always produces considerable stenosis of the rima glottidis. Less marked œdema, which for obvious reasons is more frequently met with, lessens the mobility of the arytenoid cartilages and vocal cords, particularly when the effusion is accumulated chiefly in the submucous tissue of these and the neighbouring parts. This slight partial œdematous infiltration is very often seen accompanying inflammatory ulceration.

Œdema of the larynx is invariably *secondary:* it appears as a complication of the most diverse forms of disease of the larynx (particularly perichondritis) and sometimes also of the pharynx. Sometimes, though on the whole rarely, it is connected with general nephritic and scarlatinal dropsy.—As dropsical effusions within the larynx, when they attain a certain intensity, always extend ultimately to the glottis, they are generally designated by the collective term *œdema of the glottis.*

Morbid Growths in the Larynx.

These are most commonly (in at least 75 per cent. of the cases) seated on the vocal cords, and are comparatively seldom seen at other parts of the larynx.

They may be arranged in two groups, according to their histological structure: the first includes those composed of elements which occur *normally* in the larynx, benign growths; the second those consisting of *heterogeneous* tissue elements, malignant growths.

To the *first* group belong the papillomata, fibromata, myomata, and cystic tumours of the larynx; to the *second* the different varieties of carcinoma.

The most common of the new formations developed within the larynx are the fibroid and papillary growths.

Fibroid laryngeal growths are of moderately firm consistence and, though occasionally sessile, are generally connected with the part from which they spring by a distinct pedicle. They are rounded or oval in shape, vary in bulk from the size of a pea to that of a hazel-nut, have usually a smooth, but sometimes a granulated or even lobulated surface, and are whitish, pale yellowish-red, or vivid red in colour. The differences in colour depend on the greater or less vascularity of the tumour. Fibrous growths ordinarily spring from the upper surface of the vocal cords and from their inner borders, and in the latter case may be found attached to any part of the margin; not unfrequently they are seated at the anterior insertion of the cords, and when of small size the observer has considerable difficulty in seeing them in this situation. They are seldom met

with at other parts of the larynx. Fibrous tumours of the larynx are developed from the submucous connective tissue.

The *papillomatous* growths are formed by hyperplastic development of certain portions of the mucous membrane with simultaneous hypertrophy of their epithelial covering. They assume the most diverse forms: they may be elongated or rounded, pedunculated or flat and sessile, of a warty or grape-like appearance, or may occasionally resemble closely a strawberry or raspberry. Their colour is a dull white, or whitish-yellow when they contain a large proportion of fatty tissue, or pale reddish when they are more richly supplied with blood-vessels.

The surrounding parts may be healthy, or may present the signs of active inflammation. Papillary tumours most commonly grow from the upper surface and inner borders of the vocal cords; they may be situated, however, on the under surface, when it is somewhat difficult to form any estimate of their actual size, even when they project beyond the margin of the cords. They are seldom observed on the superior vocal cords, the ventricles of the larynx, or other parts. In phthisical laryngitis a number of small greyish-white excrescences of papillary aspect are sometimes seen on the posterior wall of the larynx between the arytenoid cartilages, scattered over the swollen, inflamed, and possibly also ulcerated mucous membrane, but these are not regarded as new formations in the strict sense of the term.

Cystic tumours of the larynx are rare; they are of small size, and occur most usually on the superior vocal cords and the ventricles of the larynx, occasionally also on the inferior vocal cords and the epiglottis.—*Lipoma* and *myoma* have been observed in the larynx in only a few exceptional cases.

Carcinomatous Growths in the Larynx.

Cancerous growths are very rarely developed primarily in the larynx, or unassociated with malignant disease elsewhere; they generally extend to the larynx from neighbouring parts, the pharynx, œsophagus, &c. As the tissues so invaded are generally so altered in aspect as to be unrecognisable, and as the cancerous growth is usually of some considerable size and its rate of increase more rapid than that of any other new formation, the laryngoscopic appearances of the parts attacked scarcely admit of description. Growths of this kind have a very rough, cauliflower-like surface, which feature alone, especially if the growth be extensive, is sufficient to indicate clearly their carcinomatous nature; the diagnosis becomes more certain when similar

new formations are discovered in the adjoining parts, such as the root of the tongue, or when the lymphatic glands are found to be affected by cancerous degeneration and the other signs of malignant disease are observed in the patient. When such tumours are large they naturally cause a certain degree of stenosis of the larynx.

The forms of malignant growth described as occurring in the larynx are *epithelial* and *medullary cancer*. The first is the more common variety, and that also which appears primarily and sometimes remains localised for some considerable time in this situation.* When epithelial or medullary cancer has spread from the pharynx to the larynx the epiglottis is generally the first part attacked by the disease.

Foreign bodies in the larynx, when not, as usual, expelled by coughing, excite most intense dyspnœa and a distressing feeling of suffocation. They may be caught and retained in the folds of the mucous membrane or may be impacted at any part within the larynx, such as the ventricles of Morgagni. The largest objects that have been removed from the larynx are sets of artificial teeth; several instances of this kind are on record.

Spasm and Paralysis of the Vocal Cords.

Temporary closure of the glottis takes place from spasm of those intrinsic laryngeal muscles which approximate the vocal cords (spasmus glottidis); it occurs most frequently in children, and next most frequently in the hysterical attacks of adults. The closure may be complete or incomplete.

Paralysis of the Vocal Cords.

Paralysis of the vocal cords is due to a great variety of causes. Two forms of the affection are recognised, *central* and *peripheral* paralysis: the first of these is very rare, being observed in connection with cerebral apoplexy † at the part at which the vagus nerve has its origin, while the second is exceedingly common.

Peripheral paralysis of the vocal cords may be *neuropathic* (that is, caused by interference with the motor nerves of the

* I have observed one case of epithelial cancer of the epiglottis, in which the free border of the latter was transformed into an irregular, shapeless mass, which was of sufficient size to produce considerable stenosis of the larynx; in the interior of the larynx nothing abnormal could be seen.

† I have had under observation a case of apoplexy in which complete paralysis, of central origin, of the *left* vocal cord, together with paralysis of the *right* hypoglossal nerve and slight facial paresis, were suddenly developed, without any other sign of disturbance of motor power.

larynx such as to deprive them of their conducting power), or *myopathic*.

The *neuropathic* paralyses are generally of mechanical origin, being commonly produced by pressure on the inferior laryngeal nerve or the vagus by large tumours of the thyroid gland or of the cervical or bronchial glands, by tumours of the mediastinum and aneurisms of the aorta; in the last-mentioned case the paralysis always affects the *left* recurrent laryngeal nerve.—Neuropathic paralyses of the vocal cords occur also in certain infectious and zymotic diseases (diphtheritis, typhus, &c.) and in hysteria.

In the great majority of instances, however, paralysis of the vocal cords is *myopathic*. Two varieties have been distinguished from each other: 1. paralysis of the vocal cords in the proper sense of the term, that is, the form in which the immobility of the cords depends solely on paralysis of the muscles, the laryngeal structures being in other respects normal; 2. paralysis due simply to mechanical conditions, in which the loss of motility is caused by other laryngeal diseases, such as a high degree of swelling of the vocal cords and the parts in immediate relation with them, cicatrization after ulceration, &c. Cases of the latter kind are characterized, not by complete paralysis, but rather by greater or less impairment of the mobility of one or both cords; they have already been under consideration on a preceding page.

The paralysis may involve one cord or both; it is sometimes incomplete (paresis), at other times complete (paralysis).

In order to the better understanding of the laryngoscopic appearances in the various forms of paralysis of the vocal cords the actions of the different intrinsic muscles of the larynx may here be shortly stated.

There are three groups of muscles which move the vocal cords:

1. The muscles which separate the arytenoid cartilages (and with them the vocal cords) from each other, and which in this way *dilate* the glottis, as in inspiration; the *posterior crico-arytenoid muscles* have this action.

2. The muscles which approximate the arytenoid cartilages (and with them the vocal cords) to each other, and so *contract* the glottis. The principal muscle of this group is the *transverse arytenoid muscle*, whose action is aided by that of the *oblique arytenoid muscles*. The glottis is also contracted by the *lateral crico-arytenoid muscles*.

3. Muscles which *stretch* and render tense the vocal cords, and so tend also to bring them closer to each other. To this group belong the *crico-thyroid* and *thyro-arytenoid muscles*.

Unilateral Paralysis of the Vocal Cords.

The *left* vocal cord is much more frequently paralysed than the right. If the loss of power be complete, all the muscles which act on the cord, the dilators, constrictors, and tensors of the glottis, being paralysed together, the affected cord and its corresponding arytenoid cartilage remain perfectly immovable during respiration and phonation; the unaffected cord, on the contrary, particularly when the higher notes are sounded, moves unusually actively, and crosses over the middle line even as far as the paralysed cord, and in this way usually completely closes the glottis. The movements of the sound cord may indeed be so energetic that the corresponding arytenoid cartilage not merely touches that of the opposite side but passes over it some little distance. In all cases in which the unaffected cord comes into contact with its fellow the rima glottidis is directed obliquely towards the paralysed side. On sounding a deep note, which does not require for its production such a degree of tension of the healthy vocal cord, the latter does not cross the median line so far as to reach the paralysed cord; the closure is therefore then imperfect, a small gap being left between the vocal cords.—When the paralysis has lasted some time the cord loses its shining tendinous appearance, becomes dull and lustreless and somewhat wrinkled on the surface, and the arytenoid cartilage to which it is attached grows paler in colour and atrophies slightly.

The above-described more or less complete paralysis of all the muscles of one of the vocal cords is the most common form of unilateral paralysis and is very easily recognisable.—Paralysis restricted to certain muscles is more seldom met with. If it be confined to the dilators of the glottis the vocal cord of the affected side remains fixed in inspiration; phonation, on the other hand, is not interfered with, as the muscles which contract the glottis and stretch the cords are intact; closure of the glottis is thus normal and complete and both cords vibrate freely. When the paralysis is limited to the tensors of one of the vocal cords the movements of the cord in respiration and phonation are natural and normal, that is, the closure of the glottis is perfect; the affected cord, however, does not vibrate in phonation, it tends to curve outwards and shows on its border a *boat-shaped depression*, from deficiency of tension longitudinally (Navratil). If the paresis of the tensors of the vocal cords be bilateral the glottis becomes *elliptical* in phonation. Unilateral paralysis of the tensors of the glottis, when it appears as part of a complete paralysis of one of the vocal cords, may also be recognised by the *absence* or comparative feebleness of the sensation of vibration which should be felt on placing the finger on the outside of the thyroid cartilage, on the side corresponding to the affected cord (Gerhardt).

Paralysis of the *epiglottis* is an exceedingly rare affection (Leube, Gerhardt); if it be unilateral, produced by paralysis of either of the superior laryngeal nerves, the epiglottis is stated to be turned obliquely towards the sound side, while the upper part of the interior of the larynx, on one side, is devoid of sensation.

Bilateral Paralysis of the Vocal Cords.

Bilateral paralysis of the muscles which act on the vocal cords, unlike unilateral paralysis, is usually complete. There are two forms of the affection:

1. Bilateral paralysis of the constrictors and tensors of the glottis; and 2. Bilateral paralysis of the dilators of the glottis.

If the whole group of constrictor muscles on both sides be paralysed the vocal cords are almost motionless during inspiration and expiration, and in phonation move only very slightly towards the median line; even in forced phonation they never come perfectly into contact with each other, or if they do for an instant touch they at once fall asunder again. The vibration of the cords is also very imperfect, as the muscles which draw them together, the constrictors of the glottis, are also to some extent tensors of the vocal cords. If the paralysis of the constrictors be incomplete the movements of the vocal cords in respiration and phonation are not entirely abolished, though they are much less extensive than normally; a great many intermediate stages between absolute immobility and normal freedom of movement are observed.—Bilateral paralysis of the constrictors of the glottis may also be partial in this respect, that the loss of power may be limited chiefly to the lateral crico-arytenoid and the thyro-arytenoid muscles, or to the transverse arytenoid muscle. The following varieties of this partial paresis are met with:

a. The anterior angle of junction of the vocal cords is closed and the arytenoid cartilages touch each other in phonation, while the other parts of the cords make no movement towards each other, the *middle* portion of the rima glottidis, the pars ligamentosa, remaining open; this condition indicates paralysis confined chiefly to the lateral crico-arytenoid and the thyro-arytenoid muscles.

b. The ligamentous portion of the vocal cords closes normally, but the cartilaginous portion continues open, the arytenoid cartilages remaining fixed; here the paralysis affects principally the transverse arytenoid muscle.

c. The vocal cords come together only in their anterior part, the rest of the ligamentous and the whole of the cartilaginous portion remaining open.

Bilateral paralysis of the *dilators of the glottis* is much less common than that of the constrictors. It presents the following laryngoscopic appearances: the vocal cords, even in quiet respiration, are abnormally close together, the rima glottidis being reduced to a mere chink between them. In inspiration the cords are not drawn apart; they are, on the contrary, approximated to each other by the diminished pressure of the air, the glottis is almost completely closed, extreme dyspnœa is established, and inspiration acquires a whistling, sonorous character which is quite distinctive of stenosis of the glottis. In expiration the cords are again separated slightly, but only so far as to leave the above-described narrow chink through which the air may pass. In phonation the vibration of the vocal cords, and the movements of these structures and of the arytenoid cartilages towards each other, are normal, the constrictors of the glottis and the tensors of the vocal cords being intact.

Apart, perhaps, from the appearances observed in complete unilateral paralysis of the vocal cords, there is no more striking group of signs connected with motor disorder of the parts within the larynx than that just described, associated with bilateral paralysis of the posterior crico-arytenoid muscles. Although the number of cases of this form of paralysis recorded in medical literature is up to the present time rather small, it seems not to be so rare an affection as might on that account be supposed; I have seen two such cases, both patients being hysterical.

In most cases of paralysis of the vocal cords there is more or less change in the voice, hoarseness of all degrees of severity up to complete aphonia, or simply difficulty in the *formation of sounds*, observable sometimes only in the upper notes, sometimes only in the lower. The loss of voice is complete when the vocal cords and the arytenoid cartilages are not properly approximated, a space of variable breadth being left between them even during the most strenuous efforts to produce a sound; the voice fails also, even though the closure of the glottis be complete, if the cords

have lost their power to vibrate, from paralysis of the tensors of the glottis. If the glottis close perfectly, however, and if the paralysed cord vibrate normally, the strength and purity of the voice may be preserved unaltered. But if the cords do not come fully and accurately into apposition, if, for instance, the glottis be completely closed in its ligamentous but not in its cartilaginous portion, the voice becomes hoarser.—With regard to the difficulty in the formation of sounds, or alteration or failure of the sound when the voice is of a certain pitch, the most diverse modifications are observed; the only general statement that can be made on the subject is that the number of sounds that can be uttered by the patient and their purity depend—provided always that notwithstanding the unilateral paralysis of the vocal cords efficient closure of the glottis takes place—on the amount of vibration of which the affected cord is capable. Thus, the voice very readily breaks into falsetto when only the inner margin of the paralysed cord enters into vibration; it, on the other hand, becomes deeper in pitch when the cords are shortened and relaxed, from paresis of the thyro-arytenoid muscles, a form of the affection which is not uncommon. When energetic attempts at phonation are made sounds may naturally still be produced which are not heard as the result of feebler efforts, as in the former case more accurate closure of the glottis takes place and the vocal cords are thrown into more active vibration. *Diphthonia* is sometimes observed when the tension of the vocal cords is unequal on the two sides.

In all other affections of the larynx, from simple catarrh to the destructive ulcerative processes, temporary or permanent impairment of the voice, varying in intensity from time to time, amounting in some cases merely to slight hoarseness, in others to complete aphonia, is a symptom almost as constant as cough in the various diseases of the respiratory apparatus. But just as the cough cannot be said to be characteristic of the special *nature* of the pulmonary disorder, so the alteration in the voice indicates only approximately the nature, seat, severity, and extent of the laryngeal affection.