

cleft palate, there was bifurcation of the epiglottis, extending downward as a distinct fissure between the arytenoids and the posterior surface of the cricoid. The epiglottis in this case formed two flaps which fell into the larynx. From birth there were constant symptoms of laryngismus ending in suffocation at the age of four months. A cleft in the interarytenoid region is usually the result of defective development. Congenital dilations of the larynx in the form of pouches or laryngoceles, although very rare, sometimes occur, producing stenosis by the apparent prolapse of the ventricle.

ACQUIRED STENOSIS.—This is classed according to its cause, and may be the result of a large number of different pathological conditions. The situation may be above, between, or beneath the vocal cords; or in two or all three localities combined. There are certain symptoms common to all cases of laryngeal stenosis. All inspiratory respiration to a greater or less degree, inspiration being usually affected more than expiration. Except in cases of acute spasm of the glottis and sudden oedema, the onset is usually slow, commencing with slight interference with normal breathing, and inspiration gradually becoming stridulous.

In cases of young children, it is often difficult or even impossible to obtain a laryngoscopic view. In these cases direct linear inspection by means of Kirstein's autoscope should accomplish a good result, by giving a direct view of the larynx without reversion, as in the use of the laryngoscope. When the view is obtained, the appearance of the larynx will be found to vary greatly according to the cause which produced the stenosis. As Asch has well said: "In oedema we have a smooth, shining swelling, differing in color according as it is produced by acute inflammation, tuberculosis, or Bright's disease. In syphilis we have a ragged, deformed, irregular larynx, sometimes filled with vegetations, and sometimes obstructed by membranous bands or adhesions. In cancer we find ulcerated masses, sanious and vegetating. In perichondritis the deformed condition of the larynx and the presence of abscess point to the nature of the disease; while the appearance of polypi and of spasm or paralysis are at once apparent on examination."

One characteristic symptom common to all cases of laryngeal stenosis is the increase of dyspnea during the hours of sleep, owing to the fact that the crico-arytenoidi postici muscles, the dilators, are withdrawn during that period from the control of the will. As the disease advances, respiration becomes more difficult, the air supply to the lungs diminishes, and oxygenation of the blood is interfered with, until finally the face becomes cyanotic, and, to save or prolong life, tracheotomy or intubation may be called for.

While the diagnosis of the existence of laryngeal stenosis may not be difficult, the determination of the nature of the lesion which produces it in a given case may be far otherwise, calling, after the period of infantile life, imperatively for the use of the laryngoscope. If the stenosis is simply the result of contractions or adhesions, the nature of these may be readily discovered by the use of this instrument; but when excessive oedema is present, the cause is not so easily ascertained.

The principal pathological conditions which produce acquired stenosis are the following:

Neuroses.—These may be divided into acute and chronic functional, and organic.

An acute functional neurosis, in the form of spasm of the crico-arytenoidi laterales and the arytenoideus, is of frequent occurrence in child-life. These muscles, stimulated to intense activity, overcome the abductor muscles, and, preventing their normal action, interfere materially with respiration. In many cases the spasm is of temporary duration—the stridor lasting for a short period, to be followed by relief—after which the old symptoms of stenosis may recur or not, according to the character of the case. The classical laryngismus stridulus or spasmodic croup is of this nature, and while it may be very alarming to the friends of the little patient at the time, it is rarely fatal. The causes producing this condition are

usually congestion or inflammation in some part of the respiratory tract, either subglottic or pharyngeal; in other cases the spasm is considered to be of a purely reflex character. Probably of the latter form were the two fatal cases of neurotic stenosis reported by Clement Hunter. These cases were so unusual that they are worth recording here. The first was that of a twin boy aged nineteen months. The other twin had died at the age of one month. The child was reported as perfectly well, when the mother lifted him out of bed to give him his regular bath. In a fit of passion he threw his head back and ceased to breathe. His face became blue and his muscles rigid. He was put into a hot bath but without avail, and died at once without uttering a sound. Two days later the sister of the boy, aged seven months, was seized in a similar manner. She had always been a healthy child. Suddenly, while lying on her mother's knee, she became rigid and blue in the face, and without uttering a sound died exactly as did her brother. In both these cases the seizure was accompanied with carpo-pedal contractions. There were no general convulsions, and in neither case had there been crowing respiration at any time. Post-mortem examination found both bodies well nourished, all the organs in a healthy condition, and neither foreign body nor obstruction in the larynx of either. There were, however, marked signs of rickets in each—a condition said to be a strong predisposing factor in the development of spasm of the glottis.

A word here in reference to the stridor of laryngeal spasm. The crowing sound so frequently heard is the sign that the spasm is either forming or relaxing, and that the air is entering the partially closed glottis. When the attack is fatal, no sound is produced, as no air can enter. When an observation can be obtained during an attack of stridor, the vocal cords will be found in a state of adduction, the niche between the parallel lines being almost absent during expiration, and presenting the form of a very narrow isosceles triangle during inspiration.

Chronic functional neurosis of the larynx may occasion a certain amount of stenosis while the neurosis continues, although it is rarely dangerous *per se*. It is a condition of general paresis of the recurrent nerve and is supposed to be occasioned by a toxic influence upon the nerve centres. In the study of the pathology of toxic paralysis of this organ arising from zymotic diseases, Watson Williams and Jobson Horne report instances in which typhoid fever, measles, rheumatism, gonorrhoea, and other affections were followed by the development of abductor paralysis, or recurrent laryngeal paralysis, when both abductor and adductor muscles were affected.

An organic neurosis of the larynx may produce stenosis. That the abductor muscles of the larynx are always more vulnerable to organic nerve lesions than are the adductors is a generally conceded fact; and many authorities go as far as Sir Felix Semon, who lays it down as a law that paralysis of the adductor is always secondary to paralysis of the abductor muscle. He summarizes this conclusion in these words: "While there is not a single authenticated case on record, in which it has been shown by post-mortem examination that, in a slowly progressive organic lesion of the motor nerves of the larynx, the adductors had been primarily or exclusively affected, we are now in possession of quite a number of well-observed cases demonstrating the opposite order of events"—that is, cases in which the abductors had been primarily or exclusively affected.

Krause has advanced what is called the spasm theory: that instead of paralysis of the abductors, it is clonic spasm of the adductors that has produced the stenosis. Regarding this theory Bosworth says that "it is difficult to understand how a clonic spasm affecting a given group of muscles can persist through a long period of years, without resulting in degenerative changes which are to an extent uniform in all; for repeated investigations have demonstrated conclusively that the abductor muscles are the ones which alone undergo marked atrophic degeneration." Hence the conclusion that they are the ones primarily affected.

Grossman combats the theory of Semon, his opposition being based upon a series of experiments; but his view, apparently, is not supported by adequate clinical investigation.

A contribution to the study of toxic paralysis of the larynx, which has also a bearing upon stenosis of that organ, is given by Heymann. It contains a résumé taken from fifty papers upon the subject. Lead poisoning is responsible for a majority of these cases. There are also instances of paralysis arising from copper, antimony, phosphorus, and arsenic, as well as from cannabis indica, atropine, morphine, and alcohol. In these cases, although there were exceptions, the abductor muscles were the ones that were in the main affected.

In support of Krause's view that the apparent paralysis of the abductors is really due to continual spasm of the constrictor muscles, Gougenheim and Solis Cohen ascribe the resulting atrophy of the dilator muscles, as reported by Bosworth, to be due to mechanical rather than to parietic immobility.

Acute oedema of the larynx is an infrequent but dangerous cause of laryngeal stenosis. It is usually sudden in its development, and may occur either as a primary disease or secondary to some other affection. It is a condition of the larynx attended by infiltration of the submucosa, due to exosmosis from the lymphatics and blood-vessels.

Primary oedematous laryngitis is exceedingly rare. Of two cases that I have seen, one only was very severe. It occurred in a man aged thirty, who was in the enjoy-

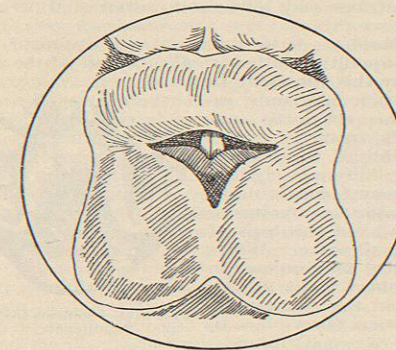


FIG. 3139.—Stenosis from Acute (Edema of the Larynx. (Bosworth.)

ment of excellent health. One night, after playing billiards until a late hour, he retired feeling as well as usual. Two hours later he awoke with a sense of suffocation. From that time until daylight his doctor did what he could to relieve him, when he was driven to my office in a cyanotic and stertorous condition. I found the epiglottis and arytenoids so oedematous that neither the ventricular bands nor the vocal cords could be seen. The man was not a drunkard but had been indulging more freely than usual. Free scarification of the posterior surface of the epiglottis and the arytenoids, together with hot steam inhalations, resulted in recovery.

Oedema may be occasioned by fractures of the cartilages, by inhalations of irritating vapors, by the use of escharotics, etc.; it may be due to inflammatory action in adjacent structures, abscesses, wounds, etc.; or it may occur as a secondary effect from syphilis, carcinoma, tuberculosis, myxoedema, syringomyelia, Bright's disease, phlegmon of the peritonsillar tissue, and many other affections.

The symptoms in acute oedema are markedly laryngeal. Dyspnea and loss of voice, with pain upon movement or upon efforts at deglutition or phonation, come on rapidly. If relief is not obtained, cyanosis, mental distress and restlessness, followed by hebetude, quickly ap-

pear; the temperature rises, and after a day or two the patient dies.

Inspection will show the epiglottis and arytenoids so swollen as to render a view of the interior of the larynx out of the question. In some cases all that can be observed by the use of the laryngoscope will be a distorted mass of oedematous tissue.



FIG. 3140.—Turban-shaped Epiglottis. (Lake.)

When the disease is less acute, and owes its origin to some chronic systemic dyscrasia, the symptoms are less alarming; and although the case may be hopeless, the condition may last for weeks without producing a fatal issue. On examining by the laryngoscope, in the milder forms of the disease, only certain parts will be found to be seriously affected, the swelling being localized about the epiglottis, arytenoids, ventricular bands, or subglottic region, some or all of these parts being affected. Good examples of this form of oedema are pictured in Lake's illustrations of laryngeal tuberculosis. In Fig. 3140 we see a turban-shaped epiglottis; and in Fig. 3141, oedema of the arytenoids.

The color of the mucous membrane in oedema varies from a grayish-pink to a bright red; the tissues are full and rounded, and the membrane is bright and glistening. There is usually copious secretion, but this is not necessarily of a purulent character, if the mucosa has not been broken.

Pseudomembranous Stenosis.—This condition is of frequent occurrence. It usually forms a complication of laryngeal diphtheria, being an extension of the disease downward from the pharynx. When the false membrane is deposited upon the laryngeal walls, it lessens the capacity of the organ, thereby diminishing the power of respiration (see article on *Diphtheria*). Sometimes false membrane has been formed within the larynx as the result of swallowing hot or caustic fluids.

Perichondritis as the result of fracture, simple or compound, will occasion stenosis of a severe character. Compound fracture is particularly likely to be fatal, probably more so than is an incised wound of the organ.

When perichondritis is the result of a specific disease, such as syphilis, tuberculosis, actinomycosis, glanders, etc., it is usually accompanied by swelling, with streptococcal, staphylococcal, or pneumococcal invasion. Purulent infiltration follows, dissecting the perichondrium from the cartilage, producing necrosis, and rapidly developing abscess formation. The result is usually extreme stenosis. In the majority of instances of perichondritis due to typhoid fever, the infection and inflammatory action are similar to those seen in abscess formation, and the pus, making for the point of least resistance, effects an opening, and there is thus established an ulcerated condition of the mucous membrane. The typhoid bacillus is usually present in the necrotic mass (Kyle).

What Lake terms the acute fulminating perichondritis of tuberculosis is accompanied by all the signs of acute oedematous laryngitis with high fever and severe stenosis, demanding immediate tracheotomy; while the chronic variety produces less stenosis, as, by reason of the slower action, ulceration, exfoliation, and expectoration of necrosed cartilage follow one another in regular order.

In perichondrial abscess of the cricoid, the stenosis is most severe and the danger imminent, owing to the great swelling which occurs in this region. When several car-

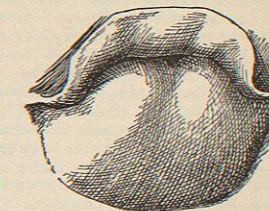


FIG. 3141.—(Edema of Arytenoids. (Lake.)

tilages are involved the prognosis is most unfavorable. In nearly all cases, however, life might be prolonged if tracheotomy were performed early in the disease. The presence of a purulent sac within the larynx would preclude the advisability of intubation.

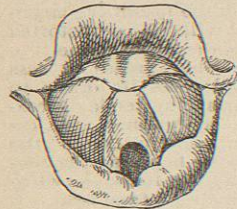


FIG. 3142.—Cicatricial Stenosis before Treatment. (Lennox Browne.)

What Gerhardt terms "*choroiditis inferior hypertrophica*," owing to the fact that it is attended with local subglottic hypertrophies, sometimes occurs, and may be productive of a serious degree of laryngeal stenosis. The "*chronic blennorrhœa of Stoerck*" likewise produces hypertrophies and cicatrices, but in the vocal cords instead of beneath them. Klebs says that histologically the elements in blennorrhœa resemble those of rhinoscleroma. It is a question whether both conditions are not of the nature of pachydermia. When cicatrization takes place in subglottic hypertrophy it results in the formation of a firm white glistening membrane, sometimes completely encircling the subglottic ring of the larynx, producing more or less permanent stenosis. Cicatricial bands in blennorrhœa chronica may produce a similar result. Asch describes a case in which he found two folds of membrane, one on either side of the larynx beneath the vocal cords and on a level with the cricoid. They had so contracted the passage that the aperture was only the size of a goose quill. The breathing was stridulous and could be heard in the next room. The dyspnoea at times was so great that tracheotomy seemed inevitable. The stricture, however, was dilated with laryngeal forceps, this being followed up with further dilatation by a succession of Schrötter's tubes, and the lumen of the larynx was restored to nearly its normal size.

Cicatrices are scars left by the healing process after destruction or injury of normal tissue. Hence these can occur only when nature makes an effort to repair the organism, parts of which, either from disease or from injury, have been destroyed. The formation of scar tissue is a pathological process of a purely provisional character, the tendency after development being toward constant contraction. Consequently, when cicatrices occur in the larynx, the stenosis which they occasion is more likely to increase than to diminish.

Syphilis, when it occurs in the larynx, is, of all constitutional diseases, the one most likely to be followed by cicatricial stenosis, as is well shown in Lennox Browne's case (Figs. 3142 and 3143). This never occurs, however, in the early stages but only in the tertiary period, years after the original infection. It is then that the gummy syphilide of Fournier and deep ulceration summarily destroy the tissues, and it is nature's effort to repair the wholesale destruction that produces the cicatrization. The parts usually affected first are the epiglottis and the arytenoids. Still no region of the larynx can be considered free from the possibility of infection. The tendency is to extend gradually to the surrounding tissues. When the cartilages are partially or wholly destroyed, they make their way through the ulcerated surfaces of the mucous membrane, being discharged intralaryngeally, rarely through the external wall.

Lupus also sometimes gives rise to stenosis by the formation of cicatricial tissue. The narrowing of the laryngeal lumen, due to cicatricial contraction in an old case of lupus, is characterized by a general matting together of the parts (Kyle), until the opening may be almost obliterated. There are several instances on record of this character. The tissues are usually anæmic,



FIG. 3143.—The same after Use of Cutting Dilator. (Lennox Browne.)

except when small red nodules give evidences of acute inflammation.

Leprosy of the larynx is always attended by more or less dyspnoea, stenosis of the glottis being a prominent feature whenever the larynx is attacked. Phineas Abraham reports a case in which the glottis was reduced to the size of a duck quill, necessitating tracheotomy to prolong the life of the patient.

Tuberculosis of the larynx is frequently the cause of stenosis, and may occur in several ways. Perhaps the most frequent is in the form of submucous infiltration of the epiglottis and of the arytenoids, as shown by Lake. Paralysis of the vocal cords due to glandular pressure upon the recurrent nerve is of not unusual occurrence. Hyperplastic formation within the larynx, immobility of the arytenoids from ankylosis of the articulation, granulomata, and papillomata, may any of them so lessen the lumen of the larynx as to produce stenosis. It may be safely said, however, that cicatricial stenosis rarely if ever occurs in tuberculosis of the larynx. The whole tendency of the disease is toward destruction. Repair after surgical measures does sometimes occur, but the prior destruction in these cases has never been so great as seriously to lessen the size of the cavity after the process of healing was accomplished.

Glanders sometimes attacks the human subject (Asch), and when it does the larynx is often affected. Simultaneously with the development of tubercles and ulcers in the respiratory tract, infiltration takes place in the laryngeal mucous membrane. Secondary œdema may give rise to dyspnoea; and, when healing occurs, contraction of cicatrices may give rise to severe and permanent stenosis.

Leucocythæmia.—Otto Barwick and Eppinger throw new light upon the pathological condition of the larynx induced by this disease. In the parts rich in glands, especially the epiglottis and false cords, catarrh occurs with swelling of the mucous membrane. Small lymph tubercles may form throughout the lining membrane of the larynx, and the tops of these may ulcerate. White blood cells accumulate in large numbers in the blood-vessels; and the characteristic infiltration takes place in the form of small islands, which have been termed leukæmic infarctions. When the tubercles or nodules are in exposed parts, they readily break down by ulceration and hemorrhage occurs from them. The most important of the clinical features is the laryngeal stenosis, which the diffuse leucocythæmic infiltration sometimes produces. In some cases this infiltration comes on very rapidly and is followed by death from dyspnoea in a few weeks.

Gout is sometimes the cause of serious spasm of the larynx. Watson Williams reports a case in which the patient would be attacked by indigestion and gout whenever he was indiscreet in diet. The gouty attacks always came on in the night, assuming the form of laryngeal spasm. Allbutt has also recorded a similar case.

Benign tumors of the larynx give rise to more or less stenosis, according to their character and location. They rarely in the adult attain a size great enough to endanger life, although the involvement may be sufficient materially to impede respiration. Of all forms of neoplasm which occur in this region papillomata are the most frequent. They occur at all ages. In adult life they are usually discrete or single, and although they may give rise to serious symptoms, they are rarely the cause of severe stenosis. Multiple papillomata, on the other hand, occur most frequently in young children, sometimes studding the vocal cords and the whole interior of the larynx, and seriously interfering with respiration. Some authorities look upon the presence of adenoids in

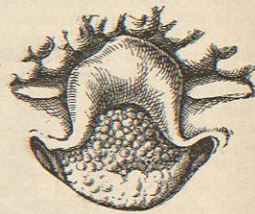


FIG. 3144.—Stenosis from Multiple Papillomata. (Grünwald.)

the naso-pharynx as the chief cause. Quinlan says that in thirty-one cases of papillomata in children and young adults, he found adenoids in all but three. The contact of the dry and often dusty atmosphere with the tender mucous membrane of the larynx, in cases of mouth breathing, is supposed to be the irritating cause of the formation of these growths. Many authorities give over fifty per cent. as the proportion which papillomata bear to all other neoplasms of the larynx, including both the benign and the malignant forms. Next in frequency come fibromata. They occur singly, as also do myxomata, fibro-myxomata, angiomas, lipomata, adenomata, and cystomata. The two latter are exceedingly rare. The symptoms produced by all these growths are very similar, varying according to the size and position of the neoplasm. It takes a larger growth to produce stenosis in the supraglottic than in the infraglottic region; while tumors situated upon the vocal cords, although smaller than in the localities mentioned, are much more likely to produce spasmodic stenosis.

The discovery of the neoplasm can be made only by the use of either the laryngoscope or the autoscope; and the nature of the growth, in many cases, can be learned only by microscopic examination of a minute section of the same.

The prognosis in benign growths is rarely unfavorable. They can usually be removed by endolaryngeal methods; and in the cases of multiple papillomata of children, which bear so large a place in the sum total of cases, the lesions will shrivel and exfoliate or be absorbed, when surgical measures relieve the mucous membrane of the larynx of the irritation caused by the inspired air.

Malignant neoplasms may occur in different types, all being histologically the same as when found in other organs of the body. The usual form in which cancer occurs in the larynx is either epithelioma or encephaloma. Scirrhous and sarcoma are more rare. Encephaloid cancer is rapid in its development, and causes stenosis by filling up the interior of the larynx with an irregular, mammillated, light rose-colored, fungous mass. Epithelial cancer is slower in growth, but, like the former, difficult to diagnose. In early stages it resembles a large and irritable papilloma. One distinguishing feature in nearly all malignant growths is the formation of glandular enlargements in the submaxillary and cervical regions.

The principal laryngeal symptoms, as in the case of benign growths, are the gradual loss of voice and the presence of increasing laryngeal stenosis; but accompanied by more pain and fever. The diagnosis will depend on the physical symptoms together with the results of laryngoscopic and microscopic examination. When visible lesions become apparent, they are not always easily distinguished from syphilis, and may require constitutional treatment for differentiation. With tuberculosis it is not so likely to be confounded. Microscopical examination of a small piece of growth should remove all doubt, although W. N. Mackenzie condemns a resort to this means of diagnosis, as too hazardous to the patient. As the disease advances, vegetative hypertrophies fill up the larynx, become more observable, and render the diagnosis more certain. The prognosis is always bad, the patient dying from one to several years after the inception of the disease, and not infrequently from asphyxia the result of the stenosis.

Foreign bodies within the larynx may by their presence produce stenosis. A number of such cases have been recorded in which relief was obtained by their removal, while in other cases the lesion caused by the foreign body, notwithstanding its removal, has been followed by stenosis. Bruggisser reports the case of a man, aged twenty-four, in whose larynx a rubber plate containing two false teeth was impacted. This was removed on the eighth day, but the removal was followed by complete abductor paralysis, and tracheotomy had to be performed to relieve the stenosis. Kiser relates the case of a man who died of laryngeal and pulmonary tuberculosis. He had suffered much from stenosis. On post-mortem examination, a tooth was found in the distended ventricle of

Morgagni. It had probably fallen into the larynx after extraction and had been coughed into the ventricle. Its presence may have been the primary cause of the fatal disease.

STENOSIS FROM EXTERNAL CAUSES is due to compression upon the larynx from without. The most common cause is goitre, particularly the enlargement of the central lobe or the isthmus of the thyroid gland, a condition that frequently obtains in exophthalmic goitre. In some cases the stenosis from compression is so great that the

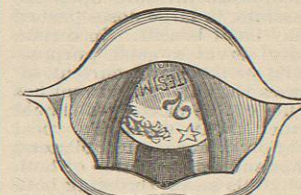


FIG. 3145.—Coin in Laryngeal Ventricle. (Grazzi.)



FIG. 3146.—Coin in Grasp of Forceps: Showing Method of Removal. (Grazzi.)

recumbent posture has to be abandoned and the sitting one assumed even during sleep. Abscess, aneurism, enlarged tuberculous glands, or neoplasms in the region of the larynx may produce compression upon the larynx sufficient to induce stenosis. In some cases the extension of portions of the morbid growth to the interior of the larynx has aided much in producing the stenotic result.

TREATMENT.—In congenital diaphragm-formation, when stenosis is severe, operative treatment becomes necessary, to save life as well as to give voice to the patient. One characteristic of the web which connects the anterior portions of the vocal cords in these cases, is its great toughness and the impossibility of cutting it *in situ* with a knife. In Kreig's case attempted incision of the web was followed by so much œdema that tracheotomy had to be done. In Seifert's case the knife broke when he was trying to cut with it. In Greenfield's and also in Semon's cases it was impossible to cut the membrane with the ordinary laryngeal knife; but Morell Mackenzie was able in his case to excise the membrane with scissors. Sir Felix Semon after cocaine anesthesia punctured the membrane with the electro-cautery. To his surprise the result was satisfactory, and he repeated the process, at intervals, several times. The tissue gradually shrank away, leaving the cords clear; and to complete the operation, he removed the remaining segment of the web at the anterior commissure with cutting forceps. His patient made a good recovery without any return of the web formation. The diaphragm, in these cases, is usually thickest at the anterior or acute end. The condition is so exceedingly rare that each individual case must be treated on its merits, guided by the judgment and laryngeal experience of the operator.

In functional stenosis, particularly laryngismus stridulus of childhood, induced by irritation of the nerve centres, the rapid production of counter-irritation or peripheral shock will often give relief. Dashing cold water in the face or hot water on the nape of the neck, traction on the tongue made at respiration intervals, immersion in a hot bath, or the application of sinapisms to the anterior or posterior surface of the neck may be useful. Nerve sedatives may also be indicated—such as chloral hydrate, bromide of potassium, chloroform, or nitrite of amyl. When catarrhal laryngitis is the cause, aconite, tartar emetic, pilocarpine, or apomorphine may in appropriate doses prove of benefit; while placing the patient in a steam atmosphere of a uniform temperature should aid materially in putting an end to the spasm. Should the stenosis be severe enough to threaten life, as in the cases recorded by Hunter, intubation should be resorted to at once. The difficulty lies in not always being able to secure the necessary instrument in time to save life.

As children thus affected are often of a rachitic diathesis, the general system during the intervals between attacks should be carefully examined into, and appropriate treatment administered. Iron, hypophosphites, and codliver oil may any or all of them be indicated.

Organic stenosis arising from paralysis of the abductor muscles will be urgent in its call for treatment according to whether the disability is unilateral or bilateral. When of central origin, whether from the effects of tertiary syphilis or from those of neoplastic pressure upon the nerve centres, iodide of potassium, in large doses pushed to the verge of tolerance, may be of benefit. In certain cases treatment by electricity serves a good purpose. We may use either the faradic or the static current, although in the majority of cases the galvanic current has proved the most useful. One of the electrodes should always be placed within the larynx upon the vocal cords. In threatened suffocation from complete bilateral abductor paralysis, Krause has suggested section of both recurrent laryngeal nerves; by this means throwing both vocal cords into the cadaveric position, relieving the dyspnea, and prolonging the life of the patient, but destroying the voice.

Acute Edema of the Larynx.—Prompt and energetic treatment is in these cases called for. The edema needs immediate relief. If possible the patient should be confined to a room with the air surcharged with moisture at a temperature of 72° to 75° F. At the same time an ice bag may be applied to the neck and retained there—if the condition of the patient warrants it—until relief has been obtained. In some cases heat constantly applied to the neck will be attended with equally good results. As directly local treatment, free scarification of the oedematous mucous membrane should be at once resorted to. The efficiency of the latter will be enhanced by the constant respiration of warm saturated air. Together with the above, cathartic and antifebrile measures may aid in hastening a recovery. Acute oedema of the larynx is a disease in which intubation can scarcely be called for, as the tube after insertion lies at a lower level than the oedematous swelling. In cases in which the stenosis continues, tracheotomy may be required.

Pseudomembranous Laryngeal Stenosis.—As this condition is associated with diphtheria, the reader is referred to the article on that disease for more detailed information. There are practically only two methods of treatment, viz., the administration of successive doses of antitoxin, and intubation or tracheotomy; or, what is perhaps more frequent, the combined use of antitoxin and intubation. In my own practice I may say that formerly when, in consultation, I did intubation alone for the relief of diphtheritic laryngeal stenosis nearly all the patients died. Now, as in every instance antitoxin is used as well as intubation, the large majority of the patients recover.

In cases, however, in which the pseudomembrane is of a traumatic origin tracheotomy will be preferable to intubation. I have seen one case of this kind. A young child inhaled steam from a boiling kettle. Edema and false membrane formed at once in the pharynx and presumably in the larynx. The voice became inarticulate, and five hours after the accident the child became cyanotic from laryngeal stenosis. Tracheotomy gave immediate relief. The tube was worn for a week and the child recovered.

Perichondritis.—When the disease has gone to the extent of intralaryngeal abscess, it is usually accompanied by edema, particularly if located in the subglottic region, and tracheotomy may be the only resource. When the perichondritis is above the cords, affecting the arytenoids or the epiglottis, the swelling may not be so great; and the use of astringent and antiseptic sprays may be of service. In chondritis or perichondritis of syphilitic origin, constitutional treatment should be resorted to, the iodides being preferred. If stenosis becomes urgent enough to demand surgical measures, tracheotomy should be preferred to intubation, for prolonged intubation di-

minishes the possibility of effective feeding, while tracheotomy does not.

Cicatrices.—One of the chief dangers of scar tissue in the larynx is due to its constant tendency to contract, thus producing steadily increasing stenosis. In cases of syphilitic laryngitis systemic treatment with iodides and mercury would minimize the destructive action of the disease and lessen the danger of subsequent stenosis; but when the latter exists, from the presence of bands actually formed, relief can be obtained by dilatation. It is better, however, to incise the bands and then dilate or use an instrument such as Whistler's or Lennox Browne's, either of which will perform the double duty of incision and dilatation at the same time. Schrötter advises tracheotomy first, and then the use of dilators in gradually increasing size. Störck uses a dilator attached to the upper portion of a tracheotomy tube, distention of the constriction being thus made from below, without the passage of any instrument through the mouth. Navratil has invented an instrument for rapid dilatation. The great danger, after dilatation, in all cases of scar-tissue stenosis, whether the cicatrices have been incised or not, is that of recurrence. To aid in the prevention of this, iodides should be administered and a judicious oversight of the patient retained.

Benign Neoplasms.—When stenosis is occasioned by the presence of benign neoplasms their partial or complete evulsion may be required. Evulsion is not, however, in these cases a hard-and-fast rule. While many authorities have advocated and practised thyrotomy and subsequent evulsion, and also removal by intralaryngeal methods, in papillomata of children, other recent writers have advocated tracheotomy and the wearing of a tracheal tube, as the more successful method of treatment—leaving the papillomata severely alone. In Railton's case of multiple papillomata, tracheotomy was done at the age of three and one-quarter years, and at the end of the first week, the metal tube was replaced by a soft one. This was removed twice a week to be cleansed, and worn for three and three-quarter years, to be finally discarded at the end of that time, the child being cured. Hunter MacKenzie has written a long article upon the subject, recommending this as the radical method of treatment, in which he is indorsed by such men as Garel, Oertel, Eliasberg, White, Chappell, Gleitsman, Baumgarten, and Carmichael.

Except in cases of papillomata of children, benign neoplasms are rarely multiple, and when laryngeal stenosis is produced by their presence intralaryngeal evulsion when possible should always be practised. This may be accomplished by the use of snares, cutting forceps, knives, or the electro-cautery, under the influence of cocaine. Care should always be taken lest the occurrence of hemorrhage complicate the operation; and preparation should be made to meet the emergency by tracheotomy if necessary. In some cases the growth can be removed by thyrotomy.

Malignant Neoplasms.—When the neoplasms producing stenosis are of a malignant character, attempted relief by evulsion is almost out of the question. Only when they are pedunculated, which carcinoma rarely is, and attended by no glandular involvement, should this ever be attempted. Fraenkel reports a case in which an epithelial growth was removed successfully from the right vocal cord by the galvano-cautery snare, although he had to repeat the operation a number of times at intervals of several months before the disease was finally arrested. I believe this is the only case on record of complete and lasting recovery from epithelioma of the larynx by intralaryngeal operation. When the tumor is large enough to produce stenosis, and, while unattended by glandular disease, is still confined within the larynx, removal of the whole of the organ by thyrotomy is considered warrantable, tracheotomy having first been performed. As a rule, however, the only relief in these cases that can wisely be given is that of the latter operation, which grants freer respiration, nature being left to do what she can with the offending neoplasm. Intubation in malig-

nant stenosis of the larynx is not advisable, as it would only increase the irritation by pressure upon the malignant growth.

External Compression.—The treatment of stenosis arising from external pressure depends upon the nature of the compressing body. Probably goitre is the most common cause of this condition, the isthmus or middle lobe being in certain cases so hypertrophied as to compress seriously both the larynx and the upper rings of the trachea. Relief in these cases may sometimes be accomplished by the administration of large doses of thyroid extract. Thymus extract has also found its advocates. In other instances a portion of the isthmus or a lateral lobe of the thyroid has been removed, this being followed by relief of tracheal and laryngeal pressure. The removal of the whole of the thyroid is not advisable as it might stimulate the development of myxœdema.

Sometimes the pressure, upon the larynx, of a posterior or lateral pharyngeal abscess has produced stenosis. Peritonsillar abscess has been known to extend down the sheath of the pharyngeal muscles to the arytenoid region and, interfering with circulation, to induce œdema of the larynx, with the same result. In like manner abscess of the lingual tonsil may induce œdema of the epiglottis and seriously interfere with respiration. In all these cases giving free vent to the retained pus by incision, either externally or internally, as the merits of the case may demand, should afford relief, and, by removing the pressure, restore the sympathetic condition of the larynx to its normal state.

When benign external neoplasms interfere with respiration, they should be removed by ordinary surgical methods, while malignant growths pressing upon the larynx demand low tracheotomy as the one measure likely to afford relief and prolong life.

This brief survey of the main causes of laryngeal stenosis, and the principal methods of treatment now in use, while not by any means complete, will give a fair idea of the means at our disposal for dealing with this distressing class of cases. No exact set of rules can be laid down. Each individual case must be treated on its merits; and the surgeon having become familiar with the technique required, should grant to his patient the most practical as well as the most scientific treatment at his command. It should be remembered also that, to obtain the best results, a large share of unwearied patience and perseverance is often required. *J. Price-Brown.*

LARYNX, DISEASES OF: SYPHILIS.—The period from the primary infection to the development of general infection, as evidenced in the larynx, varies from eight weeks to three months, but the latter may occur as late as twenty or even thirty years after the primary inoculation. Primary syphilis of the larynx is an extremely rare condition, only two cases, so far as the writer has been able to discover, having been reported—one by Krishaber in 1877, and the second one by Moure in 1890. The lesions met with in acquired laryngeal syphilis are, therefore, of the secondary and tertiary type, and concomitantly with these there are frequently cutaneous lesions corresponding to each period. The larynx, from its liability to various forms of catarrhal trouble, is especially apt, on account of its thus lowered resisting power, to show lesions of syphilis. From the frequency with which they are exposed, through the variety of occupations of life, to catarrhal conditions of the respiratory passages, men—as it appears from a review of the statistics of numerous authors on this subject—are more liable than women to have syphilis of the larynx. The question of relative frequency of secondary or tertiary laryngeal manifestations is variously stated by different authors. In the writer's experience the tertiary manifestations have been the more frequent. There is no relation between the character of either the primary or the secondary manifestations and the subsequent tertiary symptoms. In a few cases neither the physician nor the patient himself has been able to detect any evidence of primary infection, and even secondary manifestations

may not be noticed; and the only evidence one has that a former infection has occurred is the presence of extensive tertiary ulceration.

OBJECTIVE SYMPTOMS.—The lesions which manifest themselves are of the secondary and tertiary stages. The most common lesions of the secondary stage are: (1st) erythema; (2d) superficial ulceration; (3d) a mucous patch, and (4th) condylomata.

Upon laryngoscopic examination the mucous membrane will either be found to be uniformly hyperæmic, thus presenting essentially the same appearance as that of an ordinary acute laryngitis, or it may show an irregularity in the distribution of the inflammatory areas, this irregularity being due to interposed areas which are non-vascular, and the whole picture presenting a so-called mottled appearance which, as some authors maintain, is definitely characteristic of secondary syphilis.

The areas involved in the inflammatory process are generally the epiglottis, the false and the true cords. In cases in which the inflammation is uniformly distributed and persistent, its specific nature may be inferred from the fact that it does not yield to anything but definite antisyphilitic treatment. This inflammatory process may lead to a destruction of the superficial layer of the mucous membrane, in which case there will then be seen a small, shallow, and irregularly shaped ulcer whose surface is covered with a yellowish-colored secretion. The superficial ulcers may extend and unite with others, and when healed leave a very thin, stellate-looking cicatrix.

The occurrence of the mucous patch within the larynx is doubted by many, and yet, on the other hand, there are some who believe that it occurs frequently in this locality. As a feature of secondary laryngeal syphilis it evidently occurs with comparative rarity. In appearance the laryngeal mucous patch is similar to that which occurs in the mouth; there is a thickening of the mucous membrane, rounded, oval or oblong in outline, of a whitish-gray or yellowish color, and surrounded by an area which is markedly hyperæmic. The surface of the patch may be either elevated or depressed. The localities where such a patch may be seen are the laryngeal surface of the epiglottis and its edges, the aryepiglottidean fold, and the false and true cords. This lesion is generally associated with the earliest syphilides.

Condylomata in the larynx appear as rounded or oval elevations with a yellowish-colored surface; they seem like aggregated mucous patches. Whistler has called attention to a relapsing ulcerative laryngitis, which marks an intermediary stage between the secondary and the tertiary forms, and is characterized by a loss of substance of the mucous membrane neither so extensive nor so deep as that which occurs in the tertiary form. This ulceration attacks, in order of frequency, the vocal cords, the interarytenoid space, and the false cords.

Tertiary Syphilis manifests itself in the three forms of a gumma, an ulceration, and cicatricial tissue. These conditions exhibit themselves in succession within a period varying from three to twenty or more years after primary infection.

The gumma presents itself as an infiltration, varying in size from that of a very small pea to a size sufficient to produce obstructive symptoms. In appearance the mucous membrane covering it may be normal or of a darker hue, elevated above the surrounding mucous membrane, and its base presenting an area of inflammation of a deep rose color. It may be found on the laryngeal surface and edges of the epiglottis, the aryepiglottidean folds, the interarytenoid space, the false cords, and the subglottic region. The gumma is usually single but may be multiple. With the progress of time the gumma undergoes a retrograde metamorphosis, as a result of which it becomes yellowish in color and at last breaking down, presents the stage of *ulceration*.

The ulcer thus formed has generally a circular outline, edges which are ragged and thickened, a surface excavated and covered with a dirty yellowish-colored secretion, and a base displaying a zone of hyperæmia. The ulcer is usually single, but sometimes there are