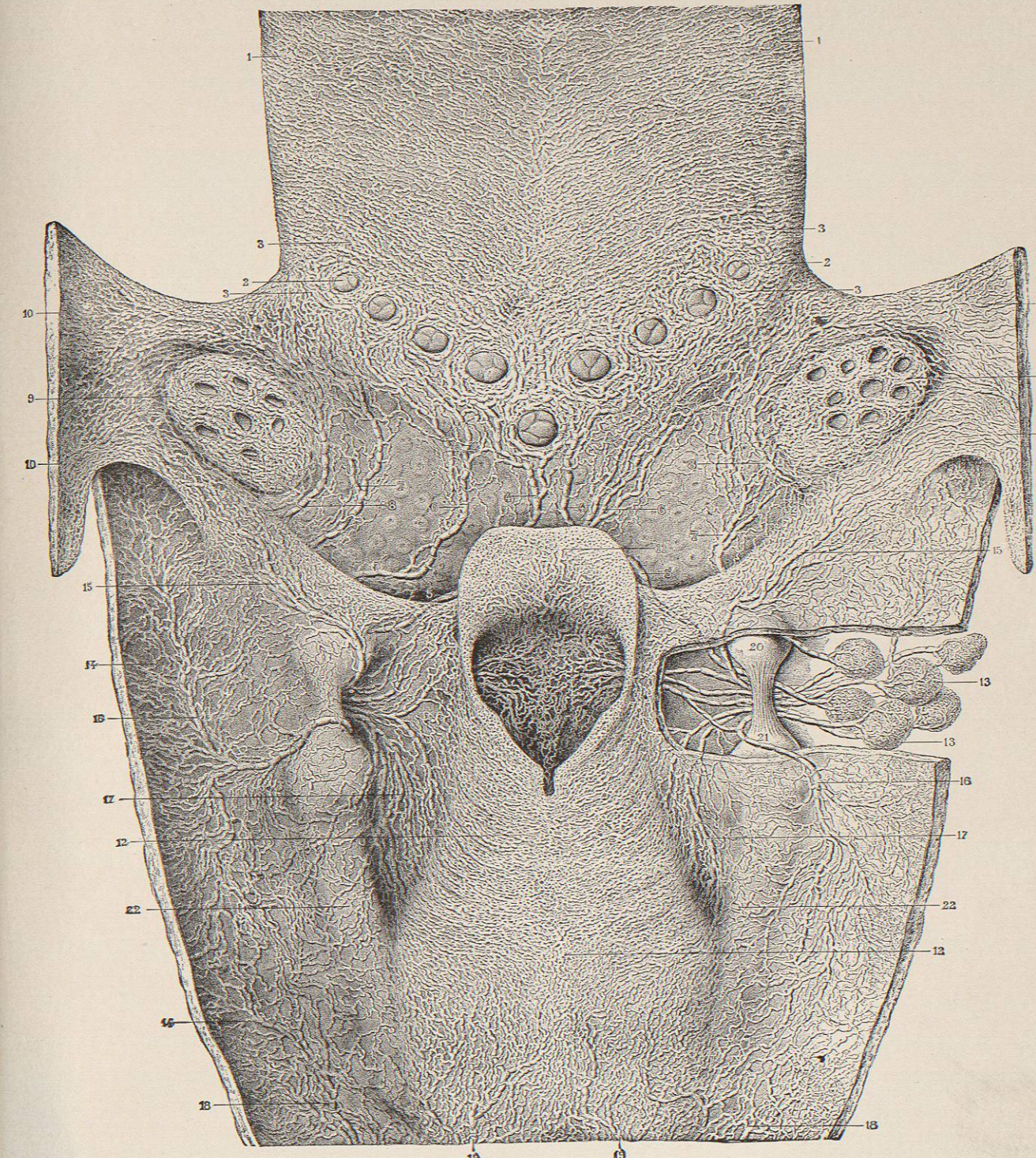


EXPLANATION OF PLATE XLII.

Which Represents the Base of the Tongue, the Tonsils, the Pharynx, and the Opening of the Larynx of Man. The Pharynx was Divided on the Dorsal Side, and the Walls were Reflected. (Sappey, "Atlas.")

1, 1, Lymphatic network on the dorsum of the tongue, the general direction of the vessels is obliquely toward the raphe (meson) and the base of the tongue; 2, 2, circumvallate papillæ in the form of a V; 3, 3, 3, vessels surrounding these papillæ and soon converging to form mesal and lateral trunks; 4, 4, lymphatic trunks extending along the meson from the middle circumvallate papilla; 5, 5, continuation of 4, one on each side of the middle glosso-glottic fold, and finally penetrating the lateral fold, they enter the lymphatic glands (13) of the ental cervical plexus near the lateral thyro-hyoid ligament; 6, 6, other trunks farther from the meson, taking the same course; 7, 7, lateral trunks from the base of the tongue, tonsil, etc.; they penetrate the pharyngeal mucosa and terminate in the same group of glands, but cross the dorsal instead of the ventral surface of the great cornu of the hyoid; 8, 8, trunks coming from the anterior pillars of the fauces, skirting the edge of the tonsils, and finally entering the cephalic, ental (superior deep) cervical lymphatic glands; 9, 9, the tonsils, covered by a dense network of lymphatics; 10, 10, 10, 10, the reflected sides of the arch of the palate (just below the "10" on each side is the divided uvula); 11, dense lymphatic network covering the epiglottis and extending upon the aryteno-epiglottic folds; 12, 12, a similar very dense and fine network of lymphatics upon the pharyngeal mucosa covering the larynx; 13, 13, several lymphatic glands belonging to the cephalic, ental (superior deep) cervical lymphatic glands, situated at the level of the thyro-hyoid ligament; as is evident from the plate, they receive the trunks from the base of the tongue, part of the palatine arch, the tonsils, the larynx, and a great part of the pharynx; 14, lymphatics arising from the ventral and lateral part of the pharynx; 15, 15, lymphatics from the posterior pillars of the fauces, they wind round the ventral edge of the great cornu of the hyoid and enter the deep cervical glands at 13, 13; 16, 16, lymphatics arising from the dorsal and lateral aspect of the pharynx and extending to the cervical glands at 13, 13; 17, 17, lymphatic trunks on each side of the larynx to the ental cervical glands at 13, 13; 18, 18, lymphatics from the dorsal and lateral wall of the pharynx next the œsophagus, they extend toward the thorax and enter the chain of ental cervical glands along the trachea and œsophagus; 19, 19, lymphatics from the ventral part of the pharynx, and extending to the chain of ental cervical glands in company with 18; 20, summit of the great cornu of the hyoid exposed by the removal of the pharyngeal wall; 21, end of the major horn of the thyroid, connected with the hyoid by the thyro-hyoid ligament; 22, 22, dorsal border of the thyroid cartilage showing through the pharyngeal wall.



BASE OF THE TONGUE, THE TONSILS, PHARYNX, AND OPENING OF THE LARYNX OF MAN
(SAPPEY, ATLAS)

lower jaw join the lymphatics of the cheek and extend to the submaxillary lymphatic glands. A part also join those of the pillars of the fauces.

The lymphatics of the hard and soft palate, while directly continuous with those of the gums, have a direction toward the pharynx, the trunks of the two sides often crossing. They join those of the pillars of the fauces, and go with them to the ental cervical glands near the larynx (Fig. 3264; Plate XLII.). Some also extend to the glands near the bifurcation of the common carotid with the trunks from the soft palate (Fig. 3264). The lymphatics of the soft palate on the pharyngeal or superior surface are only moderately developed, and communicate with those from the nose and from the Eustachian tube; the collecting trunks extend in part along the posterior pillar of the fauces to enter the glands along the larynx (Plate XLII., 13). But a greater number of collecting trunks pass laterad and penetrate the pharyngeal walls to enter the gland on the ventral aspect of the atlas. The ventral or lower face of the soft palate differs from the dorsal or upper face in having a greater number of lymphatic vessels, and the uvula is so richly supplied that it appears almost like erectile tissue, increasing two or three times in volume when successfully injected. The collecting trunks from the uvula and ventral aspect of the soft palate extend along the two pillars of the fauces, and join the trunks from the base of the tongue; but the greater number pass laterad through the wall of the pharynx and extend to the ental cervical lymphatic glands around the bifurcation of the common carotid.

The lymphatics of the tongue escaped discovery until 1847, when Sappey demonstrated them. They are difficult to demonstrate in the adult on account of the number and calibre of the veins, but in the infant and child the veins cause less trouble, and the lymphatics are easily injected. They form a rich network over the entire free surface to a point slightly beyond the circumvallate papillae. Around the circumvallate papillae they reach their greatest development. Up to the present no lymphatics have been demonstrated as arising in the substance of the tongue itself, the vessels traversing the tongue being collecting trunks from the mucosa. Around the edges of the tongue the network of the dorsal and ventral surfaces freely anastomose. But the main course of the collecting trunks is toward the middle, on the dorsal side, and toward the base. A few small trunks penetrate the tongue and after traversing the lingual glands, when those are present, extend to the ental cervical glands near the bifurcation of the common carotid. Most of the trunks, however, continue along the dorsum of the tongue, unite into large trunks beyond the circumvallate papillae, and extend in a wide curve to the ental cervical lymphatic glands situated near the thyro-hyoid ligament (Plate XLII., 13). The lymphatics on the ventral side of the tongue extend mostly through the substance of the organ, traversing the lingual glands when present, and finally extend with those which penetrate from the dorsal side, to the lymphatic glands around the bifurcation of the common carotid.

The tonsils, although composed of lymphoid tissue, were not shown to possess a lymphatic network until Sappey succeeded in demonstrating it, in 1876. This network, which covers the surface and extends into the depths of the tissue, is much more easily injected in the new-born child than in the adult. The network anastomoses with that of all the surrounding structures, and the collecting trunks pass with those from the tongue and pillars of the fauces to the glands next the thyro-hyoid ligament (Plate XLII.). The lymphatics of the pharynx also resisted demonstration for a long time. They were found by Sappey to be directly continuous with those of the bordering structures, and while the trunks all communicate at their origin, there are three groups on each side: 1. A dorsal group extending along the dorsal or posterior wall of the pharynx nearly to the postnares, and then turning laterad and penetrating the pharyngeal wall, enters the gland on the ventral side of

the atlas. 2. Several lateral trunks which extend along the side of the larynx and enter the lymphatic glands near the thyro-hyoid ligament. 3. Several ventral trunks extending mostly in a caudal (inferior) direction to join the supraclavicular lymphatic glands along the oesophagus and trachea.

Larynx.—The lymphatics of the larynx form one of the densest networks known in the body. Commencing with the epiglottis the number is almost infinite, the appearance being as if all the soft structures were composed of nothing but lymphatics. With the infant the abundance of lymphatics is continued without interruption along the trachea; but as age advances, the network in the larynx quite suddenly diminishes, so that, commencing with the vocal cords, the network in the larynx and trachea is comparatively slight. From the epiglottis, vestibule of the larynx, the sinus or ventricle, and the vocal cords, collecting trunks extend through the lateral wall of the vestibule, perforate the thyro-hyoid membrane, and terminate in the ental cervical glands beside the larynx (Plate XLII., 13).

Lymphatics of the Central Nervous System.—The spaces and membranes of the brain and the myel are so directly continuous that a discussion of the lymphatics of both seems desirable. Sappey denies lymphatics to the entire nervous system, both central and peripheral, but this is not in accordance with most observers who have made special investigations upon the subject. It is true that independent vessels with definite walls are not found to exist in the nervous substance proper; but from the investigations of Kölliker, Virchow, Robin,⁵ and Key and Retzius, it has been shown that, in the nervous substance of the brain and myel, the blood-vessels ramifying in it are possessed of a loose adventitia which is continued from the pia, the so-called pial funnels; and in the meshes of this adventitia are long spaces, like those around the blood-vessels of reptiles. It is supposed that these communicating spaces form the lymph passages of the nervous substance. They may be injected from a considerable distance into the nervous substance from the subarachnoid space, and injections by the puncture method into the nervous matter not infrequently fill these passages, and extend into the subarachnoid space. After reviewing carefully all the evidence, Key and Retzius⁶ consider the perivascular space of His—that is, a space entirely outside all the walls of the blood-vessel—as an artifact, as is also the presence of a subpial lymph space into which it opens. From the standpoint of Key and Retzius, then, the nervous matter of the central nervous system is drained of its lymph through the adventitial lymph spaces of its blood-vessels, and these spaces open into the subarachnoid space.

The lymphatics of the meninges are still in some doubt. In the dura there are wide-meshed, often ampulliform, vessels with endothelial walls that are supposed by some to be true lymphatics. Although their form is so strikingly like lymph vessels, Key and Retzius found, on making the crucial test, that they communicate with the blood-vessels and do not extend to lymphatic glands. There are, however, in the dura a great number of elongated clefts which are probably lymph clefts or channels. In the pia a very distinct and undoubted network of lymph vessels has been described and figured. It is probably largely through these that the lymph of the subdural and subarachnoid spaces is drained away.

The subarachnoid space communicates directly with the neurocele (ventricles of the brain) through the foramen of Magendie, and both the subarachnoid and subdural spaces of the optic, auditory, and olfactory nerves, and, in fact, all the nerves arising from the brain and myel, except that in the ordinary nerves the arachnoid as a special membrane soon disappears, and the subdural and subarachnoid spaces become one.

The ento-cranial lymphatics converge to form larger and larger trunks. Those from the vascular plexuses or telas accompany the *vena magna Galeni* to the base of the brain, where they are joined by the lymphatic trunks

from the surface of the brain. The combined trunks follow the great blood-vessels out of the cranial cavity mostly through the jugular foramen, and enter the deep cervical lymphatic glands. Small trunks are described as traversing the spinous and oval foramina with the middle meningeal vessels, finally to enter the ental cervical glands in the sphenomaxillary fossa; but the existence of these lymphatic trunks is disputed.

As stated, the subarachnoid and subdural spaces of the brain are directly continuous with the corresponding spaces of the myel, and are also projected out with the nerves, most completely with the optic, auditory, and olfactory, and in this way communication is gained with the lymphatics of the structures to which the nerves are distributed.

The exact relations of the ento-spinal lymphatics do not seem to have been well worked out, but they are described as following the blood-vessels, and terminating in the glands in course of the blood-vessels which they follow. The lymphatics of the central nervous system then extend to all great groups of glands in the neck and trunk.

Lymphatics of the Neck.—These are ectal and ental (superficial and deep), and include the lymphatics of the structures of the neck proper, and also all the trunks from the head and face. The vessels from the integument extend mostly to the ectal cervical glands, but part of them enter the supraclavicular glands directly (29, 29, of Fig. 3269).

LYMPHATIC GLANDS OF THE HEAD AND NECK.—These are very numerous and important. They are all con-

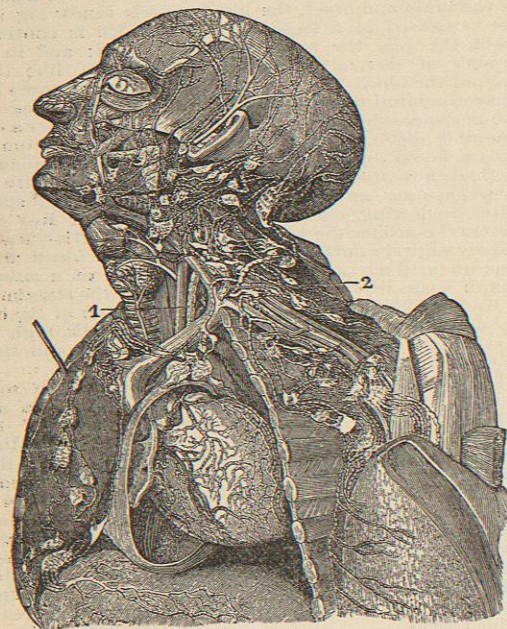


FIG. 3265.—General View of the Head, Neck, and Thorax, also the Termination of the Thoracic Duct. (Mascagni.) 1, Thoracic duct as it emerges from the thorax opposite the first rib; 2, termination of the thoracic duct at an angle formed by the junction of the subclavian and internal jugular veins. In the original folio plate there is a considerable swelling shown on the thoracic duct about 15 mm. before its termination. At the lower part of the figure is the arching diaphragm with vessels extending to the sternal glands; the heart is displaced to the left from the opened pericardium. This cut does scant justice to the beautiful original, in which every detail is clear and clearly marked by letters or numerals.

finied to the sides of the face, around the base of the head, none having been found within the skull, and along the great cervical blood-vessels. They have been

divided into two great paired groups or plexuses, the ectal or external, and the ental or internal jugular lymphatic plexuses; the ectal jugular plexus including all the ectal glands and finally pouring its lymph into the ental plexus, which includes all the ental cervical glands. This, while communicating with the glands in the thorax and axilla, sends a main efferent trunk, *truncus jugularis*, to join the thoracic duct on the left, the common lymphatic trunk on the right; or in some cases the jugular trunk ends partly or wholly independently in the veins (4 and 5 of Fig. 3283). These plexuses form a kind of double and closely connected chain along the course of the great cervical vessels, and yet, for convenience of description and reference, they have been described as several groups; but here, as in other parts of the body of man, the groups merge so insensibly into each other that the same gland might be placed in one group by one anatomist, and in the adjoining group by another. Furthermore, it should not be lost sight of that from a limited region lymphatics may go to quite widely separated groups of glands, and also that the number and size of the glands in a group are subject to considerable individual variation. (For examples, see Fig. 3268 B. and 3276, also the description of the lymphatics of the liver, Fig. 3273.)

The ectal glands of the head and neck, *i. e.*, the glands of the ectal or external jugular lymphatic plexus, are divided into the five following groups:

1. The occipital lymphatic glands (*glandulae lymphaticae occipitales, s. suboccipitales*), one or two, usually small glands on the complexus muscle between the cranial attachment of the trapezius and the sternomastoideus. The afferent vessels are from the occipital, partly, also, from the temporal and parietal regions; the efferent vessels extend partly to the ectal cervical, and partly to the supraclavicular glands (Figs. 3263 and 3265).

2. Parotid lymphatic glands (*glandulae lymphaticae parotidae, s. auriculares anteriores, s. faciales superficiales, s. zygomaticae*). There are usually ten to twelve of these on the surface and in the substance of the parotid salivary gland. The afferent vessels are from the temporal and frontal regions, the sides of the face, lateral part of the eyelids and conjunctiva, concha, tragus, membrana tympani and external auditory meatus of the ear; from part of the mucosa of the cheeks and the gums of the maxilla or upper jaw. The efferent vessels pass to the submaxillary and ectal cervical lymphatic glands.

3. Mastoid lymphatic glands (*glandulae lymphaticae mastoideae, s. subauriculares, s. auriculares posteriores*). Several small glands on the cranial attachment of the sternomastoid muscle, near the mastoid process and base of the ear. The afferent vessels are from the parietal, temporal, and occipital regions in part, from the helix, antihelix, convex surface, and lobule of the ear. The efferent vessels extend to the ectal and ental cervical glands.

4. Submaxillary lymphatic glands (*glandulae submaxillares*). There are several of these extending along almost the entire extent of the body of the mandible. In this group are included the glands on the buccinator muscle, sometimes described as a separate group (*glandulae buccales, s. buccinatores*) and sometimes classed with the ental glands. The submaxillary glands extending near the chin are also sometimes called submental, and a single one near the meson has been named suprahyoid by Sappey. The afferent vessels of this group are from the middle of the forehead, the nasal canthus of the eye, the integument of the nose and vestibule, and in the horse and ox also partly from the nasal fossae; from the cheeks and lips, the gums of the mandible in part, and the floor of the mouth, part of the efferent vessels from the parotid lymphatic glands; the efferent vessels pass to the ectal and ental cervical glands.

5. Ectal cervical lymphatic glands (*glandulae lymphaticae cervicales ectales, s. superficiales, s. jugulares superficiales*). Several small glands along the ectal jugular vein, but extending on both sides of it. They are between the platysma and the sternomastoid muscles. The afferent vessels are from the ectal structures of the neck, part of

the efferent vessels from the occipital, parotid, mastoid, and submaxillary groups; efferent vessels extend to the supraclavicular glands.

The ectal or external jugular lymphatic plexus in the larger animals—horse and ox—is approximately like that of man; but in the rabbit it is represented only by the submaxillary lymphatic glands and two small glands near the ear (3 and 4 of Fig. 3286). In the dog only the submaxillary lymphatic glands seem to belong to this plexus (3 of Figs. 3281 and 3284); in the cat the mastoid glands are large and may be injected from the inner or concave aspect of the external ear. It is possible that the small gland on the trunk following the external jugular vein, shown in Fig. 3282, may also belong to the ectal plexus. One cannot help being struck with the fewness of the glands in the dog, cat, and rabbit.

The ental glands of the head and neck, or the glands of the ental jugular plexus are situated on the course of the great vascular trunks and extend from the atlas to the thorax. The lymphatics of the entire head and neck ultimately traverse this plexus.

The glands of this plexus have been quite commonly divided into three great groups, with some minor groups—the deep facial, the superior and inferior deep cervical; but in actual descriptions of the lymphatics of the various organs the anatomists of the present day, although they recognize three groups, and some of them minor groups, actually divide all the glands of the ental jugular plexus into two groups, *viz.*, those extending from the level of the base of the cranium, along the deep vessels, to the bifurcation of the common carotid, and those from the bifurcation of the carotid to the junction of the jugular and subclavian veins. This division was adopted in the previous description, and has been called (1) ental cervical, and (2) supraclavicular. (1) Ental cervical lymphatic glands (*glandulae lymphaticae cervicales entales, s. profundae, s. glandulae lymphaticae jugulares cephalicae*). The ental cervical, or jugular group of glands, includes all the ental glands around the deep structures from the bifurcation of the common carotid artery nearly to the base of the skull, and includes the glands on the internal maxillary vessels in the sphenomaxillary fossa, which are usually given a separate group under the name of deep facial or internal parotid, internal maxillary, etc. It also includes the glands generally grouped as the superior jugular or superior deep cervical.

The glands in this group are numerous and quite widely separated from one another, extending from the ventral face of the atlas to the side of the larynx, being about as variously arranged as the organs of this region. The one between the atlas and pharynx is said to be the most cephalic of all the lymphatic glands of the body.

The afferent vessels of this group are from the orbit, nasal cavity, the cheek, roof and floor of the mouth, in part from the tongue, pharynx, tonsil, tympanum, and Eustachian tube, the larynx, the thyroid, and the brain and its membranes. The efferent vessels pass to the supraclavicular glands.

(2) The supraclavicular glands (*glandulae lymphaticae supraclaviculares, s. cervicales profundae inferiores, s. jugulares inferiores*). These glands are arranged along the carotid artery and internal jugular vein from the bifurcation of the common carotid to the junction of the subclavian and internal jugular veins. All the efferent trunks from the ectal jugular plexus and from the ental cervical glands enter this group, also many of the lymphatics of the pharynx, oesophagus, trachea, the lymphatics accompanying the vertebral artery and vein, also some of the ectal and ental lymphatics of the neck and the clavicular region. They also communicate with the anterior mediastinal and with the axillary glands. The efferent vessels form a single or multiple trunk (*truncus lymphaticus jugularis*) and terminate on the left in the thoracic duct, or on the right in the right common lymphatic trunk, or sometimes partly or wholly by an independent opening into the great veins (Figs. 3263 and 3283).

In the horse and ox the glands of the neck are approx-

imately like those of man; but in the cat, dog, and rabbit there is but a single ental cervical lymphatic gland, and the jugular trunk is usually large and long, and not infrequently opens partly or wholly into the vein independently (Figs. 3282, 3283, 3285, and 3287).

Lymphatic Vessels of the Thoracic Limb (Arm and Shoulder).

—The lymphatics of the arm and shoulder form an ectal and ental set, as in most parts of the body. The lymphatics of the hand arise by a complex network on the dorsal and palmar surface of the fingers, and extend toward each side of the finger, where they unite into two or three anastomosing trunks which follow the direction of the collateral arteries to the hand when they reach the dorsal surface. From the palm many vessels wind round both edges to the dorsal side also; but many next the wrist extend directly upon the ventral or flexor aspect of the arm and extend to the axillary region. The trunks on the dorsum of the hand and the extensor side of the entire arm gradually wind round to the flexor surface in their course to the axilla. Most of the vessels enter directly the axillary glands, but a few of those from the fourth and fifth fingers and the ulnar side of the antibrachium traverse one or two glands (ectal brachial or supra-epitrochlear glands in the flexure of the elbow, Fig. 3267) before proceeding to the axillary glands. Frequently, if not constantly, one or more trunks follow the cephalic vein and go to the subclavian glands instead of going to the axilla, and not infrequently there is a gland in the course of these near the insertion of the deltoid, or even farther along (13 of Fig. 3267; see also Fig. 3269).

The ectal lymphatics of the shoulder either join the trunk following the cephalic vein or extend round to the axilla. The ental lymphatics of the arm arise in the deep structures and follow the principal blood-vessels much more closely than do the ectal lymphatics. In the antibrachium there are, therefore, three groups following the radial, ulnar, and interosseous blood-vessels. There are occasionally a few small lymphatic glands in the antibrachium (antibrachial glands) through which a part of the vessels pass; but usually none are reached until in the flexure of the elbow, where, extending along the brachial vessels, there are regularly met three or four glands (ental or deep brachial glands), which most of the vessels traverse. Before reaching the axillary glands, according to most authors, there is a free anastomosis between the ectal and ental lymphatics at the wrist and elbow, but Sappey denies any such anastomosis.

According to the description of most veterinarians, the lymphatics of the arm and shoulder of the horse and ox are quite comparable with those of man both as to glands and vessels, except that there is a larger lymphatic gland in the fold between the scapula and the neck—the pre-scapular gland. In the dog and cat the arrangement is exceedingly simple. All of the vessels, except a few cutaneous ones whose course is somewhat irregular,



FIG. 3266.—Ectal Lymphatics of a Finger. (Sappey.) To show the extreme abundance of the lymphatics and the fineness of the network on the end and the palmar aspect, also that the vessels from both the dorsal and ventral surfaces extend to the side where two or three considerable trunks, parallel with the collateral artery, convey the lymph toward the hand. By comparing Fig. 3267, it will be seen that these trunks always extend upon the dorsum of the hand.

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