Lard should be of a soft solid consistency, white, unctuous, with a faint but not at all rancid odor, and a bland taste. Its specific gravity is about 0.932 and it melts at 38° to 40° C. (100.4° to 104° F.). It is insoluble in water and very little soluble in alcohol.

Olein, palmitin, and stearin are the principal constituents of lard, their relative proportions (upon which its consistency depends) varying considerably.

Commercial lard is so universally impure, either being mixed with water or salt, or having a portion of its liquid oil removed, that it is in general unfit for medicinal use, and the apothecary will do well always to prepare his own. Tens of thousands of barrels of cotton-seed oil are annually used in this country for the manufacture of artificial lard.

Ordinary lard rather rapidly becomes rancid and irritating, but if perfectly pure and free from water it will keep, in a cool place, for a very long time. When it is to be used during warm weather, five per cent. of it, or more if necessary, should be replaced with white wax. For pharmaceutical purposes it is scented, as well as preserved, with benzoin, a little of the balsam being tied in a bag and suspended in the melted lard for two hours. Thus treated, it is almost entirely permanent, besides having an agreeable odor.

Lard is an article of food, and is emulsified, like other fats, when taken into the intestines, without any particular physiological action. As an external dressing, it is protective and bland in a high degree, qualities which have given it its popularity as a basis of ointments and cerates. Those of the United States Pharmacopœia follow: A. Benzoinatus, just mentioned, Ceratum, Ceratum Cantharidis, Ceratum Extracti Cantharidis, C. Resinæ, Unguentum, Ung. Hydrargyri, Ung. Mezerei, Ung. Iodi, etc.

W. P. Bolles.

LARDACEOUS DEGENERATION. See *Amyloid.*

LARYNGISMUS STRIDULUS. See *Croup.*

LARYNX, ANATOMY OF THE.—The larynx, which is the principal organ of phonation as well as the guardian against the entrance of foreign bodies into the trachea and bronchial tubes, is situated at the upper and fore part of the neck. Until puberty it is small and presents a rounded form in front. At about this time in the male there are marked and rapid changes. It becomes nearly double in size and the thyroid produces a prominent ridge in front, called the Adam's apple.

The larynx lies between the base of the tongue and the hyoid bone above and the beginning of the trachea below, and, when at rest, in the adult, is in front of the fourth, fifth, and sixth cervical vertebræ, from which it is separated by the lower portion of the pharynx and the prevertebral muscles. In front, it is covered near the median line by the skin and cervical fascia. On either side there are also the sterno-hyoid, the sterno-thyroid, and the thyro-hyoid muscles with the upper portion of the lateral lobe of the thyroid gland and a portion of the inferior pharyngeal constrictor. Farther back and on the side are the large cervical vessels. At the upper part the larynx is triangular in shape with the apex pointing at the anterior median line, but it approaches the shape of a cylinder and is much smaller below, where it joins the trachea. The hyoid bone, the thyroid and cricoid cartilages, the thyro-hyoid membrane, and the crico-thyroid membrane are easily located and are important landmarks.

The Interior of the Larynx.—The first portion of the larynx we see when looking from above is the epiglottis situated at the base of the tongue. This varies greatly in shape, size, and position. Its crest may present itself as the arc of a small or a comparatively large circle. It is usually situated in the median line, and is commonly but not always symmetrical; it swings up and down over the superior aperture of the larynx, so that it may be found in any position from the vertical to the horizontal. Immediately below the crest of the epiglottis, is a rounded prominence, the cushion produced by a prominence of the petiolus together with some fatty and adenoid tissue. The mucous membrane covering the epiglottis is of a yellowish pink color and is more adherent to the posterior surface, in which open the mouths of a number of glands. From both sides of the epiglottis there extend toward the arytenoids, at the posterior portion of the larynx, two folds of mucous membrane, the aryteno-epiglottidean folds, which contain some ligamentous and muscular fibres as well as the cuneiform cartilages. These cartilages show as a whitish nodule in front of the prominence produced by the arytenoid and Santorini's cartilages on either side. At the posterior portion of the larynx, between the arytenoid cartilages, is a space called the interarytenoid space. This is quite extensive during respiration but is much shorter during phonation. Just below the apex of the arytenoids and extending from the front of these to the angle of the thyroid cartilage, below the attachment of the epiglottis, are two folds of mucous membrane enclosing delicate fibrous bands, the superior thyro-arytenoid ligaments. These folds are called the ventricular bands and form the upper boundary of a space, the ventricle of the larynx, which extends under and between them and the alæ of the thyroid cartilage, and then terminates anteriorly in a pouch, the sacculus laryngis. This pouch contains many mucous glands which by their secretion moisten the vocal cords. Just below and parallel with the ventricular bands are two white bands, the *true vocal cords.* They appear to be a part of the ventricular bands, but are at a lower level and are separated from them by the ventricles. They are composed of yellow fibrous tissue covered by a very thin and closely adherent mucous membrane. A cross section shows the vocal cord to be a triangular prism with the base outward and attached throughout its whole extent to fibres of the thyro-arytenoid muscle. Anteriorly the cord is attached to the receding angle of the thyroid cartilage just below the ventricular band and within the insertion of the thyro-arytenoid muscle. Posteriorly there are three sets of fibres; one is attached to the vocal process of the arytenoid cartilage, another to its anterior surface, and the third to the crico-arytenoid capsular ligament. At their posterior attachment there is often seen a slight depression of a pearly white color; this is the tip of the vocal process of the arytenoid cartilage. There is an open triangular space between the vocal cords—the *glottis* or *rima glottidis.* This varies in extent according to sex and age, being about seven-eighths of an inch long in the adult male and about five-eighths of an inch in the female. The width constantly varies as the cords are approximated or separated, and in

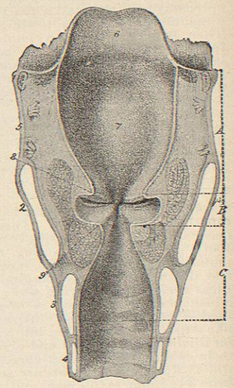

Fig. 3103.—Frontal Section of an Undissected Larynx. The three divisions of the larynx are marked off by the straight dotted lines on the right side of the figure. *A*, The superior compartment, extending from the aryepiglottic folds to the superior vocal cords (ventricular bands); *B*, the cavity of the ventricle, bounded above by the superior vocal cord, below by the inferior or true vocal cord, and externally by the elastic membrane of the larynx; *C*, the inferior or subglottic compartment, extending from the true vocal cord to the inferior border of the cricoid cartilage; 8, edge of the superior vocal cord; 9, edge of the inferior vocal cord. Below the true vocal cord is seen the *thyro-arytenoideus* muscle.

the male is about one-half inch at the posterior portion when the cords are separated to their fullest extent. Through the glottis can be seen the anterior portion of the cricoid and a few of the superior rings of the trachea and at times the whole anterior portion of the trachea as far down as the bifurcation. Below the glottis the space widens and is oval laterally, but gradually approaches a circular form as it extends toward the trachea.

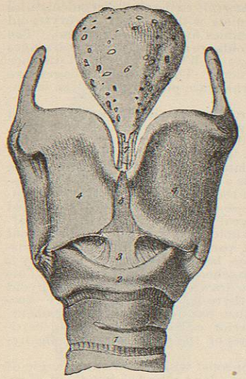

Fig. 3104.—Anterior View of the Cartilages of the Larynx. 1, Upper rings of the trachea; 2, anterior arch of the cricoid; 3, anterior portion of the cricoid-thyroid membrane (conoid ligament); 4, 4, lateral halves or alæ of the thyroid; 5, median portion of the thyroid; 6, epiglottis; 7, thyro-epiglottic ligament. (Luschka.)

Cartilages of the Larynx.—There are five principal cartilages of the larynx, the epiglottis, the thyroid, the cricoid, and the two arytenoid, and two pairs of very small unimportant cartilages, the cornicula laryngis (cartilages of Santorini) and the cuneiform cartilages (cartilages of Wrisberg). The thyroid, the cricoid, and the two arytenoid cartilages are of hyaline cartilage and liable to become ossified with age, while the epiglottis and the four small cartilages are of a fibrous nature.

The Thyroid Cartilage, the largest in the larynx, consists of two large quadrilateral symmetrical plates called alæ, which unite anteriorly at an angle of 85° to 95° and form the greater portion of the front and sides of the larynx.

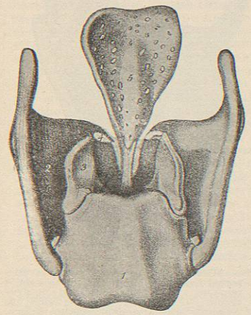

Fig. 3105.—Posterior View of the Cartilages of the Larynx. 1, Broad posterior arch of the cricoid; 2, internal surface of the ala of the thyroid; 3, arytenoid cartilage; 4, cornieulum laryngis (cartilage of Santorini); 5, the posterior surface of the epiglottis. (Luschka.)

The alæ present an external flattened surface, marked by a rather indistinct oblique line, running from the inferior tubercle at the lower anterior border upward, outward, and backward to the superior tubercle at the posterior part of the superior border. This ridge gives attachment below to the sterno-thyroid, and above to the thyro-hyoid muscle, and just below this line are attached a part of the inferior constrictor of the pharynx and the stylo-pharyngeus. The internal surfaces are more or less concave and smooth, and near the angle of union in front are attached the epiglottis, the thyro-epiglottidean and thyro-arytenoid muscles, and the true and false vocal cords. Of the borders, the anterior is the shortest, and, except for a bursa which is sometimes present, is subcutaneous.

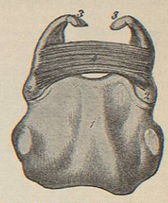

Fig. 3106.—Posterior View of the Cricoid and Arytenoid Cartilages, showing the Attachment of the Arytenoideus Muscle. 1, Cricoid; 2, arytenoid; 3, corniculum laryngis; 4, arytenoideus muscle. (Luschka.)

The upper is somewhat convex except for a well-marked concavity near the superior cornu. The posterior extends above into a long delicate process, the superior cornu, which gives attachment at its extremity to the thyro-hyoid ligament, and terminates below in a short and thick process, the inferior cornu, presenting on the inner side a small oval facet which articulates with the side of the body of the cricoid. The lower border is nearly straight and is notched near the inferior cornu. It gives attachment anteriorly to the crico-thyroid membrane and laterally to the crico-thyroid muscle.

The Cricoid Cartilage, much thicker and stronger than the thyroid cartilage, forms the lower and greater part of the posterior portion of the larynx. The anterior portion is rounded and convex in shape and measures vertically about one-fifth of an inch. The external surface at the front and sides is smooth and gives attachment to the crico-thyroid muscles and inferior pharyngeal constrictors. Posteriorly, it rises until its vertical diameter is about three times that of the anterior portion.

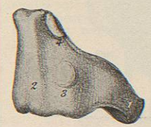

Fig. 3107.—Lateral View (right side) of the Cricoid Cartilage. 3, Articular surface for the inferior cornu of the thyroid; 4, articular surface for the base of the arytenoid. (Luschka.)

It also increases in thickness and forms the signet portion of the ring. This shows a depression near the middle on the superior border, on either side of which, looking upward and outward, is an elongated, oval and slightly convex facet for articulation with the arytenoid cartilages. At the middle of the posterior surface is a slight vertical ridge to which are attached a few of the longitudinal fibres of the œsophagus. On either side of this are depressions which are occupied by the posterior crico-arytenoid muscle; and just outside of these are the slightly raised oval facets for articulation with the inferior cornua of the thyroid cartilage. The whole interior surface is smooth and covered with mucous membrane.

The Arytenoid Cartilages, two in number, are situated at the posterior superior portion of the larynx, and are the most active of all the cartilages in tuning the larynx for the production of sound. To them are attached the vocal cords and all of the muscles controlling their movements except the crico-thyroid. In shape they are three-sided pyramids and are about half an inch high and one-fourth of an inch wide. They articulate near the outer portion of the base with the facets on the superior surface of the cricoid, and their inner surfaces are nearly parallel. At each apex is situated the cartilage of Santorini. The inner surface, which is the narrowest of the three, is triangular in shape and nearly flat. It is covered with mucous membrane. The anterior surface has a triangular ridge at the junction of the lower and middle thirds, above and below which are concavities. Near the inner end of this ridge

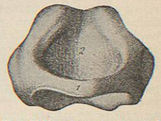

Fig. 3108.—Anterior View of the Cricoid Cartilage. 1, The anterior arch; 2, the posterior arch. (From Luschka.)

is attached the ventricular band. The thyro-arytenoid muscle is attached to the rest of the surface. The posterior surface is triangular, broad, and concave from above downward and gives attachment to part of the

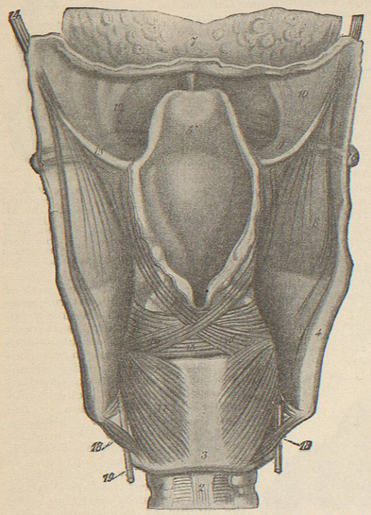

FIG. 3109.—Posterior View of the Larynx. The pharynx and mucous membrane are removed. 1, Trachea; 2, posterior crico-tracheal ligament; 3, cricoid; 4, posterior border of the thyroid; 5, epiglottis; 6, great cornu of the hyoid bone; 7, root of the tongue; 8, thyro-hyoid; 9, hyo-epiglottic membrane; 10, hyoglossal membrane; 11, middle glosso-epiglottic ligament; 12, lateral glosso-epiglottic ligament; 13, pharyngo-epiglottic fold; 14, stylo-laryngeus muscle; 15, arytenoideus muscle; 16, 16, crossing bundles of the arytenoideus (*constrictor vestibuli laryngis*); 17, posterior crico-epiglottideus muscle; 18, 18, a few slender bundles, crico-thyroideus, posticus, or kerato-cricoideus of Merkel; 19, inferior laryngeal nerve. The aryepiglottic folds are seen reaching from the sides of the epiglottis to the arytenoid eminences, and bounding the superior orifice of the larynx, the *vestibulum laryngis*. (Luschka.)

arytenoid muscle. The whole base is slightly concave, with a smooth, more marked concavity near the outer portion for articulation with the cricoid cartilage. The anterior angle extends into a horizontal process (the vocal process), to which the vocal cord of that side is attached. The external angle, which extends outward and backward, forms a short and rounded process (the muscular process), to which are attached the posterior and lateral crico-arytenoid muscles.

The Epiglottis is a thin leaf-like cartilage which is attached to the inside of the thyroid cartilage just below the superior median notch. It is inside of, and attached to, the body of the hyoid bone. During respiration it is nearly vertical, but during deglutition as the larynx is drawn upward it drops backward and more or less completely closes the laryngeal opening. The anterior surface is covered by mucous membrane which is reflected on to the sides and base of the tongue, forming the lateral and median glosso-epiglottidean ligaments. The posterior surface is concave from side to side and convex from above downward. There are numerous small pits, sometimes perforating the cartilage, which lodge small glands. The mucous membrane is smooth and at the sides forms the aryteno-epiglottidean folds.

The *cartilages of Santorini*, two small conical nodules of fibro-cartilage, articulate with the tip of the arytenoid cartilages and are sometimes firmly united to them. The aryteno-epiglottidean folds are attached to these cartilages and enclose the *cartilages of Wrisberg* at a short distance in front of this attachment. These latter cartilages give rise to the elevations which are plainly seen in the laryngeal image.

Ligaments.—The cartilages of the larynx are bound together and to the hyoid bone above, and the trachea below, by fibrous bands and membranes. The thyroid cartilage is attached to the hyoid bone by a broad central membrane and two lateral rounded ligaments. The thyro-hyoid ligament is a broad fibrous and slightly elastic membrane, thick in the middle where it is subcutaneous, and thin and loose at the sides where it is pierced by the superior laryngeal vessels and nerve. It is attached below to the whole upper edge of the thyroid cartilage, and above it passes behind the posterior surface of the hyoid bone, being separated from it by a synovial bursa, to be attached to its upper surface. This allows the larynx to be drawn upward within the hyoid bone. The lateral thyro-hyoid ligaments are two rounded elastic cords just back of the middle ligament. They connect the superior cornua of the thyroid cartilage with the extremities of the great cornua of the hyoid bone.

The epiglottis is connected with the receding angle of the thyroid cartilage by a long rounded bundle of fibro-elastic tissue, the thyro-epiglottic ligament. It is also attached to the hyoid bone by a fibro-elastic membrane extending from near the apex of its anterior surface to the upper surface of the body of the hyoid bone. There are two lateral folds and one median fold of mucous membrane, already mentioned, which attach the epiglottis to the base of the tongue.

The crico-thyroid membrane and two capsular ligaments bind the thyroid and cricoid cartilages together. The crico-thyroid membrane, triangular in shape, is thick in front where it joins the cricoid and thyroid cartilages, and thin at either side where it extends from the cricoid cartilage to the inferior margin of the true vocal cords, and is joined with them at their anterior insertion into the thyroid cartilage. Anteriorly the crico-thyroid membrane is subcutaneous and is crossed horizontally by a small arterial branch which forms an anastomosis between the crico-thyroid arteries of either side. At the sides the crico-thyroid membrane is covered by the crico-thyroid and crico-arytenoid muscles. The capsular ligaments are lined with synovial membrane, and bind the articulations of the inferior cornua of the thyroid with the sides of the cricoid cartilage. A loose capsular ligament lined with synovial membrane and strengthened posteriorly by a strong band, the posterior crico-arytenoid ligament, connects the arytenoids with the cricoid cartilage.

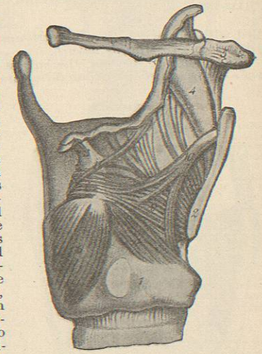

FIG. 3110.—Right Lateral View of a Dissected Larynx. The ala of the thyroid is removed. 1, Cricoid; 2, thyroid; 3, arytenoid; 4, epiglottis; 5, hyoid bone; 6, posterior crico-arytenoid muscle; 7, aryteno-epiglottideus muscle; 8, the lateral crico-arytenoideus; 9, thyro-arytenoideus. The other fibres, seen running in various directions, are inconstant in their distribution. (After Luschka.)

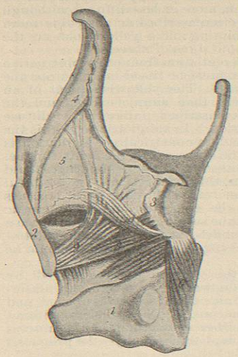

FIG. 3111.—Lateral View of the Laryngeal Muscles. 1, Cricoid; 2, thyroid; 3, arytenoid; 4, epiglottis; 5, elastic membrane of the larynx; 6, posterior cricoid-arteneid; 7, lateral crico-arytenoid; 8, thyro-arytenoid; 9, thyro-epiglottideus; 10, fine fibres spreading out in the elastic membrane (*arymembranosus*). (Luschka.)

Muscles. — The larynx as a whole is moved and also fixed in its varying positions by muscles which attach it to the hyoid bone above, the sternum below, and the region of the fourth and fifth cervical vertebræ behind. It is elevated principally by the thyro-hyoid muscle and depressed by the sterno-thyroid; and the two muscles, acting at the same time, tend to hold it firmly in a fixed position.

There are also some muscular fibres, forming the so-called laryngo-pharyngeal muscle, which are attached to the posterior border of the thyroid cartilage and pass backward around the pharynx to be inserted into the vertebræ behind. The sterno-hyoid, the omo-hyoid, the two lower constrictors of the pharynx, the stylo-pharyngeus, and the palato-pharyngeus also act more or less upon the larynx as a whole. The thyro-hyoid is a small quadrilateral muscle arising from the lower border of the body and greater cornu of the hyoid bone and is inserted into the oblique line on the ala of the thyroid cartilage; and the sterno-thyroid has its upper attachment to this same oblique line and is attached below to the posterior surface of the manubrial portion of the sternum, below the attachment of the sterno-hyoid. The middle thyroid vein is situated along its inner border.

The muscles which change the shape of the larynx and act directly upon the vocal cords are the crico-thyroid, the crico-arytenoideus posticus, the arytenoideus lateralis, the arytenoideus, and the thyro-arytenoideus.

The crico-thyroid, a short triangular muscle, is attached below to the anterior and lateral portion of the cricoid cartilage. From this the fibres pass upward and outward and divide into two bundles, the anterior being attached to the inner lower margin of the thyroid cartilage and the posterior to the anterior border of the lower cornu. Whether this muscle depresses the thyroid or elevates the cricoid it increases the length and tension of the vocal cords. The posterior crico-arytenoid muscle is attached to the muscular process of the arytenoid cartilage behind that of the lateral crico-arytenoid. The fibres spread like a fan, the upper nearly horizontal and the lower nearly vertical, and are attached to the broad depression on the posterior surface of the cricoid cartilage. This muscle draws the muscular process of the arytenoid backward and inward, and thus by rotating the vocal processes outward widens the rima glottidis. The lateral crico-arytenoid, from its attachment to the muscular process and adjacent part of the anterior surface of the arytenoid cartilage, spreads out and passes downward and forward to be attached to the upper slanting surface of the cricoid cartilage as far back as the articulation of the arytenoid. The action of this muscle is to draw the muscular process of the arytenoid forward and downward and, by rotating the vocal process inward, to approximate the vocal cords. The action of this muscle is antagonistic to that of the posterior crico-arytenoid, and when the two act simultaneously the arytenoid is not rotated but is drawn inward and the glottis is narrowed.

The arytenoideus is a single muscle which passes between the posterior outer borders of the arytenoid cartilages. The deep fibres are transverse but the superficial pass obliquely from the base of one to the apex of the other arytenoid. Some of these fibres pass around the cartilages and join with the fibres of the thyro-arytenoid or the aryteno-epiglottic muscle. The arytenoideus draws the bases of the arytenoid cartilages together.

The thyro-arytenoid muscle contains both longitudinal and transverse fibres and is made up of internal and external portions which are sometimes described as two distinct muscles. The long fibres of the inner portion arise in front from the receding angle of the thyroid cartilage, a few sometimes from a nodule of fibrous tissue in the anterior portion of the cord, the cartilage of Luschka. They pass backward with a slight outward curve and are attached to the whole length of the vocal process and adjacent outer surface of the arytenoid. The whole inner border is attached to the vocal cord. The outer portion arises from the thyroid cartilage near that of the inner, and also from the crico-thyroid membrane. Some of the fibres pass backward and are inserted into the lateral border and muscular process of the arytenoid cartilage, others pass obliquely upward to the aryteno-epiglottidean fold, and still others pass vertically in a thin layer around the ventricle and sacculus, ending in the false cord. There is one set of fibres which pass from the anterior attachment outward around the sacculus laryngis and are inserted into the side of the epiglottis. On account of the various directions and attachments of this muscle its action is rather complicated. The longitudinal fibres of the inner portion tend to bring the edges of the vocal cords together, while the short oblique fibres tend to tighten them.

The Blood Supply.—The superior thyroid artery gives off a branch, the superior laryngeal, which passes with the

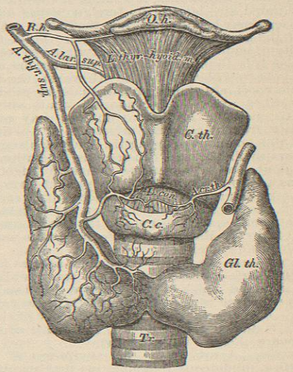

FIG. 3112.—Arteries of the Larynx. (From Luschka.) *C. th.*, Thyroid cartilage; *Gl. th.*, thyroid gland; *Tr.*, trachea.

superior laryngeal nerve between the great cornu of the hyoid bone and the thyroid cartilage through the thyro-hyoid membrane, and supplies the structures of the anterior superior portion of the larynx. The inferior laryngeal artery also arises from the superior thyroid,

near the lower border of the thyroid cartilage. It divides into two branches, one anastomosing with its fellow of the other side and the other with branches of the superior laryngeal. The posterior laryngeal artery, a branch of the inferior thyroid, passes with the recurrent laryngeal nerve; it then divides, near the crico-arytenoid articulation, into two branches which anastomose with branches of the superior laryngeal artery.

The laryngeal veins are associated with the arteries and empty into the internal jugular through the superior, middle, and inferior thyroid.

Lymphatics.—The lymphatics may be divided into two sets. The upper pierce the thyro-hyoid membrane and empty into the glands located near the bifurcation of the common carotid artery. The lower, after piercing the crico-thyroid membrane, end in glands in front of this membrane or at the side of the cricoid cartilage.

Nerves.—The pneumogastric nerves, joined by sympathetic fibres, give off the superior laryngeal nerves, which supply the mucous membrane, the crico-thyroid muscles, and a part of the arytenoideus muscle, and the inferior laryngeal nerves which supply all of the other muscles of the larynx. *Edgar M. Holmes.*

LARYNX, DISEASES OF: ABSCESS.—Abscess of the larynx is a circumscribed collection of pus due to an inflammatory process which has developed principally in the submucous tissue. *Laryngitis submucosa acuta* may culminate, aside from abscess, in either acute œdema of the larynx or in diffused phlegmonous infiltration, and when abscess is present these conditions to some degree are usually associated with it. Very rarely is there more than one abscess. Both acute and chronic suppuration may also be dependent upon perichondritis and its various constitutional and local causes, but this type of abscess will be reserved for consideration in connection with the subject of perichondritis.

Etiology.—Any of the causes of acute laryngitis, any exposure leading to infection, can by a more intense action involve the submucous tissue. It is probable, however, that the microbic invasion which is incidental to "taking cold," vocal abuse, inhalation of steam, smoke, or badly vitiated air, damage by foreign bodies and corrosive poisons, may be different from that which occurs with some of the graver forms of laryngitis. Thus, from the similarity of acute phlegmonous laryngitis to recognized erysipelas it is thought that the streptococcus erysipelatis may be responsible for it. However, the ordinary pyogenic cocci are doubtless adequate to produce the circumscribed abscess. Secondarily, acute submucous laryngitis, possibly leading to abscess, may result, by contiguity, from neighboring infections, *e.g.*, peritonsillar abscess, phlegmonous pharyngitis, Ludwig's angina, etc. It follows syphilitic and tuberculous ulceration of the larynx doubtless by secondary pyogenic infection. It occurs as a serious complication of typhoid fever, typhus fever, septicæmia, ulcerative endocarditis, erysipelas, smallpox, scarlet fever, and measles. It is liable to follow contusions and fractures of the cartilages due to external injury. Marked systemic depression and sepsis are predisposing conditions.

Pathological Anatomy.—When an abscess forms on the lingual surface of the epiglottis it extends to the valleculæ, in one of which it may rupture. It does not extend over the free edge of the epiglottis to the laryngeal surface. It may point externally at the side of the neck. When it is due to perichondritis, fragments of necrotic cartilage are likely to be exfoliated.

Symptoms.—Apart from the symptoms of simple laryngitis a submucous inflammation first manifests itself by increasing dyspnœa. The formation of an abscess is indicated by tenderness to pressure and by severe pain on swallowing and speaking. If the abscess is on the lingual surface of the epiglottis there may be no dyspnœa, only very painful dysphagia; if it is on the aryepiglottic fold the dyspnœa may be only inspiratory. If the abscess is within the larynx and is not opened, it is likely to cause suffocation; but it may burst spontaneously. The development is sometimes quite gradual, or again the suppuration may culminate within a very few days. The temperature varies with the extent of inflammation and with the nature of the underlying affection.

Laryngeal Image.—At first the appearance is that of submucous inflammation, more or less diffused, although if the inflammation is circumscribed an abscess is more strongly indicated. Pointing and a yellow color are the only certain laryngoscopic signs of abscess.

Diagnosis.—The differentiation from other obstructive conditions of the larynx must be based largely upon the laryngoscopic appearance. The yellowish point of an abscess is less translucent than simple œdema and the swelling tends to be circumscribed, unlike that of diffuse phlegmonous inflammation. In subglottic laryngitis the swelling is bilateral and symmetrical. Fluctuation is discernible only when the abscess is at the radix linguæ. Severe pain indicates an abscess, but perichondritis should also be remembered in this connection. In doubtful cases an exploratory puncture with a laryngeal lancet is justified. In children the epiglottis and aryepiglottic folds can be palpated, thus serving to exclude an abscess of these parts or to establish its exact location. Retropharyngeal abscess pressing upon the larynx should be kept in mind.

Prognosis.—In all the thirteen cases observed by Mackenzie, the symptoms were very severe, but all terminated in recovery; in nine the abscess was opened, and in four it burst spontaneously. Nevertheless, without surgical interference—either evacuation of the abscess or when necessary a prompt tracheotomy—the prognosis would be grave.

Treatment.—While the disease is still in the stage of *laryngitis submucosa acuta*, appropriate measures to prevent the possible formation of an abscess are absolute rest for the voice and cold applications. Cold wet cloths frequently reapplied may be used externally, and cracked ice may be dissolved in the mouth. Cold applications, however, should not be indefinitely prolonged. When suppuration is obviously imminent hot applications are more comforting. If œdema is a marked feature scarification is usually recommended, but the benefit is slight. A four-per-cent. cocaine spray affords temporary relief by causing the œdematous tissue to shrink. The atmosphere should be kept moist. The abscess when formed should be opened under laryngoscopic observation by means of a laryngeal lancet. When it is very large, care should be taken not to evacuate it too rapidly as there is danger of suffocation by inspiration of the pus. If there is pronounced dyspnœa and evacuation of the abscess is not feasible, the only efficient resource is tracheotomy. This should not be too long delayed, on account of the danger of fatal congestion of the lungs secondary to stenosis of the larynx. Intubation is not a satisfactory substitute for tracheotomy in these cases. *W. E. Casselberry.*

LARYNX, DISEASES OF: ACUTE LARYNGITIS.—(Synonyms: Acute laryngeal catarrh, pseudo croup, laryngorrhœa, mucous laryngitis, and sore throat.)

Definition.—Acute laryngitis is an acute inflammation of the mucous membrane lining the larynx, characterized by a moderate degree of exudation, with or without some slight febrile disturbance. The characteristics of the disease in children differ somewhat from those of the adult, but these variations are not sufficient to require the separate study of the two classes, and they will therefore be considered here under a common title. In the adult acute laryngitis seldom threatens life, although the dyspnœa and loss of voice are often unduly alarming to the patient. In childhood the disease occurs in three different forms, the mild, the severe, and the grave.

Etiology.—The most common predisposing cause is some pathological condition of the nose or naso-pharynx, the occasional or continued mouth-breathing which accompanies these inflammations of the upper air tract, rendering the larynx sensitive to the more immediate causative factors. The laryngeal mucous membrane in these cases of improper breathing is subjected to more

irritation than is its due by the dry and unfiltered air which passes over it, and this induces a more or less severe chronic inflammation in this locality; and the various exciting causes of laryngitis then find a ready soil in the existing chronically inflamed membrane. The disease occurs more often in males than in females, and more often in adult life than in childhood. It is more apt to be grave in children, and in them occurs oftenest between the ages of two and four years and with equal frequency in the children of either sex. Amongst the immediate causes of acute laryngitis are exposure to cold, depressed general vitality, inhalations of irritating dust, vapors, steam or gases; the dust from our modern asphalted streets, the vapors of chlorine, iodine, ammonia, or sulphur, and the excessive use of alcohol are exciting causes. Overtaxing the voice by public speaking, singing, or shouting is a common cause. Wetting of the feet may be rated as one of the most frequent causes. Previous attacks make the patient more liable to subsequent ones. Among the general causes may be mentioned rheumatism, the eruptive fevers, influenza, and hay fever. The introduction of drugs like the iodide of potassium into the general economy or the introduction of various irritating drugs locally into the larynx may bring on an attack.

Pathology.—The pathology is similar to that of inflammations of mucous membranes elsewhere, there being a primary hyperæmia with scanty secretion, the *dry stage*, and after that a second, or *moist stage*, caused by the pouring out of serum from the distended blood-vessels and the increased secretion of mucus from the glands. The desquamation of epithelial cells and the exudation of leucocytes give the whitish color and the tenaciousness to the secretions of the later stages. While there may be some desquamation of epithelium, there are as a rule no deeper destructive changes. The swollen membrane encroaches on the breathing space, thus interfering to some degree with the respiration, and the dry feeling of the early stages adds to the discomfort. The inflammation may be general or confined to certain localities. The interarytenoid commissure shows the most decided changes and the ventricular bands or aryepiglottic folds come next. These areas show more marked changes because of the loose attachment of the mucous membrane to the subjacent tissue in these regions, and also of the fact that the unusual mobility of the commissure favors desquamation of the epithelial cells. The submucous layers are not often affected, the inflammation being more commonly confined to the superficial layers, and so too the supraglottic region is more often affected than the subglottic—which is fortunate, as the subglottic variety is accompanied by grave symptoms. In children the pathological changes are exaggerated; the exudation, being more plastic, becomes almost pseudomembranous; and, owing to the relative smallness of the breathing space, respiration is more interfered with, this resulting in stridor and spasms of respiration, which add to the gravity of these cases. The mucous membrane of the epiglottis does not as a rule show marked inflammatory change, but in chickenpox yellowish vesicles may appear in this region, while in measles and Rötheln the mucous membrane partakes of the cutaneous characteristics. Stoerck described a "fissura mucosa" of the interarytenoid space which occurs when there is an erosion in this region, and the writer has seen at least two cases of this in which there was marked hemorrhage.

Symptoms.—The symptoms are somewhat more aggravated in childhood than in adult life. This is owing partly to the narrowness of the lumen in children, partly to the excess of lymph cells in their mucous membranes, and partly to the muscular deficiency which makes it more difficult for them to throw off the tenacious exudate. In the adult the chief complaint is the disturbance in vocalization, the voice becoming hoarse and husky or even completely lost, the degrees of loss depending upon the progress of the disease. Some tones can usually be elicited, but talking is difficult and requires a manifest effort. This is owing to the thickening and congestion of the mucous membrane which interferes with the proper approximation of the cords and with their resilience. The thickening of the arytenoid commissure and of the subglottic mucous membrane especially interferes with clear speech, and at times the ventricular bands may become so swollen as to lap over the true cords and add to the disturbance. It is possible that the loss of nerve tone also adds to the difficulty in controlling the muscles of speech, and at times too there seems to be an hysterical element in the exaggerated speech deficiency.

Cough is an occasional symptom of acute laryngitis. This is due to the swelling of the mucous membrane and the excessive secretion in the later stages, but severe coughing usually implies an extension of the disease to the subglottic region or to the trachea or bronchi. The cough is apt to be harsh, metallic, and irritating, and may be due to congestion in any of the four cough centres. There may be some distress in the larynx accompanying attempts to speak or upon coughing, but this is not marked as a rule. There is not apt to be tenderness or pain externally, and respiration in adults is little interfered with except when there is a concurrent œdema glottidis. Expectoration is scanty and serous at first, later becoming mucous and more copious and, when the bronchi are involved, muco-purulent and abundant. The constitutional symptoms when present are very mild in the adult, consisting of slight fever with possibly some anorexia, headache, and general malaise.

In children the supraglottic variety is similar to the acute laryngitis of adults, but the subglottic form is more serious. The first marked symptoms are more often those relating to respiration. This becomes spasmodic and there may even be attacks of suffocation. These suffocative or croupous attacks occur more often at night and imply subglottic inflammation. The first night attack is apt to be the most severe, and although there may be subsequent attacks on three or four succeeding nights, each is apt to be less severe than its predecessor. These night exacerbations are brought on by the mouth-breathing. In the subglottic form cough sets in earlier, it is croupy in character and is probably due to the approximation of two opposite portions of swollen subglottic mucous membrane. The cough is harsh, dry, and husky, even when the child is aphonic. Children subjected to these attacks are especially apt to have lymphatic enlargements in the naso-pharynx, or chronic inflammations of the nasal mucous membrane. One attack predisposes to another, and children are more apt than adults to have febrile disturbances.

Diagnosis.—The diagnosis is made from alterations in the voice, from the fact that the cough, if present, is dry, and not accompanied by secretion as in bronchitis, and from the absence of the constitutional symptoms present in syphilis, tuberculosis, etc. The most important aid to diagnosis, however, is the laryngeal image, by means of which laryngitis symptomatic of the more severe constitutional disturbances may be recognized or eliminated. This image can usually be obtained even in children. The writer has at times been enabled, in a child, to get a good laryngeal image with the largest size mirror, one inch and a half in diameter, when smaller sizes had failed. The laryngoscope reveals a generally red and congested mucous membrane, and this appearance is more marked in localities where the mucous membrane is loosely attached. The cords vary in color, they appear slightly thickened, and somewhat sluggish in their movements. The color of the mucous membrane varies from a delicate pink to a brick red, or a beefy color. The vocal cords may be pink or may show blood-vessels running over the elastic tissue or may be ecchymotic and show bleeding spots from the rupture of the capillaries due to coughing. This latter form is the so-called "hemorrhagic laryngitis." If the interarytenoid desquamation has been excessive a slit like a knife-cut may show in the median line, and this is apt to be found in cases of severe bleeding like the two referred to above. The fact that the vocal cords of public speakers are often habitually red must not be overlooked in making this