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The Region of the Mouth

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taining the incisor teeth on both sides being disconnected from the rest of the palate by a chasm, and attached above to the vomer only: this condition is usually associated with double hare-lip.

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The opening of the mouth is bounded by the upper and lower lips, which are soft and flexible, and consist chiefly of the orbicularis oris muscle interlacing with fasciculi from the surrounding facial muscles (Plate 15). The lips are covered outwardly by the skin, which is closely adherent and very thin at their borders, and inwardly by the loose oral mucous membrane. There is no fat in the extensive connective tissue of the lips, which allows of considerable swelling when these parts are inflamed; and they are very mobile, owing to their muscular structure being almost entirely independent of bony attachment. The lips are joined on each side, forming the angles or corners of the mouth, which are in relation to the first bicuspids teeth when the mouth is closed. There is great variability in the length and thickness of the lips, depending upon the peculiarities of age, sex, and race. The vermillion color of the borders of the lips is due to the translucent nature of the stratified epithelium with which they are covered, and through which the vascularity of the subjacent tissues, due to the numerous papillae and capillary plexuses, can be seen. The lips are endowed with marked sensibility, through the presence of sensory papillae, resembling tactile corpuscles, derived from the ultimate fibres of the infra-orbital nerves in the upper lip and from the mental nerves in the lower lip. The coronary arteries (page 124) ramify between the under surface of the orbicularis muscle and the mucous membrane, and form a free circular anastomosis around the inside of the lips. They are of large size, and can be readily felt pulsating on pressing the lips from within; and they are apt to be wounded by the teeth in consequence of a blow upon the mouth. When wounded it is usually found necessary to tie both ends of the cut vessels. The labial veins form a wide-meshed plexus in relation to the arteries. Owing to the vascularity of the lips, naevi frequently occur here; and it is worthy of mention in this connec-
tion that the lower lip is the most common seat of epithelioma. Embedded in the meshes of the submucous tissue, within the inner margins of the lips, there are many racemose mucous glands, the labial glands, which are arranged in a continuous zone, being most numerous in the centre of the upper lip. These glands are about the size of small peas, and their ducts open by small orifices upon the mucous membrane. The closure of the ducts of these glands produces the mucous cysts often found in this situation. There are folds of the mucous membrane on the inner side of the middle of each lip,—the frena labiorum,—which connect the lips with the adjacent gums. The lips serve as organs of suction, prehension, and speech; and, from their varied associations with many of the expressions, they often constitute a characteristic feature. Sometimes a congenital fissure exists in the upper lip, from arrest of development: this is known as simple hare-lip. The space between the closed teeth and the inner surface of the lips and adjacent portions of the cheeks is called the vestibule. The cheeks form the sides of the face externally and of the mouth internally, and consist of two strata of muscular fibres, with a variable quantity of fatty tissue interposed. The outer layer of muscular tissue is formed by the zygomaticus and platysma muscles, over which the skin is loosely spread; and the deep muscular layer is the buccinator muscle, which has a fibrous sheath externally extending to the superior constrictor muscle of the pharynx and called the bucco-pharyngeal fascia. On the oral surface of the buccinator the mucous membrane is attached by a firm submucous connective tissue. The buccal mucous membrane is continuous with the lining of the cavity of the mouth, but it is thinner and less sensitive than that of the lips. It contains a number of little glands,—the buccal glands,—which resemble the labial glands in structure, but are smaller and are arranged in clusters, especially in relation to the second superior molar tooth, where the mucous membrane is pierced by the opening of Stenson's duct from the parotid gland. These are called the molar glands, and they are often involved in abscesses, or are subject to scirrhous-like nodules, in consequence of stoppage of their ducts. The cheeks are very elastic, and serve to keep the food between the teeth, mainly through the action of the buccinator muscles. They are also
vascular, both within and without. Within, the vessels in the submucous tissue form fine vascular plexuses; while without, the vessels are large and are superficial to the buccinator muscle. In relation to the anterior border of the coronoid process of the lower jaw, and between it and the tuberosity of the upper jaw, there is a recess in which a deep-seated abscess of the temporal region is prone to discharge, owing to the density of the overlying external fascia. This may be detected by the finger passed between the teeth and the cheek.

The mucous membrane reflected upon the arching alveolar borders of the jaws is closely adherent to the periosteum, and forms the gums. It is peculiarly modified, and contains dense masses of reticulated connective tissue, which surrounds and sends processes between the necks of the teeth. The gums are very vascular, and bleed freely upon laceration, furnishing most of the blood which follows the extraction of a tooth. They have very little sensibility, except when inflamed, and in health are smooth and of a pale pink color. They present fine papillae around the margins of the alveoli, which secrete the tartar, and their peculiar vascularity occasions a red line which is often conspicuous in phthisical patients. In chronic lead-poisoning a blue line appears along their margins, from a deposition of sulphide of lead, produced by the sulphuretted hydrogen arising from the decomposition of particles of food retained between the teeth acting upon the lead circulating in the capillary vessels. The alveoli are lined with an inflection of the outer epithelial layer of the gums, which firmly adheres to their periosteal lining membrane.

The gums form a tough protecting covering to the developing teeth in infancy; and there is always a separation between them until the further development of the alveolar arches and the eruption of the teeth.

The small size of the facial portion of the skull at birth and during childhood is due to the rudimentary condition of the jaws and teeth. The upper and lower maxillary bones commence to ossify at a very early period, the lower maxillary first. They are developed very slowly, and undergo various modifications until their complete form is attained at puberty. There are two sets of teeth, both of which appear at different periods during childhood,—the first, called the temporary, giving way
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to the second, called the permanent. The development of the temporary teeth in the fetus begins with the first formation of the jaws,—about the seventh week.

The teeth are calcified papillae of the mucous membrane. The stages of their development have been more carefully studied than perhaps those of the development of any other portion of the body at this period of life. Briefly stated, the process may be summed up as follows. The primitive dental groove is caused by a turning inward or depression of the oral epithelium, forming a furrow in the edges of the jaws, from the bottom of which a vascular ridge of papillae springs up contemporaneously. Each of these papillae gradually assumes the shape of a future tooth, and is covered with a cap of epithelial cells, which undergo a differentiation so as to form the dentine, the enamel, and the cement. The changes which take place in the bones of the jaws relate only to the formation of the sockets of the teeth. At first there is no appearance of alveoli; but as the changes by which the teeth are developed occur in the mucous membrane, there is a groove formed in the jaw itself, which by degrees becomes wider and is divided by thin bony partitions. The edges of the alveoli are turned toward one another shortly after birth, so as to protect the developing temporary teeth from injury. The germs of the temporary teeth make their appearance from the seventh to the twelfth week of embryonic life. They are not set vertically opposite one another in the two dental arches, the upper-jaw teeth being in front of the lower, a relative position which they maintain, after their eruption, throughout life. The temporary teeth are very imperfectly developed at birth, and are not fully formed until about the age of four and a half years. They number twenty,—four incisors, two canines, and four molars in each jaw. Their periods of eruption after birth are, approximatively, the central incisors about the seventh month, the lateral incisors from the eighth to the tenth month, the anterior molars from the twelfth to the eighteenth month, the canines from the fourteenth to the twentieth month, and the posterior molars from the eighteenth to the thirty-sixth month. The lower teeth generally precede the upper ones.

The permanent teeth consist of two groups,—those which have, and
those which have not, predecessors. To the former group belong the incisors, canines, and bicuspids; to the latter, the molars. The incisors, canines, and bicuspids directly succeed to the positions occupied by the temporary teeth, and correspond in number to them. The molars, three in number, on both sides of each jaw, are the additional permanent teeth. The development of the first group of the permanent teeth is effected in a manner analogous to that of the temporary teeth, a second dental furrow being formed out of the epithelial lining of the gums and vascular papillae. In the process, the sac which encloses each tooth-germ becomes attached to the back of the sac of a temporary tooth. The three additional permanent teeth, the molars, are developed by successive prolongations of the epithelial tissue toward the angles of the jaws. The calcification of the permanent teeth extends from birth to about the twelfth year of life. The fangs, or roots, of the temporary teeth disappear by absorption as the permanent teeth develop, and the loose crowns gradually become detached, giving place to the new-comers. The eruption of the permanent teeth takes place usually as follows: the first molars at six and a half years, the middle incisors in the seventh year, the lateral incisors in the eighth year, the first bicuspids in the ninth year, the second bicuspids in the tenth year, the canines about the twelfth year, the second molars from the twelfth to the thirteenth year, and the third molars (wisdom teeth) from the eighteenth to the twenty-first year, or later. It is not practicable to keep all these facts in mind, but it should be remembered that the first tooth of the temporary set makes its appearance in the seventh month, and the first of the permanent set in the seventh year. The lower-jaw teeth precede the upper-jaw teeth, as in the temporary set. About the sixth year, before the temporary incisors are shed, the jaws contain all the temporary and permanent teeth, except the wisdom. During the growth of the teeth the lower jaw increases in depth and length and changes its form. At birth this bone consists of two lateral halves united by fibro-cartilage. The body is a mere shell of bone, and the angle of the jaw is obtuse. About the first year the two halves become joined at the symphysis. The jaw becomes gradually elongated behind the mental foramen, so as to accommodate the three extra permanent molars.
The angle also steadily becomes less obtuse until adult age is reached, when it is nearly a right angle. In old age it becomes again obtuse. The difference in width between the incisors of the temporary and permanent sets is compensated for by the smallness of the bicuspids in comparison with the temporary molars to which they succeed.

In the adult, the teeth are rarely found in a perfect state, owing to neglect or abuse. They are symmetrically arranged upon both sides of the jaws, and are thirty-two in number, eight above and eight below on each side. The four anterior teeth in each jaw are the incisors, the middle two of which are called the central and the outer ones on each side the lateral incisors. Next to the incisors are the canines, one on each side; behind these are the two bicuspids, or premolars, and last of all the three molars. Each tooth consists of a free surface, the crown, a body, a neck, which is embraced by the gum, and one or more roots or fangs, which are sunk into the alveoli. The crown of a tooth is covered with a cap of enamel, which is the hardest known animal substance, and the fang is covered by a layer of true bone tissue, called cement. The mass of any tooth is composed of a hard outer substance, dentine, or ivory, which is harder than bone, and encloses a cavity in which is lodged the gelatinous mass called the pulp. The pulp is exactly the shape of the tooth which contains it, and consists of a mass of fusiform cells, called odontoblasts, surrounded by the minute dental vessels and nerves, which enter the cavity through canals in the fangs (Plate 3, Fig. 2).

The incisor teeth are constructed for biting, having a crown shaped somewhat like a chisel, convex on the outer side and usually concave on the inner. They have a single, long, conical fang, which is slightly grooved at the sides. The crowns of the central incisors are three-pointed, until they are worn away by use, and they are rounded where they join their fangs. The lower incisors are more slender than the upper ones,—in fact, they are the smallest of all the teeth,—and their crowns are narrower, with a straighter cutting edge. The lateral incisors are shaped like the central incisors, although they are smaller, and in both jaws they correspond with each other in general character. The edges of the upper incisors overlap those of the lower in such a way that they are both worn away
PLATE 22.

Figure 1.

Dissection of the back of the neck to show the superficial muscles and the nerves and arteries in the occipital triangles.

1. The external occipital protuberance.
2. The left occipital artery.
3. The left occipitalis major nerve.
4. The left trapezius muscle.
5. The left splenius muscle.
6. The posterior auricular vein.
7. The left sternomastoid muscle.
8. The left occipitalis minor nerve.
9. The internal cutaneous branches of the second dorsal spinal nerve.
10. One of the dorsal cutaneous arteries, from the posterior branch of the second intercostal artery.
11. The right occipital artery.
12. The right occipitalis major nerve.
13. The right complexus muscle.
14. The right splenius muscle.
15. The right splenius minor nerve.
16. The right levator anguli scapulae muscle.
17. The right rhomboideus minor muscle.
18. The posterior scalene artery.
19. The nerve to the levator scapulae muscle.
20. The right rhomboideus major muscle.

Figure 2.

The deep parotid region. The malar bone and the ramus of the lower maxillary bone have been removed to show the parts beneath, involving the internal maxillary artery (or deep facial artery).

1. The infra-orbital artery.
2. The alveolar artery.
3. The inferior dental artery and nerve.
4. The facial artery and vein.
5. The submaxillary gland (partly dissected to show the facial vessels).
6. The lingual artery and hypoglossal nerve.
7. The superior thyroid artery and the superior laryngeal nerve.
8. The deep temporal artery.
9. The deep temporal nerve.
10. The middle meningeal artery.
11. The parotid gland partially removed.
12. The origin of the internal maxillary artery.
13. The posterior auricular artery.
14. The lingual branch of the fifth cranial nerve or (gustatory nerve).
15. The stylo-hyoid muscle.
16. The posterior portion of the diaphragmatic muscle.
17. The auricularis magnus nerve.
18. The internal carotid artery.
19. The external carotid artery.
20. The internal jugular vein.
21. The tendon of the digastic muscle in relation to the hyoid bone, the hypoglossal nerve, and the lingual artery.
22. The external jugular vein.
23. The common carotid artery, just below its bifurcation.
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in a bevelled manner, which does not lessen their cutting power. The canine teeth are constructed for tearing, having a sharp-pointed crown, convex in front and slightly hollowed behind. They each have a single stout fang, which is longer than that of any other tooth, and sometimes enters the antrum. The lower canine teeth are smaller than the upper, with blunter points and shorter fangs. The canine teeth overlap each other so that the upper ones are worn upon their inner surfaces and the lower ones upon their outer. They become gradually blunted, and eventually their cutting borders are reduced nearly to the level of the incisors. The premolars, or bicuspid teeth, are shorter than the canines, and are provided with two cusps or tubercles on the crown, one of which, on the cheek side, is marked by a middle ridge. The cusp on the tongue side of the premolars is highest anteriorly. These teeth usually have only a single fang.

The molar teeth are the largest in size. Their crowns are rhomboidal in shape and have from three to five cusps, and each tooth has from two to four fangs. The cusps on the cheek side are smaller, higher, and sharper than those on the tongue side. The first upper molar has four cusps. The first lower molar has five cusps, three outer and two inner, and has two pulp-canals in its posterior fang. The second upper molar usually has only three cusps, two outer and one inner. Its outer fangs are often united. It is very variable. The second lower molar has four cusps, and has two pulp-canals in its posterior fang. The third upper molar has three cusps and very irregular club-shaped fangs. The lower third molar has, in addition to its four cusps, a rudimental cusp posteriorly on the cheek side.

When the teeth are brought in apposition, the upper teeth overlap the lower ones in front, while the surfaces of the molar teeth are in contact, so that the arch formed by the teeth of the upper jaw is slightly larger at the sides and in front than the arch formed by the teeth of the lower jaw. The last molars, or wisdom teeth, are the only teeth which are exactly in contact with one another, all the others having each two antagonists. The upper incisors overlap the lower ones and the adjacent sides of the canines, the bicuspid and molar teeth above and below alternating,
so that each has a bearing on two opposite teeth. By this arrangement, when one tooth is lost its fellow of the opposite jaw is still useful in mastication.

The cavity of the mouth (cavum oris) is bounded in front by the teeth and gums, above by the hard palate, behind by the soft palate and its arches and the opening into the pharynx, and below by the tongue and the mylo-hyoid muscles. The walls of the cavity are lined by mucous membrane, which is continuous with that of the vestibule over the surfaces of the gums, and is variously modified in the different localities. The hard palate is the vaulted roof of the mouth (Plate 12, No. 34, and Plate 13, Fig. 4, No. 1), formed by the union of the under surfaces of the palate processes of the superior maxillary bones (page 144). When the mouth is formed in the fetus there is at first no separation between it and the nose; but the general cavity is gradually closed by the horizontal plates of the superior maxillary and palate bones advancing toward each other and the septum of the nose descending from above to join them in the middle line. Normally the only trace of the original fissures is the naso-palatine canal. The closure of the palate begins in front and extends backward, and is ordinarily accomplished from the eighth to the tenth week. What is called cleft palate is simply an imperfect closure of the fetal gap in this region. The cleft is always in the middle line, and often involves the soft palate and the uvula. If the cleft in the hard palate includes the alveolar border, it leaves the middle line and follows the suture between the maxillary bone proper and the os incisivum. This defect is usually associated with a corresponding fissure in the upper lip, called hare-lip, which hardly ever occurs in the middle line, and is always opposite the interval between the lateral incisor and canine teeth at the intermaxillary suture. If the cleft in the palate extends on each side of the os incisivum—separating that bone completely—it is often accompanied by fissures on both sides of the upper lip,—double hare-lip. The mucous membrane covering the hard palate is so intimately connected with the peristeme that the two cannot be separated. In the middle line the membrane is comparatively thinner than along the borders of the alveoli, where it is quite thick and contains a compact layer of mucous
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glands,—the palatine glands (Plate 13, Fig. 4, No. 11),—the orifices of which open upon the surface of the membrane and are especially numerous where the hard and soft palates blend into each other. The density of the muco-periosteal covering of the palate plays an important rôle in the operation for the remedy of cleft palate. The surface of the palatal mucous membrane is smooth posteriorly, but raised in transverse ridges anteriorly, and is divided by a slight raphé, which ends in a little papilla just behind the interval between the central incisor teeth.

The soft palate (velum pendulum palati) consists of a movable flap of muscular tissue covered with mucous membrane, which is directly continuous backward from the hard palate, from which it extends obliquely downward between the mouth and the posterior nares into the pharynx (Plate 12). From the middle of the soft palate a free conical process is suspended, called the uvula (Plate 13, Figs. 2, 3, and 4), from the sides of which two folds of mucous membrane, enclosing muscular fibres, arch outward on each side, connecting the palate with the tongue and the pharynx. These are the arches or pillars of the palate. The anterior pillars curve downward and forward to the tongue, while the posterior pillars curve downward and backward to the pharynx. The posterior surface of the soft palate is continuous with the floors of the nasal cavities, and in the act of swallowing it is lifted upward by the levatores palati muscles into apposition with the back of the pharynx, so as to close the posterior nares. A raphé exists in the median line of the uvula, prolonged from that of the hard palate, which indicates its original formation by two halves, and is the line of division when the soft palate is affected with cleft. The uvula varies in length according to the relaxation of its intrinsic muscles, and occasionally becomes permanently elongated, causing a tickling sensation in the throat and a distressing cough. The muscles of the soft palate are immediately under the mucous membrane; and a proper understanding of their relative position and function is of the utmost importance in all operations in this region, especially for the closure of cleft palate, as the action of some of them tends to widen the cleft, requiring their division before attempting to close it.

The hamular process of the internal pterygoid plate of the sphenoid
bone can be easily detected by the finger pressed upon the soft palate in close relation to the last upper molar tooth, and is a valuable landmark.

The *levatores uvulae* (or *azygos*) are two little bundles of muscular fibres which hang side by side, suspended from the posterior nasal spine of the palate bone and from the palatal aponeurosis, and are covered with a loose reflection of the mucous membrane, forming the uvula, already mentioned.

The *levator palati* arise from the under surfaces of the apices of the petrous portions of the temporal bones, and from the adjoining cartilaginous portions of the Eustachian tubes. After passing over the superior constrictor muscles of the pharynx their course is obliquely downward, and their fibres blend with the levatores uvulae on their posterior surface. Their normal action is to raise the soft palate in deglutition, and they are powerful retractors of the flaps in cleft-palate operations. In order to divide either of these muscles, a narrow curved knife should be entered through the soft structures half-way between the hamular process and the Eustachian tube and an oblique incision made outwardly.

The *tensor palati*, or *circumflexi*, muscles are situated, one on each side, externally to the levatores palati. They are interposed between the internal pterygoid muscles and the internal pterygoid plates of the sphenoid bone, arising mainly from the scaphoid fossae and spines of that bone. Some of their fibres also come from the contiguous vaginal processes of the temporal bones and the outer sides of the Eustachian tubes. From these broad origins the muscles descend on each side perpendicularly to the hamular processes, where they become somewhat tendinous and are held in position by bands of connective tissue and lubricated by synovial bursæ. Thence they take an inward direction, and, approaching each other, their fleshy fibres interlace on the anterior surface of the base of the uvula, while the tendinous fibres are inserted into the horizontal plates of the palate bones. The function of these muscles is to render the palate tense, and they also oppose the closure of a breach extending through it. Their division may be effected, on either side, by introducing a narrow knife with the edge upward just along the inner side of the hamular
process and cutting upward a few lines. If the knife in this operation is pressed against the posterior surface on its withdrawal, the levator palati may be cut also, but this latter muscle is better cut transversely, as described before, as its retractive power is greater than that of the tensor.

The muscles which are contained within the mucous folds of the pillars of the palate are the palato-glossi anteriorly and the palato-pharyngei posteriorly. The *palato-glossi muscles* arise from the anterior surface of the soft palate, interchanging fibres with each other across the base of the uvula, and curve downward and forward, to be inserted into the sides and dorsum of the tongue, blending with the fibres of the stylo-glossi muscles. The *palato-pharyngei muscles* each arise from the soft palate by two fasciculi, which embrace the levatores palati in their relation to the uvula, and also interchange fibres with each other. Besides these fibres of origin, a slip from the neighboring Eustachian tube, called the *salpingopharyngeus*, often joins each muscle. The palato-pharyngei are directed backward, and, blending with the fibres of the inferior constrictor and stylo-pharyngei muscles, are inserted into the posterior borders of the thyroid cartilages. These muscles aid the levatores and tensores palati in drawing apart the flaps after the operation of staphylorrhaphy, and their division consists in simply cutting across the posterior pillars, just below the tonsils, with blunt-pointed scissors.

The principal arteries of the hard and the soft palate are the posterior palatine branches of the internal maxillary arteries (page 141), which, after passing down the posterior palatine canals, emerge from the posterior palatine foramina and run along close to the alveolar borders to the anterior palatine canal (Plate 13, Fig. 4, No. 2). In dissecting off the muco-periosteal flaps to cover a cleft palate the lateral incisions should be made as close as possible to the alveoli, in order to preserve these vessels and secure the vitality of the flaps.

The pillars and back of the soft palate also receive blood on each side from the ascending pharyngeal artery and from the ascending palatine branches of the facial artery. The latter vessel is in close relation to the levator palati muscle, and is the chief source of bleeding after division of
**PLATE 23.**

**Figure 1.**

The skin removed from the anterior region of the neck to show the platysma myoides muscle and the superficial cervical veins.

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<tbody>
<tr>
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<td>The median raphé.</td>
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<td>2.</td>
<td>The right thyro-hyoid muscle, seen through the superficial fascia.</td>
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<tr>
<td>3.</td>
<td>The anterior border of the right sterno-mastoid muscle.</td>
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<td>4.</td>
<td>The right external jugular vein.</td>
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<tr>
<td>5.</td>
<td>The anterior jugular vein, occupying the middle line.</td>
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<tr>
<td>6.</td>
<td>The clavicular and acromial nerves.</td>
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<tr>
<td>7.</td>
<td>A perforating thoracic artery.</td>
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<tr>
<td>8.</td>
<td>The anterior border of the left sterno-mastoid muscle.</td>
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<td>9.</td>
<td>The platysma myoides muscle.</td>
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<td>10.</td>
<td>Superficial transverse veins.</td>
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<tr>
<td>11.</td>
<td>The left external jugular vein.</td>
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<tr>
<td>12.</td>
<td>The clavicular nerve.</td>
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<tr>
<td>13.</td>
<td>The anterior perforating thoracic artery.</td>
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**Figure 2.**

The anterior cervical muscles, in relation to the veins, arteries, and nerves. The median raphé has been cut through and the anterior thyroid muscles separated to display the nerves over the larynx and trachea.

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<tbody>
<tr>
<td>1.</td>
<td>The right facial artery and vein.</td>
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<td>2.</td>
<td>The anterior portion of the right digastric muscle.</td>
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<tr>
<td>3.</td>
<td>The facial artery tunnelling the submaxillary gland.</td>
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<tr>
<td>4.</td>
<td>The oblique vein, connecting the external and internal jugular veins.</td>
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<td>5.</td>
<td>The thyroid notch.</td>
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<td>6.</td>
<td>The right thyro-hyoid muscle.</td>
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<td>7.</td>
<td>The right common carotid artery, just below its bifurcation.</td>
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<td>8.</td>
<td>The right internal jugular vein.</td>
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<tr>
<td>9.</td>
<td>The trunk of the right superior thyroid artery, passing beneath the sterno-thyroid muscle.</td>
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<tr>
<td>10.</td>
<td>The crico-thyroid artery and vein.</td>
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<td>11.</td>
<td>The superficial cervical plexus of nerves on the sterno-mastoid muscle.</td>
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<td>12.</td>
<td>The transverse cervical nerve.</td>
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<td>13.</td>
<td>The right external jugular vein.</td>
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<td>14.</td>
<td>The right omohyoid muscle.</td>
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<td>15.</td>
<td>The right sterno-hyoid muscle.</td>
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<td>16.</td>
<td>The right sterno-thyroid muscle.</td>
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<td>17.</td>
<td>The sternal nerve.</td>
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<td>18.</td>
<td>The external jugular vein, where it passes into the subclavian vein.</td>
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<td>19.</td>
<td>The sternal end of the right sterno-mastoid muscle.</td>
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<td>20.</td>
<td>The supra-ternal notch.</td>
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<td>21.</td>
<td>The left facial artery and vein.</td>
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<td>22.</td>
<td>The anterior portion of the left digastric muscle.</td>
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<tr>
<td>23.</td>
<td>The left facial artery, coming out of the submaxillary gland.</td>
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<tr>
<td>24.</td>
<td>The body of the hyoid bone.</td>
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<td>25.</td>
<td>The thyro-hyoid membrane.</td>
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<td>26.</td>
<td>The left omohyoid muscle.</td>
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<td>27.</td>
<td>The left external carotid artery.</td>
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<tr>
<td>30.</td>
<td>The position of the cricoid cartilage.</td>
</tr>
<tr>
<td>31.</td>
<td>The superficial cervical plexus of nerves.</td>
</tr>
<tr>
<td>32.</td>
<td>The left sterno-mastoid muscle.</td>
</tr>
<tr>
<td>33.</td>
<td>The descending branches of the superior thyroid arteries.</td>
</tr>
<tr>
<td>34.</td>
<td>The anterior jugular vein.</td>
</tr>
<tr>
<td>35.</td>
<td>The left sterno-hyoid muscle.</td>
</tr>
<tr>
<td>36.</td>
<td>The left external jugular vein.</td>
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<tr>
<td>37.</td>
<td>The margin of the left sterno-thyroid muscle.</td>
</tr>
<tr>
<td>38.</td>
<td>The clavicular nerves.</td>
</tr>
<tr>
<td>39.</td>
<td>The sternal end of the left sterno-mastoid muscle.</td>
</tr>
</tbody>
</table>
THE REGION OF THE MOUTH.

this muscle. The palatine nerves (from Meckel's ganglion) accompany the posterior palatine vessels.

The tensor palati muscle receives a special nerve from the otic ganglion, which enters the muscle on its posterior surface.

The tongue is the freely movable muscular organ occupying the cavity of the mouth, designed to assist the various offices of mastication, deglutition, taste, and speech. When the mouth is closed, the upper surface, or dorsum, of the tongue is convex, conforming somewhat to the palatal roof, and the point, or tip, lies behind the lower incisor teeth (Plate 12). The back, or root, of the tongue is attached to the hyoid bone, and it is supported on each side by a sling of muscles from the styloid process of the temporal bone and the anterior palatine arches. The under surface of the organ is connected to the symphysis of the lower jaw. The mucous membrane covering the upper surface of the tongue is provided with a thick layer of stratified epithelium, which is being constantly renewed.

The furring or coating of the tongue, as it is commonly called, consists of detached epithelium commingled with fungi of peculiar and variable growth, according to the state of the digestive canal. The appearance of the tongue is an important guide to the physician, and merits very close scrutiny. The dorsum of the tongue is divided by a raphé into symmetrical halves, which end, at the level of the isthmus of the fauces, in a depression, the foramen cecum, which is the common opening of several large mucous glands. The posterior third of the upper surface of the tongue is quite smooth compared to the anterior two-thirds, which are rough and covered with papillae of several distinct kinds. These papillae are supported in a layer of connective tissue, the corium, which is thicker and looser posteriorly than it is anteriorly, where it is very closely adherent to the muscular tissue. The corium is composed of a dense net-work of connective and elastic tissue, continuous with the intermuscular septa, and contains the vessels, nerves, and lymphatics which are associated with the papillae.

The papillae circumvallatae (Plate 13, Fig. 4, No. 9) are much the largest, and vary from eight to twelve in number. They are arranged upon the back of the tongue in two rows, one upon each side, which
converge toward the foramen cæcum, resembling in shape the letter V inverted. Each of these papillæ is a conical body, inverted, with its apex resting in a little fossa, and its base presenting on the surface of the tongue covered with papillæ, into each of which can be traced with the microscope filaments from the glosso-pharyngeal nerve and branches from the dorsal artery of the tongue. The epithelial lining of these papillæ, as well as of the walls of the fossæ which contain them, encloses numerous flask-shaped bodies, called taste-buds. The general velvety appearance of the tongue is due to the numberless filiform papillæ which are spread over its surface. These papillæ consist of conical processes, which terminate in free, hair-like villi, and are mostly arranged in rows parallel to the circumvallate papillæ. The points of the filiform papillæ are directed backward, so that they give a rough sensation to the finger if it is passed over the tongue from behind forward. Scattered over the sides and tip of the tongue, throughout the filiform papillæ, are the papillæ fungiformes (Plate 13, Fig. 4, No. 10), so called because they resemble little mushrooms. At the point of the tongue they are most numerous, and are always of a bright red color. In many of the exanthematous fevers these fungiform papillæ become hypertrophied and their color intensified. The fungiform papillæ contain capillary loops and nerve filaments from the lingual branch of the inferior maxillary nerve, which terminate in taste-buds. The taste-buds are composed of a congeries of flattened support-cells, which enclose the so-called gustatory cells.

The mucous membrane on the under surface of the tongue is smooth, thin, and loose, and presents several distinct folds. In front, in the middle line, there is a fold reflected from the tongue to the inner surface of the gum, called the frænum linguae. Sometimes the frænum is continued farther forward than usual, or may be abnormally short, producing the condition known as “tongue-tie,” which is attended by a lisping of the speech. This can be easily remedied by snipping the free border of the frænum with blunt-pointed scissors as close to the jaw as possible, so as to avoid wounding the ranine vessels, which are contained within the elevated fringes of mucous membrane on the under surface of the tongue, extending on each side of the frænum toward its tip. The ranine artery lies deeper
than the vein on each side. If the frenum and subjacent muscular fibres
be too freely divided in operating for tongue-tie, there is danger of a child,
in its efforts at sucking, tearing these lax fibres farther open, so that the
tongue may be forced down upon the epiglottis by the muscles of deglut-
tition and occasion suffocation.

At the sides of the tongue the mucous membrane is reflected to the
body of the lower jaw, and covers over the mylo-hyoid muscles, forming
the floor of the mouth. At the back of the tongue there are folds passing
on each side to the soft palate, which enclose the palato-glossi muscles, and
there are also three folds to the epiglottis, a right and a left glosso-epiglottic
fold and a posterior median, the frenum epiglottidis. The latter serves to
raise the epiglottis when the tongue is protruded (Plate 13, Fig. 4), a fact
which is taken advantage of by drawing out the tongue, so as to open the
pharyngeal air-passages, when a patient under ether breathes stertorously.
The orifices of the submaxillary ducts open upon elevations of the mucous
membrane close to the borders of the frenum linguae; and the orifices
of the sublingual ducts are in the furrows between the sides of the tongue
and the gums. There are a number of mucous glands in the submucous
tissue of the tongue, especially about its root, which resemble the labial
and buccal glands (page 149). Beneath the apex of the tongue, on each
side of the frenum, there is a group of glands which are supposed to be
salivary. There is a considerable amount of connective tissue, as well as
of lymphoid tissue, in the substance of the organ. The latter is found
chiefly at its root. To the presence of these tissues in the otherwise
dense structure are to be attributed the great amount of swelling which
follows inflammation, and the enlargement of the tongue in the affection
known as macroglossia.

The substance of the tongue is composed of intrinsic muscular fibres,
with a small quantity of adipose tissue, arranged in symmetrical halves
which are distinctly separated from each other by a median fibrous septum.
This septum consists of a layer of fibrous tissue extending vertically from
the base to the point, and sometimes contains a plate of fibro-cartilage.
The intrinsic muscles of the tongue are the linguales, which consist of
two strata of longitudinal fibres, the superficial and the inferior, the latter
being the larger, extending from the hyoid bone to the tip of the organ, and having between them an interlacement of transverse and vertical fibres. The extrinsic muscles of the tongue are those which mainly produce its numerous and complicated movements. The genio-hyo-glossi muscles arise from the upper genial tubercles on the inner side of the symphysis of the jaw, and their fibres radiate in a fan-like manner to be inserted into the whole of the under surface of the tongue and the upper part of the body of the hyoid bone. The action of the genio-hyo-glossi muscles is manifold. Their anterior fibres retract the tongue; their posterior fibres raise its base and help to protrude the organ. In connection with the linguales they draw down the centre of the tongue from the tip toward the base, as in sucking. The hyo-glossi are flat quadrilateral muscles which arise from the body and the cornua of the hyoid bone and blend with the other muscular fibres on the sides of the tongue. The fibres from the body pass upward and backward and overlap those from the greater cornua, which pass obliquely forward. The stylo-glossi arise from the outer sides of the apices of the styloid processes and from the stylo-maxillary ligaments, and curve downward to the sides of the tongue, each dividing into two portions, one of which blends with the linguales and the other with the hyo-glossus. The palato-glossi are described with the soft palate, with which they are more particularly associated.

The sublingual salivary gland (Plate 13, Fig. 2, No. 4) is about the size and shape of an almond, situated between the mucous membrane and the mylo-hyoid muscle, its front portion resting in a depression behind the symphysis of the jaw. It has about a dozen ducts,—the ducts of Rivinus,—which open upon the floor of the mouth, mostly by independent orifices, but one of them terminates in the submaxillary duct, and is called the duct of Bartholin.

The submaxillary salivary gland (Plate 13, Fig. 2, No. 6, and Plate 18, No. 20) is very irregular in shape, and about twice the size of the sublingual gland. It is covered externally by the skin and platysma muscle (Plate 18), and is in relation to the posterior border of the mylo-hyoid muscle, generally presenting a submaxillary lobe beneath that muscle, and a buccal lobe above it, which terminates in the duct of
Wharton, which is five centimetres, or about two inches, in length, and opens by a narrow orifice at the side of the frenum linguae. The submaxillary gland is placed a little in front of the angle of the jaw, and upon its back part is tunnelled by the facial artery, which after leaving it passes up over the body of the jaw in front of the masseter muscle. Posteriorly the submaxillary and parotid glands are separated by the stylo-maxillary ligament, although they are often joined together.

The genio-hyoid muscles are very slender fleshy bands which arise from the inferior genial tubercles back of the symphysis of the jaw and are inserted into the body of the hyoid bone. They act as elevators of the hyoid bone. The mylo-hyoid muscle arises mainly from the mylohyoid ridge of the lower jaw, extending from the symphysis to the alveolus of the last molar tooth, and is attached to the body of the hyoid bone. It presents a tendinous raphé where the anterior fibres are attached, but frequently this raphé is absent and the fibres from the mylo-hyoid of one side become continuous with those of the other and thus establish a muscular partition or diaphragm to the mouth. This muscle is also an elevator of the hyoid bone, as in swallowing.

The hyoid bone is a horseshoe-shaped bone, unattached to the general skeleton, placed above the larynx, and serving to support the numerous muscles of the tongue. When the head is held erect it may be felt just below the lower border of the jaw, and four and a half centimetres, or an inch and three-quarters, behind the chin (Plate 1). It consists of a body and right and left greater and lesser cornua. The body is the central portion, has a vertical ridge in the middle anteriorly, and posteriorly has a smooth concave surface which is in relation to the epiglottis. The greater cornua extend backward and a little upward to about a line dropped from the angle of the lower jaw on each side, and have blunt cartilaginous ends. The lesser cornua on each side are about the size of a grain of corn, and are connected, by a little joint lined with synovial membrane, to the point of junction of the body and the greater cornua. The hyoid bone is suspended by the stylo-hyoid ligaments, which extend from the tips of the styloid processes of the temporal bones to the lesser cornua. The hyoid bone is an important landmark in the upper part of the neck.
The tongue is very vascular, receiving most of its blood from a special artery upon each side, called the lingual, which enters its base and divides within its substance into numerous branches. These branches anastomose with one another and with vessels from the facial and ascending pharyngeal artery, but there is no communication from side to side, owing to the median fibrous septum, except perhaps by minute branches at the apex. The lingual artery arises from the external carotid artery about the level of the hyoid bone, round the greater cornu of which it curves, after crossing the superior laryngeal nerve and the middle constrictor muscle of the pharynx. Thence it passes inward beneath the hyo-glossus muscle and the hypoglossal nerve, about the point where the intermediate tendon of the digastric muscle pierces the stylo-hyoid muscle and becomes looped by a fold of deep fascia to the hyoid bone. At the anterior margin of the hyo-glossus muscle the artery passes in a very tortuous course along the under surface of the tongue toward its apex, where it is known as the ranine artery. The tortuous condition of the lingual artery enables it to accommodate itself to the elongation and movements of the tongue. In its course it gives off, near the greater cornu of the hyoid bone, the little supra-hyoid artery; close to the lesser cornu the dorsal artery, which supplies the mucous membrane at the back of the tongue and the tonsil, and the soft palate; and, in relation to the genio-hyo-glossus muscle, the sublingual artery, which supplies the sublingual gland.

In consequence of its vascularity, the tongue is often the seat of naevoid growths, and the operation of excision of the organ for cancer is apt to be attended with excessive hemorrhage unless the lingual artery is secured early in the undertaking.

In order to expose the lingual artery for ligation, a curved incision should be made over the great cornu of the hyoid bone, about two centimetres, or a finger's breadth, from the angle of the jaw, and parallel with it, the head being turned back and to the opposite side. Upon reaching the tendons of the stylo-hyoid and the posterior portion of the digastric muscles, a layer of fascia is met with overlying the hypoglossal nerve, which can be seen through it taking a curved course parallel to the angle of the jaw. The artery is generally found under the nerve in this
relation, but if it originates higher up, in common with the facial artery from the external carotid, as it sometimes does, it can be readily found by drawing outward the submaxillary gland. The lingual veins accompany the branches of the lingual artery, forming net-works about them, but instead of emptying into a common trunk they join the superficial and the deep facial veins. The ranine veins are very large and tortuous, and are easily noticeable when the tip of the tongue is protruded and turned upward.

The motor nerve to the tongue is the hypoglossal, which leaves the skull by the anterior condyloid foramen, and, in close connection with the pneumogastric nerve, passes deeply beneath the internal jugular vein and the internal carotid artery, until it reaches a point corresponding to the angle of the jaw, when it comes forward between the vein and the artery, and, in relation to the posterior portion of the digastric muscle, takes a curved course over the carotid arteries and the occipital and facial arteries. As it crosses the occipital artery the branch called the descendens hypoglossi is given off, which lies for some distance upon the sheath of the carotid vessels and is distributed to the depressor muscles of the hyoid bone (Plate 21, No. 41). The hyo-glossus muscle separates the hypoglossal nerve from the lingual artery, along the upper border of the greater cornu of the hyoid bone. After passing over the hyo-glossus muscle the hypoglossal nerve communicates with the lingual nerve, and then penetrates the mylo-hyoid muscle and divides into various branches to supply all the lingual muscles with motor power. The hypoglossal nerve receives communications from the first two cervical nerves, and is also connected with the pneumogastric nerve and the superior cervical sympathetic ganglion at the base of the skull. These communications have important physiological bearings. The tongue receives its sensory and gustatory functions through the distribution of the lingual and glosso-pharyngeal nerves. The lingual nerve is a branch of the inferior maxillary nerve, and, descending between the internal pterygoid muscle and the ramus of the lower jaw (page 143), curves forward over the superior constrictor muscle of the pharynx and the upper part of the hyo-glossus muscle. In front of the latter muscle it is superficial to the duct of the submaxillary gland.
PLATE 24.

Figure 1.

The anterior region of the neck. The sternothyroid and sternohyoid muscles are removed to show the thyroid body in position. (Same as Plate 23.)

1. The right facial artery and vein.
2. The right digastric muscle.
3. The facial artery passing out of the submaxillary gland.
4. The thyroid notch.
5. The right thyrohyoid muscle.
6. The right internal jugular vein.
7. The right superior laryngeal nerve.
8. The right superior thyroid artery and vein.
9. The right common carotid artery.
10. The right sternomastoid muscle.
11. The right omohyoid muscle.
12. The branches of the superior thyroid vessels over the right lobe of the thyroid body.
13. The anterior jugular vein, at the point where it passes over the isthmus of the thyroid body.
14. The right clavicular nerve.
15. The right external jugular vein.
16. The left facial artery and vein.
17. The left digastric muscle.
18. The left submaxillary gland.
19. The thyrohyoid membrane.
20. The left internal carotid artery.
21. The left external carotid artery.
22. The left internal jugular vein.
23. The left thyrohyoid muscle.
24. The left superior laryngeal nerve.
25. The left superior thyroid artery and vein.
26. The left sternomastoid muscle.
27. The left omohyoid muscle.
28. The left external jugular vein.
29. The superior thyroid vessels over the left lobe of the thyroid body.
30. The left clavicular nerve.

Figure 2.

The anterior region of the neck. The isthmus of the thyroid body is divided and the two lobes drawn to either side to expose the depth of the trachea at the root of the neck, and its relation to the deep transverse thyroid veins. (Same as Plate 23.)

1. The right facial artery and veins.
2. The right digastric muscle.
3. The right facial artery passing out of the submaxillary gland.
4. The right hyoid artery.
5. The body of the hyoid bone.
6. The thyroid notch.
7. The right thyrohyoid muscle.
8. The right superior laryngeal nerve.
9. The right superior thyroid artery and veins.
10. The right common carotid artery.
11. The right internal jugular vein.
12. The right omohyoid muscle.
13. The right sternomastoid muscle.
14. The right lobe of the thyroid body, drawn aside.
15. The superficial cervical veins.
16. The right external jugular vein.
17. The right inferior thyroid artery and vein.
18. The right recurrent laryngeal nerve.
19. The transverse thyroid veins in the supra-ternal notch.
20. The manubrium sterni.
21. The left facial artery and vein.
22. The left digastric muscle.
23. The left submaxillary gland.
24. The left hyoid artery.
25. The thyrohyoid membrane.
26. The left thyrohyoid muscle.
27. The left internal carotid artery.
28. The left superior laryngeal nerve.
29. The left superior thyroid artery and vein.
30. The cricothyroid artery over the crico-thyroid membrane.
31. The cricoid cartilage.
32. The left internal jugular vein.
33. The left external jugular vein crossing over the common carotid artery.
34. The left lobe of the thyroid body, drawn aside.
35. The left sternomastoid muscle.
36. The left external jugular vein.
37. The trachea.
38. The left recurrent laryngeal nerve.
39. The left clavicular nerve.
40. The supra-ternal notch.

N. B.—The dissections represented in Plates 23 and 24 were made upon a thick, short-necked, well-developed male subject, aged thirty-five years, to demonstrate the parts especially concerned in the operations of laryngotomy and tracheotomy.
At the under surface of the tongue the lingual nerve divides into numerous branches (Plate 13, Fig. 2, No. 1), which ultimately are distributed to the mucous membrane and the fungiform and filiform papillae on the anterior three-fourths of the dorsum of the organ. It also supplies the neighboring mucous membrane of the mouth and gums and the lingual gland, and connects with the terminal branches of the hypoglossal nerve at the apex of the tongue. In severe neuralgic affections of the tongue division of this nerve sometimes affords relief. It can readily be reached by making an incision through the mucous membrane between the vertical ramus of the jaw and the last molar tooth, or, if the mouth is too small, by an external incision through the cheek in the line of the oral commissure. In relation to the external pterygoid muscle the lingual nerve is joined by the chorda tympani from the facial nerve, as already described (page 143); and it sends a few filaments to the submaxillary ganglion near the posterior border of the mylo-hyoid muscle.

The submaxillary ganglion is not larger than a pin’s head, and is situated on the hyo-glossus muscle behind the point where the lingual nerve crosses the submaxillary duct. Its motor root is the chorda tympani; its sensory roots come from the lingual, and its sympathetic root is formed by a branch from the sympathetic plexus around the facial artery. The branches of distribution go to the submaxillary gland, to the floor of the mouth, and sometimes to the hypoglossal nerve. The glosso-pharyngeal nerve leaves the skull at the middle of the jugular foramen anterior to the pneumogastric and spinal accessory nerves, and passes between the internal jugular vein and the internal carotid artery, crossing the latter vessel below the styloid process to curve forward over the stylo-pharyngeus muscle. Here it holds an intermediary position between the lingual and hypoglossal nerves (Plate 13, Fig. 2, No. 16, and Plate 36, No. 7), and divides into branches which supply the mucous membrane of the pharynx, the tonsil, and the back of the tongue. There are two branches of the glosso-pharyngeal nerve which supply the back portion of the tongue. One is distributed to the circumvallate papillae and the surface between them and the epiglottis; the other passes along the side of the tongue and joins with the lingual nerve.
The tongue is plentifully supplied with lymphatic vessels, which mostly accompany the ranine vessels, and, after entering several small lymphatic glands upon the hyo-glossus muscle, terminate in the deep cervical glands. The space between the cavity of the mouth and that of the pharynx is called the fauces, and the narrow part of this space bounded by the palatine arches constitutes the isthmus faucium. Within the triangular intervals between the anterior and posterior pillars of the palate, on each side, are situated the tonsils.

The tonsils (amygdalae) (Plate 13, Fig. 2, No. 15, Fig. 3, No. 16) are two oval glandular bodies, composed of an aggregation of lymphatic follicles, between which small mucous glands open, and are covered on the external surface by a fibrous sheath and an expansion of the submucous lining of the pharynx. Normally they should not project beyond the palato-glossal folds; and their inner surfaces are marked with minute depressions, which are the orifices leading into the glandular crypts or follicles. The secretion of the tonsils, in the healthy state, is viscid and transparent; but it is apt to become white and thick from inflammation, as in chronic tonsillitis, and to accumulate in the superficial depressions, appearing like small ulcers or detached pieces of membrane. The tonsils are variably enlarged in different individuals, and their removal is so often required that their immediate relations are of great interest. The enlargement, however, is generally toward the middle of the throat, where no resistance is offered; and it is for this reason not so easy as it is often supposed to be to feel an hypertrophied tonsil through the external surface of the neck, where it is in relation to the angle of the jaw. There are several lymphatic glands between the tonsils and the greater cornua of the hyoid bone, which receive the lymphatic vessels from the tonsils: these are usually enlarged when the tonsils are indurated, and their enlargement may easily be mistaken for the tonsils themselves. Each tonsil is separated by the superior constrictor muscle of the pharynx and its aponeurosis from the internal carotid artery and the ascending pharyngeal branch of the external carotid. The latter is very close to the tonsil, but the internal carotid, except when it is very tortuous, is really out of the way from danger of being wounded in excision of the tonsil or in the opening of a
tonsillitis. The external carotid artery is not far from the outer surface of the tonsil, and the *facial artery* is almost always in close connection with its front border, where it furnishes the *tonsillar branch*, which is the vessel most apt to give rise to troublesome hemorrhage. The tonsil itself is very vascular, as it receives blood from many sources,—the tonsillar and palatine branches of the facial, the descending palatine from the internal maxillary, the ascending pharyngeal, and the dorsalis linguae all contributing to it.

The *veins* from the tonsil form the *tonsillar plexus* on the outer side of the gland, which empties into the inferior palatine vein and thence into the deep facial vein. The *nerves* to the tonsil are derived from Meckel's ganglion and from the glosso-pharyngeal nerve. There is a continuous chain of lymph-follicles extending from one tonsil to the other across the upper part of the pharynx. The lymphatics arise around the numerous follicles in the glandular substance and pass into the submaxillary lymphatic glands.

**The pharynx** (Plates 12 and 13) is the passage-way which connects the cavity of the mouth with the oesophagus. It is eleven centimetres, or about four and a half inches, in length, and extends from the base of the skull to the level of the cricoid cartilage. It is lined with a mucous coat continuous with that of the neighboring passages which open into it, and its walls consist of muscular fibres arranged in three overlapping planes, and of a fibrous layer, called the *pharyngeal aponeurosis*, which is interposed between the muscular and mucous coats. The widest part of the pharynx is at the level of the greater cornua of the hyoid bone, where it measures five centimetres, or two inches, across; its narrowest part is at its junction with the oesophagus, it being here only about nineteen millimetres, or three-quarters of an inch, in diameter, and it is here, consequently, that foreign bodies most frequently become lodged. Owing to the yielding nature of the walls of the pharynx, its cavity is very dilatable. The submucous tissue of the pharyngeal aponeurosis is much thicker above, where the muscles are deficient, than it is below, where it gradually becomes lost as the tube becomes contracted. It is attached to the basilar process of the occipital bone and to the apices of the petrous portions of
the temporal bones. In the middle the aponeurosis is strongly fixed to
the pharyngeal spine of the occipital bone, and it is continued downward
as the posterior raphé into which the constrictor muscles are inserted. The
superior constrictor muscle is practically a continuation backward of the
buccinator muscle (page 121), being separated from it only by the pterygo-
maxillary ligament. Its fibres are pale in color, and they arise from the
hamular process and the lower part of the internal pterygoid plate of the
sphenoid bone, from the tuberosity of the palate bone, and from the pos-
terior portion of the mylo-hyoid ridge on the lower jaw, to be inserted
mainly into the upper part of the posterior raphé. The upper border of
the superior constrictor is attached by a few fibres to the pharyngeal spine,
and then arches beneath the levator palati muscle and the Eustachian
tube, leaving a semilunar space below the base of the skull, known as
the sinus of Morgagni. The deficiency in muscular fibres in this space
is made up for by a thickening of the aponeurosis in this locality.
The superior constrictor, in addition to the above, also takes origin from
the pterygo-maxillary ligament and from the reflected tendon of the tensor
palati muscle. The lower border is overlapped by the middle constrictor.
The latter muscle arises from the upper border of the greater and lesser
cornua of the hyoid bone and part of the stylo-hyoid ligament. Its fibres
diverge in a radiating manner to their insertion at the median raphé,
where the middle ones interlace with those of the opposite muscle. The
middle constrictor is partially separated from the superior by the stylo-
pharyngeus muscle, a long slender fasciculus which arises from the inner
side of the base of the styloid process and is mainly inserted into the
posterior border of the thyroid cartilage, a few of its fibres blending with
those of the constrictors. The lower border of the middle constrictor is
overlapped by the inferior constrictor. The lingual artery runs forward
between the outer surface of the middle constrictor and the hyo-glossus
muscle.

The inferior constrictor muscle is the thickest of the three, and arises
from the side of the cricoid cartilage, behind the crico-thyroid muscle,
and from the oblique line on the great wing of the thyroid cartilage and
to its lower cornu. The fibres spread out from their origin and are
inserted into the posterior raphé. The lower fibres blend with the circular fibres of the oesophagus. Between the middle and inferior constrictor muscles the superior laryngeal artery and nerve penetrate the thyro-hyoid membrane to supply the larynx, and beneath the lower border of the inferior constrictor muscle the recurrent laryngeal nerve enters the larynx. The action of the constrictor muscles is to compress the pharynx from above downward. The cavity of the pharynx is divided anteriorly by the plane of the soft palate into an upper portion, the *naso-pharynx*, and a lower, the *oro-pharynx*. The mucous membrane varies in these different parts, and is peculiarly adapted to their purposes: the former, being for the passage of air, is lined with columnar ciliated epithelium and very delicate, and the latter, for the passage of food, is provided with squamous epithelium like the rest of the mouth. Throughout the whole of the pharynx there are numerous mucous glands whose secretion keeps the surface lubricated. In the neighborhood of the Eustachian tubes there are aggregations of these mucous glands and lymphatic follicles, constituting the so-called *pharyngeal tonsils*. This area is peculiarly liable to become thickened and swollen in catarrh. The mucous membrane on each side of the upper part of the pharynx is puckered into a pouch, called the *pharyngeal recess*.

The *Eustachian tube*, which conveys the air to the cavity of the tympanum (page 65), on each side, opens, by a perpendicular elliptical slit twelve millimetres, or about half an inch, in length, opposite the back part of the inferior turbinated bone, in the *naso-pharynx* (Plate 12, No. 32). The tube has the tensor palati muscle to the outer side and in front of it, and the levator palati muscle internal and behind it. Its orifice is usually closed, but during swallowing the tensor palati probably serves to open it. There is a slight bulging of the mucous membrane behind the opening of the Eustachian tube, formed by the levator palati. In relation to the glottis the mucous membrane is gathered into folds, which allow of the expansion of this part of the pharynx in deglutition. The mucous membrane of the pharynx is readily inflamed, owing to its great vascularity, and the inflammatory process is apt to involve the larynx through contiguity of structure. The pharynx is separated posteriorly
PLATE 25.

Figure 1.
Deep dissection of the root of the neck. The thyroid body and omo-hyoid muscle are hooked aside to show the vessels and nerves, and the clavicle is detached from the sternum.

1. The anterior portion of the right digastric muscle.
2. The facial artery and vein, coursing along the front border of the masseter muscle.
3. The masseter muscle.
4. The tendon of the digastric muscle, looped down to the hyoid bone by a band of the deep cervical fascia.
5. A cluster of superficial lymphatic glands.
6. The omo-hyoid muscle, drawn aside.
7. The descendens hypoglossi nerve, over the common carotid artery.
8. The sternomastoid muscle, turned back.
10. The internal jugular vein.
11. The deep cervical artery and vein.
12. The masseter muscle.
13. The tendon of the digastric muscle, looped down to the hyoid bone by a band of the deep cervical fascia.
14. The subclavian artery.
15. The vagus (or pneumogastric nerve).
16. The subclavian vein.
17. The right innominate vein.
18. The innominate artery.
19. The subclavious muscle.
20. The clavicle, detached from the sternum and pulled forward.
21. The anterior portion of the left digastric muscle.
22. The body of the hyoid bone.
23. The thyro-hyoid membrane.
24. The thyroid notch.
25. The crico-thyroid muscle.
26. The superior thyroid artery and vein.
27. The superior laryngeal nerve.
28. The left sterno-mastoid muscle.
29. The cricoid cartilage.
30. The thyroid body.
31. The isthmus of the thyroid body.

Figure 2.
Deep dissection of the root of the neck. (Same as Figure 1, the veins being removed.)

1. The facial artery.
2. The posterior portion of the digastric muscle.
3. The external carotid artery.
4. The internal carotid artery.
5. The bifurcation of the common carotid artery.
6. The sterno-mastoid muscle, turned back.
7. The omo-hyoid muscle, drawn aside.
8. The outer cord of the brachial plexus.
9. The middle cord of the brachial plexus.
10. The inner cord of the brachial plexus.
11. The subclavian artery.
12. The clavicle.
13. The superior thoracic branch of the axillary artery.
14. The anterior portion of the digastric muscle.
15. The body of the hyoid bone.
16. The lingual artery and hypoglossal nerve.
17. The thyroid notch.
18. The crico-thyroid muscle.
19. The superior thyroid artery.
20. The superior laryngeal nerve.
21. The left sterno-mastoid muscle.
22. The cricoid cartilage.
23. The common carotid artery.
24. The left lobe of the thyroid body.
25. The inferor thyroid artery.
26. The trachea.
27. The scalenus anticus muscle.
28. The pneumogastric nerve.
29. The innominate artery.
30. The phrenic nerve.
31. The manubrium sterni.
32. The first external intercostal muscle.
from the prevertebral muscles and their fascia by the loose but strong post-pharyngeal fascia, which is connected with the sheaths of the carotid vessels on each side (Plate 13), and which has an extension outward by the gap in the deep cervical fascia by which the pharyngeal wall is brought into relation with the parotid region, as in post-pharyngeal abscess (page 133). In the connective tissue between the back of the pharynx and the axis vertebra there is a little lymphatic gland, which sometimes is the seat of a suppurative collection.

In the areolar layer between the pharyngeal fascia and the constrictor muscles is the pharyngeal plexus of veins, made up of numerous intercommunicating veins which branch in all directions and terminate in the internal jugular veins.

The structures of the pharynx receive their arterial blood by branches from the ascending palatine and ascending pharyngeal arteries. The lateral walls of the pharynx are in close proximity, on each side, to the internal carotid artery and to the pneumogastric, glosso-pharyngeal, and hypoglossal nerves (Plate 13, Figs. 2 and 3).

The constrictor muscles are all supplied with nerves from the pharyngeal plexus of nerves, the inferior constrictor receiving in addition twigs from the external and recurrent laryngeal nerves. The lymphatic vessels of the pharynx empty into the deep cervical lymphatic glands, which form a chain along the sheath of the carotid artery and internal jugular vein.

THE REGION OF THE LARYNX.

At the back of the tongue, and behind the stretch of mucous membrane which contains the chain of follicles extending between the tonsils, is the pharyngeal opening of the larynx. It is a triangular aperture, having its base directed toward the tongue, and the cavity of the larynx into which it leads extends as far as the lower border of the cricoid cartilage.

The larynx is the commencement of the respiratory passage, and serves as the organ of the voice, in which are produced the sonorous vibrations caused by the air coming from the lungs, bronchial tubes,