

A most conservative estimate of the number of wounded in naval actions of the future is thirty-three per cent; in the action between the *Bonne-Homme Richard* and the *Serapis* it reached fifty per cent. on each side.

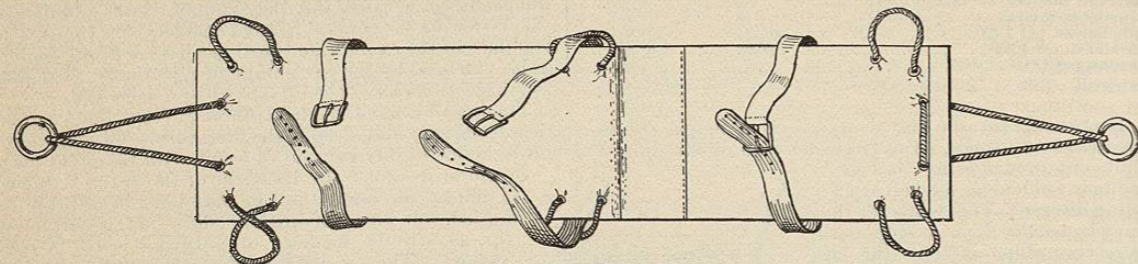


FIG. 3512.—Mahan's Stretcher.

Long before thirty-three per cent. of a crew are placed *hors de combat*, no aid will be available from the guns.

The careful medical officer, before an action, will have studied this question as applying to his own ship. He will have established the stations for the wounded and the base of supplies. He will have indicated points of temporary shelter about the decks and will have distributed first-aid packages. In all probability there will be no systematic transport of the wounded during an action at sea. In the turrets, tops, and fire-rooms the wounded will be given emergent aid, and will be allowed to remain where they fall, or they will be pushed aside into temporary shelter.

For the dark, narrow, acute-angled passages hand portage is alone available; and this method will prevail in those heated contests in which time cannot be taken or aid secured to send all the wounded below.

During the late war with Spain the navy gained little experience in this respect, for the number of casualties on the American ships was insignificant, while on the vessels of the enemy the destruction of life was so great and the conditions were so frightful that no systematic relief could be attempted.

For the removal of the sick or injured from the hold or fire-room, or for sending them down from the tops, we can conceive of no better device than the Lowmoor jacket (Fig. 3510), which may be briefly described as follows:

This jacket is T-shaped, and adapts itself to men of different sizes. The arms of the T surround the body, and extend from the axillæ to the waist, fastening in front by three leather buckles and straps; the leg of the T, passing down behind the body and over the perineum, comes up and fastens in front by two straps and buckles. Two leather straps are stitched to the back of the jacket for its whole length, and their free ends are then brought high up above the shoulders (in the form of loops) and carried down to points where they can be fastened by buckles to the front of the jacket. The ends which extend beyond these first buckles are to be passed through two other buckles which are fastened to the ends of the two perineal straps (cut off at *a, a*, in Fig. 3510).

The transportation of the disabled along the deck, or between decks, from above below, can be accomplished by by several different stretchers. The writer devised a stretcher and slide for this purpose, which has been favor-

ably reported upon by a board of officers for use in the naval service (Fig. 3511). This stretcher consists of two poles seven feet eight inches in length, and a piece of canvas six feet two inches long, into the sleeves of which the

poles run. Two steel stretcher-bars, three-quarters of an inch in diameter, join the poles (at points where the canvas terminates), and passing through them are secured by nut and screw. Two canvas bands are fastened to the frame on either side so as to cross the chest of the occupant at the axillæ and fasten in front with hooks and lacing. When the patient is put upon the stretcher, his insteps take upon the lower bar, preventing his slipping downward. The slide to be used with this stretcher is made of ordinary boards, battened together, and may be placed in a hatchway, extending from the coaming to the deck below, over the ladder, or it can be used without the ladder. Upon this slide the stretcher is sent below.

The advantage of this stretcher is, that it does not involve suspension of the body; and it is immaterial whether or not a ladder is in place in a hatchway.

When not in use the bars are removed at one end, laid parallel with the poles, and the whole is neatly rolled. This form of stretcher is available for landing parties. Lieutenant-Commander Mahan has devised a stretcher which is described by Medical Director Gravatt, U. S. N., as follows (Fig. 3512): "This stretcher is

made of light pine boards, six feet five inches long, fourteen inches broad, and one and one-half inches thick, with a wooden batten several inches in height and thickness, firmly fastened across each end and a little below the middle. Three canvas bands, four inches broad, are made so as to buckle just across the chest at the armpits, over the abdomen, and across the leg. The middle batten takes under the buttock, and gives surprising support. A man so strapped can be put in any position, prone, upright, or at any angle. Near each end of the board, rope handles are made, by which it can easily be carried through narrow doors and up and down ladders. By means of a loop across the head-end it can be lowered through hatches or over the side."

The suspension of sick or wounded men on shipboard is a very unusual occurrence, and it will probably never be attempted in action. For bearers to carry a man down a ladder in a stretcher is a very awkward procedure; and a device like Mahan's, when sending below, will be most serviceable when used with a slide.

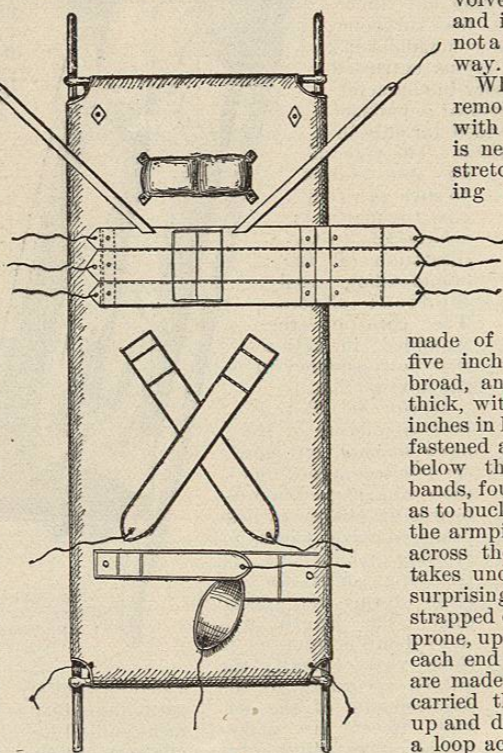


FIG. 3513.—Gihon's Stretcher.

Objections urged against this stretcher are, that it would be injurious in case of thigh fracture, and that it cannot be availed of for landing parties. Medical Inspector Gravatt, U. S. N., reports that he has used Mahan's device in cases of thigh fracture without detriment.

There are many other forms of stretcher available for the purpose under consideration. Wells' ambulance cot is in use in the United States naval service, but, as is true of other devices of this kind, men cannot be sent below upon it conveniently without the slide. This is an excellent form of stretcher for landing parties. "The improved cot" of Gorgas, or the "ambulance lift" of McDonald are seldom used. Gihon's "naval ambulance cot" is a secure and excellent device (Fig. 3513) and adapted to any ordinary need of transportation. Most of the stretchers devised for the old type of ship contemplate the suspension of the wounded, with hoisting or lowering; but, as hitherto remarked, this is a rare procedure. During an action at sea, if a hatchway is cleared, it will, as a rule, be used for militant purposes, and it is only where the ladder is taken away that suspension can be practised. If the ladder remain, one of the forms of stretcher already described, and with a slide, will be found the simplest and best procedure when hand-portage is not desirable.

For an improvised stretcher Lieutenant-Mason, U. S. N., suggested the use of a ship's hammock, which is stretched and laced to a wooden frame, made of poles and cross-bars.

John C. Wise.

NECK, SURGICAL ANATOMY OF THE.

By the neck we usually mean the space between the occipital bone and lower jaw, above, and the upper aperture of the thorax, below. For convenience of description it is advisable to divide the neck into regions, viz., two lateral, an anterior median, and a posterior.

The lateral region represents a quadrilateral which is divided diagonally by the great sterno-mastoid muscle into two triangles, the anterior (carotid) and the posterior. Each of these is again subdivided into two by the omohyoid muscle. The anterior triangle is subdivided into a superior and an inferior carotid triangle, and the posterior into an occipital and a subclavian triangle.

The anterior median region is divided into two spaces by the hyoid bone, the upper being called the suprahyoid or submaxillary, and the lower the infrahyoid or hyosternal region.

The submaxillary region is bounded posteriorly by the posterior belly of the digastric and stylohyoid muscles, and contains the submaxillary gland.

The posterior region includes the portion commonly known as the nape of the neck.

SURFACE ANATOMY.—The outline of the neck varies much in different people; in stout individuals it is round and full, and the various landmarks are not easily distinguished; in thin people, on the other hand, every landmark stands out prominently, and can be made out by even the most inexperienced. The neck is, as a rule, fuller and rounder in women and children, and the *pomum Adami* is less marked. In muscular males the prominences are well seen; in old people who are thin the sterno-mastoid muscles and superficial veins stand out well, as does also the internal border of the platysma myoides.

Bony Points.—The most important bony point, and one of those most easily felt, is the hyoid bone, which is in the median line, a finger's breadth above the thyroid cartilage. It is opposite the fourth cervical vertebra. The cricoid cartilage is opposite the sixth cervical. Below and in front of the mastoid process, and behind and above the angle of the lower jaw, the transverse process of the atlas can be felt. In the posterior region in the middle line is a depression formed by the complexus and trapezius muscles of each side; here can be indistinctly made out the third, fourth, fifth, and sixth cervical spines, while the seventh can be easily felt, and also the spines of the first two dorsal vertebrae. These become more prominent when the head is bent forward; occasionally, when the spine of the sixth cervical vertebra is well developed, it is quite as prominent as the seventh. The transverse process of the sixth cervical vertebra can be felt on deep pressure opposite the cricoid cartilage, in the course of the carotid vessels. This is called the "carotid tubercle," and here the carotid may be easily compressed against it.

Anterior or Median Region.—In the receding angle below the chin is the hyoid bone, which can be easily felt in the fattest necks, it divides the anterior part of the neck into the suprahyoid and infrahyoid regions. In the median line of the suprahyoid region the anterior bellies and the digastric muscles cause a slight convexity; on the outer side of each anterior belly of the digastric muscle is felt the submaxillary gland lying on the mylohyoid muscle, which helps to form the floor of the mouth. This region is commonly cut into in self-inflicted wounds of the throat. About half an inch below the hyoid bone is the prominent thyroid cartilage (*pomum Adami*). This cartilage is prominent in deep-voiced men and people with thin necks, but in women and children it is not so distinctly seen; the notch at its upper border can be easily felt, and is commonly situated to one side of the median line. The superior cornua of the thyroid cartilage can be traced with the finger.

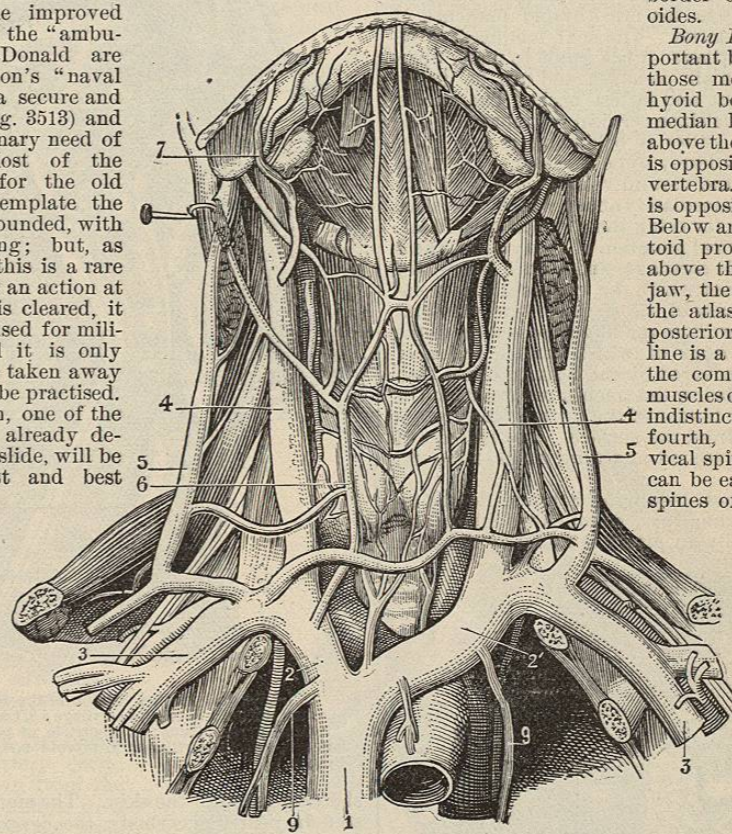


FIG. 3514.—Superior Vena Cava and Its Affluents. (From Testut.) 1, Superior vena cava; 2, trunk formed by the union of the brachial and cephalic veins on the right side; 2', the corresponding venous trunk on the left side; 3, 3, subclavian veins; 4, internal jugular vein; 5, external jugular vein; 6, anterior jugular vein; 7, facial vein; 8, thyroid veins; 9, internal mammary vein.

The space between the thyroid cartilage and the hyoid bone is called the thyrohyoid space, a membrane connecting these two structures; this membrane is covered by the muscles going to the hyoid bone from below, and is pierced by the superior laryngeal nerve and artery of each side. A cut made through the thyrohyoid space would sever the lower part of the epiglottis. The rima glottidis is opposite the middle of the thyroid cartilage. Below this cartilage the finger sinks into a slight depression, the cricothyroid space; this is the space in which the operation of laryngotomy is performed, the opening here being well below the vocal cords. Across this space ramify two small vessels, the cricothyroid branches of the superior thyroid arteries. The next landmark of interest is the cricoid cartilage; it is a guide to many operations on the neck and air passages, and can be distinguished in the youngest and fattest neck. The cricoid cartilage is opposite the sixth cervical vertebra, and the narrowest part of the gullet is behind it; at this point foreign bodies are most likely to be arrested. The omohyoid muscle crosses the carotid vessels on a line with the cricoid cartilage, immediately above which line is the point usually selected for tying the common carotid artery. The middle cervical ganglion of the sympathetic is also on a line with this cartilage, and a little below and outside of it is the point where the vertebral artery enters the transverse process of the sixth cervical vertebra. Below the cricoid cartilage the finger passes on to the trachea, the separate rings of which cannot be easily felt, because they are covered by the isthmus of the thyroid gland above, and below the trachea recedes from the surface. At the upper border of the sternum the trachea is one inch and a half from the surface. The isthmus of the thyroid crosses the second and third rings of the trachea.

In front of the trachea, below the isthmus, lie the inferior thyroid veins, which give so much trouble in tracheotomy. Occasionally an artery is found lying upon

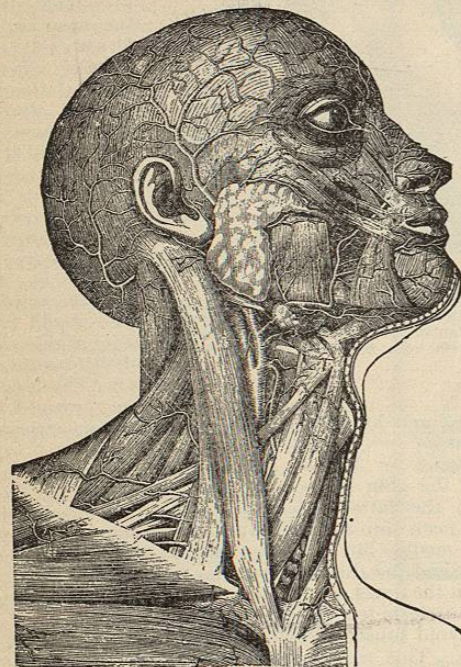


FIG. 3515.—Dissection of the Neck, showing the Triangles and their Contents. (Tiedemann.)

the trachea, on its way to the thyroid gland; it is called the thyroidea ima and generally arises from the innominate. The episternal notch is felt at the top of the sternum, and is opposite the second dorsal vertebra.

Lateral Region.—The sternomastoid muscle is the promi-

nent landmark in this region; in thin subjects, especially, it is well seen, and stands out distinctly when the face is turned to the opposite shoulder. The inner border, which covers the carotid artery, is more strongly marked than the posterior, which is thin, only the lower portion

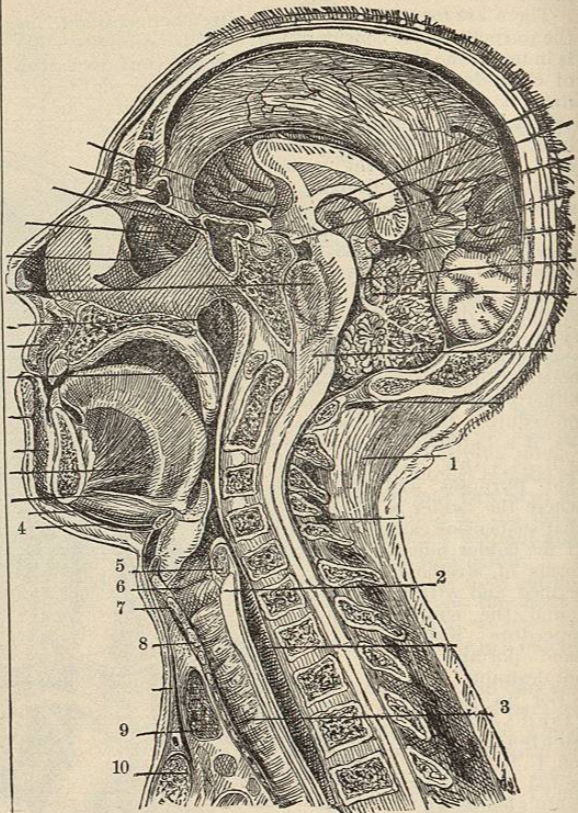


FIG. 3516.—Vertical Median Section of the Head and Neck. 1, Ligamentum nuchæ; 2, cricoid cartilage; 3, trachea; 4, hyoid bone; 5, musculus arytenoideus; 6, ventricle of larynx; 7, thyroid cartilage; 8, cricoid cartilage; 9, thyroid body; 10, sternum. (After Braune.)

showing through the skin. The sternal tendons are well seen in nearly everybody, the depression between them being named the suprasternal fossa. In some necks this fossa is absent, owing to the space being filled with fat. The space between the sternal and clavicular portions of the sternomastoid can usually be made out; in thin necks it is well marked. The internal jugular vein and carotid artery lie behind this space; deeper down still, we have the apex of the lung, which sometimes rises an inch and a half above the clavicle.

The sternoclavicular articulation is an important landmark; immediately behind it, on the left side, is the common carotid artery and the division of the innominate; on the right, it is opposite the point where the internal jugular joins the subclavian vein to form the innominate. The division of the innominate artery in children is higher up than the articulation; in some cases it divides in front of the trachea (see *Arteries, Anomalies of*).

The depression above the clavicle, between the trapezius and the clavicular origin of the sternomastoid, is called the supraclavicular fossa. In this fossa the external jugular vein terminates in the subclavian, after piercing the deep cervical fascia. Here also may be felt, in thin persons, the brachial plexus of nerves and the omohyoid muscle, and in the angle formed by the sternomastoid and clavicle the third part of the subclavian artery may be felt pulsating. At this point it can be compressed against the first rib. The central point of the greatest convexity of the clavicle is opposite the third portion of

the subclavian artery. This is a more certain landmark than the muscle, the extent of attachment of which to the clavicle varies considerably.

The posterior border of the sternomastoid corresponds pretty closely to the outer border of the scalenus anticus muscle; this point should be borne in mind in tying the subclavian artery.

Behind the sternomastoid the chain of lymphatic glands, when enlarged, can be easily felt.

The posterior belly of the digastric muscle corresponds to a line drawn from the mastoid process to the body of the hyoid bone. When the chin is extended a prominent fold of cervical fascia can be felt going from the angle of the lower jaw, downward and outward.

The position of the tonsil corresponds externally to the angle of the jaw.

VEINS (SURFACE MARKING OF).—The most important of these is the *external jugular*, which can always be seen. Its course is marked out by a line drawn from the angle of the jaw to the middle of the clavicle, at which point it pierces the deep cervical fascia to join the subclavian vein. It is occasionally joined by a vein which runs over the clavicle (see *Veins, Anomalies of*). By pressing above the clavicle, the vein is distended, and its course is easily traced.

The *anterior jugular vein* lies on the sternohyoid muscle and in front of the inner border of the sternomastoid. When the external jugular is small this vein attains considerable size.

The surface marking of the *internal jugular* corresponds to a line drawn immediately external to the line of the artery. The *facial vein* runs from the anterior border of the masseter muscle downward and backward, and joins the internal jugular opposite the upper border of the thyroid cartilage.

The *middle thyroid vein* crosses the carotid artery opposite the cricoid cartilage.

ARTERIES (SURFACE MARKING OF).—The *carotid artery* corresponds to a line drawn from the sternoclavicular articulation to a point midway between the mastoid process and the angle of the jaw. The *common carotid* reaches as high as the upper border of the thyroid cartilage. It can be compressed against the sixth cervical transverse process ("carotid tubercle"), which is opposite the cricoid cartilage. The *superior thyroid artery* comes off from the external carotid a little above the upper border of the thyroid cartilage. The *lingual artery* runs forward from the external carotid to the upper border of the great cornu of the hyoid bone, to which it is parallel. The hypoglossal nerve lies above the artery. The course of the *facial artery* in the neck corresponds to a line drawn from the tip of the great cornu of the hyoid bone to the outer border of the masseter muscle.

The *occipital arteries* can be felt pulsating immediately below and a little in front of the tip of the mastoid process.

NERVES (SURFACE MARKING OF).—The *spinal accessory* nerve passes beneath the anterior border of the sterno-

mastoid muscle an inch below the tip of the mastoid process, and emerges from the posterior border at a point on a level with the upper border of the thyroid cartilage; it then crosses the posterior triangle obliquely and enters the trapezius muscle on a level with the sixth or seventh cervical spines.

The *phrenic nerve* commences in the neck about the level of the hyoid bone, and runs obliquely downward over the scalenus anticus to its inner edge. In the neck the phrenic nerve is covered by the sternomastoid.

The *superficial cervical nerves* all emerge at a point corresponding to the middle of the posterior border of the sternomastoid. The *great auricular* crosses the sternomastoid on its way up to the ear; the *lesser occipital* runs along the posterior border of the sternomastoid; the *superficial cervical* crosses the sternomastoid at right angles and reaches the middle of the neck, and lines drawn from the point of emergence to the sternum, middle of the clavicle, and the acromion would mark the course of the *suprasternal*, *supraclavicular*, and *supra-acromial* nerves.

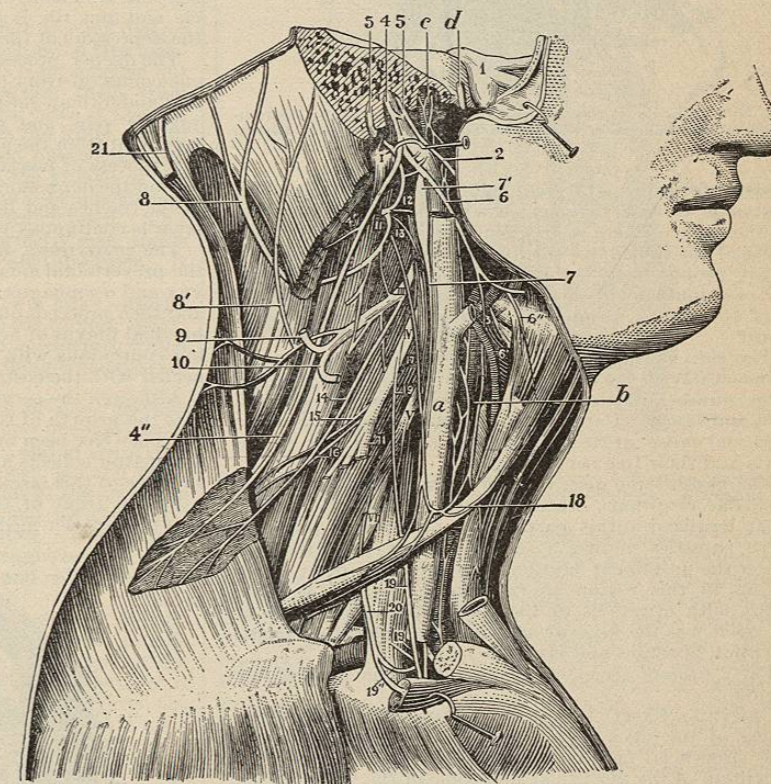


FIG. 3517.—Deep Cervical Plexus of Nerves. (From Testut.) I, II, . . . VIII, Anterior branches of the eight cervical nerves.—1, trigeminal nerve, with its three branches; 2, glossopharyngeal; 3, pneumogastric, with 3', its branch, the superior laryngeal; 4, spinal accessory, with its two branches—4', that which supplies the sterno-clavicular muscle, and 4'', that which goes to the trapezius; 5, facial nerve; 6, the main trunk of the hypoglossal, with its two branches—6', the descending ramus, and 6'', that which supplies the thyrohyoid muscle; 7, the great sympathetic, with 7', its superior cervical ganglion; 8, the larger mastoid branch of the cervical plexus; 8', the little mastoid branch; 9, the auricular branch; 10, the transverse cervical branch; 11, the subclavian and subacromial branches; 12, point of anastomosis with the great sympathetic; 13, nerve of the large anterior rectus muscle; 14, trapezian branch of the cervical plexus; 15, 18, bend of the hypoglossal, with its efferent branches that supply the subhyoid muscles; 19, phrenic nerve, with 19', its anastomosis with the great sympathetic, and 19'', its anastomosis with the nerve that supplies the subclavius muscle; 20, the nerve of the subclavius muscle; 21, great occipital nerve. a, Internal jugular vein; b, the common carotid artery; c, the internal carotid; d, the middle meningeal; e, the subclavian artery.

The cutaneous branches of the cervical plexus are widely distributed, supplying the ear, back of scalp, cheek, parotid gland, side and front of neck, and upper part of chest and shoulder.

The facial nerve sends a branch to the neck, which supplies the platysma myoides muscle.
TOPOGRAPHICAL ANATOMY.—The skin over the anterior and lateral regions of the neck is thin and lax, and in

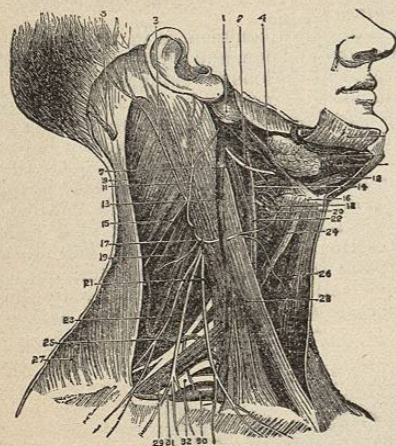


FIG. 3518.—Superficial Dissection of the Neck, showing the Distribution of the Branches of the Superficial Cervical Plexus of Nerves. (Heath.)

plastic operations is of great value in making flaps. The platysma is closely connected with the skin of this part of the neck. There is frequently some transverse wrinkling of the skin above the hyoid bone, and in this region in fat people there is much fat, giving rise to what is called a double chin; here also the sebaceous follicles are very abundant. In adult males this part is covered with beard.

The skin of the posterior region is very thick and adheres closely to the deeper structures; this is due to the large number of short fibrous connections between the skin and fascia. Carbuncles and boils frequently occur here and cause great pain, owing to the density of the parts and their free nerve supply.

The nape of the neck is often the seat of pustular and vesicular eruptions, which are due almost invariably, when localized in this part, to the presence of pediculi, these parasites finding a safe habitat in the thick hair under the prominent portion of the occipital bone. The glands in this region are frequently enlarged in sympathy with eruptions of the hairy scalp. The nape of the neck was the favorite site, in olden times, for the application of setons and issues.

Fatty tumors are often seen at the lower part of this region.

CERVICAL FASCIA.—It is the custom to divide the deep fascia of the neck into *superficial* and *deep* processes. The superficial fascia invests all the muscles, with the exception of the platysma; and some of the veins, as the external jugular, are also superficial to it. It is attached posteriorly to the spinous processes of the cervical vertebrae and ligamentum nuchae; passing forward it splits to enclose the trapezius and then crosses the posterior triangle; at the posterior border of the sternomastoid the fascia divides into two layers which enclose that muscle, these layers unite at the anterior border of the muscle, and the fascia passes on to the middle line of the neck, where it is continuous with that of the opposite side. It covers the anterior triangle, being attached above to the lower jaw. In the posterior triangle the fascia is attached below to the clavicle and above to the mastoid process and the superior curved line of the occipital bone; in this triangle it is pierced by the external jugular vein and some of the superficial cervical nerves. In the anterior triangle the fascia is attached above to the body of the lower jaw, and continues backward and upward over the parotid gland to be attached to the zygoma. It sends a process (the stylomaxillary ligament) be-

tween the parotid and the submaxillary glands. In front the fascia is attached to the hyoid bone and covers the thyroid gland, below which it splits into two layers; the deeper covers the sternohyoid and sternothyroid muscles, and is attached below to the posterior edge of the first piece of the sternum, behind the sternoclavicular joint; the superficial and thinner layer passes down over the sternomastoid muscles, and is attached to the anterior edge of the manubrium and interclavicular ligament. The space between these two layers is filled with cellular tissue and fat, and sometimes a small gland is found here. In this compartment are also found the sternal head of the sternomastoid and the anterior jugular vein. In tenotomy of the sternomastoid this space must be opened, and the vein is avoided by keeping the knife close to the tendon of the muscle.

This space is also cut through in performing the operation of tracheotomy, and air is sometimes driven at every inspiration into the cellular tissue beneath the deep layer, an occurrence which complicates the operation exceedingly. The process of fascia covering the posterior belly of the omohyoid and binding it down to the clavicle and first rib, is continuous with the fascia covering the depressors of the hyoid bone.

The deeper processes of cervical fascia are important; one comes off from the anterior border of the sternomastoid and forms a sheath which encloses the carotid artery, jugular vein, and pneumogastric nerve. The vein is separated from the artery by a thin septum of fascia.

A process of fascia also invests the thyroid body, passes behind the depressors of the hyoid bone, and lies in front of the trachea and deep vessels of the neck; below, this layer is continuous with the fibrous pericardium.

The *prevertebral* fascia is a layer which descends on the prevertebral muscles, separating them from the pharynx and cesophagus; laterally it joins the carotid sheath and then proceeds outward covering the scalene muscles, brachial plexus of nerves, and subclavian vessels, becoming continuous with the axillary sheath. It is also connected with the costocoracoid membrane.

Although the cervical fascia influences to a certain extent the growth of tumors and collections of matter, this influence has been much exaggerated, and tumors grow and matter collects and distributes itself often quite irrespective of this fascia.

Pus in front of the trachea would tend to gravitate into the anterior mediastinum and on the side of the neck

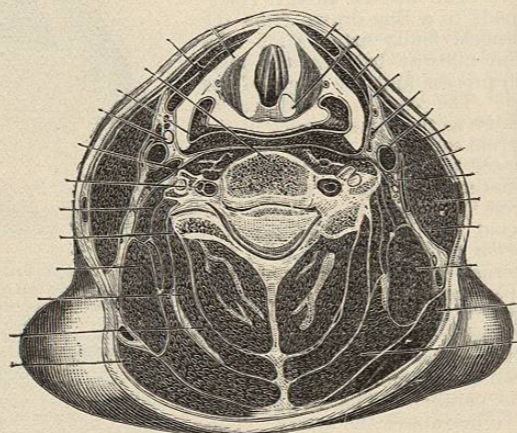


FIG. 3519.—Transverse Section of the Neck through the Fifth Cervical Vertebra, showing Cervical Fascia. (Braune.)

might perforate the apex of the pleural sac. An abscess in front of the vertebra would lie beneath the prevertebral fascia, and if it did not burst into the gullet, might extend laterally and present itself outside the sternomastoid, or descend to the posterior mediastinum. In some cases these collections of pus have been known, after reaching

the posterior triangle of the neck, to follow the course of the brachial plexus and present themselves in the axilla. Pus pent up between the layers of the cervical fascia has destroyed portions of not only the jugular vein, but also the carotid artery, and when the abscess cavity was opened the patient has died of hemorrhage from these vessels. Dr. S. W. Gross (*American Jour. of the Medical Sciences*, April, 1871) has collected twelve cases of ulceration of the jugular veins, with hemorrhage into the sacs of closed abscesses, or into abscesses several days after their contents have been evacuated, or into acute or chronic ulcers. The majority of cases were in children who had cellulitis of the neck following scarlet fever—all the cases proved fatal.

Dr. Erichsen (*St. Petersburg. med. Woch.*, December, 1877) reports a case of suppurative angina which broke off itself, and several days afterward a profuse and fatal hemorrhage occurred. The autopsy revealed ulceration of the internal carotid artery. In such cases the lesson to be learned is to prevent the destructive effects of diffuse cellulitis by early and free incision, and, if hemorrhage does occur, not to rely exclusively on packing, but to ligature the affected vessel.

In opening abscesses in the neck, there is some danger of wounding some of the great vessels if a too free incision be made with the knife, the vessels being pushed out of their normal position by the abscess; their exact course is difficult to determine. In such cases at first the skin only should be incised; after this the knife should be laid aside and a director should be pushed through the fascia; and when pus runs along the groove of the director, a pair of dressing forceps should be introduced, opened in the abscess cavity, and withdrawn open. This method has the advantage of being perfectly safe, and is especially adapted for opening deep-seated abscesses. It is known as Hilton's method.

ARTERIES OF THE NECK.—The two large arterial trunks which are seen in the neck are the *carotid*, which lies in the anterior triangle, and the *subclavian*, which lies in the lower part of the posterior triangle (subclavian triangle).

The *carotid* is included in a sheath of deep cervical fascia with the internal jugular vein and pneumogastric nerve. The vein lies to its outer side, and in the living subject overlaps the artery at the lower end and especially on the left side. To the inner side of the artery lie the trachea and cesophagus, larynx, and pharynx, and low down the recurrent laryngeal nerve. The thyroid gland also lies to its inner side. The vagus nerve lies to the outer side and posteriorly above, and rather more in front below.

Lying on or in the sheath of the vessels is the descendens noni nerve. The great sternomastoid muscle covers not only the common, but also the internal and external carotid arteries. In the undissected subject it is impossible to puncture the common carotid from the side of the neck without piercing the sternomastoid muscle (Riche). This fact is not sufficiently dwelt on in anatomical works, the descriptions given being applicable to dissected subjects only. The omohyoid muscle crosses the artery and vein obliquely and on a line with the cricoid cartilage. The most important structures behind the artery are the sympathetic trunk, the inferior thyroid artery, and the recurrent laryngeal nerve. The common carotid normally gives off no branches in its course. It divides into external and internal carotid opposite the upper border of the thyroid cartilage. The right and left common carotid arteries are so similar in their course in the neck that one description will answer for both. The left, however, it is well to bear in mind, arises from the arch of the aorta, and is somewhat longer than the right, which arises from the innominate opposite the right sternoclavicular articulation. The right common carotid is generally larger and not so deeply placed in the neck as the left; it is also farther away from the trachea.

As the vessels ascend the neck they become more superficial, and, having a direction somewhat backward, get

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farther apart as they reach their termination. The surface-marking of the carotid has already been described.

The artery may be easily compressed against the transverse process of the sixth cervical vertebra.

Ligature of the Common Carotid.—A ligature may be applied to any part of the artery, except near its origin or termination. The usual point of ligature is either im-

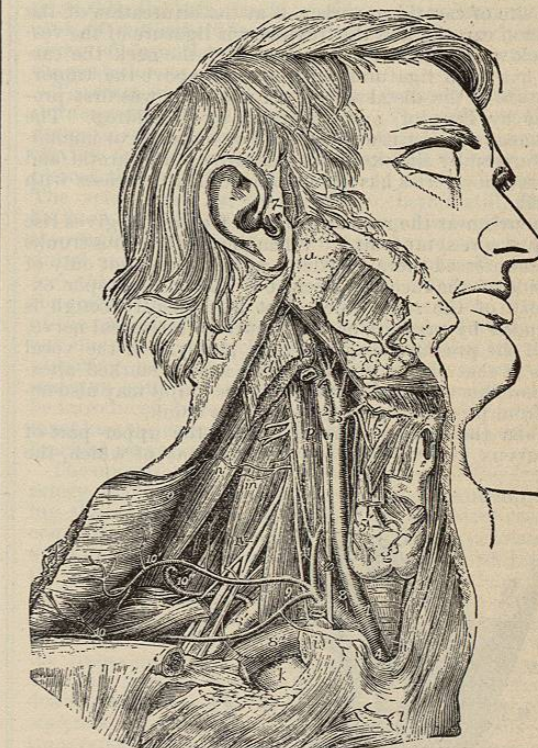


FIG. 3520.—View of the Common Carotid and Subclavian Arteries, with the Origin of their Branches and their Relations. (R. Quain.)

mediately above or below the omohyoid muscle. It is usually ligatured above the omohyoid; as here the artery is more superficial, and the operation is, in consequence, easier. An incision should be made along the inner border of the sternomastoid muscle, and the parts carefully divided until the sheath of the vessels is reached. The operation is much facilitated by drawing the sternomastoid outward and (if the superior operation be chosen) pulling inward the omohyoid. Should any veins or small branches of the superior thyroid artery come in the way, they should be divided between two ligatures. The sheath of the vessels should be opened on its inner side, so as to avoid the jugular vein, and the descendens noni nerve should be held aside to avoid injury. The aneurism needle with the ligature should be passed from without inward; in this way the vein and vagus nerve are most easily avoided.

The lower operation is the more difficult one, for, to expose the sheath of the vessels it is often necessary to divide some fibres of the muscles covering it. Again, the vein, if large, overlaps the artery; this renders the passing of the aneurism needle a proceeding of some difficulty. On the left side the internal jugular vein is much closer to the artery than on the right, and so the difficulty of passing a ligature around the artery is much increased. Ligature of the carotid is performed for wounds of the vessel or some of its branches, also for aneurism. It has been ligatured for pulsating orbital tumor. Mr. W. Rivington (*British Medical Journal*, October, 1885) records an interesting case of a boy, aged nine years, who swallowed a fish bone; this was followed

by pyrexia, stiff neck, salivation, and a tender lump on the left side of the neck opposite the cricoid cartilage. Three days later, the boy had two severe attacks of hemorrhage from the mouth. Wound of the carotid was diagnosed, and the artery cut down upon and ligatured. The fish bone was found in the centre of a clot, and it had ulcerated into the artery. The patient died of abscess of the brain ten days after the operation. A common site of carotid aneurism is at the bifurcation of the common carotid, and the treatment is ligature of the vessel below. In aneurism at the root of the neck the carotid has been ligatured with success above the tumor. Ligature at the distal side of an aneurism was first proposed by Brasdor, and practised by Wardrop. The treatment of aneurism of the arch of the aorta or innominate artery by simultaneous ligature of the carotid and subclavian arteries has been attended in a few cases with benefit.

Aneurism at the root of the neck frequently gives rise to "pressure symptoms." When the great venous trunks are compressed there is oedema and lividity, not only of the side of the face and neck, but also of the upper extremity of the same side. Not infrequently cough is produced by pressure on the recurrent laryngeal nerve, and if the pressure be great, then paralysis of the vocal cords of that side will ensue and cause a marked alteration of the voice. Dilatation of the pupil may also occur from pressure on the sympathetic trunk.

When the common carotid reaches the upper part of the larynx, it divides into two trunks, one of which, the

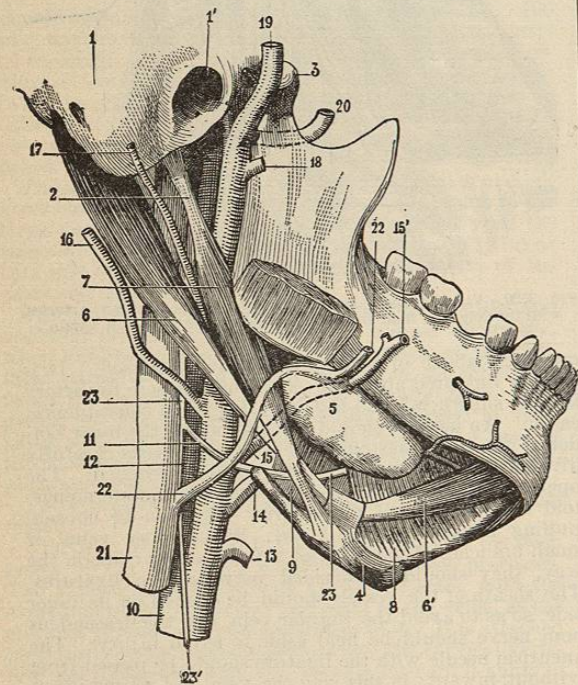


FIG. 3521.—Relations of the Two Carotids to the Styloid and Digastric Muscles. (From Testut.) 1, Mastoid process; 1', orifice of the external auditory canal; 2, styloid process; 3, condyle of the inferior maxilla; 4, hyoid bone; 5, submaxillary gland; 6, 6', the anterior and posterior bellies of the digastric muscle; 7, stylohyoid muscle; 8, mylohyoid muscle; 9, hyoglossus muscle; 10, common carotid; 11, internal carotid; 12, external carotid; 13, superior thyroid artery; 14, lingual artery; 15, 15', facial artery; 16, occipital artery; 17, posterior auricular artery; 18, transverse artery of the face; 19, superficial temporal artery; 20, internal maxillary artery; 21, internal jugular vein; 22, facial vein; 23, great hypoglossal nerve, with, 23', its descending branch.

external, gives off a number of branches, and is distributed to the superficial parts of the head and face and the tongue; the other, the internal, furnishes blood to the brain and eye. As a rule, the internal carotid has the

deeper course, and lies behind the external, but not infrequently the two arteries lie side by side for some distance, the internal lying more posteriorly, and being recognized by the accompanying pneumogastric nerve. The two vessels are separated by the styloid process and stylohyoid ligament, also the styloglossus and stylopharyngeus muscles and glossopharyngeal nerve. The external trunk has two muscles and a nerve in relation to it anteriorly, viz., the digastric and stylohyoid muscles, and the hypoglossal nerve which hooks round one of its branches, the occipital. After passing behind the angle of the lower jaw the external carotid becomes embedded in the parotid gland.

Ligature of the external carotid is not a very easy operation owing to the number of branches given off from it, and the large venous trunks which lie over the lower portion may much increase the difficulties. The artery is reached by an incision in the line of the vessel, having its midpoint about the level of the hyoid bone. It is usually ligatured immediately below the digastric. It occasionally requires ligature in the course of operations for the removal of tumors about the angle of the jaw and neck.

Branches of External Carotid.—The most important branches in the neck are the superior thyroid, lingual, and the cervical portion of the occipital and facial.

The superior thyroid arises near the origin of the main vessel and curves downward, forward, and inward, beneath the depressors of the hyoid bone. It is distributed to the upper part of the thyroid gland, and can be readily exposed by an incision between the omohyoid and sternomastoid muscles. It sends a branch along the cricothyroid membrane which is sometimes wounded in the operation of laryngotomy. The superior thyroid artery has lately been tied with success for the purpose of arresting the growth of an enlarging thyroid body.

The lingual artery arises from the external carotid nearly opposite the great cornu of the hyoid bone (it may however, arise in common with the superior thyroid and cross the hyoid bone). It runs above and parallel to the great cornu and beneath the hyoglossus muscle. It is frequently necessary to ligature the lingual previous to extirpation of the tongue.

In ligaturing this vessel the one guide which the operator must rely on is the great cornu of the hyoid bone—it can always be felt and its relation to the artery is nearly always constant. The best place to expose the artery is immediately above the great cornu. Some authorities advise ligature of the artery near its origin from the carotid; but here, owing to the large veins which cover it, the operation is more difficult, and besides we have no absolute guide as to the exact point of origin of the artery, which frequently varies. On the other hand, the relation of the vessel to the great cornu of the hyoid bone is nearly always constant. The incision should be a curved one, and should extend from near the symphysis menti to near the angle of the lower jaw. The convexity of the curve should be downward, and its lowest point ought to reach the hyoid bone. After dividing the skin, platysma, and deep fascia, the tendon of the digastric muscle should be searched for, and in the angle which the tendon forms with the hyoid bone the artery will be found running beneath the hyoglossus muscle; the hypoglossal nerve is seen running over this muscle. If the submaxillary gland cover the parts, it should be held aside with hooks. After carefully dividing the hyoglossus muscle the artery will be felt pulsating at the bottom of the wound. If the incision be carried too far back the facial vein may be wounded.

When it is necessary to remove the submaxillary gland the facial artery must be ligatured. The operation presents no difficulties and requires no special description.

The subclavian artery is, surgically, a very important vessel. The left subclavian lies deeper than the right and arises directly from the arch of the aorta, while the right is one of the terminal branches of the innominate and commences opposite the right sternoclavicular articulation. Each artery curves upward into the neck

under the anterior scalenus muscle, and then descends into the subclavian triangle under the clavicle and over the first rib. The subclavian vein lies in front and somewhat below the artery, from which it is separated by the anterior scalenus.

The artery is divided into three portions by the scalenus anticus muscle, viz., first, portion internal to the

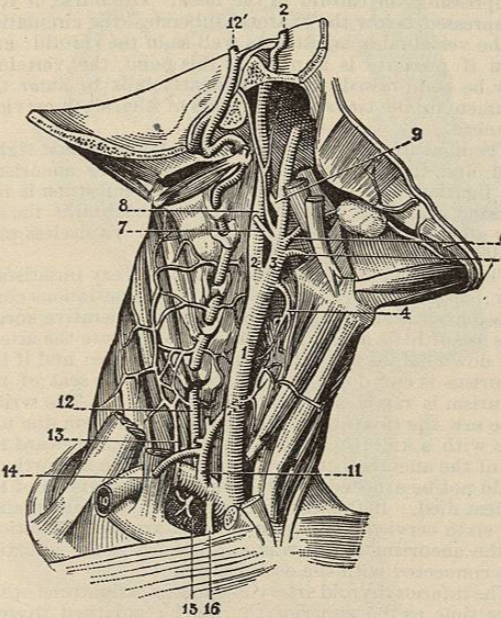


FIG. 3522.—Inferior Thyroid and Vertebral Arteries. (From Testut.) 1, Common carotid artery; 2, internal carotid artery; 3, external carotid artery and its branches; 4, superior thyroid artery; 5, lingual artery; 6, facial artery; 7, occipital artery; 8, inferior pharyngeal artery; 9, posterior auricular artery; 10, subclavian artery and its branches; 11, thyroid axis; 12, vertebral artery; 12', posterior cerebral artery; 13, deep cervical artery; 14, subscapular artery; 15, superior intercostal artery; 16, internal mammary artery.

muscle; second, portion beneath the muscle; and, third, portion external to the muscle reaching to the lower border of the first rib. Surgically, the third portion is most important. The external jugular vein crosses the artery, and the sternomastoid and the deep fascia which binds down the omohyoid muscle to the clavicle are in front of it; the brachial plexus of nerves lies above and to the outside of the third portion of the artery. Posteriorly the artery lies on the pleura and on the scalenus medius, and finally it rests on the first rib. The third portion of the artery can be felt pulsating above the clavicle, in the supraclavicular fossa, and here it may be readily compressed against the first rib with the thumb or the handle of an old-fashioned door-key wrapped in lint. The direction of the pressure should be vertical to the axis of the body; before attempting compression the shoulder should be lowered as much as possible. In compressing this vessel pain is sometimes caused by pressing on the lowest cord of the brachial plexus, which usually lies behind the artery; this may be easily avoided by rolling the nerve away from the artery, and then the proceeding is quite painless.

Some individuals (the writer among them) can arrest the pulse at the wrist by forcibly carrying the shoulder downward and backward. In this case the artery is compressed against the first rib by the subclavius muscle and clavicle.

Ligature of the subclavian is, as a rule, confined to the third portion, or that part lying in the supraclavicular space between the sternomastoid and trapezius muscles; the other portions are so deeply placed, so thickly studded with branches, and so closely connected with such important structures as the phrenic and vagus

nerves, the junction of the internal jugular and subclavian veins, and, on the left side, with the thoracic duct, that ligature is rarely attempted. On the right side it is possible to ligature the vessel between the common carotid and the internal jugular vein.

The third portion of the vessel is comparatively superficial, being covered above the clavicle by no other soft parts than the skin, fascia, and fat. In at least fifty per cent. of subjects it is branchless, and when a branch is given off from the third portion it is almost invariably the posterior scapular.

To reach the artery an incision is made between the sternomastoid and the trapezius. The skin should be drawn down and the first incision should be made upon the clavicle to avoid wounding the external jugular, which pierces the deep fascia immediately above the clavicle. The vein should be held aside, or, better still, divided between two ligatures, and the deep fascia attached to the clavicle cut through; the finger should then be introduced and the scalene tubercle of the first rib searched for; this tubercle is usually found by following down the scalenus anticus muscle, which runs in the direction of the posterior edge of the sternomastoid. Having made out the scalene tubercle, the surgeon will feel the artery pulsating beneath the finger immediately outside the scalenus anticus muscle. The aneurism needle should be introduced from below upward to avoid the vein; it must hug the artery closely so that the lowest cord of the brachial plexus may not be included.

The operation is performed for aneurism of the axillary artery, and also of the innominate; also before amputating the whole upper extremity. In the latter case the common carotid is also tied. In axillary aneurism the operation is much complicated by the great distention of the veins and the great elevation of the clavicle.

Branches of the Subclavian.—The subclavian is rich in branches which are distributed in three different directions, viz., the vertebral and inferior thyroid, upward; the transversus colli and transversus humeri, outward; and the internal mammary and superior intercostal, downward. Most of the branches arise internal to the scalenus anticus; three of them, the transversus colli, transversus humeri, and inferior thyroid arise from a single trunk, the thyroid axis. The posterior scapular is frequently given off from the third part of the artery in place of from the transversus colli. The branches of the subclavian artery are subject to innumerable variations both as to their number and origin (see *Arteries, Anomalies of*). When the subclavian is ligatured, there being free anastomosis between its branches and those of the axillary artery, the nutrition of the arm is not interfered with.

The vertebral artery, which is the largest branch of the subclavian, arises from the upper and posterior part of



FIG. 3523.—Showing Line of Incision and Parts Exposed in Ligature of the Third Part of the Subclavian Artery. (Modified from Roser.)

the first portion, and ascends to enter the transverse process of the sixth cervical vertebra; after piercing the transverse process of the axis it makes a remarkable