several of them, corresponding to the areas previously occupied by gummata. If neglected the inflammatory process may extend to the deeper-lying structures, and a perichondritis with subsequent abscess formation, necrosis of the cartilage and its exfoliation, may ensue. Perichondritis may, however, occur without ulceration. It is in this stage of ulceration that dangerous symptoms are apt to supervene. An œdema, either acute or chronic, may arise and produce symptoms of marked dyspnœa; or the exfoliated cartilage may obstruct the respiratory tract, or the loss of the cartilage—especially if it be a portion of the thyroid, cricoid, or arytenoid—may lead to such collapse of the larynx proper as very materially to interfere with respiration. The epiglottis may be involved to such an extent as to interfere with the process of deglutition and allow portions of food to enter the larynx. Fixation of one or both vocal cords, as a result of a perichondritis or chondritis, may lead in some cases to a narrowing of the rima glottidis and its consequent dyspnœa. Myopathic paralysis of the abductors is not of common occurrence but of very serious moment when present. Finally, hemorrhage may occur and may even result fatally, but, fortunately, this happens rarely.

Fig. 3147.—Acute Syphilitic Laryngitis. (Türck.)

The final step of the tertiary stage is that of cicatrization. The result of a healed syphilitic ulcer may present itself in many forms. The less extensive cicatrization is evidenced by a white stellate scar of varying extent. The results of ulceration and cicatrization of adjacent structures often lead to the epiglottis being bound down to the base of the tongue, or to the posterior or the lateral walls of the pharynx. Bands may be stretched across the lumen of the larynx and by their contraction lead to great distortion of its structures. Again, adhesions between the vocal cords may result in web-like bands which may involve the glottis to a greater or less degree. The cicatricial process may be so severe as simply to convert the larynx into a mass of cicatricial tissue with a small perforation in the centre acting as the glottis.

Subjective Symptoms.—In the secondary stage the subjective symptoms are usually those of a severe acute laryngitis: the voice is husky and even aphonic, there is moderate cough with expectoration of a small amount of tenacious secretion, and, if the epiglottis be involved, deglutition may be painful. In the tertiary stage the symptoms are more pronounced. The alteration in the character of the voice varies from a slight huskiness to complete aphonia. Dysphagia is apt to be a more frequent symptom in this than in the secondary stage, owing to the involvement of the epiglottis in the inflammatory and destructive processes. Occasionally food finds its way into the larynx when the epiglottis is involved in the destructive process, but it is astonishing how readily patients in whom the epiglottis is totally destroyed learn to swallow without food entering or obstructing the larynx.

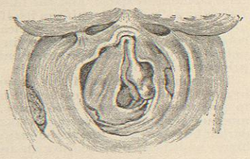

Fig. 3148.—Extensive Destruction and Cicatrization of the Epiglottis; Involvement of the False and True Vocal Cords; Stenosis of the Pharynx from Adhesion of the Epiglottis to the Root of the Tongue and Posterior and Lateral Walls of the Pharynx. (Türck.)

It is in the tertiary stage that sudden œdema is apt to supervene, and it may produce such grave symptoms of stenosis as to necessitate immediate tracheotomy. When a suppurative process is going on in the larynx there is apt to be marked general disturbance, the temperature rising to 102° or 103° F. Externally, the perichondritis or suppurative process may be marked by swelling and tenderness over the affected part, and with destruction of the cartilage and its exfoliation there is always danger of the exfoliated portion obstructing respiration. The breath, when the disease has reached such a stage, is usually very offensive; the expectoration is muco-purulent in character, sometimes tinged with blood, and it may contain fragments of necrotic tissue.

Diagnosis.—It is the diffuse laryngitis of the secondary stage that alone requires differentiating from the non-specific acute catarrhal laryngitis. Objectively, there may be at times, and especially when the inflammation is uniformly disposed, considerable difficulty in deciding which of the two conditions one has to deal with. Under such circumstances it will be found that the non-specific form of laryngitis will yield to the usual methods of treatment, whilst one should always be suspicious of a laryngitis which resists such treatment. A laryngitis which occurs in a tuberculous subject may also resist local treatment, but in this case there are marked pallor of the soft palate and an irritable condition of the posterior wall of the pharynx, and a careful examination of the patient's general condition and of the sputum will very

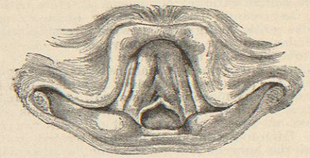

Fig. 3149.—Membranous Adhesion Between the True Vocal Cords. (Türck.)

materially aid in clearing up the diagnosis. It is, however, more in the ulcerative form of the disease that difficulties of diagnosis present themselves; the diseases from which syphilis of the larynx in this stage requires to be differentiated, being tuberculosis and carcinoma.

In tuberculosis the ulcers are apt to be numerous, the outline not so sharp or distinct, the edges less indurated, the surface not so deeply excavated, and the granulations pale and indolent-looking; the mucous membrane of the soft palate, pharynx, and larynx is distinctly pale; there is some general febrile disturbance (99⅘° to 101° F.) with increased rate of pulse: and the general appearance of the patient is commonly that of a person suffering from anæmia. Smears from the ulcerated areas will often reveal the presence of tubercle bacilli, and an examination of the expectoration will generally give a like result. It must be borne in mind that the two diseases may coexist; the ulceration, being originally syphilitic, may take on tuberculous action.

In carcinoma the difficulty of a differential diagnosis is much greater. Here a new growth precedes the stage of ulceration, and it is in this latter condition that the difficulty of a diagnosis so often arises. In carcinoma the disease presents itself more frequently as an ulcerating outgrowth, rather than as a true, deep, excavating ulcer such as is observed in syphilis. The ulcerating outgrowth has a more vascularized appearance and bleeds very easily on manipulation. The surrounding inflammatory area is of a much deeper color than that which is seen in syphilis. The progress of a carcinomatous ulcer is much slower than that of a syphilitic one. Other subsidiary points which are frequently considered in the question of a differential diagnosis, are:

the age of the patient, the presence or absence of enlarged glands, and the existence of pain. But, in the writer's experience, these afford very little support for either view of the case.

Microscopical examination of a portion removed is often doubtful in its results, but recourse should always be had to it, for occasionally it has given satisfactory aid. But the writer has, on the other hand, repeatedly subjected portions thus removed for examination with a very unsatisfactory result. This, however, may be explained by the fact that the portion removed has not been from the more deeply situated tissue. In doubtful cases, recourse to proper antisyphilitic remedies may clear up the difficulty, and yet one must not be too sanguine as to ultimate results, for the iodide of potassium has often the effect of producing absorption of the inflammatory products in cases of carcinoma and thus materially altering the picture presented. One is sometimes confronted with the further difficulty of finding the two diseases (syphilis and carcinoma) coexisting.

Prognosis.—The prognosis to be expressed in any given case of syphilis of the larynx depends upon: 1st, the absence of any other coexisting disease (tuberculosis and carcinoma); 2d, the extent of the existing lesions; and 3d, the faithfulness with which the patient will adhere to treatment and advice. In the secondary lesions recovery usually takes place without leaving any noticeable after-result. In the tertiary stage, when ulceration is present, the progress is usually readily arrested and the function of the larynx interfered with only so far as the destructive process has extended. When cicatrization has occurred very little improvement is to be expected from treatment.

Treatment.—The treatment of syphilis of the larynx is similar to that of syphilis affecting other parts of the body. In the secondary manifestations mercury, exhibited by the process of inunction, furnishes by far the most satisfactory results. It must be admitted that at times it is very difficult to carry out this mode of treatment with any degree of thoroughness; and yet, unless this be done, one can scarcely hope to secure very satisfactory results. The details of this method of treatment will be found in the general article on *Syphilis*.

Locally, alkaline sprays, such as Dobell's and Seiler's, and sedative inhalations (compound tincture benzoin) are indicated, and, after the subsidence of the acute stage, applications of weak solutions (gr. xx.–xxx. to the ounce) of nitrate of silver may be applied to the larynx. In the tertiary manifestations (gummatous and ulcerous infiltration) iodide of potassium in increasing doses is indicated. The writer's method of giving it is in a saturated solution (one ounce of the iodide to one ounce of water), each drop of which approximately represents one grain of the iodide. It is well to begin with small doses, ten drops, to be taken in half a tumblerful of water three times a day *before* meals. It is to be noted that most physicians prescribe the iodide after meals, and this is the reason, the writer thinks, why one frequently hears the complaint that the iodide disagrees with the patient, producing symptoms of indigestion. And so it does, for the iodide of potassium given after meals neutralizes to a very great extent the action of the gastric juice. The writer has repeatedly met with patients who have made such complaints, and, upon their taking the iodide before meals, not only did they find that it agreed with them but they were able to take it in much larger doses. The quantity of the iodide should be slowly increased, and, if we watch its effect upon the ulceration or the gummatous condition, we may find it necessary to increase the dose to gr. l. or lx. three times a day. The chief points in the administration of this drug for syphilitic affections are, that it should be taken before meals and that it should be largely diluted. The acne accompanying the use of the iodide may be moderated by the administration of small doses (♏ i.–iij.) of Fowler's solution after meals.

Locally, cleansing the ulcerated area with alkaline and antiseptic sprays and the subsequent application of a solution of nitrate of silver (gr. xx. or xxx. to the ounce), or the insufflation of iodoform or iodol, will very materially assist in the healing process and moderate the offensiveness of the breath. Vegetations may require the use of the curette, forceps, galvano-cautery, or chromic acid, to hasten their disappearance. Neither general nor local treatment avails when fibroid changes with extensive hypertrophy have already taken place. The local treatment of adhesions and of fibrous bands or membranes, and of stenosis of the larynx, is dealt with in the preceding article, to which the reader is referred.

When syphilis and tuberculosis coexist it is generally agreed that the syphilitic element should first receive treatment. In all forms of syphilis of the larynx smoking and the use of alcohol in any form should be prohibited.

Syphilis of the Trachea and Bronchi.

The trachea and bronchi are less frequently involved in the syphilitic process than are the upper portions of the

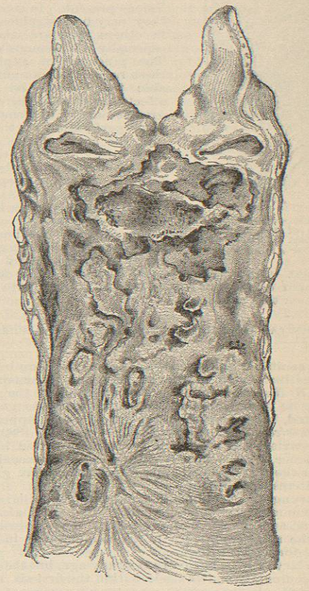

Fig. 3150.—Extensive Ulceration and Cicatrization of the Larynx and Trachea. (Türck.)

respiratory tract. It is rare to find these regions involved without existing lesions in the remaining portion of the respiratory tract, for usually the conditions here found are extensions of the process existing above. Mucous patches have occasionally been met with and may be found situated in any portion of the trachea. Gummata, in the writer's experience, are more frequently met with; they are usually single, although occasionally several

are present at the same time. As regards the situation occupied by these lesions, I may say that those which I saw (three cases) were located on the posterior wall of the trachea. They vary in size and to such a degree that in some cases they may produce no symptoms at all, while in others they may give rise to the symptoms of increasing stenosis. In the ulcerative stage the lesions may, as in the case of the gummata, be multiple, but usually they are single and very extensive, as seen in the accompanying figure (Fig. 3150). Cicatrization is also apt to be extensive, the affected areas assuming a great variety of shapes.

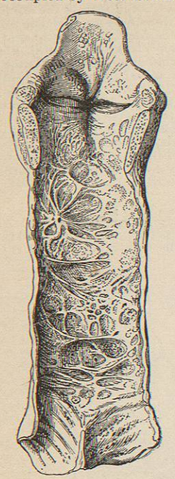

FIG. 3151.—Syphilitic Cicatrices of the Larynx and Trachea. (Orth's "Pathologische Anatomie.")

The *symptoms* depend upon the nature and extent of the lesions present. In some cases they may be insignificant, but in others they are alarming, especially when stenosis exists. The *prognosis* of syphilis in these regions is more unfavorable than when the disease affects the larynx, there being greater danger of hemorrhage from perforation of the ulcer into the aorta or the pulmonary artery. Perforation has also taken place into the mediastinum or into the œsophagus. When stencsis exists as the result of cicatrization the outlook is very grave.

The *treatment* resolves itself into that of syphilis in general. Local treatment cannot be carried out with any degree of certainty. The surgical treatment of stenosis of the trachea is dealt with in the article on that subject.

Congenital Syphilis of the Larynx, Trachea, and Bronchi.

Congenital syphilis of these regions has long been recognized but in an indifferent way, and it remained for John N. Mackenzie to draw the attention of the profession to its more frequent occurrence than was generally admitted, by a most scholarly article which appeared in the *American Journal of the Medical Sciences* in 1880. And, as the writer has seen only seven cases within his own experience, he has largely drawn upon Mackenzie's paper for the full and elaborate information there given of this interesting subject.

"Laryngeal affections in congenital syphilis are the most common and characteristic of its pathological phenomena, and invasion of the larynx may be looked for with the same confidence in the congenital as in the acquired form of the disease."

The larynx may be involved at any age, but the disease more commonly shows itself within the first six months after birth. In the writer's cases the ages were as follows: Two within the first year, three between the ages of four and five years, and two between the ages of six and ten years. As to sex, it is more frequently met with in the female—in the proportion of three to two (Mackenzie). In the writer's cases, four were females and three males. In congenital syphilis of the larynx three distinct forms are to be met with: In the first, the lesions involve the mucous membrane and the submucosa; in the second, the lesions involve the deeper structures, and are characterized by extensive ulceration rapidly involving the cartilaginous framework of the larynx; in the third form, there is a deposit of dense, fibrous tissue leading subsequently to contraction and stenosis.

Symptoms.—In the early manifestations of the disease the subjective symptoms are those of an intense laryngitis, the voice being quite hoarse, and in two of the writer's cases, seen in infancy, nothing more than a very marked hyperæmia of all the laryngeal structures was observed, the examination being carried out under a general anæsthetic. The coexistence of cutaneous syphilis is of frequent occurrence. In the secondary stage the presence of extensive ulceration involving the epiglottis and laryngeal structures leads to the cry of the child being extremely hoarse and more deeply pitched than in the early stages. The cough is harsh and paroxysmal, leading frequently to an attack of vomiting, and deglutition is often difficult. In the third variety the voice is almost aphonic, and, in consequence of the lumen of the larynx and trachea being considerably reduced, there is marked respiratory difficulty, amounting in some cases to orthopnœa, cyanosis, and convulsions. The degree to which stenosis of the trachea may reach in this form is well shown in the accompanying figure taken from a specimen in the Museum of the Medical Faculty of McGill University (Fig. 3152).

Diagnosis.—In the early forms of the disease it may be mistaken for simple laryngitis, but often there are other symptoms of the inherited form to be seen in the skin and mucous membranes of the mouth and throat. In the more advanced form the evidence of the disease may be found in the state of the teeth, the condition of the eyes, and the presence of cicatrices about the angles of the mouth.

Prognosis.—The prognosis of congenital syphilis of these regions is always grave, but less so in the earlier stages, when, if the affection be recognized and treated, favorable results may be looked for. In the later forms of the disease, however, even when its true nature is recognized, the treatment seems to produce less effect than it does in the acquired form.

Treatment.—The best method of treating these forms of infantile syphilis is by the use of the mercurial ointment. A small quantity of this may be applied on the walls of the abdomen, and a small flannel binder also containing a small quantity of the ointment may be applied about the body. One must be careful in using mercurial ointments on the skin of very young infants, as, owing to its being particularly sensitive, the application may do harm. Calomel, gr. ¼, three times a day for

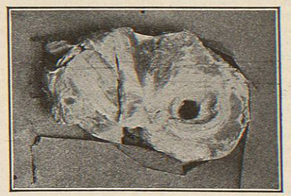

FIG. 3152.—Congenital Syphilis of the Trachea, showing very marked Stenosis. (Pathological Museum, McGill University.)

several weeks; pulv. hydrargyri cum creta, gr. ¼–½, may also be given. General tonic treatment should follow a course of mercury. *Herbert Stanley Birkett.*

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LARYNX, DISEASES OF: TUBERCULOSIS.—Definition.—Tuberculosis of the larynx is a disease characterized by an infiltration, into the mucous membrane of the larynx, of newly formed cells among which are to be found tubercle bacilli, and frequently by the breaking down of the tubercle and the formation of ulcers. The disease may involve the perichondrium and cartilage, resulting in caries and necrosis of these structures.

History.*—Ulcerations on the larynx were first definitely described by Morgagni[1] and subsequently researches were made by Petit,[2] Sauvée,[3] and others. The close relation, however, existing between laryngeal and pulmonary phthisis was not clearly established until 1825, when Louis[4] made public his famous contribution. In this treatise Louis laid special emphasis on the point that "ulcerations of the larynx, and especially those of the trachea and epiglottis, must be considered as lesions of phthisis." The acceptance of so broad a statement as this necessarily led to many errors of diagnosis and much confusion, which, however, were cleared up by the publication, two years later, of the results of the investigations of Trousseau and Belloc,[5] who showed the existence of three kinds of ulcerations in the larynx, viz., those caused by syphilis, tuberculosis, and cancer respectively.

With the settlement of the clinical status of laryngeal phthisis as an ulcerative process belonging to the tuberculous dyscrasia, and entirely distinct from syphilis and other diseases, there sprang up a new topic for dispute, viz., as to the tuberculous or non-tuberculous character of the disease. Louis[4] denied the existence of tubercle in the affection, taking the ground that the ulcerations in the larynx were due to the corroding action of the discharges from the diseased lung passing over its surface. Trousseau and Belloc,[5] on the other hand, believed that there were deposits of true tubercle in the laryngeal membrane which gave rise directly to the ulcerative process, although they acknowledged that their researches had failed to discover them.

The teaching of Louis as to the non-tuberculous character of the disease was followed by that of Andral,[6] Cruveilhier,[7] Rhule,[8] and others. The tuberculous character of the disease was asserted by Barth[9] and Lhéritier,[10] in France, and by Rokitansky,[11] Günsberg,[12] Tobold,[13] and Virchow,[14] in Germany. The latter, in giving the weight of his great name in favor of the tuberculous theory, recommends the larynx for the study of those who "wish to know the true tubercle," and in a later contribution[15] writes: "I am absolutely convinced that laryngeal phthisis is due to tuberculization of the larynx."

The later and very painstaking investigations of Heinza,[16] supplemented by those of Eppinger,[17] have been so thorough and so exhaustive that they have received very general acceptance as settling this vexed question in favor of the view which traces the origin of the disease to a direct deposit of true tubercle.

We thus reach the conclusion that laryngeal and pulmonary phthisis are one and the same disease, and yet the tuberculous process shows marked differences in its manifestations and development in the two regions. This difficulty, however, has been very ingeniously overcome by Virchow,[14] who explains that a superficial deposit of miliary tubercle in a membrane exposed to injury is very liable to break down early and to change into an ulcerative process before the more advanced or caseous changes have had time to set in.

Etiology.—Laryngeal tuberculosis is usually secondary to pulmonary tuberculosis. The disease is more common in males than in females, the proportion being about 3 to 1. The following table taken from Lake,[18] shows clearly the influence of age as an etiological factor:

Age.	Mackenzie.	Lake.	Total.
1 to 10 years	1	2	3
11 to 20 "	34	29	63
21 to 30 "	194	107	301
31 to 40 "	162	67	229
41 to 50 "	82	44	126
51 and upward	27	10	37

It will be seen that while a few cases occur under ten years of age, and a somewhat greater number between the eleventh and twentieth years, most occur between the ages of twenty-one and thirty; that in the period from thirty-one to forty the disease is very frequent and gradually diminishes in the next decade; while a few cases are seen beyond fifty.

Occupation has a marked influence upon the production of laryngeal tuberculosis. Those whose daily work brings them in contact with a considerable amount of dust which has to be inhaled—such as bakers, stone-cutters, and the like—are very prone to both pulmonary and laryngeal tuberculosis. The sedentary occupations also seem to predispose to involvement of the larynx. As a predisposing factor may be mentioned the fact that any chronic inflammation of the larynx, such as that which frequently accompanies chronic hypertrophic rhinitis or pharyngitis, is far more apt to result in the larynx becoming affected with tuberculosis in those individuals who already have the pulmonary form of this disease than in those whose lungs are healthy. It is probable that the cause of the involvement in these cases is a direct infection of the laryngeal mucous membrane by the sputum laden with tubercle bacilli which is brought up during the course of pulmonary tuberculosis. The thick folds in the mucous membrane often seen in chronic laryngitis, between the arytenoids and on the posterior wall of the larynx below the arytenoids, are favorable spots for the retention of tuberculous sputum. Maceration and softening of the epithelium and superficial ulcers resulting from such maceration are highly probable sources of infection. Any acute inflammation of the larynx occurring in a person having pulmonary tuberculosis is liable to result in superficial erosion of the epithelium, thereby affording a point of ingress for the tubercle bacilli. The ulcerations occurring in the course of syphilis of the larynx in a person afflicted with pulmonary tuberculosis are peculiarly liable to infection with the tubercle bacilli; in which case the so-called mixed infection will occur in the larynx.

Statistics vary considerably as to the frequency with which pulmonary tuberculosis is complicated with laryngeal tuberculosis. Most statistics are the result of observations made in dead-houses and come from the general hospitals in the larger cities of Germany where autopsies are made upon nearly all persons dying in these institutions. Thus Schroetter, in Vienna, found the larynx involved in only six per cent. of the cases, while Heinze, of Leipsic, found laryngeal involvement in fifty-one per cent. of the cases of pulmonary tuberculosis. Lake[18] claims that fifty per cent. of all cases of pulmonary tuberculosis have tuberculous involvement of the larynx. This percentage is somewhat higher than laryngologists generally are willing to admit, the greater number believing that the larynx is involved in only about one-third of the cases of pulmonary tuberculosis.

Much discussion has been going on as to whether the larynx is or is not the seat of a primary tuberculous lesion. It has not infrequently happened to me that the first evidence of the existence of tuberculosis in a patient has been discovered by my examination of the larynx and the finding of typical tuberculous laryngitis. In these cases it usually happens that the contemporaneous examination of the chest reveals pulmonary tuberculosis. In a few cases, however, it has not been possible to detect evidence of pulmonary disease for a period of several weeks following the diagnosis of laryngeal tuberculosis. This must not be taken as furnishing positive evidence that the larynx was the primary site of the infection, for we well

* This historical account is taken unchanged from the article on "Phthisis of the Larynx" in the first edition of this HANDBOOK.

know that it is often impossible for any physical examination of the chest to reveal the very earliest changes that occur in pulmonary tuberculosis. Then, again, the changes in breathing and the breath sounds due to the laryngeal involvement often mask the early physical signs of the pulmonary condition, which probably would have been noted had they not been changed as a result of the laryngeal involvement. However, a few cases of undoubted primary tuberculosis of the larynx have been reported. Thus, Fraenkel[19] reports a case of laryngeal tuberculosis with ulceration and tubercle bacilli in the sputum in which the autopsy revealed tuberculous ulcerations on the arytenoids and vocal cords of the larynx, while the lungs did not show any evidence of tuberculosis. Delio,[20] Avelus,[21] Germain Sée,[22] Aronson,[23] Moritz Schmidt, Rualt,[24] and Clark[25] have all reported cases of undoubted primary laryngeal tuberculosis.

I think, however, that great caution should be exercised in making a diagnosis of primary laryngeal tuberculosis unless there is—and remains for some little time after the diagnosis is made—an entire absence of evidence of tuberculosis in every other portion of the body.

Tubercle bacilli can gain entrance to, or infect, the laryngeal mucous membrane in one of three ways. 1. Through the lymphatics, and this is probably the most common way and accounts for the greater frequency of the disease upon the side of the larynx corresponding to the lung involved. 2. By deposit of the tubercle bacilli in the submucosa of the larynx as a result of their presence in the blood stream, originating probably in the passage of the blood through the lungs. 3. Infection through slight abrasions of the mucous membrane, more frequently, of course, from the tubercle-laden sputum, in the ulcerative stage of pulmonary tuberculosis, and occasionally from inhalation of dust contaminated with the tubercle bacilli and the deposit of these on the laryngeal mucous membrane.

Pathology.—The pathological changes occurring in the larynx may conveniently be divided into four heads: 1. Anæmia; 2. Hyperæmia; 3. Infiltration; 4. Ulceration.

1. *Anæmia.*—In very many cases the first change to be noticed in the mucous membrane of the larynx is an intense pallor. The vocal cords, ventricular bands, aryepiglottic folds, epiglottis, and as much of the tracheal mucous membrane as may be visible will be noticed to be extremely pale, almost bloodless. It is not uncommon to find over one or the other vocal cord, especially near the vocal process of the cord, a few dilated capillaries, the area adjoining them standing out quite pink in contrast to the rest of the mucous membrane. Such unilateral, localized engorgement of the blood-vessels in a pale mucous membrane in a person who has pulmonary tuberculosis is almost pathognomonic of a beginning tuberculous laryngitis. The pallor is probably due to secondary anæmia, for a quite similar pallor is frequently found in the mucous membrane of the soft palate and posterior pharyngeal walls.

2. *Hyperæmia.*—In a few cases an intense hyperæmia of the entire laryngeal mucous membrane has been observed as antedating the appearance of tubercle. In such cases which have come under my own observation the hyperæmia has resisted all methods of treatment which have been employed, and, when round-cell infiltration has later taken place, ulceration has followed very quickly, and the course of the disease, both pulmonary and laryngeal, has been one of extreme rapidity.

3. *Infiltration.*—The round-cell infiltration, with the formation of giant cells in the infiltrated area, is the commonest form of pathological change met with. The portions of the larynx involved are the posterior commissure of the larynx between the arytenoids, the vocal cords, the aryepiglottic folds, the ventricular bands, and the epiglottis. In the posterior commissure the infiltration produces a corrugated appearance of the membrane, and oftentimes the tissue is so heaped up as to present the appearance of a tumor which may be sufficiently large to hide entirely any view of the posterior portion of the vocal cords. The tumor may be of such size as to encroach markedly upon the lumen of the larynx and be a prominent factor in the dyspnœa from which the patient suffers. The mass is usually pale and somewhat irregular in outline.

Infiltration of the vocal cords may take place anywhere throughout their extent and may be unilateral or bilateral. The affected cord is usually deformed, the even contour of the inner border being replaced by a wavy outline. The infiltrated area in the acute form appears quite red, whereas in the more chronic forms it is pale in color.

The infiltration in the aryepiglottic folds is quite characteristic, and from it alone in many cases a diagnosis of laryngeal tuberculosis can be made. Both aryepiglottic folds are more frequently involved, although one may be involved to a greater extent than the other. The swelling has the characteristic pear shape, the bases of the swellings being situated over the arytenoids and the apices extending outward toward the epiglottis. There is considerable œdema of these folds, which in the stage of infiltration alone has a peculiar pale, translucent appearance in the majority of cases. It is very rarely that one finds this swelling of a bright-red appearance, as is met with in acute inflammation or in syphilitic involvement of the larynx. In a few cases small yellowish nodules can be seen studding the infiltrated area. These are either the result of an accumulation of retained secretion in the mucous glands found in this region, or else they are due to the presence of small miliary tubercles.

Infiltration into the ventricular bands may be accompanied by the same sort of pallor which is found in the aryepiglottic folds, or if ulceration is soon to make its appearance the mucous membrane may be quite red. The ventricular bands are often so swollen as to hide any view of one, or, if bilateral, of both vocal cords. When the mucous membrane of the ventricular bands of the larynx is involved, the swelling accompanying this infiltration may be so marked as to cause the appearance of prolapse of the ventricle with the appearance of two ventricular bands on that side.

The appearance of the epiglottis in the stage of infiltration is also quite characteristic. The swelling that occurs upon the free margin of the epiglottis gives it, when viewed in the mirror, that peculiar broad aspect known as the turban-shaped epiglottis. When the infiltration is great, it is often impossible, on account of the inability to draw the epiglottis forward, to get a view of any part of the larynx, except perhaps the region of the aryepiglottic folds. As in the case of infiltration of the aryepiglottic folds, small grayish-white nodules may sometimes be seen studding the infiltrated area, and these are either obstructed gland ducts or miliary tubercles.

4. *Ulceration.*—Ulceration is usually sooner or later found in nearly all cases of laryngeal tuberculosis. It is only occasionally that one finds, in the tumor-like infiltration that occurs in the interarytenoid commissure in chronic cases of pulmonary and laryngeal tuberculosis, that ulceration does not occur. The ulcers may, therefore, be found in any of the above regions in which we have described infiltration. The ulcerative process is very apt to occur at more than one part of the infiltrated area, and at first may present the appearance of several small superficial ulcers which rapidly break down and coalesce, thus producing one large ulcer, the outline of which is very apt to be irregular; hence the "mouse-nibbled" appearance that is frequently described as characteristic of these ulcers. They are usually superficial and covered with grayish-white exudate in the scrapings from which tubercle bacilli can almost always be found. Very rarely these ulcers undergo healing with loss of more or less tissue from the part they involved. Thus we have seen the greater portion of one vocal cord destroyed by this ulcerative process; the crico-arytenoid articulation may become destroyed, and the arytenoids are often lost, with ankylosis and consequent fixation of the vocal cords. The greater part of the epiglottis may be destroyed by the ulcerative process, which may later be arrested, leaving only a stump of the epiglottis remaining. When the

ulcerative processes—as they occasionally do—involve the perichondrium of the cricoid and thyroid cartilages, necrosis of these cartilages results and abscess in the neck may occur, with the formation of fistulæ leading to the larynx.

Symptoms.—The first symptom that is usually present in connection with laryngeal tuberculosis is hoarseness. Although the hoarseness may be the result of an acute laryngitis that is not tuberculous, yet in every patient with pulmonary tuberculosis, as soon as hoarseness manifests itself, a careful examination of the larynx should be made to determine its cause. The individual may speak clearly for a little while and suddenly become hoarse, and then, after he has uttered two or three words, and has perhaps cleared his throat, the voice may again become perfectly clear. When there is considerable infiltration of the tissue the voice may become aphonic or whispering. The changes in the voice may be due to one or more of the following conditions: 1. Mechanical interference with the action of the vocal cords, as when there is marked infiltration of the interarytenoid commissure and also when there is œdema of the aryepiglottic folds. 2. Infiltration of the vocal cords, causing unevenness in their contour and thereby interfering with their proper approximation during vocalization. 3. Thick, tenacious mucopus brought up from the lungs or derived from the laryngeal ulcers may be temporarily deposited upon the cords, thus interfering with their action; but when the throat is cleared, the removal of these permits of proper vocalization. The sudden alteration in the pitch of the voice that is so frequently noted in patients with tuberculous laryngitis, is most probably caused by the presence of mucus on the vocal cords. 4. The muscles of the larynx may be involved so that they are interfered with in contracting, and thus the proper approximation of the cords is prevented. 5. The recurrent laryngeal nerve on one or the other side may become implicated in the tuberculous process in the thorax and thus produce loss of innervation of the laryngeal muscles; paresis and then paralysis occur, interfering with the proper approximation of the vocal cords. When the right vocal cord is paralyzed it becomes so, most commonly, as the result of a pleurisy at the apex of the right lung, in which the right recurrent laryngeal nerve becomes embedded in the pleuritic exudate. Paralysis of the left vocal cord is more commonly due to intrathoracic pressure of the enlarged bronchial glands which are found at the root of the lung, upon this nerve as it winds around the aorta. 6. In advanced lesions of the lungs the volume of air contained in the thorax may be so much less than normal that, with the weakened condition of the muscular system generally, the blast of expired air is insufficient to cause the vocal cords to vibrate properly, and the voice, as a result, is weak and aphonic.

If the epiglottis or the aryepiglottic folds are involved, a feeling as if there were a lump in the throat, accompanied with difficulty in swallowing, is frequently complained of by the patients. When the disease process is limited to the interior of the larynx dysphagia is seldom complained of. When ulcerations appear—especially when the epiglottis or aryepiglottic folds are involved—dysphagia and odynophagia are very marked, so much so that it is only with difficulty that the patients can be coaxed to take any nourishment. Reflex pain radiating to the ear, root of the tongue, and sides of the pharynx often distresses the patient very markedly.

Other symptoms of which the patients are apt to complain, such as cough, fever, emaciation, night sweats, and profuse expectoration, are those which are found in all cases of puimonary tuberculosis; they may sometimes be intensified by the laryngeal condition, but are not peculiar to it.

Diagnosis.—The diagnosis of laryngeal tuberculosis is usually readily made. Examination of the larynx and the finding of such conditions as have been described under the heading of pathology, usually suffice to make one positive of the existence of this condition. The four diseases of the larynx which are accompanied by infiltration and ulceration are tuberculosis, syphilis, carcinoma, and lupus. The following table, modified from that arranged by Dr. J. S. Gibb, shows the main differential points between these.

Tuberculosis.	Syphilis.	Carcinoma.	Lupus.
Pain severe on deglutition	Pain usually slight	Pain constant, lancinating	No pain.
Favorite site in the interarytenoid space, and base of arytenoid cartilages.	Attacks any portion of the larynx.	Attacks any portion of the larynx.	Attacks epiglottis.
Ulcerates slowly	Ulcerates rapidly	Ulcerates more slowly than syphilis.	Ulcerates very slowly.
Usually first appears as small spots or nodules which are rapidly followed by great œdema.	Is rarely seen in stage of induration, the first evidence being a clear-cut, deep ulcer.	First appearance is that of a new growth occupying laryngeal cavity; no clear-cut ulcer.	Nodular mass.
Great œdema of arytenoids	Some induration around ulcer, but usually very little œdema.	The growth fills or encroaches upon the laryngeal cavity.	Little or no œdema.
Ulcers extend laterally but not deeply.	Ulcers extend deeply, often involving cartilage.	Growth extends in all directions, involving all tissue in its course.	Very slow in progress. Ulcers rarely observed.
Surface of ulcer covered with thick muco-purulent secretion and agglutinated mucus.	Surface of ulcer covered with muco-purulent secretion and necrosed tissue.	Surface of growth covered with discharge.	Little or no discharge.
Mucous membrane usually pale	Mucous membrane hyperæmic, injected.	Mucous membrane hyperæmic	Mucous membrane injected.
Laryngeal stenosis rarely occurs	Laryngeal stenosis uncommon until cicatrization occurs.	Laryngeal stenosis common	Slight stenosis.
Health impaired previous to laryngeal involvment.	General health unimpaired	Early in disease no impairment of general health. Later, marked cachexia.	Very little impairment of general health.
Previous or coincident pulmonary trouble common.	Frequently evidence of syphilitic disease in other tissues.	In primary laryngeal carcinoma no other evidences until later in the disease.	Frequently nasal, pharyngeal, and cutaneous manifestations.
Iodides have no influence	Readily improves under iodides	Iodides may at first have slight influence, later none, on the course of the disease.	Iodides have no influence.

Injection of a small amount of tuberculin, 1 to 5 mgm., hypodermically, is advocated by Dr. Trudeau as a means of differentiating laryngeal tuberculosis from other laryngeal infiltrations in cases in which a positive diagnosis cannot be made, especially when pulmonary tuberculosis cannot be certainly demonstrated. The patient's temperature should be taken every four hours for three days previous to the administration of the tuberculin, and again taken at the same intervals after the injection. A rise of temperature of two or three degrees indicates tuberculosis, and it will be noticed that the infiltrated area in the larynx will become hyperæmic and somewhat increased in extent if it is tuberculous.

Prognosis.—The prognosis in laryngeal tuberculosis depends on three things: (1) The character of the tuberculous process existing in the lungs; (2) the form in which the tuberculous involvement of the larynx manifests itself; and (3) whether the patient can put himself in the best hygienic surroundings and under the best and most skilful treatment.