

Diagnosis.—Mediastinal tumours require to be distinguished from pleuritic and pericardial effusions, enlargement of the heart, and from chronic pneumonia. The history of the case is important in the differentiation of these, and it should be noted that a pleuritic effusion may arise, secondarily, when the pleura is reached by a new growth. (For the differentiation of aneurism, see p. 50.) If a cancerous cachexia be present it is an important indication.

The *prognosis* in all cases of mediastinal tumour is grave; and the *treatment* can only consist of relieving symptoms.

CHAPTER III.

DISEASES OF THE RESPIRATORY SYSTEM—Section I.

Contents.—Coryza—Epistaxis—*Laryngoscopy*—*The anatomy of the larynx*—Acute laryngitis—Edematous laryngitis—Chronic laryngitis, phthisis, and syphilis of the larynx—Perichondritis—Morbid growths within the larynx—Laryngeal paralysis—Laryngismus stridulus—Spurious croup—Adenoids—**Percussion**—*Medical anatomy of the lungs, liver, and spleen*—**Auscultation**.

Catarrh—Coryza.—“Catching cold” is of the nature of a fever or febricula when acute. The quantity of blood within the cutaneous capillaries is controlled by the vaso-motor nerves to the smaller blood-vessels, and these nerves, by their contracting and dilating fibres, regulate the supply. The external temperature, through the sensory nerves of the skin, acts upon the vaso-motor centre, and reflexly contracts or dilates the blood-vessels according to the stimulus—cold or warmth. Any *sudden* change from warm to cold, by the exposure of a larger quantity of blood to the cooling process, probably sets up chemical change within it, and at the same time the sudden reflex contraction of the blood-vessels produces congestion of the internal organs. There is increased tissue metabolism, especially in the muscles and red blood corpuscles, as shown by the increased excretion of potash. The heat-regulating mechanism is also disturbed. The organs which suffer will be those which are weakest in vitality, either from constitutional tendencies or the result of previous attacks. Careless exposure will produce catarrh in the most robust; but it is far more frequent in the delicate or strumous, or in those who may be temporarily in a low state of health. The nervous diathesis is an important predisposing factor in the tendency to catarrh, some people being morbidly sensitive to changes of temperature. When the two constitutions—strumous and nervous—are combined, as they frequently are, the

tendency to catarrh is very great, and it often becomes more or less chronic, with subacute attacks.

The **symptoms** begin with a feeling of chilliness, perhaps a rigor, and the temperature rises to 101° or 102° Fahr. The pulse is quick, the skin dry, the tongue furred, and the urine is thick with urates, which are deposited on cooling. Sometimes there is much depression, and often there is a tired or aching feeling in the limbs. These symptoms are accompanied by frontal headache and dryness of the nasal mucous membranes, followed soon by increased mucous secretion. The congestion may extend to the pharynx, larynx, and trachea—pain upon swallowing, hoarseness, and a tickling cough being the results. The Eustachian tubes may be affected, and partial deafness may be noticed in some cases. Taste and smell may be impaired. The nostrils become sore from the irritating discharge, and herpes may affect the lips. The fever, under treatment, may disappear in a few hours, but the cough accompanied by at first mucus and then muco-purulent expectoration, may remain for several days, and if chronic, for a considerable time longer. In the chronic form, the mucous membranes become hyperæmic and hypertrophied, sudden changes in the atmospheric conditions being apt to produce subacute attacks.

The **diagnosis** of an acute catarrh is obvious, but *measles, influenza, hay asthma*, and the coryza produced by *iodide of potassium*, must be remembered. The chronic form may suggest an examination for such surgical diseases as *polypi* of the nose, *ozæna*, strumous and syphilitic *ulcerations*, *hypertrophy* of the mucous membrane, and sometimes *chronic abscess of the antrum* with a muco-purulent discharge from the nostril.*

A cold may extend to the bronchial tubes, especially in the young and in the aged; but in some cases it attacks the stomach and bowels, a chill producing gastric symptoms and often a sharp attack of diarrhoea. Recovery from an acute cold generally takes place within a few days.

The **treatment** of catarrh depends upon the stage. If taken very early, a Turkish or hot vapour bath may cut it short. The latter may easily be taken at home by means of Allen's spirit kettle, a simple and safe apparatus which may be used in any bath-room, and its use has the advantage of allowing the patient at once to proceed to bed without risk of a second chill. Ten grains of quinine or phenacetin, fifteen grains of antipyrin, or ten grains of Dover's powder, may be taken at bedtime—hot milk or gruel being allowed for supper. This treatment may be sufficient, and it may enable the patient to go about next morning with care; but if the cold be a severe one, he should certainly keep his bed for a few days. Tincture of aconite—drop doses in water every ten minutes for two hours—is a useful remedy when the fever is high and the pulse strong and bounding.

* Apart from nasal catarrh altogether, it should be noted that “many cases of megrim, asthma, nightmare, nervous cough, supra-orbital neuralgia, swelling of the face, vertigo, and epilepsy,” are intimately associated with diseases of the nose (M'Brice).

Spirit of Mindererus (*liquor ammonii acetatis diluti*), in half ounce doses with plenty of water, every four hours, is a good diaphoretic. Salicylate of soda may be added in rheumatic cases (R 11). For the hoarseness or sore throat give inhalations of steam with compound tincture of benzoin (a teaspoonful to a pint of boiling water in a Maw's inhaler); also gargles of cold water with chlorate of potash and glycerine of tannic acid (a teaspoonful of each to a tumbler of water). Mustard may be applied to the front of the chest, and chlorodyne—five to fifteen drops in water—or other cough mixture (R 12) may be necessary. When the feverish symptoms have been allayed, a diuretic mixture (R 7) may be ordered, or small doses of calomel or blue pill may be given, with a saline aperient to follow in a few hours. For the prevention of colds the skin should be kept healthy in its action by the regular cold bath in the morning. Cod-liver oil—a dessert spoonful at bedtime—and tonics, as arsenic and iron, are good prophylactics in those who have a tendency to chronic catarrh. Local measures, as the inhalation of ammonium chloride vapour, and painting the mucous membranes with tannic acid and glycerine, or a solution of nitrate of silver—ten grains to the ounce—are of benefit; but if the attacks be frequent, and recovery slow, a change, either to sea air or to a mountainous district, is to be recommended.

Epistaxis, or bleeding at the nose, is described in surgical works, but it is mentioned here merely to classify the diseases in which it occurs as an important symptom. They are as follow, viz.:—Hypertrophy and valvular diseases of the heart; Bright's disease, especially the cirrhotic form. (In these, epistaxis indicates a tendency to, and it may be a warning of, cerebral hæmorrhage.) Tuberculosis and phthisis; Cirrhotic liver; Hæmorrhagic diseases—as purpura, scorbutus, leucocythæmia, pernicious anæmia, and hæmophilia, &c.; Intracranial growths, cerebral atheroma; Fevers—as typhoid, ague, small-pox.

Epistaxis has been observed in some cases to be vicarious with the catamenia (*vicarious menstruation*); and at puberty bleeding at the nose may readily be excited in some subjects. It occurs also from local causes, as acute nasal congestion and catarrh, ulceration of the mucous membranes, vascular tumours, &c.

Laryngoscopy.

The mirrors used in the examination of the larynx are too familiar to need any description. The interior of the larynx is usually illuminated by the reflected light of an ordinary lamp; but the electric and oxyhydrogen limelights are frequently used. Direct sunlight, although it has the advantage of showing the tissues in their natural colouring, is not often convenient. The lamp being placed at the side of the patient's head, and the reflecting mirror strapped to the operator's forehead, a beam of light is thrown into the pharynx. The patient keeps the mouth wide open and protrudes

the tongue, which he may hold down by a napkin. The laryngoscopic mirror, after being warmed over a spirit lamp, and tested upon the back of the hand, is gently introduced, and just touches the uvula, palate, and pharynx. It should be kept quite steady, as otherwise it is apt to excite retching. Gargling with iced water, and spraying or painting the throat with a 10 per cent. solution of cocaine, will lessen the sensibility, and allow of greater freedom in the examina-

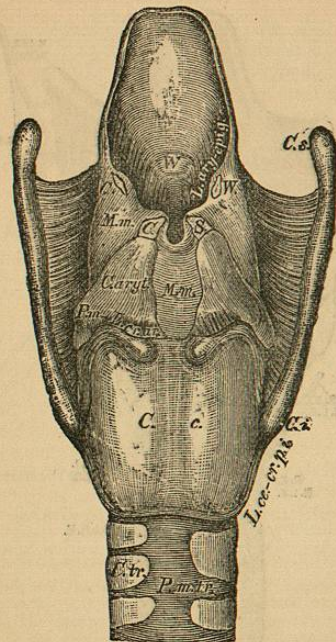


Fig. 8.—Larynx from behind after removal of the Muscles.—Epiglottis cushion (*W*); *L.ar.ep*, lig. ary-epiglotticum; *M.m.*, membrana mucosa; *C.W.*, cart. Wrisbergii; *C.S.*, cart. Santorini; *C.aryt.*, cart. arytenoidea; *C.c.*, cart. cricoidea; *P.m.*, processus muscularis of cart. aryten.; *L.cr.ar.*, ligam. crico-aryten.; *C.s.*, cornu superius; *C.i.*, cornu inferius of cart. thyreoidea; *L.cc.cr.*, lig. kerato-cricoidea post. inf.; *C.tr.*, cart. tracheales; *P.m.tr.*, pars membranacea tracheæ. (From Landolt and Stirling's Physiology.)

tion of such cases. The mirror must be gently deflected until the image of the larynx is seen, the patient being instructed to take deep breaths, and to sound "ah," and high "e" (as in *feet*). Practice will generally overcome the early difficulties of getting a view of the vocal cords and the interior of the larynx; and it should be

remembered that the laryngeal structures are seen in the mirror *reversed*, the arytenoid cartilages, for instance, being seen at the lower part of the mirror, and the anterior angle of the glottis at the upper.

The Anatomy of the Larynx.—The accompanying diagrams (Figs. 8 and 9) will serve to review the general anatomy of the larynx. The cricoid cartilage, whose small narrow portion is

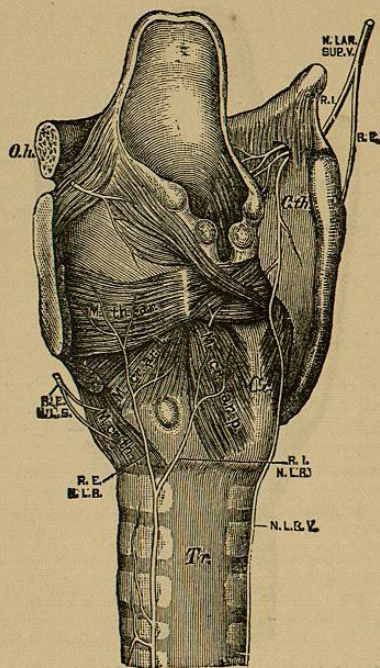


Fig. 9.—Nerves of the Larynx.—*O.h.*, Os hyoideum; *C.th.* cart. thyroidea; *C.c.* cart. cricoidea; *Tr.* trachea; *M.th.ar.* M. thyreo-arytænoideus; *M.cr.ar.p.* M. crico-arytænoideus posticus; *M.cr.ar.l.* M. crico-arytænoideus lateralis; *M.cr.th.* M. crico-thyroideus; *N.lar.sup.v.* N. laryngeus sup.; *R.I.* ramus internus; *R.E.* ramus ext.; *N.L.R.V.* N. laryngeus recurrens; *R.I.N.L.R.* ramus int.; *R.E.N.L.R.* ramus ext. nervi laryngei recurrentis vagi. (From Landois and Stirling's Physiology.)

directed forwards, and the broad plate backwards, articulates with the inferior cornua of the thyroid. The triangular arytenoid cartilages articulate, at some distance from the middle line, with oval, saddle-

like, articular surfaces placed upon the upper margin of the plate of the cricoid cartilage. The true vocal cords arise close to each other, from near the middle of the inner angle of the thyroid cartilage, and they are inserted each into the anterior angle, or *processus vocalis*, of the arytenoid cartilages.

The *posterior crico-arytenoid* muscles pull the *processus musculares* of the arytenoid cartilages backwards, downwards, and towards the middle line, so that the cords are separated and the glottis widened as in inspiration.

The *transverse arytenoid muscle* and the *oblique* muscles (the latter seen in Fig. 9 as crossed bundles lying upon the posterior surface of the former, the fibres being continued up to the root of the epiglottis), and also the *lateral crico-arytenoid* muscles, approximate the arytenoid cartilages, and with them the vocal cords, and so contract the glottis. The *crico-thyroid* and *thyro-arytenoid* muscles, stretch and render *tense* the true vocal cords during phonation (see

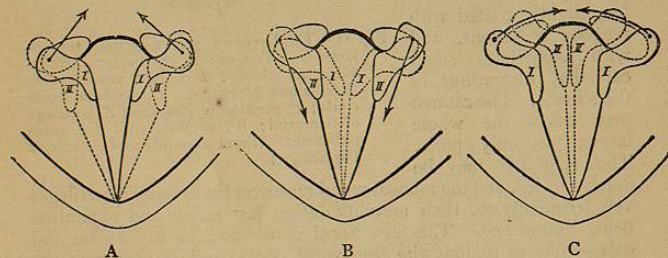


Fig. 10.—Schematic Horizontal Section of the Larynx. (From Landois and Stirling's Physiology.)

- A. *I, I*, Position of the horizontally divided arytenoid cartilages during respiration; from their anterior processes run the converging vocal cords. The arrows show the line of traction of the *posterior crico-arytenoid* muscles; *II, II*, the position of the arytenoid muscles as a result of this action.
- B. Schematic horizontal section of the larynx, to illustrate the action of the *arytenoid muscle*. *I, I*, Position of the arytenoid cartilages during quiet respiration. The arrows indicate the direction of the contraction of the muscle; *II, II*, the position of the arytenoid cartilages after the *arytænoideus* contracts.
- C. Scheme of the closure of the glottis by the *thyro-arytenoid* muscles. *II, II*, Position of the arytenoid cartilages during quiet respiration. The arrows indicate the direction of the muscular traction; *I, I*, position of the arytenoid cartilages after the muscles contract.

Fig. 10). The *superior laryngeal nerve* is the sensory nerve to the mucous membrane of the larynx, and it also supplies the crico-thyroid muscle. All the other intrinsic muscles of the larynx are supplied by the *inferior (recurrent) laryngeal nerve*.

The following diagram (Fig. 11) shows the structures of the larynx as seen by the laryngoscope.

Acute Laryngitis.—In acute catarrh of the larynx there is

slight fever, with a dry sensation or feeling of tightness at the wind-pipe, sometimes also a tickling cough and pain upon swallowing. If the vocal cords be affected the voice becomes husky, the cough hoarse, and there may be complete aphonia. There is much tendency to "hawk," the expectoration being at first slight, if any; later, some mucus is ejected. The laryngoscopic examination shows the mucous membranes to be bright red and swollen, slightly coated with mucous secretions, and with sometimes small catarrhal ulcerations of the surface. The catarrh may affect the whole larynx or only parts. The epiglottis may be

much swollen, and the mucous membrane over the arytenoid cartilages very frequently so, their mobility during inspiration and expiration being diminished. The false vocal cords may be so swollen and œdematous as to hide the true vocal cords, and to obliterate the ventricles of the larynx. When the true vocal cords are affected, they lose their white lustre and become more or less injected, the colour varying from pink to red; and if they be swollen, their margins become rounded and their mobility impaired.

The causes of acute laryngitis are direct exposure to cold or irritating vapours; extension of a cold from the nasal and pharyngeal mucous membranes; alcoholism; rheumatism; excessive use of the voice; and ulcerations and growths within the larynx. It occurs also in certain febrile conditions, as typhus, erysipelas, &c. Recovery is usual in adults; but laryngitis is apt to recur and to become chronic. In children it is more serious, and there is more liability to spasm.

The treatment (of adults) in the early stages is the same as in acute coryza (p. 52). A cold compress over the throat may also be used. Aconite and ipecacuanha are useful drugs—the latter in small doses to increase the mucous secretions and render expectoration easy; and in teaspoonful doses as an *emetic*, if there be breathlessness and cough without relief, as frequently happens with children. The bronchitis kettle may be necessary, and hot sponges may be applied to the larynx. Ice may be sucked. The voice should be rested. Leeches are sometimes used over the upper part of the sternum.

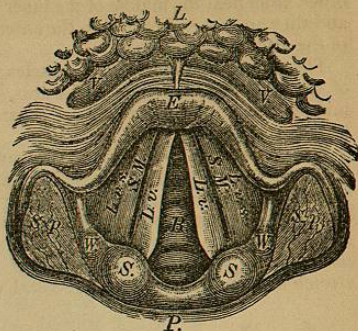


Fig. 11.—The Larynx as seen with the Laryngoscope.—*L*, Tongue; *E*, epiglottis; *V*, vallecula; *R*, glottis; *L.v.*, true vocal cords; *S.M.*, sinus Morgagni; *L.v.s.*, false vocal cords; *P*, position of pharynx; *S*, cartilage of Santorini; *W*, of Wrisberg; *S.p.*, sinus piriformes. (From Landois and Stirling's *Physiology*.)

The inhalation of a few drops of chloroform will relieve spasm. The inhalation of steam, with the compound tincture of benzoin (5j to a pint), is soothing. A spray of cocaine (5 per cent.) is useful for the cough. The room should be kept very warm; and the diet should consist of milk and cooling drinks, beef tea and soups, &c.

Edematous Laryngitis.—Œdema Glottidis.—Œdema of the larynx is most marked where the submucous tissue is most lax, as in the aryteno-epiglottidean folds, arytenoid cartilages, and epiglottis. The swelling is light yellow in colour.

Œdema may occur in connection with acute laryngitis, but it is also induced by chronic laryngeal diseases, and it occurs as a part of general dropsy from cardiac or renal disease. It may also be induced by swallowing hot liquids. It is said (very rarely) to follow the continued use of iodide of potassium. The symptoms may occur suddenly during an ordinary laryngitis—urgent inspiratory dyspnoea being the most prominent symptom. Prompt scarification is the treatment, with ice to suck constantly while there is danger of suffocation. An emetic may be given, and the general treatment of acute laryngitis should be carried out. Tracheotomy may be necessary. Hydragogue cathartics are indicated when the œdema is due to cardiac or renal disease.

Chronic Laryngitis.—In chronic catarrh of the larynx the mucous membranes and submucous tissues become thickened and hyperæmic, with more or less œdema. The surface is pale, dry, and shining, and coated with viscid mucus. Erosions and superficial ulcerations are common. In severe cases the calibre of the larynx may be narrowed, especially in the phthisical and syphilitic forms. The epiglottis and aryteno-epiglottidean folds or ligaments become much thickened. Several forms are described as *laryngorrhœa*, "*ozæna laryngis*," *pachydermia laryngis*, &c. Chronic laryngitis may follow repeated acute attacks, or be simply chronic from the first. It may be secondary to chronic laryngeal disease, or an indication of phthisis, alcoholism, or syphilis. Excessive smoking, over-use, and irritation of the recurrent laryngeal nerve, are also causes.

In **Phthisis of the larynx** the mucous membranes are paler, and thrown into folds. The inter-arytenoid and ary-epiglottic folds are infiltrated, the arytenoids appear as pink swellings, and small patches are seen on the mucous membrane. As the disease advances there is ulceration of the laryngeal structures, generally superficial, but sometimes extending to the deeper tissues. Most commonly the vocal cords suffer from infiltration, which gives them an irregular *nodular* appearance. If an ulcer affect the inner border, the cord has a notched, "eaten-out" appearance, and it is congested and swollen, the ulcer itself being of a dull grey-white colour. The false cords are frequently so swollen as to obscure the view of the true cords, and give the appearance of greater destruction than really exists. The epiglottis is also a frequent seat of ulceration in phthisis, and it generally is much thickened and hypertrophied.

Syphilis of the larynx presents the same appearance as phthisis, but the ulcers are said to be more circular in form and to have sharper edges, with lardaceous looking particles upon their surfaces. Ulceration is rapid, and the upper surface of the epiglottis is a favourite site. There may only be one ulcer present. Under treatment they cicatrise, and, if large enough, they may produce stenosis and deformities of the larynx and destruction of the cords. Gummata are occasionally found developed in the larynx, and they give rise to the same symptoms as tumours and morbid growths.

Perichondritis of the larynx may be primary, but generally it is a secondary affection, and often it is a result of phthisis or syphilis. It may also appear during the course of acute fevers, diphtheria, &c. The arytenoid cartilages are most commonly the seat of the disease, the cricoid sometimes, and the thyroid seldom being affected, and then it is secondary to disease elsewhere. The appearances at first, as the abscess forms, are the same as in ordinary inflammatory swellings, and these may project into the larynx and produce symptoms of stenosis. When the arytenoid cartilages suffer, their mobility is much impaired, and when limited to one, this impairment is very obvious with the laryngoscope. After pus has formed the abscess bursts, and it may leave excavations after expectoration of fragments of cartilage, &c.

Symptoms.—The foregoing chronic laryngeal diseases are attended with a feeling of irritation within the larynx and spasmodic cough; and the voice is either harsh or there is complete aphonia. The breathing may be embarrassed and noisy, and there may be much dyspnoea should the larynx be obstructed by thickening and oedema. Deglutition is painful, especially when the epiglottis is affected. In the severe cases, blood, pus, and laryngeal structures are expectorated.

The diagnosis between simple, phthisical, and syphilitic laryngitis rests far more with the history and other physical signs of these diseases than with the laryngoscopic appearances of each. In phthisis there may be advanced laryngeal symptoms before any of the physical signs of pulmonary disease can be made out; while, on the other hand, phthisical patients may have a simple chronic laryngitis which is in no way tubercular. The presence of laryngeal *anæmia* is strongly indicative of phthisis, and it should always suggest an examination of the lungs. M'Bride considers the presence of a swelling, irregular in outline, in the inter-arytenoid commissure, as strong presumptive evidence of tuberculosis. The lungs should always be examined in cases of chronic laryngeal disease.

The prognosis of chronic laryngitis, and syphilis of the larynx, is hopeful if seen early enough, and if proper treatment be carried out. When advanced, chronic laryngitis may continue for years, with occasional acute attacks, and without the general health suffering, if the patient be placed in favourable circumstances. In syphilis, a cure may be expected even if advanced, but cicatrizations

may permanently affect the larynx and the voice if the treatment should have been too long delayed. The phthisical form is, of course, the least hopeful, and it is very intractable to treatment.

Treatment.—In the treatment of chronic laryngitis, the principle of rest should be carried out as far as possible. Clergymen and others who suffer from excessive use of the voice, must avoid all unnecessary straining of the cords. Solutions of tannin, chloride of zinc, nitrate of silver, or of iodised glycerine (see R 13) should be applied to the vocal cords and larynx by means of a soft brush. Solutions of morphia or cocaine (5 per cent.) may be applied when there is much irritability. Iodine tincture, or the ointment of the red iodide of mercury, may be applied externally as a counter-irritant. Sudden changes of temperature are to be avoided, and change to a warm and dry climate may bring about a favourable result even in very chronic cases. The treatment of laryngeal phthisis is much the same; but the insufflation of powders as alum, tannin, iodoform, or iodol, and the inhalation of iodine (a teaspoonful of the tincture to a pint of boiling water) will be found to be useful. Oil of pine and creasote are also useful in steam inhalations. A solution of menthol in olive oil (20 per cent.) is sometimes injected into the larynx by means of a laryngeal syringe, in phthisis, and the application of a solution of lactic acid (20 to 80 per cent.) has been recently recommended by Krause (M'Bride). The solution of menthol and olive oil (5 to 20 per cent.) may be sprayed into the throat with De Vilbiss' spray. Menthol pastilles may also be used for painful throat. The general treatment of phthisis should be followed, cod-liver oil and the hypophosphites, &c., being indicated. Surgical procedures may become necessary. A modification of Koch's *tuberculin* may yet prove to be beneficial in phthisis. In syphilis of the larynx, similar local remedies may be applied, while the general treatment by mercury and iodide of potassium is carried out. In perichondritis, abscesses should be opened if possible when suffocative attacks supervene, and laryngotomy should be performed if necessary.

Morbid Growths within the larynx.—These are papillomata and fibromata, or fibrous polypi, which are common; myomata, cysts or mucous polypi, which are not so frequent; and malignant growths.

The *fibroid* tumours are firm, smooth, white-yellow in colour, and they spring generally from the upper border of the vocal cords, and frequently at their anterior insertions. They may be the size of a pea or larger, and they are generally pedunculated.

The *papillomata* are wart-like, pedunculated or sessile, and of a grey colour. They may arise from the vocal cords, epiglottis, or aryteno-epiglottidean folds. Sometimes they are syphilitic in origin.

Cancer, generally epithelial, has a rough cauliflower appearance and grows rapidly. The vocal cord is the favourite site, and the disease extends upwards to the aryteno-epiglottidean folds. In the later stages the cervical lymphatics begin to enlarge and the can-

cerous cachexia is developed. The larynx enlarges and it is tender to pressure. Perichondritis and complete destruction of the larynx, with expectoration of blood and fragments of cartilage, &c., ultimately takes place. Two years is the usual duration of cancer of the larynx. It occurs in advanced life, while the other tumours mentioned may appear in the young.

The *symptoms* of morbid growths are at first much the same as in chronic laryngitis—the laryngoscopic examination revealing, however, the presence of the growth. There is a feeling of a foreign body within the larynx, and suffocative attacks (*inspiratory dyspnoea*) may supervene.

The *treatment* is entirely surgical; but in suspicious cases (wart-like growths), iodide of potassium should be first tried.

Laryngeal Paralysis.—The causes may be *central* or *peripheral*, the former being very rare, but it may occasionally occur with apoplexy and other brain diseases. The *peripheral* paralyses may be due to interference with the nerves, especially the pneumogastric and inferior laryngeal, by pressure of mediastinal tumours, enlarged glands, or aneurisms of the aorta; but in the majority of cases the paralysis is *myopathic*, and either due to paralysis of the muscles themselves or to mechanical conditions, as swellings and cicatrizations of the tissues. It is then generally incomplete (paresis). Paralysis may also be the result of diphtheria, lead and arsenic poisoning, or it may be due to hysteria.

Bilateral paralysis of the adductors.—If the whole group of muscles be paralysed, the voice is lost and the laryngoscope shows that the vocal cords are almost motionless during inspiration and expiration, and when phonation is attempted. Sometimes the paralysis is only partial and confined to certain muscles, and hence slight differences arise according as the *tensors* or *constrictors* are most affected (see p. 57). The commonest cause is hysteria, and hence bilateral paralysis of the adductors is sometimes spoken of as *hysterical aphonia*.

In *unilateral paralysis of the adductors* the voice is altered, and the laryngoscope shows that there is no movement of the cord forwards to meet its fellow—the rima glottidis being directed towards the paralysed side when phonation is attempted. Slight differences also occur when the *tensors* or *constrictors* are alone affected. It is generally the left cord that suffers, and this is due to some direct pressure upon the recurrent laryngeal nerve.

Bilateral paralysis of the abductors, or dilators of the glottis, is accompanied by noisy stridulous breathing, the voice being harsh and rough. The cords do not separate on taking a deep breath.

In *unilateral paralysis of the abductors* the dyspnoea is not so marked, and the affected cord remains near the median line when phonation is attempted.

Amongst the *neuroses* of the larynx, M'Brice mentions *mogiphonia*—an affection which is analogous to writer's cramp—*laryngeal vertigo*, and *nervous cough*.

In the treatment of paralysis the constant and induced currents

are both useful. In hysterical cases the electrodes are applied to the sides of the larynx with good results. In more difficult cases direct faradisation of the larynx may be used, the negative electrode being placed upon the neck, while an intra-laryngeal electrode is applied to the arytenoid cartilages. The treatment should be continued for a considerable time.

Laryngismus Stridulus.—Spasm of the glottis is a disease of early childhood, occurring chiefly in the scrofulous and rachitic; but it may also affect adults, and be either the result of hysteria or a consequence of pressure of aneurisms or tumours upon the recurrent laryngeal nerve. The chief symptom is the occurrence of sudden dyspnoea with stridulous and crowing inspiration—the attack often terminating in general convulsions. Recovery is usual; but recurrence of the attacks is frequent, and death may take place from suffocation.

The *causes* are generally reflex, as teething, worms, errors in diet, and exposure to cold draughts. It is common in hydrocephalus. The diagnosis is considered elsewhere (*Spurious croup* and *Diphtheria*).

The *prognosis* is favourable if the cause be removable, and if the child is not weakly.

The *treatment* during an attack is to endeavour to relieve the spasm by hot sponges applied to the throat, by hot baths, and by dashing cold water upon the head and chest. The throat should be tickled or an emetic given, if possible, as an emetic tends to relieve the spasm. Inhalations of chloroform may be of use in severe cases, and artificial respiration should be tried if still unrelieved. An enema should be given to clear the bowels. Tracheotomy may sometimes be necessary. During the intervals of the attacks ammonium bromide may be given, and ultimately tonics, cod-liver oil, &c.—with attention to the diet and regulation of the bowels.

[**Croup.**—Hitherto, this affection has been described as a substantive disease, and divided into *true* and *spurious*. Membranous laryngitis, or true croup as it was called, has been proved, bacteriologically, to be the same disease as diphtheria, and hence it is discussed under that heading—*laryngeal diphtheria*. The so-called *spurious* croup was the name given to a milder form of spasm than laryngismus stridulus, unaccompanied by any inflammatory symptoms, beyond, perhaps, a slight catarrh of the larynx. If the name *croup* is to be retained, and it has a certain amount of practical significance, it must be understood always to mean *catarrhal laryngitis* with spasm. A *post-pharyngeal abscess* has been known to give rise to "brassy" cough with dyspnoea; while pertussis, in the early stage when the cough is dry and harsh, may resemble "croup."]

[Although a *special* subject with surgical treatment, **Adenoids** may briefly be mentioned here. It is a disease of childhood in which there is increased growth of lymphoid tissue in the post-nasal regions, and as a consequence there is nasal obstruction and deafness. The features soon take on a characteristic appearance. The mouth is kept open, and the upper lip is retracted. The face

appears lengthened and the nose pinched; and the expression is dull and unintelligent. The tonsils are usually enlarged, the fauces relaxed, and the posterior wall of the pharynx seems set deeply back. The voice is altered, and the breathing, in advanced cases, may be very noisy and snuffling, especially during sleep. A reflex cough, and various other neuroses, may be the result of adenoids. The child is usually pale and strumous-looking, with possibly enlargement of the lymphatic cervical glands. The *early* removal of adenoids not only allows of better facial configuration, but is of immediate and marked benefit as regards the general health.]

Percussion.

Although more fully discussed in special works upon physical diagnosis, it is necessary here to sketch the theory of percussion and its practical application to medicine, especially to diseases of the chest. The subject is a difficult one, and it is rendered more so by the different views of authors, and by the confusion in the use of terms which have, in practice, been generally applied without regard to the scientific nomenclature and to the properties of sound.

While endeavouring, so far as possible, to reconcile these different views, an attempt will be made only to briefly formulate the simple characteristics of sound, which are concerned in the production of percussion-tones, and to point out what is practically necessary for their proper interpretation.

Definition of Sound.—"All sounds originate in impulse, or in vibrations of the particles of elastic bodies, which generally reach the ear through the medium of undulations in the air."

If a small steel rod be fixed at one end within a vice, and if the free end be struck, sound will result, and the vibratory movement will be visible; while, at the same time, a fine wire suitably attached to the vibrating extremity, and allowed to touch the smoked paper of a quickly-revolving cylinder, may be made to record these vibrations graphically.

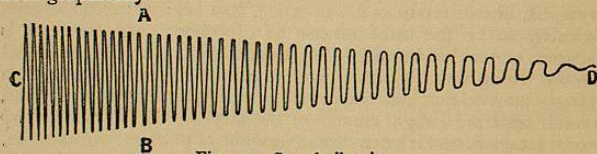


Fig. 12.—Sound-vibrations.

Tone depends upon the frequency of the vibrations. They must be rhythmical and sufficiently rapid; and the greater the frequency the higher the *pitch*. The *loudness* or *intensity* of the sound depends upon the *amplitude* of the vibrations—A to B. The *duration* of the sound is the time during which the vibrations last—C to D. The *undulations* in the air are set up by the alternate condensation and rarefaction of sheets or layers of air in contact with the vibrating body, and these layers propagate the impulse to adjacent layers.

The waves are, in free space, ultimately lost; but if the waves be confined they are reflected.

The undulations may be illustrated by observing what occurs in water when a pebble is dropped into it. That they are a phenomenon of translated motion and not of translated matter, may be shown by floating a cork upon the surface, when it will be seen to rise and fall with the waves, but is not carried on with them. If the water be confined in a trough, the waves are seen to be reflected from the sides.

No sound can be propagated in a vacuum, and the greater the density of a gas the stronger or more intense will the sound be. In water a sound travels four times faster than in air, and most solids conduct sound at a great velocity, and with greater loudness. Sonorous vibrations, however, are not readily communicated from gas to fluid, as will be considered when we come to treat of pleuritic effusion interfering with the conduction of breath-sounds.

Overtones — Harmonics.—When the string of a monochord is made to vibrate throughout its whole length, the sound produced is called the fundamental note. If a *node* be formed by touching the centre of the string, it will vibrate in two segments, and the note will be an octave higher because the two segments vibrate simultaneously at double the speed. In the same way *thirds, fourths, &c.*, may be made to vibrate; and the corresponding higher tones of a fundamental note are called its overtones or harmonics. "Whenever a string vibrates throughout its whole length, it also vibrates in *halves, thirds, fourths, &c.*—the aggregate motion being exceedingly complex." Trained ears can detect the fundamental tone and its overtones; and upon the richness in number of these overtones the quality or *timbre* of a sound depends.* *Noise* is produced by a succession of sound-waves lacking periodicity, or by a number of tones which do not harmonise.

Vibrating Membranes.—Stretched membranes do not yield tone unless they are very tense and vibratile, or enclose an air-containing cavity. In the latter case the tone is produced by the conduction and rhythmical reflection of waves within the cavity—*i.e.*, *resonance*.

Resonance may be defined as "a sympathetic vibration resulting from the accumulation of small periodic impulses imparted by one sonorous body to another, whose period or time of vibration is *synchronous with it*"—*e.g.*, sounding-boards in stringed instruments. To procure a *clear* tone by rhythmical reflection or resonance, the size of the air cavity must be in relation to the flexibility of the vibrating membrane, or else they do not consonate, and the tone is more or less muffled or dull. This may be shown by holding a tuning-fork over a tall, empty jar, and pouring in water until the size of the resonant space or air column is such as to allow of the undulations of the air being in unison with the vibrations of the fork. The sound then becomes clearer and more intense.

The *intensity* and *pitch* vary with the size of the air column. A

* This will be well appreciated if the vowels be loudly sounded into an open pianoforte, with the *loud* pedal pressed down.