The penetration of mast cells and leucocytes and even of tumor cells into the muscle cells is one of the most interesting points mentioned in the study of these cases. Fujinami has figured a number of muscle cells containing a larger or smaller number of tumor cells and states that the tumor cells may be derived from the degenerating muscle cells. This idea is refuted by Schaeffer, although supported by Schroeder, Neumann, Bardeleben, and others. Schaeffer states that there may be a great similarity between the tumor tissue and the muscle tissue, which makes confusion possible, and that the tumor cells may penetrate the muscle fibres. The origin and etiology of these tumors in muscle, as in other tissues, are still obscure; but it seems more reasonable to regard the appearance of the tumor cells within the sarcolemma as a result of the passage of these cells through a broken sarcolemma, especially as they are accompanied in this position by leucocytes and mast cells, than to believe that the tumor cells are formed from the contractile substance of the muscle fibre by its degeneration.

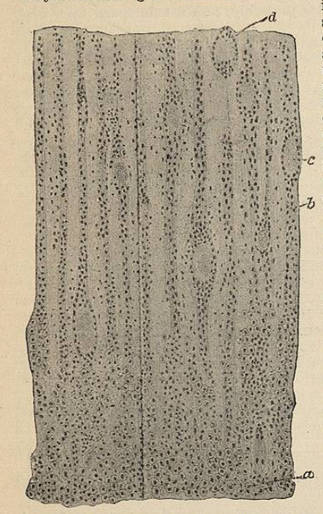

FIG. 3432.—Atrophied Muscle with Circumscribed Dilatations and Nuclear Proliferation in the Neighborhood of the Tumor Mass. (Fujinami.) *a*, Carcinoma cells; *b*, atrophic muscle; *c*, ampullar portion, beginning of giant cell formation; *d*, giant cells.

Lydia M. DeWitt.

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MUSCLES, ANOMALIES OF.—The muscular system of man is subject to many variations, all of which are interesting from a morphological point of view, and many are important surgically. Not only do muscles vary as to form and attachment, but supernumerary and rudimentary muscles are not infrequent. Again, some may be absent in a certain number of individuals, *e.g.*, the pyramidalis, palmaris longus, etc.

Many muscles are mere rudiments of those which exist in a well-developed condition in the lower animals, and there is, in fact, no muscular variation in man which has not a corresponding normal condition in some animal lower in the scale.

In the present article space forbids the giving of any extended account of muscular variations, for it is a subject on which volumes have been written. It is intended to describe only the commoner and more important anomalies, especially mentioning those whose relation to arteries renders them of surgical interest. The reader who wishes to obtain a fuller knowledge of the subject is referred to Wood, Turner, and others, in the *Journal of Anatomy and Physiology*; J. Wood, "Proceedings of the Royal Society," 1864–69; "Guy's Hospital Reports"; "St. Thomas' Hospital Reports"; Macalister's "Catalogue of Muscular Anomalies," in Trans. Royal Irish Academy, 1872; W. Gruber, in the *Mem. of Acad.*, St. Petersburg, and Virchow's *Archiv f. klin. Med.*; Henle, "Handbuch, Muskellehre"; Hallett, *Edin. Med. Jour.*, 1845; Krause, "Handbuch," 1880; Testut, "Les Anomalies Musculaires chez l'Homme," Paris, 1884; also various papers in the *Journal of Anatomy and Physiology*.

MUSCLES OF THE HEAD AND NECK.—*Occipito-Frontalis* varies much as to size and position. The *occipitalis* occasionally approaches the median line, and may be divided into several portions. Some of its fibres may be continuous with the posterior auricular muscle.

The *Frontalis* may send slips to the nasal and superior maxillary bones. Theile says that it generally sends a bundle of fibres to the external angular process of the frontal bone. Its fibres have been described as normally continuous with the levator labii superioris alæque nasi.

Auricular Muscles.—Very various as to their development. The retrahens is very often of large size, and its tendon frequently arises from the neighborhood of the external occipital protuberance; in such cases its belly is

very fleshy, and may be divided into two portions. It is sometimes connected with the transversus nuchæ. Cruveilhier has described a deep *musculus auricularis anticus*, which goes beneath the superior from the zygoma to the outer surface of the tragus. The anterior auricular muscle is often very much diminished in size, and its fibres may be very indistinct.

Muscles of the Nose.—Absence of the pyramidalis has been observed. The compressors and dilators are often so feebly developed as to be seen only with a magnifying glass.

The *Musculus Anomalus* (Albinus) is a slip described as being frequently present. Lying beneath the levator labii superioris alæque nasi, and arising with it from the nasal process of the superior maxillary bone, it is inserted into the same bone near the origin of the compressor naris.

Muscles of the Face.—Zygomaticus Major. Frequently double. The second head may arise in the neighborhood of the infra-orbital foramen or from the masseteric fascia below the zygoma. It is sometimes absent.

Zygomaticus Minor. Frequently absent. It may be inserted into the fascia of the cheek. It may be fused with the levator labii superioris proprius, zygomaticus major, or frontalis. It is not infrequently double; the second head may arise in common with the levator labii superioris proprius. Sometimes it arises from the orbicularis palpebrarum, and it may be inserted into the levator labii superioris proprius or levator labii superioris alæque nasi, or both.

Levator Labii Superioris Proprius occasionally sends a slip to the zygomaticus minor. The writer has twice seen this muscle arise by two heads, the extra head arising from the malar bone. In both these cases the zygomaticus minor was present.

Risorius (Santorini). Often absent. Santorini describes it as double, and even triple. It has been seen to arise from the zygoma, external ear, fascia over the mastoid process, and the skin over the upper portion of the sterno-mastoid.

Depressor Anguli Oris (triangularis menti). Santorini described a muscle, the *transversus menti*, which is sometimes found arising from the inner border of the depressor, and passing downward and inward across the mesial line below the chin to the corresponding part of the opposite side.

Muscles of the Orbit.—Levator Palpebræ. Sometimes absent or fused with the superior rectus. Budge describes the *tensor trochleæ*, which is a muscular slip given off from the levator to the trochlea.

The muscles of the eyeball are very constant. The two heads of the *rectus externus* have been seen separate to their insertion, forming a double muscle. Absence of the outer head has been noted by Macalister, and Curnow describes it as giving slips to the outer wall of the orbit and lower eyelid.

Transversus Orbitæ (Bochdalek). This is an arched slip of muscular fibres passing from the orbital plate of the ethmoid across the upper surface of the eyeball to the outer wall of the orbit (Quain). Macalister suggests that it is a deep, displaced slip of the palpebral fibres of the orbicularis.

Obliquus Inferior Accessorius is a slip going from the inferior rectus to the inferior oblique. The writer has seen a slip going from the inferior oblique to the superior rectus.

Muscles of Mastication.—Masseter. Monro has described a bursa as occasionally occurring between the two portions of this muscle, and Hyrtl has once seen a bursa between the masseter and the capsule of the inferior maxillary articulation.

Temporal. Henke says that sometimes the temporal muscle, and sometimes the deep portion of the masseter, is attached to the fore and back part of the interarticular fibro-cartilages of the lower jaw, or from the borders muscular fibres arise which are inserted into one or other of the afore-mentioned muscles. In many cases these fibres form a well-developed muscular belly, the *musculus temporalis minor*, which is inserted into the bottom of the sigmoid notch of the lower jaw (Henle). The writer has occasionally seen a deep slip from the temporal muscle attached to the pterygo-maxillary ligament. This slip is sometimes pierced by the internal maxillary artery.

Pterygoideus Externus. A considerable portion may be inserted into the capsule of the inferior maxillary articulation. When the pterygoideus proprius is present the upper head is of small size.

Pterygoideus Proprius. This is a muscle which is not infrequently seen arising from the infratemporal crest of the sphenoid and part of the great wing itself; it then passes over the external pterygoid to the lower part of the external pterygoid plate, or to the tuberosity of the palate and superior maxillary bones. It sometimes receives a slip from the upper head of the external pterygoid, and a portion of the upper head of the muscle may arise from it. The writer has occasionally seen the pterygoideus proprius inserted into the pterygo-maxillary ligament and alveolar process of the upper jaw (see Fig. 3433). In one case it sent a slip over the internal pterygoid to be inserted into the inferior maxilla near its angle. Externally this muscle is tendinous, and deep down, muscular; sometimes it is tendinous along the inner border only. When the pterygoideus proprius is present, the upper head of the external pterygoid is generally much diminished.

Pterygospinosus (Thane). This name is given to a muscular slip occasionally seen springing from the spine of the sphenoid and inserted into the hinder margin of the outer pterygoid plate, between the external and internal pterygoid muscles; the parts are frequently connected by fibrous tissue, and sometimes by bone.

MUSCLES OF THE NECK.—*Platysma Myoides.* This muscle varies considerably in its development. It is sometimes well developed, thick and red, and at other times its fibres are pale, thin, and hardly to be seen. It has been reported absent by Macalister. The platysma may reach over the clavicle as far as the fourth rib. It sometimes fails to reach as far as the clavicle; in such cases it is reduced in extent at other parts as well. It may have an insertion into the thyroid cartilage or the sternum. When well developed it has been seen attached to the lower jaw above and to the clavicle below. The upper part of the platysma is occasionally joined by a slip from the mastoid process, or from the occipital bone. The two muscles not infrequently cross each other in the median line. The writer has seen the lower fibres continuous with some fibres of the musculus sternalis. Fasciculi in connection with this muscle have been traced to the axilla. The platysma is the principal representative in man of the skin muscle (*panniculus carnosus*) of the lower animals. In most mammals with loose skins these tegumentary muscles are well developed; *e.g.*, in the hedgehog, porcupine, porpoise, etc.

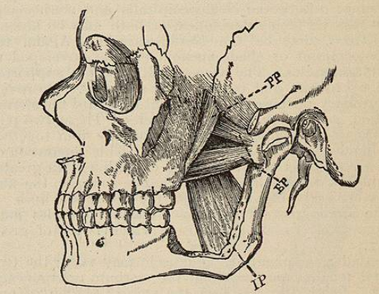

FIG. 3433.—*PP*, Pterygoideus proprius; *EP*, external, and *IP*, internal pterygoid muscle. (Shepherd.)

Occipitalis Minor. This is the name given to a bundle of muscular fibres arising from the fascia over the upper

end of the trapezius and ending in the fascia over the upper end of the sterno-mastoid. It is probably a modification of the slip which occasionally joins the platysma from the mastoid process or occipital bone.

Sternocleidomastoideus. This muscle is usually considered to be made up of two muscles, the sterno-mastoid

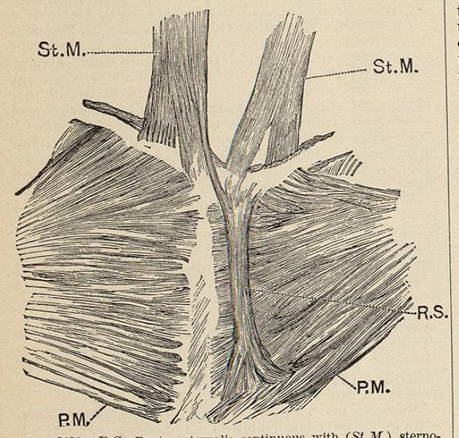

FIG. 3434.—*R.S.*, Rectus sternalis continuous with (*St.M.*) sterno-mastoid of the opposite side. (Shepherd.)

and cleido-mastoid. Krause, however, regards it as consisting of four muscles, viz.: (1) Sterno-mastoid, (2) sterno-occipital, (3) cleido-occipital, (4) cleido-mastoid. The spinal accessory nerve pierces the cleido-mastoid, or runs between the cleido-occipital and cleido-mastoid. Krause suggests the name *sternocleidomastoideooccipitalis*, or the *musculus quadrigeminus capitis*. He says that the ordinary varieties in man are readily explained by the isolation or absence of particular parts, or by the extension of the cleidooccipitalis to the occipital protuberance. Both the cleidooccipitalis and sternooccipitalis may be feebly developed, or both may be absent, as, indeed, may be the sterno-mastoid. Again, the cleido-occipital or cliedo-mastoid may be developed as separate muscles. The views of Krause are supported both by human and comparative anatomy. However, for ordinary purposes it is sufficient to regard the sterno-mastoid as consisting of two muscles. These two portions may be completely separate, or may join together at a much higher point than usual. This separation of the muscles into two is the normal condition in the greater number of mammals; *e.g.*, ruminants, solipeds, the majority of carnivora, and many of the anthropoid apes.

The sterno-mastoid and cleido-mastoid muscles may be completely fused—a condition which is not of great rarity.

Sternal attachment of the muscle may vary; the two sternal tendons may unite on the sternum or cross each other. The writer has seen the sternal tendon of one side continuous with a musculus sternalis of the opposite side (see Fig. 3434).

The sternal tendon may in rare cases be divided into two portions, inserted separately into the sternum. The sternal portion has been noted absent by Macalister. A sesamoid bone is sometimes seen in the tendon of the sterno-mastoid; this is looked upon as a rudiment of the episternal bone of monotremes and lizards.

The clavicular portion varies considerably as to the extent of its attachment to the clavicle; it not infrequently covers the space called the subclavian triangle, and this should be borne in mind when performing the operation of ligature of the subclavian artery in its third part. The writer once, when operating on the neck, found the clavicular portion absent. In animals without clavicles the cleido-mastoid forms part of the cephalo-humeral muscle, being continuous with the outer portion of the pectoralis major or deltoid.

Cleido-occipital (Cephalo-humeral of Flower). This is a muscle described by Wood and others as arising from the clavicle outside the cleido-mastoid and inserted into the superior curved line of the occipital bone close to the origin of the trapezius. It is usually separated by a distinct areolar interval from both the sternal and clavicular fibres of the sterno-cleido-mastoid (see Fig. 3435).

This muscle corresponds to the cleidooccipitalis of Krause. It exists as a separate muscle in the guinea-pig, hedgehog, etc. In apes and monkeys it is always present, but is in them continuous with the hinder border of the true sterno-cleido-mastoid. In many of the carnivora, as the dog and cat, it forms part of the cephalo-humeral muscle. Wood found this muscle thirty-seven times in one hundred and two subjects.

The sterno-mastoid has been described as sending slips to the angle of the lower jaw and hyoid bone (Gruber). The sterno-hyoid and omo-hyoid, and in rare cases the trapezius, may unite with the sterno-mastoid.

A tendinous intersection is sometimes seen near the lower end of the muscle; the same intersection is seen in the sterno-hyoid and sterno-thyroid muscles; it is probably the remains of one of the transverse septa of the primitive ventral muscle plate. These intersections are seen normally in the rectus abdominis.

Levator Claviculæ arises from the clavicle, and is inserted into the cervical vertebræ. A fuller description of this muscle will be given farther on, under Muscles of the Upper Limb.

Supraclavicularis is a small muscle behind the sterno-mastoid, which arises by a slender tendon from the first piece of the sternum, crosses above the sterno-clavicular articulation, and is inserted into the upper surface of the clavicle. When present on both sides the muscles may be continuous in the middle line.

Transversus Nuchæ. This is described by many anatomists as a normal muscle, which is always represented when absent by tendinous fibres. It arises from the external occipital protuberance, and is inserted into the aponeurosis of the sterno-mastoid (see Fig. 3436).

Sternohyoideus occasionally arises only from the clavicle. In such cases there is a wide interspace at the root of the neck devoid of muscle. The writer in one case saw, on both sides, the sterno-thyroid and sterno-hyoid arise altogether from the clavicle an inch outside the sterno-clavicular articulation. On removing the skin and fascia the trachea and thyroid gland immediately came into view.

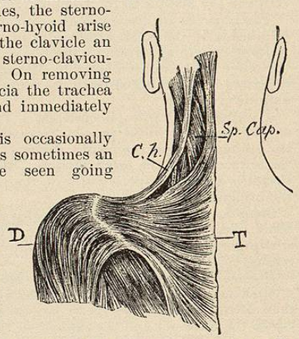

FIG. 3435.—*C.h.*, Cephalo-humeral muscle; *Sp. Cap.*, splenius capitis; *D*, deltoid; *T*, trapezius. (After Flower, from the dissection of a Bushwoman, *Jour. of Anat. and Phys.*, vol. i.)

This muscle is occasionally double. There is sometimes an accessory muscle seen going from the clavicle to the hyoid bone (cleido-hyoid). The sterno-hyoid has been described as occasionally arising from the sterno-clavicular ligament and first costal cartilage. It is sometimes fused with the muscle of the opposite side, as in the horse. The muscular fibres are not infrequently interrupted by a tendinous intersection, which is generally on a line with the tendon separating the two bellies of the omo-hyoid. This intersection is seen

normally in some animals, as the chimpanzee, horse, etc. The muscle has been noted as absent on one side. It may be united by slips with the omo-hyoid, mylo-hyoid, or sterno-thyroid. All the anomalies above mentioned have their corresponding normal condition in the lower animals.

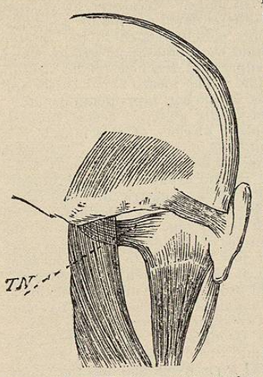

FIG. 3436.—*TN*, Transversus nuchæ. (After Henle.)

Sternothyroideus. Occasionally some of the fibres of this muscle continue on upward and are inserted into hyoid bone with the omo-hyoid, or are continuous with the hyo-glossus muscle. A few fibres may be continued into the thyro-hyoid or inferior constrictor of the pharynx. In one case the writer saw it, on both sides, arise, with the sterno-hyoid, entirely from the clavicle. Walsham reports a case ("St. Barth. Hosp. Rep.," 1880) in which the right sterno-thyroid arose from the left as well as the right side of the sternum and crossed the trachea. The left muscle was rudimentary. This muscle would be a source of embarrassment in performing tracheotomy.

In the gorilla and chimpanzee some fibres usually arise from the clavicle. The two sterno-thyroid muscles are often united at their origins across the middle line. Doubling of the muscle, as well as absence, has been observed. A tendinous intersection is sometimes seen opposite the tendon of the omo-hyoid. It may exist in both the sterno-hyoid and sterno-thyroid in the same line.

Costofascialis. Wood describes a slip arising with the sterno-thyroid from the hinder part of the first rib, which crosses the carotid vessels to be inserted into the cervical fascia as high as the thyroid cartilage.

Sternofascialis. This is a slip described by Gruber as arising from the first piece of the sternum behind the sterno-mastoid and passing upward to be inserted into the fascia of the subclavian triangle. It might be called the tensor fasciæ colli.

Thyrohyoideus. This muscle is often fused with the sterno-thyroid, and in such cases the sterno-thyroid is inserted into the hyoid bone. Absence of this muscle has been reported; this is generally due to a fusion of the sterno-thyroid and thyro-hyoid, so that they form one muscle, which is inserted into the hyoid bone. The muscle may be divided into two distinct slips.

Cricohyoid. Walsham first described this muscle as arising from the lower border of one side of the cricoid cartilage and inserted into the lower border of the hyoid bone. Gruber also mentions its occurrence.

Depressor Thyroideæ. A small muscle described by Bradley as arising from the first tracheal ring, passing over the cricoid cartilage and inserted into the lower border of the thyroid cartilage.

Omohyoideus. This muscle is frequently abnormal. In 250 subjects examined the writer found anomalies of the omo-hyoid in 39, or about 1 in 6. The muscle may be completely absent, and in rare cases it has been noted double. Again, one or other of its bellies may be wanting. When the anterior is absent, the posterior belly ends in the cervical fascia beneath the sterno-mastoid. In 250 subjects the writer has seen this arrangement twice. Sometimes the anterior belly arises from the clavicle and ascends the neck directly to its insertion into the hyoid bone without having any intermediate tendon or intersection. This has been regarded by some as absence of the posterior belly. The writer has only in one subject seen this anomaly; it occurred on both sides. This muscle has been called the *cleido-hyoid*. In some rare cases, however, the posterior belly is altogether absent, the anterior arising from the fascia covering the subclavian triangle (*hyofascialis*).

The posterior belly not infrequently arises from the clavicle solely. In 120 subjects examined, the writer has seen this arrangement 8 times (1 in 15). The posterior belly may be double, the supernumerary portion arising from the clavicle. The writer has seen this occur 9 times in 120 subjects. In these cases the origin from the clavicle is generally extensive, and is from the middle third of the posterior border for a distance of two and sometimes three inches. In rare cases it may arise from the sternal end. The posterior belly of the omo-hyoid may be so bound down by fascia to the clavicle that the subclavian triangle is obliterated. In ligaturing the subclavian, it would be well for surgeons to bear in mind this occasional arrangement. This condition is present more frequently when the posterior belly arises from the clavicle.

The omo-hyoid being originally fused with the sterno-hyoid, it would be natural to see the lower portion occasionally displaced and have its origin from any of the osseous points between the scapula and sternum, or to receive supernumerary heads from the various points.

The scapular head of the omo-hyoid, besides having an accession from the clavicle, may receive one from the coracoid process, the acromio-clavicular joint, the acromion process, and even the first rib.

The anterior belly of the omo-hyoid is occasionally double. The writer has seen this anomaly three times. In the first case the supernumerary belly was inserted into the superior cornu of the thyroid cartilage; in the second, into the great cornu of the hyoid; and in the third it blended with the sterno-hyoid.

The anterior belly not infrequently blends with the sterno-hyoid so as to form one broad muscle, which is occasionally bounded below by an arched tendon, as in the seal. This fusion is due to the non-differentiation of the primitive brachiocephalic sheet from which these two muscles are developed.

The writer has twice seen a portion of the omo-hyoid muscle pass over the hyoid bone and go up between the anterior bellies of the digastrics to be inserted into the lower jaw near the symphysis (see Fig. 3437).

The omo-hyoid may send slips to muscles in the neighborhood; *e.g.*, sterno-mastoid, sterno-hyoid, and the various muscles of the submaxillary region. A slip has been seen going from the posterior belly to the transverse process of the sixth cervical vertebra.

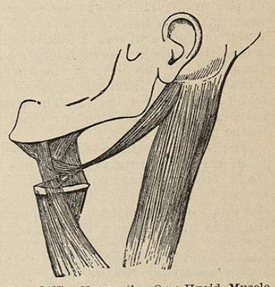

FIG. 3437.—Shows the Omo-Hyoid Muscle Continuing up Over the Hyoid Bone to be Inserted into the Inferior Maxilla; also, the Muscular Belly going from the Tendon of the Digastric to be Inserted into the Body of the Hyoid Bone. (Shepherd.)

The intermediate tendon of the omo-hyoid may be absent or represented by a tendinous intersection.

Comparative Anatomy. The omo-hyoid is completely wanting in many animals, as the cat, dog, peccary, mole, and also in rodents without clavicles. The anterior belly is absent in the orang-outang. The muscle arises from the clavicle in the scink and in some of the bats and the iguana. The intermediate tendon is absent in many mammals as the echidna, ornithorhynchus, the American black bear, and some of the quadrumana. In the seal

the anterior belly is fused with the sterno-hyoid and is bounded below by an arched tendon.

Levator Glandulæ Thyroideæ. This is a fibrous or muscular band which goes from the body of the hyoid bone to the isthmus or one of the lateral lobes of the thyroid gland. There may be two or three slips. The writer, in one subject, on both sides, saw this slip proceed from the oblique line of the thyroid cartilage and go to each lateral lobe of the gland. The levator thyroideæ is looked upon as an aberrant portion of the muscles between the sternum and hyoid bone (see Fig. 3438).

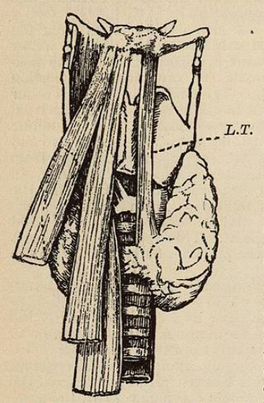

FIG. 3438.—*L.T.*, Levator thyroideæ, going from Hyoid Bone to Left Lateral Lobe of Thyroid Body. (Quain.)

Digastricus. The digastric muscle is subject to many variations. Occasionally its tendon fails to pierce the stylo-hyoid. The *anterior belly* is very often abnormal; not infrequently the two anterior bellies unite in the median line and completely shut out from view the mylo-hyoid muscles. The two bellies often decussate, as in the Norway rat and ruminants. It is not uncommon to find the anterior belly divided into two or more parts, one of which may cross the middle line of the neck and join the anterior belly of the opposite side. A slip from the anterior belly may join the mylo-hyoid, or decussate in the middle line with a similar slip from the opposite muscle. These slips may be looked upon as varieties of the mento-hyoid muscle, described below. In one subject the writer saw a well-marked muscular slip given off from the intermediate tendon and inserted into the body of the hyoid bone (see Fig. 3437). Also, in another subject there was complete absence of the anterior belly on the left side; the posterior belly ended in the deep cervical fascia attached between the hyoid bone and angle of the jaw. This might be regarded as a form of the monogastric muscle, which is well seen in the lower animals, as the carnivora. MacWinnie describes a case in which the muscle was monogastric and was inserted into the middle of the body of the lower jaw. In rare cases a muscular slip from the angle of the jaw joins the anterior or posterior belly. The writer once saw a well-marked tendinous slip going from the angle of the jaw to the posterior belly.

The *posterior belly* occasionally receives accessory slips from the styloid process. It has been seen arising entirely from the styloid process. It is sometimes connected by a muscular slip with one of the constrictors of the pharynx. Walsham describes a tendinous intersection, and in one case a distinct tendon, occurring in the posterior belly. The posterior belly has been seen to pass behind instead of in front of the carotid artery.

Occipito-hyoid. Perrin (*Jour. Anat. and Phys.*, vol. v.) first described this muscle as an additional digastric; he regarded it as homologous with the stylo-hyoid of birds. The muscle is double-bellied; its posterior belly arises from fascia covering the occipital bone, and its anterior belly is inserted into the hyoid bone beneath the hyoglossus. Humphry looks upon it as a superficial appendage to the stylo-hyoid and digastric muscles. There is a similar muscle in the seal.

Mento-hyoid (Macalister). This is the name given to a slip of muscle of variable size, and sometimes double, which is not infrequently seen passing, superficial to the mylo-hyoid, from the lower jaw near the symphysis to the body of the hyoid bone. Occasionally the muscle does not reach the hyoid bone, but ends in a fascia which covers the mylo-hyoid and is attached to the bone. It is sometimes triangular in shape. Macalister looks upon the mento-hyoid as a differentiated portion of platysma; but it is probably more closely related to the anterior belly of the digastric and the sterno-hyoid group, which are formed from the superficial brachiocephalic stratum of muscle (see Fig. 3439). The mento-hyoid exists normally in many animals, as the bat, hippopotamus, etc.

Stylohyoideus. Occasionally absent. Testut suggests that in cases of supposed absence of this muscle it is fused with the posterior belly of the digastric. A division of the muscle into three has been noticed. It may sometimes pass behind the carotid artery. It is occasionally inserted into the tendon of the digastric or lesser cornu of the hyoid bone. Its fibres may be continuous with the mylo-hyoid, thyro-hyoid, omo-hyoid, or, as in the ant-eater, with the muscles of the tongue. It sometimes arises from the lower jaw and goes to the hyoid bone (hyomaxillaris); again, it may not reach the hyoid bone, but go from the styloid process to the angle of the lower jaw, as in birds (stylomaxillaris). The writer has seen this muscle absent in two subjects, once on both sides.

Stylochondrohyoideus (Douglass); *Stylohyoideus alter* (Albinus). This is an additional muscle which occasionally replaces the normal stylo-hyoid and has the course of the stylo-hyoid ligament; in other words, it is the stylo-hyoid ligament become muscular. It is inserted into the lesser cornu of the hyoid bone and passes behind the carotid artery. In one case, noted by the writer, in which this muscle existed the normal muscle was represented by a thin tendinous slip. The normal stylo-hyoid and this muscle frequently are present together. The

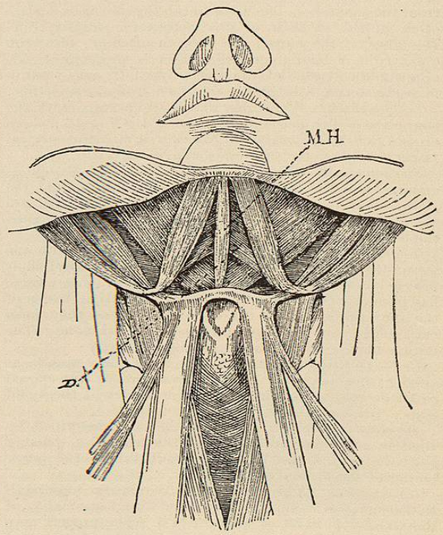

FIG. 3439.—Showing Mento-Hyoid Muscle (*MH*); also, the Anterior Bellies of the Digastric Muscles United in the Middle Line by Muscular Fibres (*D*). (Shepherd.)

stylohyoideus alter may receive a slip from the lower jaw. In one hundred and twenty subjects the writer has seen this muscle nine times; three times it occurred on both sides of the same subject.

Stylohyothyroideus. This is the name given by the

writer to a muscle seen by him in a female subject in the anatomical rooms of McGill University during the winter session 1885–86. On both sides of a thin female subject, in addition to the usual stylo-hyoid, a stylo-chondro-hyoid was present. On the left side this muscle gave off a slip to the middle constrictor of the pharynx. On the same side, arising in common with the stylo-chondro-hyoid, was another muscle of the same size, this had a well-developed belly, and passed down posterior but parallel to the above-mentioned muscle to a little above the hyoid bone; here it left its companion and developed a well-formed round tendon, which passed under the middle constrictor and was inserted into the tip of the superior cornu of the thyroid cartilage. The stylopharyngeus was of normal size and insertion.

Mylo-hyoid. The median raphe between the two muscles is sometimes absent. The mylo-hyoid is often closely united to the anterior belly of the digastric, and may be partially replaced by it. The sterno-hyoid, omo-hyoid, or stylo-hyoid may send slips to it. The muscle may be divided into two portions, an anterior and a posterior, separated by a considerable interval. This is the arrangement in some of the rodents. A deficiency of the fore part is of common occurrence, the origin not reaching farther than the canine tooth (Quain).

Geniohyoideus. The two muscles may be fused in the middle line. It occasionally receives a slip from the great cornu of the hyoid bone. It may be closely united with the geniohyoglossus or hyoglossus.

Geniohyoglossus. This muscle has been found united with the genio-hyoid. The two muscles may be fused together, no cellular interval separating them. Slips have been seen going from the geniohyoglossus to the epiglottis, stylo-hyoid ligament, and lesser cornu of the hyoid bone. An accessory muscle has been described by Henle, Luschka, and Bochdalek, going from the mental spine to the hyoid bone between the two geniohyoglossi muscles.

Hyoglossus. Sometimes pierced by the lingual artery. The middle portion of the muscle is occasionally absent, leaving a larger or smaller interval between the outer and inner portions, and exposing the lingual artery (see Fig. 3440). The lingual artery may lie on the muscle instead of beneath it.

Triticoglossus (Bochdalek). This is a small muscular slip which arises from a cartilaginous nodule in the thyro-hyoid ligament, and passes upward and outward to join the posterior part of the hyoglossus.

Chondroglossus. This has been described as a distinct muscle, occurring normally, separated from the hyoglossus by the pharyngeal fibres of the genioglossus. It arises from the base of the lesser cornu and, spreading out, is inserted into the dorsum of the tongue near the middle line.

Styloglossus. The styloglossus is occasionally absent. The writer once saw it absent on both sides of the same subject. There is sometimes an additional origin, from the angle of the lower jaw or the stylo-maxillary ligament. The whole muscle may arise from these points, the styloid origin being absent. When it arises from the angle of the jaw it is called the *myloglossus.* Gruber has described a rare origin of this muscle, from the external auditory meatus (*styloauricularis*). The muscle may be divided into two portions; one of which is inserted normally, the other into the pharynx (Sandifort). Macalister has reported this muscle as double. Henle has described a slip going from the styloglossus to the genioglossus near its origin.

Muscles of the Pharynx.—Constrictor Superior. The second portion may be distinct. Meckel describes an accessory slip, arising from the pharyngeal spine and becoming lost in the middle line of the posterior wall of the pharynx. The writer once, on both sides of the same subject, saw this muscle receive a slip from the Eustachian cartilage.

Constrictor Medius occasionally receives fibres from the stylo-hyoid ligament or hyoid bone; also from the tongue and hinder part of the mylo-hyoidean ridge. It is common to see a slip from the thyro-hyoid ligament (*syndesmopharyngeus*, Douglass). The upper fibres of the muscle may reach the occipital bone.

Constrictor Inferior. A few fibres of origin may come from the trachea. It is occasionally connected by muscular slips with the crico-thyroid, sterno-hyoid, or sterno-thyroid muscles.

Stylopharyngeus. Cleavage of this muscle into two or even three parts has been noted. Gruber has described a double-headed stylopharyngeus. The accessory head in his case arose from the mastoid process.

Supernumerary Muscles of the Pharynx are not infrequently present, proceeding from the lower part of the

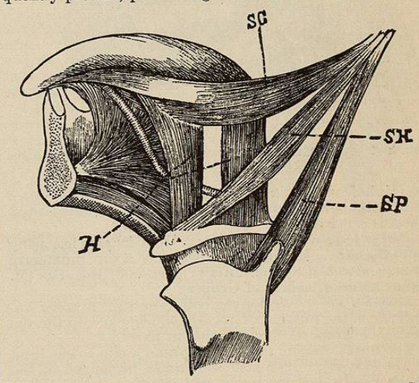

FIG. 3440.—*H*, Hyoglossus muscle deficient in its central portion; *SG*, styloglossus; *SH*, stylo-hyoid; *SP*, stylopharyngeus. (Walsham.)

base of the skull and going to one of the constrictors or passing between these muscles and the fibrous layer of the pharynx. They may arise from the petrous portion of the temporal (*petropharyngeus*), spine of the sphenoid (*sphenopharyngeus*), hamular process (*pterygopharyngeus*), basilar process (*occipitopharyngeus*), or from the pharyngeal tubercle of the occipital bone (*azygopharyngeus*).

PREVERTEBRAL MUSCLES.—*Scalenus Anticus.* Absence of the muscle has been reported by Macalister. In this case the subclavian vein was in direct contact with the artery. The attachment to the cervical vertebræ may vary in extent. The muscle may be divided into several distinct portions. It is sometimes pierced by the subclavian artery, and in rare cases lies behind the artery, or, more properly speaking, the artery passes in front of it.

Scalenus Medius and Posticus. These two muscles are so intimately united that French anatomists regard them as one muscle. They vary considerably as to the extent of their attachments to the transverse processes of the cervical vertebræ; frequently the slips from the upper cervical are absent. In rare cases the posterior scalenus may be attached as far down as the third and even the fourth rib, as in many of the lower animals. In some animals, as the bear, it reaches as far as the seventh and eighth ribs. In man it is not infrequently absent. The scalenus medius is perforated by branches of the brachial plexus and frequently by the posterior scapular artery.

Scalenus Minimus (Albinus). This is a small slip of muscle, normal in apes, which is seen in man occasionally. It passes from the transverse processes of the lower cervical vertebræ to the first rib, behind the subclavian artery, and in front of the brachial plexus.

Transversalis Cervicis Medius (Törnblom). Under this name a muscle has been described as arising from the transverse processes of the second, third, and fourth cervical vertebræ, and inserted into the sixth and seventh cervical transverse processes.

Rectus Capitis Anticus Major. Varies occasionally in the extent of its attachment to the cervical vertebræ. It is sometimes strengthened by a fasciculus from the transverse process of the axis, and has been noted as having

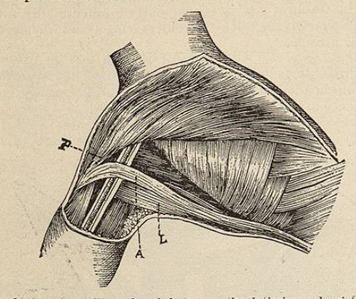

FIG. 3441.—*A*, Axillary band, between the latissimus dorsi (*L*) and the great pectoral (*P*).

no origin from the sixth cervical. It is frequently united with neighboring muscles, as the anterior scalenus, transversalis cervicis, etc.

Rectus Capitis Anticus Minor. Occasionally has a slip from the axis. Macalister has described a supernumerary muscle attached to the anterior portion of the atlas (M. rectus anterior medius of Gruber).

Longus Colli. The longus colli is subject to some variations in the number of its attachments and in the degree of separation of its constituent parts.

The lower oblique portion may send a slip to the head of the first rib. It is also sometimes prolonged to the rectus capitis anticus major, and has been seen sending a slip of insertion to the basilar portion of the occipital bone. A supernumerary longus colli (*M. transversalis cervicis anterior* Luschka) may arise by thin, tendinous slips from the anterior tubercles of the transverse processes of the lower four cervical vertebræ and be inserted by two tendons into the base of the transverse process of the atlas and the body of the axis (Henle).

MUSCLES OF THE UPPER LIMB.—*Trapezius* (Cucullaris). The attachments of this muscle are subject to considerable variation. The muscle may be much smaller than usual, and have no occipital origin or be attached to as few as six instead of twelve dorsal spines; it may be divided into a cervical and a dorsal portion. Again, its spinal attachments may be confined to the upper three or four dorsal, or lower three or four cervical spines, the other portions being absent. It is sometimes inserted into more of the clavicle than normal, being continuous with the insertion of the sterno-mastoid. Occasionally there is a slip passing forward across the subclavian triangle to reach the sterno-mastoid; this would be in front of the third pert of the subclavian artery, and interferes somewhat with the operation of ligature of that artery. Again, it may be continuous with the deltoid, as is the case in animals without clavicles. In rare cases the portion attached to the clavicle is absent or very small. This arrangement is seen in some of the lower animals. A slip has been described going from the anterior border of the muscle near the clavicle to the sternum; this is a variety of the sterno-scapular muscle. Not infrequently slips of attachment unite the trapezius to the levator anguli scapulæ.

Latissimus Dorsi. The number of dorsal vertebræ to which this muscle is attached may vary considerably. It may be attached to as many as nine, and as few as four. The writer has seen it attached to all the dorsal vertebræ. Its attachments to the ribs also vary, the number being sometimes increased, sometimes diminished. It is occasionally attached to the lower angle of the scapula; the writer has twice seen it send slips to the spine of the scapula.

Axillary Band (Achselbogen). This is a muscular band which crosses the lower part of the axilla from the latissimus dorsi to the great pectoral muscle near its insertion (see Fig. 3441).

It may, instead of uniting with the great pectoral, be inserted into the coracobrachialis or fascia covering the biceps. In its course it usually crosses the axillary vessels, and hence it is well to bear this in mind in ligaturing the axillary artery in its third part. It is sometimes of large size, being as broad as 6.2 cm., and so may cover a considerable extent of the axillary vessels. More frequently it is a small slip, from 1 to 3 cm. broad. It occurs in about five per cent. of all subjects, and is frequently on both sides of the same subject. The writer has seen it in eleven subjects out of two hundred and fifty noted. This muscular band exists normally in many animals, as deer, etc., and is the remains of the continuity which previously existed between the latissimus dorsi and the pectoralis major.

Dorsoepitrochlearis. This is a muscle which is occasionally seen in man in a rudimentary form, but in many of the lower animals, as apes, lemurs, seals, bears, etc., is a well-developed muscle, and is the normal arrangement. It is a muscular slip which is given off from the lower border of the tendon of the latissimus dorsi, and is attached to various points in the arm. It may end in the long head of the triceps, some portion of the internal intermuscular septum, the epitrochlear process of the internal condyle, or the olecranon process (see Fig. 3442). In man the muscle is occasionally represented merely by a fibrous band, sometimes by a small, muscular slip ending in a fibrous cord, which is inserted into the internal condyle, or is continuous with the internal intermuscular septum.

Rhomboideus Minor and Major. Both these muscles are subject to variation as to extent of origin and insertion. They may be divided into two fasciculi, as in some animals.

Rhombo-occipital (occipito-scapular of Wood). This is a slip not infrequently seen in man, and occurs normally in many of the lower animals, *e.g.*, the deer, cat, tiger, etc., as a well-developed muscle immediately beneath the trapezius, and reaching from the occiput to the base of the spine of the scapula. In man it generally exists in an incomplete form, and varies considerably as to its upper and lower attachments. Instead of reaching the scapula it may be connected with either of the rhomboid muscles, serratus posticus superior, or levator anguli scapulæ. Its superior attachment may not reach the occiput, but be connected with the spines of the upper cervical vertebræ. Again, in man, this muscle may be represented by a slip from the aponeurosis covering the splenius capitis to the spine of the scapula, or by a slip from the levator anguli scapulæ to one of the rhomboids. In one case recorded by the writer it consisted of a well-developed muscular slip reaching from the transverse process of the atlas to the aponeurosis over the greater rhomboid (*rhombo-atloid* of Macalister). The many varieties of this muscle in man have been carefully described by Prof. J. Wood (Proceed. Roy. Soc., 1870—see Fig. 3443).

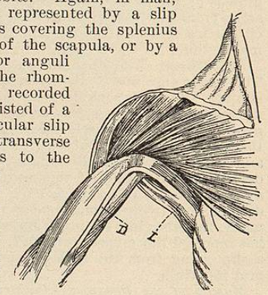

FIG. 3442.—*D*, Dorsoepitrochlearis muscle; *L*, latissimus dorsi. (Perrin.)

Levator Anguli Scapulæ. This muscle varies considerably in the extent of its attachments to the vertebræ and scapula. It is often seen attached to as many as six vertebræ and to as few as two. It has been seen arising from the mastoid process and occipital bone in addition to its spinal origin. It may have an attachment to the spine of the

scapula, and it sometimes sends slips of insertion to the first or second rib. Occasionally it is seen divided into two or more slips, the portions connected with the different vertebræ remaining separate. It is often connected with neighboring muscles by muscular slips. The writer has seen it thus connected with the serratus posticus superior, serratus magnus, deep surface of the trapezius, complexus, splenius capitis, rhomboideus minor, and scalenus posticus. These slips are regarded by Wood as varieties and modifications of the occipito-scapular muscle of the lower animals. In many of the lower animals the levator anguli scapulæ is merely the upper portion of the serratus magnus, forming with it a single muscle.

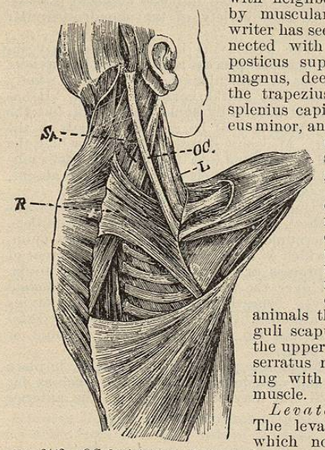

FIG. 3443.—*OC*, Occipito-scapular muscle; *L*, levator anguli scapulæ; *R*, rhomboid muscles; *Sp*, splenius. (Wood.)

Levator Claviculæ. The levator claviculæ, which normally exists in all mammals with the exception of man, is occasionally seen in him. It appears as a separate muscular slip arising from the transverse processes of one or two upper cervical vertebræ, and inserted into the outer end of the clavicle. Slips of muscle from the levator anguli scapulæ, or from the upper cervical spines, to the scalene muscles, serratus magnus, and ribs, are regarded as modifications of the levator claviculæ.

Cleidocervicalis (Gruber). This is a form of the above muscle arising from the transverse process of the sixth cervical and inserted into the outer end of the clavicle. Gruber looks upon it as a supernumerary scalene muscle attached to the clavicle.

Pectoralis Major. Many variations of this muscle have been observed. The more common varieties consist of a greater or less extent of attachment to ribs and sternum, and the separation of its clavicular from its costal attachment.

M. Testut divides the anomalies of this muscle into eight groups, viz.:

1. Fusion of the clavicular portion with the deltoid.
2. Fusion with the great pectoral of the opposite side.
3. Union with the rectus abdominis.
4. Union with the biceps brachii (see Fig. 3450).
5. Separation of the clavicular and sterno-costal portions by an interspace.
6. Division of the costo-sternal portion into two strata or layers.
7. Anomalies in the mode of insertion into the arm.
8. Complete or partial absence of the muscle.

Testut divides the anomalies of the brachial insertion into: (*a*) Insertion into the coracoid process and aponeurosis of the coracobrachialis. (*b*) Insertion into the capsule of the shoulder-joint. (*c*) Prolongation of the tendon of insertion into the capsule of the shoulder-joint. (*d*) Supernumerary insertion into the humerus. (*e*) Insertion into the brachial aponeurosis. (*f*) Insertion into the two lips of the bicipital groove.

Chondroepitrochlearis (Duvernoy). This is the name given by Duvernoy to a muscular slip which is sometimes seen arising from the cartilage of one or two ribs, the aponeurosis of the external abdominal oblique, the lower border of the great pectoral itself, or its tendon; from one of these origins it passes down and out, and is inserted in a variable way into the arm. It is often inserted into the internal intermuscular septum and occasionally reaches as far as the internal condyle of the humerus.

Mr. J. B. Perrin (*Jour. Anat. and Phys.*, vol. v.) has described under the name of epigastric slips a number of muscles connected with the lower border of the pectoralis major, or arising separately from the sixth or seventh rib and inserted into the tendon of the great pectoral, or into the fascia covering the coracobrachialis muscle (see Fig. 3444). They may also be connected with the latissimus dorsi. These muscles are developed to a high degree in many mammals, and are well seen in pigeons and fowls.

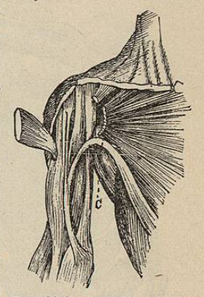

FIG. 3444.—Example of the Chondroepitrochlearis Muscle (*C*). (Perrin.)

Musculus sternalis. Syn.: Rectus sternalis, sternalis brutorum (Albinus), présternal (Testut). The musculus sternalis is a supernumerary muscle which has always excited a great deal of interest among anatomists; even yet its proper morphological significance is not fully determined. It is seen in about three or four per cent. of ordinary individuals, but in anencephalous monsters is nearly always present. Its fibres are generally at right angles, and superficial, to the great pectoral; it is often bilateral, but more frequently unilateral, and is subject to many variations. Frequently it has no attachment to bone but rests on the great pectoral, attached above and below to fascia (see Fig. 3445). It is often attached to the sternum and costal cartilages of one side or both, and is occasionally continuous above with the sternal origin of the sterno-mastoid, and below, with the external abdominal oblique (see Fig. 3433).

It usually arises from the first piece of the sternum, and is inserted into some of the ribs and costal cartilages, generally the fifth and sixth. It may be continuous in

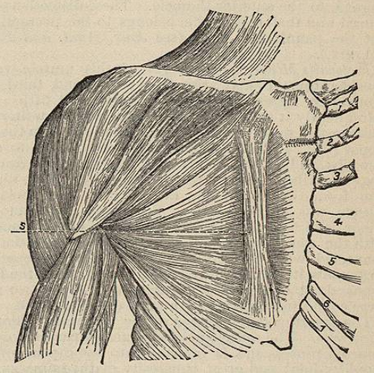

FIG. 3445.—S, Musculus sternalis, attached above and below to fascia. (Shepherd.)

part with the great pectoral itself and be associated with deficiency of that muscle. Sometimes it is of small size, but occasionally it is quite a large muscle, 8 to 10 cm. long, and 3 to 5 cm. broad. It has been recognized under the skin in the living. It derives its nerve supply from the same source as the pectoral muscles,