direction, size, and form, accurately continues the sterno-thyroid,) and, after a course of an inch and a half, is inserted into the body and part of the cornu of the os hyoides, beneath the omo-hyoid and sterno-hyoid, and superficially to the thyro-hyoid membrane. To this is given the name of *thyro-hyoid*.

The sterno-thyroid and thyro-hyoid are covered throughout by the sterno-hyoid and in part by the sterno-mastoid and omo-hyoid muscles. The sterno-thyroid corresponds by its inner edge to the inferior thyroid vein,—by its outer edge receives the terminal branch of the descendens noni, by its deep surface covers the thyroid body and many of its vessels, the trachea and part of the larynx, and the sheath of the carotid vessels: by its origin it enters into the mediastinum, covers the great arterial trunks springing from the arch of the aorta and the brachio-cephalic veins. From these parts it is separated by the remains of the thymus gland. The thyro-hyoid muscle covers the superior laryngeal nerve and artery as they pierce the wall of the larynx. These muscles are fleshy in their whole extent, with exception of the short tendinous fibres, by which they have their origin and insertion: the sterno-thyroid has frequently a transverse tendinous intersection in some part of its course.

The *omo-hyoid* is a slender but long bi-ventral muscle, obliquely extending from the superior costa of the scapula to the os hyoides. It arises by short tendinous fibres at the root of the coracoid process, from the ligament which crosses the coracoid notch, and from the adjoining part of the costa, directs itself with a slight ascent towards the median line, and, in emerging from behind the clavicle, frequently derives a few fibres from its posterior edge. It contracts to a flattened tendon as it passes beneath the sterno-mastoid, and abruptly changes its direction from a nearly horizontal to a vertical course, by undergoing a trochlear reflexion in a loop of the cervical fascia,—and, again becoming fleshy, ascends beside and parallel to the outer edge of the sterno-hyoid, to which it is closely united,—to be inserted into the lower border of the hyoid bone at the junction of its body and cornu. The very important relations of this muscle will be more fully given in the detailed surgical anatomy of the region. It may for the present suffice to say, that, in crossing the direction of the sterno-mastoid muscle, it furnishes the subdividing line of the great triangles of the neck; that its posterior belly lies parallel to and just above the subclavian artery and brachial plexus, is covered by the platysma and partly by the trapezius, clavicle and subclavius, and crosses the scaleni and phrenic nerve: that its looped tendon is covered by the sterno-mastoid, and lies on the sheath of the carotid vessels, across which its anterior belly continues obliquely to run.

The two omo-hyoid muscles acting in concert are capable of depressing the os hyoides; but their chief action is of a different nature. Being contained in their whole bent course within a sheath of cervical fascia, they affect this membrane by their contraction, tensely spanning it across the median line in a space which extends from the hyoid bone to its clavicular attachment. This appears to be one of the consensual movements in the act of deglutition, designed to give, during that act, additional efficacy to the protection against atmospheric pressure, which Burns has shown to be an important function of the fascia of the neck.*

The *digastric* muscle is likewise, as its name imports, double-bellied; it passes from the mastoid process of the temporal bone to the symphysis of the jaw, but is looped down in its course to the side of the os hyoides. Its temporal attachment is to the groove, which is named from it, on the inner surface of the mastoid process: a large fleshy belly proceeds from this origin downward and forward, contracts to a round tendon, which usually pierces the stylo-hyoid muscle, traverses an aponeurotic ring lined by synovial membrane, which strongly binds it to the hyoid bone, near its lesser cornu, and is then reflected upward, expanding again to a strong muscular belly, which fixes itself by short aponeurotic fibres into the lower border of the jaw, at an oval depression beside the symphysis. Its tendon, just after passing through the fibrous pulley that maintains its curve, gives off a fascial process toward the median line: this attaches itself strongly along the upper edge of the hyoid bone, and

* Surg. Anat. of Head and Neck, p. 36. Glasgow, 1824.

internally joins a similar process from the opposite side to form with it a tendinous expansion, (often assisted by a few fleshy fibres from the anterior belly of the digastric,) which reaches from the os hyoides as far as the jaw, and contributes to support the floor of the mouth.

The relations of this muscle are complicated and important: the convexity of its curve is the upper limit of the anterior triangle of the neck; its concavity bounds a space, the area of which extends within the jaw to the myloid ridge, containing various parts, and named from the muscle the *digastric space;* its posterior belly crosses the external and internal carotid, the facial, lingual, and occipital branches of the former, the internal jugular vein, the three divisions of the eighth, the ninth, and the sympathetic nerve, the side of the pharynx, the trachelo-mastoid and styloid muscles, and the hyo-glossus. The sterno-mastoid and splenius cover its origin; the portio dura emerges at its anterior edge, along which the posterior aural artery runs, and round which the posterior part of the parotid gland is folded. Its anterior belly and tendon support the submaxillary gland, are covered by fascia and platysma, and correspond to the mylo-hyoid muscle, which is covered and strengthened by the aponeurotic expansion derived from the digastric.

The action of this muscle varies according to the fixity of the jaw: when the mouth is firmly closed, the contraction of the two bellies will draw the hyoid bone vertically upward, and communicate to the pharynx the movement of elevation, which adapts it for receiving the masticated food. A firm closure of the jaw, a contraction of the digastric muscles, and consequent shortening of the pharynx, (indicated by rising of the pomum Adami,) are well known acts in the process of deglutition. When the hyoid bone is fixed by its depressors (and perhaps in some degree retracted by the joint actions of the posterior belly of the digastric and of the omo-hyoid), the anterior belly, both passively as a reflected cord, and actively, in virtue of its muscular fibres, depresses the lower jaw and opens the mouth. Simultaneously, too, with its act of raising the pharynx, this muscle must tighten, by its posterior belly, the mesial aponeurotic expansion, which joins it to its fellow; and, by so doing, must assist the mylo-hyoid in raising the floor and reducing the capacity of the mouth. It fulfils, therefore, important uses in the mechanism of deglutition.

The *stylo-hyoid* muscle is an accessory to the posterior belly of the digastric, and arises from the outer surface of the styloid process, about midway from its base, by a small round tendon, which soon swells into an elongated body. This lies along the posterior belly of the digastric, parallel to its anterior edge, and, when it reaches the os hyoides, is inserted into the outer surface of that bone, at the union of its body and cornu, by short aponeurotic fibres. It usually divides, just previously to its insertion, to give passage to the tendon of the digastric. The portio dura of the seventh pair emerges between its origin and that of the digastric: in other respects its relations so entirely agree with those of the descending belly of that muscle, as do likewise its uses, that no particular description of these is necessary.

The *mylo-hyoid* muscles are so mutually dependent that they might almost be described as a single muscle. They arise on either side from the oblique or myloid ridge on the buccal surface of the lower jaw in its whole extent, i. e. from opposite the last molar tooth to the neighbourhood of the symphysis. The fleshy fibres, that succeed the short aponeurosis of origin, proceed parallelly toward the median line, and are inserted into a raphe, which reaches from the symphysis of the jaw to the body of the hyoid bone, and likewise into the upper border of the body of that bone. The anterior fibres are short; those which succeed progressively increase in length, and the posterior, which are fixed to the hyoid bone, are of all the longest. Each muscle is, therefore, triangular, having an outer edge by which it rises from the jaw, an inner edge of union with its fellow, and a posterior edge, which is seen to extend, in the digastric space, from the posterior extremity of the myloid ridge to the upper edge of the body of the hyoid bone, close to its cornu. The under surface of the muscle corresponds to the submaxillary gland and to the insertion of the digastric; its upper surface sustains the tongue and floor of the mouth,—from the mucous membrane of which it is separated by Wharton's duct, the sub-lingual gland, and gustatory nerve; it also corresponds to the hyo-glossus, genio-hyoideus, and genio-hyo-glossus, and to the termination of the lingual artery and nerve. The duct of the sub-maxillary gland winds round its posterior edge, in proceeding to open beside the frænum linguæ. The habitual state of this muscle is one in which it is rendered, with its fellow, convex downward by pressure of the superincumbent parts; and so its surfaces cannot strictly be said to face upward and downward, but with a modification of these directions respectively inward and outward. Thus the two muscles furnish a concave floor to the mouth, and it is only in their contraction, which accordingly diminishes the cavity, that this becomes strictly horizontal. Their action, especially when assisted by other muscles, is to propel the masticated food by lessening the capacity of the mouth.

The *hyo-glossus* is a thin quadrilateral plane of parallel muscular fibres, having the attachments which its name indicates. It rises from the entire length of the great cornu and adjoining part of the body of the os hyoides, on their upper surface, and ascends to be inserted into the side of the tongue. From beneath its anterior thicker edge the lingual artery emerges; its posterior thin border receives the insertion of the stylo-glossus; its deep surface corresponds to the genio-hyo-glossus and lingualis, from the former of which it is partly separated by the lingual artery; its external face is separated from the mylo-hyoid muscle by the lingual and gustatory nerves and duct of the submaxillary gland.

The *stylo-glossus* arises, as a round fleshy bundle, from the tip of the styloid process, and from the adjoining part of the stylo-maxillary ligament, becomes flattened into divergent parts, as it approaches the side of the tongue at the posterior border of the hyo-glossus, after a short course downward, forward, and inward, and is there inserted. A part is continued for some distance along the hyo-glossus, crossing the direction of its fibres, and interwoven with them; other fibres seem to bend into the substance of the tongue, near its base and at right angles to its axis. Its surface corresponds to the parotid gland, external carotid artery, internal pterygoid muscle, and mucous membrane of the mouth; deeply, it lies on the internal carotid artery, the superior constrictor of the pharynx, the tonsil and hyo-glossus.

The *genio-hyo-glossus* is a large, fan-shaped muscle, radiating from within the symphysis of the jaw to the entire length of the tongue, and constituting, with its fellow, the chief muscular bulk of that fleshy organ. It rises by a strong square mass of short tendinous fibres from the upper genial tubercle, and the fleshy fibres, which succeed, immediately and widely diverge; the highest bend upward and somewhat forward to the tip of the tongue; those, which next follow, occupy its entire remaining length, spreading with more or less obliquity into the substance of the organ, through which on a section they may be followed even to the dorsum: some of these may be traced beyond the posterior edge of the hyo-glossus, expanding on the side of the pharynx just above the hyoid attachment of the middle constrictor, and constituting the so-called lingual origin of the superior constrictor, (see PHARYNX); the remaining fibres complete the semicircular spread of the muscle, by passing downward and backward, to be inserted into the upper border of the body of the os hyoides. This muscle is opposed by its entire mesial surface to its fellow: their tubercles of origin are almost blended on the symphysis, and their fleshy fibres are only to be distinguished by a thin intermediate layer of adipose tissue: their upper edges raise the mucous membrane of the mouth on either side of the frænum; their lower edges extend to the hyoid bone in perfect parallelism to each other, and to the genio-hyoidei, which cover them; their outer surfaces, partly covered by the hyo-glossi, form with these on each side the inner wall of a triangular space (roofed by the mucous membrane and floored by the mylo-hyoid muscle) in which lie the terminal branches of the lingual and gustatory nerves, the lingual artery, the sublingual gland, and the excretory duct of the submaxillary.

Close at the implantation of this muscle in the tongue, between its fibres and those of the hyo-glossus, and crossing the direction of both, is a small bundle of fleshy fibres, which runs longitudinally from base to apex, and, since it has no fixed attachment, may most fitly be considered among the intrinsic muscles of the organ; it has been named *lingualis*. (See TONGUE.)

The *genio-hyoideus* is a strong cylindrical muscle intimately associated with the genio-hyo-glossus, and ordinarily co-operating with its posterior fibres. It rises by a square tendon from the inferior genial tubercle, beside its fellow of the opposite side and just below the genio-hyo-glossus. From this origin it directs itself backward and downward, and is inserted into the upper surface of the body of the os hyoides. Its insertion is somewhat broader than its origin: its inner surface corresponds to that of the opposite side; its upper surface is parallel to the genio-hyo-glossus, which it supports; its under surface rests on the mylo-hyoid, beside its raphe; its outer surface has similar relations to that of the genio-hyo-glossus, contributing with it to form the inner wall of the sub-lingual space just described.

The action of the extrinsic muscles of the tongue is modified and more nicely adapted to the delicate offices of speech by the co-operation of other and intrinsic muscles. These will be described in a future article (see TONGUE). Those already considered operate on the tongue *en masse;*—elevate, advance, depress or retract it, shift its volume to either side, and direct its extremity, by a kind of circumduction, over a wide range of surface. Thus, the stylo-glossus can elevate and retract, the hyo-glossus depress and lateralise; the anterior fibres of the genio-hyo-glossi, with the linguales, regulate the motions of the tip, while the genio-hyoid and adjunct fibres of the genio-hyo-glossi can cooperate in these movements by shifting the base of support in any direction. As the genio-hyo-glossus is of largest bulk, so is it of most various office in the tongue; by its posterior fibres it gives an elevation to the os hyoides by which the tongue is protruded from the mouth; or, half antagonizing this action by its middle fibres, it may so forcibly hollow the dorsum of the tongue as to direct its apex within the incisor teeth, and, with aid of the stylo-glossi, enable it to sweep the concavity of the palate; or, by this co-operating with either hyo-glossus and with the opposite lingualis and stylo-glossus, the tongue may be made, as it were, to probe with its eminently tactile extremity the entire length of the alveolar arches, or by a yet more definite contraction to exert suction on any spot with which its dorsum can have contact.

The *third class* includes the sterno-cleido-mastoideus and the platysma myoides.

The *sterno-cleido-mastoideus* is a long and powerful muscle, obliquely crossing the side of the neck, from the neighbourhood of the sterno-clavicular joint to the mastoid process of the temporal bone. It is fleshy in almost its whole extent; flattened at the extremities, but rather prismatic in the intermediate portion; and the anterior edge, which is more particularly continuous with the sternal origin of the muscle, and which, in certain positions of the neck, raises the integuments in a well-known diagonal relief, considerably exceeds the thickness of the posterior border. The name of the muscle is a summary of its attachments. It arises by two heads, which are usually

separated by a distinct cellular interspace, corresponding to the sterno-clavicular articulation: 1. from the anterior surface of the first bone of the sternum close to its clavicular joint, by a very strong flat tendon which is directed upward and backward for the space of more than an inch, before terminating in fleshy fibres; 2. from the upper edge of the inner third of the clavicle by a thin origin composed of parallel aponeurotic fibres, which directly become fleshy, and take a nearly vertical course. As these two bundles ascend, the sternal, more oblique in its course, seems to overlap the other, and, both by difference of direction and by a line of cellular separation, can often be distinguished from it in the lower two-thirds of the neck; but in approaching the mastoid process they are indistinguishably fused together. The insertion is, 1. by a strong and rounded tendon into the mastoid process, of which it seems to embrace the tip and anterior border; 2. by a thin aponeurosis along the posterior edge of the process, and about a third of the superior semicircular line, which is continued into it.

This muscle, to which I shall have abundant occasion to refer in speaking of the surgical anatomy of the neck, has very important relations: the space between its heads corresponds to the bifurcation of the arteria innominata; and the broad band-like muscle, as it ascends, crosses in succession the subclavian and carotid arteries, the jugular and subclavian veins, the hypo-glossal, pneumogastric, phrenic, sympathetic, spinal accessory nerves, and a portion of the cervical plexus; the sterno-hyoid, sterno-thyroid, omo-hyoid, scaleni, levator anguli scapulæ, splenius, and digastric muscles, besides many lymphatic glands and branches from several of the nervous and vascular trunks which have been enumerated. Its *superficial* aspect corresponds to the integuments and platysma, to the external jugular vein and superficial branches of the cervical plexus; its thick *anterior* edge bounds the anterior triangle of the neck, receives branches from the external carotid artery or from its thyroid branch, and corresponds above to the parotid gland and posterior aural artery; its thin *posterior* edge limits the other great triangle of the neck, is pierced by the spinal accessory nerve, corresponds to a chain of lymphatic glands, and is wound round by the nerves and vein which lie on the surface of the muscle.

The two sterno-mastoid muscles acting together directly bend the head on the chest, and their joint action is well illustrated in an endeavour to raise the head from the supine position. But when the head is thrown far back, a predominance is given to the posterior fibres of the muscle, which being attached behind the line of the occipito-vertebral articulation, become then capable of increasing this direction of the head. The sterno-mastoid of one side, acting singly, rotates the head and flexes it with a lateral inclination to its own side, so as to bring the side of the head nearer to the shoulder, and to turn the face in the opposite direction.

The *platysma myoides* (*latissimus colli* of Albinus) is a broad, thin, membraniform muscle, which covers the side of the neck and lower part of the face, and is in its whole course subcutaneous. It arises by scattered fibres in the superficial fascia below the clavicle, and covers by its origin the upper part of the pectoralis major and deltoid, as also the space between those muscles, which corresponds to the coracoid process. This origin does not extend within an inch or two of the median line, but reaches as far outwardly as the acromial process. The fibres become more closely aggregated as they ascend, and the muscle accordingly narrows. Its direction is obliquely upward and to the median line; it passes over the base of the lower jaw, and its fibres again spread to their insertion: those which are posterior lose themselves in the skin covering the parotid gland and masseter muscle; others from this neighbourhood bend forward toward the angle of the mouth, and in some subjects constitute a very distinct horizontal *retractor anguli oris*, which is generally known as the *risorius Santorini*: some fibres from the middle of the muscle obtain a more fixed insertion about the base of the jaw and into the skin covering it; while the anterior portion of the muscle, which is most constant in its relations, is inserted into the lower lip by blending its fibres with those of the depressor labii inferioris, and by decussating toward the border of the lip and in the substance of the chin with the mesial fibres of its fellow.

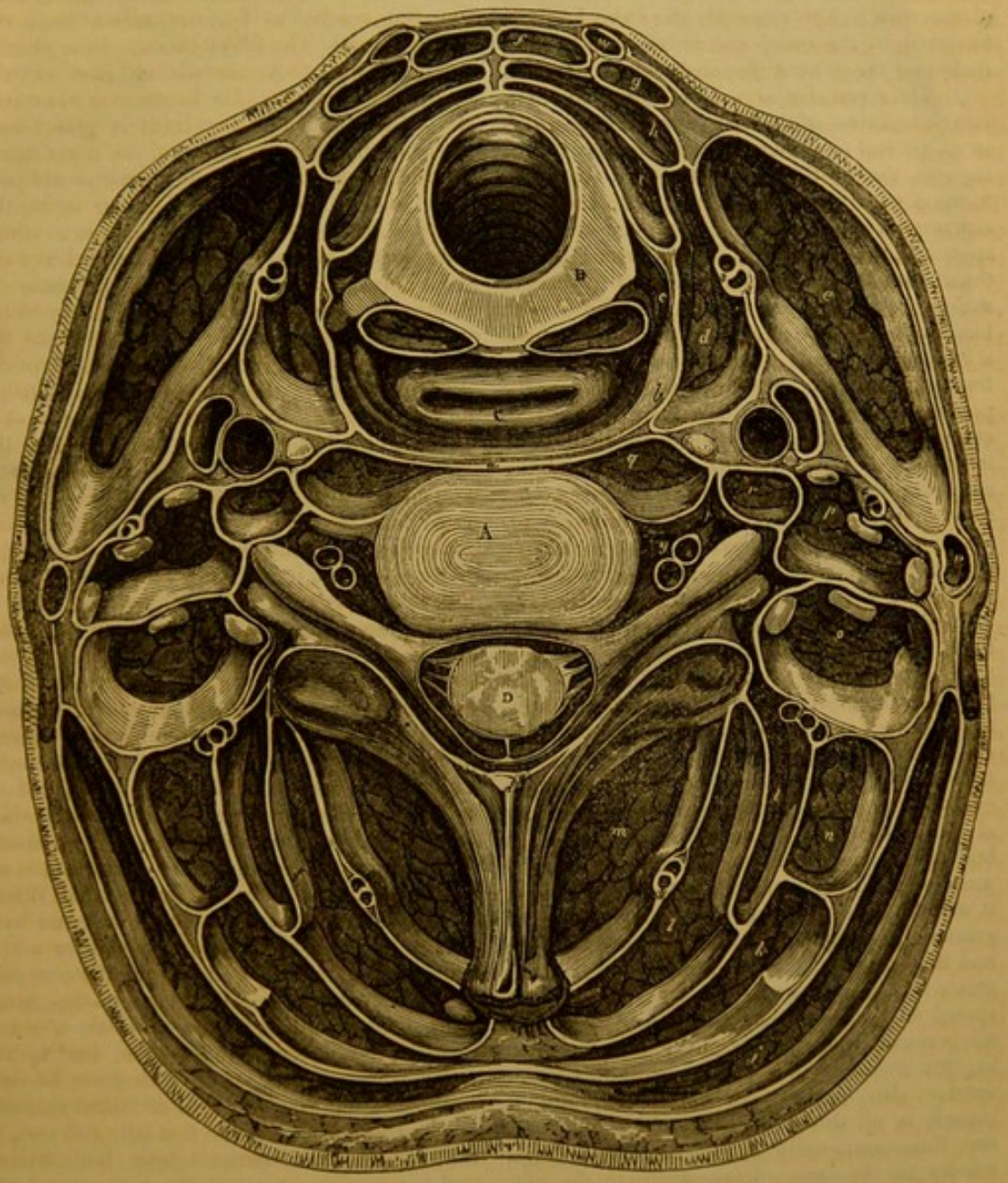
This muscle is subcutaneous in its whole extent, and by its extremities intimately attached to the deep surface of the skin which covers it. In approximating its extreme attachments, it wrinkles the skin in a direction transverse to that of its fleshy fibres. It is a single and partial relique in the human subject of that general muscular investment, which fulfils various functions in different orders of Mammalia, as an appendage of the tegumentary system: rolling the hedge-hog in a ball, erecting the quills of the porcupine, and the bristles of the boar, or dislodging insects from the hide of grazing cattle. Its relations to the deeper parts in the neck will be detailed hereafter: between it and the cervical aponeurosis lie chiefly, cutaneous nerves and veins; branches from the cervical division of the portio dura are distributed to its upper portion, reaching the deep surface just below the angle of the jaw, and branches from the cervical plexus crossing the sterno-mastoid partly supply the platysma, partly pierce it in their course to the skin; the superficial pectoral branches lie beneath it till they reach the clavicle; the external jugular vein lies immediately beneath this muscle, and runs nearly parallel to its fibres, crossing transversely those of the sterno-mastoideus.

II.—Fasciæ of the neck.

1. The *superficial fascia*, or *subcutaneous areolar tissue*, presents characters in common with the same structure in other parts of the body, and is universally continuous with that

general investment; being prolonged without interruption, below, into the superficial fascia of the chest,—above, into that of the head and face. It consists here, as elsewhere, of two layers, which have the local peculiarity of being separated by the platysma myoides in the greater part of their extent. Its *deeper layer* occurs in the form of delicate, scarce, lax, fatless areolar tissue, interposed between the proper aponeurosis of the region and the platysma myoides, furnishing means for the loose gliding of this muscle, and continued, without adhesion or sensible change, into the adjoining regions. Its *subcutaneous layer* is of coarser materials and of less uniform thickness, is in close union with the skin, and follows its movements: it contains the variable amount of fat, which the region presents; and so, though it

Fig. 327.



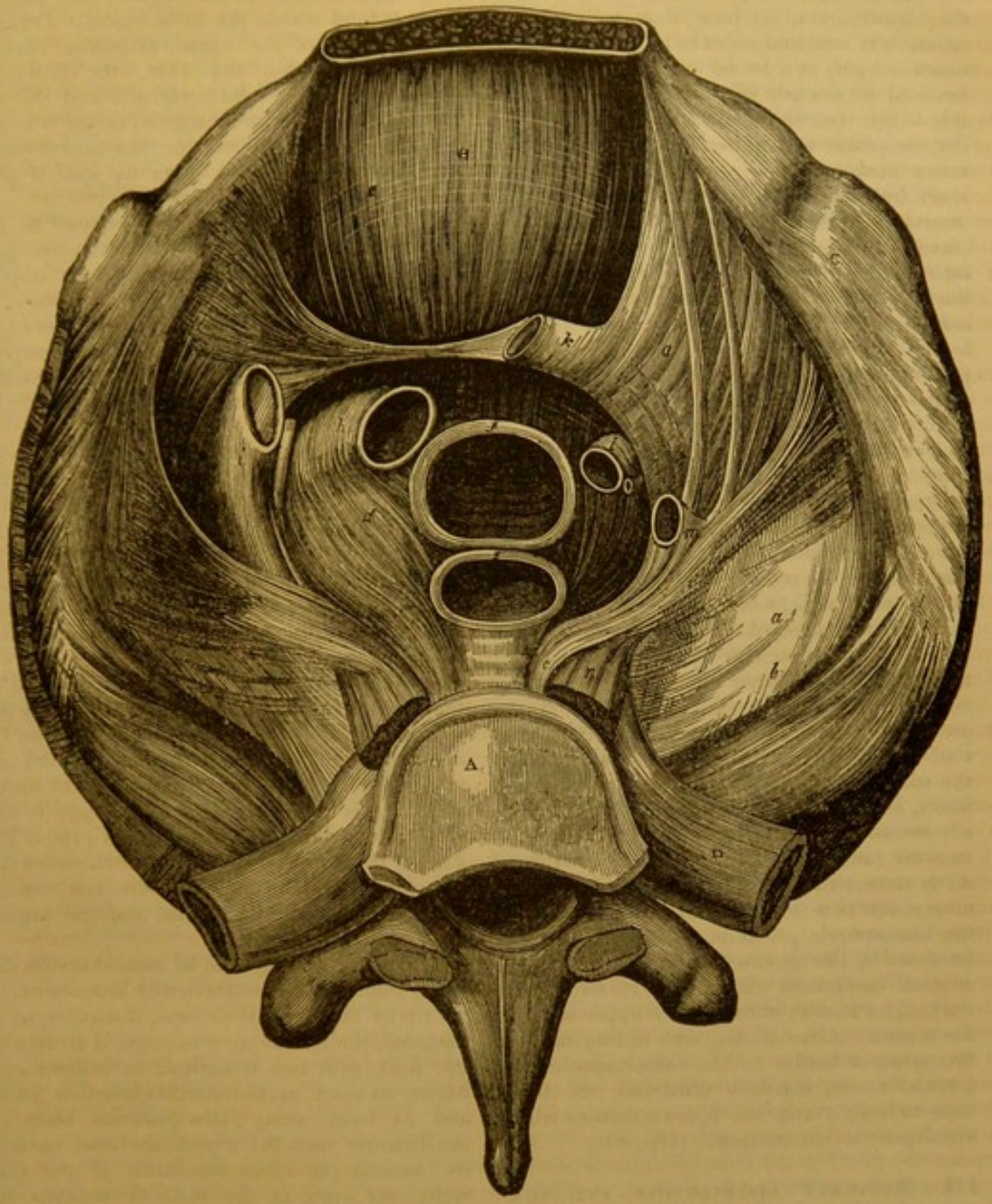
Transverse horizontal section of the neck, seen from above.

A, fourth cervical vertebra.
B, cricoid cartilage.
C, pharynx.
D, Medulla spinalis.
a, prevertebral aponeurosis.
b, posterior pharyngeal aponeurosis.
c, middle constrictor.
d, thyroid body.
e, sterno-mastoid muscle, in the space behind which is seen a section of the great vessels, and of their sheath.
f, sterno-hyoideus.
g, omo-hyoideus.
h, sterno-thyroideus.
i, crico-thyroideus.
j, trapezius.
k, splenius.
l, complexus.
m, semi-spinalis and multifidus.
n, levator anguli scapulæ.
o, scalenus posticus.
p, scalenus anticus.
q, longus colli.
r, rectus capitis anticus major.
s, superior thyroid vessels.
t, ascending cervical vessels.
u, deep cervical vessels.
v, external jugular vein.
w, anterior jugular vein.
x, platysma and superficial fascia.

constitutes, in lean subjects, a manifest and resisting lamina, yet, in those of an opposite character, it is rendered indistinct by the predominant adipose tissue which occupies its areolæ. Along the side of the neck, from the clavicle to the jaw, these layers are kept asunder by the platysma myoides, which adds, as it were, a third lamina to the subcutaneous expansion; but both in front and behind, where the muscle ceases, they are in close relation, and constitute a single covering to those regions of the neck. The deep layer of this fascia is traversed by the cutaneous nerves and vessels, including the external jugular vein.

2. The *cervical fascia* is a proper aponeurotic investment of this region, and corresponds in its general characters to the fibrous sheathings of the limbs. Like these, it not only forms a general, compressive, and modelling cincture for the part, but, by various secondary splittings, furnishes dissepiments which isolate the different organs, and allot to each its proper sheath or fascial chamber. It may be briefly, but insufficiently, described as originating from a kind of *linea alba*, or mesial commissure in front, and in its backward course to the spinous processes furnishing a separate investment to every organ which it encounters, and attaching itself, both below and above, to the chief bony eminences which present themselves. (A section of it, as it thus *cellulates* the neck, is represented, with Bourgery's almost invariable accuracy, in a lithograph, (vol. vi. pl. 10,) from which the accompanying woodcut is copied.) It requires, in at least many regions of the neck, a more particular description than this summary contains; and I shall accordingly proceed to consider such portions of it with some detail. The *sterno-cleido-mastoideus* is ensheathed through its whole extent; the fascia, on reaching its anterior edge, is bi-laminated, encloses the muscle, and becomes again single at its posterior border. When this sheath is laid open by removing its anterior wall, and the muscle carefully everted from its prismatic cell, it will be seen that the posterior lamina is of greater strength than the removed anterior one; and this surface is the one from which the dissector may most conveniently trace the further spread of the membrane. He will find that the cervical fascia (of which the portion covering the sterno-cleido-mastoideus is but a secondary slip) extends itself from behind that muscle in all directions; inwardly to the mesial line,—outwardly to the trapezius,—upwardly to the jaw,—downwardly to the clavicle. *a*. Traced *inwardly*, its arrangement differs in the upper and lower parts of the neck: 1. in that below the os hyoides a superficial lamina covers the subhyoid muscles, joins its fellow in the median line, and is fixed below to the interclavicular notch of the sternum; a second, thin process divides the sterno-thyroid from the sterno-hyoid muscle; a third, stronger one, passing between the sterno-thyroid and air-tube, covers this latter organ and the thyroid body, is attached below to the inner surface of the manubrium sterni, internally joins the layer from the opposite side, and helps with it to form a raphe, reaching from the os hyoides to the sternal notch. Previously to the divisions here mentioned, the fascia encloses the flat tendon and anterior belly of the omo-hyoid muscle; and in a line, which will presently be more particularly indicated, covers the carotid artery, jugular vein, and nervus vagus. Just external to these parts, along the outer edge of the jugular vein, it detaches a delicate process, which passes behind the vessels, separating them from the sympathetic nerve, and is continued inwardly to join its fellow from the opposite side, as a cellular clothing to the œsophagus. 2. Above the os hyoides, the arrangement of the fascia is simpler; covering the mylo-hyoid and submaxillary gland, and inclosing the anterior belly of the digastric, it is fixed to the lower border of the symphysis, and hence to a mesial raphe as far as the os hyoides. It has some deep connexions, to which I shall return directly; and, to the sheath of the great cervical vessels it preserves the same relations as below, its deepest process losing itself on the pharynx. *b*. Traced *upwardly*, the fascia is seen to split on the inferior edge of the digastric muscle; the superficial lamina is attached, behind, to the mastoid process,—in front, joining the part last described, to the lower edge of the jaw,—and, intermediately, ascends upon the parotid gland, which it invests; the deeper layer is fixed to the styloid process of the temporal bone, and gives origin to a remarkable septal slip, (sometimes called the stylo-maxillary ligament,) which, just in front of the posterior belly of the digastric, passes outwardly, is inserted into the deep surface of the superficial lamina and into the angle of the jaw, so serving to separate the space, circumscribed by the digastric muscle, into two parts, and isolating the parotid gland, which occupies the posterior of these, from the submaxillary, which is situated in the anterior one. Further, this deep layer (joined by a slip from the fascia, which covers the submaxillary gland and is attached to the jaw) prolongs itself around Wharton's duct, between the mylo-hyoid and hyo-glossal muscles, and likewise furnishes origin to the investing cellular tissue of the pharynx. *c*. *Below*, the cervical fascia attaches itself around the insertions of the muscles, which it incloses, viz. towards the median line to the notch of the sternum, and—with the sub-hyoid muscles—to the deep surface of the manubrium and to the cartilage of the first rib, and then to the clavicle in its entire length, both around and between the sterno-cleido-mastoid and trapezius. In descending to the clavicle, it ensheathes the posterior belly of the omo-hyoid; and a firm process of it, folded around this muscle and directed backward to the levator anguli scapulæ, is infixed along the superior costa of that bone, and circumscribes the so-called omo-hyoid space. *d*. Traced *outwardly and backwardly* the fascia covers in the interval between the trapezius and sterno-mastoid (posterior triangle) from the clavicle to the occiput, and, on arriving at the anterior edge of the trapezius, splits to enclose it. The further distribution of it, in this direction, is in ac-

Fig. 328.



Shews from below the cervico-thoracic septum constituting the roof of the thorax, and giving passage to the great vessels. It represents a transverse and horizontal section through the second intervertebral disc, and parts at the same level.

A, second dorsal vertebra.
B, tranverse division of the manubrium sterni.
C, first ribs.
D, vertebral extremity of second ribs.
a, a, fascia, extending between the great vessels and first two ribs.
b, b, its insertion at the first ribs.
c, c, its insertion at the second vertebræ.
d, d, lamina between the great vessels, attached centrally to them,—in front to the sternum, where it forms a cul-de-sac,—and behind to the second dorsal vertebra.
e, the aponeurosis, extending within the sternum.
f, the trachea.
g, the œsophagus.
h, the arteria innominata.
i, the right vena innominata.
k, the left vena innominata; tranverse band uniting the two sides of the aponeurosis.
l, the left carotid artery.
m, the left subclavian artery.
n, section of the musc. long. colli.

cordance with the general law of its arrangement for the separation of muscles; is destitute of any particular surgical interest, and forms no exception to the general observations given in a preceding article. (See BACK.)

A portion (but a very distinct portion) of this great aponeurosis is the *pre-vertebral* fascia. It extends from the occiput—to which it is fixed in front of the *recti capitis antici*—to the inlet of the chest, where it adheres, beside the longus colli, to the neck of the first rib; it binds down the pre-vertebral muscles, is attached deeply to the tips of the transverse processes, and receives by its surface a septal slip from the cervical fascia just externally to the sheath of the vessels. An important process is

the prolongation which it sends downward on the scaleni; and which partly fixes itself to the rib around the attachments of those muscles, partly extends itself, as a strong infundibulum on the brachial plexus and subclavian vessels. From this—their fascial sheath—an horizontal slip detaches itself and passes forward to the posterior surface of the clavicle, where it fixes itself by two laminæ; the upper of these is inserted just above the attachment of the subclavius muscle, while the lower is continued into the sheath which that muscle derives from the coraco-costal fascia. The horizontal process separates the cavity of the axilla from the lower triangle of the neck, and the vaginal prolongation, contracting as it descends, becomes lost in the sheath of the axillary vessels.

Finally, as these various layers of fascia attach themselves about the inlet of the thorax, (the sub-hyoid part of the cervical aponeurosis in front, and the pre-vertebral behind,) they are connected to one another and to the large vascular and mucous canals, which traverse that passage, by certain horizontal processes of fibrous membrane, which constitute together a kind of diaphragm, or *cervico-thoracic septum*. Viewed from below this would seem a vaulted membrane, overarching the tops of the pleuræ, and giving infundibular passage to the great arterial and venous trunks and to the trachea; viewed from above it would present the various deep implantations of the cervical fascia, and a surface without aperture or breach of continuity, prolonging itself in several directions round the canals, which it thus indirectly transmits. The obvious use of these arrangements is to supply adequate resistance to the atmospheric pressure, which, were it not borne off by the tension of these fasciæ, would at each inspiratory effort tend to flatten the trachea, or to rush through the upper strait of the thorax. Allan Burns, who in this country first drew attention to the importance of the cervical fascia, carefully illustrates its functions in health, and the inconveniences which accompany its destruction. (Op. cit.)

III.—Regional distribution and surgical anatomy of the neck.

The posterior parts of the neck having been described in a previous article (see Back), the present will be restricted to an account of its anterior aspect.

The cervical vertebræ (by their bodies, intervening fibro-cartilaginous discs, and transverse processes), together with the anterior and lateral vertebral muscles, already described, compose the skeleton and supporting fabric of this region; the anterior fibres of the trapezii, as they descend on either side to the inner edge of the acromio-clavicular arch, form its lateral boundaries; the larynx and trachea (covered by their own extrinsic riband-like muscles, and partly covering the pharynx and œsophagus) separate the nearly symmetrical halves of the neck by constituting along its median line a marked columnar relief, in the recesses beside which lie the great cervical vessels; the base of the skull and the oblique line of the jaw are the upper limits of the region; the clavicle (just behind which the great vascular and nervous trunks of the upper extremity course) bounds it below; the skin, the platysma myoides (in its cellular covering), and the cervical aponeurosis are stretched across it as general investments; while the last-named fascia ensheathes the various parts by special processes from its deeper surface.

Thus, in general terms, the structure of the neck may be described; but, for the more precise and particular account, which the importance of its anatomy renders necessary, a division of it into spaces of small extent is convenient. The arrangement, which I propose following, differs but little from that usually adopted, and, perhaps, somewhat exceeds it in precision.

The upper limits of the neck having been stated as the oblique line of the jaw and the base of the skull (which parts, as we shall presently see, are brought into relation by the attachments of the constrictor pharyngis superior), our highest region has in that direction these parts for its boundary, and extends below as far as the curve of the muscle, from which it is named the *digastric* space.

A small space that can hardly be referred to the digastric,—from which it is separated by the vaginal process of the temporal bone, and by attachments of fascia,—and which, from the importance of its contents, deserves careful consideration, is the *posterior pharyngeal;* it lies closely beneath the base of the skull, (from the vaginal process to the median line) between the pharynx and spine, and includes the carotid, jugular, and condylic canals, and the organs traversing them.

If now an oblique line be carried across the neck, from the sterno-clavicular articulation to the tip of the mastoid process, it divides, as a diagonal, the remaining quadrilateral surface of the neck into two triangles; an anterior one having its apex at the sterno-clavicular joint, and its base along the posterior belly of the digastric muscle; a posterior one, having, its base at the inner two-thirds of the clavicle,—its apex at the mastoid process,—its posterior side formed by the trapezius,—its anterior border defined by the imaginary line which demarks it from the anterior triangle. The omo-hyoid muscle, in its reflected course, crosses both these triangles, subdividing them; and since the angle of its bend falls just on the line of their separation, and since it proceeds from behind the outer third of the clavicle to the body of the hyoid bone, it acts as a second diagonal in the neck, dividing each into an upper and a lower triangular space. These four triangles will be described in detail; and since the sterno-mastoid (which is too substantial to be treated as a mere boundary-line) enters into all of them, and has to parts of each relations of the extremest practical importance, some separate, chiefly recapitulatory, consideration will be given to its relative anatomy. Finally, to ensure for the organs of the median line the consideration they require (the usefulness of which mainly depends on their being

viewed connectedly), it may be well to take them in that relation.

Thus, (1) *a region of the median line*, (2) *an antero-inferior*, (3) *an antero-superior*, (4) *a postero-superior*, and (5) *a postero-inferior triangle*, (6) *a digastric*, and (7) *a posterior pharyngeal space*, are to be severally considered; and a few preliminary remarks may be given to the tegumentary parts, which are more or less common to all.

The *skin* is fine, thin, and extensible, especially below and in front; becoming coarser and more adherent toward the upper part of the posterior triangle; it frequently presents some transverse wrinkling above the hyoid bone, which seems to depend on the platysma myoides; here, too, the follicles are larger and more abundant than in the other parts of the neck, and, in the male subject, the surface is overgrown by the beard. The *subcutaneous cellular tissue* has already been described; in the upper part of the posterior triangle it becomes almost inseparably confounded with the cervical aponeurosis; the *platysma myoides* lies between its layers and keeps them apart over the greater surface of the neck; the fibres of this muscle are absent in the lower part of the anterior, and upper part of the posterior triangle, and at these spots the two layers of the superficial fascia fall together and are nearly confounded. In the deeper lamina of this texture, subjacent to the platysma in the parts where it lies, run the *superficial veins and nerves*. The *external jugular vein* commences in the parotid gland, usually by radicles, which correspond to the terminal branches of the external carotid artery, temporal, internal maxillary, and transverse facial; pierces the fascia near the angle of the jaw, and directs itself almost vertically toward the middle of the clavicle, in the deep layer of superficial fascia: just at the edge of the clavicular insertion of the sterno-mastoid muscle it bends inward, pierces the aponeurosis, and discharges itself into the subclavian vein. It thus very obliquely crosses the sterno-cleido-mastoideus from its anterior to its posterior edge, separated from that muscle by its fascial sheath; the auricular nerve runs upward parallel to its posterior border; the platysma covers it in its whole course with fibres which cross its direction; its place of discharge into the subclavian vein is usually just opposite the scalenus anticus, covered by fascia and by the sterno-mastoid muscle. It receives superficial occipital, superior and posterior scapular veins; branches from the posterior triangle of the neck, and from the trapezius; it has uncertain and irregular communication with the anterior jugular vein, and receives a certain, though not regular, branch from the internal jugular; this is usually given to it at the lower part of the parotid, or on its emergence from that gland, and occasionally seems to constitute its commencement. Obvious surgical inferences from the anatomy of this vein are: the relief that its communication with the internal jugular enables it to give, when opened in cases of cerebral congestion; the eligibility of its line of passage over the thick belly of the sterno-mastoid for that mode of venesection; the necessity for dividing some fibres of the platysma transversely to their length (by an incision nearly in the direction of the sterno-mastoid) in order to obtain a clear opening and free jet of blood; the need for care in this operation, but still more in proportion as the vein is wounded lower in the neck, to hinder the possibility of air being inspired through its cavity.

The *anterior jugular* vein is an irregular subcutaneous supplement to the external: it commences in the submental region, near the hyoid bone; descends vertically beside the median line, receiving branches from the larynx, and sometimes from the thyroid body; on arriving at the sternum, or near that bone, it bends horizontally outward, piercing the fascia, and runs behind the origin of the sterno-mastoid, to throw itself into the subclavian vein, somewhat within the termination of the external jugular. It generally has free communications with its fellow and with the internal and external jugular. Its size is in inverse proportion to that of the external; and, in absence of this, it is generally a very considerable branch; it is sometimes single and mesial; but more usually two exist, which are commonly of unequal calibre.

The *superficial nerves* are of two classes, being partly derived from the cervical plexus, partly from the portio dura.

The cervical plexus sends its superficial branchings in three directions: the *mastoid* and *auricular* pass upward; the *anterior cervical* runs forward; the *supra-clavicular* and *supra-acromial*, as their names denote, descend more or less obliquely.

The *mastoid*, originating from the second cervical nerve, winds upwardly across the splenius, and almost parallel with the posterior edge of the sterno-mastoid, which it crosses in its ascent. It pierces the fascia soon after its origin, and becomes subcutaneous. Its distribution is entirely to the skin of the mastoid and occipital regions. The *auricular*, rising from the second and third cervical nerves by a trunk, common to it with the anterior cervical, directly pierces the fascia, loops round the posterior edge of the sterno-mastoid, and ascends across its surface (the fascial sheath intervening) toward the angle of the jaw; where, after supplying twigs to the integuments over the parotid gland, it divides into terminal branches, which are distributed to the external and internal surfaces of the auricle and to the adjoining integument, in a manner which need not be particularised in the present article. In crossing the sterno-mastoid it is parallel to the external jugular vein, and behind it. The *anterior cervical* rises in common with the last, and pierces the fascia in its company; bends at right angles across the sterno-mastoid muscle, and is itself crossed by the external jugular vein. On arriving at the edge of the muscle, it divides into many twigs, which, traversing the platysma at several spots, distribute themselves to the skin of the anterior triangle of the neck, and to that of the adjacent part of the digastric

space. This nerve, where crossed by the external jugular vein, gives one or two minute twigs, which follow its direction toward the angle of the jaw.

The *supra-clavicular* and *super-acromial* are the two superficial branches in which the plexus terminates: as they descend, they divide into a lash of twigs, which diverge in the posterior triangle of the neck, and at various heights pierce its fascia, become subjacent to the platysma, and contribute to supply it. Their ultimate branching takes a very wide range: the inner filaments obliquely cross the clavicular origin of the sterno-mastoid; the outer, the anterior fibres of the trapezius; the middle ones, the clavicle itself; and are distributed, in their respective regions, to the integuments of the scapula, shoulder, chest, and sternum.

The branch from the *portio dura*, which enters the neck, is the lower division of its cervico-facial part. From near the angle of the jaw, where it traverses the fascia, it passes toward the hyoid bone, and supplies the platysma from its deeper side. Some of these twigs, approaching the cutaneous surface of the muscle in the anterior triangle of the neck, communicate with filaments of the anterior cervical nerve.

1. *Mesial region of the neck.*—This presents different relations, as considered above or below the level of the *os hyoides*.

Above the os hyoides, and extending from the body of that bone to the symphysis of the lower jaw, is the narrow space which separates the anterior bellies of the digastric muscles. It is an elongated triangle, broadest below—where the tendons of the digastrics are kept apart by the body of the hyoid bone—having its apex above, where these, having expanded into the fleshy anterior bellies, are infixed side by side at the median line of the jaw. The platysmata in their cellular sheath cover this space, and sometimes decussate across it with each other. The cervical aponeurosis likewise extends over it, adhering to its bony limits, and strengthened by the tendinous slip, which is derived from the digastric. Deeper than the digastrics are seen the fibres of the mylo-hyoid muscles, meeting in the median raphe, which runs along the space. The natural direction of this raphe is almost antero-posterior, and that of the fibres which meet in it almost horizontally transverse: but when (as in any operation on this part of the neck) the head is thrown back and the chin elevated, the raphe presents a considerable downward slope, and the fibres of the mylo-hyoid have a corresponding obliquity. The same observation applies to the deeper fibres which course from the tubercles within the symphysis to the body of the hyoid bone—those, namely, of the genio-hyoid and genio-hyo-glossal muscles. This little region can hardly be said to have any special surgical relations; it contains neither vessels nor nerves of size; its injuries only assume importance when they extend beyond it into the adjoining digastric space; its diseases derive no peculiarities from their situation, and for the most part belong to the integuments, which are vascular, highly folliculated, and in the male densely bearded: sycosis often extends to them, and they are a frequent seat of sebaceous tumours.

Below the os hyoides, the anatomy, which involves the surgical relations of the larynx and trachea, becomes of extreme importance. Between the two layers of the fascia superficialis the platysma no longer intervenes; they accordingly lie together and are blended. The vaginal processes of cervical fascia, which have isolated the sub-hyoid muscles, become united into a strong and single raphe along the middle line, from above to within a short distance of the sternal notch; but here the layers remain distinct, a superficial one fixing itself to the notch and to the interclavicular ligament, while the deeper one descends with the muscles into the mediastinum. The interval contains loose cellular tissue, and sometimes (as Burns noticed) an absorbent gland. Accordingly, in the very median line, an operator may expose the larynx, trachea, or thyroid body without dividing or displacing any portion of muscle; but a lateral deviation from this imaginary line would imply an exposure of the sub-hyoid muscles on one side or on the other. Indeed, the muscles so nearly approach to the line in question, and constitute in their laminar arrangement so useful a guide to the subjacent parts, that the bare possibility of avoiding them is wisely neglected, and the surgeon learns from them his nearness to the organs which they cover.

In tracing, from the hyoid bone downward, the irregular profile of the air-tube, the finger may distinguish through the integument the following changes of outline. 1. A horizontal semicircular notch, limited below by the prominent angle of the thyroid cartilage, and corresponding, in the interval of the muscles, to the thyro-hyoid membrane; the lateral parts of this give passage, as we shall presently see, to the laryngeal artery and nerve, but its mesial part, with which alone we are now occupied, has only a small twig from the thyroid artery ramifying over it: the membrane is thick, and composed of strong vertical fibres in the median line; it becomes weaker and of laxer tissue in proceeding backward. Its deep aspect contributes to the skeleton of the pharynx, and corresponds to the epiglottis, from the attached portion of which it is separated only by cellular tissue and the epiglottidean gland; while, above, the mucous membrane, in being folded forward to the epiglottis, intervenes between it and the membrane. This notch is frequently invaded by the knife of the suicide; and there is perhaps no part of the neck on which a gash may be inflicted with less serious injury: the large vessels are far removed, and the larynx lies below the blade, which may, if near to the hyoid bone, enter the pharynx above the epiglottidean fold of mucous membrane, leaving the epiglottis unhurt, or, if more nearly approached to the thyroid border of the space, may partly or entirely sever that cartilage from its inferior attachments. No special surgical operation belongs to the space; if indeed we

except a proposal made by M. Malgaigne* for reaching the larynx through it, which has not yet received the sanction of practice. 2. The angle, in which the alæ of the thyroid cartilage meet, having—under the quaint name of *pomum Adami*—its extreme prominence above. Within it are the essential organs of voice, which, buckler-like, it protects: the inward aspect of its angle attaches the vocal ligaments; its outward jutting marks their length, and measures the development of the larynx. Hence the *pomum Adami*, as indicating by its prominence that matured growth of the organs of voice, which belongs to male puberty, is a physiognomical character of sex. Desault's mode of laryngotomy consists in a vertical division of this angle from below upward, and has the recommendations of easy performance and of efficiency for the extraction of a foreign body. That it invades parts of high functional endowment and extreme irritability,—that ossification of the cartilage may unexpectedly prevent its completion,—that perfect reunion of the divided structure is uncertain—are alleged as objections to it, and perhaps over-estimated as such; for to the first may be answered, that the operation is of *relief*, and hence little likely to aggravate an irritation, the cause of which it removes; to the second may be conceded, that the mode of operation is not eligible for cases likely to present the bony deposit referred to; and against the third may be adduced the evidence of the French surgeons, by whom chiefly the operation has been performed, that the parts are as quickly repaired, and their functions as completely recovered, as after any other mode of operative procedure. As regards its anatomy, nothing can be easier than to lay bare the pomum Adami; a division of the skin, of the superficial and proper fasciæ, with some lateral displacement of the sub-hyoid muscles, will suffice for its exposure: and, for its division,—the closest following of the medial line, in order that the knife may pass *between* the vocal ligaments, leaving both uninjured, is the chief precaution to be observed. The upper edge of the glottis is on a level just below that of the superior thyroid notch. The prominence of the thyroid cartilage and the unyielding support which the borders of its arched surface receive from the bony column behind it, render it liable to be crushed by any considerable, direct, antero-posterior violence. Such has, more than once, been the cause of immediate death where a straightforward blow has reached the larynx in prize-fighting; and such, too, is a not infrequent effect in death by hanging, especially where, as in the English mode of judicial execution, the rope is made to tighten itself jerkingly. The thyroid cartilage is sometimes partially divided in attempts at self-destruction, which it commonly frustrates by defending more important parts. 3. A depression which answers to the crico-thyroid ligament: it is here that the usual operation for urgent glottic dyspnœa is performed. The common integuments and the fascial raphe cover the little interspace in question, which is safely reached—between the crico-thyroidei—by displacing in a slight extent the sub-hyoid muscles. It has about half an inch of transverse breadth, and about a third of an inch of height,—is bounded by the inferior thyroid notch and by the anterior part of the circumference of the cricoid cartilage; which borders give attachment to the strong yellow elastic membrane that closes the space. This depression is so readily felt through the integuments—its boundaries are so definite and its relations so simple, as to render it a peculiarly eligible spot for bronchotomy, when suddenly and urgently required. A small artery sometimes forms, with its fellow of the opposite side, a transverse communication across this membrane, and its presence has been much insisted on as a circumstance of practical importance: it is of extreme minuteness, and by no means constantly present: it is the *crico-thyroid*, and arises from the thyroid branch of the external carotid, near the upper angle of the thyroid body, and runs across the membrane toward the median line. The necessity for haste is commonly of too urgent a character to admit of any deliberate, layer-by-layer, dissective operation: a single steady puncture with a canulated trocar, or with a bistoury—directly followed by a tube—is the usual mode of conducting it. In such instances the minute artery can hardly be avoided with certainty, but neither can its division be injurious, since the closely fitting canula will secure the cavity of the air-tube against its trifling hemorrhage. In the rarer cases, where time is allowed for a slower division of the tissues, it would be desirable not to puncture the membrane till the artery, if present, had been disposed of. It usually lies near to the border of the cricoid cartilage, and might easily be drawn downward away from injury; or its division might be rendered harmless by torsion, or by a fine ligature. In the more extemporaneous mode of laryngotomy the bistoury should be guided flatly, close beneath the thyroid cartilage; in so making a transverse division of the membrane, it is parallel to the line of the artery, but above its usual position. 4. The slight prominence of the cricoid cartilage, and the series of tracheal rings—becoming progressively deeper toward the sternum,—are next felt. In some subjects their chain is seemingly interrupted by a transverse fleshy eminence (which, however, is in health generally imperceptible through the skin), the isthmus of the thyroid gland. To the lateral portions of this body I shall presently return: the isthmus is its only part having relations in the median line, which it crosses to a very variable extent. Most frequently it measures about half an inch in breadth, and corresponds by its middle to the second ring of the trachea: but from this, its normal extent may vary on the one hand to the extreme of entire absence—on the other to that of being an uncontracted, flattened union of the lateral lobes, which it may so equal in its vertical dimension. Downward from its lower edge, in front of the remaining rings of the

* Médecine Opératoire, 1840, p. 517.

trachea, passes the inferior thyroid venous plexus, on a level with which would be found, in rare cases, the middle thyroid artery (of Neubauer) ascending from the aortic arch: these vessels are covered by a layer of fascia dividing them from the sterno-thyroid muscles. These parts are variously involved in the two remaining modes of bronchotomy; one of which—the tracheal—consists in dividing three or four rings of the tube, below the isthmus of the thyroid gland; the other—the crico-tracheal—in dividing its upper rings and with them the cricoid cartilage of the larynx. The first—*tracheotomy*—(after a vertical division of the tegumentary parts and a separation of the muscles from the lower part of the larynx to the sternum) exposes the tube in that portion of its extent in which it is deepest and most nearly related to vessels. The operator is required to bear in mind the possible presence of a middle-inferior thyroid artery, lest he wound it inadvertently; he must avoid, or, before opening the air-tube, must secure the inferior thyroid veins; in recollecting the great lateral mobility of the trachea and its close parallelism to the carotid arteries in the lower part of the neck, he must guard against any oblique glancing of his knife, by which these great vessels might be injured; in proceeding to divide the cartilaginous rings, he must commence below and on a completely exposed part of the tube, and with the blunt border of his knife toward the middle line of the sternum, and with its point directed slightly upward, lest (as might happen in neglect of these precautions) the great vena innominata, transversely crossing the tube just below the level of the sternum, or the large arterial trunks, which are there diverging from the median line, should sustain injury: nor must he rudely transfix the tube and encounter the risk of puncturing parts, normally or abnormally behind it.* The second operation, *crico-tracheotomy*, first proposed by Boyer,† pretends to preference over that just mentioned, on the ground of obtaining an equally free opening with less invasion of important parts. Indeed, although M. Boyer, in proposing it, seems to have considered the section of the thyroid isthmus inevitable, and accordingly included its division in his estimate of risks,—perhaps even that objection might be withdrawn from the operation, if performed in exact agreement with his description; since the finger may depress the thyroid body to an extent which admits a safe division of the first two rings of the trachea. But it seems to have escaped his notice, while theorising on the operation, that a section of the cricoid cartilage must be *useless*, unless *abused;* that a rigid ring, divided at one point of its circumference, remains unloosened; that a single section of the cricoid cartilage could not be made available as a means for increased access to the air-tube, over and above that afforded by division of the trachea, except by employing on it a disruptive force, that should effect a counter-fracture at some other part of its circumference. Such violence on such an organ M. Boyer was far too judicious a surgeon to have sanctioned; and from the single instance, appended (p. 142 *bis*) to his speculations on the subject, it appears probable that the upward extension of his opening in the air-tube was useless; that an incision through the upper rings of the trachea sufficed for the escape of the foreign body; and that, in all essential particulars, the crico-tracheal operation is but tracheotomy at a higher than ordinary level, complicated with an unadvantageous and therefore objectionable intrusion on the larynx.

2. The *antero-inferior triangle* adjoins inwardly the space last described, is bounded outwardly by the decussation of the omo-hyoid muscle (which separates it from the superior compartment of the great anterior triangle) with the imaginary diagonal, which demarks it from the postero-inferior or supra-clavicular space. Its various parts and contents require some separate description. As regards the integuments, it will be remembered that the platysma only partly covers this space, and that the anterior jugular vein, when it exists, is contained here in the lower part of its course. The sterno-cleido-mastoideus follows the outer side of the triangle, but extend over it by its sternal border, so as to cover a large portion of its area. Beneath this muscle, the stronger deep layer of the cervical fascia is extended and splits internally to enclose the sterno-thyroideus, which likewise encroaches on the space by its inner side. Under this fascia the common carotid artery (beside which are the jugular vein and the pneumogastric nerve) ascends vertically, and is slightly overlapped from within by the thyroid body. The anatomy of the space is well developed, in considering the best mode of reaching the carotid artery: a vertical incision falling on the sterno-clavicular joint exposes the superficial fascia and part of the platysma; these being divided, the sheath of the sterno-mastoid is seen, and on its being opened the sternal fibres of the muscle present themselves, obliquely ascending outward: their division and displacement exposes the posterior layer of their fascial investment, which is here seen to ensheath the sterno-thyroid muscle: the descending branch of the lingual nerve (descendens noni) seems almost embedded in the deep layer of the aponeurosis, and reaches the outer edge of this muscle in the upper part of the space:—beneath the stratum of parts so constituted, the carotid lies with the associated organs: the jugular vein is on its outer side,

* In suggesting the possibility of injuring organs abnormally situated behind the trachea, the text particularly refers to the occasional passage of a right subclavian artery, from the left part of the arch, either between the œsophagus and trachea, or behind both those tubes. The anomaly is not a very rare one; and a case is reported, in which the artery, so running, was pierced by a bone, arrested in and perforating the œsophagus. (*Dublin Hospital Reports*, vol. ii.) The irregularities of the aorta itself, quoted by Tiedemann from Hommel and Malacarne, are of almost unique occurrence, hardly furnishing an additional argument for that uniform caution, which the above less infrequent abnormality makes imperative.

† Maladies Chirurgicales, vol. vii. p. 131.

the nervus vagus lies deeply between the two vessels and behind them; the cellular membrane, which invests and binds them together, appears to form an indistinct septum to isolate the artery; crossing the front of the sheath,—from the median line toward the jugular trunk, opposite which they pierce—are many veins, of which some are occasionally considerable in size: they are branches from the larynx, trachea, thyroid body, and sub-hyoid muscles, and among them, when it exists, must be counted the anterior jugular: they are capable of causing much inconvenience to the operator, and require to be carefully managed: on the left side, the internal jugular vein itself, inclining toward the median line below, slightly overlaps the artery: the posterior layer of the sheath of these vessels is a thin process of the fascia interposed between them and the sympathetic nerve, which descends vertically behind: separated in like manner from the great vessels, we find the inferior thyroid artery, which ascends in an obliquely serpentine course to the lower angle of the thyroid body, and the recurrent laryngeal nerve, mounting (on a plane deeper than that artery, internal to which it is situated) toward the posterior part of the cricoid cartilage; the nerve is therefore very nearly approached to the hindermost part of the tracheal cartilages, and, on the left side, ascends between them and the œsophagus, closely applied to the latter.*

The *thyroid body* belongs to this space by its lateral parts, and, when of moderate development, overlaps the carotid sheath. It consists of symmetrical lobular halves, united by the isthmus already alluded to: its lobes are pear-shaped, on a section, the small end being upward; they are plump outwardly where the fascia gives them a smooth envelope, but hollowed inwardly where they adapt themselves to the air-tube: the isthmus commonly connects the lobes by their lower part only, by overbridging the trachea at about its second and third rings: the apex of each lobe reaches to the ala of the thyroid cartilage, covering the fibres of the constrictor pharyngis, which arise there, and receiving the superior thyroid artery from the external carotid: the circumference of the organ presents, then, upward a crescentic sinus in which the angle of the thyroid cartilage, the crico-thyroid membrane and muscles, the cricoid cartilage, the first one, two or three rings of the trachea are seen: its thick outer margin,—running from the apex to the third, fourth, or fifth ring of the trachea—corresponds in that extent to the carotid artery, which it more or less overhangs, and below to the recurrent nerve of the larynx; by the extremity of this border the inferior artery reaches it from the thyroid axis; the inferior margin gives exit to veins, which have already been mentioned, and not infrequently receives by its middle a fifth artery from the arch of the aorta or from the arteria innominata.

From the remarkable vascularity of this body, so disproportionate to its volume and apparent unimportance in the œconomy, it readily falls into the heterogeneous group which the German anatomists have named "Blood-ganglia" (*blut-knoten*). From the same circumstance, and from the probably vicarious function which it seems to discharge, it is extremely liable to hypertrophy, the different forms of which, attended by whatever structural change, are confounded under the name of *goître* or *bronchocele*. From the account given of its anatomy, the symptoms of its enlargement may be surmised; for it is obvious that a tumour, so related to the windpipe and so checked in its outward growth by tense aponeuroses, must gravely affect respiration. Overlapping the common carotid arteries, the tumour derives from them a strong and often visible impulse; and, over and above the jerk, which they communicate to it, a general thrill of distensive pulsation, arising from its own almost erectile vascularity, may be felt by the surgeon. Superficial observation might fail to distinguish such a tumour from carotid aneurism, but anatomy establishes the diagnosis; for, in each movement of deglutition, the diseased mass accompanies the larynx, and is seen to rise and fall in the neck. Attempts at extirpating

* The *cardiac branches of the sympathetic*,—although they require notice in connexion with the anatomy of the large vessels,—have little particular interest in regard of the surgical operations, which are practised on these, and some account of them is therefore better appended in a note than blended with the text. They are seldom or never distinctly seen in operations; and the rule for their management is but a part of the general principle (which ought to be supreme in every surgical exposure of an artery, and the neglect of which has been, I doubt not, at the root of most unsuccessful issues) that the disturbance of surrounding parts, and the denudation of the artery, should both be in the very least degree, which will permit the ligature of the vessel to be accomplished. The cervical cord of the sympathetic lies, as already mentioned, behind the sheath of the cervical vessels, and presents three ganglia, from which, and from the cord, various branches originate. Of these ganglia,—the uppermost has often above an inch in length, is of tapering rounded form, and is situated in the posterior pharyngeal region, on the second and third vertebræ: the second, of smaller size and inconstant occurrence, usually lies upon the inferior thyroid artery: the third, frequently confused with the first dorsal ganglion, is deeply imbedded behind the origin of the vertebral artery. From these sources, assisted and reinforced by the pneumogastric and other nerves, the cardiac branches originate in a manner and succession which will be described in a future article. (See SYMPATHETIC NERVE.) In descending, they lie posterior to the sheath, and the superior one internally to it, close to the trachea, and, on the left side, to the œsophagus. When they approach the inlet of the thorax, they comport themselves variously in regard of the subclavian artery; sometimes passing behind it, on each side, and furnishing twigs, which cross its anterior surface; sometimes, on the contrary, crossing its front by their main branches; and sometimes so dividing as to envelop the artery in an abundant nervous plexus. They are very irregular; but, in all cases, largely communicate with the recurrent nerves, behind the subclavian arteries, and furnish numerous continuations, which descending around the three great vascular trunks to the arch of the aorta, hence prolong themselves to the base of the heart.

goitres by the knife have been almost superseded by the discovery, that iodine exerts a marked controul over many enlargements of the thyroid body; and it would evince other boldness than that of knowledge, lightly to undertake the excision of a tumour so importantly connected. The jugular vein, the carotid artery, the pneumogastric nerve, which on each side the diseased body would overlap, —the trachea and œsophagus, which it would almost encircle, might indeed be avoided in an attempt at its removal; but the enormous venous as well as arterial hæmorrhage that must occur, and the extreme likelihood of dividing the recurrent nerves, would involve a not small possibility of accelerating the fatal result, and deter every prudent surgeon from attempting an operation of such extraordinary risk, except under circumstances that might justify the most favourable remote prognosis. The ligature of its nutrient arteries has been advocated as a cure for bronchocele; but, although this mode of procedure presents fewer anatomical difficulties than that last mentioned, yet, from surgical considerations of its extreme uncertainty and unsafe protraction, it seems little entitled to preference.

On the left side, the *œsophagus*, inclining from the median line, presents itself in the antero-inferior triangle. It only half emerges from behind the trachea (which still covers its right portion), and closely lies on the vertebræ: it continues the canal of the pharynx, from a line of abrupt distinction opposite the lower edge of the cricoid cartilage, downward. It is at its commencement that this tube most frequently interests the surgeon, by becoming the seat of stricture, or by arresting and fixing foreign bodies. To this space the operation of œsophagotomy belongs; and the left side is, for obvious reasons of convenience, chosen for its performance. In Mr. Arnott's instructive paper on the subject the following directions occur, which may serve to illustrate the anatomy of the region in regard of the operation in question: "The situation of the external incision will, in some measure, depend upon that of the body to be removed, but as the pharynx, tapering gradually in its descent, terminates in the œsophagus immediately under the larynx, it is here that a bulky substance is most apt to be detained. In reaching the œsophagus at this place, taking as a centre a spot corresponding to the level of the lower margin of the cricoid cartilage and the first ring of the trachea, the only parts of consequence, whose injury is to be dreaded, are the inferior thyroideal artery and recurrent nerve, (the superior thyroideal artery being too high to run any risk;) but these will not be wounded, if the same plan is adopted as that in the case related, of separating the deeper-seated parts by the handle of the scalpel and the finger instead of by the knife. Here they were not seen during the operation, in fact they were not within the sphere of the wound, for, on examining the parts after death, the artery and nerve were found below and on the inner side of it. Still I am satisfied by trials on the dead body, that the artery is likely to be divided if the operation is completed by the knife, and hence the expediency of proceeding deliberately, cutting but little at a time, sponging carefully, so as to see and avoid the artery, if possible, or to tie it immediately when cut. The recurrent nerve runs less risk as it reaches the side of the trachea, to which it is attached in its ascent, lower down. I do not allude to the carotid artery as being exposed to any peril. I think, with Mr. Allan Burns, that he must be wanton indeed in the use of his knife, who hurts this vessel. In making the incision into the œsophagus, it is to be remembered that the recurrent nerve runs in the angle between this tube and the trachea, and therefore the incision is to be made a little behind this angle." *

3. *Antero-superior triangle.*— This pretty nearly corresponds to the depression which in lean subjects is seen at the side of the neck beneath the jaw and in front of the sterno-cleido-mastoid muscle. It is bounded behind by the diagonal line to which we have so often referred; the posterior belly of the digastric and the superior belly of the omo-hyoid constitute, respectively, its upper and lower borders, and their convergence to the hyoid bone anteriorly forms its apex. The fascia superficialis, enclosing the platysma myoides, extends uninterruptedly over its borders; and the cervical aponeurosis splitting at each, extends singly over the area which they enclose: the transverse processes of the vertebræ, covered by muscular attachment and by the pre-vertebral aponeurosis, form its floor. The common carotid artery enters it below, and, at about the level of the lower border of the third vertebra, divides into the internal carotid, which continues to the cranium the direction of the trunk, and the external, which runs and ramifies in more superficial parts; the sympathetic, as in other regions of the neck, lies between the posterior layer of the sheath of the vessels and the pre-vertebral fascia; the superior laryngeal nerve lies in the same interval, obliquely bending from above to the posterior part of the thyro-hyoid membrane behind the vessels: it is on the confines of this triangle and the digastric space that the posterior belly of that muscle, accompanied by the stylo-hyoid muscle above and the lingual nerve below, arches across the external and internal carotids, and at about this level the stylo-glossus and stylo-pharyngeus with the glosso-pharyngeal nerve intervene between those large arteries. It is only below this crossing that the vessels fall under our present consideration, and their study may be facilitated by extending an arbitrary line of division from the os hyoides (at the apex of the space) transversely backward. Such a line would have below it the trunk, bifurcation and continuing branches of the common carotid, and the origin from the external of the superior thyroid artery alone; while, above the level referred to, the continued secondary trunks would be seen, and many of the branches

* Medico-Chirurgical Transactions, vol. xviii.

which spring from the external one, viz. the occipital passing obliquely toward the mastoid process, under cover of the posterior belly of the digastric, and hooked round by the hypoglossal nerve; the muscular, which is not invariably present, inclining outward to the sterno-mastoideus; the lingual and facial (divided by an imaginary prolongation of the cornu of the os hyoides from the superior thyroid) entering the digastric space, the former transversely by running along the cornu of the os hyoides between the hyo-glossus and middle constrictor, the latter more obliquely ascending; and the pharyngeal artery deeply running upward beside the pharynx. To all these branches a more particular description has been given in a previous article, than would be suitable to the present one; and to that the reader is referred for the details of their distribution. (See CAROTID.) The jugular vein descends externally to the internal, as to the common carotid, the vagus lying, as in the lower region of the neck, between the two vessels and rather behind them. The vein receives several branches, in traversing this triangle, from the larynx and tongue, and usually the facial vein: all these, since they come from within, must cross in front of the artery, and sometimes form an intricate plexus, which much embarrasses an operator. In front of the sheath descends, with a slight inward obliquity, the branch of the lingual nerve, which at the lower part of the space, and while lying over the vein, forms a reversed arch of communication with the cervical plexus, whence branches are distributed to the subhyoid muscles. The integuments and platysma require no particular notice; their veins and nerves have already been described; among the former must be reckoned the anterior jugular; the space contains a great number of lymphatic glands, a long chain of which *(glandulæ concatenatæ)* lies along the outer side of the sheath of the vessels, while some also lie about the thyroid and lingual arteries on the inner side of the sheath. The surgical relations of this space are chiefly confined to the arteries: ligature of the common carotid or of either of its branches may easily be performed here, since the vessels lie under a much less thickness and variety of parts than below. A vertical incision falling on the point of intersection of the omo-hyoid and sterno-mastoid muscles, and successively dividing the superficial fascia (in which the platysma and cutaneous nerves are contained) and the cervical aponeurosis (a single layer, as it stretches across the space, but, of course, double where it encloses the sterno-mastoid,) exposes the sheath of the vessels, the veins which transversely cross its arterial portion, and the descendens noni which runs on the part of its wall corresponding to the jugular vein: and here, as he might open the sheath lower or higher, the surgeon would expose the common carotid or its branches; and, in remembering that the internal (so named from its distribution only) lies at first external to and behind the other, he would be able to isolate and secure either of these at his option. In any attempt to tie the branches of the external carotid, a clear notion of their respective relations to the hyoid bone is of indispensable necessity; and, in ascending toward the digastricus, it must be remembered that the lingual nerve crosses the carotid sheath but just below the border of that muscle, and that it and the facial vein are consequently exposed to injury. Attempts at suicide by cutting the throat seldom succeed; the incision is usually made closely either above or below the hyoid bone; in the former case entering the digastric regions, and dividing, with the muscles of the tongue, the lingual and perhaps the facial artery; in the latter case, traversing the thyro-hyoid membrane, penetrating the pharynx, perhaps implicating the epiglottis, dividing the thyroid artery, and very rarely reaching the external carotid. The mode of searching for these vessels must vary according to circumstances, but, in all essential particulars, may readily be deduced from their anatomy.

4. The *postero-superior triangle* is a large space of singularly little interest, having its inferior boundary fixed by the omo-hyoid muscle, its anterior by the diagonal which intersects this, its posterior by the edge of the trapezius, and its apex by the mastoid process. It contains, below, a part of the brachial plexus (the anterior branches, namely, of the fifth and sixth cervical nerves, which directly pass beneath the omo-hyoid muscle into the adjoining inferior triangle,) the whole of the cervical plexus and many of its branches, the spinal accessory nerve, obliquely crossing from the sterno-mastoid to the trapezius, which it enters near its clavicular insertion, and some ramifications from the arteria transversalis colli, which, under the name of superficial cervical, ascend in the space, supply its cellular membrane and lymphatic glands, and ultimately inosculate with descending twigs from the occipital. The pre-vertebral fascia covers its deep parts; the common cervical extends between its borders; the platysma myoides exists as a covering for it only in its lower part.

5. The *postero-inferior triangle*, (that of the subclavian artery,) is one of manifold importance. The well-known lines of the omo-hyoid and clavicle limit its area above and below, the former dividing it from the space last considered, the latter from the pectoral region; intersecting the omo-hyoid, our imaginary diagonal, as it stretches from the centre of the sterno-clavicular joint upward and outward, bounds it internally, and constitutes an arbitrary but most useful separation between the space, exclusively appropriated to the subclavian artery with its branches and that internally adjoining it, (the antero-inferior,) which is the proper territory of the carotid. The parts forming its deep or posterior wall are, the transverse processes of the lower cervical vertebræ and head of the first rib, the outer edge of the longus colli and the broad lower part of the scalenus posticus: its inferior wall presents the upper surface of the first rib, and within the curve of this bone a part of the upper inlet of the

thorax, at which during life the pleura bulgingly rises, deriving considerable support from the horizontal infixion of the cervico-thoracic fascial septum. Externally to the curve of the rib, (with the coracoid process bounding it outwardly, the clavicle in front, and the superior costa of the scapula behind,) is the space through which vessels and nerves connect the cervical and axillary regions; to the borders of which, deep layers of aponeuroses are so fixed that the regions only communicate in the line of the vessels, within the infundibulum of prevertebral fascia. Its anterior or covering wall presents, in addition to the platysma and subcutaneous areolar tissue, which in all directions extend beyond its margins, the cervical fascia, as a single layer (except where it splits at the trapezius and sterno-mastoid) fixed to the clavicle below, and enclosing the omo-hyoid above. From the higher part of its posterior wall, originating at the anterior tubercles of the transverse processes, descends the scalenus anticus to fix itself in the floor of the space, on the upper surface of the rib, anteriorly. It intercepts, like a flying buttress, a space between itself and the posterior wall, occupied by the brachial plexus and subclavian artery, round all which, as also round the subclavian vein, which lies in front of the scalenus, the prevertebral aponeurosis is folded and prolongs itself as a funnel; it is from this, that the slip of fascia is derived, which passes to the clavicle, in the manner described above, as a horizontal process, dividing the axilla from the neck.

As the distributive anatomy of the vessels and nerves will be detailed in a future article, (*vide* SPINAL NERVES, SUBCLAVIAN ARTERY), their arrangement will now be only sketched, in its regard to surgical relations. The many important points of distinction between the right and left sides of the body in this region will presently be considered, the description meanwhile applying to both indifferently. The subclavian artery, from the sterno-clavicular joint outward, over-arches the floor of this region, presenting upwards a convexity in the interspace of the scaleni, downwards a concavity, which adapts itself to the pleura and to the rib. It gives off, as from an axis, branches from the four cardinal points of its circumference: 1. downwards the internal mammary, which, crossed at its origin by the phrenic nerve, descends within the cartilages of the ribs; 2. upwards the vertebral, which, after a course of an inch between the scalenus anticus and longus colli, enters the canal of the transverse processes, usually at the sixth; 3. forwards the thyroid axis, a short trunk giving origin to the inferior thyroid branch (already seen obliquely ascending behind the carotid sheath), the ascending cervical, which mounts beside the phrenic nerve, along the scalenus anticus, and two transverse branches, which direct themselves outwardly, crossing that muscle,—the transversalis humeri along the clavicle, the transversalis colli higher, amid the branches of the brachial plexus and winding round the scalenus posticus to gain the inner edge of the scapula; lastly, 4. backwards an artery, which, directing itself to the neck of the rib, subdivides there into two branches, one of which descends across the rib to the thorax, the superior intercostal, while the other continues, between the neck of the rib and the seventh cervical transverse process, the backward direction of the common trunk, and then ascends among the deep muscles of the dorsal region—the arteria cervicalis profunda. The course of the subclavian artery is conveniently divided into three stages; a last or distal one, in which after having passed behind the scalenus anticus, it has, behind it, the scalenus posticus, below it the groove of the rib, above it (extending likewise a little behind) the brachial plexus of nerves, in front of it the coverings of the space we are considering, a familiar knowledge of which is here especially needed, since it is in this portion of its course that the artery is usually tied for axillary aneurism: a second stage, in which it lies between the scaleni, its convexity toward their origin from which the brachial plexus divides it, its concavity reposing on the pleura; and a first or tracheal portion of its course, differently related on the two sides of the body, but thus far alike in both, that from it the branches originate, that its concavity is to the pleura and its convexity, almost at right angles to the direction of the carotid, looks upward; that it is related, behind, to the sympathetic and to the last cervical transverse process,—in front, to the vagus and phrenic nerves and to the jugular and subclavian veins,—inwardly to the carotid artery. The circumstances of difference are mainly due to the fact, that, while on the right side a common brachio-cephalic trunk exists—the arteria innominata,—which lies at no great depth from the sternum, so that its branches diverge to their respective destinations from a comparatively superficial and single point, behind the sterno-clavicular joint; on the left side, contrarily, the carotid and subclavian arise separately from the arch, the latter, at a vast depth from the surface, actually beside the vertebræ; with the exception of having a thoracic commencement (nearly corresponding to the tracheal *half* of the arteria innominata), the left carotid can scarcely be said to differ importantly from the right, at least in virtue of its own course; it is somewhat deeper, lies in front of the œsophagus from the inclination of that tube, has the thoracic duct ascending at its outer side, and is, as will be explained directly, overlapped by the jugular vein in the lower part of the neck. The subclavian artery on the right side passes from its origin almost transversely to the scalene space, covered by the muscles which have been enumerated, crossed at right angles by the phrenic and pneumo-gastric nerves and by the jugular vein; the left subclavian, on the other hand, reaches the groove on the rib after a very deep and a very oblique course; it can scarcely be said to have any transverse direction, but gradually, by an inclination outwards and forwards, approaches the rib during its ascent, so that, if traced toward its origin from the tracheal edge

of the scaleni, it would appear, instead of having, as its fellow has, a certain length of transverse course, to bend abruptly toward the arch of the aorta, becoming deeper and deeper; or, in other words, while the right subclavian has a considerable extent at its highest level, from the sterno-clavicular joint to the scalene space, the left has comparatively but a culminating point, to which it suddenly rises and from which it quickly sinks. Thus the nerves, which cross the course of the right, are nearly parallel to that of the left: and the relation of the jugular vein is similarly changed, while the subclavian vein, having a longer course than on the right side, obliquely crosses the thoracic portion of its artery.

The anatomy of the veins requires some separate notice: in crossing the scalenus anticus at its insertion, the *subclavian vein* is, on both sides, anterior to the artery, from which the tendon divides it, and somewhat inferior to it; the *jugular vein* in the upper part of the neck descends as already mentioned, beside the internal and common carotid arteries, to which it is external, similarly on both sides. The union of these veins, however, to form the venæ innominatæ differs in the following manner. On the right side, the jugular vein, inclining from its artery below, joins the subclavian on the insertion of the scalenus anticus: the arrangement of these important parts is such that they form together an elongated triangle, of which the carotid artery is the inner side, the jugular vein the outer, and the first stage of the subclavian the base, here crossed at a right angle by the pneumogastric nerve, (which reflects its recurrent branch upward and inward behind the artery,) and more outwardly by the phrenic: from this point of junction the innominata vein runs toward the pericardium on the pulmonic side of its artery, that is, externally to it and on an inferior plane. On the opposite side the jugular vein, anticipating its ultimate destination, obliquely bends toward the right side, overlapping the carotid artery, in front of which it receives the subclavian vein by its outer side: the resulting vena innominata sinistra runs almost transversely across the arch to join its fellow at the right extremity of this. The vertebral vein opens into the innominata, just internally to the confluence which forms that trunk. On the left side it crosses the subclavian artery: on the right side it is usually, though not always, behind it.

The *thoracic duct*, mounting from the mediastinum, passes behind the arch, emerges between the carotid and subclavian arteries in the root of the neck, and, curving abruptly downwards, outwards, and forwards, crosses the latter artery and discharges its contents by a valvular opening into the subclavian vein close to the angle of its confluence with the jugular.

The surgical relations of this region regard the subclavian artery and the operations which are practised on it. Of these the most usual is its ligature on the outside of the scalene space, where lying upon the upper surface of the rib. An incision, corresponding to the middle of the clavicle, through the skin, superficial fascia, and platysma, and through the strong single layer of cervical aponeurosis which is fixed to the bone,—extending, if necessary, to the origin of the sterno-mastoid and to its sheath, with careful avoidance of the external jugular vein, here bending round the outer edge of the muscle,—opens a space, wherein loose cellular tissue alone veils the continuation of the pre-vertebral fascia, which is prolonging itself from the scaleni around the subclavian vessels: a division of this lamina, as near as possible to the costal attachment of the scalenus anticus, completes the exposure of the artery, which is recognised by the finger, as it emerges from behind the tendon of that muscle, in immediate contact with the rib. The steps of the operation thus considered seem of no great difficulty, and are, in fact, so long as the parts retain their normal bearings, of extremely easy performance: the artery is at an inconsiderable depth; its relations are singularly definite and unembarrassed. But such is not their practical facility, under circumstances which necessitate the operation. To tie the subclavian artery for axillary aneurism may be one of the most difficult operations in surgery, involving extreme patience and much manual skill in him who undertakes it; for the disease, as it extends, not only fills the axilla, but encroaches on the neck, thrusting up the clavicle, and obliterating the interval between that bone and the omo-hyoid muscle. The operation might almost be compared to one of tying the axillary artery in its normal relations from above the clavicle. It lies at the bottom of a deep and narrow cavity, in which the operator must be guided entirely by the sense of touch, and can only apply this under the disadvantage of distance. The circumstances of such a case are well given by the late Mr. Todd of Dublin,* who states that, "so much was the relation of parts altered by the magnitude of the tumour and consequent elevation of the clavicle, that the omo-hyoid was situated an inch below this bone, and it was found necessary to draw it up from its concealment, and to cut it across, that the subjacent parts might become accessible." It must be under the influence of such changes that the aneurismal sac, by encroaching on the very seat of the operation, becomes liable to injury, and may, as I have witnessed, be actually transfixed by the needle. The relation of the brachial plexus is commonly such that it lies on a plane posterior to the artery, and for the greater part above it; occasionally, however, its last root passes in front of the vessel, and in the disguised condition of parts is not readily to be distinguished from it; since the touch fails in its ordinary discrimination, where exercised with so much difficulty, and it is hardly practicable to apply the test of compression to the supposed arterial trunk, in the view of ascertaining its relation to the tumour, without unintentionally extending the same pressure to the subjacent artery and mis-informing one's-

* Dublin Hospital Reports, vol. iii.

self accordingly. It must have been through these means of fallacy that I have seen a most cautious and experienced operator deceived: he compressed the supposed artery, raised on the aneurism-needle, with his finger; the pulsation ceased, the ligature was tightened, and the severe pain occasioned by this step at once declared the error (which was in the course of a few moments remedied, and the operation ultimately and entirely successful); the convexity of the needle was doubtlessly resting on the artery, and compressed it upon the surface of the rib.

The application of a ligature to the subclavian artery on the tracheal side of the scaleni presents, perhaps, fewer merely mechanical difficulties than that just described, but involves a disturbance of more important organs, and requires perfect acquaintance with their anatomy. A separation of the sterno-cleido-mastoideus from its inferior attachment, and a division of the sterno-hyoid and sterno-thyroid muscles and of their sheaths (including that deep layer which lies beneath the sterno-thyroideus and immediately covers the vessel) will expose the artery.* The jugular vein is seen crossing it, close to the scalenus, at the outer part of the wound, behind which lies the phrenic nerve; at the inner part of the wound the bifurcation of the arteria innominata is brought into view, and the subclavian is seen diverging from the carotid. Between this point and the border of the jugular vein, from half an inch to an inch of artery intervenes, about midway on which the nervus vagus crosses at a right angle. If the nerve require to be drawn aside, this manœuvre must be executed with the extremest delicacy and gentleness;† and the operator should not fail to remember his dangerous proximity to the pleura. The view of these parts is obscured by considerable venous hæmorrhage, which is here especially inconvenient, from the imperative necessity which exists for clearly seeing the artery and ascertaining the position of its branches before making any attempt to pass the needle. It is considered desirable to apply the ligature on the inner side of the vertebral branch, and as near to it as possible: yet, even under the most favourable circumstances, the adhesive actions at the seat of ligature must be seriously disturbed, both by the near direct stream of the carotid, and by the recurrent tides of the vertebral, mammary, and thyroid arteries. The single instance, in which I have seen this rare operation performed, was by my friend, Mr. Partridge, who brought to bear on its execution a perfect familiarity with every actual relation, and with every possible contingency; nor could it have been confidently undertaken, or safely conducted, by one of inferior resources. The case was in so far favourable, that the tumour was small, the position of parts unaltered, the arteries regular and free from disease, and the venous hæmorrhage not so troublesome as in many cases it certainly would be; the parts were clearly seen, and the artery secured without the least unnecessary disturbance of contiguous parts. Yet, I confess the impression, which I derived from this single instance of operation, and from frequent consideration of the parts in a great variety of subjects, to have been, that ligature of the arteria innominata would in all cases be as easy, and, in many, far easier to perform, would (by involving organs of less delicacy and importance, than those interested in the tracheal ligature of the subclavian) render hæmorrhage a less embarrassing obstacle, and would afford a better prospect of undisturbed adhesion in the artery. The steps, necessary for exposing the one, require so little modification, to become equally adapted for the other, that the surgeon might even be determined in his choice of either, by considerations developing themselves during the operation, by greater or smaller branchless extent of the subclavian artery, by the vertebral vein obscuring a large portion of this, or by other circumstances of the kind.

Although the *arteria innominata* cannot in anatomical strictness be considered as belonging to the neck, yet, in regard both of disease and of surgical operation, its affinity to that region is so close as to warrant its mention in this place. It rises from the convexity of the arch of the aorta, just as that main vessel, having terminated its ascent, inclines leftward. This point is in young subjects the highest level to which the aorta attains; but, as Cruveilhier notices, in old age the extreme part of the arch, which corresponds to the origin of the left subclavian artery, is higher. In early life, too, from incomplete development of the sternum, the convexity of the arch more nearly

* The description in the text is confined to the mode of tying the *right* subclavian artery, on which alone, as yet, the operation has been performed. As regards the left, the course of the vagus and phrenic nerves (which run parallel to the vessel), and of the thoracic duct (which almost surrounds it) would enormously multiply the risks of the operation; and the increasing depth and oblique descent of the artery, as traced from the scalenus inwardly, would, it is believed, defeat every endeavour to effect its adequate exposure. Should it be desirable to secure the vessel internally to its passage over the rib, the most available method would probably be that of tying it in the scalene space. This operation was performed in a single instance by Dupuytren in 1819 with success. The section of the scalenus anticus, if it were carefully executed, would be less perilous than on the right side, and might, under favourable circumstances, afford a sufficient space, between the branches of the artery and the aneurismal sac, to admit the safe application of a ligature. A complete division of the clavicular origin of the sterno-cleido-mastoideus would be required; and it would be necessary to obtain a distinct view of the phrenic nerve, before cutting the scalenus: the internal mammary artery might, as M. Malgaigne remarks, be injured even more readily than the nerve, if this incision were carelessly extended toward the median line.

† It is difficult, in reading the record, or in witnessing the progress of unsuccessful cases of operation at this part of the neck, to avoid believing that a neglect of cautious tenderness in managing the pneumogastric nerve, has tended to compromise the safety of the patient. No surgeon, who considers its vital importance to the functions and nutrition of the lung, can avoid viewing any unnecessary disturbance or rude traction of it as eminently perilous.

approaches the root of the neck than in adult growth, and, as also the branches arising from it, may more easily be endangered in tracheotomy and other operations in the neighbourhood. Its length is somewhat above an inch: its direction obliquely upward and outward, toward the sterno-clavicular joint, opposite to which it divides. In this course it corresponds, behind, to the trachea,—in front to the sternum, from which the remains of the thymus gland, the origin of the sterno-hyoid and sterno-thyroid muscles, and (close to its origin) the transverse crossing of the left vena innominata separate it,—externally, to its accompanying vein, and, mediately, to the pleura,—internally, to the left carotid from which it is separated by a triangular interval in which the thymus, or its remnant, lies upon the trachea.

The frequency of its undue extension beyond the precise limit assigned to it, and consequent appearance in the sub-hyoid region of the neck, together with the fact of its often furnishing a middle inferior thyroid artery, are contingencies never to be disregarded in operations thereabout.

This artery has now been tied for cure of aneurism at least six times; unsuccessfully—it is true—but with such nearness to success as not to forbid cautious repetition. The mode of procedure adopted by Dr. Mott consisted in a transverse division of the skin, muscles, and fasciæ along the edge of the clavicle and sternum,—in raising these, and taking the subclavian and carotid arteries (which he seems to have denuded to some extent) as guides to the innominata, in drawing the jugular vein, the vagus, phrenic and recurrent nerves outwards, in pressing the pleura carefully downwards with the convexity of the needle, while he carried its point from below upwards around the vessel.

6. *The digastric space* is bounded below by the curve of the digastric muscle, and extends above within the angle and horizontal ramus of the jaw, so that, if considered as a triangle, it may be described as having its base represented by the internal oblique (or myloid) ridge of the lower jaw, and an imaginary prolongation of this to the root of the mastoid process,—its anterior border formed by the ascending belly of the digastric muscle,—its posterior by the descending fibres of the same; and its apex will obviously be at the point of their reflexion by the hyoid bone. The skin, the superficial fascia with the platysma, and the cervical aponeurosis, wall it in, and that part of the inferior maxilla which lies beneath the oblique line, to the basial edge of which the fascia adheres, overhangs it; its deep surface is constituted by the mylo-hyoid muscle and by the side of the tongue and pharynx in front, by the vaginal and styloid processes of the temporal bone behind. A fibrous slip, reflected outwardly from the styloid process to the angle of the jaw, and to the deep surface of the aponeurosis, distinctly divides the digastric space into two parts. Of these, the *posterior* is the smaller; its vertical extent is to the temporo-maxillary articulation: backwards it is bounded by the auditory canal and mastoid process; inwardly, by the vaginal plate, the styloid process and its muscles. In the anterior direction the border of the jaw, together with the septum just described, are its limits: whence it seems, within the neck of the jaw, to prolong itself as an interspace between the attachments of the pterygoid muscles.

Between the unyielding walls of this narrow space, the *parotid gland* contracts itself into a wedge-like form, reaches in the one direction to the styloid process and is folded round it, in the other is prolonged with the maxillary vessels between the insertions of the pterygoidei. In its substance the external carotid ascends to its terminal subdivision,—the portio dura curves from the stylo-mastoid foramen, and breaks into the lash of communicating branches, known as *pes anserinus*,—the roots of the external jugular vein unite to assume that name,—and junctions of the portio dura with the superficial temporal nerve, and with the auricular branch of the cervical plexus, are met with. Its remarkable impaction behind the jaw is probably designed for affecting its function by the mechanical stimulus of the masticatory movements. Its enlargement may inconveniently hinder these motions, and, where accompanied by much induration, actually lock the jaw. The merely anatomical difficulties of extirpating the parotid gland have probably been somewhat over-rated; but cases requiring the operation must be of exceeding rareness. Absorbent glands lie on many points of its surface, and in its substance; their enlargement is frequent, and has been mistaken, in several instances, for an affection of the parotid itself.

The arteries met with in this space are all branches of the external carotid: the occipital and auricular follow its posterior border, the latter usually traversing a part of the gland; the temporal artery emerges at the upper, the transverse facial at the anterior edge of the parotid, while from its deep portion the internal maxillary passes forward, within the neck of the jaw, toward the zygomatic fossa.

The *anterior* division of the digastric space considerably exceeds the posterior in size: its vertical extent behind is from the curve of the digastric up to the outward surface of the buccal mucous membrane, where reflected from the molar alveoli to the side of the tongue; but anteriorly it seems to be limited by the lower surface of the mylo-hyoid muscle, and so to be shallower; though, in reality, this is not the case, for the muscle referred to merely forms a partial septum, dividing the shallow and superficial part, just mentioned, from a deeper, sublingual portion of great importance. The anterior division of the digastric space may accordingly be considered as bounded above by the mucous membrane of the mouth in its reflexion from the oblique line of the jaw to the border of the tongue, in an extent reaching from the base of the coronoid process to the symphysis; and, internally, by the side of the tongue, (presenting the muscular substance of the genio-hyoideus, genio-hyoglossus, hyoglossus, and stylo-glossus,) and by that of the pharynx. It is only in front that the mylo-hyoid muscle, as

a partial septum, divides a superficial space from the general submucous tract; and it is necessary to understand this arrangement, in order to apprehend the mode in which the submaxillary gland approaches the mucous membrane of the mouth: the gland lies in the superficial division of the space, and it is round the posterior edge of the mylo-hyoid muscle that its duct is reflected in proceeding to discharge itself, which by so entering the sublingual space it is enabled to do. The anterior division of the digastric space contains, superficially the gland just mentioned, the facial artery and vein with some of their branches, the mylo-hyoid twig from the third division of the fifth, and many lymphatic ganglia. The gland receives a thin capsular investment from the deep surface of the fascia, closing the space, and this prolongation contracts and condenses itself round the posterior extremity and duct, accompanying these in their turn round the mylo-hyoid, and furnishing the duct with a dense fibrous tunic. The artery enters the space from below, by passing beneath the posterior belly of the digastric muscle, very tortuously winds through the submaxillary gland, and bends over the basial edge of the jaw a little in front of the masseter. It furnishes a deep ascending branch (the tonsillary) near the angle of the jaw and many glandular twigs; but its only considerable branch in this region is the sub-mental, which runs toward the median line just beneath the jaw, and, supplying the mylo-hyoid muscle on which it is applied, and the anterior belly of the digastric, terminates by freely communicating with its fellow. The sub-mental branch derives additional importance from the frequency of an anomalous distribution, by which, piercing the mylo-hyoid muscle and entering the sublingual space, it partly discharges the functions of the lingual artery in supplying the sublingual gland. The facial vein lies behind the artery, and quits the space below in passing over the digastric and stylo-hyoid muscles, which divide it from the artery. Its usual or chief termination is in the internal jugular; but it frequently contributes more or less to form the external or the anterior jugular vein. The mylo-hyoid nerve runs parallel to the origin of the muscle, which gives it its name, and supplies it and the anterior belly of the digastric. The lymphatic glands are numerous and important: they receive the absorbent vessels from the face and likewise from the mouth and pharynx, are the frequent seat of strumous inflammation, readily sympathize in disordered conditions of the fauces and alveoli, and take an active part in propagating the malignant influence of cancerous ulcerations on the face. These parts are all covered in by the aponeurosis,—which fixes itself to the base of the jaw,—and by the platysma and superficial fascia,—which continue themselves on the face. They are readily accessible to the surgeon, but seldom subjected to any operation of importance. The deep or sublingual portion of the digastric space has its roof formed by the mucous membrane, which, between the tongue and alveolar arch, constitutes the floor of the mouth: the side of the tongue and the continuous surface of the pharynx, as already described, compose its inner wall; and it follows from the previous description that, in part at least, the mylo-hyoid is its floor. The gustatory nerve runs through it beneath the mucous membrane, which it supplies: the hypo-glossal, describing a parallel but inferior curve, is distributed in succession to the muscles of the inner wall of the space; the glosso-pharyngeal between these two in height, but confined to the root of the tongue, bends inwardly beneath the stylo-glossus; the lingual artery, emerging from under cover of the hyo-glossus, which has hidden its tortuous ascent, divides anteriorly into two branches; a ranine, which follows the curved border of the tongue to its tip, where it archingly unites with its fellow; a sublingual, which directing itself a little outward, supplies the third salivary gland: this little body lies on the divergent fibres of the genio-glossus, near their origin, and close beneath the membrane of the mouth: finally, the duct of the submaxillary gland, traversing the space obliquely, crosses its contents, and communicates with the cavity of the mouth just beside the frœnum. This space is the seat of ranula (a tumour formed by obstruction of the submaxillary duct), and of some salivary concretions; in both which complaints the distended canal is brought so immediately beneath the mucous membrane, which it raises, that other parts are little liable to injury: here, too, it is that the surgeon, when obliged to divide the frœnum linguæ, must cautiously cut the too tight fold near to the symphysis, and vertically, lest, in extending his incision backward, he should wound the ranine artery. Sharp instruments penetrating downward beside the tongue may wound the sublingual artery, and the consequent hæmorrhage, distending the submucous space, raise the reflected membrane on each side into swellings of such size, as to suggest imminent peril of suffocation.*

7. The small region to which, under the name of *posterior pharyngeal*, I propose giving brief notice, has for its roof the basilar portion of the occiput and petrous part of the temporal bone, and presents in this direction the orifices of the jugular, carotid, and anterior condylic canals: it extends downwards between the pharynx and vertebræ into the anterior triangle of the neck, and is separated from the posterior division of the digastric space, within which it lies, by the styloid and vaginal processes, and by the attachment to these of a strong layer of fascia, which passes beneath the digastric muscle. The internal carotid artery, surrounded by branches from the superior cervical ganglion,

* Such an accident I have seen arise from the inadvertent thrust of a tobacco-pipe; the swelling was very considerable on both sides, and produced alarming distress. Cold (aided, no doubt, by the pressure of the effused blood) succeeded in staying the hæmorrhage; had this not been the case, it would have been necessary to expose the lingual artery on the cornu of the os hyoides and to secure it; or, had its ligature not sufficed, likewise to tie the adjoining trunk of the facial, from which the sublingual branch is occasionally derived.

ascends here; and since, from the angle of the jaw to the base of the skull, it lies beside the pharynx, covered by the lateral parts of that cylinder, it is liable to be involved in a punctured wound from the mouth; and this unfortunate accident has not unfrequently occurred in operations on the tonsil, which organ in its swollen state is so closely applied to the internal carotid artery, that if it were transfixed by a bistoury in an outward direction, the vessel could hardly escape. Hence the importance of care, in relieving tonsillary abscesses, to direct the point of the instrument, as much as possible, towards the median line, and to select for incision that part of the cyst which most nearly adjoins the palate. The jugular vein emerges behind the artery and runs downwardly along its outer side: of the three divisions of the eighth nerve, which leave the cranium in front of the vein, the glosso-pharyngeal is applied to the outer, the vagus and spinal accessary to the inner part of its circumference. The muscular branch of the latter winds from within behind the vein, and obliquely descends to the sterno-mastoid: the vagus continues to descend vertically along its inner side, but both the glosso-pharyngeal and hypo-glossal nerves obliquely cross between it and the artery, and subsequently arch over the latter in their passage to the tongue. From its relations to the vertebræ in this space, the pharynx may participate in their diseased conditions, and give vent to abscesses, dependent on caries of the cervical spine. The surgeon may sometimes assist his diagnosis of complaints so situated, by introducing his finger into the pharynx.*

8. Lastly, I proceed to recapitulate, briefly and in connexion, the practical relations of the *sterno-cleido-mastoideus* in regard of the spaces which have been described. Its clavicular origin is in the inferior division of the posterior triangle, covers the subclavian artery in the first and second portions of its course, and in many instances extends this origin so far outwardly as to hide the vessel during a considerable part of its third stage; it likewise, of course, covers many parts lying between it and the artery,—the jugular and subclavian veins, the vagus and phrenic nerves, the scalenus anticus and omo-hyoid muscles, and the origin and divergence of many arterial branches: these fibres obviously require division, varying according to circumstances, when the subclavian artery is to be exposed. The interval between its origins corresponds to the sterno-clavicular joint, and, on the right side, to the bifurcation of the arteria innominata: along the cellular line, prolonged from this interval, (which answers to the diagonal dividing the two great triangles,) M. Sedillot proposes to penetrate, without section of muscular fibre, in order to reach the common carotid artery. The sternal head of the muscle, directing itself backward, obliquely crosses, in the inferior segment of the great anterior triangle, the sheath of the vessels, from which the sub-hyoid muscles partly divide it. In order to reach the common carotid artery these fibres are accordingly cut asunder, except where the operator prefers the anatomical *finesse* of M. Sedillot's plan. Tracing the muscle in the middle of the neck, we find it a most serviceable guide in operations on the common carotid, and on its primary or secondary branches. A vertical incision directed to the point of its intersection with the omo-hyoid muscle (nearly opposite the cricoid cartilage) enables the surgeon conveniently to draw these muscles aside, and to expose, according as the wound is higher or lower, the external and internal carotids, or the trunk from which they originate, and, in close connexion with the anterior layer of their sheath, the descending branch of the hypo-glossal. Finally, about and above the level of the hyoid bone, the anterior edge of the sterno-mastoid, with the posterior belly of the digastric, and the cornu of the os hyoides, furnish definite marks for discovering the superior thyroid, the lingual, the facial or the continued external carotid artery; since, in the space so bounded, the last named vessel vertically ascends, the first almost horizontally advances, and the other two pass to their destinations with intermediate obliquity.

* A case has lately occurred to the writer illustrating this fact. It was one of neuralgia; the pain was of extreme severity and obstinacy; it affected the occipital region, and was referred to the great occipital nerve. An examination through the pharynx succeeded in detecting, as its probable cause, a firm (apparently bony) tumour, connected with the transverse processes, between which that nerve emerges.

IV.—ADDITIONAL PRACTICAL OBSERVATIONS.

It yet remains, in conclusion, briefly to review some circumstances in the anatomy of the neck, which particularly bear on its diseases and on the operations undertaken for their cure. 1. In endeavouring to form a *diagnosis of tumours* in this region, the surgeon will, in the first place, remember their extreme liability to deceptive pulsation, and will neglect no precaution for ascertaining their relation to the large arterial trunks. The glands, which lie about the common and external carotid arteries, in the anterior triangle of the neck, and those which are situated in the supra-clavicular space, are particularly subject, when enlarged, to derive pulsation from the vessels to which they are respectively contiguous. The history of the case,—the signs afforded by auscultation,—the manner in which a non-aneurismal tumour may frequently be moved away from the artery that communicates an impulse to it,—the marked difference even to the unpractised hand, between the mere jerk of elevation in the one case, and the thrilling diastole in the other, are materials for distinction, to which it is here enough to allude. Nor must it be forgotten, that, from the nearness of the aortic arch to the root of the neck, its aneurisms, as they grow upwards and clear the strait of the thorax, may simulate the characters of a like disease in the carotid or subclavian artery. Cases constantly occur, (and may be found abundantly quoted in systematic surgical works,) in which tumours of this kind,

rising in the vicinity of the sterno-clavicular articulation, have been mistaken for aneurisms of the innominata, on the one side, or of the carotid or subclavian on the other, according as they have, in their growth, deviated right or left from the median line. Burns records a case, in which an aneurism so originating from the aorta, was even falsely attributed to the right subclavian: it bulged first on the acromial side of the sterno-mastoid muscle, "a point, where no one would expect a tumour to present, which had worked its way from within the chest."* This is an extreme and rare instance; but not so are the misapprehensions, previously alluded to: it is certain, and matter of frequent experience, that aneurisms of the arch, where they escape from the resisting stricture of the sternum and clavicles, project so abruptly, as to have the appearance of belonging to the artery, over which their fundus is situated. They frequently have (as in the case which Burns quotes from Sir Astley Cooper) a Florence-flask-like form, the neck of which may be narrow, and the fundus high in the neck. In several such cases the deception has been so complete, as to suggest to the surgeon the propriety of tying the common carotid below its supposed aneurism:† but no instance is on record, as I believe, of the adoption of so calamitous a proceeding. It is, indeed, true and almost self-evident that an aneurismal swelling, formed at the root of the carotid, will commonly first be perceived in the small interval between the heads of the sterno-mastoid, and, in its further growth, may displace these, or cause their absorption:—that one connected with the arteria innominata is likely to project nearer to the trachea, and on the inner side of the sterno-mastoid:—that one originating from the subclavian will usually rise on the outer side of the same muscle; and that the force of the pulse is generally diminished in the branches of a trunk affected with aneurism:‡ yet, while such facts may have their weight, as excluding certain tumours from the respective categories of subclavian, carotid, or innominata aneurism, and as so assisting the negative diagnosis of these diseases,—it admits of no doubt that they are insufficient to establish grounds for positive recognition. The aortic aneurism may imitate every circumstance of position in the neck, which has been mentioned; and can hardly fail by its abnormal pressure to affect the circulation through the contiguous artery, and to weaken the pulse of its branches. To other criteria, than the mere symptom of external prominence, the cautious surgeon will look for a safe diagnosis of swellings in the root of the neck. The minutest inquiry into the history of the patient during the period, which preceded any outward projection of the tumour, and into the actual state of his thoracic organs and of their functions (with notice of every pain, palpitation, or dyspnœa),—an observation of any existing impediment to the return of blood, as evidenced by venous congestion,*— and complete and careful stethoscopy, are all requisite to that *study of the particular case*, which alone can justify an opinion.

2. An important subject for mention, in regard to the surgical anatomy of the neck, is the provision for *collateral circulation*, when the main trunks are obliterated. Mr. Burns, in discussing the question of tying the arteria innominata, speaks of these natural resources in the spirit of confidence, which has been familiar to English surgery, since the time of its profound lawgiver, John Hunter: "We entertained no dread of the circulation being supported in the right arm; nay, we reduced it to a demonstration. On the dead subject, I tied the arteria innominata with two ligatures, and cut across the vessel in the space between them, without hurting any of the surrounding vessels. Afterwards, even coarse injection impelled into the aorta, passed freely by the anastomosing vessels into the arteries of the right arm, filling them and all the vessels of the head completely." The fluid passed (as the blood would, under similar circumstances, pass in the living subject) from the carotid of the left side to that of the right, through the mesial inosculations of the thyroid, lingual, facial, temporal, occipital, and (not least) cerebral arteries: from the left subclavian, in like manner, chiefly through the thyroid and vertebral branches; and thus a regurgitant stream would flow into the main vessels, up to the very site of ligature. Partly through the continued trunk of the tied vessel, so reinforced by its fellow, and partly by secondary communications (as of the occipital with the cervicalis profunda, of the facial with the internal maxillary, of the pharyngeal and palatine arteries) the blood is distributed in its legitimate destination. If the subclavian alone be obliterated at its commencement, the inferior thyroid and vertebral (communicating with their fellows, but still more largely with the carotid of the same side) helped by the muscular branches of the occipital, will convey the derived current. If the ligature have been applied beyond the scaleni, the transverse branches of the thyroid axis, by their free inosculations with the articular branches of the axillary, and with its subsca-

* Op. cit. p. 62 et seq.

† Hodgson, Diseases of Arteries, p. 90.

‡ Vide Cyclopædia of Surgery, vol. i. p. 237.

* An interesting case is given by Professor Pattison, in his Appendix to the edition of Burns, (on the Surgical Anatomy of the Head and Neck,) from which I have already quoted. A person who had suffered during six months with obscure pains about the lower region of the neck, which were attributed to rheumatism, died comatose. It was found on dissection that there arose from above the arteria innominata a large tumour, which projected forwards, adhering to the sternum, which its pressure had rendered carious; and that "the transverse vein, formed by the union of the left subclavian and jugular veins, presented a very uncommon appearance. It had more the character of a ligamentous cord than of a distended vessel; and when opened, it was found filled with coagulable lymph, which completely obliterated its cavity. On being traced downwards towards the right auricle, the vein was seen to terminate at the sternal aspect of the aneurismal tumour, that portion of it which crossed the tumour having from pressure become obliterated."

pular branch, abundantly restore the circulation. Should the carotid have been tied, its mesial communications, already mentioned, especially those within the skull, and about the thyroid gland,—assisted at those places and elsewhere by anastomoses with the subclavian,—adequately fulfil their vicarious duty. So abundant are these various communications, that the ligature of a main trunk, in the dead subject, in no degree interferes with the distension of its branches by fine injection: if we inject water, or any equally fluid material, through one carotid artery, it freely returns by the other. Under these circumstances, it excites our surprise that the cure of aneurism by ligature should be so certain; for the amount of circulation through the affected vessel can at first be little affected, and the arrest and ultimate cure of the disease must be referred rather to the withdrawal of a distensive impulse than to any considerable derivation of current. It seems to have been considered, in operating for aneurism, that, so long as no large branch arose from the vessel closely on the cardiac side of the ligature, it mattered not what branches might arise on its distal side,—how large, or how near. In many instances secondary hæmorrhage, inducing death, has manifestly depended on defective adhesion at the distal side of the ligature, and for an obvious reason. The condition of that part of the artery has been neglected: it has been thought unimportant though a large vessel should arise just beyond the ligature; or, if a great length of artery have been injudiciously denuded, the cardiac portion has had an exclusive preference of security given to it, by the ligature being drawn as high as possible in that direction. If an equal attention were bestowed on both sides of the proposed seat of ligature,—if like care were taken, in both directions, to avoid the likelihood of disturbance to the adhesive process by side currents,—if, where the artery has been much denuded, (instead of a single thread being applied at the cardiac extremity of that isolated portion, by which plan the succeeding part of the tube,—though separated from its connexions, and likely to ulcerate or slough,—is yet left open to the stream of recurrent blood,) a second ligature were placed at the distal limit of the endangered part, there would seem no greater reason to anticipate the occurrence of secondary hæmorrhage than when arteries are tied after an amputation.

3. *Anomalous arrangement* of the cervical vessels is a contingency which the surgeon must bear in mind. Most of these are comprehended in the abnormalities of the arch already described. (See Aorta.) The existence of a median inferior thyroid artery, derived from the arch, or from the arteria innominata;—the irregular passage of the right subclavian artery from the left side, behind the œsophagus, or between that tube and the trachea;—an early division of the carotid, even to nearly the level of the sternum, or so late a one, that the common trunk furnishes many, or most, of the branches normally originating from the external;—the absence of an arteria innominata, its branches arising separately from the arch, or in irregular combination with those of the left side; the occasional origin of the vertebral from the common carotid,* are the deviations which it most behoves the practitioner to remember.

4. Certain *veins* in the neck have an anatomical disposition, rendering them liable, when opened in surgical operations, to become channels for inspiration of air to the cavities of the heart, the fatal tendency of which is well known. The internal jugular, innominatæ, and subclavian veins are, as M. Bérard notices, "at the root of the neck, so firmly united by fascial laminæ and cords to the adjacent bones and muscles, that they do not collapse on division, but gape:" and it is obvious that this circumstance (but for which they would be flattened, and rendered impervious, by the atmospheric pressure on their outward surface) must expose them remarkably (perhaps alone) to a dangerous participation in the *inhaustive* movements of breathing. M. Velpeau (who has written a paper of excellent critical research on the subject†) recommends the following precautions in approaching veins of the nature described *(veines canalisées)*: studiously to avoid wounding them,—to detach no deeply fixed tumour from its adhesions, without having previously commanded the vessels at its base,—and to maintain no unnecessary tension on the fasciæ, by forced positions of the shoulder.

* A single instance has occurred to me in the dissecting-room, of an arrangement, which I believe to be very rare. An innominata (for so its origin and course entitled it to be named) divided at the sterno-clavicular joint into common carotid and *vertebral*: the right subclavian arose from the descending part of the arch, and directed itself to the scalene space by passing behind the œsophagus.

† Médecine Opératoire; and Lettre sur l'Introduction de l'Air dans les Veines. Paris, 1838.

THE END.

Marchant, Singer, and Smith, Printers, Ingram-Court, Fenchurch-Street.