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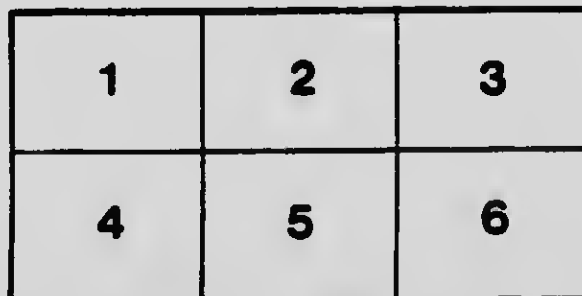
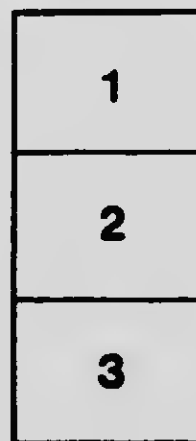
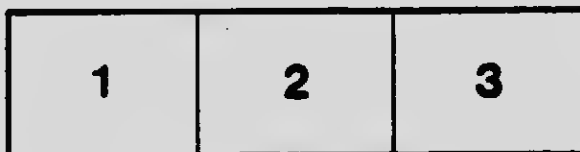
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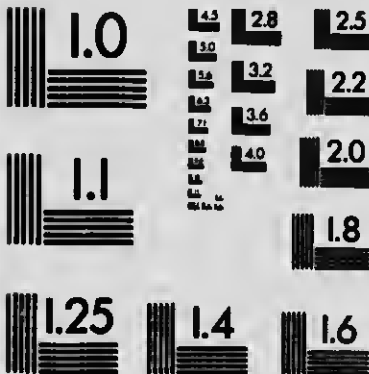
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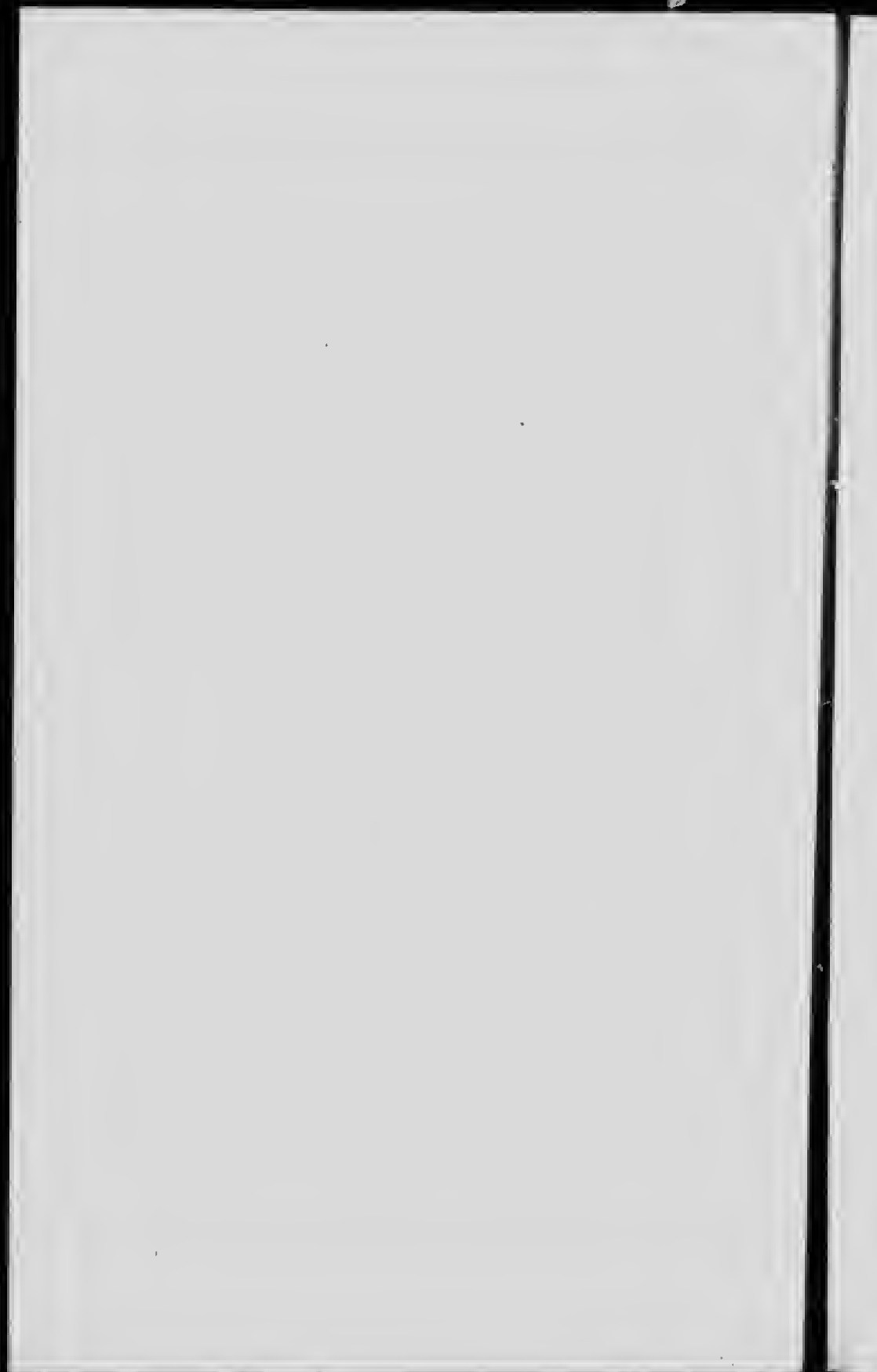
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DISEASES OF THE
THROAT, NOSE, AND EAR

FOR PRACTITIONERS AND STUDENTS

BY

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WITH 77 ILLUSTRATIONS, 44 OF WHICH
ARE IN COLOURS

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PREFACE

In writing this book, my main object has been to provide the practitioner and senior student with a single volume of moderate size, embracing sufficient information on the Diseases of the Throat, Nose, and Ear to be of value in practice. Special attention has accordingly been paid to diagnosis, and to treatment in so far as the latter can be carried out by the non-specialist: but the major operations have not been described, the indications for their performance and their general features alone being given. There is a full account of the ordinary methods of examination at the beginning of each section, and this is followed by remarks on general semeiology and therapeutics.

Anatomical descriptions have been omitted except for the elucidation of special points arising in the text, and illustrations of instruments have also been excluded: the former because an anatomical text book is in the hands of nearly everyone, and the latter because an instrument catalogue can generally be consulted.

To avoid constant repetition in the text, an appendix has been added containing some of the descriptions more commonly used in the specialty.

I have endeavoured to make the book up-to-date and complete within the limits mentioned above. Recent literature has been laid under contribution as far as possible, and sufficient acknowledgment will, I trust, be found in the text.

PREFACE

The coloured illustrations are all original, and most of them were drawn from my own patients by Mr. A. A. Gamley, under my supervision. To Dr. McBride and Dr. Logan Turner I am greatly indebted for many valuable suggestions and criticisms, and to the latter for very kind permission to have drawings made from some of his patients (*Figs. 15, 17, 19, 20, 28, 30*). To Dr. Halliday Croom I am also under much obligation for kind and valuable help, and especially for reading the MS. I have also to thank Mr. Alexander, pharmacist to the Royal Infirmary, Edinburgh, for kindly revising the formulæ in the Appendix; Messrs. Mayer and Meltzer for *Fig. 40*, my publishers for *Fig. 42*, and also for their unvarying help and courtesy.

W. G. P.

EDINBURGH,

October, 1912.

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DISEASES OF THE THROAT, NOSE, AND EAR.

SECTION I. DISEASES OF THE PHARYNX.

CHAPTER I. METHODS OF EXAMINATION.

IN this section the term pharynx refers to the oro-pharynx, i.e., the part of the pharynx which can be surveyed with the aid of a tongue depressor alone. A view of this region, sufficient for ordinary purposes, can be obtained by daylight without the aid of a mirror, but it is certainly not possible to make a thorough examination in this way; and it is accordingly advisable to make use of a reflector and good artificial light when they are available. It is unnecessary in this section to enter into a consideration of the best form of forehead mirror and source of light to be used, as these will be fully discussed in the chapter on the examination of the larynx; there remains, therefore, only the choice of a tongue depressor. Lack's instrument is one of the best on the market; it consists of a piece of metal bent in the middle at right angles, and is not wide enough to cause the retching so apt to be induced by the broader types of tongue depressor, although it is sufficiently wide to control a large flabby tongue. Brünings' spatula, which is somewhat similar, is equally good. If neither of these is available, one of the other patterns of tongue depressor, or even the handle of a spoon, will answer the purpose.

The light is adjusted after the manner described on page 31, and the patient is asked to open his mouth. The tongue and

DISEASES OF THE PHARYNX

mucous membrane of the buccal cavity should be inspected first; to do this thoroughly the spatula is used to draw the cheeks away from the upper and lower jaws in turn; the inner aspect of the lips, and the under surface of the tongue should also be looked at. In this way the whole mucous lining of the mouth can be examined rapidly, and any abnormality will be detected at once. It is essential to carry out this examination when there is any suspicion of secondary syphilis, for the delicate mucous patches characteristic of this disease easily escape notice.

The state of the teeth and of the tongue must not be overlooked, for abnormal conditions of either of these organs will not infrequently throw light on symptoms referred to other regions. Dentures should therefore be removed, to permit of examination of the underlying parts; for in numerous patients, especially of the hospital class, these plates are fitted over carious roots.

Attention can now be directed to the soft palate, where in particular anæmia should be looked for. The distance of the velum from the posterior wall of the pharynx is sometimes a factor of importance. In singers, this space should be large, as this gives more room for resonance, and the quality of the voice is thereby improved. The mobility of the soft palate may also be tested, either by making the patient say "ah" while the throat is being inspected, or by asking him to repeat a test sentence, such as the following, which has been suggested by Professor Wyllie, of Edinburgh:—"Billy Button bought a butter hiscuit." If the action of the palate is impaired, the "b's" are all pronounced "m's." Nasal speech caused by insufficiency of the palate is called *rhinolalia aperta*, in contradistinction to that caused by nasal obstruction, which is known as *rhinolalia clausa*, and which is typically found in adenoid vegetations. It is necessary at times to test the tactile sensibility of the soft palate; to do so it should be touched with a probe, a comparison being made between the two sides.

A careful inspection should be made of the tonsils. They should not project beyond the anterior pillars of the fauces, nor should the latter be adherent to the tonsil. The mouth of the so-called supra-tonsillar fossa, which is found in the upper part of the tonsil, should also be examined. The clinical importance of this cavity, first recognized by Paterson and Killian, has now been fully admitted. The fossa is really intra-tonsillar, and lies

METHODS OF EXAMINATION

3

within the upper pole of the tonsil ; it is covered in by the plica tonsillaris, which is prolonged from the anterior pillar of the fauces. It is bounded above and in front by the capsule of the tonsil covered by a layer of lymphoid tissue, while the posterior boundary is formed by the tonsil itself. Some of the crypts of the upper part of the tonsil, and of the mucous glands in the soft palate, open into this fossa. The prolongations of the tonsil to the tongue can be seen by firmly depressing that organ with a spatula.

On rare occasions a congenital perforation is seen on each of the anterior pillars of the fauces ; they should not be mistaken for syphilitic lesions.

The posterior wall of the pharynx can now be inspected. Tortuous veins are not infrequently observed coursing over its surface, but they have little clinical significance, and may be disregarded. Larger pulsating vessels are occasionally detected ; they do not give rise to symptoms, but cutting operations should obviously be avoided in their neighbourhood. Granules of lymphoid tissue may frequently be found, scattered irregularly over this area, and their presence should not be overlooked, as they may cause a certain amount of irritation and discomfort.

When abnormal conditions have been found in the pharynx, the state of the lymphatic glands should be investigated, for this is frequently of no little importance in modifying prognosis and treatment.

Some children refuse to allow their throats to be examined peaceably ; it then becomes necessary to use force. The most satisfactory way to do this without hurting the child is to have him held according to the German method (*Fig. 1*) when proceeding to operate for enlarged tonsils. A nurse takes the child



Fig. 1.—Holding a refractory child.

4 DISEASES OF THE PHARYNX

on one knee, imprisoning his legs with her own; she then places one arm round his body, pinioning his arms, while with her other arm and hand she steadies his head against her shoulder. The surgeon closes the anterior nares of the patient until the latter is forced to take a breath through the mouth; the spatula is then introduced, and a view of the parts is obtained.

CHAPTER II.

ACUTE INFLAMMATIONS OF THE PHARYNX.

ACUTE PHARYNGITIS.

THIS is one of the conditions most commonly met with in the throat, and most of us have had personal experience of it. It is more liable to occur in autumn and winter than in summer, it is common in measles, scarlet fever, smallpox, and typhoid, and is a frequent manifestation in syphilis. It may also occur after the administration of certain drugs, such as iodide of potassium, mercury, and arsenic; while gouty or rheumatic persons are more liable to be attacked than other individuals.

SYMPTOMS.—An attack begins with a feeling of *chilliness* (due to slight pyrexia), pains in the limbs and back, and a sensation of rawness in the throat, which sometimes amounts to actual pain. Cough may be present; there is a varying degree of pain in swallowing, and if the process extends to the larynx the voice becomes hoarse. On examining the throat there is seen a marked congestion of the mucosa, accompanied by some swelling which gives a succulent appearance to the parts. The tonsils, the anterior and posterior pillars of the fauces, the soft palate, and the posterior wall of the pharynx may all share in the congestion, and the uvula may become œdematous.

TREATMENT.—A good many people do not undergo any treatment, but if advice is sought at the beginning of the attack, the patient should be recommended to retire to bed early after a very hot bath, and to take aspirin, gr. x. A Turkish bath will sometimes abort an impending attack. To relieve the rawness of the throat, equal parts of boroglyceride in glycerine may be applied, and a woollen scarf or stocking should be worn round the throat at night. A favourite German remedy, known as a Priessnitz compress, may be substituted; it is applied in the following way: A cloth wrung out of cold water is wound round the neck; this is covered by a layer of oiled silk, while the whole is bound round with a woollen comforter.

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VINCENT'S ANGINA.

This is not a common affection of the throat, but as it presents an appearance resembling the formation of a false membrane, it calls for some description. The condition is due to Vincent's fusiform bacillus and Vincent's spirillum. These organisms stain with aniline dyes, and can be detected in a smear preparation; they do not grow on any culture medium. The symptoms are usually those of an ordinary angina, while there may be in addition some swelling of the neck. On inspecting the throat, necrotic areas are seen on one, or more rarely on both, tonsils; the process sometimes extends on to the palate. It may be impossible to differentiate the condition clinically from diphtheria, hence it is important to make a microscopic examination. The disease usually runs a mild course, but fatal results have been recorded by Bruce.

TREATMENT consists in the application of tincture of iodine or of some other antiseptic pigment (see Appendix).

ANGINA ULCEROSA BENIGNA.

This condition was first described by Heryng, and although rare, is worthy of some notice, as it may be mistaken for diphtheria or syphilis. In most cases a single oval ulcer is found, covered with a dirty grey deposit, and situated on one of the anterior pillars of the fauces; more rarely the ulceration involves both pillars. There may be severe pain, but in a case observed by myself, where there was a single ulcer, pain was not complained of.

A careful examination should prevent a mistake in diagnosis, as the loss of tissue distinguishes it from a mucous patch; and if there is any difficulty in eliminating syphilis, the progress of the case will shortly clear up the diagnosis. It should also be possible to exclude diphtheria, for there is no false membrane, but merely a grey deposit on the ulcer.

TREATMENT.—A mild antiseptic mouth-wash (see Appendix) should be used, while salicylates may be given internally, as there is a possibility of the condition being rheumatic.

DIPHTHERIA.

It would be outside the scope of this book to give a full description of diphtheria, for it does not usually come under

the notice of the specialist, and it is fully discussed in works on general medicine. It is necessary, however, to make some remarks on the diagnosis, as diphtheria must be distinguished from other inflammatory conditions met with in the throat. In typical cases the disease is characterized by the formation of a false membrane, patches of which are seen on the tonsils and the soft palate, and sometimes also on the posterior wall of the pharynx. The colour of the membrane varies; it is usually grey, but may be dead white, yellow, or dark brown. The membrane is firmly attached to the mucosa, and if forcibly removed a bleeding surface is left, on which it soon re-forms. Diphtheritic sore throat is not, however, always associated with the formation of false membrane, and in these cases it is indistinguishable by the naked eye from simple sore throat. False membrane, however, may appear upon the fauces during the first week of scarlet fever, and in some other conditions. In many cases, therefore, a diagnosis cannot be arrived at until a bacteriological examination has been made. It is not right, however, to wait for confirmation by the microscope; but the patient should be isolated as soon as diphtheria is suspected, and treated as if he were suffering from that disease.

HERPES.

This condition is rarely met with in the throat, but the possibility of its occurrence must be borne in mind, for it is one of the conditions which may be mistaken for diphtheria. Groups of small vesicles appear, which are usually situated on the soft palate, but also occur on the pharyngeal wall. They soon become opalescent, and burst, leaving white, round, shallow ulcers, which may coalesce and give rise to an appearance resembling false membrane. The ulcers are surrounded by an area of redness, and may occasion considerable pain. The condition is not serious, and the treatment consists in the use of a mild antiseptic mouth-wash or pigment (see Appendix).

PEMPHIGUS.

This disease is very rarely met with in the throat, and the bullous stage is hardly ever seen. The blebs are much larger than herpetic vesicles, and may be found on any part of the mucosa of the mouth. They very soon burst and collapse, giving rise to ulcers covered by thin white epithelium. There

is generally severe pain and dysphagia: to relieve the latter, insufflations of orthoform and anæsthesin may be given before meals, though in a case which came under my observation, no treatment appeared to afford relief. In addition to the palliative treatment, the effect of arsenic may be tried.

The ultimate prognosis is usually very serious.

ACUTE SEPTIC INFLAMMATION OF THE PHARYNX.

Under this heading a group of conditions⁷ is described which have all a common etiology (Semon), though they differ widely in their clinical aspects. The micro-organism usually present is the *Streptococcus pyogenes*; similar conditions may, however, be caused by other bacteria, such as *Staphylococcus aureus*, *Pneumococcus*, *Bacillus coli communis*. We may differentiate clinically between: (a) Slight septic inflammation, commonly called hospital sore throat; (b) Acute œdematous inflammation; (c) Acute suppuration or phlegmon; (d) Gangrenous sore throat.

At the present day hospital sore throat is most commonly caused by exposure to bad drains; it may also be due to contact with decaying organic matter. The symptoms are those of an ordinary angina, but are more severe. The tonsils may be primarily affected, in which case the appearances are those of an acute follicular tonsillitis (see page 19), and in addition the patches of lymphoid tissue on the pharyngeal wall may be similarly affected.

The prognosis is good, but the treatment must be energetic. A preliminary dose of calomel (gr. iij in powder) should be given at night, followed by a saline cathartic in the morning. The patient must be kept in bed, and the throat should be sprayed every hour with a solution of peroxide of hydrogen (10 vols.), followed by an antiseptic mouth-wash (see Appendix). Antiseptic pigments may also be applied. After convalescence, a change of air is important, while good diet and tonics are indicated.

In the more severe forms of inflammation, the symptoms are much more serious. The onset is usually sudden, and in some cases the disease is ushered in by a rigor. The patient is seized with pain in the throat, and has great difficulty in swallowing; the temperature rises to its highest point at once, except in those cases in which the individual is immediately felled by the toxin,

and in which there may be no pyrexia. The pulse is at first full and rapid, but soon becomes weak and thready; after suppuration has begun there is profuse sweating. On examination, marked congestion and swelling are observed, and the uvula is œdematous, and greatly thickened and elongated. If suppuration occurs, it may be limited to the oro-pharynx, but the disease tends to spread rapidly to the larynx; the epiglottis then becomes enormously swollen and red, while the ary-epiglottic folds also participate in the swelling, so that dyspnoea may supervene and necessitate immediate tracheotomy.

These cases correspond to the condition described by Senator as acute infectious phlegmon of the pharynx. In some instances the infection spreads to the submaxillary region, and causes a hard brawny swelling under the jaw, which is generally known as *angina Ludovici*. Patches of gangrene may appear on the uvula or posterior wall of the pharynx, but this is very unusual. The lungs and serous membranes are liable to become secondarily affected, and pleurisy, pericarditis, or meningitis may manifest itself early in the disease.

PROGNOSIS.—The prognosis in suppurative pharyngitis is very grave; the purulent and gangrenous varieties usually end in early death, but the serous cases may recover, even when the disease has spread to the lungs or serous membranes.

TREATMENT.—The treatment must be both prompt and energetic. In these severer forms of inflammation, an attempt should be made at once to combat the toxæmia by the injection of a suitable serum. If possible the bacteriology of the condition should be investigated in the first instance; but if the means for this are not available, a polyvalent antistreptococcus serum may be employed, as the majority of these cases are due to a streptococcal infection. The full dose is 20 c.c.; this may be repeated, if necessary, every twenty-four hours for a week. At the same time the general condition of the patient requires careful attention. If the temperature exceeds 103° F., quinine, gr. v, should be given every four hours, and if the prostration is great, strychnine and alcohol, or ethereal stimulants should be prescribed. At a later stage in the disease, *strophanthus* or *digitalis* should be ordered if the pulse becomes irregular, or if cardiac failure manifests itself. The local treatment is the same as for hospital sore throat, and when the larynx is involved the patient must be kept under the most careful observation, as œdema may develop

rapidly and necessitate immediate tracheotomy. The reader should refer to page 46 for further details as to the treatment of this complication.

RETRO-PHARYNGEAL ABSCESS.

This is a somewhat rare condition, and the majority of cases are met with in young children, though adults may also be affected. It is usually idiopathic, and consists in a collection of pus beneath the mucosa of the posterior wall of the pharynx. It is the result of inflammation and suppuration of lymphoid tissue, which is found in children at the level of the second and third cervical vertebræ. The affection may, however, be secondary, and in that case it almost invariably results from caries of the cervical vertebræ, though it may be due to the burrowing of pus from other regions, e.g., the ear.

The condition may run an acute or a chronic course; in the former case, pain and fever are predominant symptoms, and in all varieties there is interference with respiration and with deglutition, while in children a croupy cough is a notable feature. Stiffness of the neck is also frequently met with, especially in the cases due to vertebral caries. On examination, a smooth fluctuating swelling is found on the posterior wall of the pharynx, to one or other side of the middle line. The abscess rarely extends above the soft palate, but sometimes it spreads towards the œsophagus. In young children the diagnosis is often difficult, for the condition is liable to be mistaken for laryngeal croup; but the presence of the swelling if it can be detected, and the difficulty in swallowing, should obviate this error. In the idiopathic variety the prognosis is favourable if treatment is not delayed; in the secondary cases it depends on the primary condition.

TREATMENT is necessarily surgical: the abscess may be opened through the mouth, the patient's head being placed in the dependent position in order to prevent the pus from entering the larynx. In cases associated with cervical caries, access should be obtained through an incision behind the posterior border of the sternomastoid. This operation requires the most careful aseptic precautions, and should be relegated to the surgeon.

CHAPTER III.

CHRONIC INFLAMMATIONS OF THE PHARYNX.

CHRONIC PHARYNGITIS.

A VARIETY of conditions may produce chronic pharyngitis. The most common causes of the affection are: Repeated attacks of acute pharyngitis; over-indulgence in tobacco, alcohol, or irritating articles of food; excessive or faulty use of the voice and prolonged exposure to a dusty atmosphere; while gouty or rheumatic individuals are especially liable to be attacked. For clinical purposes it is advisable to discuss this disease under three headings:—

(1) *Simple catarrhal pharyngitis*; (2) *Hypertrophic pharyngitis* (syn. granular pharyngitis, clergyman's sore throat); (3) *Atrophic pharyngitis, or pharyngitis sicca*.

1. In **Simple Catarrhal Pharyngitis** there are usually enlargement and congestion of the uvula and soft palate; the posterior wall of the pharynx may also be congested, and dilated veins may be seen coursing over its surface. This variety of pharyngitis is usually produced by exposure to dust, errors of diet, or over-smoking, indeed nearly every smoker exhibits the condition in a greater or less degree. The symptoms generally complained of are a feeling of thickness in the fauces, and a frequent desire to clear the throat.

TREATMENT.—This consists in correcting errors of diet, while the consumption of alcohol and tobacco should be very much restricted or entirely given up for a few weeks. The bowels should be kept open; a good aperient in these cases is a teaspoonful of Carlsbad salts taken before breakfast in a tumblerful of hot water. As a local application, Mandl's solution may be used, or an astringent pigment such as chloride of zinc or nitrate of silver (see Apper dix). In very rare instances it may be advisable to snip off the end of the uvula with a pair of scissors; this procedure is, however, advisable only in quite

DISEASES OF THE PHARYNX

exceptional circumstances, and should not be resorted to unless the uvula is sufficiently long to cause irritation by coming in contact with the back of the tongue.

2. **Hypertrophic Pharyngitis**, or Clergyman's Sore Throat. This form of pharyngitis is met with as a rule in persons who have to use their voices professionally, though a gouty or rheumatic diathesis also predisposes to the condition.

APPEARANCES.—Small nodules of lymphoid tissue are seen scattered over the posterior wall of the pharynx; hence the condition is sometimes termed granular pharyngitis. Thickened bands of tissue may also be found on the lateral walls of the pharynx behind the tonsils.

SYMPTOMS.—There is a constant desire to clear the throat, and a feeling as if there were a foreign body in it; the chief complaint, however, is that the voice soon becomes tired, and that its carrying power is diminished, so that the patient finds it difficult to continue in the exercise of his profession.

TREATMENT.—The treatment of these cases is by no means easy, owing to the difficulty in determining how far the symptoms are due to the objective changes found in the throat. In many cases faulty voice production, or forcing the voice, may be the chief cause of the condition, while the changes in the pharynx may be only secondary. It is, therefore, important before proceeding to local treatment to inquire into the patient's method of using his voice in speaking in *public*. Pitching the voice too high, or an incorrect method of breathing, are common mistakes; in such cases, the patient should be instructed to speak slowly, and to allow pauses for inspiration, while the voice should be pitched in a lower key. When these mistakes have been rectified, local treatment may be employed. Granules may be burnt with the cautery; a flat burner at a dull red-heat should be used, and several may be cauterized at one sitting; the throat should then be painted with equal parts of boroglyceride and glycerine. Mandl's pigment is frequently of service in relieving the discomfort in the throat, and gymnastic gargling with salt and cold water may be prescribed. In this form of gargling the patient commences to swallow, but brings the fluid up again just before it has got beyond his control; the solution is thereby brought into contact with parts which are not reached by the ordinary method of gargling. If the patient is gouty or rheumatic, considerable benefit may result from a visit to some

spa, such as Ems, Aix-les-Bains, Eaux Bonnes or Cauterets, where special facilities for local treatment are afforded.

3. **Atrophic Pharyngitis, or Pharyngitis Sicca.**—In this variety of chronic pharyngitis the etiology is obscure, though, according to Schech, it is not uncommonly associated with Bright's disease and diabetes. The appearances are very different from those found in the other forms of the disease.

APPEARANCES.—The posterior wall of the pharynx presents a glazed surface on which a little dried secretion may be observed; this change may be limited to the pharynx, or may extend to the larynx; it is frequently met with in cases of atrophic rhinitis.

SYMPTOMS.—The chief symptom is dryness of the throat. Treatment can only be directed towards the alleviation of this symptom, as it is impossible to regenerate the atrophied structures of the mucosa. Mandl's pigment is of use for this purpose, more particularly with the addition of carbolic acid, gr. xx. Potassium iodide given internally is also of value, while an inhalation containing creosote and light magnesia (see Appendix), frequently relieves the discomfort in the throat.

CHAPTER IV.
*CHRONIC INFECTIVE CONDITIONS OF THE
PHARYNX.*

SYPHILIS.

PRIMARY sores are but rarely found in the throat ; when they do occur they are most frequently situated on the tonsils. The secondary lesions are much more common and are of infinitely greater importance. One of the earliest is erythema, which appears as a sharply defined area of congestion, pink in colour and irregularly shaped, and which is usually situated on the soft palate, but may also be found on the inner aspect of the cheeks and on the posterior wall of the pharynx. At a later stage, minute erosions may appear in the erythematous area. The mucous patch is the lesion most commonly met with ; it may be found on any part of the mucous membrane of the mouth or pharynx, and appears as a round or oval delicately opalescent area which projects slightly from the surface, and which is frequently surrounded by a narrow border of congestion. These patches vary in size from a pea to a sixpenny bit ; several may become confluent, and ulceration is then liable to occur. It is not uncommon to find a greyish deposit on the tonsil, not unlike a false membrane, rather streaky in outline, and associated with slight loss of tissue ; such an appearance is very suggestive of syphilis. In the tertiary stage gummata develop ; they tend to break down and give rise to deep ulcers, and have a special predilection for the middle line of the soft palate. They appear as rounded red swellings with a well-defined area of congestion round them : if not treated, they break down in the centre and form a circular ulcer containing a tough yellow slough ; the edge of the ulcer has a characteristic punched-out appearance. At a later stage the slough separates, leaving a circular perforation in the soft palate. The tonsils afford another favourite site for the formation of gummata, which may also occur on the posterior wall

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of the pharynx ; in these situations also the gummata tend to break down, and deep ulceration follows. When the ulcers heal, white scars are left which are usually sufficiently characteristic to enable a diagnosis to be made. During healing there is a great tendency for adhesions to form between the soft palate and the posterior wall of the pharynx ; these are sometimes so extensive that the naso-pharynx may be almost entirely cut off from the mouth. If large gummata have been allowed to break down in the soft palate, the uvula and velum may be entirely destroyed, or the ulceration may extend to the hard palate, and a communication be formed with the nose.

SYMPTOMS.—The symptoms complained of in the secondary stage are usually limited to discomfort or slight pain in the throat, but where ulceration has occurred within a few months of the appearance of the primary sore, there may be marked dysphagia. In the tertiary lesions, pain is usually absent, the patient being driven to seek advice owing to food gaining access to the nose when eating, or else from the speech having become markedly nasal.

DIAGNOSIS.—The diagnosis of syphilis of the pharynx is not difficult as a rule, though it is often impossible to obtain a history of infection corresponding to the appearances met with in the throat. It must be remembered, however, that no hard and fast line can be drawn between secondary and tertiary lesions ; deep ulceration may be observed within a few months of infection, while gummata may not appear for many years after the first manifestations of the disease, and then after a period of absolute freedom from symptoms ; and further, the so-called secondary lesions may reappear from time to time for several years after the primary infection. Syphilitic erythema and mucous patches are so characteristic in their appearance that it is unlikely a mistake will be made as to their nature ; but the mucous patches may readily escape notice in a casual examination, and this is one of the reasons why State regulation of prostitution fails so signally in diminishing venereal disease. Gummata on the tonsils may present very considerable difficulty in diagnosis, as they have to be distinguished from cancer ; but in the latter condition there is usually pain shooting up to the ears, there is more induration, and the cervical lymphatic glands may be enlarged. It must not be forgotten, however, that cancer and syphilis may both be found in the same individual.

In doubtful cases, the diagnosis may be confirmed by the detection of the *Spirochæta pallida*. The method is applicable only to primary sores, mucous patches, and the early ulcerative lesions of malignant syphilis. A preparation must be made from the tissue fluid expressed from the ulcer after thorough cleaning, and not from the débris on the surface of the ulcer. The spirochæte, if present, may be demonstrated by dark-ground illumination, or by Burri's method. In the latter, one platinum loopful of Indian ink, and one of the suspected exudate, are taken, the mixture is spread out as in making a blood film, and dried without heat. The preparation is then examined under an oil-immersion lens, and the spirochæte, if present, is easily found. It appears as an extremely delicate filament, coiled to form a spiral; the spirals are close and numerous, ten to twenty-six in number. The spirochæte appears as a clear space against a dark background. This method of diagnosis is not applicable in tertiary lesions; in such cases, and in the earlier manifestations where a search for spirochætes has been unsuccessful, the examination of the blood for Wassermann's reaction may be undertaken, but as it is a laboratory method, it should be entrusted to one who is familiar with the technique.

TREATMENT.—It would be out of place here to discuss the general treatment of syphilis, but undoubtedly the method of administering mercury by inunction gives, as a rule, excellent results. Syphilitic lesions of the air-passages also resolve with extraordinary rapidity after the injection of salvarsan, and this should certainly be employed in gummata of the palate or pharynx where it is particularly important that no destruction of tissue should take place. It is unnecessary to discuss the question of combining the administration of salvarsan with mercury, a course which is recommended by many syphilologists. As regards local treatment, it is the custom in Germany to paint superficial ulcerations and mucous patches with a weak solution of chromic acid, but in this country local treatment is not so much resorted to. When mercury is being taken, the teeth should be most carefully cleaned after every meal with a soft brush, and the mouth rinsed out several times a day with a mild antiseptic mouth-wash. Tobacco and alcohol (except possibly light wines, such as claret) should be forbidden in all stages of the disease. Where considerable defects have been left in the palate as the result of syphilitic processes, an

PLATE I.
AFFECTIONS OF THE PHARYNX



Fig. 2.
Chronic mucinomegical ulceration of the
pharynx, tonsils, and tongue.

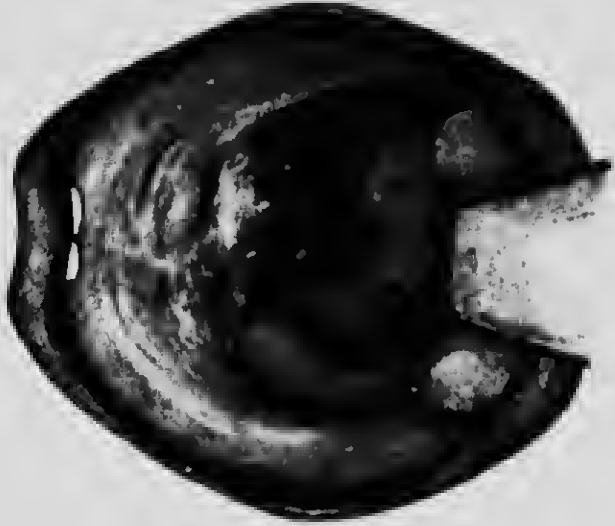
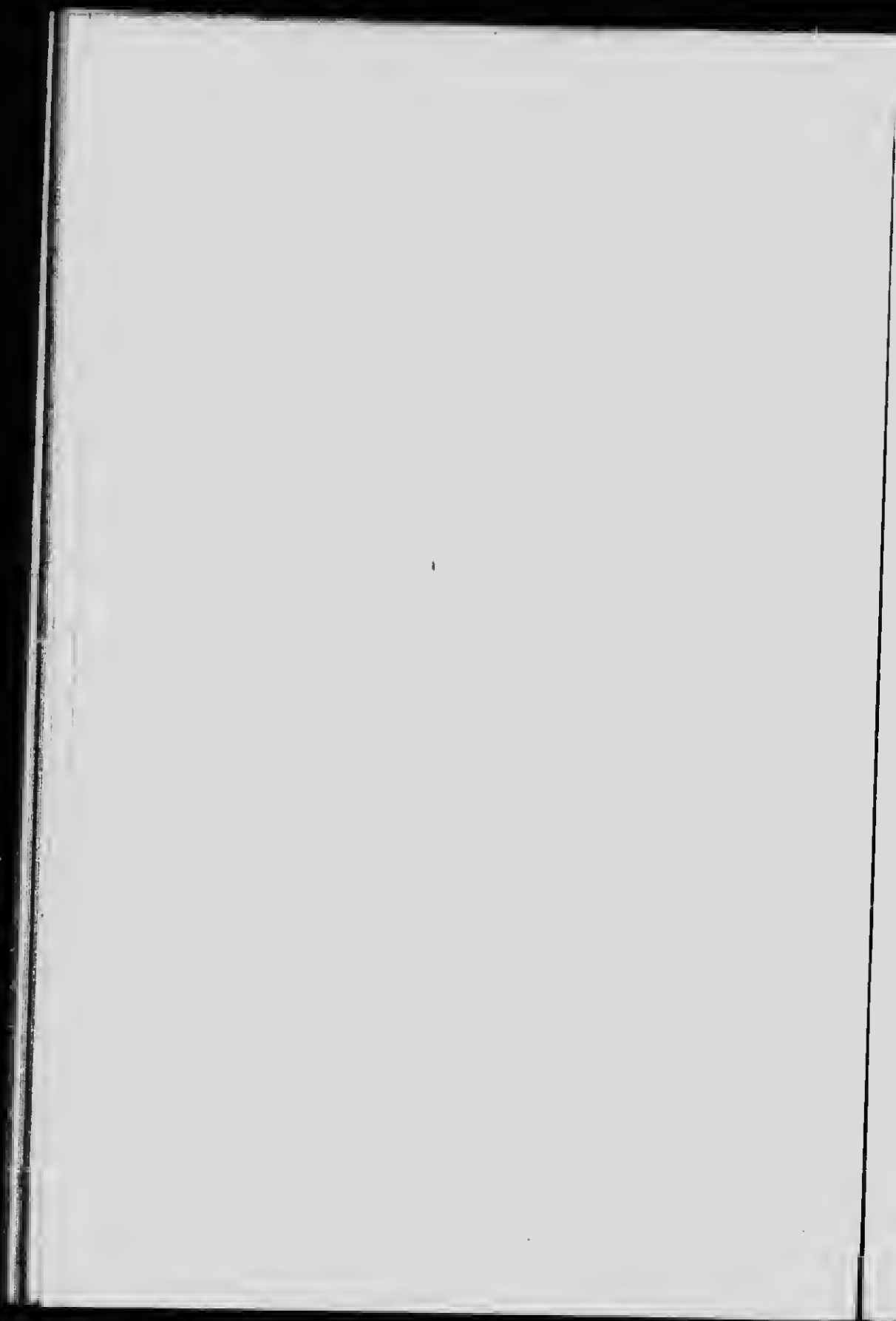


Fig. 3.
Varix of the soft palate, tonsil, and
posterior pharyngeal wall.

DISEASES OF THE THROAT, NOSE, AND EAR



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obturator may be fitted by a dentist to diminish to some extent the discomfort of the condition.

TUBERCLE.

Tuberculosis of the pharynx is a somewhat rare affection, and is generally secondary to pulmonary or laryngeal phthisis. In the earlier stages, discrete shallow lenticular ulcers appear on the pharynx; they are covered with a dirty grey deposit, and remain shallow, though they spread superficially until finally the whole posterior wall of the pharynx may present an ulcerated surface, covered with grey secretion, and from which pale granulations project. There is no surrounding area of congestion, and pain and dysphagia, which are generally absent in syphilis, are marked features. These characteristics should make it possible to distinguish tuberculous from syphilitic ulceration. In doubtful cases, a portion of tissue may be removed from the edge of the ulcer by means of a conchotome, for microscopic examination. If the tissue is tuberculous, characteristic giant-cell systems and areas of caseation may be found, but it is difficult to demonstrate the presence of tubercle bacilli. As an alternative, the blood may be examined for Wassermann's reaction, which will be positive in the case of syphilis; or von Pirquet's cutaneous reaction may be tried. If the latter is positive, it shows that there is some tuberculous lesion in the body; but if negative, no conclusion can be drawn.

PROGNOSIS.—This is very grave, and the treatment is mainly palliative. The effect of tuberculin injections may be tried, but they are hardly likely to prove beneficial in such advanced and serious manifestations of this disease. The ulcers may be painted with lactic acid, beginning with a 20 per cent solution and gradually increasing the strength to 60 per cent; previous to this, the ulcerated area may be curetted. The symptom which especially requires treatment is the dysphagia, and this may usually be relieved by the insufflation of equal parts of orthoform and anæsthesin a quarter of an hour before meals; or if this fails, a solution of cocaine (5 per cent) may be sprayed on the throat.

LUPUS.

This is an exceedingly chronic and painless affection which somewhat rarely attacks the fauces; it is usually associated with lupus of the face and nose. The palate and tonsils are the

parts generally affected ; groups of small, round, pink nodules appear, which are sometimes no larger than a pin's head, but may be three or four times that size ; they break down in course of time, and after healing leave scars. Lupus usually affects children, more especially girls before the age of puberty. The extreme chronicity of the disease, the absence of pain, the age of the patient, the presence of lupus of the face or nose, along with the appearances described above, should enable the diagnosis to be made. Where there is doubt, von Pirquet's cutaneous reaction should be employed.

TREATMENT.—The nodules should be curetted, and a strong solution of lactic acid applied, or they may be destroyed by the use of the electric cantery. The effect of repeated applications of x-rays may also be tried, and tuberculin injections may be given. It is of importance to attend to the general hygiene.

PNEUMOCOCCAL AFFECTIONS OF THE THROAT.

Semon has described a very rare and interesting affection of the throat, which, though it is probably due to the pneumococcus, resembles in many respects a syphilitic lesion. His cases differed from any known throat condition in that they presented the most extraordinary fluctuations in severity, varying from intensely painful inflammation and ulceration to almost entire disappearance of symptoms, followed by repeated and unexpected recrudescence until a complete cure was finally attained. Two of his three cases were characterized by absence of pyrexia and by marked asthenia, and the ulceration was succeeded by loss of tissue having the punched-out appearance so characteristic of a syphilitic lesion ; in both cases the pneumococcus was found on culture, and there was no response to antisyphilitic treatment. I have also recorded a case of chronic pneumococcal ulceration of the throat (*Plate I, Fig 2*), which was wholly unaffected by treatment which included the administration of vaccines. After a year, spontaneous recovery resulted.

RHINOSCLEROMA AND LEPROSY

are met with in the throat, but these diseases are so rarely seen in this country that it is unnecessary here to give a detailed description of them. Rhinoscleroma is characterized by the presence of smooth hard infiltrations which are often symmetrical. In leprosy, infiltrations are found, followed by ulceration.

CHAPTER V.

AFFECTIONS OF THE TONSILS.

ACUTE INFLAMMATION.

THERE are several varieties of acute inflammation of the tonsils; they may be classified under the following heads:—

(1) *Catarrhal or parenchymatous tonsillitis*; (2) *Lacunar tonsillitis*; (3) *Follicular tonsillitis*; (4) *Tonsillar and peritonsillar abscess*.

The etiology of these affections is not always the same, for the tonsils afford a portal of infection by which all the pathogenic organisms may gain access to the throat. Staphylococci or streptococci, or a combination of the two, are the bacteria generally present in acute cases, but Löffler's bacillus and the *Diplococcus pneumoniae* may be met with, and it is important not to overlook the long-recognized fact, that in many cases tonsillitis is a manifestation of rheumatism. The symptoms are the same as in acute pharyngitis, but there is usually more constitutional disturbance, especially in the case of children. The temperature frequently rises to 104° or 105° F., the tongue is furred, and the breath often offensive. There is usually great difficulty in opening the mouth, a constant but much-dreaded desire to swallow, and extreme dysphagia, while pain radiating up to the ears is generally complained of. Constipation is common, and the urine is high-coloured and scanty. The appearances vary considerably: in the catarrhal variety, the inflammation involves the whole structure of the tonsil, which becomes enlarged and appears red and swollen. In the lacunar form (*Plate II, Fig. 5*), the inflammation is superficial and invades the crypts, which fill with fibrin; ulceration follows and involves the follicles (follicular tonsillitis), on which necrotic areas appear. On examination of such a case, the tonsils are seen to be congested, slightly swollen, and studded with minute white points which become larger as the process extends, and which may coalesce. At first these can be easily wiped off, but later they are sometimes adherent.

A tonsillar abscess may develop, and is usually the result of the catarrhal form of inflammation. There is then greater enlargement of the tonsil, which projects towards the middle line, the anterior pillar becomes slightly œdematous, and the abscess finally points, and bursts, in most cases through the tonsil itself.

Peri-tonsillar abscess is more common; in this case the palate becomes red, swollen and, finally, œdematous above and external to the tonsil, which is displaced towards the middle line. If not previously opened, the abscess usually bursts through the soft palate. Difficulty in opening the mouth is a very characteristic feature in both varieties of abscess, and the pain is very severe; the submaxillary glands also become much swollen. When the abscess is unilateral, as is usually the case, the patient frequently inclines the head to one side to lessen the tension of the inflamed tissues.

PROGNOSIS.—The prognosis is favourable if the diagnosis be correct, but the possibility of some of these appearances being due to diphtheria, or to one of the septic forms of sore throat, must not be overlooked. Mistakes are most liable to be made in lacunar or in follicular tonsillitis, and if there is any reasonable doubt as to the nature of the disease, the proper course is to isolate the patient, take a swab from the throat, and treat the case as one of diphtheria until the bacteriological examination clears up the diagnosis. The lacunar and follicular varieties are, however, undoubtedly infectious, so that the patient should, if possible, be isolated in any case, especially when there are children in the house. The sore throat of scarlet fever is often indistinguishable from a simple angina, and if the rash has not appeared and the tongue does not present the typical strawberry appearance, the diagnosis may be impossible.

TREATMENT.—The patient should be sent to bed, and aspirin, gr. x., may be given every four hours until the temperature falls. The bowels should be opened by a dose of calomel at night, followed by a saline cathartic in the morning. The throat may be painted with glycerine of carbolic acid, or boroglyceride and glycerine, and when the breath is offensive, a solution of peroxide of hydrogen (10 vols.) may be sprayed on the throat several times a day, after which the mouth should be washed out with boric lotion, a weak solution of permanganate of potash, or some other mild antiseptic mouth-wash (see

Appendix). A combined vaccine, containing 250 million staphylococci and five million streptococci, may be injected with advantage; one dose is generally sufficient, but a second may be given at the end of a week, if the condition has not cleared up. When a collection of pus is suspected, an endeavour should be made to evacuate it. In the case of peri-tonsillar abscess, the opening is made in the soft palate where there is most bulging (*Fig. 4*), while in tonsillar abscess the tonsil itself is incised. For this operation, Hilton's method should be employed:—A shallow cut is made with a bistoury, and through it a strong pair of sinus forceps is introduced; the blades are then opened, and the forceps withdrawn; if pus is found, relief is instantaneous, but even where no matter is evacuated, there is generally a gradual improvement in the symptoms. It must be remembered that the forceps may have to be forced in to a depth of two inches, or even more, before the abscess cavity is reached; if, however, Hilton's method be adopted, there is little or no risk of injuring any important structure. A peri-tonsillar abscess occasionally re-forms after it has been evacuated, and requires to be opened a second time. In the acute stages, milk with plasmon should be given, supplemented if necessary by rectal feeding. During convalescence, tonics and nourishing foods must be prescribed, and a change of air is desirable.



Fig. 4.—Position of incision in peri-tonsillar abscess.

CHRONIC INFLAMMATION.

Chronic inflammation of the tonsils may be divided into two groups:—

- (1) *Chronic enlargement or chronic parenchymatous tonsillitis*;
- (2) *Chronic lacunar tonsillitis*.

1. **Chronic Enlargement of the Tonsils**, though it may occur in adults, is found chiefly in children between the ages of five and fifteen, and in the majority of cases is associated with

hypertrophy of the lymphoid tissue of the naso-pharynx; in other words, with the presence of adenoid vegetations. Heredity undoubtedly predisposes to the condition, for several cases are frequently met with in one family. The enlargement is often noticed first after an attack of one of the exanthemata, especially measles, scarlet fever, or diphtheria; in other cases it has been proved to result from tuberculous invasion of the tonsils; but in a certain percentage the etiology remains obscure.

The symptoms depend to a great extent on the amount of the hypertrophy, and also on the presence of adenoid vegetations, which are so frequently found in children in association with enlarged tonsils. Where the hypertrophy is marked, or adenoid vegetations are present, the respiration is interfered with, and the patient becomes a mouth breather; the result of this is discussed in the chapter dealing with adenoid vegetations. The voice is also affected, so that the child speaks as if its mouth were full; the cervical lymphatic glands are nearly always more or less enlarged, sore throat is liable to occur, and a dry cough is a frequent symptom. On inspection in typical and well-marked cases, the tonsils are found projecting into the mouth, and appear almost like cherries; the hypertrophy may be so extreme that the tonsils actually meet in the middle line. Sometimes, although there is definite hypertrophy, the tonsils are of the so-called buried variety, and do not protrude into the mouth.

TREATMENT.—Treatment is necessary when:—(a) The tonsils are sufficiently large to interfere with respiration or with speech; (b) The cervical lymphatic glands are enlarged, especially if this is due to invasion by tubercle; (c) There are recurring sore throats, or persistent reflex cough.

If treatment is required, it should be operative; and operation should not be delayed on the plea that the tonsils tend to atrophy after the age of puberty, for the child's health may be permanently impaired during the intervening period. With regard to the choice of operation, there is at the present day a tendency to enucleate the tonsils in all cases, either by dissection or by a modified guillotine operation. Advocates of wholesale enucleation condemn the ordinary guillotine operation because the hypertrophy occasionally recurs after it, but in reality recurrence is very rare when this operation is performed by an expert. If the tonsils are too small to be removed by the guillotine, they

should not be interfered with, unless the cervical lymphatic glands are enlarged or there is a history of recurrent sore throats; in such cases enucleation is the most suitable operation, but wholesale enucleation of tonsils in every case of adenoid vegetations, regardless of their condition, is to be deprecated.

When the tonsils are associated with adenoid vegetations, or when dealing with an unmanageable child, a general anæsthetic should be employed, the operation being performed with the head in the dependent position. In other cases it is performed under local anæsthesia while the patient sits upright in a chair. The guillotine operations are described in the section on adenoid vegetations (page 133), and enucleation by dissection on page 24. Serious hæmorrhage occasionally, though rarely, follows the removal of tonsils; it occurs more frequently in adults than in children; the treatment of this complication will be discussed later (see page 137).

2. Chronic Lacunar Tonsillitis is commonly met with in adults, and results from repeated attacks of acute lacunar tonsillitis. Cheesy matter collects in the crypts of the tonsils, and can frequently be expressed as white particles, which have a very offensive smell and taste. The whole tonsil may be riddled with such collections, and some of the cheesy matter may find its way into the supra-tonsillar fossa. On rare occasions one of the crypts becomes distended owing to the blocking of its mouth, and a smooth yellow swelling appears on the surface of the tonsil; if this is opened, yellow creamy fluid and débris escape.

APPEARANCES.—On examining a typical case, one or more white particles may be seen lying in the mouths of the tonsillar crypts; at first sight they resemble the excrescences seen in keratosis pharyngis, but they differ from this condition in that they can be easily wiped off; the diagnosis should not, therefore, be difficult (see also page 25). The liability to repeated attacks of sore throat from which these patients suffer, the discomfort they experience from the unpleasant smell and taste accompanying the discharge of the particles, and the ill effects which the continual ingestion of septic matter has on the digestion, all call for active treatment.

TREATMENT.—The only rational method of treating such cases is to enucleate the whole tonsil with its capsule; it is not an easy procedure, and should be entrusted to the specialist.

The operation may be performed in various ways. The tonsil is firmly seized by a vulsellum, and the plica tonsillaris is divided close to the inner margin of the anterior pillar with a pair of scissors or a knife, thereby exposing the white, shining capsule. The tonsil is then easily separated from its bed by dissection with a pair of scissors or a suitable tissue separator. When it has been freed from the anterior and posterior pillars, and the upper pole has been exposed, a snare is passed over the tonsil to divide the final attachments. The operation may also be completed with a pair of scissors or a curved probe-pointed bistoury, but there is much less hæmorrhage when a snare is used. The operation can be performed on adults under local anæsthesia, but in the case of children a general anæsthetic is necessary. The hæmorrhage at the time of the operation is sometimes copious, but it can be readily controlled as a rule by pressure with a sponge or swab in a sponge-holder. Hæmorrhage may also occur an hour or two after the operation; the treatment of this will be discussed later.

Before the operation of enucleation was introduced, the cautery was sometimes used to partially destroy the tonsillar tissue; in other cases several crypts were slit up with a knife, the intervening tissue being removed with some form of tonsil punch.

TONSILLOLITHS (Tonsillar calculi).

These originate in the tonsillar crypts as a result of chronic inflammation; one or more may be formed, and they may reach a very large size, as is shown by a case recorded by Aitchison Robertson, in which the calculus was over an inch in diameter. They may be detected with a probe or by palpation; or, occasionally, a portion may be seen projecting from the tonsil. Inflammation is liable to occur round the calculus, which is then extruded. When diagnosed, the concretion should be removed either by itself or with the portion of the tonsil in which it is lodged; this may be done with a vulsellum and bistoury.

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PLATE II.

AFFECTIONS OF THE PHARYNX

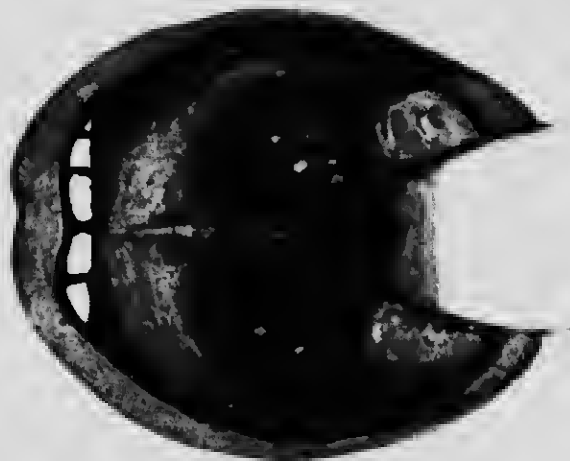


Fig. 5.
Acute lacunar tonsillitis.

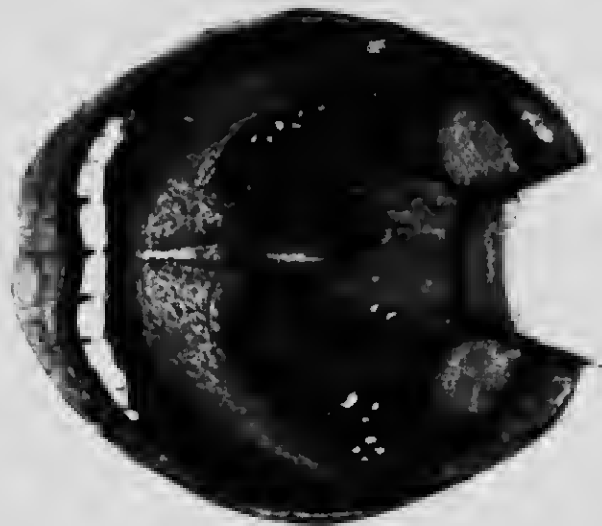


Fig. 6.
Keratosis of the pharynx.

CHAPTER VI.

VARIOUS CONDITIONS OF THE PHARYNX.

KERATOSIS OF THE PHARYNX.

THIS is not a very common affection. It was formerly supposed to be the result of the accumulation of leptothrix in the pharynx, but Siebenmann and Brown Kelly have shown that it is due to a horny outgrowth from the crypts of the tonsils composed of keratinized epithelial cells, which are arranged in concentric layers within the crypts. On examination, white chalky excrescences are seen projecting from the crypts of the tonsils; there is an entire absence of congestion around them, and they cannot be wiped off (*Plate II, Fig. 6*). The projections may be found wherever there is lymphoid tissue within the area known as Waldeyer's Ring—the region bounded above by the pharyngeal tonsil, below by the lingual tonsil, and laterally by the faucial tonsils.

SYMPTOMS.—There may be slight irritation of the throat, but as a rule there are no symptoms, and advice is not infrequently sought by patients who have accidentally discovered the white spots in their throats. If a careful examination is made, there should not be much difficulty in arriving at a correct diagnosis. The absence of constitutional disturbance and of local inflammation, and the chalky nature of the outgrowths should prevent the condition from being mistaken for lacunar tonsillitis, the only other affection with which it is likely to be confounded. In doubtful cases the microscope may be called into requisition.

TREATMENT has generally but little effect, and it is as well to refrain from interference, as the condition is quite harmless, and often disappears spontaneously, especially if the general health improves.

HÆMORRHAGE FROM THE PHARYNX.

This is an unusual condition, although patients frequently seek advice for "bleeding from the throat." In the vast majority of

these cases the blood really comes from the lungs, the cause of the hæmoptysis being pulmonary phthisis; in other cases the hæmorrhage may proceed from the larynx, the nasopharynx, or the nose, and is due to such conditions as laryngeal phthisis, adenoid vegetations, or epistaxis. When the pharynx is the site of the bleeding, it may be the result of the ulceration of syphilis, tubercle, or malignant disease; but when there is no gross morbid lesion to account for it, the probable causes are either some blood disease, such as hæmophilia, pernicious anæmia, or leukæmia, or else the rupture of enlarged veins in the pharynx in gout. Malingerers, however, occasionally produce artificial bleeding from the pharynx in the attempt to simulate pulmonary phthisis. Bleeding from the mouth due to spongy gums may also be mistaken for hæmorrhage from the pharynx. It is obvious from this rather formidable list of possible errors, that a very careful examination of the upper air-passages must be made when a patient complains of this symptom, and a diagnosis of pharyngeal hæmorrhage must not be arrived at unless the bleeding-point is actually seen. It is especially important in every case to exclude pulmonary phthisis. When the pharynx is the site of the hæmorrhage, the patient should be given ice to suck, and the bleeding-point may be touched with the galvano-cautery, or with a bead of chromic acid fused on a probe. Any general condition underlying the hæmorrhage, should also be treated.

FOREIGN BODIES IN THE PHARYNX.

A great variety of foreign bodies have gained access to the air-passages; of these, fish and other small bones are specially liable to be arrested in the pharynx. They may lodge in the anterior or posterior pillars of the fauces, in the crypts of the tonsils, or in the posterior wall of the pharynx. The power of localization in the air-passages is very poor, and patients not infrequently refer their sensations to a point at some distance from the site in which the foreign body has been caught. Another common fallacy is that the feeling of pain or pricking continues unabated for a considerable time after the object has passed on, and has been either swallowed or coughed up. So vivid are these impressions that it is often extremely difficult to persuade such patients that the foreign body is not lodged in the place they indicate.

SYMPTOMS.—These are pain or a sensation of pricking, and sometimes cough. If the foreign body passes beyond the pharynx, the symptoms may become urgent: this will be discussed later (see page 91).

DIAGNOSIS.—It is of great importance to begin the examination by inspection with good illumination. Palpation should not be resorted to at first for fear of dislodging the foreign body or imbedding it deeper in the tissues; if it is not detected, a complete examination of the air-passages may have to be made; but if it is seen in the pharynx, it can as a rule be removed easily with forceps.

TUMOURS OF THE PHARYNX.

Benign Tumours.—Of the simple tumours met with in the throat, papillomata are the most frequent. They may be found attached to the uvula, the margins of the soft palate, or the pillars of the fauces; they are light pink in colour, have a cauliflower or granular surface, and may be sessile or pedunculated. Adenomata, fibromata, angiomata, cysts, dermoid cysts, and exostoses have also been observed, but they occur so rarely that it is unnecessary to enter into descriptions of them (*Plate I, Fig. 3*).

SYMPTOMS.—Those produced by simple tumours are generally due to their mechanical interference, and diagnosis is made by inspection.

TREATMENT.—Papillomata can usually be removed with scissors; or, if sessile, they may be destroyed with the cautery-point. In the absence of symptoms, the removal of other growths need not be undertaken, but where treatment is necessary, it must be carried out under general surgical principles, a description of which is outside the scope of this book.

Malignant Tumours.—Malignant disease is nearly always primary in the pharynx; both carcinomata and sarcomata are met with: carcinoma is rarely found before the age of forty, but sarcoma is met with at any age. Carcinoma may attack the soft palate, the pillars of the fauces, or the tonsils; it presents at first a hard, uneven surface surrounded by an area of induration, which tends to ulcerate early; this ulceration extends both laterally and in depth, and the floor of the ulcer is covered by muco-pus; the glands in the neck soon become involved, and form hard immobile masses.

Lymphosarcoma is the variety of sarcoma most frequently met with in the pharynx, though round-celled, mixed round- and spindle-celled, and melanotic sarcomata occur. Sarcoma tends to grow rather rapidly, and when it has attained a considerable size the mucous membrane covering it appears bright red and succulent. The growth usually begins in the tonsil; it is not so hard as carcinoma, and may indeed feel soft; it spreads by invasion of deeper structures, and very frequently involves the region behind the angle of the jaw, and causes large swellings in the neck. Lymphosarcoma tends to ulcerate early and to spread superficially.

SYMPTOMS.—Pain is a prominent symptom in most cases of carcinoma; it is usually lancinating in character, and radiates towards the ears; there is frequently considerable salivation, and at a later stage the tongue may become much restricted in its movements; difficulty may then be experienced in opening the mouth. A foul-smelling discharge follows the breaking down of the tumour, and the patient soon becomes cachectic in appearance. In sarcoma, pain is not so common, the symptoms being due more to the mechanical interference from the size of the growth.

DIAGNOSIS.—This may present considerable difficulty. Carcinoma has to be distinguished from primary chancre, breaking-down gumma, ulceration due to some septic process, such as is caused by the pneumococcus, and even from acute tonsillitis; while sarcoma has to be diagnosed from tumours of a benign nature. In doubtful cases it is advisable to remove portions of the tumour for microscopical examination, though the pathologist is not always prepared to give a definite opinion on the nature of such fragments. When the diagnosis lies between carcinoma and tertiary syphilis, Wassermann's reaction should be tried, and salvarsan administered; a course of mercury and iodide of potassium may be given. A primary chancre will hardly cause serious difficulty in the diagnosis, as it is unlikely to occur at the age when carcinoma is met with; moreover, the appearance of secondary manifestations will clear up the diagnosis. Ulcerating sarcoma may be mistaken for tuberculous ulceration, but the nocturnal rises of temperature, the existence of a pulmonary lesion, and the presence of tubercle bacilli in the sputum, should distinguish the latter condition.

PROGNOSIS.—The prognosis in all varieties of malignant disease

is very grave, especially in the case of carcinoma, for the pharynx is a region from which it is especially difficult to eradicate disease.

TREATMENT.—This should be operative if possible; unfortunately these cases do not offer much hope of a successful issue; the decision as to the practicability of removal must rest with the surgeon. If the case is inoperable, the effect of x-rays or of radium may be tried.

NEUROSES.

Anæsthesia is most commonly met with after diphtheria; it may also be found in diseases of the central nervous system, such as syringomyelia, bulbar paralysis and intracranial tumours. It is usually associated with paræsthesia and paralysis of the palate.

Hyperæsthesia, Neuralgia, and Paræsthesia.—

Hyperæsthesia of the pharynx is a very common condition, especially in gouty and rheumatic individuals, and in those who over-indulge in alcohol and tobacco, but in these cases it is usually associated with pharyngitis.

Neuralgia of the Pharynx is not a common affection; it occurs in both sexes, and is closely allied to paræsthesia.

By *Paræsthesia* is understood some abnormal sensation in the throat, e.g., a feeling as if there were a foreign body or a lump in it, while sometimes there is an irritation causing a frequent desire to clear the throat. On examination, very little can be made out as a rule, but it must be remembered that similar symptoms may be produced by enlargement of the lingual tonsil (see page 92), while in other cases a few granules may be seen on the posterior wall of the pharynx; before arriving at a diagnosis of a functional neurosis, care must therefore be taken to exclude all possibility of organic disease.

TREATMENT.—It is most important in the treatment of these cases to attend to the general health. In anæmia and chlorosis, iron and arsenic may be prescribed; in anæsthesia due to diphtheria, faradization or galvanism to the throat, and hypodermic injections of strychnine are indicated. Massage of the neck, and cold douching may be tried, but the local application of pigments should be avoided in cases of paræsthesia, as they do but little good, and patients are liable to become more depressed by their symptoms when treatment fails to produce improvement.

In paræsthesia due to the menopause, Semon has found that spontaneous cure is likely to take place. As a neurosis of secretion, Sheeh has described cases in which there has been a constant desire to expectorate. McBride has found in such individuals, when the mucosa of the pharynx was healthy and there was no abnormal secretion in the nose or larynx, that the sputum was usually frothy and mingled with a little viscid mucus, and was produced by the action of clearing the throat. The patient should be assured that there is no disease, and should be advised to refrain from "hawking" and spitting.

Rhythmic Movements of the Soft Palate is a somewhat rare condition. The movements may be limited to the soft palate, or they may also involve the floor of the mouth, the larynx, and even the diaphragm. In some cases they are due to trigeminal neuralgia; in others they have been attributed to functional disturbance of the central nervous system, and they may also be due to organic disease of the brain. The contractions occasionally produce objective tinnitus.

TREATMENT must be conducted on general principles.

Paralysis of the Soft Palate.—The most common cause of this affection is diphtheria; it may also be due to diseases of the central nervous system, implicating the spinal accessory, more especially to bulbar paralysis, but also to syringomyelia, embolism, tumours, or basilar meningitis. The paralysis is generally unilateral, but may be bilateral; when unilateral, the velum is drawn to the healthy side, but when bilateral it hangs loosely and does not respond to stimuli; the voice is nasal, and food escapes into the nose when eating.

TREATMENT.—In diphtheritic paralysis, hypodermic injections of strychnine, and local faradization should be employed. In many cases, of course, no treatment can be of use, but in slowly developing cases faradization may be tried.

SECTION II.
DISEASES OF THE LARYNX.

CHAPTER VII.
EXAMINATION, SEMEIOLOGY, GENERAL
THERAPEUTICS.

EXAMINATION.

GOOD illumination is essential for a proper examination of the larynx. When the house is lit by gas, an incandescent light should be made use of in the consulting-room, but where electric light is installed, a 50-80 candle-power lamp will be required. Whatever the source of the light, it is usual to have it enclosed in a funnel provided with a bull's-eye lens; this lamp may be fixed either to a wall bracket or to a standard, but it must be possible to alter its height quickly and easily. When an examination has to be made in a private house, the room should be darkened and the strongest available light requisitioned; a tolerable view of the larynx may even be obtained by the light of an ordinary oil lamp. In every case the light should be placed to one side of, and rather behind the patient (who is seated on a chair), and at the same level as his head (*Fig. 7*). The observer seats himself opposite the patient; if he uses his right eye in looking through the aperture, the light is placed on the patient's left; but if the left eye is employed, the lamp should be on the patient's right. The forehead mirror must be carefully chosen, and in its selection the following points should be considered. The diameter of the mirror should not, in my opinion, be more than 9 cm., as this permits of binocular vision when examining the nose, though it is more usual to have a larger one, with a focal distance of about fourteen inches. The same forehead mirror is used in rhinoscopy as in laryngoscopy. The central aperture may be large, and this makes the

examination easier for the beginner, but it is not essential, as after some practice it is quite as easy to see through the ordinary small opening. The reflector should be attached to the support in such a way as to allow of its lying in close apposition to the face when in use; it is usually fixed by a hall-and-socket joint to a forehead band of webbing, but for home use it is more comfortable to have it fastened to a circlet of celluloid or other light material, which is made to fit the head in the same way as a hat. Many mirrors are sold which have two little knobs attached to



Fig. 7.—Method employed in examination of the larynx.

the forehead band; these rest on the root of the nose when the mirror is worn, and should accordingly be avoided by anyone who has to wear glasses. The reflector should be adjusted with the central opening opposite one eye; if there is any difference in the acuity of vision between the eyes, the better should of course be used. A laryngeal mirror has now to be selected; it is circular in shape, and is attached to a stem at an angle of about 120° ; a variety of sizes should be procured, and in every case the largest should be used

compatible with the capacity of the fauces of the individual to be examined.

Before beginning the examination, the mirror must be warmed by holding the reflecting surface above a flame until a film of moisture has appeared and again disappeared on it; its temperature should be tested on the back of the hand before introducing it into the mouth. The patient is requested to protrude his tongue, and a small cloth or clean handkerchief is laid on it, the thumb of the left hand being placed on the cloth as it lies on the dorsum of the tongue, while the first finger tucks it under the tip, which is then grasped between the thumb above and the index finger below (*Fig. 8*). If the patient has a moustache, the index finger should be used to hold it out of the way, the tongue being grasped in that case between the thumb and middle finger. The mirror is held in the right hand like a pen, the length of the stem being so adjusted in the handle that the little and ring fingers of the right hand can rest on the patient's cheek when the mirror is in position. The patient, whose head is slightly tilted backwards, is asked to breathe



Fig. 8.—Holding the tongue while examining the larynx.

deeply but quietly; and when the uvula is seen to rise during inspiration, the mirror is introduced horizontally, its back being placed firmly but gently on the base of the uvula, which is then lifted upwards and backwards. This is done without hesitation, and when the mirror has touched the uvula, it should not be allowed to move over its surface; any change in its position must be made by angular movement alone; neglect of this precaution is one of the most common causes of failure in laryngoscopy, as it induces retching.

The parts that first come into view are usually the base of the tongue, the epiglottis, and the valleculæ (*Fig. 9*). It must be remembered that the parts which are really in front appear above in the laryngeal mirror, while the structures which are behind are seen below, but there is no inversion of right

and left. The valleculæ (*Fig. 10*) appear as two hollows between the tongue and the epiglottis, separated from each

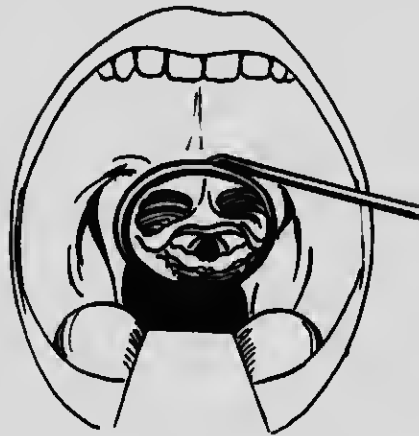


Fig. 9.—First position of the laryngeal mirror.

other by a median ridge—the central glosso-epiglottidean ligament—and bounded externally by the lateral glosso-epiglottidean ligaments. Immediately in front of the valleculæ are the remains of the lymphoid tissue, known as the lingual tonsil. To see the rest of the larynx, it will usually be necessary to tilt the reflecting surface of the mirror downwards (*Fig. 11*). If the epiglottis hangs backwards, so as to cover the larynx, the patient should

be made to say “eh,” when the epiglottis will as a rule erect itself, and permit of a view being obtained. The epiglottis

- a* Base of tongue and lingual tonsil
- b* Lateral glosso-epiglottidean ligament
- c* Cushion of epiglottis
- d* False cord
- e* True vocal cord
- f* Ary-epiglottic fold
- g* Swelling caused by arytenoid cartilage
- h* Central glosso-epiglottidean ligament
- i* Vallecula
- j* Epiglottis
- k* Ventricle of larynx (*syn. sinus of Morgagni*)
- l* Trachea
- m* Swelling due to cartilage of Wrisberg
- n* Pyriform fossa
- o* Posterior aspect of cricoid cartilage
- p* Beginning of œsophagus

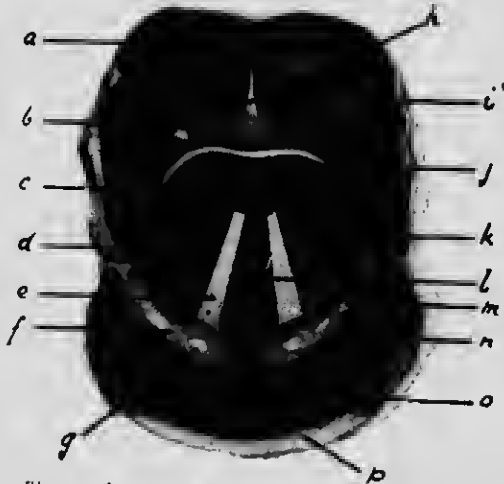


Fig. 10.—Larynx as seen in the laryngoscopic mirror.

is slightly concave from side to side, and convex from above downwards, but it varies very much in shape in different

individuals. Stretching backwards from the sides of the epiglottis, so as to enclose a triangular space—the inlet to the larynx—are the ary-epiglottic folds, on which two prominences are to be seen; of these, the external is caused by the small cartilage of Wrisberg, while the internal is formed by the arytenoid cartilage surmounted by the capitulum of Santorini. On the outer side of the ary-epiglottic folds, and thus external to the larynx proper, are the pyriform fossæ, which are enclosed by the thyroid cartilage.

On looking into the interior of the larynx, the eye is at once caught by the vocal cords (*Plate III, Fig. 13*); these glistening white structures meet in front at the anterior commissure, immediately above which is a rounded swelling on the epiglottis, known as the cushion of the epiglottis. Each cord is attached by its posterior end to the vocal process of the arytenoid cartilage. During quiet respiration, the cords remain in a position midway between adduction and complete abduction, being separated by a triangular space—the glottis, or glottic chink. During phonation the cords are approximated, and appear to touch along their whole length, while during deep inspiration the cords become fully abducted. There is a fourth recognized position of the cords, which is assumed after death or in complete paralysis; in this case the cords are rather less than midway between abduction and adduction, their free margins are concave, and their vocal processes project slightly; this is known as the cadaveric position. The space between the posterior ends of the vocal cords is called the inter-arytenoid region or fold. Above the true cords are seen the false cords, which consist of two folds of mucous membrane; and between the false and true cords the opening into the sinus of Morgagni appears as a dark line. Below the glottic chink the rings of the trachea may be seen, and occasionally even its bifurcation.

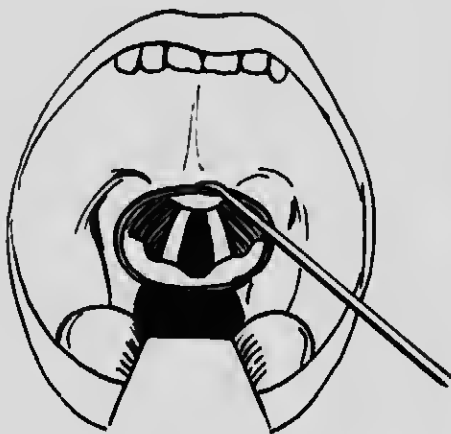


Fig. 11.—Second position of the laryngeal mirror.

DIFFICULTIES EXPERIENCED IN LARYNGOSCOPY.

Difficulties produced by the Tongue.—Occasionally a patient is met with who cannot put out his tongue ; this makes it impossible to catch hold of it, and it must accordingly be depressed with a spatula. A common mistake with beginners is to attempt to pull out still farther a tongue which is already extruded as far as possible, or to pull the tip down and so excoriate its under surface on the sharp edges of the incisor teeth. Both these mistakes are fatal to successful laryngoscopy.

Errors in introducing the Laryngeal Mirror.—A common mistake is to place the mirror too far forward on the soft palate ; if this is done, only the epiglottis and the back of the tongue are seen. The cause of this mistake is probably that the beginner has difficulty in seeing the uvula owing to the arching of the tongue ; in such a case he should ask the patient to say " ah " ; this causes the palate to rise, and he should then have no difficulty in placing the mirror on the uvula.

Holding the Breath on the part of the Patient.—Some people have a tendency to hold the breath during the examination and at the same time to contract the muscles of the throat, thereby rendering it impossible to obtain a view of the larynx ; this can be overcome by making the patient breathe deeply and audibly, or else pant.

Hyperæsthesia of the Pharynx.—If this is at all marked it may make laryngoscopy exceedingly difficult, but it can generally be obviated by painting the uvula and soft palate with a 10 per cent solution of cocaine.

Overhanging Epiglottis.—If this is not very marked, it can generally be overcome by asking the patient to sing a high-pitched " eh " or " e," or to take sharp panting inspirations, or else to make him laugh. If these manœuvres fail, it will be necessary, after spraying the epiglottis with a 10 per cent solution of cocaine, to hold it forward with a laryngeal probe : the mirror is then held in the left hand, and the patient controls the tongue himself.

Special Methods of Laryngoscopy.—Killian has devised a useful method by which a better view of the inter-arytenoid region can be obtained than is possible by ordinary laryngoscopy. It is carried out in the following way : the patient stands and looks down on the observer, who is seated ; the light is reflected

into the pharynx, the lamp being adjusted to permit of this being done; the mirror is then introduced in the usual way.

Some authorities recommend the introduction of a second small mirror into the larynx itself, in order to obtain a view of the posterior wall and subglottic region.

Von Eicken has devised a method which he has called Hypopharyngoscopy; it permits of inspection of the upper part of the œsophagus, and is therefore of special service in detecting malignant growths situated at the level of the cricoid cartilage. It is carried out in the following way: The fauces and larynx having been thoroughly cocaineized, the examiner kneels in front of the patient, who looks down on him. A stout laryngeal probe is introduced into the larynx, directed by the laryngeal mirror which is held in the left hand (the tongue being controlled by the patient); the end of the probe, which may be protected by a rubber tube, is carried through the glottis and is hooked against the anterior commissure; the whole larynx is then forcibly drawn away from the posterior wall of the pharynx, thereby permitting inspection of the upper part of the œsophagus.

DIRECT LARYNGOSCOPY, TRACHEOSCOPY, AND BRONCHOSCOPY.

Direct Laryngoscopy, i.e., inspection of the larynx without the aid of a mirror, was first performed by Kirstein in 1894. A year or two later, Killian introduced the method of direct inspection of the trachea and bronchi through rigid tubes, which were passed into these passages through the mouth; both the method and the original instrumentarium for this procedure have been modified and greatly improved by Killian and his assistants, especially Brünings. Chevalier Jackson, in America, has also worked independently at this subject. In his instrument the illumination is obtained by a small lamp carried in the distal end of the tube; in the German instrument, rays of light are reflected down the tube from an electroscope attached to the handle. This method of investigation is not an easy one, and as it is rarely necessary, and moreover requires an expensive instrumentarium, it should be relegated to the specialist. It is carried out preferably under local anæsthesia, but a general anæsthetic may be employed.

Although a description of the technique is outside the scope of this book, it is necessary to mention the conditions in which

this procedure should be adopted. The chief indication is the presence, or suspected presence, of foreign bodies in the larynx, trachea, and bronchi; it is also of value in the examination of the larynx of infants, in whom ordinary laryngoscopy fails; it is an alternative method for performing certain intra-laryngeal operations; it may also be used in the detection and treatment of stenosis of the trachea, and in the diagnosis of mediastinal growths, aneurysms, and bronchiectatic cavities; while in cases of goitre, attended with dyspnoea, information may be obtained as to which portion of the thyroid gland should be removed.

GENERAL SEMEIOLOGY.

Interference with Phonation is one of the most common symptoms in affections of the larynx; it may vary from slight huskiness to complete aphonia. It must be remembered, however, that marked changes in the larynx, such as certain forms of paralysis or the presence of new growths, may be unattended by alteration in the voice.

Dyspnoea, due to laryngeal affections, is less commonly met with, and is usually a symptom of acute disease; for where stenosis of the larynx develops gradually, remarkable tolerance is established, and breathlessness may be observed only on exertion.

Pain is not a very common symptom; in acute catarrh, a feeling of rawness is complained of; in malignant disease, pain shooting up to the ears is a frequent symptom; in superficial ulceration, especially of the epiglottis, there may be severe pain and extreme dysphagia.

Cough is not a common symptom, and expectoration, when due to laryngeal disease, is usually scanty.

Hæmorrhage may occur in the larynx, but is very unusual, and is then small in quantity.

GENERAL THERAPEUTICS.

Inhalations are frequently prescribed in the treatment of diseases of the larynx; a teaspoonful of the drug which has been ordered is added to a pint of boiling water, which has been poured into a wide-mouthed quart jug; the water is allowed to cool to about 140° F. (this will take about five minutes), and the steam is then inhaled, a towel being wrapped round the jug and the

patient's head. The patient should remain in a warm room for an hour after each inhalation.

Sprays may also be ordered, for though the greater part of the fluid remains in the pharynx, some of it undoubtedly reaches the larynx, especially if the patient inhales deeply during the procedure. The sprays may be watery or oily; for the latter, an atomizer or aerizer must be employed.

Direct Applications to the Larynx.—Both fluids and powders may be introduced directly into the larynx under the guidance of the laryngeal mirror, but the procedure, though easy to the expert, is not usually successful when performed by the beginner. In the case of fluids, a laryngeal syringe may be used,

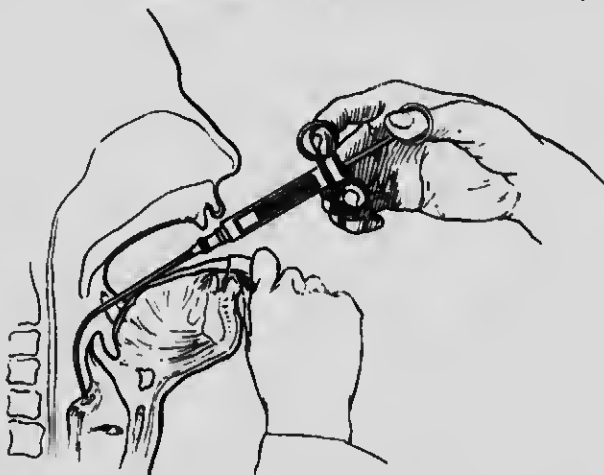


Fig. 12.—Position of laryngeal syringe when making applications to the larynx. The laryngeal mirror, which is held in the surgeon's left hand, is not shown in the drawing.

and it is advisable to select one which has a very small terminal orifice, so that it is easy to control the amount of fluid injected. Powders are puffed into the larynx by means of a laryngeal insufflator. The technique is similar in the two cases: the laryngeal mirror is held in the left hand, while the patient himself controls the tongue. The laryngeal syringe or insufflator is introduced by direct vision until its point appears reflected in the mirror; the wrist is then raised, the fingers are depressed, and the tip of the instrument is thus guided over the epiglottis (*Fig. 12*). If the application has to be made to the cords, the patient should be asked to say "ah," and at that moment the

injection is made, or the powder insufflated. A common mistake with beginners is not to arch the wrist sufficiently, the effect of this being that the drug falls on the posterior pharyngeal wall, and little or none reaches the larynx. In cases of painful ulceration of the larynx, when powders, such as orthoform or anæsthesin, have to be applied frequently, the patient should learn to introduce them himself. This can be done by Leduc's auto-insufflator, which consists of a glass tube bent at right angles at one end; this end is introduced into the mouth and carried well into the pharynx; the other end rests on a watch-glass or saucer which contains the powder to be insufflated. The patient closes his lips tightly round the tube and takes one or two sharp inspirations, thus drawing some of the powder into the larynx. In certain cases it is preferable to apply solutions of drugs rather vigorously; for instance, in the treatment of tuberculous ulceration by lactic acid, a pledget of wool is then firmly fixed in a pair of Krause's forceps and dipped in the solution, care being taken to remove any excess of fluid from the wool, the forceps are introduced in the same way as the laryngeal syringe, and the application may be made as vigorously as is desired.

Electricity, in the form of the interrupted current, is a valuable therapeutic agent in certain pareses of the larynx. It may be applied externally, in which case one electrode is held in the patient's hand and the other is applied to the side of the neck; or both electrodes may be applied to the neck, one being placed on either side of the larynx. Where a maximum psychical effect is desired, an endo-laryngeal electrode should be used; this is insulated except at the extremity, the point of the electrode is guided over the epiglottis after the manner previously described (page 39), and is depressed until it touches a spot between the arytenoid cartilages; the current is then allowed to pass for a few seconds by pressing the button on the handle; the process may be repeated two or three times at each sitting. The current should be weak at first, so that it can just be felt when the electrode is placed on the back of the hand; if a current of this strength is well tolerated by the patient, it may gradually be increased.

The Electric Cautey is frequently used in the treatment of tuberculosis of the larynx, but it should not be employed except by those who have acquired considerable dexterity in intra-

laryngeal manipulations ; before its use the larynx is thoroughly cocaineized. In dealing with infiltrated tissues, a pointed burner is employed, and should be plunged deeply into the swollen parts ; but when granulations have to be destroyed, a flat burner will be found more suitable. When treating a tolerant patient, two or three applications may be made at one sitting, and may be repeated in a few days. If there is much pain after the use of the cautery, ice may be sucked, or a 5 per cent solution of cocaine or novocain may be sprayed into the throat. The electric cautery is also occasionally employed to destroy small neoplasms within the larynx.

X-rays have been used in the treatment of certain diseases of the larynx. The ordinary tubes may be applied externally, or else specially devised tubes may be introduced into the pharynx in order to obtain a more direct application of the rays.

Method of Inducing Anæsthesia in the Larynx.—The most satisfactory plan of inducing anæsthesia in the larynx is by the drop method, i.e., the instillation, drop by drop, of a 20 per cent solution of cocaine from a syringe, under guidance of the laryngeal mirror. Three or four drops of the solution are allowed to fall first on the epiglottis, then, in succession, on the ary-epiglottic folds, the false and the true cords, short pauses being made between each instillation ; from 20 to 30 minims are sufficient to anæsthetize the whole larynx. The soft palate and the posterior pharyngeal wall may first be rendered insensitive by applying a 10 per cent solution of the drug with a swab.

Endo-laryngeal Operations.—The successful performance of these requires much practice, and a high degree of skill in endo-laryngeal manipulations, and must of necessity be entrusted to the expert. These operations may be carried out by the direct or the indirect method ; the latter is certainly more pleasant for the patient, and is the method usually employed in adults ; but in the case of young children, where a general anæsthetic is necessary, the direct plan is preferable.

General Hygiene and Internal Medication.—It is hardly necessary to emphasize the importance of attending to the general health of the patient ; and where hoarseness is complained of, it is essential to ascertain if the patient uses his voice professionally, for in that case no precaution must be omitted

which will tend to preserve it. Mineral waters are of value in gouty and plethoric individuals. In catarrhal conditions of the throat, a course of treatment at Ems, Mont Dore, or Eaux Bonnes may be recommended to those who can afford it. In many cases smoking must be forbidden, or restricted, and if allowed should be indulged in only out of doors. Alcohol in a concentrated form, such as spirits or the heavier wines, must also be looked upon as an irritant, while exposure to a dusty atmosphere or to extremes of temperature, should be avoided. In many cases it is necessary to order rest of the voice, and occasionally this must be absolute, not even a whisper being allowed; any communications must then be made in writing.

CHAPTER VIII.

ACUTE INFLAMMATIONS OF THE LARYNX.

ACUTE CATARRHAL LARYNGITIS.

THIS is a form of cold, and is one of the more common minor affections of the throat ; it may result from a catarrhal process spreading downwards from the pharynx, or upwards from the trachea, but in certain cases the larynx alone is affected.

The causes of acute laryngitis are :—exposure to sudden change of temperature ; irritating vapours or dust ; excessive use of the voice, or over-indulgence in alcohol and tobacco ; it is also a frequent manifestation in secondary syphilis ; it occurs in certain of the exanthemata, and it may be rheumatic or gouty in origin.

SEMEIOLOGY.—There may be a feeling of chilliness associated with a slight rise of temperature and of pulse-rate ; but frequently the only symptom complained of is hoarseness, which may vary from slight huskiness to complete loss of voice. At first there is a feeling of rawness in the throat and a constant desire to clear it ; later, small pellets of mucus may be coughed up.

APPEARANCES.—On laryngoscopic examination, the vocal cords are seen to be congested (*Plate III, Fig. 14*), and they may become somewhat succulent in appearance. On phonation an elliptical space is usually seen between the cords, due to paresis of the internal thyro-arytenoid muscles. In some cases the epiglottis alone is affected by the inflammation ; the voice is then clear, but there is a sensation as of a foreign body in the throat, and there is usually marked dysphagia. On inspection, the epiglottis is seen to be red and swollen.

ACUTE HÆMORRHAGIC LARYNGITIS.

In rare cases, in the course of acute laryngitis, a vessel may rupture within the larynx, and give rise to spitting of blood. The bleeding-point will probably be seen on a vocal cord.

**SPASMODIC LARYNGITIS, FALSE CROUP OR
PSEUDO-CROUP.**

This condition occurs in children ; it is an acute laryngitis, with a nervous element in addition, which causes glottic spasm ; this is probably reflex, resulting from the inflammation in the larynx. There is a tendency in these cases for sub-glottic swellings to develop. During the day the child is hoarse, with no tendency to spasm, but in the night he is wakened several times by a brassy cough and great embarrassment of the respiration. These attacks may recur for two or three nights in succession, but they become less severe as the condition improves. The prognosis is always favourable.

TREATMENT.—*Acute Laryngitis.* The patient should be confined to a warm room, and should speak as little as possible ; he should also refrain from the use of tobacco and spirits. To relieve the sensation of rawness in the throat, steam inhalations, such as compound tincture of benzoin (see Appendix), will be found useful. He may be given ice to suck, and cold compresses may be applied to the neck. Pastilles containing menthol, morphine, or benzoic acid (see Appendix), will be found soothing, and when the condition is passing off, the instillation of a few drops of a solution of silver nitrate (gr. xx to 1 oz.) or chloride of zinc, may be employed every second day. If the paresis of the internal thyro-arytenoid muscles persists, faradization should be employed, and strychnine given internally. It is especially important that singers should refrain from using the voice too soon after an attack, otherwise prolonged rest may become necessary.

In the case of *Croupous Laryngitis* it is advisable to put the child to bed, and make use of a steam kettle ; while for the acute attacks at night, an emetic of ipecacuanha wine or apomorphine will probably give the most rapid relief ; if, however, the dyspnoea is not alleviated by these means, it may rarely become necessary to perform tracheotomy or intubation.

ACUTE ŒDEMA OF THE LARYNX.

This may be :—(1) *Non-inflammatory*, or (2) *Inflammatory*.

1. **Non-inflammatory Œdema** may be the result of a general disease, such as nephritis or cardiac disease, or it may be due to

compression of the veins of the neck by a tumour or cicatricial tissue; it may also result from angioneurotic œdema; and it may follow the administration of potassium iodide.

The symptoms complained of are hoarseness and shortness of breath. The appearances are similar to those found in the inflammatory varieties, except that the colour of the swellings is paler.

TREATMENT.—The condition causing the œdema must be treated as well as the complication in the larynx. If the laryngeal symptoms are marked, scarification of the swollen parts may be tried; this is done with a guarded laryngeal knife, numerous small incisions being made under the guidance of the laryngeal mirror. It may sometimes even become necessary to perform tracheotomy or intubation. For the angioneurotic variety, Strübing recommends giving the patient ice to suck, and morphine internally.

2. **Inflammatory Œdema** may be:—

(a) Primary, acute septic inflammatory œdema; (b) Secondary, resulting from tubercle, syphilis, or cancer; also from trauma, due to the impaction of a foreign body, the swallowing of scalding fluid, or the inhalation of chemical irritants.

(a) *Acute Septic Inflammatory Œdema.*—The etiology, pathology, and general treatment of this condition are the same as in the case of acute septic inflammations of the pharynx (page 8), of which indeed the laryngeal inflammation is frequently a part. It is therefore necessary here only to describe the appearances found in the larynx, and the special treatment to be adopted for the laryngeal complication.

(b) *Secondary Œdema.*—The appearances and treatment of the primary and secondary forms of inflammatory œdema are so similar that they may be considered together.

APPEARANCES.—Whatever the cause of œdema of the larynx may be, the amount and position of the swelling are dependent on the anatomical relation of the loose submucous areolar tissue of the larynx. Logan Turner and Hajek have investigated this subject, and have obtained similar results from their experiments. Thus Turner found that if an injection were made between the epiglottis and the base of the tongue, the fluid filled the valleculæ and passed on to the anterior surface of the epiglottis, but was stopped by its free margin and by the pharyngo-epiglottic fold; the latter gave way, however, under more forcible pressure,

and the fluid then found its way into the loose areolar tissue beneath the pyriform sinus and ary-epiglottic folds. If the ary-epiglottic folds were injected, they first became pear-shaped, but with more force the whole pyriform sinus became filled; if both sides were injected, the upper aperture of the larynx was completely blocked. The fluid was stopped internally at the upper margin of the false cords, while the greater part of the laryngeal surface of the epiglottis could not be injected from the ary-epiglottic folds. If the false cords were injected, the fluid was limited to them, but with greater pressure it spread to the ary-epiglottic folds. Injections made with moderate pressure in the upper surface of the true cord did not pass below the free margin of the cord, but the fluid found its way into the inferior and outer walls of the ventricle: with more pressure, however, it passed the edge of the cord to the subglottic region. If both cords were so injected, the lumen was much diminished.

SYMPTOMS.—The symptoms produced are hoarseness and dyspnoea; and, if the œdema becomes so marked as to occlude entirely the lumen of the larynx, death from asphyxia will result. On examination of the larynx, a swelling will be observed, similar in position and shape to one of those obtained by the injection experiments; the colour varies from a pale-yellow tint in the non-inflammatory varieties, to a dusky-red in the acute inflammatory forms.

TREATMENT.—This must be energetic in proportion to the severity of the symptoms; in the milder cases the patient should be confined to bed in a warm room in which the air is kept moist by the use of a steam kettle; ice may be given to suck, and cold compresses may be applied to the neck; hypodermic injections of pilocarpine, gr. $\frac{1}{4}$, have given good results. If the œdema does not diminish, scarification of the parts should be tried, and in any case it is advisable to make preparations for immediate tracheotomy or intubation. In private practice, the former should be preferred, unless skilled assistance is at hand to replace the tube in the event of its being coughed up.

DIPHTHERITIC LARYNGITIS OR CROUP.

Diphtheria may affect the larynx primarily, or it may spread downwards to that organ from the fauces.

SYMPTOMS.—The temperature rises two or three degrees, and there is also at first an increase in the pulse-rate, which in

uncomplicated cases is followed after two or three days by a normal or subnormal temperature, and a fall in the pulse-rate. The voice is hoarse, or may be entirely lost; cough is also present and soon develops the characteristic metallic ring known as croupy. At first there is no dyspnoea, but later, spasmodic attacks manifest themselves, which unlike the spasms of false croup, are not limited to the night-time. During the attacks the dyspnoea may be so severe that the child has to fight for breath: a paroxysm of coughing usually ends the seizure, and after it has passed off, the respiration is not much embarrassed. If no treatment be adopted, the attacks increase in number and severity, and the dyspnoea becomes permanent; the extraordinary muscles of respiration are brought into action; there is recession of the intercostal spaces, the subclavicular fossæ, and the epigastrium, during inspiration; cyanosis is marked, and there is great restlessness. Finally the child becomes too exhausted to struggle, the cyanosis is replaced by a pale livid colour, and death soon supervenes.

APPEARANCES.—As the majority of those who suffer from this disease are in the first decade of life, and most of these are between the ages of two and five, it is rarely practicable to make a laryngoscopic examination, while in the more severe cases it is hardly justifiable to attempt it; for where a condition is suspected to be diphtheritic, it should be treated as such even in the absence of a definite diagnosis. This has already been insisted upon in the section on Diphtheria of the Pharynx (page 7). In adults the appearances found are those of an acute laryngitis, accompanied by the presence of a false membrane; there may, however, be extensive formation of membrane without any marked dyspnoea, as there is much more breathing-space in adults than in children.

The **DIAGNOSIS** may be difficult in children, but if there is any suspicious exudation on the pharynx, diphtheria may almost certainly be diagnosed; where, however, there is a history of repeated previous attacks, the condition is probably spasmodic laryngitis. *Laryngismus stridulus* is another affection (see page 78) which is sometimes mistaken for diphtheria, but as it is rarely met with in children over two years of age, as there is no pyrexia, and as the patient is usually fairly well between the attacks of spasm, it should be possible to differentiate between these conditions.

DISEASES OF THE LARYNX

PROGNOSIS.—The prognosis is grave, the death-rate being higher than in cases of faeial diphtheria. Dr. Ker states that in the Edinburgh City Hospital during the five years ending 1909, it varied from 11 to 18 per cent, while the total death-rate from diphtheria was never above 8 per cent.

TREATMENT.—The general treatment of diphtheria must be carried out, but it is not discussed here for reasons already given; it is also advisable to place the patient at once in an atmosphere of steam. Dr. Ker does not approve of its use in conjunction with a tent, as this hinders the circulation of air, but advises that two or three eroup kettles should be kept working at once, and in this way sufficient steam is supplied without the aid of a tent. Hot fomentations applied frequently to the throat also give relief. The indications for operative interference depend largely on whether the patient is treated at home or in a hospital, for in the former case, if there is definite dyspnoea, or if there has been one severe paroxysm of coughing, it is not safe to leave him without performing tracheotomy or intubation. Tracheotomy is preferable, unless skilled aid is immediately forthcoming to replace the tube in the event of its being coughed up. In hospital there is no need to operate until the dyspnoea is very severe, and then intubation is generally performed, though, in case of failure, the instruments for tracheotomy are always kept at hand. However bad the dyspnoea may be, operative interference should not be resorted to until the effect of steam has been tried, if only for a few minutes.

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PLATE III.

AFFECTIONS OF THE LARYNX

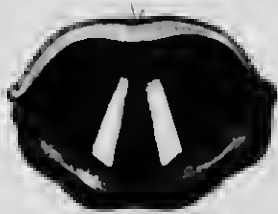


Fig. 13.
Normal larynx.

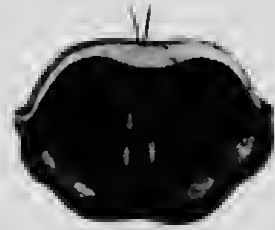


Fig. 14.
Acute laryngitis.



Fig. 15.
Pachydermia laryngis.



Fig. 16.
Laryngitis sicca.



Fig. 17.
Inter-arytenoid pachydermia



Fig. 18.
Singers' nodes.

CHAPTER IX.

*CHRONIC INFLAMMATIONS OF THE LARYNX.***CHRONIC LARYNGITIS.**

ETIOLOGY.—The causes of chronic laryngitis are the same as those of acute laryngitis; indeed, repeated attacks of the latter affection frequently result in chronic inflammation. Chronic laryngitis may, however, come on gradually, and in such cases the most common causes are excessive or faulty use of the voice, abuse of alcohol and tobacco, chronic nasal obstruction, dusty atmosphere, or, more rarely, suppuration in the accessory sinuses of the nose; while gouty or rheumatic patients are probably more susceptible than others.

SEMEIOLOGY.—The symptoms are huskiness, which is generally worse in the morning, a feeling of dryness or irritation in the throat, a frequent desire to clear the throat, and often an irritable cough, which may be accompanied by the expectoration of pellets of mucus.

APPEARANCES.—The changes in the larynx vary considerably, and the following types may be recognized: (1) Catarrhal; (2) Hypertrophic; (3) Atrophic.

1. *Chronic Catarrhal Laryngitis.*—In this variety there is increased redness of the parts, most noticeable on the vocal cords; there is also increased secretion, which sometimes forms bands across the cords, but there is no marked thickening of the tissues. On phonation, some degree of adductor paresis may generally be observed.

2. *Chronic Hypertrophic Laryngitis.*—In this variety, in addition to redness there is increase in size; in some cases the enlargement is general, in others the hyperplasia is limited to the vocal cords, or to the ventricular bands; the latter may become so large as to hide entirely the true cords. The hypertrophy may also be subglottic; this condition is known as *chorditis vocalis hypertrophica inferior*, and many of the cases

are of the nature of scleroma; but these are very rarely met with in this country.

3. *Chronic Atrophic Laryngitis*.—This form is described under the heading *Laryngitis sicca* (page 51).

DIAGNOSIS.—Great caution should be exercised before making a diagnosis of chronic laryngitis, as it must be remembered that this disease is frequently a forerunner of tuberculosis or cancer of the larynx, especially in those cases where the condition is unilateral. The differential diagnosis is fully discussed in the section on Cancer of the Larynx (page 73).

TREATMENT.—Before beginning the local treatment of chronic laryngitis, it is necessary to emphasize the importance of rest of the voice, especially in the case of individuals who use their voices professionally; and it must not be forgotten that faulty voice production, as well as over-use or straining of the voice, predisposes to laryngitis in such persons. Any errors in this direction must therefore be rectified when work is resumed; this is, however, a question rather for the teacher of singing or elocution than for the physician. Where there has been over-indulgence in alcohol or tobacco, these must be interdicted, while avoidance of any dust-laden atmosphere is also important; in gouty or rheumatic subjects, or in persons whose general health is below par, appropriate general treatment must not be neglected. In obstinate cases, where the patient can afford it, a course of treatment at some spa may be recommended, such as Ems, Mont Dore, Aix-les-Bains, or Cauterets, on the Continent, or Harrogate in our own country. In all of these health resorts there are special facilities for treating throat affections.

Local Treatment.—Inhalations (see Appendix) are of value, and one of the best is oil of pine. Where there is much secretion, the inhalation of nascent chloride of ammonium is distinctly beneficial. Direct applications to the larynx may also be made, either by the patient himself, or preferably by the physician, with a laryngeal syringe. The remedies which are most useful when applied by a spray are tannin, chloride of zinc, and perchloride of iron (see Appendix). The nozzle of the spray should be introduced well back into the throat, and the patient should inspire deeply. Direct applications by the laryngeal syringe are, however, more serviceable for obstinate cases, and solutions of protargol or of silver nitrate are perhaps of most value, though Mandl's solution, or chloride of zinc, may

be similarly employed (see Appendix). In cases where there is noticeable adductor paresis, faradization or massage to the neck is indicated, combined with the internal administration of strychnine, and where there is marked nasal obstruction, causing mouth breathing, this should be treated.

ATROPHIC LARYNGITIS, OR LARYNGITIS SICCA.

This form of chronic laryngitis requires a more special description. The ETIOLOGY is obscure, though it may be associated with an atrophic condition of the mucous membrane of the nose and pharynx. The condition is generally met with in women, and, in my experience, chiefly in those who have to do much washing, and are in consequence exposed to an atmosphere of steam.

APPEARANCES.—The structures of the larynx appear atrophied and unusually dry; the openings into the ventricle of the larynx are well seen owing to the small size of the false cords; viscid secretion can be detected on the cords, and tends to form crusts which have a dark, sometimes a bluish, tint (*Plate III, Fig. 16*); this crust formation may be so extensive as to encroach on the lumen of the larynx, and cause dyspnoea. The crusting may be limited to the larynx, or it may extend downwards to the trachea and upwards into the pharynx, while in rare cases it may be associated with a smell similar to that present in ozæna; this condition has accordingly been named by Baginsky, "ozæna laryngis." The crusts give rise to fits of coughing, by which they are dislodged, leaving sometimes an excoriated surface below; after the expulsion of the crusts, the voice becomes temporarily less hoarse. If there is abundant crust formation, the lumen of the larynx may be seriously encroached upon, and give rise to dyspnoea.

TREATMENT.—This should be directed in the first instance towards getting rid of the crusts, which can usually be accomplished by the use of inhalations (see Appendix). Creosote is very serviceable for this purpose, though other inhalations may be tried. When the crusts have separated, the larynx may be painted with Mandl's solution, while potassium iodide, given internally, is of value.

PACHYDERMIA LARYNGIS.

This condition was first described by Virchow from post-mortem examinations, and was first recognized clinically by

B. Fränkel. It is usually found in adult males. The **ETIOLOGY** is obscure, but it is supposed that over-indulgence in alcohol and tobacco predisposes to the condition. Pathologically it consists of a proliferation of the epithelium, and great multiplication of the papillæ; this occurs either on the true cords, or in the inter-arytenoid region; if on the cords, the thickening is symmetrical.

SYMPTOMS.—These usually consist in huskiness, and sometimes in a certain amount of discomfort in the throat.

APPEARANCES.—The appearances vary with the site of the swellings; the most common situation is on the two vocal processes; a pink elevation is then seen on both cords, with a slight crater-like excavation on the surface of one, into which the apex of the swelling on the opposite vocal process fits on phonation. In other cases, symmetrical pink swellings are found at the junction of the anterior with the middle third of the cords (*Plate III, Fig. 15*); when in this situation there is usually no hollow on either side. A third situation is the inter-arytenoid region. When the pachydermia is in this position, a smooth projection is seen, grey in colour but tinged with pink (*Plate III, Fig. 17*); this may be confounded with the inter-arytenoid tumour found in phthisis, but it should not be difficult to distinguish the two conditions, for the latter is pink in colour and has an irregular surface.

There is another variety of pachydermia known as **Singers' Nodes**. As the name implies, this condition is generally met with in singers, but it may also be found in those who use their voices professionally in other ways, and it is also met with in children. In singers it is usually produced by a faulty method of voice production, or by overstraining the voice. The swellings form at the junction of the anterior and middle third of the vocal cords, and are frequently bilateral; they appear as small pearly-white projections on the anterior surface and edge of the cord, and form a mechanical interference to perfect adduction (*Plate III, Fig. 18*). Singers' nodes are not, however, always of the same nature as pachydermia, for O. Chiari and B. Fränkel have demonstrated that some of these nodes are retention cysts, formed by the obstruction of the openings of mucous glands found in this situation.

TREATMENT.—The treatment of pachydermia is not usually attended with much success. If possible, the voice should be

given a prolonged rest, and at the same time potassium iodide should be taken internally; where there has been excessive indulgence in alcohol or tobacco, these should be restricted. Various local applications to the larynx may be tried, such as lactic acid in solution up to 50 per cent; or milder astringent solutions may be used, such as zinc chloride or silver nitrate (see Appendix). Singers' nodes may be successfully treated by prolonged voice rest, but for those who use their voices professionally, surgical interference may be recommended, as a successful operation will greatly shorten the period of treatment—a most important point for those dependent upon their voices for their living. As the operation is one of great delicacy and difficulty, the services of a specialist must be requisitioned. The procedure I prefer is removal by forceps; but if the nodes are too small to be gripped by forceps, they may be destroyed by the galvano-cautery. Both methods are attended with risk to the voice, even when performed by a competent specialist, as the slightest injury to a cord during the operation may result in permanent impairment of the voice.

KERATOSIS (*Syn. Keratosis Laryngis Circumscripta*).

Keratosis of the larynx is a condition of extreme rarity, and I have been able to find only some eight cases in the literature. These have been observed by Juffinger, O. Chiari, Fein, Logan Turner, and myself, among others. The onset is slow, and hoarseness is usually the only symptom. The appearances observed are of a patch or patches, chalky or snowy-white in colour, with a rough surface presenting frequently a number of spicules (*Plate IV, Fig. 19*). They are generally situated on one or both cords. On microscopic examination, the tissue is found to consist of layers of cornified epithelium, underlying which are columnar-shaped and squamous epithelial cells. Treatment has been successful when the overgrowth has been mechanically removed, while painting with a 10 per cent alcoholic solution of salicylic acid has also proved efficacious.

PERICHONDRITIS OF THE LARYNX.

Perichondritis very rarely occurs as a primary affection of the larynx; it is nearly always secondary, the most common causes being syphilis, tubercle, cancer of the larynx, or trauma either from cut throat or blows on the larynx, or from the

impaction of foreign bodies; it may also result from septic inflammation, and from typhoid, diphtheria, and other acute infectious fevers.

PATHOLOGY.—As a result of the inflammation, the perichondrium separates from the underlying cartilage, and an abscess forms, or else degenerative changes take place which result in the adhesive perichondritis first described by Semon, and which produce thickening of the affected cartilage. If an abscess forms, it bursts externally, or into the larynx, according to its site. In either case it continues to discharge until the necrosed cartilage is exfoliated; healing may then take place, but is usually followed by marked deformity, and stenosis of the larynx often results. It is rare for more than one cartilage to be involved, and the arytenoid cartilages are those most frequently affected.

SYMPTOMS.—The onset is accompanied by pain, slight fever, and moderate increase in the pulse-rate; and there is always tenderness on pressure over the affected cartilage, which becomes red and swollen. If the swelling encroaches on the lumen of the larynx, the breathing becomes embarrassed, and sudden death from asphyxia may supervene. In the case of the epiglottis and of the arytenoid and cricoid cartilages, there is pain on swallowing.

APPEARANCES.—These vary with the site of the perichondritis. If the epiglottis is affected, it swells to three or four times its natural size, and assumes a characteristic turban shape. If the cricoid cartilage be involved, the swelling may be situated in the ary-epiglottic folds, the external surface of the larynx, or the subglottic region. If the thyroid be affected, the swelling may be subglottic, or external to the larynx. If the arytenoid cartilage be the site of inflammation, it becomes markedly red and swollen; the vocal cord on the same side is then fixed, and the lumen of the larynx may be much diminished. Acute inflammation of the crico-arytenoid joint presents an almost identical appearance; it may occur in the course of perichondritis of the arytenoid or cricoid cartilages, and may therefore be produced by the same conditions which set up perichondritis; but it may also occur in the course of acute rheumatism. It results in suppuration and destruction of the joint, or else in ankylosis.

PROGNOSIS.—The prognosis depends largely on the nature of the disease which causes this complication; it is unfavourable

as regards restitution of the voice in those cases in which the movements of the cords are interfered with ; in some instances there is danger to life itself.

TREATMENT.—Absolute rest to the voice is of prime importance, so that there may be no encouragement for the inflammation to spread beyond the affected cartilage. Cold applications may be made to the neck, in the form of an ice-hag or Leiter's tubes ; ice may be given to suck, and potassium iodide prescribed. This drug should, however, be withheld where the lumen of the larynx is encroached upon to any extent, on account of its tendency to produce œdema. If an abscess appears to have formed, the pus should be evacuated ; where the collection is external, this is of course an easy matter, but when the incision has to be made under guidance of the laryngeal mirror, the services of a specialist will be required. Should there be a suspicion that the condition is specific, energetic anti-syphilitic treatment should be begun at once. When suppuration takes place, the swelling may so seriously encroach upon the lumen of the larynx as to cause dangerous dyspnoea, necessitating tracheotomy. When healing begins, there is a great tendency for stenosis of the larynx to develop, especially in those cases where there has been suppuration, with exfoliation of cartilage. The practitioner must accordingly be on the look out for this complication, which should be combated by the passage of Schrötter's bougies ; if the larynx becomes markedly narrow in spite of the use of these instruments, it may be necessary to perform tracheotomy, and the patient may have to wear a tube permanently. An alternative procedure is to lay open the larynx by thyrotomy, and to fashion a new lumen for the larynx, which is kept open at first by a rubber tube ; the raw area may be skin grafted, and the larynx is closed later by a plastic operation. This operation, known as laryngostomy, has been developed specially by French authorities (Sargnon and Barlatier).

CHRONIC FIXATION OF THE CRICO-ARYTENOID JOINT.

Chronic fixation of the crico-arytenoid joint is a result of inflammation of the articulation, which is due either to a local or to a general condition, and which may run an acute or a chronic course. Of all the causes producing ankylosis, perichondritis is by far the most common, but it may also be due to

inflammation following on a wound involving the joint. Enteric fever, rheumatism, gout, and diphtheria are other conditions which produce ankylosis, while permanent immobility may also be produced by purely mechanical causes, such as cicatricial contraction of the mucous membrane after syphilitic and other ulcerations.

APPEARANCES.—The appearances vary, for the cord may be fixed anywhere between full abduction and full adduction (*Plate IV, Fig. 20*); the most common position is one slightly internal to the cadaveric. Immobility of the arytenoid cartilage may also be due to luxation of the joint, in which case there is marked deformity; this condition was first described by B. Fränkel.

DIAGNOSIS.—The diagnosis may be very difficult, and it may be impossible to distinguish between ankylosis and recurrent paralysis, but the presence of tumefaction at the base of the arytenoid process is, as Semon pointed out, suggestive of ankylosis; and in the latter condition the arytenoid cartilage is fixed, while in recurrent paralysis it moves slightly on phonation.

TREATMENT.—In early cases some good may result from methodical dilatation by bougies, but when the breathing is not embarrassed it is wiser to abstain from treatment. When there is danger to life from asphyxia, tracheotomy may have to be performed.

PLATE IV.

AFFECTIONS OF THE LARYNX



Fig. 10.
Keratosis of the larynx.



Fig. 18.
Chronic fixation of
the cricoarytenoid joint.



Fig. 21.
Tuberculous larynx.



Fig. 22.
Unilateral cataract in a case
of apical phthisis.



Fig. 23.
Tuberculous larynx.



Fig. 24.
Lupus of the larynx.



CHAPTER X.
 CHRONIC INFECTIVE CONDITIONS OF THE
 LARYNX.

LARYNGEAL PHTHISIS.

TUBERCULOSIS of the larynx may be a primary disease, but in the vast majority of cases it is secondary to pulmonary phthisis. In the latter affection, changes may be found in the larynx which are not due to a local invasion of tubercle, and accordingly, when they are detected, a thorough examination of the chest should be made. The most common of these changes is anæmia, which is often associated with fugitive blushing; and catarrh, when limited to one side of the larynx (*Plate IV*, *Fig. 22*), is always suggestive of some grave condition, i.e., tuberculosis, syphilis, or malignant disease; while obstinate laryngeal congestion affecting both cords, and indistinguishable from chronic laryngeal catarrh, may be a precursor of laryngeal phthisis.

Tuberculosis of the larynx is more common in men than in women; it occurs at all ages, but is more generally met with between the ages of twenty and forty. The changes produced by the invasion of tubercle are infiltration and, later, ulceration. The epiglottis, the arytenoid cartilages, the ary-epiglottic folds, and the inter-arytenoid fold are the parts usually affected, but the true cords or any other part of the larynx may be attacked.

SEMEIOLOGY.—The symptoms vary with the part affected; if the interior of the larynx is the site of the disease, there may be hoarseness or complete aphonia; if, on the other hand, the epiglottis and arytenoid region are involved, and especially if there is superficial ulceration, laying bare the sensory nerve endings, there are marked pain and dysphagia. Pain, cough, and expectoration are common symptoms in all varieties, and the constitutional disturbance due to the pulmonary lesions may also be met with.

APPEARANCES.—These vary with the part affected. If the epiglottis is the site of the disease, it becomes swollen to several times its normal size, and appears œdematous, but the œdema is solid. At a later stage the upper surface of the epiglottis usually becomes studded with small superficial ulcers (*Plate IV, Fig. 23*); these coalesce and form one large ulcer, which extends in depth, and frequently presents a worm-eaten appearance. The process may continue, and more and more of the epiglottis may be destroyed, until finally only the stump is left. The early stages of ulceration are usually associated with pain and marked dysphagia, but as the ulceration becomes deeper, these symptoms diminish or may disappear. Along with the changes in the epiglottis, it is common to find the arytenoid cartilages pale and greatly swollen; they appear as large rounded bodies, and entirely hide the interior of the larynx.

The ary-epiglottic folds are a favourite site for tuberculous infiltration, and present, along with the arytenoid cartilage, a pale greyish-pink swelling, which is usually pear-shaped, the narrow end pointing forwards; small superficial ulcers may form on the surface, and later these tend to coalesce.

The inter-arytenoid fold is also frequently attacked; the infiltration may take the form of a tumour, and this may be followed by ulceration. On laryngoscopy, the upper edge of the ulcer alone can be seen, and it is frequently hidden by exuberant pale granulations, with finger-like projections (*Plate IV, Fig. 21*); the ulceration may invade the vocal cords. Lesions in the inter-arytenoid fold invariably cause hoarseness, and where the ulceration is extensive there may be complete aphonia.

The false cords may become infiltrated and swollen to such an extent that the true cords are entirely concealed or only their free margins are visible (*Plate IV, Fig. 21*); ulceration may take place, usually in the form of small superficial ulcers, which later tend to coalesce.

Infiltration of the true cords also occurs, the thickening being irregular. When ulceration follows, the cords frequently look as if they were split longitudinally, and present the appearance of two cords, one above the other; ulceration of the cords may extend from ulceration in the inter-arytenoid fold, and there is then marked hoarseness or aphonia.

It must not be imagined from the above description that only one part of the larynx can be affected by tubercle at one time,

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for in advanced cases these changes may be seen in all the structures of the larynx, and there may be so much destruction in the interior of the larynx as to make it impossible to differentiate between the various parts.

There is one other manifestation of tuberculosis in the larynx, which is however so rare that it does not require a detailed description; I refer to tuberculous tumours, first described by John Noland Mackenzie. These growths are usually pale in colour and sessile; as Avellis has shown, they may closely resemble fibromata or papillomata, and in such cases the diagnosis can be made only by microscopic examination.

DIAGNOSIS.—The diagnosis of laryngeal tuberculosis is usually simple in typical cases; the characteristic changes in the larynx, the presence of tubercle bacilli in the sputum, and the evidence of pulmonary phthisis, should enable a correct conclusion to be arrived at. In some cases there is difficulty in differentiating between tubercle and syphilis, or malignant disease; it must, however, be remembered that either of these conditions may be grafted on a tuberculous infection. In the case of syphilis, the difficulty usually arises after ulceration has taken place, as before that stage, tuberculous infiltrations are of a pale greyish tint, while syphilitic gummata are red and angry-looking. Tuberculous ulcers are at first small and multiple, and increase in size slowly, while in syphilis there is usually a single ulcer, which develops rapidly. The tuberculous ulcer is superficial, and has an irregular edge with no marked induration round about it, and the floor of the ulcer, especially near the edge, is often studded with small pale granulations; the syphilitic ulcer, on the other hand, is deep, appears punched out, has a sharply defined edge, and is surrounded by a dark-red indurated area, while the floor is covered with dirty-grey debris.

With regard to malignant disease, the age of the patient may be of assistance; for carcinoma rarely occurs before the age of thirty, while tubercle is met with between twenty and forty years of age; there are however exceptions to this rule. In the earlier stages, tuberculous lesions are usually bilateral, while carcinoma generally affects one side of the larynx only. The greatest difficulty is met with in cases of tuberculous tumours, where the disease is advanced and there is much destruction of the parts, or where perichondritis has been set up. Much help may be obtained in the diagnosis by microscopic

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examination of a portion of tissue removed for that purpose, but a negative result does not exclude malignancy, nor does the detection of tubercle bacilli in the sputum, for, as has already been mentioned, carcinoma and tuberculosis may occur in the one individual.

Finally, laryngeal phthisis may be mistaken for lupus of the larynx; the differential diagnosis will be discussed after the description of the latter disease (see page 66).

To recapitulate: In every case where the laryngoscopic appearances are suggestive of a tuberculous lesion, the lungs should be carefully overhauled, and the sputum examined for tubercle bacilli; if they are not found at first, the examination should be made repeatedly. If there is still doubt, the temperature should be taken twice daily, to see if there is any evening rise, and von Pirquet's cutaneous reaction should be tried. The value of this test must not, however, be exaggerated, as it will be positive if there is any tuberculous focus in the body, and accordingly a positive reaction does not necessarily prove that the laryngeal lesion is tuberculous; if the result is negative, the test should be repeated. If the diagnosis lies between tubercle and syphilis, the blood should be examined for Wassermann's reaction, or the effect of antisyphilitic treatment should be tried; while, where malignancy is feared, a portion of tissue should be removed for microscopic examination; for this purpose the services of an expert will have to be requisitioned.

PROGNOSIS.—The prognosis of laryngeal phthisis depends largely on the extent of the pulmonary lesion; but there is no doubt that much can be done for the local condition by suitable treatment, for tuberculous ulcers may heal, and extensive lesions occasionally clear up in a remarkable way.

TREATMENT.—In the first place, the general treatment of tuberculosis must be carried out; it is unnecessary to discuss this subject here, as it is dealt with in every book on the practice of medicine. If the laryngeal and pulmonary lesions come under observation at an early stage, prolonged and absolute rest to the voice, combined with sanatorium treatment, may be strongly recommended: Moritz Schmidt, St. Clair Thomson, and Semon were among the first to point out the therapeutic value of voice rest. As regards the choice of a health resort, it should be mentioned that, according to general experience, high altitudes are often not well borne by subjects of laryngeal phthisis,

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accordingly Davos and other places in the Engadine should not be selected. Tuberculin injections may be given, either in conjunction with sanatorium treatment or alone. Dr. Camac Wilkinson has reported some very striking results in cases of laryngeal phthisis by treatment with large doses of tuberculin alone; other observers, however, have not been so successful; in my experience, which is limited to a few advanced cases, I have not seen any improvement follow the administration of small doses.

Local treatment is of the greatest importance. Where there is limited ulceration, the application of lactic acid is of value, as first suggested by H. Krause. It should be vigorously carried out by means of Krause's forceps, mounted with a pledget of cotton wool; it is well to commence with a weak solution of lactic acid, about 20 to 30 per cent, and if this is well borne it should be gradually strengthened, until finally an 80 per cent solution may be employed. The applications with the weaker solutions may be made once or twice a week, but when the full strength is used one sitting a week is sufficient. Menthol may also be employed locally: a half to one drachm of a 10 to 20 per cent solution of that drug in olive oil is instilled into the larynx by means of a laryngeal syringe; the instillations should be repeated several times a week. Ulcers occasionally heal as a result of this treatment, while in any case the menthol has an anæsthetic action.

When granulations cover a limited area of ulceration, they may be removed by means of Heryng's curette, or Landgraf's forceps; a solution of lactic acid may subsequently be applied to the raw surface. When the disease is limited to the epiglottis, the affected part may be removed. Such operative procedures should be undertaken only by one who has acquired the technique of intra-laryngeal manipulation, and the decision as to their advisability should rest with the specialist; indiscriminate operating is to be avoided. Grünwald has warmly recommended deep galvanic cauterization of infiltrated parts. In cases of extensive laryngeal disease, where there is marked embarrassment of the breathing, it is advisable to perform tracheotomy, and in many such cases the subsequent relief to the patient is no less remarkable than the rapid improvement in the local condition.

Thyrotomy has also been performed in cases where the disease

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was widespread, but it is justifiable only where the pulmonary lesion is slight.

The effects of x-rays and of radium have also been tried, but no conclusions can as yet be drawn regarding the value of such treatment. It should also be mentioned that sunlight has been used as a therapeutic agent, a mirror being arranged to reflect the rays of the sun on to a laryngeal mirror, and so into the larynx itself.

Apart from the attempt to cure the disease, treatment is frequently called for to relieve the pain and dysphagia which are often such outstanding and distressing symptoms. The pain can usually be relieved temporarily by instilling a 5 to 10 per cent solution of cocaine or novocain into the larynx, or by spraying weaker solutions into the pharynx, while the patient inspires deeply. Orthoform or anæsthesin, or equal parts of the two powders, if insufflated into the larynx a quarter of an hour before meals, will also be found very efficient in relieving dysphagia; this application can be successfully carried out by the patient himself, with Leduc's auto-insufflator (see page 40). If these drugs are found to be effective, they should be used in preference to cocaine, owing to their atoxicity. The dysphagia may also be relieved by applying firm and even pressure at the angles of the jaw at the moment of swallowing.

Hoffmann has more recently advocated the injection of alcohol into the superior laryngeal nerve, as a result of Schlösser's experience in the treatment of trigeminal neuralgia by the same method. His procedure is as follows: The patient lies on the back with a small pillow under the neck, and the skin is cleansed with alcohol and ether; an 85 per cent solution of alcohol heated to 113° F., is used for the injection. The tender point in the thyro-hyoid membrane is sought for; this corresponds to the point where the superior laryngeal nerve enters the larynx; the index finger of the left hand is placed immediately below this point, while the thumb on the opposite side pushes the larynx across towards the side where the injection is being made. The needle of the syringe is introduced at right angles to the skin, nearer the hyoid than the thyroid cartilage; a length of 1½ cm. is marked off on the syringe, as the depth to which the needle should be carried. If the nerve is touched, the patient at once complains of severe pain in the ear; a few drops of alcohol are then injected, the pain increases for a little.

and then passes off gradually; more alcohol is thereupon introduced, and if there is no pain, the needle is directed a little to one side, and a third injection is made; if the pain still remains in abeyance, the needle is withdrawn. In all, $\frac{1}{2}$ to $1\frac{1}{2}$ c.cm. of alcohol is injected. If the effect is not lasting, this procedure may be repeated. Dundas Grant has also had satisfactory results in the treatment of pain by this method.

It is not to be wondered at that the effect of Bier's congestion has been tried, and both Grabower and Polyak report favourable results from this treatment. The former uses a rubber band, $2\frac{1}{2}$ cm. in breadth, which is adjusted below the larynx, and is prevented from slipping by two bands which pass under the axillæ. The bandage is fastened as tight as the patient can bear it, so that the face becomes slightly blue. It is left on for six hours the first day, for twelve to sixteen hours the second day, and for eighteen hours the third day. From the fourth day onwards it remains in position for from twenty to twenty-two hours. The pain diminishes as early as the second day, and after the sixth day the patient can often swallow solids. If there is any œdema, it increases greatly at first, but gradually diminishes, and on the tenth or twelfth day it is less than it was originally. According to Grabower, the pain is invariably relieved.

SYPHILIS OF THE LARYNX.

Syphilis of the larynx may be either inherited or acquired. Hereditary syphilis usually appears shortly after birth, when it takes the form of laryngeal catarrh, but it may not manifest itself until after puberty, when it usually presents the characteristics of tertiary lesions. Acquired syphilis affects the larynx in its secondary and tertiary forms, but no hard and fast line can be drawn between these varieties. The larynx is not very commonly affected in syphilis, but when it is, the majority of cases belong to the earlier and milder stages.

Secondary Manifestations.—One of the more common lesions is a catarrh of the larynx, which does not differ in appearance from a simple catarrh, except that it resists ordinary treatment but clears up readily under anti-syphilitic remedies. Another not uncommon manifestation is a peculiar mottling of the cords, produced by alternate patches of red and white.

Either of these appearances may be seen six or eight weeks after the primary sore ; they may, however, appear two or three years after the initial infection, or they may reappear at intervals for several years. Mucous patches or condylomata are rarely met with in the larynx, but may be seen occasionally on the epiglottis, the ary-epiglottic folds, the inter-arytenoid space, and the vocal cords ; they appear as grey, slightly raised patches, which may break down and leave superficial erosions ; like the other secondary lesions, they may appear early, and return at intervals for several years after the primary sore.

Tertiary Manifestations take the form of infiltrations which may be diffuse or localized (gummata), and which tend to break down and form ulcers. Gummata are usually single, and appear as smooth, dark-red, defined swellings, most frequently situated on the epiglottis, but also to be found on the ary-epiglottic folds, the false cords, the inter-arytenoid fold, and, very rarely, in the trachea. A gumma about to break down presents a yellow spot in the centre. When ulceration occurs, there is rapid destruction of tissue ; the ulcer appears punched out, it is surrounded by a well-defined and darkly coloured area of induration, the edges are undermined, and the floor is covered by grey necrotic tissue. The ulcer extends more in depth than superficially, so that when healing takes place it is often accompanied by marked deformity, and if the epiglottis is the site of the ulceration, it may be completely destroyed. When the ulceration occurs in the interior of the larynx, healing may be followed by stenosis, and membranous webs may form across the glottis.

Papillary growths may occur, as in the case of laryngeal tuberculosis ; they may be found in any part of the larynx, and are very similar in appearance to true neoplasms.

Perichondritis is the most serious complication of syphilitic disease of the larynx. It may occur in association with a gumma, and any of the cartilages may be affected ; necrosis, with exfoliation of cartilage, may follow. The condition is described in the section on Perichondritis (see page 53). Paralysis of the vocal cords may also occur in syphilis ; this is described in the section on Laryngeal Neuroses (see page 83).

SEMEIOLOGY.—In its earlier manifestations the symptoms of syphilis of the larynx may be trifling, some degree of huskiness, and possibly slight sore throat, alone being complained

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of; but in the later stages there may be complete aphonia, and pain, though usually absent, may be very severe. If perichondritis develops, there will probably be narrowing of the lumen of the larynx, which may be so considerable as to cause dyspnoea.

PROGNOSIS.—This is good in the earlier stages, but in the later there may be risk to life from asphyxia, which may necessitate the permanent wearing of a tracheotomy tube; there is also in many cases lasting injury to the voice.

DIAGNOSIS.—The diagnosis in the secondary manifestations is usually made readily from the evidence of syphilis found in other parts of the body. The tertiary lesions offer the greatest difficulty in diagnosis. When ulceration has occurred, the character of the ulcers, the absence of pulmonary changes, and possibly the evidence of syphilis in other parts of the body, should serve to distinguish syphilitic from tuberculous ulceration (see description of syphilitic and tuberculous ulcers, page 59). Syphilis must also be distinguished from carcinoma; the differential diagnosis is fully discussed in the chapter on new growths (see page 73). Syphilis is not likely to be mistaken for lupus; the nodular infiltration, and the absence of secretion and of obvious ulceration, are sufficiently characteristic to distinguish the latter affection.

TREATMENT.—The treatment of syphilitic affections of the larynx is mainly constitutional; in the early stages the laryngeal appearances generally clear up rapidly after the administration of mercury, and inunction will usually be found the most satisfactory method. In the tertiary lesions, iodide of potassium must be given, beginning with doses of 10 gr. three times a day, and increasing this to 30 or 40 gr. a dose; in some instances a combination of the two drugs is advisable. The cases which give rise to the greatest anxiety are those where there is a threatening of ulceration, or where it is feared that perichondritis will supervene. Salvarsan should then be administered, and also in obstinate cases which do not react well to mercury and iodides. For the wealthier classes, a course of treatment at Aix-la-Chapelle may be recommended.

Local treatment is rarely called for, unless œdema or perichondritis supervenes; the treatment of these conditions is fully discussed under their respective headings (see pages 46 and 55).

LUPUS.

Lupus of the larynx is an exceedingly chronic disease, but it is not at all common, and when it does occur, usually affects young persons under the age of twenty: in most cases there is also evidence of the disease on the skin. The pathology of lupus is apparently identical with that of laryngeal tuberculosis, and tubercle bacilli in small numbers are found in the infiltrated tissues. Clinically, however, there is a wide difference between these two conditions, but the reason for this difference has not been satisfactorily explained.

SEMEIOLOGY.—The symptoms may be nil, but when the posterior commissure is involved, the voice becomes hoarse. There is, as a rule, a complete absence of pain; in the later stages dyspnoea may arise as a result of stenosis.

APPEARANCES.—The epiglottis is commonly affected, but the ary-epiglottic folds, the ventricular bands, the inter-arytenoid space, and the vocal cords may all be attacked. The diseased parts become thickened, and present a number of small elevations on the surface, not unlike those seen on a raspberry (*Plate IV, Fig. 24*). As the disease advances, there is marked loss of tissue, though, as McBride has pointed out, there is never the ordinary appearance of ulceration, and there is very little secretion. If cicatrization takes place it is most often accompanied by great deformity, and by stenosis of the glottis.

DIAGNOSIS.—The diagnosis is not difficult in most cases, and if lupus of the external skin is also present, there will probably be no doubt at all as to the nature of the condition. When the laryngeal lesion is primary, there may be difficulty in distinguishing between lupus and tuberculosis, but the characteristic nodular infiltration, the absence of secretion, the extreme chronicity of the disease, and the very slight constitutional and local disturbance, should enable the diagnosis of lupus to be made. Lupus may also be confounded with syphilis, but it is uncommon to find tertiary syphilitic manifestations at such an early age; and, moreover, syphilitic infiltrations have not got a nodular appearance, while the tertiary ulcers are usually characteristic. If there is difficulty in deciding the nature of the lesion, von Pirquet's cutaneous reaction should be made use of, which should be positive in lupus. If doubt still remains, Wassermann's reaction should be tried.

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TREATMENT.—The results of the treatment of lupus are not as a rule very satisfactory. The general health and hygiene should be particularly looked after, as patients who suffer from lupus not infrequently die of pulmonary phthisis. In addition to the ordinary constitutional treatment, tuberculin may be administered, though most observers have not seen much improvement result from a course of that drug.

Local treatment should not be neglected; the infiltrated areas may be curetted, and subsequently painted with a solution of lactic acid. The strength of the solution to be used and the number of applications to be made, are the same as in the treatment of laryngeal phthisis (see page 61). The galvanocautery may also be tried; a pointed burner is used, and is plunged deeply into the infiltrated tissues. If it is convenient to subject the patient to treatment by x-rays, it is worthy of trial, for undoubted cases of cure have been recorded by this method. The application may be made through the skin, but it must be remembered that at the best a long series of sittings, extending over a period of many weeks, is necessary. When the endeavours to obtain cicatrizations are successful, stenosis may develop, and in such cases Schrötter's bougies should be passed through the constriction once or twice a week. These may fail to preserve the aperture of the glottis, and in rare cases tracheotomy may become necessary. It has then to be decided whether the patient will have to wear a tracheotomy tube for the rest of his life, or whether thyrotomy should be performed, with resection of the cicatricial tissue.

LEPROSY AND SCLEROMA.

Leprosy and scleroma may affect the larynx, but as both of these conditions are exceedingly rarely met with in this country, no detailed description of them will be given. Leprosy is characterized by the formation of smooth or nodular infiltration, and later, slow ulceration sets in. In scleroma, smooth pale-pink swellings develop, situated on either side, below the vocal cords.



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CHAPTER XI.

TUMOURS OF THE LARYNX.

NEOPLASMS of the Larynx may be simple, or malignant. In this chapter, tuberculous tumours, syphilitic tumours, and exuberant granulations will not be referred to, as they have already been dealt with.

INNOCENT TUMOURS.

There are not sufficient data to permit of a conclusion being made as to the etiology of simple tumours, though it is supposed by some that chronic laryngitis, and excessive or faulty use of the voice predispose to their formation. If this were the case, laryngeal neoplasms would probably be much more common than they are, while the fact that some tumours are undoubtedly congenital is also at variance with this theory. New growths occur more frequently in men than in women.

A great variety of neoplasms have been met with in the larynx, but with the exception of papillomata and fibromata, they are all rare. Of these two varieties, papillomata are by far the more common, providing, according to Semon, 39 per cent of all cases.*

SEMEIOLOGY.—The symptoms necessarily depend on the size and the site of the tumour ; if it is small, and does not interfere with the movements of the cords, there may be no symptoms ; in other patients, hoarseness alone is complained of. Neoplasms may, however, reach a large size without producing symptoms ; in one case which came under Dr. Logan Turner's notice, a child, who was supposed to be perfectly well, died suddenly of asphyxia, and it was found at the autopsy that death was due to a large laryngeal papilloma, which had suddenly become displaced so as completely to block the glottis. It is

* The experience of the late Professor Moritz Schmidt, and of Professor Meyer differs in this respect from that of most observers, for they place the fibromata first in order of frequency.

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PLATE V.

AFFECTIONS OF THE LARYNX



Fig. 25.
Papilloma of the larynx.



Fig. 26.
Fibroma of the larynx.



Fig. 27.
Connective tissue tumour
containing large blood spaces.



Fig. 28.
Advanced extrinsic carcinoma
of the larynx.



Fig. 29.
Carcinoma of the larynx.



Fig. 30.
Tumour of the larynx,
simulating malignant disease.

unnecessary to dilate further on the semeiology of laryngeal growths, as the diagnosis can only be made by inspection of the larynx.

Papillomata occur most frequently in children, but are met with in adults (*Plate V, Fig. 25*). They grow from the vocal cords, the ventricular bands, and the ary-epiglottic folds; they may be multiple, and so extensive as to hide entirely the vocal cords, or they may be single; if solitary, they are usually attached to a vocal cord. Their appearance is characteristic: they are pale pink in colour and have an uneven surface resembling a cauliflower or a miniature bunch of grapes. Characteristic as this appearance is, it must not be forgotten that, in elderly people, carcinoma may very closely resemble a simple papilloma, and in cases of single growths in such persons, a definite diagnosis should be withheld until the tumour has been removed and subjected to microscopic examination. Papillomata, though they are benign, have a great tendency to return after removal.

Fibromata of the larynx are usually single; they vary in size from a pin's head to a walnut, or even larger (*Plate V, Fig. 26*). When small, they appear as smooth rounded bodies, attached to the edge and upper surface of a vocal cord; they are generally pink in colour, but may be red, or even have a bluish tint. The larger varieties may be sessile or pedunculated, and may nearly fill the larynx; they have a slightly lobulated surface.

Cysts are rarely met with in the larynx, but may be found attached to the epiglottis or to the ventricular bands, or they may spring from the ventricle, or even from the true cords. They result from the obstruction of a duct of a mucous gland, and appear as smooth, globular, translucent swellings; in some cases blood-vessels may be seen coursing over their surface, and they may attain so large a size as to threaten asphyxia.

Angiomata are occasionally found; they consist of aggregations of blood-vessels held together by loose connective tissue (*Plate V, Fig. 27*). They are usually single, and are found on the vocal cords, the epiglottis, the ventricular bands, and the pyriform sinus; they are red or purple in colour.

Myxomata are generally solitary, and appear as pink, sessile, translucent growths which are attached to the vocal cords.

Lipomata are exceedingly rare, and may attain a considerable size. Cartilaginous tumours or *ecchondromata* are also met with, but are very rare; they are hard, sessile growths, and are generally attached to the thyroid or cricoid cartilage.

PROGNOSIS.—The prognosis of benign growths is nearly always favourable as regards life, though, in rare instances, death has occurred from asphyxia. As regards the voice, the prognosis is also good as a rule, especially if their removal can be achieved through the natural passages; in the cases of multiple growths, however, some impairment of the voice may remain after operation, and the papillomata tend to recur.

TREATMENT.—Where no symptoms are produced, and the situation of the growth is such that it is unlikely to give trouble, interference is unnecessary; in other cases removal, if possible through the natural passages, is the only rational treatment. The specialist must decide whether these operations are to be carried out by the indirect method (i.e., by the aid of the laryngoscopic mirror), or by the direct method; the choice depends partly on the tolerance of the patient, partly on the nature and site of the tumour, and partly on the idiosyncrasies of the operator. For my part, I always select the indirect method if it is at all possible, for it undoubtedly puts the patient to much less inconvenience than the direct. In rare instances, in dealing with large tumours where asphyxia is threatened, tracheotomy has to be performed, and occasionally it may be deemed advisable to perform thyrotomy in order to remove the growths. The prognosis as regards the voice is not so good in such cases.

MALIGNANT TUMOURS.

The causes of malignant disease of the larynx are obscure, and there is no proof that long-standing laryngitis, or excessive use of alcohol or tobacco, predisposes to its development, but it is well known that men are much more commonly affected than women. It was supposed at one time that benign growths could undergo a malignant transformation, and that intra-laryngeal manipulation predisposed to this change; but a collective investigation, instituted by Semon, conclusively proved that such was not the case. Malignant disease occurs in later adult life, most often between the ages of forty and sixty. Both carcinoma and sarcoma arise in the larynx, but

the former is by far the more common ; it is usually primary, but may affect the larynx secondarily by direct extension from neighbouring parts, e.g., the œsophagus. Carcinoma of the larynx is nearly always of the squamous-celled variety. Sarcoma may be of the round- or spindle-celled variety.

The arrangement of the lymphatics of the larynx must be referred to, for it is of the greatest importance from the clinical point of view. Though they form an abundant network, these lymphatics do not anastomose much with the lymphatics of neighbouring parts, but empty themselves into two small glands on either side of the larynx, one beside the trachea, and one below the greater cornu of the hyoid bone. This explains why metastases from carcinoma in other parts of the body rarely appear in the larynx, and also why carcinoma, when it occurs primarily in the interior of the larynx, tends to remain localized for a considerable time. For clinical purposes, carcinoma may accordingly be divided into two groups, extrinsic and intrinsic. Extrinsic growths (*Plate V, Fig. 28*) are those arising from the arytenoid cartilages, the ary-epiglottic folds, the inter-arytenoid space, the epiglottis, and the posterior surface of the cricoid cartilage. Intrinsic growths include those springing from the vocal cords, the ventricular bands, and the sinus of Morgagni ; and also subglottic growths within the limits of the larynx. Intrinsic growths are met with much more frequently than the extrinsic variety.

SEMEIOLOGY.—The symptoms necessarily vary with the part of the larynx which is first affected. In intrinsic cases, the earliest and frequently the only symptom complained of for a long time is hoarseness, which, as Semon points out, is very often out of proportion to the amount of local change. This is due to the infiltrating character of the growth, which at an early stage limits the mobility of the affected cord. The hoarseness increases as the process advances, but the voice may improve temporarily, when the breaking down of the tissues commences, for at this time the cords may be able to come into apposition. In the later stages, there is complete aphonia. Pain is as a rule absent at first, and in some cases the whole course of the disease may be painless, but it is a common symptom after ulceration has commenced ; it is radiating in character, and shoots up the side of the neck to the ears. Dysphagia is not an uncommon symptom when the

epiglottis or posterior aspect of the cricoid cartilage is ulcerated ; it is not, however, an invariable symptom even in ulceration of the epiglottis. In the later stages of cancer, a certain fœtor may be imparted to the breath, owing to the breaking down of the tissues ; increased salivation is also as a rule a noticeable feature at this period. Cough is rarely a prominent symptom. The general health of the patient may remain excellent until the pharynx becomes affected, but as soon as this is involved, cachexia is not long delayed, especially when there is dysphagia. In the later stages of intrinsic cases, and when perichondritis supervenes, there is generally embarrassment of the respiration.

APPEARANCES.—Carcinoma of the larynx may manifest itself in a number of different ways, and in the following description I have availed myself largely of the results of Semon's work, which has been such a valuable contribution to this subject.

1. It may appear as a unilateral congestion of a vocal cord.
2. It may have the appearance of a broad-based, pale or dirty-grey wart, attached to the middle or posterior part of the cord. At an early stage some defective mobility of the cord is generally noted, due to the infiltrating character of the growth. It is also common to find an area of congestion immediately surrounding the growth, while the rest of the cord remains quite normal in appearance. Though usually single, these growths may appear simultaneously in two places, and sometimes, as Newman has pointed out, there seems to be grafting on the opposite cord by contact.
3. It may show itself as a diffuse papillomatous fringe along the true or the false cord (*Plate V, Fig. 30*).
4. It may take the form of a diffuse infiltrating growth (*Plate V, Fig. 29*).

Epiglottic growths are diffuse, red, and infiltrating. Cancer may begin in the sinus of Morgagni ; it then tends to displace the false cord, and remains masked for a time ; at a later stage it may simulate a new growth, beginning on the true or the false cord. Cancer may also be subglottic. In its earlier stages, and especially in the intrinsic forms, the disease may remain stationary for several months ; later, however, there is a rapid increase in size, and the growth tends to ulcerate ; the ulcers, which are at first superficial, become deeper, the

underlying cartilages are involved, and perichondritis may be set up, with subsequent suppuration and exfoliation of the cartilage. The ulcers are bathed in pus, and their floor is covered with dirty-grey débris; bleeding readily takes place from the ulcerated area. In an advanced case there is so much destruction that it may be impossible to recognize the various parts of the larynx. In intrinsic cancer of the larynx, the lymphatic glands of the neck are not affected until late in the disease, but in extrinsic cases they tend to become involved at an early period.

The duration of an untreated case of cancer of the larynx is rarely more than three years, and death may occur much earlier than this, owing to the onset of an inhalation pneumonia.

DIAGNOSIS.—It is of the utmost importance that every practitioner should be able at least to suspect, if not to recognize, early carcinoma of the larynx, for in this situation there is the greatest probability of a successful result by early operation. In early cases, the age of the patient, hoarseness out of proportion to the local lesion, and the fact that the general health is as a rule excellent, are all suggestive of malignancy. In cases where the only objective sign is catarrh, a unilateral congestion is suggestive of tubercle, syphilis, or carcinoma. In cases of tubercle and syphilis, there will probably be evidence of these diseases in other parts of the body, while the absence of such evidence, and a tendency to lag in the movements of the affected cord are highly suggestive of malignant disease. Congestion is not, however, always unilateral in cancer, and an obstinate bilateral catarrh in an elderly person must always be looked upon as suspicious.

In the cases where cancer takes the form of a localized wart, the diagnosis has to be made from an innocent neoplasm and a tuberculous tumour; here again, impaired mobility of the cord, when present, is a valuable sign as evidence of malignancy. Malignant tumours have a predilection for the posterior part of the cord, while innocent neoplasms are generally attached to the anterior parts of the cord. A chalky-white colour, and, as Semon describes it, a "mown-grass" appearance of the tumour, are also characteristic of carcinoma. Considerable help may be obtained in doubtful cases by the microscopic examination of a portion of the tumour, removed for this

purpose; but if the result is negative, malignancy is not excluded, and accordingly in some cases the diagnosis must be made on clinical grounds alone.

Carcinoma has also to be differentiated from pachydermia laryngis; but in the latter affection the free movements of the cords, the comparatively slight degree of hoarseness compared with the amount of local change, and the characteristic excavation on the one side in well-developed cases, are usually sufficient to enable the correct diagnosis to be made. More difficulty will be experienced when carcinoma takes the form of a diffuse infiltrating growth, and it may be impossible to distinguish it from a gumma by the appearance alone; it is a good rule in such cases to give the patient a course of iodide of potassium, beginning at first with gr. x three times a day, and rapidly increasing the dose to gr. xxx, or else to try Wassermann's reaction. In advanced cases, where there is great destruction and where possibly perichondritis has supervened to mask the characteristic features of the disease, it may also be impossible to distinguish clinically between a malignant growth and syphilis. Here again, it is advisable in the first instance to give a trial course of the iodides; it must, however, be remembered that syphilis and cancer may be present in the one individual.

PROGNOSIS.—The prognosis of intrinsic cancer of the larynx is favourable as regards life, if the diagnosis is made in the early stages, and operation by thyrotomy is performed at once. The improvement in our therapy must be attributed to the work of Semon and Butlin. In the cases where the disease is advanced, or is extrinsic from the first, the prognosis is very serious, the only hope of cure being in the performance of laryngectomy, which is one of the most mutilating operations in surgery. Gluck, who has probably the largest experience of such operations, and who was one of the first to undertake total laryngectomies, has had successful results.

TREATMENT.—It is necessary to mention that B. Fränkel advocated the removal of the more circumscribed of intrinsic laryngeal cancers, by the intra-laryngeal method; and that he and a number of other observers have recorded undoubted cases of cure by this method; but when it is remembered that the disease is generally much more extensive than it appears on laryngoscopic examination (Semon), and that

complete removal is of the first importance to prevent recurrence, it will be agreed by most that it is wiser to perform thyrotomy, and so make a clean sweep of the new growth. This operation has now only a small mortality, and the results in the hands of experienced men have been most satisfactory. Though the majority of surgeons probably still use general anaesthesia, this operation has been performed under local anaesthesia by Professor Paul von Bruns. It is of course outside the scope of this book to give any details of the operation itself. The results as regards the voice are generally wonderfully good.

When the disease is advanced, or when it has been extrinsic from the first (*Plate V, Fig. 28*), the only operation which offers any hope of cure is laryngectomy, either the half or the whole of the larynx being removed. The results of this operation, both immediate and remote, are far from being so good as those obtained after thyrotomy, but improvements in technique have made the outlook much less desperate of late years. Owing to the mutilating character of the operation, the final decision as to whether it is to be undertaken or not should always rest with the patient. If a case is inoperable when first seen, or if operation is refused, certain palliative measures may have to be taken. Pain or dysphagia may be relieved by insufflations of orthoform or anaesthetin, a quarter of an hour before meals. I am not aware whether injections of alcohol into the superior laryngeal nerve have been tried in cases of cancer, but from its effect in cases of pain and dysphagia in laryngeal phthisis, the procedure would probably be worthy of trial. In advanced cases, when the breathing becomes embarrassed, it may be necessary to perform tracheotomy; the low operation is to be preferred, otherwise the wound is liable to become infected as the disease extends. In the latest stages, morphia may be necessary to relieve the sufferings of the patient.

Sarcoma of the larynx is a much rarer condition than carcinoma. It generally springs from the vocal cords, but may involve the false cords or ventricle. Its appearance is that of a well-defined tumour, pale to dark red in colour, and with a smooth surface and firm consistence. Ulceration rarely occurs, and swelling of the cervical glands of the neck is even more uncommon than in intrinsic laryngeal cancer.

DISEASES OF THE LARYNX

In other respects, the clinical features of this disease are so similar to those of carcinoma that the reader may refer to the description of carcinoma given above.

PROGNOSIS.—The prognosis of sarcoma is more favourable than that of carcinoma.

TREATMENT.—Treatment is by operation, and, as in the case of carcinoma, the extent of the disease must determine which operation is to be performed.

CHAPTER XII.

NEUROSES OF THE LARYNX.

NEUROSES OF SENSATION.

Anæsthesia.—The sensory nerve to the larynx is the superior laryngeal nerve, and paralysis of this nerve, which may be peripheral or central, results in a varying degree of anæsthesia. The loss of sensation may be very slight or it may be complete, and the paralysis may be unilateral or bilateral. The most common cause of the latter is diphtheria; in that disease the anæsthesia is usually associated with motor paresis of the larynx and palate. Unilateral paralysis may be due to apoplexy, unilateral lesions in the medulla, tumours at the base of the brain, locomotor ataxia, syringomyelia and hysteria. The anæsthesia in many of these cases is associated with various forms of motor paralysis.

SYMPTOMS.—When the loss of sensation is bilateral and complete, the condition is accompanied by great danger to the patient, as particles of food are very liable to pass through the insensitised larynx and set up an inhalation pneumonia, the "Speisepneumonie" of German writers. In other cases, larger pieces of food may be caught in the larynx and threaten asphyxia. The diagnosis can only be made by palpating with a probe; this is not perceived in the anæsthetic area, but produces cough and contraction of the parts where sensation is unimpaired. Anæsthesia of the palate, tongue, or pharynx should be looked for at the same time.

PROGNOSIS.—This depends upon the cause. Anæsthesia due to diphtheria usually passes off in five or six weeks, but when it is caused by some organic central lesion, the chances of recovery are very poor.

TREATMENT.—Treatment is mainly palliative, and consists in preventing food from passing into the larynx and trachea. This is best accomplished by the use of an œsophageal tube; before introducing the food, the patient should be made to cough or

phonate, to see that the tube has really passed into the œsophagus. In diphtheritic cases, the interrupted current may be used; an intra-laryngeal electrode is employed, while the external electrode is placed against the side of the larynx. Hypodermic injections of strychnine may also be given.

In syphilis of the central nervous system, iodide of potassium and mercury should be administered.

Paræsthesia, Hyperæsthesia and Neuralgia.— These symptoms are found in neurotic individuals, and are especially common in women at the climacteric period. Paræsthesia, by which is meant a feeling of pricking, of heat, or of a foreign body, is also sometimes felt after a foreign body, which was in the larynx, has passed on or has been removed. Hyperæsthesia is not uncommon in those who suffer from gout. In true cases of paræsthesia and hyperæsthesia, the larynx is quite normal; accordingly, before making the diagnosis, any organic condition must be carefully excluded, and enlargement of the lingual tonsil must especially be looked for, as it is liable to cause the sensation of a foreign body. If the larynx is anæmic, the lungs should also be carefully examined, as the case may be one of incipient tuberculous infection.

TREATMENT.—The treatment should be directed towards improving the general health; regular hours, abundant diet, and fresh air should be enjoined, and bodily or mental fatigue should be avoided. In gouty individuals, the diet should be restricted and Carlsbad salts may be ordered, while in anæmic patients iron and arsenic are indicated, combined with valerian. If pain is complained of, a menthol spray may be used, but cocaine is not to be recommended in these conditions. In some cases the constant current has been found of service, the positive pole being applied to the neck. The results of treatment are, as a rule, unsatisfactory.

SPASMODIC AFFECTIONS.

Laryngismus Stridulus is a condition which is met with in children under two years of age, the majority of whom also suffer from rickets; but teething, digestive disturbances, the presence of enlarged bronchial glands, and intestinal parasites, may all be etiological factors. According to Semon and Horsley, the condition is due to irritability of the cortical adductor centres.

SYMPTOMS.—In a typical attack, the child has suddenly a few crowing inspirations, followed by a period of apnœa which may last for some seconds, the movements of respiration coming to a stop. The face assumes an expression of great terror; it is at first flushed but soon turns pale; the eyes are staring, the pupils contracted; the head is thrown back, and the skin is covered with sweat. The attack ends as it began, with some stridulous inspirations. In rare cases the child dies during the seizure. The attacks may be repeated several times a day, or may occur only at long intervals. In severe cases, there may be spastic contractions of the feet and hands, the thumbs being flexed into the palms and the fingers either folded over them or rigidly extended. General convulsions may also supervene.

PROGNOSIS.—The prognosis depends on the cause. It is commonly good, but, as has been stated, some patients have died from asphyxia during an attack.

DIAGNOSIS.—The diagnosis has to be made from false croup, and depends on the sudden onset, the complete apnœa during the attack, and the absence of laryngeal symptoms in the free intervals.

TREATMENT.—If the patient is seen during an attack, the clothes round the neck should be loosened, and the window thrown open to permit of a free draught of air; cold water should be applied to the face and neck, and smelling salts held to the nostrils. If there is real danger of asphyxia, tracheotomy must be performed at once. The general treatment depends on the cause, and as in the great majority of cases this is rickets, the reader should refer to a work on the practice of medicine, it being outside the scope of the present volume. It will suffice to state that the diet must be carefully regulated, and that cod-liver oil and phosphorus should be administered. If the attacks recur frequently, bromide of potassium may be given.

Congenital Laryngeal Stridor.—This is a rare affection, which manifests itself shortly after birth and generally disappears before the end of the second year. The symptoms have been well described by John Thomson: "The infant, who appears in other respects normal, is noticed to have noisy breathing. The noise consists of a croaking sound accompanying inspiration, which rises to a high-pitched crow when a longer or more

vigorous breath is taken ; expiration may be accompanied by a short croak when the stridor is loud, but at other times is noiseless." There is marked indrawing of the epigastrium and of the epi-sternal notch during inspiration, but there are no movements of the alæ nasi, there is no cyanosis, and the cry is clear. The stridor tends to diminish during sleep, and to increase with any excitement.

Of the various theories advanced in explanation of these phenomena, that of John Thomson and Logan Turner is the most convincing. They regard the primary element to be a disturbance of the co-ordination of the respiratory movements, possibly due to some developmental backwardness of the cortical structures which control them. As a result, a change takes place in the upper aperture of the larynx, so that an exaggeration of the normal infantile type results.

Lack believes that the appearances met with in the larynx are not secondary, but are due to a congenital malformation of the vestibule of the larynx. He examined six cases by direct laryngoscopy, and found that the epiglottis was folded on itself, that the ary-epiglottic folds were approximated, and the upper aperture of the larynx was reduced to a slit.

DIAGNOSIS.—The diagnosis has to be made from laryngismus stridulus, laryngitis, croup, and laryngeal growths. If the larynx is examined by the direct method, the question will at once be settled ; but apart from an examination, the age of the patient, the character of the stridor, the absence of cyanosis, and the apparent health of the child, should assist in making the correct diagnosis.

The **PROGNOSIS** is favourable, as the affection gradually tends to pass off.

TREATMENT.—The general health should be maintained, and excitement should be avoided.

Laryngeal Spasm in adults may be due to central nervous diseases such as locomotor ataxy (in which it produces the well-known laryngeal crises), or it may occur in epilepsy, tetanus, hydrophobia, tetany, or chorea ; it may result from mediastinal growths which stimulate the vagus nerves, and it may also depend on direct irritation of the larynx by foreign bodies, tumours, or the application of medicaments. The duration of the spasm varies, it may be sufficiently prolonged to cause loss of consciousness. In the hysterical forms, the spasm may

be continuous, in which case the cords tend to approximate instead of to abduct, during inspiration.

The SYMPTOMS are similar to those found in spasm in children, but are usually less severe, though death has been recorded in cases where a growth has been gripped by the spasm of the cords.

TREATMENT.—The treatment of an attack is the same as that of laryngismus stridulus, and the general treatment depends on the exciting cause.

Phonic Spasm is a condition met with in neurotic adults who use their voices professionally. The cords act quite normally during respiration, but when the patient attempts to speak they become firmly pressed together after a few words, and no further sound can be emitted, as air cannot be forced through the glottis. The spasm ceases as soon as the endeavour to phonate is abandoned. The results of treatment are usually very unsatisfactory, but in early cases careful breathing exercises and lessons in voice production should be advised.

Mogiphonia is an affection allied to phonic spasm, and was first described by B. Fränkel. It is a professional neurosis occurring in singers, teachers, and clergymen. The patient finds speaking or singing at first difficult, and then impossible; associated with this there is a feeling of pain in the neck. The ordinary conversational voice is unaffected.

Phonasthenia is a condition similar to mogiphonia, except that the fatigue of the voice is evident on any attempt to speak. The prognosis is not very good. Treatment should consist in rest, followed by massage of the neck, and also in systematic instruction in voice production.

Rhythmic Movements and Tremor of the Vocal Cords.—Tremor of the vocal cords is not infrequently observed; it is found in disseminated sclerosis as a form of intention tremor, and is then frequently associated with paresis. Tremor has also been met with in cases of syringomyelia, paralysis agitans, chorea, and hysteria.

It is more uncommon to find cases showing rhythmic continuous involuntary movements of the vocal cords, which resemble an ocular nystagmus, and are unaccompanied by paralysis. These movements are usually synchronous with contractions of some or all of the muscles which take part in the act of deglutition. There has been evidence of organic disease

of the central nervous system in all the recorded cases. In only two have the movements been restricted to one side of the larynx; one case was recorded by Scheinmann, and the other by myself.

TREATMENT in such cases can be of little service.

Laryngeal Vertigo.—This is a rare affection, which nearly always occurs in men; it was first described by Charcot. The nature of an attack is as follows: The patient is seized with a fit of coughing, during which he becomes giddy, or falls down and loses consciousness for a second or two; he then gets up and feels quite well. Various theories have been advanced in explanation of this phenomenon, but McBride's is the one most generally accepted, i.e., that it is due to forced expiration with a closed glottis. He made experiments under these conditions, and found that the pulse became weaker, and that the sphygmographic tracing showed a rapid and continuous diminution of the upstroke. He argues that in laryngeal vertigo "the closure of the glottis is complete, and that the whole expiratory effort is felt through the air contained in the lungs, by the alveoli, the large vessels in the thoracic cavity, and the heart itself. As a result syncope—or a tendency to syncope—is produced, and almost at the same moment the spasm of the glottis relaxes and the attack is over."

The PROGNOSIS is favourable.

TREATMENT.—The treatment should be directed to maintaining the general health, and to relieving the tendency to spasm by the administration of bromides.

Nervous Cough.—This is a spasmodic, and frequently a barking, cough, met with in young persons of both sexes, who are commonly of a neurotic type, and in whom no affection can be detected which is associated with this symptom. The cough is generally single, but may be paroxysmal in character; as a rule it continues throughout the day, and ceases only during sleep.

TREATMENT.—The condition is not amenable to ordinary treatment. Morell Mackenzie found that the best results were obtained by sending the patient for a sea voyage. If this is impossible, large doses of bromides may be given, or arsenic, with or without iron, may be tried.

MOTOR PARALYSIS.

The recurrent laryngeal nerve is the motor nerve to the whole of the intrinsic muscles of the larynx, with the exception of the crico-thyroid muscle, which is supplied by the external branch of the superior laryngeal nerve. The movements of abduction and of adduction have cortical representation in both cerebral hemispheres; that for adduction on the left side being identical with the motor speech centre. Stimulation of a centre in one cerebral hemisphere produces movement in both cords, and destruction of the centres on one side does not affect these movements, as both sides of the larynx are innervated from each cerebral hemisphere. As a result of experimental research and clinical observation, Semon years ago formulated his well-known law, that, in all progressive organic lesions of the centre or trunk of the motor laryngeal nerves, the abductors succumb much earlier than the adductors. This law holds good to the present day, and there is only one well-authenticated case in which the opposite condition was found; it was recorded by Professor Saundby. The patient suffered from extensive carcinoma of the œsophagus, involving both recurrent laryngeal nerves, yet the adductors were the first to succumb. The cause of this exception to the rule was never made clear.

Paralysis of the Muscles supplied by the Superior Laryngeal Nerve.—Paralysis of the crico-thyroid muscles alone is a very rare condition. According to Morell Mackenzie it may be caused by cold or by over-strain of the voice. Mygind has collected thirteen cases, in the majority of which there was some bulbar lesion.

SYMPTOMS.—These consist in a difficulty in producing the higher notes, and in the voice becoming readily tired. On laryngoscopy, a wavy outline of the cords can be detected (*Fig. 31*), and if the paralysis is unilateral, the affected cord stands at a lower level than its fellow. Anæsthesia of the larynx is also present in most of these cases, and Morell Mackenzie has stated that if the finger be placed in the crico-thyroid space during phonation, a lack of tension can be detected.

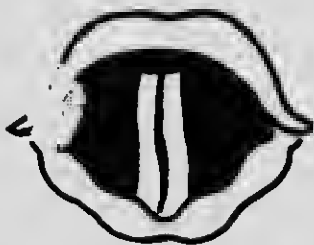


Fig. 31.—Paralysis of crico-thyroids.

TREATMENT.—Treatment consists in massage of the neck, in the application of faradic electricity, and in hypodermic injections of strychnine.

The remaining laryngeal pareses may be divided into three groups:—(1) *Paralysis of the adductors or closers of the glottis.* These include the lateral crico-arytenoid muscles (the adductors proper), the thyro-arytenoid muscles (the internal tensors of the cords), and the inter-arytenoid muscle (the muscle which approximates the arytenoid cartilages); (2) *Paralysis of the abductors, or openers of the glottis, i.e., the posterior crico-arytenoid muscles;* (3) *Paralysis of all the muscles supplied by the recurrent laryngeal nerve.*

1. Paralysis of the Adductors of the Larynx.—Paralysis of the adductors is nearly always bilateral. It is functional in origin, and occurs typically in hysterical women, but it may be met with in boys. The immediate exciting cause may be fright, or some severe mental strain. It is also found in cases of laryngitis, as a result of the inflammation extending to the muscles, and it occurs in anæmia and in early tuberculosis. The onset of hysterical aphonia (the name by which this condition is generally known) is almost always sudden, but although the voice may be reduced to a whisper, the cough is generally clear and loud, indicating closure of the glottis. The duration of the condition varies very greatly; it may react at once to treatment, or it may prove quite unamenable and continue for years. Dr. McBride relates the case of a boy suffering from hysterical aphonia, on whom every kind of treatment was tried without effect. One day the father, without thinking, said to his son, "Tommy, run into the garden and call your sister." Tommy did so, though he had not spoken except in a whisper for some years; and the cure was permanent.

Though the majority of patients suffering from hysterical aphonia can at least whisper, Solis Cohen described a condition which he called Apsithyria, in which the patient cannot produce any sound at all.

APPEARANCES.—On laryngoscopic examination, when the lateral crico-arytenoid muscle is at fault, the cords are seen to be widely abducted, and on attempted phonation they either do not approximate, or only partially approach each other, and immediately separate widely. The reason for this will be

understood when it is remembered that the function of this muscle is to rotate the arytenoid cartilages inwards, and so approximate the true cords from the anterior commissure to their point of insertion on the vocal processes of the arytenoid cartilages. In paresis of the thyro-arytenoid muscles, the function of which is to act as internal tensors of the cords and so keep them taut, an elliptical space is left between the cords on attempted phonation.

When the inter-arytenoid muscle alone is affected, a triangular space is left on phonation between the posterior ends of the cords; the explanation of this is, that the anterior portions of the cords are approximated by the lateral crico-arytenoid muscles, while the function of the inter-arytenoid muscle is to approximate the arytenoid cartilages, and so bring the vocal processes into apposition. It is not uncommon to find the thyro-arytenoid and the inter-arytenoid muscles paresed at the same time: on attempted phonation in these circumstances, a space like an hour-glass is seen between the cords (*Fig. 32*), which touch only at the apices of the vocal processes.

DIAGNOSIS.—The diagnosis is not difficult. The marked aphonia, combined with the ability to produce a phonic cough, the absence of inflammation, and the laryngoscopic appearances, form a clinical picture which is unlikely to be mistaken.

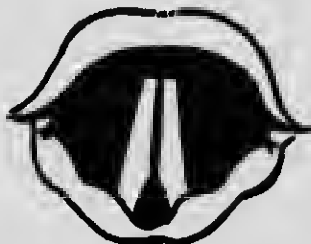


Fig. 32.—Hour-glass paresis.

TREATMENT.—In purely hysterical cases, local treatment in the form of the interrupted current, combined with suggestion, will usually cure the condition. The electrodes may be applied to the sides of the neck, but a greater effect is obtained if an intra-laryngeal electrode be used; the current should not be so strong as to cause pain. The electrode should be applied between the summits of the arytenoid cartilages, the external electrode being applied to the neck. If a battery is not available, good results may frequently be obtained by merely touching the interior of the larynx with a probe or brush, and immediately thereafter making the patient count loudly up to ten. One application of the faradic current may be sufficient to effect a cure. In addition to local remedies, the general

health must be attended to. The patient should have long hours of sleep and an abundant diet, while avoidance of mental anxiety and bodily fatigue should be enjoined. In anæmic individuals, iron and arsenic are indicated, and where there is evidence of catarrh, suitable treatment must be adopted (see p. 50).

2, and 3. **Paralysis of the Abductors, and Complete Recurrent Paralysis.**—It is convenient to consider these groups together, the difference between them being one of degree and not of kind, because according to Semon's law, the abductors succumb first in any organic lesion affecting the centre or trunk of the motor laryngeal nerves, and abductor paralysis is therefore an earlier stage of recurrent paralysis. We must, however, distinguish between unilateral and bilateral paralysis.

Unilateral paralysis may be caused by any affection producing degenerative changes in the nuclei of the laryngeal motor nerve fibres in the medulla, and accordingly it may be due to any of the following diseases: apoplexy, softening of the medulla, tumours of the brain or at the base of the brain, bulbar paralysis, multiple cerebrospinal sclerosis, locomotor ataxia, syringomyelia, and general paralysis. It may also be caused by any affection producing pressure on the vagus nerve or its motor laryngeal branches, and may therefore result from tumours in the neck, aneurysm of the carotid artery, goitre, malignant disease of the œsophagus, intra-thoracic tumours or aneurysm, mitral stenosis and incompetence, and consolidation of the apex of the lung (usually the right). It may also be caused by injury to one of these nerves during an operation. It may be due to neuritis from diphtheria, typhoid, scarlet fever, rheumatism, influenza, pneumonia, or lead poisoning; and, finally, the paralysis may be myopathic in wasting diseases. If the lesion affects the trunk of the vagus nerve above the point where the superior laryngeal nerve is given off, anæsthesia of the larynx will accompany the motor paralysis. The left side is more frequently affected than the right, and aneurysm of the aorta is the most common of the large number of possible causes given above. Cervical tumours, cancer of the œsophagus, and goitre are also fairly common causes of paralysis; while, of the central nervous affections, locomotor ataxy, multiple cerebrospinal sclerosis, and bulbar paralysis are most frequently associated with paralysis.

SYMPTOMS.—The symptoms of unilateral paralysis of the larynx vary very much ; in the earlier stages there are none ; but later, when the cord is fixed in the middle line, slight breathlessness on exertion may be noticed, though the voice is not affected until the cord assumes the cadaveric position of complete recurrent paralysis, when it becomes husky or aphonic.

APPEARANCES.—Three stages may be differentiated in describing the appearances found in unilateral paralysis. In the earliest stage, the larynx appears quite normal, except that the trained observer can detect some diminution in the outward excursion of the affected cord during deep inspiration. In the second stage, which is known as abductor paralysis, the cord is fixed in the middle line ; accordingly, during phonation the larynx appears normal and there is no impairment of the voice, as the cords come into perfect apposition. It is only during



Fig. 33.—Unilateral recurrent paralysis during phonation.

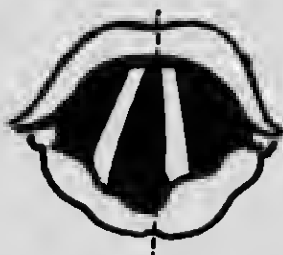


Fig. 34.—The same during inspiration.

respiration, or when the patient is made to inspire deeply, that the paralysis is obvious (*Fig. 34*). In neither of these stages are there symptoms directly pointing to the laryngeal condition. The last stage is that of complete recurrent paralysis, in which all the muscles are paralysed and the cord assumes the cadaveric position, which is one midway between adduction and complete abduction. In addition to the fixation of the cord, the free margin appears slightly bowed, owing to paralysis of the internal thyro-arytenoid muscle ; the paralysed cord also appears shorter than its fellow, as the tip of the arytenoid cartilage is generally directed a little forwards, and so hides part of the cord. During phonation the paralysed cord is immobile, but the arytenoid cartilage usually moves slightly, because the

inter-arytenoid muscle is innervated by the nerves of both sides. If the paralysis is of any standing, the healthy cord generally crosses the middle line on phonation, so as to come more or less in contact with its fellow, and the healthy arytenoid cartilage passes in front of that on the paralysed side. When the paralysis is more recent, the healthy cord may not cross the middle line; the voice in these cases may be quite aphonic.

PROGNOSIS.—The prognosis is well nigh hopeless as regards recovery from the paralysis, except in cases of neuritis (rheumatic or post-influenzal) or where it is possible to remove the cause; but it must be remembered that the diagnosis of a paralysis due to neuritis can, as a rule, be made only when recovery has taken place. The paralysis *per se* does not cause danger to life, and the ultimate prognosis must accordingly depend on the cause.

DIAGNOSIS.—The diagnosis of the paralysis is often not difficult. The condition has to be differentiated from fixation of the crico-arytenoid joint, but in the latter affection there is almost always some swelling about the joint, and if the cord is fixed in the cadaveric position there is not the characteristic bowing of its free margin, which is found in recurrent paralysis. Moreover, if the fixation is complete in a case of ankylosis, the arytenoid cartilage does not move at all on phonation, whereas it does move slightly in paralysis; and where the ankylosis is incomplete, slight movement of the cord and the arytenoid cartilage occurs, while in paralysis the cord itself remains immobile.

TREATMENT.—Apart from the treatment of the condition causing the paralysis, which is of the first importance, little interference is advisable. In the first stage, and in the phase of abductor paralysis, no local remedy is required. In complete recurrent paralysis, the faradic current may be employed, and strychnine administered, chiefly with a view to producing compensation by the healthy cord. No effect is to be expected on the paralysed cord except in cases due to neuritis, or where it has been possible to remove the cause.

Bilateral Paralysis. The causes of bilateral paralysis may be grouped in the same way as those of unilateral paralysis. The diseases which may affect the nuclei of the laryngeal motor nerve fibres in the floor of the fourth ventricle, and produce

paralysis of one vocal cord, may involve the nuclei of both sides, and so cause hilateral paralysis. The diseases which may produce hilateral paralysis by pressing on the trunks of the motor laryngeal nerves, are: tumours of the œsophagus or of the thyroid gland, intrathoracic aneurysms or tumours and pericardial effusions; neuritis from influenza, typhoid fever, and other diseases, and impaction of food in the œsophagus. Cases have also been recorded where pressure on one vagus nerve has been followed by hilateral paralysis.

Paralysis of both cords is a much more rare condition than unilateral paralysis.

SYMPTOMS.—The symptoms are of great importance. In the first stage, i.e., that of abductor paralysis, the voice is unaffected, but an inspiratory stridor is manifest, which increases markedly on exertion. The stridor is usually well marked during sleep. As long as both cords are in this position, the life of the patient is in danger, for asphyxia may be induced by even the slightest exertion, and death may result.

Complete paralysis is a very rare condition indeed, but when it is met with, the most common causes are carcinoma of the upper end of the œsophagus and central nerve lesions, such as tabes. There is no dyspnœa except on exertion, but there is complete aphonia.

APPEARANCES.—During the stage of bilateral abductor paralysis (*Fig. 35*), the cords are seen on laryngoscopic examination to lie near each

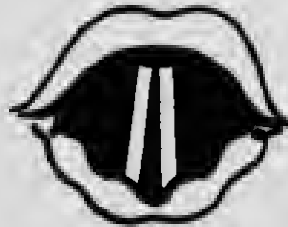


Fig. 35.—Bilateral abductor paralysis.

other, but they usually approximate slightly during inspiration, and separate during expiration. In hilateral recurrent paralysis, both cords are in the cadaveric position, but occasionally the condition is not equally advanced on the two sides, so that one cord may still be in the middle line, while the other is in the cadaveric position.

DIAGNOSIS.—The diagnosis is not difficult as a rule, but the condition has to be differentiated from hysterical inspiratory spasm, in which the cords tend to approximate during inspiration; in the latter condition, however, there is no dyspnœa during sleep. It is more difficult to distinguish between hilateral paralysis and fixation of both crico-arytenoid joints, but in the

latter, thickening about the articulation is a distinguishing feature.

PROGNOSIS.—This depends largely on the cause ; but where the cords are in the state of abductor paralysis, there is always grave risk of death from asphyxia if tracheotomy is not performed.

TREATMENT.—The treatment should be directed towards removing the cause, when this is possible. Thus, in cases of suspected syphilitic disease, iodide of potassium should be administered ; while in cases where the paralysis is due to the pressure of a tumour, this should be removed if possible. Tracheotomy is indicated when both cords are in the position of abductor paralysis, to obviate risk of death from asphyxia. Hypodermic injections of strychnine, and the application of the faradic current can only be of value in cases of neuritis, or in those instances where it has been possible to remove the cause.

CHAPTER XIII.

*VARIOUS CONDITIONS OF THE LARYNX AND
AFFECTIONS OF THE LINGUAL TONSIL.***CONGENITAL MEMBRANES OF THE LARYNX.**

CONGENITAL membranes are rarely met with; they are for the most part situated at the anterior commissure, but may be subglottic. When they stretch between the cords and are of any size, they may cause interference with respiration and phonation.

TREATMENT should be undertaken only when symptoms are produced. In such cases removal should be attempted by the endo-laryngeal method; it may be necessary subsequently to use Schrötter's bougies to prevent adhesions forming.

FOREIGN BODIES IN THE LARYNX.

When a patient comes with a history of a foreign body in the throat, it is important to begin the examination by inspection, unless the symptoms are too urgent to permit of this. The pharynx should first be examined, as detailed in a previous section (see p. 26), and then the larynx. If the foreign body is not seen, and if it is of a nature to be impervious to *x*-rays, a skiagram may give valuable aid in diagnosis. The methods of hypo-pharyngoscopy (devised by v. Eicken, see p. 37) and of direct tracheoscopy and œsophagoscopy, may have to be made use of, for foreign bodies may lodge in the upper part of the œsophagus or in the larynx, while, if they pass through the larynx, they may be found at the bifurcation of the trachea, whence they are most likely to pass into the right bronchus.

The SYMPTOMS depend on the size and nature of the foreign body, and on the position which it occupies. If it lodges in the larynx, it may cause sudden death from asphyxia; while a foreign body in the œsophagus may cause difficulty in deglutition. A sharp-pointed body, such as a bone, may set up hæmorrhage, but

if the object passes into the bronchi there may be no symptoms at first, though cough and purulent expectoration may develop later, and pneumonia or bronchiectasis may supervene.

TREATMENT.—When there are urgent symptoms of asphyxia, a finger may be passed down into the larynx in the attempt to feel, and if possible to dislodge, the foreign body. If this fails, immediate tracheotomy must be performed, though, if the symptoms permit, the effect of striking the patient sharply on the back while he is in the inverted position may first be tried. When the symptoms are less urgent, as in the majority of cases, a careful examination must be made in the first instance. The practice of attempting to push on sharp impacted bodies by means of bougies, etc., cannot be too strongly discountenanced. If a foreign body is detected, all reasonable methods must be employed to remove it, i.e., inversion of the patient, endo-laryngeal manipulations, direct œsophagoscopy, tracheoscopy, bronchoscopy, or an external operation. Such treatment must, however, in the majority of cases be relegated to the specialist.

HYPERTROPHY OF THE LINGUAL TONSIL.

The lingual tonsil is a mass of lymphoid tissue, normally found on the dorsum of the tongue, between the circumvallate papillæ in front, and the epiglottis behind. Hypertrophy of the lingual tonsil is not a common affection, and, unlike hypertrophy of the faucial tonsils, is usually met with in adults, and occurs more frequently in women than in men.

SYMPTOMS.—When sufficiently enlarged to touch the epiglottis, it may cause the sensation of a foreign body in the throat; but cough and even pain may be produced, and the hypertrophy, when extreme, may give rise to interference with deglutition.

APPEARANCES.—In marked cases the back of the tongue and the valleculæ are seen to be covered by an irregularly shaped mass, presenting a central furrow and a nodular surface, with which the lingual aspect of the epiglottis is in contact. In less-marked cases, the tip of the epiglottis does not touch the mass when the tongue is protruded.

TREATMENT.—In slight cases it may be sufficient to paint the back of the tongue with Mandl's solution (see Appendix), but if this does not relieve the symptoms, the mass may be

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reduced by the galvano-cautery, or the greater part of it may be removed by the lingual tonsillotome. Local anæsthesia should first be induced by means of a 10 per cent solution of cocaine or novocain. In many cases general treatment is required, as these patients are frequently anæmic or neurotic.

The lingual tonsil may participate in acute or sub-acute inflammations of the pharynx.

A variety of tumours have also been met with at the base of the tongue, such as polypi, cysts, papillomata, fibromata, adenomata, and carcinomata.

SECTION III.

DISEASES OF THE NOSE.

CHAPTER XIV.

EXAMINATION, SEMEIOLOGY, AND THERAPEUTICS

ANTERIOR RHINOSCOPY.

IT is unnecessary to discuss again the source of light and the forehead mirror, as they have already been fully considered in the section on Laryngoscopy. Some form of nasal speculum must be selected; of the many varieties devised by different authorities, Thudichum's is the pattern most commonly used in this country. It consists of two metal blades, connected by a loop of steel which tends to keep them apart. The instrument is not altogether comfortable for the patient, and I much prefer a modification of Kramer's ear speculum, which is largely used in Germany, and is known as Hartmann's nasal speculum. It consists of solid metal blades which, when together, have the shape of

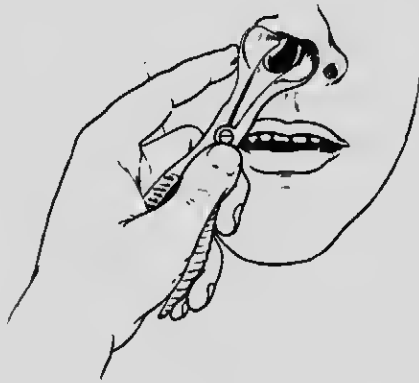


Fig. 36.—Anterior rhinoscopy with Hartmann's nasal speculum.

a cone; they are attached to the ends of two curved metal rods which are jointed near their centres by a screw, and are provided with a spring which keeps the blades together. The instrument is held in the left hand, and when the blades are introduced into the nose, they are made to separate (Fig. 36) by gently

compressing the handle ; this permits of a thorough inspection with a minimum of discomfort to the patient.

When an examination is to be made, the patient is seated, and the light and mirror are arranged as for laryngoscopy. Before introducing the speculum, the observer should tilt up the tip of the patient's nose with his thumb, and inspect the anterior nares and vestibule. The speculum is then introduced, the patient's head being held erect, i.e., neither tilted up nor down. Towards the outer side of the nose, the eye is at once attracted by a rounded body, red in colour (*Fig. 37*) ; this is the inferior turbinated body. If it is small, the observer will realize that he is looking at the anterior end of a ledge which projects into the nose from the outer wall, and which extends from the front right back to the posterior nasal opening. The passage below this body is known as the inferior meatus of the nose. On looking through

- a Sulcus olfactorius
- b Middle meatus
- c Inferior meatus
- d Bulla ethmoidalis
- e Middle turbinal
- f Processus uncinatus
- g Inferior turbinal

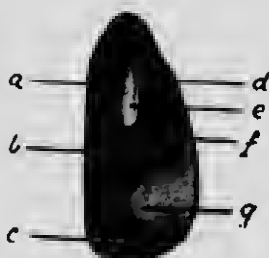


Fig. 37.—Appearances seen on anterior rhinoscopy.

the meatus, when the nose is roomy and the inferior turbinal is small, the naso-pharynx can be seen if the patient depresses his chin. The movements of the soft palate can also be observed if the patient is made to say the letter "n." It must be remembered that none of the accessory sinuses drain into the inferior meatus, but that the lachrymal duct opens into it, and accordingly certain abnormalities in the nose may give rise to epiphora. Blocking of the lachrymal duct has also been caused by operations on the antrum. In many cases the inferior turbinal is too large to permit of a satisfactory inspection of the nose, the septum and the anterior end of the turbinal alone being seen in such cases. The enlargement may be due in part to true hypertrophy, the result of chronic inflammation ; but it is frequently produced by engorgement of the vessels in the turbinated body, for in this structure there is erectile vascular tissue underlying

the mucous membrane. In cocaine we have fortunately a drug which enables us to distinguish readily between these two forms of enlargement; for, on the application of cocaine (and this is most conveniently effected by laying a pledget of wool soaked in a 5 per cent solution, within the nostril), the swelling due to engorgement collapses, while that depending on true hypertrophy remains.

On looking towards the middle line, the septum is seen; in order that a satisfactory view of this structure may be obtained, the patient should turn his head slightly to the opposite side. The septum is rarely quite straight, but is usually more or less deviated, and generally presents crests or spurs, a common position for these being parallel with the floor and opposite the inferior turbinated body. It is advisable to impress upon the reader at once that no anatomical standard can be adopted in deciding as to what degree of abnormality is compatible with health, for this depends largely on subjective symptoms. This question is, however, fully discussed in the section on Deviations of the Septum (see page 114). Opposite the anterior end of the middle turbinated body there is a thickening on the septum, due to an accumulation of glands in that region; this is known as the tubercle of the septum. In order to see the middle turbinated body and the middle meatus, it is necessary for the patient to tilt his head backwards; the middle turbinal then comes into view. If the anterior end is enlarged, it alone is visible, but otherwise the turbinal appears as a nearly vertical partition dividing the upper regions of the nose. The enlargement of the anterior end may be due to swelling of the mucosa, or to the presence of large air-cells in the bone. External to the middle turbinated body, and between it and the inferior turbinal, the middle meatus of the nose, which usually appears as a slit, can be recognized; into this passage the frontal sinus, the antrum of Highmore, and the anterior ethmoidal cells open. The posterior ethmoidal cells and the sphenoidal sinus open above the attachment of the middle turbinal.

If the nose is roomy, and the middle turbinated body lies close to the septum, a good view of the middle meatus may be obtained, and the following structures may then be recognized: towards the front, and greatly foreshortened, appears a ridge—the *processus uncinatus*; and further back, a rounded body is seen—the *bulla ethmoidalis*. If the latter is well developed, an

appearance is presented as of two middle turbinated bodies, the outer being the bulla and the inner the real middle turbinal. The bulla ethmoidalis is merely a bone cell belonging to the anterior ethmoidal labyrinth. Between the middle turbinal and the septum is a slit, which is known as the sulcus olfactorius. Before the scent of any object can be detected, the scent-laden particles of air must pass through this passage to reach the sensory area of the nose, which is situated on the superior and middle turbinated bodies and on the adjoining part of the septum.

It is not possible by anterior rhinoscopy to see the superior turbinated body or the superior meatus; in order to obtain a view of these parts, Killian devised a long-bladed speculum (similar to Hartmann's except in the length of the blades), which can be introduced between the septum and the middle turbinal after the induction of local anæsthesia. On opening the speculum, and so pressing aside these structures, a view of the upper regions of the nose may be obtained. This procedure is, however, rarely necessary, as a satisfactory inspection may be more readily made by posterior rhinoscopy. The method is called by Killian "Rhinoscopia media."

POSTERIOR RHINOSCOPY.

The successful performance of posterior rhinoscopy offers the most serious difficulties to the beginner, while the expert but rarely finds a case in which he fails to obtain a satisfactory view. It is essential, therefore, for the tyro to practise from the first a technique which is likely to permit of a satisfactory inspection of these parts. The choice of a tongue depressor is most important. If a very broad pattern is selected, there is a tendency to produce retching, while if a very narrow tongue depressor, such as B. Fränkel's, is used, and the tongue is large and flabby, the sides rise up and envelop the spatula, leaving no room for the introduction of the mirror. In my opinion, Lack's tongue depressor is the best; it consists of a comparatively narrow metal blade, bent in the middle at right angles. Brünings' is also a serviceable pattern. Before introducing the spatula, the patient is asked to open the mouth and slightly depress the chin; the light is then adjusted as before. The depressor, held in the left hand, is then laid

on the dorsum of the tongue. It must not be placed too far back or it will cause retching, and it must not be put merely on the anterior part of the tongue, as that will cause the root of the tongue to rise up towards the palate, and will effectually prevent the introduction of the mirror. Having placed the spatula in the described position, sufficient force is gradually but firmly applied to allow of a view being obtained of the uvula and the faucial pillars. In the case of a very muscular tongue, a really remarkable amount of pressure is sometimes necessary to achieve this, but if it is gradually and quietly

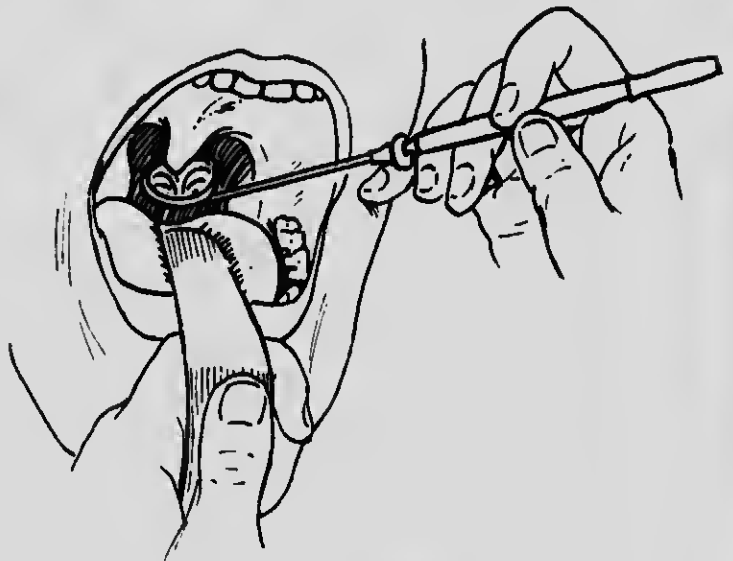


Fig. 38.—Method of performing posterior rhinoscopy.

exerted, retching should not result. It is then possible to introduce the mirror (*Fig. 38*). A small one is generally selected, as being much easier to manipulate; but with a tolerant patient who has a capacious pharynx, a comparatively large one should be employed, for better illumination is thereby obtained and a larger area of the naso-pharynx is seen with one position of the mirror. At first, however, it is wiser to select the smallest sizes. The mirror should be held like a pen, and its length should be so adjusted in the handle that when it is in position the ring and little fingers rest on the patient's cheek. I lay

considerable stress on this method of holding the mirror, as it tends to much greater steadiness, and consequently causes the patient less discomfort. The mirror, previously warmed, is introduced as soon as the tongue is depressed, and is passed rapidly behind the soft palate, care being taken to avoid touching the velum, the tongue, or the posterior wall of the pharynx (*Fig. 38*). The mirror is then turned so that its reflecting surface is directed towards the patient's forehead. Apart from the difficulty experienced in introducing the mirror without touching these parts, the observer has frequently to contend with a tendency on the part of the soft palate to contract and to lie against the posterior wall of the pharynx. This may sometimes be obviated by telling the patient to breathe quietly, or to breathe through his nose, or, if he cannot do that, to sniff, when momentary glimpses of the naso-pharynx may be obtained. If the observer is still unsuccessful, a 5 per cent solution of cocaine may be applied to the uvula and soft palate, and another attempt then be made. Considerable practice is, however, necessary before the beginner can succeed with any but the more tolerant class of patients. B. Fränkel devised a mirror in which the angle between the mirror and the handle can be altered at will. It is rather easier to manipulate than the ordinary mirror, but it has the serious disadvantage of being more difficult to sterilize, as it has a delicate joint. If the mirror has been properly introduced, the observer should see reflected in the middle line, the posterior free margin of the septum. It is always well to look for this first, for it serves as an excellent guide to the geography of the parts, and it is also advisable always to follow the same order in examining the remaining structures. I look subsequently at the roof of the naso-pharynx, the lateral walls (including the Eustachian orifices), and the turbinated bodies.

The septum appears as a pale narrow ridge, which frequently presents at the centre a symmetrical thickening on either side; at the upper end it becomes wider, and merges with the vaulted roof of the naso-pharynx. The latter is smooth in the healthy adult, but in the child is frequently furrowed and thickened, owing to the presence of the pharyngeal tonsil, which is a normal structure, and forms the upper boundary of Waldeyer's lymphatic ring. On the roof, immediately in front of the posterior nasal opening, a greyish-white fold is sometimes seen, which occasionally passes on to the septum. I believe

DISEASES OF THE NOSE

I was the first to describe this fold, and I came to the conclusion that it is a vestigial structure, the remains of what was once the bucco-nasal membrane, the persistence of which, as Haag suggested, probably results in the condition known as congenital atresia of the choana (*Fig. 39*). On the lateral wall the mouth of the Eustachian tube is readily seen by directing the reflecting surface of the mirror to the side. It is bounded behind, above, and in front by a well-marked ridge, while the orifice itself appears as a distinct hollow. This ridge or cushion varies in size considerably in different individuals, and behind it there is a depression called the fossa of Rosenmüller.



Fig. 39.—Congenital unilateral atresia of the choana. On the left side the normal appearances are seen. (Note the fold on the roof of the choana on that side.)

If attention is now directed to the posterior nasal openings, the three turbinated bodies may be seen. It will be remembered that, on anterior rhinoscopy, only the inferior and middle turbinals can be inspected, each with its underlying meatus. On posterior rhinoscopy, the superior and the middle meatuses are visible, but the inferior meatus is hidden from view by the soft palate. From behind, the turbinals appear as greyish-blue bodies, of which the upper two lie diagonally across each choana, while the inferior turbinal appears rounded, and seems to rest on the soft palate.

It is sometimes impossible to inspect the naso-pharynx by the method described above, and in such cases the observer may make use of a palate retractor; for ordinary occasions,

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however, this is unnecessary, as sufficient information may be gained by palpation (see page 102). The best form of retractor is White's self-retaining palate hook. It is held in position by a sliding clip, which is adjusted against the upper lip, and is fixed by a screw. Before introducing the instrument, the soft palate should be painted on both its surfaces with a 10 per cent solution of cocaine. The examination is then made as before, but a much larger mirror can be employed. In children and in very nervous adults this method is not applicable.

The naso-pharynx may also be inspected by means of an instrument, the pharyngoscope, introduced by Hay, and made



Fig. 40.—Hay's pharyngoscope in place with patient's mouth closed.
(Mayer & Meltzer.)

on the principle of a cystoscope (Fig. 40). Hay especially recommended it for the examination of patients confined to bed, who were too ill to tolerate the ordinary method. In using this instrument, the end is carried behind the soft palate, and the patient closes his lips; if the observer now looks through the telescope he should obtain a satisfactory view of the parts. Illumination is provided by a small lamp at the distal end. As the instrument is very expensive and is not essential, few practitioners will probably care to invest in it. Holmes has recently devised a somewhat similar instrument—the naso-pharyngoscope—which is introduced into the naso-pharynx through the nose; by turning the instrument

in various directions, a view of the whole naso-pharynx can be obtained, including the posterior surface of the soft palate, the mouths of the Eustachian tubes, the choanae, and, in many cases, the ostia of the sphenoidal sinuses. The movements of the tubes may be observed during the act of deglutition, and the most delicate shades of colour can be distinguished, from marked anaemia to intense inflammation. For operative purposes, such



Fig. 41.—Digital examination of naso-pharynx.

as the division of adhesions in the fossa of Rosenmüller, Holmes has devised instruments which are used in conjunction with the naso-pharyngoscope.

Palpation is, in many instances, a necessary adjunct to inspection; and in the anterior nares it may be performed readily and without discomfort to the patient, by using a slender probe. By this means the mobility of an object, its consistence, and its attachment, may be ascertained; the

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sensibility of the nasal mucosa may also be roughly tested, and any very sensitive areas detected. Palpation of the naso-pharynx is a very unpleasant experience for the patient, and should be undertaken only when it is really necessary. It is carried out in the following way: The observer washes his hands, and takes his stand rather behind and to the right side of the patient, who should be seated. He then puts his left arm over the patient's head, and having asked him to open his mouth, pushes with his forefinger the patient's cheek between his teeth (*Fig. 41*) to prevent him biting (in the case of a child it is advisable to have the hands held). The surgeon then quickly inserts his right index finger into the patient's mouth, and carries it behind the soft palate to the naso-pharynx; he rapidly palpates the roof, the orifices of the Eustachian tubes, and the margins of the choanae. After some practice he can determine the presence and amount of adenoid vegetations, and recognize any enlargement of the posterior ends of the inferior turbinals, and other pathological conditions. It is important to remember that, in the absence of adenoid vegetations, the roof of the naso-pharynx feels quite smooth and firm.

TRANSILLUMINATION.

This was introduced by Voltolini, and elaborated by Heryng, and is used for the investigation of the condition of the accessory sinuses. Heryng's instrument is the one generally employed; it consists of an 8-volt electric lamp, affixed to a special tongue depressor. The examination has to be carried out in a dark room. The lamp is introduced into the mouth of the patient, who then closes his lips. Any denture must be removed before the introduction of the lamp. On making the contact, a semi-circular tache is seen under each lower eyelid, if the antra transmit light; the pupils are also slightly illumined, and, if the patient closes his eyes, he has a sensation of light in them. A faint patch of light is also seen on either side of the root of the nose, due to light passing through the ethmoid labyrinth. An antrum may fail to transmit light if it is full of pus, if the walls are thick, or if it contains a solid tumour. The illumination is brighter than usual in cystic conditions, and it may be so in cases of choanal polypus arising from the interior of the antrum. The frontal sinus may be illumined through

its floor, or through its anterior wall, the lamp being covered by a shield which has only a terminal opening. When the lamp is applied to the floor, it should be placed behind the orbital margin, about half an inch from the middle line. When the current is turned on, the anterior wall is illuminated, and accordingly the area of the sinus above the eyebrow can be



A.

B.

Fig. 42.—Transillumination of the antrum. A, normal. B, suppuration in right antrum Highmori.
(From *Index of Diagnosis*.)

mapped out. This is, indeed, the chief value of transillumination of the frontal sinus. A failure to illuminate conveys no information, as it may be due to the absence of a sinus, or to disease. If the light is applied to the anterior wall, a glow is seen on the floor of the sinus, and the patient experiences a sensation of light in the eye.

SKIAGRAPHY.

Skiagraphy, which has now become a routine method of examination in many cases of accessory sinus suppuration, was first introduced by Scheier. It is outside the scope of this work to describe the technique of taking skiagrams of the head; it



Fig. 43.—Skiagram showing diseased right ethmoidal labyrinth and right maxillary sinus. There is a single healthy (left) frontal sinus. Diagnosis was confirmed at operation.

will suffice to say that those taken in the antero-posterior direction give the most information, and that for this purpose the tube is placed at the back of the head, and the plate adjusted against the face. The same method must always be

adopted in posing the patients, so as to obtain results which can be compared. Occasionally it is of value to take a lateral view of the head as well. Considerable experience is required to read the photographs correctly. The following information is obtained from the study of an antero-posterior view :—

1. The presence or absence of one or both frontal sinuses ; if present, their size in a vertical and a lateral direction, and also the existence of an orbital recess.

2. The size and shape of the antra, and the breadth of the ethmoidal labyrinth.

3. In suspected diseased conditions of the accessory sinuses, it is generally possible to say which sinuses, if any, are affected (*Fig. 43*). It is much easier to come to a definite conclusion in unilateral than in bilateral affections, as the healthy side gives a standard of comparison. I am of opinion that the frontal sinus should never be explored in a case of suspected chronic sinusitis unless a skiagram has been previously taken. Dr. Logan Turner and I have used this method now for over four years, and during that time neither of us has opened a healthy frontal sinus in the belief that it was diseased.

Further information as to the appearances of the sinuses in disease is given in the chapter on Accessory Sinus Suppuration (see page 153).

SEMEIOLOGY.

Nasal obstruction is perhaps the most common symptom of nasal disease. As a rule, the amount of obstruction varies very much from time to time, unless it be complete ; and it may also alternate from one side of the nose to the other. This is especially noticeable in cases of obstruction due to erectile swelling of the turbinals. The state of the weather has an effect on this symptom ; for example, damp weather increases the obstruction in cases due to polypi.

The effect of chronic nasal obstruction may be conveniently described here. In the case of infants, grave symptoms may be produced, as it interferes with the act of suckling, and the rest is disturbed owing to inability to breathe through the mouth when asleep. In children, very characteristic changes are produced, and as they are most frequently caused by the presence of adenoid vegetations in the naso-pharynx, the term "adenoid facies" has been applied to the appearances

met with (*Fig. 44*). In a typical case, the nose is pinched, the nostrils are narrow, there is flattening of the bridge of the nose, the upper lip is shortened, the naso-labial fold is obliterated, and there is often an eczematous condition of the skin about the anterior nares as a result of frequently recurring catarrh. The mouth is constantly open, which gives the face a remarkably vacant expression. Changes also occur in the palate and teeth, a result of the pressure of the cheeks against the alveolar margins; the palate becomes arched, and finally V-shaped; there is, in consequence, not room for the



Fig. 44.—Typical adenoid facies.

teeth to erupt regularly, so they are crowded and misplaced, and the incisors tend to project. It has been stated that the arching of the palate produces deviations of the septum; this is not, however, borne out by my experience. Finally, if the nasal obstruction is established for a sufficient length of time, changes occur in the thorax; the lower part of the chest does not expand properly, and a furrow develops where the diaphragm is attached, while occasionally, but more rarely, the child becomes "pigeon breasted."

Apart from the changes in form which result from constant

mouth breathing, the mucous membrane of the mouth, the pharynx, and the larynx becomes dry because the air is not warmed and moistened in the nose before coming into contact with these parts; there is accordingly a great tendency to attacks of catarrh in any part of the upper air-passages. Intellectual defects are also noticeable, especially when the obstruction is due to adenoid vegetations. These were first described by Guye, who called the condition aprosexia; he attributed it to blocking of the lymphatics between the brain and the nose.

Loss or diminution of the sense of smell is a common symptom in diseases of the nose. In the majority of instances it is due to nasal obstruction, for in such cases the scent-laden particles cannot reach the special sensory areas of the nose; but the sense of smell may be in abeyance apart from any nasal obstruction, as a result of atrophic rhinitis or of some central nervous lesion. In certain cases, substances which have really a pleasant scent, appear to the patient to have an offensive odour; this condition is known as kakosmia. The converse is also met with occasionally, and has been termed parosmia.

Changes in the voice occur in cases of nasal obstruction. Their character depends partly on the site of the obstruction; if this is situated in the nasal cavities, the patient "speaks through his nose," a phenomenon familiar to all from its association with an ordinary cold in the head. In these cases "m" becomes "b," "n" is changed to "d," and "ng" to "g." If the obstruction is in the naso-pharynx, as is the case in adenoid vegetations, the voice loses a great deal of its resonance; this has been described by Wilhelm Meyer as "dead speech."

The hearing is frequently impaired in morbid conditions of the naso-pharynx, but this is a comparatively rare symptom in diseases of the nose, unless the naso-pharynx is secondarily affected.

Anomalies of secretion are often complained of, usually in the direction of excessive secretion. The discharge may be watery, muco-purulent, or purulent, and may escape through the anterior nares or find its way into the throat. In certain conditions, such as ozæna, there is a marked tendency for crusts to form in the nose. When there is a history of nasal discharge, it is important to determine whether it is unilateral or bilateral, and whether any factor present is subjective or objective.

Certain affections of the eye are met with as a result of nasal disease; thus the nasal opening of the tear duct may become occluded and cause epiphora. Serious ocular and orbital complications may be produced in accessory sinus disease, but these will be discussed later (see page 166).

In rare instances *intracranial complications* also supervene. Certain reflex neuroses may be due to nasal disease, and will be discussed later (see page 149).

GENERAL THERAPEUTICS.

Application of Fluids.—Fluids, in large quantities, may be employed for cleansing the nose of crusts or of abundant discharge. The lotions may be introduced either by a Higginson syringe, or by a douche-can provided with rubber tubing and a suitable nozzle (*Fig. 45*). In using the douche, the can should be suspended not more than a foot above the patient's head. In either case the patient should sit with the head slightly bent forward over a basin, and should breathe or pant through the mouth. The stream is directed backwards along the inferior meatus, and as the palate contracts, the lotion passes round the posterior free margin of the septum, and runs out of the opposite nostril. If one side of the nose is more obstructed than the other, the fluid should be injected only into the narrow side. The patient must not attempt to speak or to swallow during the syringing. Weak lotions should be employed, such as a solution of common salt 1 drachm to a pint, or of bicarbonate of sodium or of boracic acid of the same strength. Additional prescriptions are given in the Appendix. It will



Fig. 45.—Method of applying lavage to the nose.

generally be found sufficient to inject a pint of fluid at one sitting; and if a Higginson syringe is employed, care must be taken not to exert too great force, as it is possible thereby to infect the middle ear through the Eustachian tubes: the danger of this occurrence has, however, been exaggerated. In the absence of crusting, or when the discharge is not sufficient to necessitate the employment of such large quantities of lotion, a small rubber syringe may be used; and in cases where even a small expense has to be avoided, the fluid may be dropped into the anterior nares from a teaspoon, the head being thrown back to facilitate the operation.

Sniffing fluid up the nostrils should not be recommended, as it tends to cause headache. Sprays may be employed, but it is perhaps not out of place to warn the reader against the too frequent use of nasal douches and sprays in diseases of the nose, for there is undoubtedly a tendency to prescribe some nose-wash in the treatment of a symptom, while the cause of the symptom has not been diagnosed. The same solutions may be used for sprays as are employed in syringing the nose. Oily sprays are frequently of service, and should be used either with an aerizer or an atomizer. Menthol may be prescribed in this way, dissolved in liquid paraffin (see Appendix). Inhalations are occasionally useful, especially in cases of acute inflammation of the accessory sinuses. The most valuable of these is one containing menthol in alcohol (see Appendix). Direct applications have sometimes to be made to the nose. To do this a pledget of wool, dipped in the desired medicament, is laid against the part, or the application may be effected by means of a probe dressed with cotton-wool and moistened with the drug to be used; this method is adopted for the more concentrated solutions. Applications may also be made to the naso-pharynx by means of a stout probe, the end of which is bent at right angles to the shaft.

Induction of Local Anæsthesia.—As the nasal mucous membrane is very sensitive, it is advisable to commence the induction of local anæsthesia by laying pledgets of wool, dipped in a 5 to 10 per cent solution of cocaine or novocain, within the nose; these should be allowed to remain for about five minutes. The part that is to be operated upon is then rubbed, at first lightly and then more vigorously, with a probe surrounded with cotton-wool and saturated with a 10 per cent

solution of cocaine or novocain. Anæsthesia can be induced by the method of rubbing alone, but the proceeding is very uncomfortable for the patient, and it is accordingly preferable to commence the induction of anæsthesia as described above.

When operations have to be performed upon the septum, anæsthesia may be obtained by submucous injections of $\frac{1}{4}$ per cent solution of cocaine or novocain near the anterior end of the septum.* A few drops of adrenalin chloride may be added to each drachm of solution to render the field bloodless. I now prefer novocain to cocaine for submucous injection, its toxicity being considerably less, and also because it can be sterilized by boiling. Medicated powders may be applied by means of an insufflator. The powders which may be used are astringent or antiseptic, such as nitrate of silver mixed with starch (1 in 200), boric acid, iodoform, cocaine and morphia with starch, and, in cases of painful ulceration, orthoform or anæsthesin. An insufflator with a straight nozzle is required for the anterior nares, while for the posterior nares the ordinary laryngeal insufflator suffices, only the nozzle must be directed upwards behind the soft palate.

Caustics.—Chromic acid fused to make a bead upon a probe, may be employed. If great pain is experienced by the patient, the caustic action can be stopped at once by the application of a solution of bicarbonate of soda.

The electric cautery is used a good deal in the nose. A flat burner is usually employed, but sometimes a pointed one is more serviceable. The platinum is heated to a dull red heat. When cauterizing the inferior turbinal, care must be taken not to touch the septum, for fear of synechiæ developing. The cautery should be removed from the part under treatment before the current is turned off, otherwise bleeding may be induced. Sterile vaseline should be applied to the burnt area, but packing is unnecessary.

Other Instruments.—Those instruments alone will be described which are required for minor operative procedures.

* The injection at the anterior part of the septum causes the front teeth of the upper jaw to feel quite dead, and this method of inducing anæsthesia would, I feel convinced, prove useful to the dentist in cases where extensive interference is required in caries of the upper teeth.

Snares are frequently employed for the removal of polypi or of hypertrophies of the turbinal bone. Blake's pattern will be found serviceable. The instrument is threaded with piano wire; the loop should not be made too long, i.e., it should not project at all when the snare is drawn home, otherwise the tissue that is snared is liable to slip out. In using the snare for the removal of polypi, the loop is passed round the growth, insinuated as far up in the direction of the roof of the nose as possible; it is then drawn tight, but not quite home, and is finally jerked out. In this way a stump is not so liable to be left behind.

Scissors of very varying patterns have been devised for intranasal operations: Potter's scissors, with saw edge, will be found very suitable for the removal of hypertrophies of the inferior turbinal—the only purpose for which the practitioner is likely to employ scissors.

Some form of *Forceps* is also necessary for the removal of stumps of polypi or for similar purposes, and Luc's forceps will be found very useful.

After these minor operations, the question arises whether the nose should be plugged or not. Packing, especially if both sides of the nose have been so treated, is accompanied by very marked discomfort to the patient, and in cases where the nose is in a septic condition, there is distinct risk of a spread of the infection. Tight packing should never be resorted to except in cases of severe epistaxis which cannot be controlled otherwise. It is my custom, after a minor operation in the nose, to lay one short strip of gauze (3 or 4 inches in length), dipped in a solution of peroxide of hydrogen (10 vols.), in the nose. Gauze impregnated with bismuth may be substituted if preferred. This is removed after twelve hours if possible, or at latest after twenty-four hours, and no further packing is inserted. In some cases much bleeding is not to be expected after the removal of polypi, and no packing need be introduced. The use of alcohol and tobacco should be forbidden for two or three days after an operation, and vigorous blowing of the nose must be avoided.

GENERAL HYGIENE.

What has been said of the general hygiene of the larynx applies also to the nose. A course of treatment at one of the

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mineral water spas, whether at home or abroad, will benefit patients suffering from chronic nasal catarrh. No doubt as much is due to the healthy life that is enjoined as to the local treatment.

Patients who suffer from hay fever do best at the seaside during the hay-fever season, and an atmosphere as free as possible from dust is the most suitable for nasal cases in general; it is accordingly important that the rooms they occupy should be well ventilated.

Tobacco must be restricted or stopped in catarrhal conditions, and where there is a tendency to erectile swelling of the turbinated bodies, causing nasal obstruction, alcohol should be avoided.

CHAPTER XV.

NASAL ORIFICES AND SEPTUM.

ATRESIA OF THE ANTERIOR NARES.

THIS is an exceedingly rare condition. It may be congenital, in which case it is membranous, or it may result from syphilis or lupus.

TREATMENT is operative.

ATRESIA OF THE CHOANÆ

Is also a rare condition (see *Fig. 39*). The obstruction may be unilateral or bilateral, bony or membranous, or partly bone and partly membrane. It is usually situated slightly in front of the posterior nasal opening. The symptoms are those of nasal obstruction, but where the condition is unilateral, they may be very slight.

TREATMENT, if called for, is operative.

ECZEMA ABOUT THE ANTERIOR NARES

Is not uncommon, and is frequently associated with chronic nasal catarrh. There is more or less thickening and redness of the parts, and fissures may form; while the anterior nares frequently become blocked with crusts.

TREATMENT consists in applying white precipitate ointment, and in removing the crusts when they are softened; fissures should be painted with argyrol or silver nitrate in solution (gr. x to oz. i). The eczema usually disappears rapidly on treatment. Any accompanying nasal condition should also receive attention.

DEVIATIONS AND SPURS OF THE SEPTUM.

It has already been pointed out that a perfectly straight septum is but rarely found, and even when a septum is straight

it frequently has a ridge or spur upon it. Deviations of the septum and spurs may be very slight, or so marked as to entirely block one nostril. In some forms of deviation, notably those which assume an S shape, both nostrils may be blocked, the obstruction being anterior in one nostril and far back in the other nasal cavity. Individuals vary greatly in the degree in which they suffer from an apparent blocking of the nose from septal deviation. In some, in whom the obstruction is but slight, there may be marked symptoms, while others make no complaint although one nostril is almost completely blocked. It is accordingly necessary to be guided largely by the subjective symptoms in deciding as to the advisability of operative interference. Deviations may be developmental in origin, in which case they present a C or S shape, or they may result from trauma. The latter may also be C-shaped or they may be irregular, depending on the line of fracture of the septum. The tip of the nose may be twisted to one side in all varieties of deviation. It is frequently impossible to decide whether a deviation is developmental or traumatic, but the matter is of no clinical importance.



Fig. 45.—Septal deviation as seen by anterior rhinoscopy.

APPEARANCES.—In C-shaped deviations, the septum presents a convex surface on the narrow side, while the other nasal cavity appears unduly patent. The inferior turbinal is frequently enlarged on the free side. The anterior edge of the septal cartilage is sometimes dislocated, so that it projects into and partially blocks the vestibule of the patent side of the nose.

In S-shaped deviations, both sides of the nose are more or less blocked, the obstruction being towards the front in one nostril, and towards the back in the other.

Deviations are frequently associated with crests or ridges on the septum. The most common situation for these is along the line of the upper edge of the vomer, beginning in front at the anterior nasal spine, and running upwards and backwards. These crests may be so large as to be in contact with the inferior turbinated body in its anterior part.

SYMPTOMS.—Deviations and spurs of the septum may be unassociated with symptoms, but in other cases nasal obstruction, either unilateral or bilateral, is complained of.

DIAGNOSIS.—This can easily be made by inspection.

TREATMENT, if necessary, is operative, and every class of deviation can be satisfactorily dealt with by the operation of submucous resection of the septum. The procedure is usually associated with the names of Killian and Freer, who elaborated it from the window resection first carried out by Krieg. The operation can be performed under local anaesthesia. No after-treatment is necessary, and the patient only requires to be off work for three or four days. It is, however, one of the most difficult of intra-nasal operations, and it is accordingly outside the scope of this book to describe it. The principle of the operation consists in removing the deviated cartilage and bone, without destroying the mucous membrane on either side. After the operation, the two folds of muco-perichondrium should hang down as a mesial vertical partition. The functional result is very gratifying in those cases in which the operation was really indicated. If necessary, spurs of the septum should be removed without sacrificing the overlying mucous membrane, as the healing is then more rapid.

HÆMATOMA AND ABSCESS OF THE SEPTUM.

Hæmatoma of the septum is caused by trauma, and usually occurs in children. It is generally bilateral, an extravasation of blood taking place between the perichondrium and the cartilage. On either side a smooth rounded swelling forms, just within the anterior nares, which blocks the nasal cavities. After the initial pain, due to the trauma, has subsided, nasal obstruction is the chief symptom. A hæmatoma is liable to become infected with pyogenic organisms, and an abscess is then formed; this change is indicated by a rise in temperature, the onset of pain, and increased heat and redness. The bridge of the nose may also become considerably broadened, and the septal cartilage may break down within the abscess and be partially absorbed.

DIAGNOSIS AND TREATMENT.—There should be no difficulty in detecting that the swelling arises from the septum; if there is any doubt, the use of the probe will decide the point: but it is not always possible to make sure when pus has formed. This

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is not, however, of great importance, as the treatment is the same in either case, namely, free incision and drainage. The latter is not very easy to maintain, as there is a great tendency for the incision to close. Some sinking in of the bridge of the nose may follow when the destruction of the cartilage has been extensive.

PERFORATIONS OF THE SEPTUM.

The septum may become perforated as a result of syphilis, lupus, trauma, or a perforating ulcer. It occasionally occurs also in typhoid and other fevers, or as the result of chemical irritants such as chromic acid, copper, and arsenic. The perforations due to syphilis and lupus are considered elsewhere. Traumatic perforations are generally the result of operations for the removal of septal deviations. They do not, as a rule, cause inconvenience, especially if they are situated far back. When they are small, and near the front, they may produce a whistling sound when the patient breathes through the nose, and this may cause considerable annoyance. If the perforation is large, there may be a tendency to crust formation for some months after operation.

PERFORATING ULCER OF THE SEPTUM.

This condition is idiopathic in origin, and affects the cartilaginous part of the septum, close to the anterior nares. Before the ulcer develops, a small scab appears in this region, which is usually picked off by the patient, but another soon forms. The process tends to be repeated frequently, till finally a small sharply defined ulcer forms under the scab. It gradually becomes deeper, erodes and perforates the cartilage and the mucous membrane of the opposite side of the nose, thus forming a perforation. The edges of the perforation then rapidly clean up and heal, leaving the patient with a small dry circular or oval perforation in the cartilaginous part of the septum, of which he is probably quite unconscious.

DIAGNOSIS.—It is improbable that a mistake should be made in the diagnosis of this condition, as the appearances are so characteristic. The localization of the ulcer, its limitation to the cartilaginous part of the septum, and the absence of inflammation about it, are features which differentiate the condition

from lesions due to syphilis or lupus, while the fact that after perforation has occurred the edges are sharp, also helps to distinguish it from the perforations of syphilis and lupus, in which the edges are thickened.

TREATMENT.—If the condition is seen before perforation has taken place, the patient should be enjoined not to pick the nose, and the ulcer can occasionally be made to heal if it is painted with silver nitrate. After perforation has occurred, all that can be done is to keep the parts clean, and so favour healing of the edges.

BLEEDING POLYPUS OF THE SEPTUM.

This is a somewhat rare condition. It was supposed at one time that a bleeding polypus was one of the malignant forms of tumour of the nature of sarcoma, because, when only partly removed, it grows again very rapidly. This view has, however, been shown to be wrong, for recurrence does not take place if the tumour is thoroughly removed, and metastases never occur. The growth appears as a rounded pedunculated body, dark red in colour, and springing from the cartilaginous part of the septum; it causes nasal obstruction and frequent attacks of epistaxis. The tumours are very vascular, and are of the nature of fibro-angiomata.

TREATMENT consists in complete removal with a snare, and subsequent cauterization of the point of origin. Other forms of tumour, both simple and malignant, grow from the septum, but are very rare in that situation.

EPISTAXIS.

Bleeding from the nose is a symptom of a large number of widely differing conditions. It is met with in diseases of the heart, the kidneys, and the liver; it may occur in acute fevers, such as enteric, scarlet fever, measles, diphtheria, and influenza; and it is also found in diseases of the blood, including scurvy, purpura, and hæmophilia. In many cases it is due to purely local causes, and it then arises in the majority of instances from the lower and anterior part of the septum—Kiesselbach's area. It may proceed from new growths (especially malignant) in the nose and naso-pharynx; it may occur in plethoric individuals; it is more rarely vicarious, replacing the menstrual flow; and,

finally, it is frequently the result of an injury. The blood may escape in drops, or it may pour out so profusely that several pints may rapidly be lost. If the blood is escaping only in drops, it will probably cease to flow spontaneously, and treatment will be unnecessary; but where the hæmorrhage is free, it is the duty of the surgeon to endeavour to arrest it. If the bleeding has been at all abundant, the nose will probably be full of clots, and it will be impossible to locate the bleeding-point—a very desirable preliminary to treatment. The nose should, accordingly, first be washed out with very hot borie or other mild antiseptic lotion, and should then be carefully inspected. If the blood flows too quickly to enable the bleeding-point to be seen, a gauze plug, saturated with a solution of peroxide of hydrogen (10 vols.) should be inserted; this should be quickly withdrawn and the nose rapidly inspected.

The most common site for hæmorrhage is the locus Kiesselbachii, or an area on the lower and anterior part of the cartilaginous portion of the septum. If the bleeding is not coming from that region, the floor of the nose and the turbinated bodies should be inspected. If the bleeding is coming from the front of the nose, it can generally be stopped by anterior plugging. For this purpose strips of gauze, wrung out of a solution of peroxide of hydrogen (10 vols.), are most suitable; the plugs may be left in for forty-eight hours. If the hæmorrhage is not controlled by this means, plugging of the posterior nares will have to be resorted to, but this procedure is necessary only in the rarest instances. I have used the method only once: the patient in that case suffered from purpura hæmorrhagica; the epistaxis was quite uncontrollable, even with the posterior plugging, and the patient died. In order to fix a plug in the naso-pharynx, it is necessary in the first place to pass a string through the nose and naso-pharynx, and to bring the end out through the mouth. This can be achieved satisfactorily by passing through the inferior meatus a soft rubber catheter, to the extremity of which a piece of string of sufficient length has been attached. When the point of the catheter appears below the soft palate, it is seized by a pair of forceps and drawn through the mouth, together with one end of the string. A pledget of gauze is attached to the string some inches from the end, and it is then drawn up into the naso-pharynx. The two ends of string, the one coming out of one nostril, the other from the

mouth, are then tied together. In cases of habitual nose-bleeding, it is very important to find the bleeding-point, which, in the vast majority of cases, as has already been stated, is found low down on the anterior part of the septum. When detected, the area should be cauterized, either with a bead of fused chromic acid, or with a flat burner heated to a dull-red heat; in using the latter, the affected area is stroked with the burner while the current is being allowed to pass.

CHAPTER XVI.

RHINITIS.

ACUTE RHINITIS.

ACUTE rhinitis, or cold in the head, is a condition familiar to all from personal experience. It is especially prevalent in the spring and autumn, and is liable to occur after exposure to wet and cold. It is met with in the course of the exanthemata, especially measles, and occurs in influenza. It may result from the ingestion of certain drugs, such as iodide of potassium, while a dusty atmosphere or chemical irritants also predispose to this condition. In spite of its common occurrence, the etiology is still uncertain; and, although the affection is undoubtedly contagious, inoculation experiments almost invariably fail.

SYMPTOMS.—A fit of sneezing often ushers in an attack; the nose then becomes blocked, one side being as a rule affected before the other. Loss of the sense of smell, headache, and a feeling of chilliness accompany the nasal obstruction, which is also associated with a profuse discharge from the nose; this is at first watery, but later becomes muco-purulent, and then purulent. After a few days the discharge gradually subsides. The process may spread to the pharynx and the larynx, or the nasal condition may be secondary to an inflammation of these parts. The hearing may also become impaired through temporary Eustachian obstruction. In infants, the obstruction due to a simple coryza may be a serious danger, as both feeding and sleep are interfered with.

APPEARANCES.—On examination of the nose, the mucosa are found to be red and swollen, and the naso-pharynx and pharynx may present a similar appearance.

TREATMENT.—If treatment is desired, it is advisable in the early stages to give the patient a very hot bath at bedtime, and induce perspiration by the exhibition of aspirin, gr. x. Local

applications for the nose, in the form of snuffs or sprays, may also be prescribed to relieve the nasal obstruction; Ferrier's snuff, menthol in liquid paraffin, or coryfin, may be found serviceable for this purpose (see Appendix). The local application of a solution of cocaine should not be prescribed for personal use by the patient, although it relieves the congestion in the nose. Vigorous blowing of the nose should also be avoided, as it is associated with a risk of infecting the middle ear. In some cases, an attack may be shortened by the injection of a suitable vaccine. A bacteriological examination of the discharge should be made at an early stage of the infection, to discover the causal organism.

Purulent Rhinitis is a form of acute rhinitis which is usually produced by direct contact with gonorrhœal secretion, but sometimes occurs in the course of one of the exanthemata. The symptoms are similar to those of the simple form, but are more acute. The discharge is purulent, and very profuse, and carries off the nasal bones may result. Frequent lavage of the nose by weak antiseptic lotions is all that can be done in the way of local treatment, but a suitable vaccine may be employed. The condition is fortunately a rare one.

Fibrinous Rhinitis may be either simple, or diphtheritic.

The **DIAGNOSIS** can be made only by bacteriological examination, and until the result of this has been obtained the patient should be isolated, and the case treated as one of diphtheria.

SYMPTOMS.—The condition is characterized by the presence of false membranes in the nose. In the simple form, nasal obstruction is the chief symptom, and may be very obstinate and distressing. The constitutional symptoms are slight, but in diphtheritic rhinitis the constitutional disturbance may be very severe, and evidence of the disease may develop in the pharynx. There is, however, a group of mild cases of nasal diphtheria, indistinguishable clinically from simple fibrinous rhinitis; hence the importance of making a bacteriological examination in every case before coming to a definite diagnosis.

TREATMENT.—In the local treatment of the simple form, McBride recommends the injection of diluted lime water, and Zarnico advises the application of menthol in liquid paraffin.

CHRONIC RHINITIS.

Chronic rhinitis will be considered under the following headings:—(1) *Chronic hypertrophic rhinitis*; (2) *Chronic atrophic rhinitis*; (3) *Coryza caseosa*.

1. **Chronic Hypertrophic Rhinitis** may result from repeated attacks of acute rhinitis. It is predisposed to by constant exposure to a damp or dusty atmosphere, or to chemical irritants. It is frequently met with in patients suffering from accessory sinus suppuration, from adenoid vegetations, or from marked septal deformity. In some cases it seems to be associated with a gouty diathesis, while in others it may be attributed to the excessive use of alcohol or tobacco.

SYMPTOMS.—One of the chief symptoms is nasal obstruction; this varies greatly in different individuals, and at different times, but is nearly always more marked at night. Associated with the nasal obstruction, there is generally some impairment of the senses of smell and taste; a change in the voice is also noticeable when the obstruction is very marked. Increased secretion is another important symptom, and it may be very troublesome. The discharge is generally watery or viscid in character, and free from odour.

APPEARANCES.—On anterior rhinoscopy, the mucosa present a congested appearance, and portions may also be hypertrophied. The enlargement may involve the inferior turbinated body; in that case the anterior end (*Plate VI, Fig. 49*) may be specially affected, or a fringe-like overgrowth may be seen extending along the whole length of this structure, or the posterior end alone may be thickened (*Plate VI, Fig. 52*); the swollen part has frequently a mulberry-like appearance, which is best seen on posterior rhinoscopy. The middle turbinated body is not so often affected as the inferior, nor does it become hypertrophied to such a marked extent. Before making a diagnosis of true hypertrophy, it is necessary to apply a solution of cocaine (5 to 10 per cent). This removes the swelling due to vascular engorgement, while the enlargement due to thickening is unaffected. In almost every case some shrinking takes place.

TREATMENT.—The treatment varies with the severity of the symptoms, and with the pathological condition found. The practitioner should not be in too great a hurry to operate, for

if there is unnecessary interference, not only may no good result, but a great deal of harm may be done, and an atrophic condition may be set up, associated with crusting, which is much more distressing to the patient than the symptoms produced by the hypertrophy. In the milder cases, an attempt may be made to relieve the symptoms by the use of nasal sprays, such as salt solution, bicarbonate of soda, or horax (see Appendix). When this treatment is unavailing, or when the hypertrophy is well marked, it is advisable, after the induction of local anæsthesia, to remove the thickened parts by means of scissors and snare. Too much tissue must not be taken away, and the amputation of the whole inferior turbinated body is quite unjustifiable except in the rarest instances. When the enlargement is limited to the anterior end of the inferior turbinal, it may be possible to grasp it by means of the snare alone, but if this fails, a cut should first be made with a pair of scissors into that structure, and the portion so separated should then be caught up by the snare, and removed. If there is a fringe of hypertrophied tissue along the whole of the lower border of the inferior turbinal, it can be removed by the scissors alone. Hypertrophies of the posterior end of this structure are more difficult to deal with, and a snare is most suitable for their removal. Hypertrophies of the middle turbinated body should also be attacked by means of a snare. In patients of a gouty diathesis, a course of Carlsbad salts is often of service; and in certain cases, if feasible, a visit to a spa such as Ems, Mont Dore, or Harrogate, will be found beneficial.

2. **Chronic Atrophic Rhinitis** may or may not be associated with fœtor. In the former case it is commonly known as ozæna.

Ozæna.—The etiology of ozæna is still uncertain, and of the numerous theories which have been advanced as to the cause of this disease, only a few need be mentioned here. Grünwald believes that every case of ozæna is the result of local disease in one or other of the accessory nasal sinuses, and that failure to find the focus is due to lack of skill on the part of the investigator. It has, however, been proved that this rule is not universal, although certain cases of ozæna are associated with suppuration in the accessory sinuses. Abel has discovered a bacillus—the *B. mucosus*—in cases of ozæna, which he believes is the cause of the condition, but Klemperer and Scheier consider

that Abel's bacillus is identical with Friedländer's, and that it is accordingly not pathogenic in these cases. Zaufal attributed the condition to congenital smallness of the turbinated bodies.

The pathological changes consist in progressive atrophy of the mucosa and the underlying bone of the turbinated bodies, and a conversion of the ciliated epithelium to cubical or stratified squamous epithelium; ulceration does not take place. The mucous membrane exudes a thick viscid secretion, which dries rapidly, and forms crusts which emit the characteristic and horrible odour of ozæna. Ozæna occurs chiefly among the poorer classes, and especially in anæmic and ill-nourished individuals; it is much more common in women than in men, and usually begins about the time of puberty. As a rule, both sides of the nose are affected, but in some cases the disease is unilateral.

SYMPTOMS.—The most characteristic symptom is the loathsome fœtor: this varies considerably in intensity, and in some cases the odour increases during menstruation; it is sometimes so strong that it is impossible for anyone to stay in the same room as the patient, and it has a peculiar bouquet, which to many observers is pathognomonic. The patients fortunately cannot themselves detect any smell; in fact, they often suffer from complete anosmia. The fœtor arises from the crusts which form within the nose, and which are also the cause of the second important symptom—nasal obstruction. Frequently headaches are complained of, and a feeling of dryness in the nose and throat. The crusting occasionally extends into the naso-pharynx and the pharynx, and sometimes even involves the larynx and trachea. The crusts are dislodged from the nose from time to time, and may be discharged in the act of blowing the nose, or may find their way into the pharynx. Spontaneous epistaxis sometimes occurs, probably induced by the separation of the crusts.

APPEARANCES.—In examining the nose in a well-marked untreated case of ozæna, the nasal cavities are found to be filled with greenish crusts, and on posterior rhinoscopy the vault of the pharynx may also be seen to be clothed with dried secretion. When the crusts have been removed after the method shortly to be described, the unusual size of the nasal cavities at once strikes the observer (*Plate VI, Fig. 48*). The inferior and middle turbinals may be very markedly atrophied, so that a ready view is obtained of the middle meatus, the uncinatæ

DISEASES OF THE NOSE

process, and the bulla ethmoidalis, while the margins of the choanæ, the posterior wall of the naso-pharynx, and the movements of the soft palate are all clearly visible from the front. As a rule, the diagnosis is not difficult, but care must be taken to exclude accessory sinus suppuration. The absence of ulceration will serve to distinguish ozæna from tertiary syphilitic lesions.

PROGNOSIS.—It is not within our power to cure ozæna, though cases of spontaneous recovery are met with; but it is always possible by suitable treatment to prevent the crusting, and so keep the main symptoms of the disease in abeyance, i.e., the fœtor, and the nasal obstruction.

TREATMENT.—The treatment still consists in the main in cleanliness, for none of the so-called cures of this affection have stood the test of time. The following is the method which should be employed for removing the crusts: In the first place, the nose is plugged by means of a tampon of gauze or cotton-wool, which the patient may be taught to introduce himself with a pair of forceps; if a wick of cotton-wool is used, it is pushed into the nose with a screwing motion; the nasal cavities should be packed as tightly as possible. On removing the plugs, which should be allowed to remain in place for about half an hour, many of the crusts will probably come away. The nose is then syringed with normal saline solution or weak boric lotion (1 in 60); strong antiseptic solutions should be avoided. This procedure alone is sufficient to keep the symptoms in abeyance, and more than this cannot be achieved by any method of treatment. In severe cases it has to be repeated once or twice a day, but the patient will soon find out for himself how long an interval may be allowed to elapse between successive syringings. When the fœtor is very intense, it is advisable to paint the inside of the nose with Mandl's solution (see Appendix) after the syringing.

It is hardly necessary to detail other methods of treatment, but it may be mentioned that massage within the nose, or the insufflation of powders, such as iodol or aristol, have been tried. Treatment by cupric electrolysis was at one time greatly in vogue, but it has now been abandoned. Attempts have also been made to improve the condition by submucous injections of paraffin into the turbinated bodies and septum. The suction method of producing hyperæmia has also been adopted, and

apparently the nose may be freed from crusts in this way. When one or more of the accessory sinuses are diseased, appropriate treatment should be adopted (see page 153).

Treatment by vaccines seems worthy of a trial. A few cases have been treated for me by Dr. Struthers Stewart with an autogenous vaccine made from Abel's bacillus, which was isolated in almost pure culture. A distinct improvement, with diminution of the fœtor and crusting, was observed.

3. *Coryza Caseosa* is an exceedingly rare affection; it was first described among laryngologists by Cozzolino, while more recently Beausoleil and McBride have reported cases. It is characterized by the accumulation of inspissated pus in the nose, associated with intense fœtor, and in some cases by the presence of polypi. The friable and sloughy nature of the polypi, and their tendency to bleed if touched, may suggest a diagnosis of malignant disease, but in the reported cases recurrence did not take place after removal, and in McBride's cases an absolute cure resulted.

CHAPTER XVII.

*MUCOUS POLYPI AND NEW GROWTHS.***MUCOUS POLYPI** (*Syn. Nasal Polypi*).

Mucous polypi are included in this chapter, although they are not really new growths.

ETIOLOGY.—The etiology of mucous polypi is obscure. They are more commonly met with in men than in women, and rarely occur in children; in certain cases they are associated with accessory sinus suppuration, but in others sinus disease may be absolutely excluded.

Various theories have been advanced to explain their origin. Woakes held the view that polypi were a symptom of a diseased condition of the bone, which he named necrosing ethmoiditis. Lack found, on histological investigations, evidence of osteitis, which he looked upon as the cause of the polypus formation. Yonge believed that the œdema was not inflammatory in its nature, but was due to an obstruction in the efferent circulation which was in relation to the area in which the œdema occurred. J. S. Fraser is of opinion that mucous polypi are primarily due to chronic inflammatory œdema of the submucous tissues of the nose. Watson Williams holds the view that mucous polypi are a result of the invasion of tissues by organisms, which cause blocking of the lymphatics but do not affect the blood-stream.

APPEARANCES.—Mucous polypi are generally multiple, and occur on both sides of the nose (*Plate VI, Fig. 47*). They appear as grey semi-translucent masses, and may be as small as a pea or large enough to fill one nasal cavity. If touched with a probe, they are found to be freely movable, so much so indeed, that when they are situated far back in the nose they can often be drawn to the front by a forced expiration. They are usually attached to the middle turbinated body, but may arise higher up, from the fronto-nasal duct or the superior meatus. Simple mucous polypi may, in rare instances, cause

PLATE VI.

AFFECTIONS OF THE NOSE

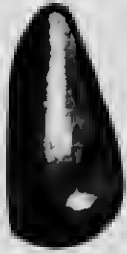


Fig. 37.
Mucous polypus.



Fig. 38.
Atrophic rhinitis.
Appearance after removal
of the crusts.



Fig. 39.
Hypertrophy of the
inferior turbinal.

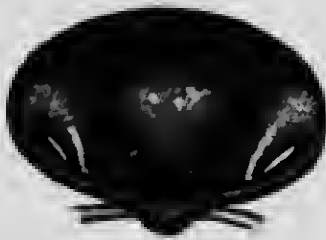


Fig. 50.
Naso-antral (choanal) polypus.



Fig. 51.
The same polypus as in *Fig. 50.*
after removal.



Fig. 52.
Enlargement of the posterior end of the
inferior turbinal.



Fig. 53.
Adenoid vegetations in the
naso-pharynx.

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broadening of the nose; this symptom is, however, very suggestive of malignancy. If small polypi are situated far back in the nose, it is sometimes difficult to detect them by anterior rhinoscopy, but in such cases the application of a 5 per cent solution of cocaine will often clear up the diagnosis by causing contraction of the turbinated bodies; or the presence of these growths may be confirmed by an inspection of the naso-pharynx.

SYMPTOMS.—Nasal obstruction is one of the chief symptoms of mucous polypi; the blocking is more marked in damp weather. The patient also usually complains of having a constant cold in the head, the discharge being watery, except in the cases which are associated with accessory sinus suppuration, when it is purulent. If the obstruction is well marked, the voice becomes nasal, mouth breathing is established, and headache is not infrequently complained of. In some instances the presence of polypi is associated with asthma. In such cases there may be only a single polypus, which is pedunculated, and often small.

DIAGNOSIS.—The diagnosis is generally made by inspection, though, as already stated, when the growths are small and situated far back in the nose, it may be possible to confirm the diagnosis only after the application of a solution of cocaine, or by posterior rhinoscopy. The colour of the growths and their extreme mobility serve to distinguish them from hypertrophy of the turbinated bodies. In elderly individuals, where the growths have not the typical appearance of mucous polypi, microscopic examination should always be made to exclude malignancy.

PROGNOSIS.—The prognosis is good as regards the general health, but polypi show a marked tendency to recur, however thoroughly they are removed.

TREATMENT.—The treatment of polypi is operative, and their removal is best undertaken by means of a snare. Local anaesthesia is induced by a 10 per cent solution of cocaine or novocain, to which a few drops of a solution of adrenalin (1-1000) may be added to diminish the bleeding. The loop of wire is introduced vertically, and carried back between the septum and the polypus; it is then turned horizontally, raised so as to encircle the growth, carried up as high as it will go, and then tightened. The polypus should not be completely cut through by the wire, but when it is firmly caught the snare should be withdrawn with a jerk;

in this way the whole pedicle will probably come away. The procedure should be repeated until all the polypi have been removed, though it is not always possible to effect this in one sitting, especially if there is much bleeding. When the polypi are too small to be removed by means of a snare, forceps may be made use of—Luc's forceps, or some similar pattern will serve for this purpose. If the whole of the mucous membrane of the middle turbinated body is polypoid, it is advisable to remove a portion of bone along with the mucous membrane. The nose should be inspected again after a week, to see if all the growths have been removed. It is not necessary to employ the cautery after removal with a snare, and its use does not insure against recurrence. When the polypi are secondary to accessory sinus suppuration, the affected sinus should be treated.

Various non-malignant growths occur in the nose, but as they are all rare, no detailed description is necessary. Besides bleeding polypi of the septum, which have already been referred to (see page 118), there may be found papillary outgrowths from the inferior turbinated body, angiomas, chondromata, exostoses and retention cysts.

MALIGNANT TUMOURS.

Both carcinomata and sarcomata occur in the nasal cavities : of the two, sarcomata are the more common. They are met with in young persons, and may arise as primary growths in the nose, or may be secondary to growths beginning in one of the accessory sinuses, especially the antrum. Carcinoma is met with as a rule in elderly individuals.

SYMPTOMS.—Nasal obstruction is one of the chief symptoms of malignant disease ; it varies in degree according to the size of the tumour, and may be complete. Another constant sign is nasal discharge, which is usually purulent, and may be associated with an extremely offensive odour. Epistaxis is also a frequent symptom ; it may occur spontaneously, or may be induced by some slight interference within the nose. External deformity may be produced, and this symptom is very suggestive of malignancy, though it is sometimes found in cases of simple mucous polypi. A less common symptom is epiphora, which is a result of blocking of the lachrymal duct. Pain is complained of, but glandular enlargement is not often observed

MALIGNANT TUMOURS

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APPEARANCES.—Sarcoma may spring from the septum or from the outer wall of the nose. Carcinoma generally grows from the outer wall, but the exact point of origin can rarely be determined. Sarcoma may resemble mucous polypi, or it may be associated with simple polypi. A reddish sloughy-looking mass, very friable, and bleeding freely when touched, is suggestive of malignant disease.

DIAGNOSIS.—While the diagnosis of malignancy may frequently be suggested by the clinical features just described, microscopical examination of a portion of the tumour should always be made when there is the slightest doubt. If the diagnosis is confirmed, it becomes important to determine the exact extent of the disease, and for this purpose a skiagram gives satisfactory information.

TREATMENT.—Treatment is operative, but is not very satisfactory. When there is a possibility of entirely removing the growth, this should be done. An external operation will be necessary in all cases except where there is a distinct localized tumour attached to the septum; but even in these cases an external operation may be necessary to gain free access. If it is decided that complete removal is impossible, an intra-nasal operation may sometimes be justifiable in order to relieve nasal obstruction.

CHAPTER XVIII.

*AFFECTIONS OF THE NASO-PHARYNX.***ACUTE INFLAMMATION.**

AN acute inflammation, beginning either in the nose or in the pharynx, may extend to the naso-pharynx, and it is accordingly not uncommon to find the mucosa of the naso-pharynx participating in an acute pharyngitis or rhinitis. Besides this we can recognize an acute inflammation which may be confined to the lymphoid tissue of the naso-pharynx, and which resembles acute lacunar or follicular tonsillitis; in such a case the pharyngeal tonsil is covered with white spots. The inflammation is associated with pain and discomfort at the back of the nose, nasal obstruction, pain on swallowing, and a rise in temperature. Examination of the pharynx is negative, but on posterior rhinoscopy the appearances described above are made out.

TREATMENT.—In so far as it is applicable this is the same as for acute tonsillitis.

CHRONIC POST-NASAL CATARRH.

ETIOLOGY.—Chronic inflammation, like the acute variety, may extend from the nose and fauces to the naso-pharynx; the causes of chronic rhinitis and of chronic pharyngitis may therefore produce chronic post-nasal catarrh. This affection is also predisposed to by nasal obstruction, even in the absence of rhinitis.

APPEARANCES.—These vary considerably. There may be merely a congestion of the mucosa, which can also be observed in the pharynx and nose, or the mucous membrane may be rugose; this irregularity is often chiefly marked in the vault, owing to the persistence to some extent of the pharyngeal tonsil. There is generally increased secretion, and mucus or muco-pus may be seen adhering to the walls of the naso-pharynx.

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SYMPTOMS.—The chief symptom is the feeling of some accumulation at the back of the nose, causing a constant desire to clear the throat by drawing back through the nose; this is followed by the expectoration of viscid secretion. The subjective disturbances vary greatly in different individuals, and are apparently quite independent of the extent of the objective changes.

TREATMENT.—If the symptoms appear to depend on the persistence to some degree of the pharyngeal tonsil, this should be removed after the method to be described later (see page 135); and when there is some definite nasal obstruction, any operative procedure is justifiable which will establish nasal respiration, and should be carried out. In the absence of such definite indications for interference, milder methods of treatment must be employed. In many cases an ammonium chloride inhaler will be found of service to diminish hypersecretion; in other cases, however, no benefit results from this method of treatment. If there is much muco-purulent secretion, the nasal douche may be ordered, for it must be remembered that the naso-pharynx as well as the nose is flushed out by this procedure. Astringent solutions, such as nitrate of silver or chloride of zinc, may be applied, or Mandl's pigment may be used (see Appendix). In gouty or plethoric individuals, a course of Carlsbad salts may be prescribed; and in neurasthenic patients, general treatment is necessary. Excessive smoking and over-use of alcohol should be discountenanced in this, as in other affections of the upper air-passages.

ADENOID VEGETATIONS, OR HYPERTROPHY OF THE PHARYNGEAL TONSIL.

This is one of the most common affections of childhood. The credit of first recognizing the condition belongs to the late Wilhelm Meyer, of Copenhagen.

ETIOLOGY.—Adenoid vegetations are met with in early life; the most common period for their occurrence is between the ages of five and fifteen, but they may also be found in infants, and in some cases are undoubtedly congenital. I have had to operate on a child of under six months who was suffering from this affection. Adenoid hypertrophy is also occasionally met with in adults. Heredity undoubtedly plays a part in the

etiology of this condition, for it is a common experience to find that several or all of the children of one family are affected. Climate is also a factor of some importance: a cold damp atmosphere predisposes to the disease, while in a hot dry climate, such as the South of Italy, it is more rarely met with.

PATHOLOGY.—Adenoid vegetations are an hypertrophy of the lymphoid tissue normally found in the vault of the naso-pharynx in the child. They present a lobulated mass, with a median furrow, which may almost fill the naso-pharynx, and which, in rare instances, may actually project below the soft palate. In structure they resemble the faucial tonsils, except that there are no crypts and that they are lined by ciliated epithelium; they are also more vascular, and have relatively less connective tissue.

SYMPTOMS.—The symptoms vary according to the degree of hypertrophy. In marked cases, the classical clinical picture is met with, which is the result of long-standing mouth breathing and has for many years been associated with this affection. This has already been described in the section on General Semeiology (page 106). Various clinical types may, however, be distinguished, depending on the most prominent group of symptoms. Thus, in one group the chief symptoms are due to the aural complications, and the patients are brought complaining of deafness, which is the result of Eustachian obstruction or of a discharge from the ear. In a second group, the nasal symptoms predominate; while in a third, cough may be the chief complaint.

APPEARANCES.—On posterior rhinoscopy, a lobulated mass, of the same colour as the mucous membrane, is seen in the naso-pharynx (*Plate VI, Fig. 53*). It may be so slight as to form only a moderate projection from the roof, and not to encroach on the posterior nasal opening; or it may hang down, and hide a part or the whole of the septum and choanæ. Not infrequently some secretion is seen lying on the surface of the vegetations. The growths occasionally extend to the lateral walls, and are in close relation to the mouths of the Eustachian tubes. It is in such cases especially, that aural complications occur. In very rare instances, as has already been stated, the vegetations extend into the pharynx, and project below the soft palate. Adenoid vegetations are frequently associated with enlargement of the faucial tonsils.

The examination with the mirror can frequently be carried out successfully in quite young children, but if it fails it is necessary to palpate the naso-pharynx after the manner described previously (see page 102). If adenoid vegetations are present, they are felt as a soft spongy mass.

DIAGNOSIS.—The diagnosis is as a rule quite easy, but in the case of young infants where there has not been time for the development of the classical symptoms, and where the parts are too small to permit of a digital exploration, it may not be possible to come to a definite conclusion prior to operation. In such cases, if syphilis can be excluded, it is wiser to give an anæsthetic and to introduce a small curette into the naso-pharynx. If adenoid vegetations are present, they will be removed, but if the naso-pharynx is free no harm is done. The method of digital exploration should not be used where it is possible to make the diagnosis with the mirror, as the procedure is extremely disagreeable to the patient. Some observers, however, prefer this method, as they believe they can thereby make a truer estimate of the amount of adenoid vegetations present than is possible by posterior rhinoscopy.

TREATMENT.—If adenoid vegetations are not well marked, and the symptoms are very slight or entirely absent, an operation should not be performed; but the patient should be seen again after an interval of a few months, when the progress of the case will determine if operative interference is necessary. When, however, one or more of the cardinal symptoms are present, no time should be lost in removing the growths. It is not a sufficient reason against operation that the vegetations tend to atrophy at puberty, because the mischief is done in the meantime, and is irreparable.

METHOD.—It is only humane to give a general anæsthetic when performing this operation, although it can be done, as in Germany it almost invariably is, without anæsthesia. Ethyl chloride is an anæsthetic admirably suited to the purpose; in skilful hands, and with an expert operator, one dose gives ample time to excise both tonsils with the guillotine, and to remove completely the adenoid vegetations. It is a very safe anæsthetic, and also permits of the sitting up of the patient immediately after the operation, which arrests the bleeding but which is not a proper proceeding after the administration of chloroform. In hospital work it is especially

valuable, as, compared with chloroform anæsthesia, the saving of time is enormous. Three c.c. will usually be found a sufficient dose for all ages ; with a very powerful adult, however, it is permissible to give up to 5 c.c. The drug is administered in some form of inhaler such as Clover's, and it is pleasanter for the patient if given rather slowly. The patient may be placed in various positions for the performance of the operation, but I shall describe only the method practised in Edinburgh, which is both safe and simple. During the induction of anæsthesia, the patient lies on his back ; as soon as he is under, the head of the table is lowered or the patient is pushed so that the head hangs over the end of the table ; this prevents blood from entering the larynx during the operation. The gag is then inserted (in Edinburgh we use a modification of Doyen's gag), and to obviate any difficulty in inserting it, a mouth-prop may be placed between the teeth before the commencement of anæsthesia. The anæsthetist has to keep the patient's head in the middle line, and to see that the gag does not slip. He stands on the left of the patient, while the operator stands on the right.

If the tonsils as well as the adenoids have to be removed, they should be dealt with first, because it is necessary to see exactly where to place the guillotine (in Edinburgh we use Reiner's pattern). The tongue is depressed with a spatula held in the operator's left hand, and the ring of the guillotine is adjusted round the tonsil ; the handle of the instrument is then carried well over to the opposite side of the mouth, while the anæsthetist, with his hand below the jaw, presses the tissues of the neck firmly inwards ; the knife of the guillotine is then pressed well home. If the tonsil is at all projecting an expert will practically enucleate it in the majority of cases. The second tonsil is removed in the same way. The adenoids have then to be dealt with. Some form of guarded curette is first employed (Delstanche's modification of Gottstein's curette is an excellent pattern) ; it is introduced behind the soft palate, being held sideways till it has passed between the uvula and the lateral wall of the pharynx, when it is pressed against the roof of the naso-pharynx, and is carried forward as far as possible in the middle line until it is stopped by the posterior free margin of the septum. With a sweeping motion, the roof and the posterior wall are scraped once by the curette, which is thereupon

withdrawn. Another curette is then taken (at this stage an unguarded one will do), and the naso-pharynx is again scraped as before, first in the middle line and then slightly to either side. Hartmann's lateral ring knife may now be used to scrape the fossæ of Rosenmüller; it is introduced in the same manner as the curette, but is made to scrape laterally, care being taken to keep behind the cushions of the Eustachian tubes. Finally the operator may insert his index finger into the naso-pharynx, to make sure that all the adenoid vegetations have been removed. The gag is then withdrawn, and at the same time the patient is rapidly turned over on his face for a few seconds, after which he may be lifted into a sitting position, which has the effect of stopping the hæmorrhage. As the dependent position of the head produces considerable bleeding, it is necessary in many cases to use sponges in sponge-holders to swab the pharynx during the operation, or the patient may be turned face downwards for two or three seconds to allow the blood to escape. The child should be kept in bed for two days after the operation, during which time only boiled milk should be given, and for a week the diet should be limited to slops, and food that is easily swallowed.

If reactionary hæmorrhage occurs some hours after the operation, it can almost always be stopped by sitting the patient bolt upright; if, however, this procedure does not have the desired effect, pressure must be applied after removal of the clots, by a swab or sponge dipped in a solution of peroxide of hydrogen (10 vols.) and held in a sponge holder. The pressure may have to be maintained for from 15 to 30 minutes, and if the bleeding returns it may be necessary to suture temporarily the anterior and posterior pillars of the fauces over a pledget of gauze. In some cases a bleeding point may be seen, and grasped by artery forceps. In very rare instances, ligature of the external or common carotid artery is called for. If much blood has been lost it may be necessary to give subcutaneous or rectal injections of normal saline solution. Local applications are rarely needed in the after-treatment, but if the throat is very sore, a solution of hydrogen peroxide (10 vols.) may be used as a throat spray, and a mild antiseptic mouth-wash should be prescribed.

Mention should be made here of a method of enucleating tonsils with the guillotine which has been developed by Whillis

and Pyhus. The guillotine they use is a modification of the Maekenzie pattern, of which the shaft is long and specially strengthened, while the handle is set at an obtuse angle; a small size is employed (No. 1), and the blade is blunted before use. The surgeon stands on the right of the patient, who is placed in the supine position, with his head turned towards the right side for removal of the right tonsil, and with his head in the supine position for removal of the left tonsil. The mouth is opened with a gag, but a tongue depressor is not used; a general anæsthetic is employed, either ethyl chloride or ether. The ring of the guillotine is hooked over the lower pole of the tonsil, the blade surface lying nearest the surface of the tonsil, and the hand is then depressed; the forefinger of the left hand presses on the outer part of the anterior pillar of the fauces and drives the tonsil through the ring; the blade is then driven home with the right thumb. In a series of 100 consecutive cases, the tonsils were completely removed in 97 per cent., while in 74 per cent the tonsils were removed in one piece. Dr. Greenfield Sluder, of America, has devised a somewhat similar operation. The guillotine (Sluder's) is introduced from the opposite corner of the mouth, and is adjusted against the inferior and posterior portion of the tonsil; it is then pushed forwards and upwards until the tonsil is pressed against the eminentia alveolaris, which is a bony prominence on the inferior maxilla below the last molar tooth. The tonsil is drawn a little further forwards until the distal margin of the ring lies against the eminence, the handle of the instrument is then slightly depressed, the tonsil is pushed through the fenestra with the left index finger, and the blade forced home.

FIBRO-MUCOUS POLYPUS OF THE NASO-PHARYNX, OR CHOANAL POLYPUS.

A solitary polypus is occasionally found in the naso-pharynx, having an appearance similar to the ordinary nasal mucous polypus, but of firmer consistence. Killian has shown that in many instances these polypi arise within the antrum (*Plate VI, Figs. 50 and 51*), and grow out through the accessory opening into the naso-pharynx. These cases are not associated with pus formation within the antrum, and on ordinary transillumination the affected sinus transmits a brighter light than

the healthy side. Dr. Logan Turner and I have found, however, in a number of cases which we have examined, that in the skiagram, the antrum from which the polypus grows throws a distinct shadow. I operated on a very interesting case in which there was evidence of right-sided antral suppuration, accompanied by a choanal polypus. On ordinary transillumination, the right antrum was dark and the left illumined brightly. A skiagram was taken and showed both antra dark. At the operation the right antrum was found to contain pus, and the mucous membrane was thickened, while the left antrum was free from pus, but contained a polypus which was found to be part of the growth in the naso-pharynx. Fibro-mucous polypi do not, however, arise from the antrum in every case, but are sometimes attached to the margin of the choana.

APPEARANCES.—On posterior rhinoscopy, the polypus appears as a bluish mass like an ordinary mucous polypus, which more or less fills the naso-pharynx. The chief symptom is nasal obstruction.

DIAGNOSIS.—We have to distinguish between true choanal polypi, and antro-nasal polypi. The brightness on transillumination associated with the opacity seen in the skiagram should distinguish between these two forms. We have also to differentiate between these growths and naso-pharyngeal fibromata, but this will be considered later (see page 141).

TREATMENT.—The removal of these tumours may be troublesome. When they are found to be growing from the antrum, the latter should be opened through the canine fossa, and the polypus should be detached; it can then be readily removed through the mouth if it is seized by a pair of forceps passed behind the soft palate. If the growth springs from the margin of the choana, or from some point in this neighbourhood, it may be possible to pass the loop of a snare round it. The snare is introduced into the nose in the usual way, but the wire is not fixed until after the growth has been embraced by it. A finger is introduced into the naso-pharynx to push the loop round the polypus, sufficient wire being paid out to permit of this being done. The wire is then fixed, tightened in the usual way, and the growth is avulsed. If difficulty is experienced in adjusting the wire, the growth may be removed by Kühn's or Löwenberg's forceps, passed behind the palate and made to grasp the polypus, which is then forcibly torn out.

NASO-PHARYNGEAL FIBROMA.

This is a somewhat rare but very serious disease. It nearly always occurs in youths between 10 and 25 years of age. The tumour arises from the roof or posterior wall of the nasopharynx; it is usually sessile, and is attached to the periosteum. The growth is pink or red in colour, and of a very firm consistence. Microscopically it consists of fibrous tissue with but few cells, and is rather richly supplied with blood-vessels, some of which may be greatly dilated. These tumours grow rapidly, and extend at the expense of the tissue with which they come in contact, causing absorption and erosion of bone. Ulceration may result, or synechiæ may form between the tumour and the neighbouring parts. Though thus locally malignant, they never form metastases.

SYMPTOMS.—In the earlier stages, nasal obstruction is the most prominent symptom; this is accompanied by changes in the voice, such as are found in marked cases of adenoid vegetations, and which Wilhelm Meyer described by the name of "dead speech." In addition to the nasal obstruction, attacks of epistaxis occur from time to time. At a later stage, ulceration may take place, and is accompanied by a fœtid nasal discharge. As the growth progresses external deformities are produced, the nature of which depends on the direction in which the processes of the tumour force their way. If they extend into the nasal cavities, broadening of the nose and so-called "frog-face" result. If the orbit is invaded, protrusion of the eyeball follows, and, when the growth extends downwards deglutition, and even respiration, may become impaired. During the later stages, severe pain is commonly met with, due to pressure on the nerves, while deafness is frequently observed as a result of implication of the Eustachian tubes. Finally, the growths may extend towards the brain; this is followed by the development of cerebral symptoms and meningitis. Death may result from exhaustion, hæmorrhage, sepsis, or from an intracranial complication.

APPEARANCES.—On examination of the pharynx, bulging of the soft palate may be observed, due to the pressure of the tumour from behind. In other cases the lower end of the growth may be seen projecting below the free margin of the soft palate. When the growth is not so large as to project in this

way, it can be seen on posterior rhinoscopy as a pale, or dark-red rounded tumour, more or less filling the naso-pharynx. On anterior rhinoscopy, nothing of note may be detected in the early stages; later on, however, pus, and projections of the tumour, may be seen in the nasal cavities. On palpation of the naso-pharynx, the growth is felt to be immobile and of very firm consistence.

DIAGNOSIS.—This is not difficult in typical cases, though the condition has to be differentiated from a fibro-mucous polypus; but the red colour, the immobility, and the firmer consistence of the tumour all serve to distinguish a naso-pharyngeal fibroma from a fibro-mucous polypus, which is of a blue colour and is freely mobile; moreover, in the latter condition, there is never a history of epistaxis. Sarcoma is the only other condition likely to be confounded with fibroma, but the former is of a much softer consistence.

PROGNOSIS.—The prognosis is always grave; for, though cases of spontaneous involution have been met with, the ordinary course is for the tumour to progress; and to be successful an operation must be complete, and may accordingly be very formidable.

TREATMENT.—The removal of the tumour may be undertaken through the mouth, and to obtain better access the palate may be split. Where the growth is too large to be completely removed by this method, an external operation has to be performed, and the best in such a case is undoubtedly Annandale's, in which access is obtained by splitting the superior maxilla in the middle line.

SIMPLE TUMOURS.

Enchondromata, exostoses, adenomata, cysts, and angiomas among the simple tumours, occur in the naso-pharynx, but require no special description.

MALIGNANT TUMOURS.

Sarcomata and carcinomata both occur in the naso-pharynx. They give rise to nasal obstruction and hæmorrhage. At a later stage, ulceration takes place, with purulent discharge into the mouth and nose. The cervical glands tend to become enlarged in both conditions, but this occurs at an earlier stage in carcinoma than in sarcoma.

APPEARANCES.—These vary considerably. Carcinoma may be present as a broad-based tumour similar to fibroma, but as carcinoma does not occur before the age of 30, a mistake in the diagnosis should not be made. Sarcoma is met with at the same age as fibroma, but it is usually softer, and the cervical glands, which may be enlarged in sarcoma, are never affected in fibroma.

PROGNOSIS.—The prognosis in both forms of malignant disease is bad.

TREATMENT.—This should be operative if there is any hope that complete removal is possible.

CHAPTER XIX.

*CHRONIC INFECTIVE DISEASES, AND OTHER
CONDITIONS.***SYPHILIS.**

Inherited Syphilis may appear in the form of coryza, beginning in the first three months of life. It is characterized by obstinate nasal discharge, which tends to dry up and form crusts; also the irritation of the secretion causes fissures to appear at the anterior nares. The hridge of the nose often becomes flat. In infants so affected, other evidence of the disease should be looked for, and the family history must also be investigated.

Acquired Syphilis.—Primary infections of the nose are very rare. Secondary lesions, in the form of mucous patches, are met with in the nose, but less commonly than in the pharynx, and only slight symptoms are produced. In its tertiary manifestations, syphilis may occur in the nasal cavities both in its hereditary and acquired forms. The septum is the part most commonly affected, but the outer wall of the nose may be involved. The stage of gummatous infiltration is rarely seen, for as a rule ulceration and destruction of tissue have taken place before the patient presents himself for examination. The ulceration is accompanied by a purulent discharge, which tends to dry, and form crusts; these emit a horrible stench, which may be detected at a distance of several feet from the patient. The odour is, however, different from that of ozæna. After the removal of the crusts by syringing the nose, or by the method described in the treatment of ozæna (see page 126), the ravages of the disease can be studied. If the septum is affected, it will be found to be perforated, and the perforation usually involves the bony structures as well as the cartilaginous portion. If the process is still active, the edges of the perforation will be covered with granulations. The loss of tissue may be so extensive

that there may be sinking of the bridge of the nose, and even ulceration and destruction of the external nose. The structures of the outer wall of the nose may also be extensively ulcerated, and in part destroyed. The naso-pharynx is not immune from attack, and ulceration may be found on its roof and in the neighbourhood of the Eustachian cushions.

DIAGNOSIS.—The diagnosis is not difficult as a rule, but syphilis must be distinguished from ozaena, tuberculosis, lupus, and glanders. In ozaena the factor is quite different, and ulceration does not occur. Tuberculous ulceration of the nose is almost always secondary to some other tuberculous lesion, and it is not accompanied by factor. In lupus there is not the rapid loss of tissue found in syphilis, and there is usually the nodular infiltration characteristic of that disease. Glanders may resemble syphilis, but is a much rarer condition. In doubtful cases, Wassermann's reaction should be tried.

TREATMENT.—Apart from the general treatment of syphilis, local remedies are required. The nose should be kept clean by frequent syringing with mild antiseptic solutions (see Appendix), and it may also be sprayed with a solution of peroxide of hydrogen (10 vols.), while all loose sequestra should be removed. The external deformities of the nose, especially the depression of the bridge, may be remedied by the injection of paraffin, or by a plastic operation.

TUBERCLE OF THE NOSE.

Tubercle rarely affects the nose primarily, but is generally secondary to a tuberculous lesion in some other part of the body, more especially in the lungs or the larynx. Tubercle in the nose may take the form of a tumour, or may produce ulceration and destruction of tissue. The tuberculous tumour is a rare manifestation; it appears as a granular growth springing from the septum, and may be mistaken for sarcoma, but microscopical examination will show the true nature of the swelling (granulation tissue with giant cells). It is more common to find ulceration taking place; and the septum is the part most frequently attacked, the cartilaginous portion being first affected. The ulceration is soon followed by perforation of the septum. The outer wall of the nasal cavity may also be attacked.

SYMPTOMS.—These are slight. The ulceration is attended by nasal discharge, but pain is generally absent.

DIAGNOSIS.—The diagnosis has to be made from syphilis and lupus, but the site of the perforation, which in tubercle affects the cartilage and in syphilis involves the bony structures as well, and also the evidence of syphilis or tubercle in other parts of the body, should make the diagnosis clear. If there is any doubt von Pirquet's cutaneous reaction may be tried; if this is positive, it points to the lesion being tuberculous, but if the result is negative, an anti-syphilitic course of treatment may be tried. If of Wassermann's reaction may be tried. If no improvement follows, or if Wassermann's reaction is negative, a syphilitic lesion can generally be excluded. The diagnosis from lupus will be considered later.

TREATMENT.— Unless there is extensive tuberculous infection in other parts of the body, an attempt should be made to remove the diseased tissues completely. In order to do this the ulcerated areas should be freely curetted; the raw surface may then be cauterized with the galvano-cautery, or painted with a strong solution of lactic acid (60 to 80 per cent). This painting should be repeated twice or thrice weekly until cicatrization occurs, as there is a great tendency to recurrence. The nose should be kept clean by irrigation with the nasal douche. The advisability of the tuberculin treatment may also be considered.

LUPUS.

In the nasal cavities, lupus is more commonly met with than tuberculosis. Young persons, especially females, are attacked, and the disease here, as in other parts of the body, is extremely chronic. It is generally associated with some cutaneous lesion. As in tuberculous infections, the septum is the part generally affected, but the turbinated bodies are not immune. The characteristic nodular infiltration already described is seen, and this may be followed by ulceration and loss of tissue. External deformity is sometimes met with, such as sinking in of the tip of the nose, while the *alæ nasi* and *columella* may be eroded, and finally destroyed.

DIAGNOSIS.—The diagnosis of lupus is not difficult as a rule. The very slow progress of the disease serves to distinguish it from syphilis, while the characteristic nodular appearance of the infiltration, and the presence in many cases of a skin lesion, will help to differentiate the condition from tuberculosis.

TREATMENT.—The local treatment is the most important, and must be thorough. The diseased parts should be curetted with a sharp spoon, and lactic acid, chromic acid, or the galvano-cautery should then be applied to the raw area. Treatment by x-rays or radium, if available, may be tried. Tuberculin may also be administered, and is occasionally of benefit. I have, however, tried it in a few cases without observing any marked improvement. The general health of the patient must also be attended to. Pfannenstill, in 1910, suggested a method of treating tuberculous processes by causing nascent iodine to be given off within the diseased tissues. He found if sodium iodide were given internally, and ozone inhaled, that iodine was given off in a nascent form when these two substances came in contact. To obtain a satisfactory result the diseased process must be localized, and there must be an ulcerated area. The method has been most successful when applied to cases of lupus of the nose, and a modified technique has been elaborated by Strandberg. The patient receives at first 1 gram a day of sodium iodide, divided into six doses; the amount is rapidly increased until 6 grams are given every day. When the daily dose has reached 3 grams, gauze tampons are inserted in the nose twice daily, and moistened every ten minutes with a solution of peroxide of hydrogen (*see Appendix*). The patient is provided with a bottle of this solution and a pipette, and makes the application himself. At first there is a marked reaction, and a weaker solution is then used (*see Appendix*). The treatment lasts two or three months. Out of 90 cases treated by Strandberg, 46 were cured.

RHINOSCLEROMA AND LEPROSY

are both met with in the nose, but as they are extremely rare in this country, no description of them is necessary.

FOREIGN BODIES.

Children sometimes introduce buttons, peas, beans, or similar bodies into the nose. If this is found out at once, the foreign body may be readily detected and removed, but if left in the nose, a discharge is set up, which soon becomes purulent and fetid. Accordingly, if a child is brought with a history of a unilateral discharge from the nose, it should at once raise the

suspicion of a foreign body, even if no history of one can be obtained. If the object is one which swells with moisture, nasal obstruction may also be produced. The body may not be visible on inspection, owing to the swelling of the mucosa and the presence of pus. In such cases the nose should be gently syringed and cocainized, after which procedure a second inspection must be made, when the foreign body will probably be seen, or if not seen may be detected by the probe. When located, the body can generally be removed with ease by a pair of toothed forceps, or by a hook which is passed beyond the object and then withdrawn. If it is situated far back, it may be easier to push it on into the naso-pharynx. When dealing with children, it is sometimes necessary to employ a general anæsthetic.

RHINOLITHS.

Rhinoliths are calcareous masses, which are occasionally found in the nose. The deposit of salts, chiefly carbonate and phosphate of lime, takes place round a nucleus, which may be a foreign body or merely blood or mucus.

The SYMPTOMS are the same as in the case of a foreign body, and the diagnosis may be made by inspection, or if necessary by the use of a probe.

TREATMENT.—This will be the same as for foreign bodies, namely, removal. If the rhinolith is too large to remove as a whole, it may be crushed with a strong pair of dressing-forceps, and extracted in pieces.

FUNGI AND PARASITES IN THE NOSE.

Fungi, such as the *Oidium albicans* or the *Aspergillus*, are met with in the nose, and occasionally centipedes or earwigs gain access to the nasal cavities. Sneezing, headache, and discharge, with resulting rhinitis, may be set up. Their occurrence is, however, sufficiently rare to make them of little clinical importance.

MAGGOTS IN THE NOSE (*Syn.* Pecnash).

In hot climates flies may deposit their ova in the nose, and maggots result. It is rare for this to occur in a healthy nose; it is more common in patients suffering from *ozæna* or syphilitic disease of the nose. Epistaxis, headache, lachrymation, and

sneezing develop, and are soon followed by a bloody discharge which becomes purulent; ulceration and destruction of the nasal structures may occur, and death may result from meningitis.

The TREATMENT, which is fortunately efficacious, consists in spraying or instilling oil, or chloroform and water, into the nasal cavities; by these means the larvæ are detached and can easily be removed.

NASAL HYDRORRHOEA.

This is a somewhat rare condition, in which a profuse watery discharge flows from the nasal cavities. St. Clair Thomson showed that some of these cases are due to the escape of cerebro-spinal fluid, while another group of cases can be classed under the vaso-motor neuroses. There are several points of difference between these two varieties.

In the first group there are no symptoms apart from the discharge and headache; the escape of fluid is constant, occurring both night and day; the fluid does not stiffen linen on drying, and when boiled with Fehling's solution it reduces the copper.

TREATMENT is unavailing, but the condition may disappear spontaneously.

In the idiopathic variety, the discharge is not infrequently accompanied by lachrymation and sneezing, both of which are intermittent and paroxysmal in character. The attacks last two or three days; the discharge is thick and viscid and does not reduce Fehling's solution, but stiffens linen on drying. Constitutional treatment is of the greatest service; and, accordingly, the general health must be attended to, and arsenic, in gradually increasing doses, may be given. Waggett recommends the internal administration of calcium lactate, sometimes combined with magnesium.

CHAPTER XX.

NASAL NEUROSES.

OLFACTORY NEUROSES.

Anosmia.—In considering the subject of anosmia, it must be remembered that the special sensory area of the nose is situated in its upper regions, on the septum and on the superior and middle turbinated bodies the olfactory nerve filaments passing into the nose through the foramina in the cribriform plate. Accordingly, before a scent can be detected, it is essential that the particles should reach the olfactory region of the nose. Anosmia, or the loss of the sense of smell, may therefore be caused by nasal obstruction, and is especially common in polypus cases. It is also met with in chronic rhinitis, and in chronic atrophic conditions of the mucous membrane. It may be due to hysteria, injuries to, or diseases of, the central nervous system, such as fracture of the base of the skull implicating the cribriform plate, tumours, apoplexy, basic meningitis, locomotor ataxy, or syphilis, or it may follow an attack of influenza. In testing the sense of smell, it is essential not to select substances such as ammonia, which stimulate the fifth nerve, but rather to employ asafoetida, musk, or peppermint. The loss of smell may be unilateral or bilateral, and usually produces the impression that the sense of taste is also impaired.

TREATMENT.—The treatment necessarily depends on the cause, but where there is no gross lesion to be dealt with, little benefit can be obtained as a rule. Strychnine, administered internally, may be of service, and local galvanization or faradization has been advocated.

Parosmia, and Hyperosmia.—*Parosmia*, or perversion of the sense of smell, is met with in central nervous lesions and in hysteria.

Hyperosmia, or hyperaesthesia of the olfactory nerves, is found in neurasthenic and in hysterical individuals.

TREATMENT as a rule has but little effect in either condition.

VASO-MOTOR NEUROSES.

Simple Erectile Swelling.—Erectile tissue is to be found underlying the mucous membrane of the turbinated bodies, especially the inferior, and to a less extent the middle, turbinal. This tends to become engorged with blood in neurasthenic individuals, particularly when they are run down from overwork; also in gouty subjects, in persons who over-indulge in alcohol, and in women during the menstrual period. The engorgement is periodic, is often more marked in the recumbent posture, and may alternate from one side of the nose to the other.

SYMPTOMS.—These are intermittent, the most important being nasal obstruction.

APPEARANCES.—On examining the nose, it may appear quite normal, or the turbinated bodies may be enlarged. To distinguish between vascular engorgement and true hypertrophy, it is necessary to apply a solution of cocaine (5 to 10 per cent); this causes collapse of erectile swelling, while the enlargement due to hypertrophy remains unaffected.

TREATMENT.—The treatment should be directed towards improving the general health by nerve tonics, exercise, and a highly nutritious diet. The habits of the patient as regards the use of alcohol, tobacco, tea and coffee should be inquired into. Occasionally the restriction of tobacco and alcohol alone will have a markedly beneficial effect on the condition. As regards local treatment, it is generally advisable to proceed at once to the application of the galvano-cautery. It is better to employ the edge of the burner rather than the flat surface; a deep furrow should be burnt along the whole length of the inferior turbinated body, thus tacking, as it were, the mucous membrane down to the bone.

Hay Fever.—Hay fever is a form of paroxysmal sneezing, accompanied by engorgement of the turbinated bodies. It is due in the majority of cases to irritation caused by the pollen of certain grasses, but it may also depend on the effluvia of some animals, such as cats, horses and dogs, or result from the emanations of certain flowers, especially roses. In many cases no abnormality can be made out in the nasal cavities, but in others spines may be found, which press against the inferior turbinals, or there may be some degree of septal deviation or

hypertrophic rhinitis; and any of these conditions may predispose to the affection.

Hay-fever subjects are generally of a neurotic disposition. In this country the attacks begin in June, but in America the incidence is later, about the end of August. Lachrymation and irritation in the nose are the first symptoms; bouts of sneezing follow, and the turbinated bodies become congested and enlarged; the conjunctivæ are also injected and swollen. The condition lasts for about three months, and in severe cases it utterly prostrates the unfortunate sufferer.

TREATMENT.—It is important that the patient's general health should be in as good a state as possible; it is therefore advisable, before the commencement of the hay-fever season, to give a course of nerve tonics, such as quinine, arsenic, or valerianate of zinc. If the patient can afford the time and cost, the condition may be prevented by sending him for a sea voyage or to a high altitude during the season. When this is out of the question, some form of local treatment must be employed, and if there is some abnormality in the nose, it may be corrected, though it is impossible to promise a cure from such interference. I have, however, had one very striking result. The patient was a lady who had been a martyr to hay fever for many years. I saw her in consultation with Dr. Burn Murdoch, of Edinburgh, and being persuaded by him, without being very hopeful myself, I removed a slight septal deviation with a spur which sometimes came in contact with the inferior turbinal. This was done before the commencement of the hay-fever season, and the patient had no trouble the summer following.

In cases where there is no abnormality to deal with, other measures must be employed. Watson Williams recommends spraying the nose with a solution of biniodide of mercury (1-10 or 1-20). In his experience this treatment has proved highly successful in many cases, but the pain following the injection is sometimes so severe that morphia has to be given. If this treatment is carried out at the onset of symptoms, the patient will sometimes remain free for the season. Some patients find relief in the use of Dunbar's serum antitoxin, pollantin; but unfortunately this is not always satisfactory, and even when successful at first, may lose its effect in course of time. The form of treatment the most likely to be of service is the application of the cautery; this is made either to

the inferior turbinal, or to any specially sensitive areas which may be detected by means of a probe.

Nasal Asthma.—It has long been known that asthma may be associated with nasal disease. Polypi, sensitive spots on the nasal mucosa, hypertrophic rhinitis, or simple erectile swelling of the turbinals, may all predispose to asthma, and the treatment of these conditions may cure, or at least relieve, the asthmatic attacks. But it must not be supposed that changes in the nose are to be found in all cases of asthma, or that intra-nasal treatment is always advisable. Mention must, however, be made of Dr. Francis' views. He advocates routine cauterization with light applications of the hurner to the tubercle of the septum, even in the absence of abnormal conditions in the nose, and has reported many lasting cures by such treatment.

Besides hay fever and asthma, many other neuroses have been attributed to nasal disease. The late Professor Hack drew special attention to this, and argued that spasm of the glottis, spasmodic cough, migraine, and epileptiform attacks might be cured by operative interference upon the erectile tissue. Other writers have added to this list Graves' disease, diabetes, tachycardia, nocturnal enuresis, and many other conditions. A warning must, however, be given against exaggerating the importance of the nose as a possible cause of such affections: still, I have seen one striking case illustrative of the association of epilepsy with nasal disease. The patient was a girl seen in consultation with Dr. Edwin Bramwell, of Edinburgh. She had for two years suffered from frequent attacks of epilepsy, following a fall on the nose. Before each attack there was a distinct nasal aura, which consisted in what she described as a "drawing" feeling at the root of the nose. She also complained that her nose was always more or less tender. I found a moderate degree of deviation of the septum to the right and a slight external swelling on the same side, and performed a submucous resection of the septum, with the very gratifying result that the epileptic attacks entirely ceased. I saw the patient again two years later, and there had been no return up to that time.

CHAPTER XXI.

DISEASES OF THE ACCESSORY SINUSES.

THE accessory sinuses consist of the antrum of Highmore or the maxillary sinus, the ethmoidal cells (which are divided into an anterior and a posterior group), the frontal sinus, and the sphenoidal sinus.

The antrum, the frontal sinus, and the anterior ethmoidal cells open into the middle meatus of the nose, while the posterior ethmoidal cells and the sphenoidal sinus open above the insertion of the middle turbinated body, the sphenoidal sinus opening into the recessus sphenoidalis, which lies above the superior turbinal. One or more of these sinuses may be the subject of inflammation, which may be either acute or chronic, and the discharge may be catarrhal or purulent. A suppuration within one of the sinuses is termed sinusitis; if the aperture of the sinus remains patent, it is said to be an "open" sinusitis, while if the aperture is blocked, it is termed a "manifest" or "closed" sinusitis. An open sinusitis, if unattended by symptoms or in which the symptoms are very slight, is called "latent." An acute suppuration may begin as a closed sinusitis and become open by the sudden giving way of the normal ostium. The evacuation of the pus may cause all the symptoms to disappear, and the sinusitis may then become latent. If the ostium again becomes occluded, the sinusitis returns to its closed state: this process may be repeated several times. In many acute cases, the inflammation within the sinus never passes the catarrhal stage, and subsides under expectant treatment. In the following description the sinuses will be considered singly, but it must be remembered that several or all of them may be simultaneously affected.

It is necessary, in the first place, to discuss briefly the bacteriology of sinus disease. This important subject has been studied by many authors, in addition to the not less important

question regarding the flora met with in the healthy nose. St. Clair Thomson and Hewlett have shown that, although cultures can readily be obtained from the vestibule of the nose and the vibrissæ, the nasal cavities are usually free from organisms. Logan Turner and Lewis, who have studied the bacteriology of suppuration in the accessory sinuses of the nose, have come to the following, among other, conclusions:—

1. That pyogenic cocci are more often responsible for sinus suppuration than bacilli.

2. That four main types of cocci are commonly met with in sinus suppuration, viz., pneumococci, streptococci, staphylococci, and diplococci of the type of *Micrococcus catarrhalis*.

3. That the following groups of bacilli are frequently present in sinus suppuration: (a) *B. coli* and its allies; (b) Putrefactive bacteria, such as proteus and its allies; (c) Dental organisms, such as *B. gangrenæ pulpæ* and *B. necrodentalis*; (d) An obligate anaerobic group, of which prominent members are *B. perfringens* and *B. influenza*.

MAXILLARY SINUS OR ANTRUM OF HIGHMORE.

Acute Inflammation.—The infection of the maxillary sinus may proceed from the nose or from the teeth, but Logan Turner and Lewis have shown that a nasal infection is the more common. The chief causes of an acute inflammation, apart from an infection from the teeth, are acute rhinitis, or influenza; but it may also result from the exanthemata, from operative interference within the nose, or from the presence of a foreign body.

SEMEIOLOGY.—The symptoms consist at first of a feeling of tension, and later of pain, which may become almost unbearable and is generally localized to the cheek, but is sometimes referred to the eye, the teeth, the temple, or the forehead: it is generally increased by applying pressure, or by sudden movements of the head. Nasal obstruction is generally complained of, and if the opening of the sinus remains patent, there is also nasal discharge, at first scanty and viscid, but except in the mildest cases soon becoming purulent and abundant; indeed it may be so excessive that many ounces are poured out during the twenty-four hours. As a rule the discharge is odourless, but it is occasionally very fœtid, even in acute suppuration. The temperature is raised except in the mildest cases, and may

reach 101° - 102° F. ; there is an accompanying feeling of malaise, and sometimes marked mental depression. In very rare instances the antral orifice remains closed throughout ; swelling, redness, and cedema of the cheek then supervene, and if the case is not treated, definite pointing of the abscess will occur.

APPEARANCES.—On anterior rhinoscopy the inferior turbinal is seen to be congested and swollen, and pus may be observed proceeding from the middle meatus. The teeth should be carefully examined for evidence of disease, especially about the roots, as the possibility of a dental infection must not be lost sight of.

The diagnosis and treatment will be considered in the section on chronic suppuration.

Chronic Suppuration.—A chronic suppuration may result from an acute infection, or the onset may be insidious from the first ; the latter is most frequently observed when the infection has been of dental origin.

SYMPTOMS.—The symptoms may be very slight ; the most constant being a purulent discharge from the nose, which is unilateral if only one antrum is affected. It is also intermittent as a rule, and varies greatly in amount ; it may be foetid and very slight in quantity, and give rise from time to time to a nauseating smell and taste. Headache is sometimes complained of, and there is often an extreme disinclination for work and an inability to concentrate the attention. Pain is occasionally present, and is of the nature of infra-orbital, or sometimes even of supra-orbital, neuralgia ; in other cases there is deep-seated pain in the eye. The symptoms may be aggravated at any time by the orifice of the antrum becoming blocked ; bulging of one of the walls may then become apparent. Paroxysmal sneezing is sometimes produced, and fits of coughing, due to the entrance of pus into the larynx, are not uncommon. Disturbance of the digestion, and diarrhoea, caused by the long-continued swallowing of pus, are also occasionally met with.

DIAGNOSIS.—The diagnosis is made from the symptoms and from the following signs : Pus seen in the middle meatus and reappearing there on the application of the "posture test." This test is carried out in the following way : the nose is thoroughly cleansed (if necessary by syringing), the patient then inclines his head forwards and downwards, and tilts it so that the cheek on the affected side is uppermost. After a few

minutes the nose is inspected, and if pus is seen to have re-appeared far back in the middle meatus, the result is positive. The rationale of the test depends on the anatomy of the antral opening, which is situated on the inner wall close to the roof of the sinus; accordingly, when the patient is in the erect posture, pus does not escape unless the antrum is full, but by lowering the head, as above described, the relation of this opening to the sinus is altered, and pus can find its way into the nose, even when it is present in small quantities. A negative result does not exclude antral disease, as the pus may be too viscid to escape through the antral orifice. A small proportion of cases are associated with polypi in the nasal cavities, but their presence is much more suggestive of ethmoidal or frontal sinus suppuration. Transillumination is also a useful test; it has been fully described elsewhere (see page 103).

Examination by x-rays is not often necessary in an uncomplicated case, but if a skiagram is taken, a diseased sinus appears dark in the positive. A solid tumour also produces a dark shadow, as does a choanal polypus springing from the antrum. The only way of proving conclusively that an antrum contains pus, is by carrying out "proof puncture" and aspirating or washing out the matter from the antral cavity through the cannula. There are a considerable number of instruments on the market for this purpose. I prefer B. Fränkel's cannula with syringe attached, by means of which pus, if present, can be aspirated. The advantage of this is that pus so obtained is not contaminated by passing through the nasal cavities, and accordingly the result of a bacteriological examination may be depended upon; there is, moreover, no doubt that the pus comes from the antrum. Before carrying out the procedure, the nose must be carefully anaesthetized by placing a pledget of wool, dipped in a 10 per cent solution of cocaine or novocain, under the inferior turhinated body and against the outer wall of the nose. This is allowed to remain for about five minutes, and is then withdrawn. The point of the cannula is next introduced under the inferior turbinal, and is pushed in an outward and upward direction at a point close to the attachment of the turbinal and about an inch from the anterior nares. There is generally no difficulty in perforating the wall of the sinus, but in the case of failure, another trial should be made at a point farther back. When the cannula has penetrated the

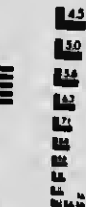
antrum, the piston of the syringe is withdrawn, and if the procedure is carried out merely for the purpose of diagnosis, and pus is aspirated, the instrument may be removed. When there is failure to obtain pus in this way, or when it is desired to combine treatment with diagnosis, the syringe is detached (it is fixed to the cannula by a bayonet joint), and the antrum is washed out through the cannula by means of a Higginson syringe, which is provided with an attachment for the purpose.

TREATMENT.—In the earliest cases, i.e., when the patient is seen within a few weeks of the onset of symptoms, and when the antrum is the only sinus affected, it is frequently possible to cure the condition by repeated puncture and lavage, the procedure being carried out daily for a few days, and thereafter every second or third day till a cure results. If there is not a marked diminution in the amount of discharge after three or four days, this method of treatment is not likely to succeed, and should be abandoned. It is then advisable to make an opening in the nasal wall, sufficiently large to permit of the patient carrying out lavage for himself. In cases of only a few weeks' standing, treatment by lavage through a large opening in the inferior meatus is frequently successful. This route should be adopted in preference to the alveolar, but in cases of dental origin the diseased tooth should be removed or stopped. The operation is performed preferably under general anaesthesia, though it can be carried out under local anaesthesia. The anterior end of the inferior turbinal is removed by a pair of scissors and a snare, the cut with the scissors being made as close as possible to the attachment of the inferior turbinal, and the part so separated being removed with the snare. An opening has next to be made in the antro-nasal wall; it should be as close as possible to the nasal floor, and well forward, as this will facilitate the introduction of the antral cannula; this is an important point, because the patient must learn to wash out the antrum himself. The opening may be made by a series of hand burrs, beginning with a small size, or by specially designed punch-forceps. It is necessary to take away a considerable area of bone, as there is in many cases a marked tendency to closure of the opening. The after-treatment consists in daily lavage through the opening by means of an antral cannula and syringe: this must be continued until the discharge ceases.



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In cases of long standing, more radical treatment is advisable, although a considerable number of chronic cases may be cured by lavage. In the selection of cases suitable for this form of treatment, some assistance may be obtained by bacteriological examination of the pus. Thus Logan Turner and Lewis have found that chronic cases, where no streptococcus is found in the pus, respond more readily to lavage than those in which that organism is present; and further, that when there is an excess of lymphocytes in association with the *Streptococcus pyogenes*, treatment by lavage should not be attempted.

The radical operation consists in opening the antrum through the canine fossa, removing any polypi within the antrum, and curetting the more diseased portion of the lining membrane. A counter-opening is then made in the lower part of the nasal wall, and the opening in the mouth is allowed to close. A portion of the inferior turbinal should also be removed to facilitate lavage, which is subsequently carried out through the nasal opening. The after-treatment may be prolonged, but a cure is to be expected unless one of the other sinuses is also affected; in which case pus is apt to find its way into the antrum, and delay or prevent recovery. In these circumstances, when it is doubtful whether the antrum alone is affected, a skiagram should be taken to determine the point.

FRONTAL SINUS.

The ETIOLOGY of inflammation of the frontal sinus is the same as that of inflammation of the antrum, with the exception that a dental infection is not possible.

Acute Inflammation.—SEMEIOLOGY.—The most characteristic symptom is frontal headache, which differs from supra-orbital neuralgia in that it is diffused over the whole extent of the frontal sinus and is not specially referred to the area of distribution of the supra-orbital nerve. There is frequently definite tenderness on tapping lightly over the diseased sinus, as well as slight redness and œdema of the skin, and also œdema of the upper eyelid. The headache may become almost unbearable, especially if the frontal opening remains blocked; it is frequently intermittent and periodic; for example, it often begins in the morning, and dies away after three or four hours. If the inflammation passes the catarrhal stage, and the opening is patent,

pus will find its way into the nose through the fronto-nasal duct, and will appear high up in the middle meatus. Edema of the processus uncinatus, and congestion of the mucosa will probably be apparent also. If the discharge comes away freely, it is generally followed by a marked diminution of the symptoms, but when the sinus remains closed, pointing of the abscess takes place. The abscess may burst externally, just above the inner canthus of the eye, or into the orbit; in the latter case there are protrusion and displacement of the eyeball.

DIAGNOSIS.—The frontal headache and the tenderness on pressure over the floor and anterior wall suggest the diagnosis of an inflammation in the frontal sinus, more especially if pus is present in the middle meatus and reappears after the nose has been cleaned while the patient's head remains in the erect posture. It is not possible without the aid of a skiagram to determine whether the frontal sinus alone is affected, or if there is an inflammation of the ethmoidal labyrinth, either alone or combined with the frontal sinusitis. Further points in the diagnosis and the treatment will be discussed in the section on chronic inflammation of the frontal sinus.

Chronic Inflammation of the Frontal Sinus.—This is usually associated with suppuration in the ethmoidal labyrinth.

SYMPTOMS.—The symptoms may be very slight when the condition is latent; in fact there may be no symptoms except the discharge of pus. There may, however, be headache and tenderness on pressure over the sinus, but when the latter is present it is less marked than in acute cases, and is usually elicited from the floor. Disinclination to work and inability to concentrate the attention are also generally noticeable. On inspection of the anterior nares, pus is found in the middle meatus, and after the nose has been cleaned may be seen coming from its upper part. Polypi are frequently present, especially if the ethmoidal labyrinth is involved.

COMPLICATIONS.—*Suppuration in the antrum* may follow a frontal sinusitis as a result of the passage of pus down the infundibulum and through the antral orifice.

Orbital complications will be described later.

Intracranial complications may also arise, either as the result of perforation of the posterior wall of the frontal sinus, with resulting meningitis or abscess of the frontal lobe, or by the

passage of the infection through the venous channels or lymphatics without the erosion of bone.

Osteomyelitis of the frontal bone is a rare but very dangerous complication; it is characterized by puffiness of the skin. It may also result from operative interference, in which case it is generally fatal.

DIAGNOSIS.—It is more difficult to diagnose suppuration in the frontal sinus than empyema of the maxillary sinus, owing to the close anatomical relationship between the anterior ethmoidal air-cells and the frontal sinus. The presumptive symptoms and signs of frontal sinusitis have already been mentioned in the discussion of acute inflammation of that cavity, namely, headache, tenderness on pressure over the floor and anterior wall of the sinus, and the presence of pus in the middle meatus, which tends to reappear, after removal, while the patient is in the erect position.

Transillumination (see page 103) does not give any assistance in arriving at a diagnosis; a skiagram affords the only conclusive proof of the presence of disease that can be obtained apart from an actual operation. An antero-posterior view is taken, and in the case of unilateral disease, there is usually very little difficulty in determining if the cavity is affected or not. A diseased sinus shows a blurred outline, and throws a darker shadow than the normal sinus when viewed in the positive; by a comparison of the depth of the shadow on the two sides, it will be possible to ascertain if the ethmoidal labyrinth is also involved. In the event of an operation being decided upon, the breadth of the ethmoidal labyrinth in association with the floor of the frontal sinus can be estimated. This gives a clue beforehand as to the amount of space available for draining the sinus into the nose. In unilateral cases, the diagnosis can usually be made by the examination of a skiagram by a comparatively inexperienced individual, but it must be admitted that in bilateral cases even the expert may have considerable difficulty in forming an opinion, although the determining factors are the same,—the blurring of the edges, and the dark shadows thrown by the sinuses, more especially when they are large. In the case of small sinuses, however, the difficulty becomes greater, as they naturally throw a deeper shadow in the positive than does a large and deep cavity, and the edges are not so well defined. In addition to determining the existence of disease, a skiagram

shows the size of the sinus and the presence of an orbital extension, or, if the sinus is absent, conclusive evidence of that fact is obtained. In short, so much information can be gained from a good x-ray picture, that I think it is hardly justifiable to open a frontal sinus without having previously resorted to this method of diagnosis.

Another method of diagnosis is available, which consists in passing a probe or fine cannula into the frontal sinus through the natural opening; if pus is withdrawn or can be washed out through the cannula, it is probable that there is suppuration in the cavity. Some experience in intra-nasal technique is required to pass the probe; indeed, owing to anatomical variations, even the expert may sometimes fail to do so; the surgeon has, moreover, no proof that the probe has really found its way into the sinus, for it may have entered an ethmoidal cell bulging the floor of the frontal sinus—a so-called *hulla frontalis*. If a skiagram is taken, this procedure may be dispensed with.

TREATMENT.—Cases of acute frontal sinusitis generally yield to expectant treatment unless the frontal duct remains blocked throughout, when the pointing of the abscess or some complication calls for an external operation. In an early acute case, the patient should be confined to bed, and potassium iodide may be given internally. An attempt should also be made to diminish the congestion in the middle meatus of the nose, so as to permit of the pus escaping from the fronto-nasal duct, and for this purpose inhalations of a 5 per cent solution of menthol in alcohol may be ordered—a teaspoonful to a pint of hot water (140° F.). If this fails, the congestion may be diminished by making linear incisions in the middle turbinal, as recommended by Lack, while suction may also be carried out by means of a Politzer bag. The bag is compressed, and the nozzle adjusted within the nostril of the affected side; the anterior nares are then compressed, and the bag is allowed to expand. The swelling may also be diminished by the application of pledgets of cotton-wool dipped in a 5 per cent solution of cocaine, and applied to the infundibulum where they are allowed to remain for a few minutes. A spray of cocaine (3 per cent) may be prescribed for the same purpose, to be used by the patient himself two or three times a day. If no relief is obtained by these means, it will be necessary to remove the anterior third of the middle turbinal body, which acts as a lid to the opening of the frontal sinus.

D.T.

The headache, frequently very distressing, can generally be relieved by the use of a light bath for the head (*Fig. 54*). This treatment was introduced by Killian, and the apparatus used is Brünings' "Kopflichtbad," made by Fischer of Freiburg. The baths may be given once or twice daily, each bath lasting about half an hour. The temperature is allowed to rise to 70° or 80° C., and then to fall to 40° C. Care must be taken to avoid a chill after the bath. If, in spite of all these measures, the symptoms are not relieved, an external operation is necessary. The sinus is opened through the anterior wall or the floor, and



Fig. 54.—Light Bath.

free drainage into the nose is provided. Ingals and Max Halle advocate intra-nasal opening of the sinus, but, owing to the risk of this operation, it is not performed by many rhinologists.

The treatment of chronic suppuration is much more conservative than it was a few years ago; and a chronic discharge of pus *per se* can hardly be considered a sufficient indication for a radical operation, because such operations have a certain mortality and are accompanied in many cases by more or less disfigurement. In any case, before such an operation is undertaken, an attempt should be made to obtain free drainage by intra-nasal methods. Any polypi in the nose

should be removed, and the anterior third of the middle turbinal resected; in many cases this treatment, if followed by regular syringing, will so far relieve the symptoms that the patient will not be inclined to undergo a severe operation. When, however, such treatment fails to relieve, or when an orbital or an intra-cranial complication threatens, a radical operation is imperative. The operation should consist in the free exposure of the cavity, the removal of the diseased mucosa, the establishment of free drainage into the nose, and in most cases an attempt to obliterate the cavity. Killian's bridge operation fulfils all these conditions; and by leaving the upper margin of the orbit, while the anterior wall and the floor of the sinus are removed, the resulting deformity is reduced to a minimum. Osteoplastic operations have also been carried out to obviate the deformity, but they do not permit of obliteration of the cavity. It is beyond the limitations of this book to give details of these operations.

ETHMOIDAL LABYRINTH.

Ethmoidal suppuration may be acute or chronic, and is nearly always associated with inflammation in one or more of the other sinuses.

Acute Inflammation.—SEMEIOLOGY.—Headache, and pain or a feeling of pressure in the nose, are complained of, and there may be tenderness on pressure on the nose and on the floor of the frontal sinus, especially if the cells in the neighbourhood of that cavity are affected. The sense of smell is greatly impaired, partly on account of the nasal obstruction. On rhinoscopic examination, the middle turbinal is found to be swollen and red, and muco-pus or pus may be seen in the middle meatus; the discharge may be very abundant.

DIAGNOSIS.—The diagnosis is made from the symptoms and appearances, while the probability of an associated suppuration in one of the other sinuses must not be lost sight of.

TREATMENT.—Expectant treatment, on the lines indicated for acute frontal sinus suppuration, will nearly always effect a cure; if necessary, however, a part of the middle turbinal may be removed, and some of the cells of the ethmoidal labyrinth may be opened.

Chronic Inflammation.—As in the case of chronic inflammation of the other sinuses, chronic suppuration in the ethmoidal

labyrinth may be attended with little general or local disturbance. Pain may, however, be complained of; there are usually nasal obstruction and discharge, and the sense of smell is also impaired. Inability to work is often a prominent symptom. On inspection of the nose, polypi are generally found in the middle meatus, and on palpation with a probe, dead bone may sometimes be felt.

DIAGNOSIS.—This is made from the symptoms and appearances in the nose, but antral suppuration and frontal sinus disease must be excluded; and, as has already been pointed out, this can most readily be managed by the examination of a skiagram.

TREATMENT.—Intra-nasal methods are much more effective in the treatment of chronic ethmoidal suppuration than of chronic frontal or maxillary sinusitis. The first step is to remove any polypi which may be blocking the middle meatus; and if the middle turbinal prevents ready access, a portion of it should also be resected. A spray of a weak solution of peroxide of hydrogen, followed by a nasal douche, should be prescribed for subsequent daily use. If new polypi appear rapidly, or if the symptoms still persist, an attempt should be made to clear out the ethmoidal air-cells by means of some cutting forceps, such as Grünwald's; this should be done under guidance of vision, and generally under local anæsthesia. The employment of curettes, guided only by the sense of touch, as recommended by Lack, is to be deprecated, as there is considerable danger of causing meningitis by fracturing the cribriform plate, or of endangering or even losing the eye by perforating the wall of the orbit. It is accordingly wiser to have recourse to an external operation if radical treatment is required: for this purpose an incision from the inner end of the eyebrow down the side of the nose, followed by removal of the nasal process of the superior maxilla, will give excellent access. At the same time, if desired, the frontal sinus may be explored through its floor.

SPHENOIDAL SINUS.

Acute Inflammation of the sphenoidal sinus generally subsides under sedative treatment, such as has been recommended for acute frontal sinusitis. The diagnosis must accordingly be uncertain in many cases, and it is only in those instances where dangerous complications ensue and where

operative interference is necessary, that the diagnosis can be confirmed. We may therefore pass at once to the consideration of chronic suppuration, the symptoms of which are similar in character to those of acute suppuration, and differ only in degree.

Chronic Inflammation.—**SEMEIOLOGY.**—The symptoms may be in almost complete abeyance, but pain is occasionally met with, and is referred to the occiput, the ear, or the eye, or may be deeply seated in the head. Nasal obstruction and anosmia are frequently complained of.

From the close relation of many important structures to this sinus, various complications, both orbital and intra-cranial, are liable to occur. Among these the most important are retro-bulbar neuritis, optic atrophy, thrombosis of the cavernous sinus, meningitis, and cerebrial abscess.

APPEARANCES.—On anterior rhinoscopy, pus may be found in the olfactory sulcus; while, on posterior rhinoscopy, pus will be seen on the roof of the naso-pharynx, in the fossæ of Rosenmüller, and also above the middle turbinal.

DIAGNOSIS.—The diagnosis is made from the symptoms and signs, and by the exclusion of suppuration in the other sinuses. A skiagram may afford considerable assistance: it should be taken through the vertical diameter of the head, after the method recommended by Pfeifer, the plate being placed under the chin. The sphenoidal sinuses are seen side by side, and their shadows can be compared. To confirm the diagnosis, it is generally necessary to expose the opening of the sinus by removing a part of the middle turbinal; it may, however, be possible to inspect the opening by Killian's method of median rhinoscopy (see page 97). If pus is seen emerging from the orifice, the sinus must be widely opened. The diagnosis and treatment of this condition present such difficulties that the assistance of a specialist will in all cases be found imperative.

COMBINED AFFECTIONS.

It has already been stated that several or all of the accessory sinuses may be simultaneously affected; in such cases the treatment must be modified to suit the special requirements, as even an operation in one sitting on all the sinuses of one side is hardly to be thought of. The views of various authorities differ on this question, and it must be left to the specialist to

decide how much is to be done at one time, and in what order the sinuses are to be dealt with. In a case where the frontal sinus, ethmoidal labyrinth, and antrum on one side are all involved, it is generally advisable to treat the antrum and the ethmoidal cells first, as this is a less serious operation, and permits of more ready discharge of pus from the frontal sinus. The condition may improve so much after this operation, that in some cases it may be found unnecessary to do anything further.

OCULAR AND ORBITAL COMPLICATIONS OF SINUS DISEASE.

Ocular and orbital complications may arise in suppuration of both the anterior and the posterior group of sinuses; and it is convenient to discuss these together to avoid repetition. The subject may be better understood if it is remembered that the anterior group,—the frontal sinus, the anterior ethmoidal cells, and the maxillary sinus,—is contiguous to the roof, the inner wall, and the floor of the orbit in its anterior half or less; while the posterior group,—consisting of the sphenoidal sinus and the posterior ethmoidal air-cells,—is in immediate relationship to the posterior half of the inner wall of the orbit, and to the sphenoidal fissure and optic foramen. In consequence of this anatomical relationship, we may find, as a result of suppuration in the anterior group of cells, œdema of the eyelids, orbital periostitis and abscess (generally sub-periosteal), and dacryocystitis; while suppuration in the posterior group of sinuses is associated with retrobulbar neuritis, optic atrophy, and paralysis of the ocular muscles. The infection may spread to the orbit in various ways, the most common being by direct contiguity, as the result of caries and absorption of the bony wall of the sinus. In some cases, however, as Zückerkandl and others have shown, there are lacunæ in the bone, so that the lining membrane of the sinus and the orbital periosteum are in direct contact, thus permitting the spread of the disease. A third means of infection is by the venous channels which pass from the sinuses through the orbit to the cavernous sinus; and a fourth route is by the lymphatics.

In orbital complications of the anterior group of sinuses, œdema of the eyelids is commonly the first sign that the inflammatory process has extended to the orbit; this is followed by

proptosis, and occasionally outward displacement of the eyeball, and diplopia. If the condition is not treated, the abscess, which is at first subperiosteal, may perforate the periosteum and cause sloughing of the orbital tissues, and it will probably also give rise to septic thrombosis of the cavernous sinus, and so cause death. When the posterior group of sinuses is the source of infection, retrobulbar neuritis, optic atrophy, and paralysis of the ocular muscles may be met with; while, in the absence of ophthalmoscopic changes, central scotoma and peripheral contraction of the field of vision, especially for colours, may be found. The diminution in the fields may be bilateral, although the sinus affection is limited to one side, while in some cases the symptoms are contra-lateral. The value of these symptoms lies chiefly in the fact that they suggest nasal disease, and should therefore lead to examination of the nose and exploration of the sinuses, even if there is no obvious supuration.

TREATMENT.—When the complication is due to one of the anterior group of sinuses, an external operation on the cavity is necessary; and any collection of pus in the orbit should be evacuated at once, for delay may lead to the loss of sight, or even to a fatal issue as a result of a secondary intracranial complication.

In the case of the posterior group of sinuses, operation is also urgently required, as it is followed in many cases by the disappearance of the eye symptoms, although in some instances there is no improvement. In latent sinus disease, the middle turbinal may be resected, and the sphenoidal sinus and posterior ethmoidal cells be opened. A good result may follow even if no pus is found.

MUCOCELE OF THE ACCESSORY NASAL SINUSES.

A mucocele is a distension of one or more of the walls of a cavity, and an accumulation within it of a mucous secretion resulting from blocking of its outlet. As a rule, one of the anterior group of sinuses is affected, most commonly the frontal sinus or the ethmoidal labyrinth; some authors dispute the possibility of the antrum being so involved. The ethmoidal labyrinth is generally considered to be more frequently affected than the frontal sinus, but the reverse is the case in the experience of Dr. Logan Turner, to whom we are indebted for an important contribution to our knowledge of this subject.

SYMPTOMS.—In many cases the orbital changes are the predominant feature, and the patient first seeks advice from the oculist. A swelling is found, which develops slowly and is characteristically free from pain. On palpation, it is frequently found to be tense and elastic, and it sometimes gives a sensation of crackling. When the bone has given way, the swelling may be made to disappear partially with pressure, and it is occasionally possible to feel the defect in the bone. The swelling is situated below the inner and upper margin of the orbit and above the inner canthus; although its position varies slightly, it is not always possible to decide whether the ethmoidal labyrinth or the frontal sinus is involved. When the swelling attains any size, the eyeball is displaced, generally in a forward downward and outward direction; this is associated in some cases with dipopia. The palpebral fissure is also seen to be at a lower level than that on the healthy side. In addition to the points above mentioned, Logan Turner lays some stress on epiphora as a possible early symptom in these cases.

APPEARANCES IN THE NOSE.—The examination of the nose may prove negative, or swelling on its outer wall may be observed, while a mucous discharge is sometimes complained of. If an air-cell in the middle turbinal is the site of the mucocele, that body will appear swollen, sometimes to an enormous degree. A mucocele may become infected by pyogenic organisms, and the condition then becomes comparable, both as regards the symptoms and signs, with a case of closed sinusitis.

DIAGNOSIS.—The diagnosis is not difficult as a rule, as the symptoms and appearances described above are sufficiently characteristic. It is not, however, always easy to determine which sinus is affected, and here a skiagram may give valuable assistance (see *Fig. 43*). If there is no absorption of the bony walls of the cavity, or if the sinus has become infected with pyogenic organisms, the appearances characteristic of suppuration are met with; but when one of the walls of the sinus has been absorbed, the sinus appears brighter than the normal.

TREATMENT.—In the cases associated with an orbital swelling, an external operation is necessary. The affected sinus is opened and treated in the same way as an acute suppuration, while the orbital collection is also evacuated. The contents of the swelling are of a thick, tenacious, mucoid

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or serous consistence, unless the mucocele has become infected, in which case they become purulent. In cases limited to the ethmoidal labyrinth, intra-nasal opening and drainage may be sufficient to effect a cure.

DENTAL CYSTS IN CONNECTION WITH THE ANTRUM OF HIGHMORE.

Dental cysts in connection with the premolar or molar teeth may encroach upon the antrum. They produce a well-marked swelling on the facial wall of that cavity, which is thinned and yields to pressure, and sometimes gives a crackling sensation to the finger. The swelling may be sufficiently large to cause a distinct bulging of the cheek. On transillumination, the affected cavity appears brighter than its fellow, unless it has become infected with organisms, in which case it does not transilluminate. In skiagrams of these cases, the cyst appears as a dark clearly defined area, surrounded by a clear area representing the healthy portion of the antrum.

DIAGNOSIS.—The diagnosis is simple, unless suppuration has taken place, in which case the condition may be mistaken for an empyema of the antrum.

TREATMENT.—The treatment consists in opening the cysts through the canine fossa; the contents are evacuated, and the cyst wall is removed; if the offending tooth can be detected, it should be extracted. A counter-opening should be made into the nose, as in the radical operation, to permit of lavage.

SECTION IV.
DISEASES OF THE EAR.

CHAPTER XXII.
METHODS OF EXAMINATION.

FUNCTIONAL EXAMINATION.

THE routine examination in every case of ear disease should include tests of the acuity of hearing; and it is advisable, before any treatment is adopted, to make a note of the results in writing, for future reference. The tests may be carried out by the watch, the acoumeter, and the voice. One ear should be tested at a time, the other being tightly closed by the patient's finger, either inserted in the meatus or pressed against the tragus. In testing the deaf ear in a case where there is a marked disparity between the hearing of the two sides, it is sometimes impossible to say whether the test sounds are heard by the deaf or by the good ear, if the latter is closed in the ordinary way. To obviate the possibility of mistake, Bárány's noisc apparatus should be used in the good ear. The instrument is worked by clockwork, and is provided with an ear-piece, which is inserted into the meatus. The results of the tests by a watch are expressed by a fraction, of which the numerator indicates the distance in inches at which the watch is heard by the patient's ear, and the denominator the mean distance at which the same watch is heard by persons with normal hearing. Accordingly, if a patient hears a watch at 12 in. which is heard at 36 in. by an individual with normal hearing, the result is expressed $H. (horologium) = \frac{1}{3}$. In carrying out this test, the watch should be held at first beyond the range of audition, and slowly approximated to the ear until the tick is heard: the test should be repeated two or three times to avoid gross errors. If heard only when touching the ear,

the watch is said to be heard on contact. In dealing with children, it is advisable to make them close their eyes, otherwise a lively imagination or a desire to please may vitiate the result. An acoumeter should be used when the tick of a watch is inaudible, and it is of value when very accurate tests are desired, but for ordinary clinical work it is not necessary.

In testing with the voice, a whisper, either low or loud, is used if it can be heard; if, however, a whisper is not audible, recourse must be had to the speaking voice, and a low, ordinary, or loud voice is employed, according to the deafness of the individual. The patient sits with the side of the head towards the examiner, and is asked to repeat the words he hears. Single words should be spoken, and it must be remembered that some words are harder to hear than others, vowel sounds being more readily perceived than consonants, while the consonants themselves vary, as they differ greatly in pitch. The letter "R" is the lowest, having, according to Oscar Wolf, only 128 vibrations per second, while the letter "S" is the highest and may have over 10,000 vibrations per second. Thus, from a judicious selection of words, some inkling may be gained as to the site of the lesion in a case of deafness, by testing with the voice alone. While the carrying out of these tests is a matter of extreme simplicity when dealing with intelligent adults, it is often impossible to get accurate results with nervous children. In this case it is better to ask simple questions in a low voice or a whisper, when a rough idea may often be obtained of the acuity of hearing.

Tuning-fork Tests.—When the acuity of hearing has been approximately gauged by the methods described above, it is necessary to carry out certain tuning-fork tests. A large number of these have been advocated by various authorities, but the impartial critic must admit that no claim of scientific accuracy can be made for any of them, although some afford considerable assistance in the clinical investigations of cases of deafness. It is sufficient for ordinary clinical work to carry out three tests, viz., Rinné's, Weber's, and Schwabach's, and in addition to determine the perception of the upper and lower tone limits. For the first three a medium tuning-fork should be selected, such as $c' = 256$ double vibrations a second. At the International Congress, at Budapest, in 1909, a committee appointed to discuss a uniform acoumetric

formula, recommended the use of the tuning-fork $a^1 = 435$ double vibrations, for these tests. The fork should be fitted with clamps to deaden the over-tones when it is thrown into vibration. It is sounded by holding the stalk between the finger and thumb, and striking the prongs firmly and smartly against a resisting object, such as the edge of a table or the knee-cap; if the prongs are then approximated to the external auditory meatus, and the sound is heard by the patient, the fork is said to be heard by *air conduction* = AC, and when it is heard by placing the end of the stem in contact with the bone of the skull, it is described as *bone conduction* = BC.

Rinné's Test consists in comparing the duration of bone conduction with that of air conduction. Rinné found that in every individual with normal hearing, air conduction is longer than bone conduction; this is called Rinné positive (R +). When the opposite state of affairs is found, viz., $BC > AC$, Rinné's test is said to be negative (R -). It is positive in health and in lesions of the sound-perceiving apparatus (nerve deafness), and it is negative in lesions of the sound-conducting apparatus.

Weber's Test is of service in cases of unilateral deafness. It depends on the following experiment: If a sounding tuning-fork is placed on the vertex in the middle line, it is heard equally on both sides, but if one ear is closed the sound immediately becomes much louder on that side. In this experiment, the patient produces artificially a lesion of the sound-conducting apparatus, so that its application to a case of unilateral deafness is at once obvious, viz., if a sounding tuning-fork placed on the vertex is heard better on the deaf side, the patient is suffering from a lesion of the sound-conducting apparatus; but when it is referred to the sound side, the lesion is in the sound-perceiving apparatus.

Schwabach's Test consists in comparing the duration of bone conduction in an individual with normal hearing and in a deaf person. It is of less value than the other tests, because the variations in time in normal individuals are considerable; but generally bone conduction is markedly diminished in nerve deafness, and is lengthened in lesions of the sound-conducting apparatus.

When these tests have been carried out, the limits of audition

at either end of the scale should be tested. The lowest note which a normal individual can hear by air conduction is produced by a fork which gives sixteen double vibrations, but for practical purposes it is sufficient to begin the tests with a fork giving 32 double vibrations, for everyone with normal hearing can hear the sound produced by that fork, though to some the lowest fork is not audible; if this fork is not heard, the next in the series should be tried, i.e., C₁ (64 d.v.). Perception of the lower tone limit is lost in lesions of the sound-conducting apparatus. The upper tone limit can be tested by Galton's whistle, Galton-Edelmann's whistle, or König's rods. The whistles are worked by a small rubber ball, and the pitch of either may be altered at will. The highest sound heard by the patient is noted, and if the Galton-Edelmann's instrument is used, the equivalent number of vibrations may be found by referring to a table which is provided with each instrument. The highest note audible in health is one giving 50,000 vibrations a second, but the upper tone limit is lowered in old age and in persons suffering from a lesion of the sound-perceiving apparatus.

The tuning-fork tests which have just been described, serve to give information as to the state of the middle ear and of the sound-perceiving apparatus.

This concludes the functional examination of the ear in the majority of cases; but it is sometimes necessary to investigate the vestibular apparatus, which consists of the vestibule and the three semicircular canals, and which is now generally recognized as being a peripheral organ of equilibration. Flourens was the first to show, in 1824, that division of the semicircular canal caused active movements of the head, the eyes, and sometimes of the whole body in the plane of the divided canal. Mach, Breuer, and Crum Brown, in 1875, proved that the semicircular canals are peripheral organs of a sense of rotation. Ewald undertook further investigations concerning the function of these canals, and found by experiments on pigeons that movement of the endolymph from the convexity towards the ampulla of the right semicircular canal causes nystagmus to the right (that is, in the opposite direction to the flow of endolymph); while movement of the endolymph from the ampulla towards the convexity, causes nystagmus to the left. Finally, Bárány, of Vienna, published in 1907 his classical monograph on the

Physiology and Pathology of the Semicircular Canal Apparatus in Man, including their Functional Examination. Since that time the methods of examination advocated by him, though modified in some respects, have become part of the routine examination of the ear in cases where the vestibular apparatus is believed to be affected.

Before describing B̄arány's tests, it is necessary to mention von Stein's method of estimating disturbances of equilibrium. In addition to the ordinary methods in use, such as making the patient stand on one foot, or with both feet together, and eyes open and shut, and making him hop backwards and forwards along a straight line, he advocates the use of an apparatus which he has designed for this purpose, called the goniometer. It consists of a board for the patient to stand on, which can be inclined at any desired angle, and it is noted to what height the patient can be raised without losing his equilibrium. A normal individual, with his face turned towards the instrument, can be raised to a height of 35° to 40°, but with his back towards the instrument, only to a height of 26° to 30°.

Vestibular Nystagmus.—This may be spontaneous, or may be induced by stimulation. It consists of two movements: a slow movement in one direction, followed by a rapid jerk back in the opposite direction. The nystagmus is increased by deviating the eyes in the direction of the rapid movement, and is described as being to the right or left according to the direction of the rapid phase.

Vestibular nystagmus may be induced (1) *By rotation*; (2) *By syringing with hot and cold water (caloric test)*; (3) *By galvanism*.

1. *The Rotation Tests.*—The patient is placed in a revolving chair, with the head erect, and the feet off the ground. He should wear smoked glasses to prevent him from fixing his eyes on any object. The chair is revolved ten times in twenty seconds; the direction of the resulting nystagmus is noted, and its duration timed. When the head is held erect, the horizontal canals are stimulated, for the axis of rotation must be at right angles to the plane of the canals. Now, the ampullæ of the two horizontal semicircular canals are to the front, so that, during rotation to the right, there is a tendency for the endolymph to flow from the convexity to the ampulla of the right canal, and

from the ampulla to the convexity of the left, and accordingly, as in Ewald's experiment, nystagmus to the right is produced. As this nystagmus cannot readily be observed, the phenomena after the rotation are studied: the nystagmus produced then is termed "after nystagmus." To understand this we must trace the sequence of events: when the rotation is suddenly brought to an end, the endolymph, because of its inertia, tends to flow on: hence there is a tendency to movement from the convexity of the left canal to the ampulla, and from the ampulla to the convexity of the right canal; accordingly the after nystagmus is to the left. That canal is chiefly stimulated in which the flow is towards the ampulla; therefore, when the patient has been rotated to the right, the left canal is chiefly stimulated, and the after nystagmus is to the left, and vice versa. The remaining semicircular canals can be tested by rotation with the head posed in different ways; thus, if the head is bent 90° to the right shoulder, vertical nystagmus results; while rotatory nystagmus is induced by inclining the head forwards or backwards. The duration of the after nystagmus should be timed; it lasts as a rule for 39 seconds when rotation has been to the right, and for 41 seconds after rotation to the left. When the canals have been destroyed, no nystagmus can be induced by rotation. The laws governing rotatory nystagmus are: (1) Each semicircular canal induces nystagmus in the same plane as its own; (2) The nystagmus due to rotation corresponds to the line of intersection of the horizontal plane with the cornea.

The rotation tests have two disadvantages: the first is that many of the patients in whom examination has to be carried out are too ill to permit of their getting out of bed and being rotated; and the second is that both sides are being tested at the same time, although one side is more strongly stimulated than the other.

2. *The Caloric Tests* are more easily undertaken than the rotation tests, and they have the further advantages that one ear is tested at a time, and that they may be applied to bed-ridden patients. They are carried out by gently injecting hot or cold water into the ear. Dr. Dan Mackenzie has modified the tests introduced by Bárány, by measuring the time necessary to produce nystagmus (the induction period). He uses water 22° to 24° C. in the case of cold water, and 42° C. in the case of hot water. The water is contained in a vessel raised two inches above

the ear. The douche is stopped the moment nystagmus appears. Dr. Mackenzie obtained the following results: In health, nystagmus appears in from 20 to 40 seconds; in hyper-excitabile states of the vestibular apparatus, in from 5 to 15 seconds; when the excitability is reduced, the induction-period may be 120 seconds or more; and when the labyrinth is inactive, there is no reaction.

The direction of the nystagmus varies; with cold water Bárány obtained horizontal and rotatory nystagmus to the opposite side, and with hot water he observed rotatory nystagmus to the same side.

Nystagmus induced by Condensation and Rarefaction of the Air in the External Meatus (Fistula Symptom).—This test is only available when there is a fistula in the horizontal semicircular canal, and when the membranous labyrinth is intact. By applying pressure, which may be conveniently done by Siegle's speculum, a state of affairs is induced comparable to Ewald's experiment, and for a few seconds active nystagmus and slow extorsory movements of the eyes are induced. The direction varies: that due to condensation of air is in the opposite direction to that produced by rarefaction. In health, no reaction is obtained.

3. *Galvanism.*—One pole is applied to the patient's wrist, and the other to the mastoid process of the ear to be investigated. A current of 10 to 25 ma. may be used. If the kathode is in contact with the ear, rotatory nystagmus appears to the right; if the anode is in contact with the ear, the nystagmus is in the opposite direction.

OTOSCOPIC EXAMINATION.

In examining the ear, it is not necessary to have such powerful illumination as is required in laryngoscopy; indeed, ordinary daylight will suffice, if it is reflected into the ear while the patient sits at a window, but it is generally more convenient to employ artificial light, and the reader should accordingly refer to the section on Laryngoscopy for a description of the various available forms of illumination. The ordinary forehead mirror may be used, but better illumination can be obtained by means of a smaller mirror with a shorter focus (4 inches); this mirror may be fixed to a forehead band, or it may be held in the hand, in which case it is provided with a handle. The light

is arranged on one side of the patient's head, and slightly above the level of his ear. The patient is seated sideways to the surgeon, who sits opposite the ear to be examined, and reflects the light on it; but, before introducing the speculum, he should examine the mastoid process and note any abnormality, such as a scar, redness, œdema, etc. He should also inspect the meatus; this will enable him to detect any swelling or irritation of the skin about the meatus, and will guide him as to the size of the speculum to be used. In order to see the drum membrane it is necessary to straighten the external auditory meatus, which may be described roughly as a curved passage, with the concavity directed downwards and forwards. As the apex of the curve is at the junction of the bony and the cartilaginous meatus, the canal can be straightened by pulling the auricle upwards and backwards. In infants, owing to the non-development of the bony external meatus, the auricle has to be drawn downwards and backwards. In a considerable proportion of cases, these manipulations permit of an inspection of the meatus without the use of a speculum. When, however, vibrissæ obstruct the view, or when the outer part of the passage is slit-like, as is frequently the case in elderly individuals, it is necessary to make use of a speculum. A metal instrument should be used, but it is immaterial what pattern is selected. I prefer one with a bell-shaped mouth, such as Pritchard's, as it is convenient to handle and facilitates the introduction of instruments: on section the speculum may be circular or oval. The surgeon should provide himself with three or four different sizes to suit all ages. To introduce the instrument, the auricle is pulled up by the middle and ring fingers, and the speculum, held between the thumb and index finger (*Fig. 55*), is gently inserted into the meatus; if vibrissæ obstruct the view, it is given a rotatory movement. It should not be pushed in far enough to come in contact with the bony meatus, as this causes much discomfort. On looking through the meatus, the skin of the posterior meatal wall will probably meet the eye first. In order to



Fig. 55.—Method of holding aural speculum.

inspect the drum head, it is necessary to direct the gaze forwards as well as inwards. In health, the drum membrane presents a highly polished grey surface (*Plate VII, Fig. 61*), of which the posterior and upper part is distinctly nearer the eye than the anterior and inferior. The colour alone is not sufficient for the recognition of the membrane, but the handle of the malleus must also be seen, for it is an integral part of the drum head, being inserted between the two sets of fibres of its fibrous or middle layer. At the upper end of the handle, the short

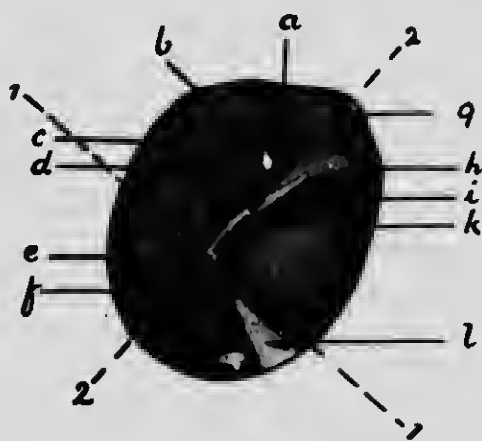


Fig. 56.—Diagram of the drum membrane, enlarged.

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|---|---|
| <i>a.</i> Posterior fold | <i>g.</i> Shrapnell's membrane |
| <i>b.</i> Long process of incus | (<i>membrana flaccida</i>) |
| <i>c.</i> Tendon of stapedius muscle | <i>h.</i> Short process of malleus |
| <i>d.</i> Head of stapes | (<i>processus brevis</i>) |
| <i>e.</i> Umbo | <i>i.</i> Anterior fold |
| <i>f.</i> Shadow of niche to fenestra rotunda | <i>k.</i> Handle of malleus (<i>manubrium mallei</i>) |
| | <i>l.</i> Light reflex |

1, 1 and 2, 2. Imaginary lines dividing membrane into four quadrants.

process is seen as a small projection; and, running downwards and backwards from this, the handle of the malleus appears as a yellow streak ending at a point, the umbo, below the centre of the membrane. For purposes of description, the membrane is divided into four quadrants by imaginary lines, one of which continues the handle of the malleus to the periphery, while the other bisects this line at right angles (*Fig. 56*). Extending downwards and forwards from the umbo, the cone-shaped light reflex is seen; this is an optical effect, and is due to the fact that the light is always reflected from this part of the membrane, as its curvature

does not vary in health. The reflex may be absent owing to the loss of polish, or it may be altered in position by changes in the curvature of the membrane, which, it will be remembered, is concave in an outward direction. In front of and behind the short process, two folds are seen on the membrane; these are called the anterior and the posterior folds. They are only very slightly marked in the normal membrane, but become greatly exaggerated in cases of indrawing. Immediately above the short process is a small outlying portion of membrane which fills the gap in the tympanic ring known as the notch of Rivinus, and which is called Shrapnell's membrane or *membrana flaccida*, the latter name indicating an anatomical peculiarity of this part of the membrane, namely, that it lacks a fibrous layer.

The translucency of the drum head varies considerably in health; and, while the above description refers to one of average translucency, additional structures may be seen when the membrane is more transparent. The long process of the incus is frequently observed: it appears as a yellow line behind the handle of the malleus and lying parallel to it (*Plate VII, Fig. 62*), but extending along only about half its length. It is sometimes seen to end in a round spot which is the head of the stapes. At right angles to this, and extending to the posterior margin of the membrane, the stapedius muscle presents a similar appearance. In the lower and posterior quadrant, a triangular shadow may be seen at the circumference of the membrane, which corresponds to the niche leading to the fenestra rotunda. The centre of the membrane is of a pale-yellow colour, due to the promontory shining through; for it will be remembered that the promontory is convex outwardly, while the membrane is concave; thus the inner wall of the tympanum is much closer to the membrane at the centre than at the circumference. Finally, it is occasionally possible to see the chorda tympani nerve: this appears as a nearly horizontal line running from the posterior margin of the membrane to a point just below the short process.

While the normal membrane is readily recognized after a little practice, the beginner will experience considerable difficulty in distinguishing many abnormal conditions. In such cases, the short process and the handle of the malleus should be looked for in the first instance, because if these are seen, there is no doubt that the structure they lie in is the drum membrane, however much its appearance may be altered. When, however, they are

not detected, the observer must attempt to estimate the depth of the structure at which he is looking. If it is obviously nearer the eye than the membrane, the appearances may be due to a granulation, a foreign body, or to some projection from the meatal wall. Finally, when the appearances are not comparable with any condition with which the observer is familiar, the ear should be syringed, as the presence of even a very little pus or a flake of wax may be quite misleading, and give rise to an incorrect diagnosis.

It is convenient to describe here some of the more common pathological conditions found in the membrane. A minute perforation appears as a black spot, because, being small, the middle ear is not lit up; but a larger perforation is always clean cut unless it is due to a traumatism, in which case the edges may be ragged (*Plate VII, Figs. 69, 70, 72, 74*). A cicatrix is always very transparent, and may appear like a dry perforation (*Plate VII, Fig. 73*); but unless it is adherent to the inner wall of the middle ear it may readily be distinguished from a perforation by means of Siegle's speculum. This is a speculum which expands into a small chamber, and is closed at its outer end by a lens. A small hollow peg, to which a rubber ball with rubber tubing is attached, is let in at the side. The speculum is introduced into the meatus, which it should fit closely; and, on looking through the lens, an enlarged view of the drum head is obtained. If the rubber ball is now successively compressed and released, the air in the chamber and external auditory meatus will be alternately condensed and rarefied. In the case of a cicatrix, each movement of the rubber ball makes it flap in and out, while a perforation shows no movement, though if the middle ear is not quite dry, some secretion may be sucked out through the perforation.

An indrawn membrane presents characteristic appearances (*Plate VII, Fig. 67*): the short process is prominent, and causes the anterior and posterior folds to be very much exaggerated, especially the latter, which frequently presents a sickle shape. The hammer handle is foreshortened and rotated so that it lies in a more backward direction than usual, and the greater part may actually be hidden behind the posterior fold. The change in direction of the handle brings the umbo into the upper half of the membrane; and, finally, the altered curvature of the drum head displaces

the light reflex, which accordingly appears as a mere spot of light at the periphery.

Other pathological conditions will be described later.

INFLATION.

To complete the examination of the ear, it is necessary to try the effect of inflation of the middle-ear cavity. By this is meant driving air through the Eustachian tube into the tympanum. This procedure is important in diagnosis and prognosis, and also as one of the chief methods of treatment. It is of importance in diagnosis, in that it gives information as to the patency of the Eustachian tube; it demonstrates the presence of abnormal secretions within the middle-ear cavity, and, finally, it gives information as to the site of the lesion by its effect on the acuity of hearing. It is of value in prognosis, as this depends largely on the immediate improvement of hearing after inflation, and on the length of time the improvement lasts. Its application as a method of treatment will be considered later.

Inflation may be performed by Valsalva's experiment, by Politzer's method or one of its modifications, or by means of the Eustachian catheter. In Valsalva's experiment, the patient closes both nostrils and makes a forced expiration with his mouth shut. If the Eustachian tube is patent, air passes into the tympanum, and the patient feels a crack, or a sense of fullness in the ears. If the membrane is inspected during inflation, it is seen to move if there is nothing to interfere with its mobility. Valsalva's experiment is not always successful, even when the tubes are patent, and one of the other methods should generally be made use of.

Poltzcr's plan is carried out by means of a Politzer's bag, the nozzle of which is protected by a small piece of rubber tubing, which should be changed for each patient. The nozzle is inserted into one nostril, and both nostrils are then tightly closed by the finger and thumb of the surgeon's left hand, the bag being held in his right hand. The patient, who has previously taken a sip of water into his mouth, is now told to swallow, and the moment he does so the bag is forcibly squeezed. Part of the air thus driven into the nose will pass into the middle ear on each side through the Eustachian tubes, unless they are very blocked. Various modifications of Politzer's method have been suggested,

and as they are less forcible may be advantageously applied in the first instance. Holt's modification consists in merely puffing out the cheeks during the compression of the bag (*Fig. 57*). Gruber suggested making the patient say the word "huck." In the case of children, the bag may be compressed during the act of crying.

When Politzer's method fails, or it is desired to inflate one ear only, catheterization must be employed. The Eustachian catheter is a tube of metal or vulcanite, of which the inner end is curved, while the outer extremity is expanded to permit the



Fig. 57.—Holt's modification of Politzer's method of inflation.

insertion of the nozzle of a Politzer's bag, and is also provided with a ring which points in the same direction as the beak. Catheters vary in calibre and in the amount of curve, and the surgeon should be provided with at least three different sizes. Before using the catheter, the nose should be examined to see if there is any obstruction to its passage; and in the case of sensitive or nervous individuals, it will render the procedure much less disagreeable if a probe, dressed with cotton-wool and dipped in a 10 per cent solution of cocaine, has been previously

passed once or twice along the inferior meatus. For the passage of the catheter, the patient should be seated with head erect, while the surgeon stands opposite him and a little to his right. An auscultating tube connects the surgeon's ear with that of the patient. This is a rubber tube, provided with an ear piece at either end, one being white and the other black. The surgeon reserves the white one for his own ear, and the other should always be cleaned after use. The surgeon places a Politzer's bag under the left armpit, with the bag to the front; it is thus readily grasped when required. He holds the catheter



Fig. 58.—Catheterization. First stage

between the finger and thumb of his right hand, and gently tilts up the point of the patient's nose with his left thumb, while he gives support to that hand by resting the little finger against the patient's forehead (*Fig. 58*). The point of the catheter is now introduced into the nose; as soon as it is within the nostril, the right hand, which was previously at a lower level than the head, is raised until the catheter assumes a horizontal position, when it is pushed gently backwards along the floor of the nose until it impinges on the posterior wall of the pharynx. The

surgeon then steadies the catheter by catching hold of it between the thumb and index finger of the left hand at the point where it enters the nose; in the subsequent movements the catheter is allowed to slip through his finger and thumb, which remain stationary. The catheter is next rotated through a right angle inwards, and is withdrawn until it catches on the posterior free margin of the septum. Finally it is rotated through two right angles, or a little more, in an outward direction, and this manœuvre should bring the point of the catheter to the mouth of the Eustachian tube, and the ring



Fig. 59.—Catheterization. Final stage.

at its outer end should be directed towards the external canthus of the eye.

It may be advisable for the sake of clearness to recapitulate shortly the stages of passing the catheter: (1) Introduce the beak of the catheter into the nostril; (2) Raise the catheter to the horizontal plane; (3) Push it straight back until it impinges on the wall of the naso-pharynx; (4) Rotate it through a right angle inwards; (5) Withdraw it until it hitches on the free posterior margin of the septum; (6) Rotate it through two right angles in a downward and outward direction.

The beak of the catheter is then in position (*Fig. 59*). The surgeon now takes the bag in his right hand, and, introducing the nozzle into the expanded end of the catheter, squeezes the bag; air should then pass into the middle ear, and the auscultatory phenomena must be observed. When the tube is patent, air passes freely into the middle ear and is heard through the auscultation tube as a definite blowing sound. When the tube is partially obstructed, the sound is less distinct. If there is fluid in the middle ear, faint cracklings may be heard, and in many cases of perforation the sound appears much closer, almost as if the air had passed direct into the observer's ear; but if the perforation is quite small, a whistling sound is produced.

DIFFICULTIES IN THE PASSAGE OF THE CATHETER.—If the nostril on one side is blocked, the catheter may be passed through the opposite nostril; only one rotation is then required, and an instrument with a longer beak must be selected. If the nasal passages are free, and if cocaine is used in the case of sensitive individuals, it is not difficult to pass a catheter; beginners, however, frequently make the mistake of pushing it well into the nose before raising it to the horizontal position, with the result that the beak passes into the middle meatus, whereas it ought to be kept along the floor of the nose. Another difficulty is produced by too rough handling of the catheter when it has passed into the naso-pharynx; this often causes spasm of the soft palate and locking of the catheter. In such cases, a pause must be made until the spasm has subsided. Occasionally the catheter is correctly passed, but there is difficulty in driving air into the tube. In such cases, the patient should be asked to swallow, and the bag must be compressed at the moment of swallowing; this will frequently enable the air to pass, but if it still does not do so, the question arises as to the desirability of employing bougies. As a rule, these instruments are unnecessary, but in some cases air passes more readily after their use. The bougie is introduced through the catheter after the latter is in position, ink-marks having been previously made on it to show when its end has reached the beak of the catheter, and also at points half an inch, one inch, and one and a half inches beyond this. The bougie should not be passed more than one inch into the Eustachian tube; in other words, it should not be passed beyond the third ink-mark.

There are several other methods of passing the catheter, but that described above is the most reliable and generally the easiest. Some authorities prefer to make only a single rotation outwards after the posterior wall of the pharynx has been reached; the point of the catheter is then drawn forward over the posterior cushion of the Eustachian tube to its mouth. Another method is to use the soft palate as the guide for the distance that the catheter has to be withdrawn.

After inflation has been carried out by one or other of the methods just described, the hearing must be carefully tested and the results noted. The respective merits of inflation by politzerization and by catheterization must now be considered. Politzerization is easier to carry out, is less disagreeable to the patient, and an intelligent person can do it for himself if it is necessary for treatment, while it is about the only method that can be employed in children. It has, however, the disadvantage that its effect cannot be limited to one ear, so that, if used constantly in a case where one ear alone is affected, it may cause stretching and slackening of the drum head on the healthy side, with resulting impairment of hearing.

The advantages of the catheter over Politzer's method are: that the action can be confined to one ear, the force of the inflation can be much more readily regulated, and the auscultatory phenomena can be more easily observed.

CHAPTER XXIII.

GENERAL SEMEIOLOGY AND THERAPEUTICS.

SEMEIOLOGY.

Deafness is the most common symptom of ear disease, and it may vary from a degree so slight as to escape the notice of the patient, to complete loss of hearing. Certain anomalies of hearing sometimes accompany the deafness; thus, especially in cases of middle-ear deafness, the patient may hear much better in a noise, as for example when travelling in a railway carriage; in some cases he hears better than normal individuals in these circumstances. This condition is called *paracusis Willisii*, after Willis, who was the first to lay stress on this symptom. In other cases, *hyperæsthesia acoustica* is met with, that is, a sensation of pain on exposure to loud, and especially shrill, noises. Much more rarely the patient complains of *diplacusis*, or the hearing of two sounds instead of one.

Tinnitus aurium, or a subjective sensation of sound in the ear, is a very common and sometimes the only symptom of ear disease. The sounds may be continuous or intermittent, and they may be synchronous with the pulse. The patient is sometimes conscious of them during the whole of his waking hours, or he may hear them only when in a quiet room, or when in bed at night. The noises may produce extreme depression, and may unfit the patient for work. The nature of the sounds varies; they may be described as roaring, rushing, hammering, or like the escape of steam or the sound of bells, and so on.

Tinnitus may be met with in any form of ear disease, and is also a symptom of some general diseases which indirectly affect the ear through the circulation; thus in renal affections, cardiac disease, and anæmia, it is a common symptom. Certain drugs, such as quinine and the salicylates, frequently cause tinnitus, and it is also met with in intra-cranial tumours. In certain cases the tinnitus is objective, and is due to clonic

contractions of the soft palate, or to an aneurysm of the internal carotid artery.

TREATMENT.—The treatment of tinnitus may conveniently be considered here. To cure the disease which causes it, is obviously the proper treatment when possible; but when this is impossible, palliative measures must be adopted. Psychological treatment is often of great importance, and where the tinnitus is not the result of organic disease, an assurance on that point will often enable the patient to tolerate the symptoms without grave discomfort. In certain cases drugs are beneficial, and of these the bromides are most efficacious, while in other cases pneumo-massage gives temporary relief. In some instances ligation of the carotid artery has been carried out, but the results have been unsatisfactory on the whole.

Pain may be due to inflammatory affections of the external or middle ear, and is occasionally reflex, arising from ulcerative conditions of the pharynx or larynx, or from carious teeth.

When the pain is due to an inflammatory condition in the external ear, it is increased by pulling the auricle, by pressure over the tragus, or by the act of mastication, while the pain resulting from middle-ear inflammation is aggravated by any act, like sneezing or yawning, which tends to increase the intratympanic pressure. In inflammation of the mastoid process, the pain is felt behind the ear, and is generally increased by pressure over the painful area.

Vertigo is an occasional symptom in cases of ear disease. It may be produced merely by the pressure of cerumen against the drum membrane, or it may be induced by syringing the ear; it is also met with in affections of the middle and the internal ear. In some cases it is more or less constantly present; it is then rarely severe, and in the slighter cases, giddiness is experienced only on stooping or on suddenly turning the head.

In another form of auditory vertigo, the attack comes on acutely. The patient is suddenly affected by tinnitus and intense giddiness, and falls towards the side of the affected ear; nausea and vomiting then set in. The vertigo passes off in the course of a few days.

THERAPEUTICS.

Syringing the Ear.—The syringe employed for this purpose should be one that can be sterilized by boiling, and should

be furnished with a nozzle sufficiently fine to enter the external meatus. A glass syringe is the best for the patient's own use. Sterile saline solution or boracic lotion (1-40), warmed to a comfortable temperature (100°), should be made use of for syringing. After filling the syringe, bubbles of air must be expelled by pressing on the piston while the point of the syringe is raised. The patient should be seated; a towel is laid over his shoulder, and a bowl is held immediately below his ear and in close contact with the skin, to catch the lotion. The auricle is pulled upwards and backwards, and the fluid is injected



Fig. 60.—Syringing the ear.

along either the upper or the lower wall of the meatus (*Fig. 60*), the parts being well illuminated by direct or reflected light. Excessive force must not be exerted. In attempting to remove hard wax which will not come away easily, it is advisable to soften the mass first by the instillation of a solution of bicarbonate of soda in glycerine.

Intra-tympanic Syringing.—It is sometimes desirable to syringe the middle ear directly, for example, in cases of attic suppuration or of perforation extending to the annulus tympanicus. The method was introduced by Schwartz. Hartmann's

or Milligan's instrument may be employed: the former consists of a fine cannula bent up at one extremity, and with a piece of rubber tubing terminating in a small rubber ball, attached to the other end. The instrument is sterilized, and filled with warm sterile saline solution. The point of the cannula is then introduced into the tympanum, through the perforation, under guidance of the eye, and the lotion is slowly squeezed out of the ball. The process may be repeated three or four times. Finally, inflation of the ear should be carried out, partly to expel the fluid remaining in the tympanum, and partly to obviate the giddiness which is generally produced.

The ear should be dried in every case after syringing. When the syringing is carried out at home, this should be left entirely to the patient. The non-luminous end of a match is dressed with cotton-wool; it is then passed deeply into the meatus, the auricle being pulled upwards and backwards by the other hand. The wool is sterilized and stored in a glass bottle, enough being removed for use on each occasion by a pair of forceps, the ends of which have been previously passed through a flame. After the ear has been dried, it is well to insert a plug of wool into the meatus to guard against any irritation.

Introduction of Medicated Solutions into the Meatus.—Among the drugs most commonly employed for instillation into the meatus are carbolyzed glycerine, rectified spirit, peroxide of hydrogen in solution, and menthol in liquid paraffin. These solutions, with the exception of the rectified spirit, should be slightly warmed before use. The method of introduction is simple: the patient bends his head to one side, the affected ear being uppermost; the auricle is pulled upwards and backwards, and about ten drops are poured into the meatus; the tragus is pressed immediately afterwards to drive the fluid inwards. After the lapse of about five minutes the fluid is allowed to escape, and the ear is dried, unless more than a temporary action is required, in which case a pledget of cotton-wool is inserted into the meatus to prevent the escape of the drug.

Insufflation of Powders.—Though some cases of otorrhœa are much benefited by the use of powders, McBride and Schwartze have pointed out that they should never be used in a chronic case where the perforation is small, for fear of interfering with the drainage. The method of employment is as follows: after the ear has been syringed and dried, the powder

is blown in by an insufflator with a fine straight nozzle, only a sufficient quantity of powder being used to form a thin film.

Caustics may be employed to destroy small granulations or the stumps of polypi. The electric cautery, a head of chromic acid fused on a probe, or solid silver nitrate may be used for this purpose. The caustic should be applied under guidance of the eye. If too wide an area is burnt, the action can be stopped at once by the instillation of a solution of chloride of sodium when nitrate of silver has been used, and of bicarbonate of sodium in the case of chromic acid.

Anæsthesia in Aural Operations.—For major operations, a general anæsthetic is required, while for minor operations local anæsthesia is generally sufficient, except when dealing with nervous children.

A solution of cocaine alone has but little effect in the ear, but if it is dissolved in aniline oil and spirit, as first suggested by Gray, a considerable degree of anæsthesia is obtained. Bonain's formula (see Appendix) will, however, be found more useful, for it is of service even in inflammatory conditions. It is applied by means of a piece of cotton-wool dipped in the mixture and allowed to remain against the tympanic membrane for five minutes. A more complete anæsthesia may be obtained by injecting a 0.5 per cent solution of cocaine hydrochloride (containing a few drops of a solution of adrenalin chloride 1-1000) under the skin, at the upper and back part of the meatus. This is done under guidance of the eye, by means of Neumann's syringe. A little practice is required before a successful injection can be made. The procedure has been extended, and Neumann and Alexander state that they have performed radical operations on the ear painlessly by this method. In such cases, some of the solution is also injected below the periosteum over the mastoid process.

Operations.—Most instruments constructed for use in the external auditory meatus are bent at an angle of rather over 90°, with the object of bringing the hand below the line of vision when the instrument is being used. During the routine examination of the ear, a pair of angled forceps, such as Politzer's, should be at hand to remove shreds of epithelium or flakes of wax. Probes of two kinds are also required, the one fairly stout ending in a screw thread which may be dressed with cotton-wool and employed as a mop, and the other slender, for use as an aid to

diagnosis. It is also advisable to have a set of knives, curettes, and hooks which can be fixed in a common handle. A useful form of knife for incising the membrane is one with a small diamond-shaped blade, such as Politzer's, while for incision of furuncles in the meatus a tenotomy knife is well suited. Various forms of aural snares have been devised, of which Wilde's pattern, or one of its modifications, is probably the best. It is threaded with fine iron wire. In dealing with polypi too small to be snared, a ring knife or curette may be used. Double curettes may also be employed for this purpose, but they are not more efficacious and are very expensive.

Rarefaction and Condensation of Air.—The value of rarefaction and condensation of the air in the meatus as a means of diagnosis in eliciting vestibular nystagmus and in distinguishing between cicatrices and perforations, has already been discussed.

As a method of treatment it is less important, though at one time it was greatly in vogue, especially for the relief of tinnitus and in chronic adhesive processes in the middle ear. For this purpose Delstanche's rarefacteur may be used, or if very rapid alternations are desired, an air pump driven by an electric motor may be obtained.

Bier's Congestion in the Treatment of Ear Disease.—This method of treatment has been tried by a number of observers, but the general opinion is that it has not much scope in severe forms of ear disease. Experience has shown that it is contra-indicated in arteriosclerosis, and in the presence of intracranial complications, and that it may be impracticable in children with adenoid vegetations.

Interest in this method of treatment has been revived by Eschweiler's monograph. He has been associated with Bier in the observation of the ear cases subjected to this line of treatment, and he lays great stress on the importance of carefully following the technique. The congestion is produced by applying a woollen spun elastic garter round the neck, sufficiently tightly to give the face a bluish-red colour and a rather swollen appearance. As long as the treatment continues, the bandage remains in position for twenty-two hours out of the twenty-four. Eschweiler found that the cases of acute mastoiditis which reacted most favourably to this form of treatment were those in which there was a superficial abscess over the mastoid process.

PLATE VII.
AFFECTIONS OF THE EAR



Fig. 61.
The normal drum.



Fig. 62.
Healthy but transparent membrane.



Fig. 63.
Acute inflammation,
early stages
(radial injection of vessels)



Fig. 64.
Acute inflammation
(bulged membrane).



Fig. 65.
Acute inflammation
limited to attic (bulging of
Shrapnell's membrane)



Fig. 66.
Catarrhal exudate in
middle ear.

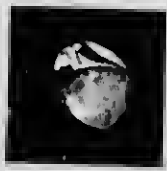


Fig. 67.
Indrawing, and catarrhal
exudate in a case of
adenoids.



Fig. 68.
Exostoses.



Fig. 69.
Perforation in chronic
otitis media.



Fig. 70.
Kidney-shaped
perforation.



Fig. 71.
Large aurial polypus.



Fig. 72.
Dry perforation



Fig. 73.
Cicatrix in thickened
membrane.



Fig. 74.
Perforation in Shrapnell's
membrane.



Fig. 75.
Concretion on the
drumhead.

CHAPTER XXIV.

*DISEASES OF THE EXTERNAL EAR.***MALFORMATION OF THE AURICLE.**

ARRESTED development may give rise to malformation of the auricle (*Fig. 76*), and this is frequently associated with atresia of the meatus. In such cases, an attempt to fashion a passage to the middle ear is not to be recommended.



Fig. 76.—Congenital malformation of auricle and atresia of meatus.

DEFORMITIES OF THE AURICLE.

Outstanding Auricle.—Patients occasionally complain of undue prominence of the auricle. In these cases a plastic operation may be performed as follows: An area of skin is removed from the posterior aspect of the auricle and from the

D.T.

mastoid process; the raw surfaces are then brought into contact, and the edges of the skin are sutured.

Fistula Auris Congenita.—This is an opening, which, when present, is usually found on the helix, and leads to a fine blind canal. The orifice may become blocked, with the result that a fluctuating tumour forms. The fistula is the remains of the first branchial cleft.

Hæmatoma Auris may result from injury; for example, it is not uncommonly met with among boxers and Rugby football players. It may also occur spontaneously, especially in the case of insane persons and the aged. An effusion of blood occurs under the perichondrium and forms a swelling on the outer and upper surface of the auricle, which may have a bluish tinge. In traumatic cases considerable pain is experienced. Suppuration may take place, resulting in destruction of cartilage, and finally in shrivelling of the auricle. If uncomplicated by inflammation, the serum becomes absorbed, but a certain amount of permanent thickening remains.

TREATMENT.—In the early stages, before coagulation of the blood has taken place, aspiration is often serviceable, but may have to be repeated, owing to a reaccumulation of blood. If the patient is not seen at this stage, free incision and evacuation of the hæmatoma is probably the most satisfactory treatment. When suppuration occurs, the abscess should be opened and drained.

Perichondritis of the auricle may be due to a hæmatoma becoming infected with micro-organisms, but is most frequently the result of the radical mastoid operation. In post-operative cases, the causal organism is usually the *B. pyocyaneus*, and the pus in such cases has frequently a green tinge. The condition manifests itself, as a rule, on the tenth day after operation: it is characterized by severe pain in the ear, accompanied by a rise of temperature; the auricle rapidly becomes swollen and dusky in colour, and its normal contour is lost, the swelling being apparent on both its surfaces. As the suppuration progresses, necrosis of the cartilage takes place, with the result that the auricle finally shrivels.

TREATMENT consists in early free incision and drainage, and when the cartilage is affected, it should be pierced, and a drain passed through the auricle from front to back. A 10 per cent solution of ichthyol may be used as a wet dressing.

and the mastoid cavity should be swabbed out with a 2 per cent solution of silver nitrate.

Various skin diseases may affect the auricle. Their treatment must be carried out on general principles, and will not be discussed here. Malignant disease occasionally affects the auricle in the form of epithelioma; it is then to be diagnosed upon general principles.

THE EXTERNAL MEATUS.

Furunculosis.—Furuncles may be found in the external auditory meatus, and may be restricted to this part or be associated with boils in other parts of the body. They generally occur in debilitated persons, and in diabetics, but are sometimes met with in healthy individuals. Furunculosis is due to the infection of hair follicles or sebaceous glands by staphylococci, which may gain entrance from without as the result of scratching, or from within in a case of middle-ear suppuration. The furuncle may develop in the superficial layers of the skin, or it may be more deeply seated. Several furuncles may be present at the same time, and there is a great tendency to recurrence.

SYMPTOMS.—Furuncles are associated with severe pain in the ear, and if there is sufficient swelling to occlude the meatus, deafness may also be present. In their superficial form they present a small, red, circumscribed, and very tender swelling on the skin of the external meatus. When they are more deeply seated, the swelling is more diffuse and of the same colour as the rest of the meatus. Movements of the jaw or of the auricle considerably aggravate the pain. When the boils are situated on the posterior wall, close to the bony meatus, the auricle may become erect, and œdema may appear over the mastoid process. If this is associated with discharge from the ear, it may be very difficult to decide whether the signs are due to the presence of a boil or to inflammation of the mastoid process.

TREATMENT.—In the milder cases, palliative measures may be adopted to relieve the pain. Instillations of menthol in liquid paraffin (10 per cent) or of aceto-tartrate of aluminium frequently give relief, especially when combined with hot fomentations. If the pain is at all severe, relief will be quickly obtained by incising the furuncle deeply from within outwards

with a tenotomy knife. For after-treatment, instillations of a solution of peroxide of hydrogen should be ordered. When the boils have healed, an attempt must be made to sterilize the skin lining the meatus, to prevent recurrence. For this purpose instillations of a solution of corrosive sublimate in alcohol (1-2000) are to be recommended. If, in spite of every care, recurrence takes place, a vaccine (preferably autogenous) may be used with advantage. The general health must also be carefully attended to.

Diffuse Inflammation of the Meatus.—This is generally secondary to suppuration in the middle ear; it may also result from mechanical and chemical irritants. Occasionally diphtheria may attack the external ear; it is characterized by the presence of a fibrinous exudate within the meatus. Erysipelas may also spread to this region, and in syphilitic subjects, condylomata may be found which give rise to a very obstinate form of inflammation. Diffuse inflammation of the meatus is associated with a considerable degree of pain; the meatus becomes narrowed owing to swelling of its walls and to the accumulation of surface epithelium and inflammatory exudate. The drum membrane cannot usually be seen, and there is frequently a moderate degree of pyrexia.

TREATMENT.—If the pain is severe, anodyne instillations may be employed, such as menthol in liquid paraffin (10 per cent), or a solution of carbolic acid and cocaine in glycerine (see Appendix). If relief is not obtained in this way, linear incisions should be made in the swollen meatal walls. After the acute stage has passed, syringing with boracic lotion, and instillations of peroxide of hydrogen (10 vols.), should be employed. When some definite cause of the inflammation can be found, appropriate treatment is indicated.

Eczema.—Eczema may attack the meatus alone or be associated with eczema of the auricle and other parts. As a rule, the outer part of the canal is especially affected. The skin becomes dry and scaly, and occasionally fissures form near the meatus, which becomes plugged with epithelial debris. In many cases the eczema is due to chronic middle-ear suppuration.

TREATMENT.—The ear should be kept clean by syringing, followed by careful drying. Though this treatment alone is sufficient in mild cases, local applications are often required,

and undoubtedly the most serviceable is a solution of silver nitrate in spirits of nitrous ether (g. . xv ad ʒj), which is applied by a probe dressed with cotton-wool and dipped in the solution. The application of silver nitrate will probably have to be repeated several times; this should be done at intervals of a few days. If there are deep fissures and much crusting at the mouth of the canal, ammoniated mercury ointment may be employed.

Otomycosis.—By this term is meant the presence of some fungus within the external meatus. Various forms may be met with, the most common being some variety of *Aspergillus*. Fungi do not, however, grow in the ear unless there is some underlying inflammatory condition of the meatus.

SYMPTOMS.—Deafness may alone be complained of, but itching and pain may also be present. On inspection of the ear, the meatus may be found filled with a mass resembling wet newspaper (McBride); only rarely is the mass coloured.

TREATMENT consists in syringing the ear, and the instillation of rectified spirit or salicylic acid (2 per cent), or corrosive sublimate in alcohol. This should be carried out twice a day at first, and afterwards less frequently. There is, however, a great tendency to recurrence, as it is difficult to kill all the spores.

Impacted Wax.—Wax is secreted from the ceruminous glands situated in the outer part of the meatus, and numerous sebaceous glands are also present in this region. As a rule the secretion from these glands finds its way to the external meatus and is there thrown off. Various factors may tend to the accumulation of wax within the meatus, such as undue narrowness of the passage, excessive secretion—which is found in persons who perspire freely—the entrance of water into the ear during washing or bathing, the presence of a foreign body, and frequently also an attack of middle-ear suppuration.

SYMPTOMS.—A considerable plug of wax may be present in the ear without producing any symptoms so long as a chink exists which allows of sounds passing to the ear. When the blocking becomes absolute, deafness results; this often occurs with striking suddenness, and is usually due to water finding its way into the ear. Tinnitus and pain may also be present, and when the wax presses against the membrane, vertigo may be complained of.

DIAGNOSIS.—The diagnosis is generally easy. A mass is seen in the meatus obviously nearer the eye than the drum membrane; it may be coal-black and glistening, or of a yellow or brown tinge, but when the observer is in doubt as to what he is looking at, he should syringe the ear (see also page 180).

PROGNOSIS.—The prognosis must be guarded, as the expulsion of the wax does not always improve the hearing; indeed, McBride has recorded a case in which the hearing became worse after a plug of wax had been removed; in this instance the wax probably acted as an artificial drum, as the membrane presented a large perforation.

TREATMENT.—The treatment is generally simple. The ear is syringed with warm boracic lotion until the plug comes away. When the wax is hard, considerable difficulty may be experienced in removing it; in such cases, especially if pain is produced, a solution of bicarbonate of soda (see Appendix) should be instilled several times before syringing; liquid paraffin or a solution of peroxide of hydrogen (10 vols.) may be employed for the same purpose. When the ear is being syringed, the surgeon should inspect it from time to time so that he may not continue the syringing after all the wax has been removed. A plug of wool should be worn in the ear for a few hours after the syringing.

Keratosis Obturans.—The ear occasionally becomes blocked by masses of epithelium, which form hard plugs and generally contain a certain amount of wax. Considerable difficulty is usually experienced in removing the plug, as it is closely attached to the meatal walls; this should be accomplished if possible by syringing, an attempt being made in the first place to detach it gently with a probe.

Foreign Bodies in the Ear.—Foreign bodies, both animate and inanimate, may be found in the ear. The latter are much more frequently met with, and, in the case of children, are often introduced by the patients themselves. Inanimate objects may be divided into those which swell with moisture, such as peas and beans, and those which do not swell, such as beads, buttons, or shells. Foreign bodies rarely cause any trouble of themselves unless the tympanic membrane has been injured; indeed, they may remain in the ear for years without producing the least disturbance. It is to ill-directed attempts at removal that most of the disasters which have occurred in these cases must be attributed. In this way

membranes have been ruptured and ossicles removed, purulent inflammation of the middle ear, the inner ear, and the meninges has been set up, and in some cases death has resulted, even when no foreign body has been present. It is accordingly of the utmost importance, when a patient comes with a history of a foreign body in the ear, that the practitioner should assure himself of its presence by careful inspection. If it is not seen, the ear may be gently syringed, as a very small body may be out of sight on the floor of the meatus close to the membrane. In this way I have removed two foreign bodies which were not visible: in one case a tiny glass bead, and in the other a small dead fly. If the foreign body is detected, an attempt should be made in the first instance to remove it by syringing. The stream should be directed along that part of the wall of the meatus where there is the widest space between it and the foreign body.

While the removal of a foreign body is usually effected with ease when it has not been driven in by ill-directed interference, great difficulties may be presented in cases of impaction, when the object has become much swollen from absorption of fluid, or when the meatal walls have become inflamed; in such circumstances, the practitioner will be well advised to call in a specialist. In cases of impaction, it is sometimes possible to withdraw the foreign body by means of a fine hook passed between it and the meatal wall. Considerable ingenuity has been displayed by various authorities in the extraction of bodies which cannot be removed by syringing. Löwenberg suggested passing a paint brush dipped in glue, down to the foreign body: after the glue has set, the brush with the foreign body attached is forcibly removed. In some cases the galvano-cautery is used to break up bodies swollen with moisture, the current being turned on only for an instant; great care must, however, be taken to avoid injuring the meatal walls. When diffuse inflammation of the meatus has been set up by ill-directed attempts at removal, it is advisable to use palliative measures and to wait until the inflammation has subsided, before taking further steps to extract the foreign body. In rare instances, especially when the object has been driven into the middle ear, an external operation is required for its removal. An incision is made down to the bone close to the attachment of the auricle, which is then turned forward.

The posterior margin of the meatus is exposed, and if necessary a portion of the posterior meatal wall is removed with hammer and gouge; the foreign body is then extracted with a hook.

Atresia and Narrowing of the Meatus.—It has already been stated that atresia of the meatus may be a congenital deformity associated with malformation of the auricle (*Fig. 76*). Marked narrowing of the passage, and even complete occlusion, are also sometimes met with in cases of chronic middle-ear suppuration and in chronic eczema. The narrowing may be a simple diminution in the calibre of the meatus, due to thickening of the walls from their being constantly bathed in pus. In other cases complete occlusion may result from a granulation becoming adherent to the walls of the meatus. Chronic eczema is another condition often associated with narrowing of the meatus. Injuries to the meatus are sometimes followed by the formation of membranes which occlude the passage.

TREATMENT.—Most cases of congenital atresia should not be interfered with, as the results are rarely satisfactory. Where there is a narrow diaphragm occluding the passage, this should be excised. The tendency to contraction after operation may be obviated by the introduction from time to time of tents, or small leaden plugs. In narrowing due to chronic middle-ear suppuration, a radical mastoid operation may be called for if the treatment of the causal condition does not relieve the stenosis; this is more especially indicated when there is evidence of retention of pus.

TUMOURS OF THE MEATUS.

Exostoses are the variety of tumour most commonly met with in the meatus (*Plate VII, Fig. 68*). They may be single or multiple, pedunculated or sessile. When the base of the tumour is very broad, and the exostosis is flat, it is usual to apply the term hyperostosis to the condition.

The **ETIOLOGY** is somewhat obscure. Sea bathing is said to predispose to the condition, and it is also more frequently met with in gouty subjects. Exostoses occasionally develop in cases of long-continued middle-ear suppuration, but such a history can sometimes be definitely excluded.

APPEARANCES.—A single exostosis is less common than the multiple variety. It is usually attached to the posterior wall of

the meatus, and appears as a smooth rounded body, which may completely fill the passage. Multiple exostoses are frequently bilateral and symmetrical; they may spring from the anterior and posterior meatal walls, and a small one is occasionally seen on either side of Shrapnell's membrane. The growths may almost entirely hide the membrane, but complete occlusion of the meatus is unusual in the multiple variety.

The DIAGNOSIS is, as a rule, obvious on inspection, but if there is any doubt it can be cleared up by touching the growth with a probe, when its bony consistence will at once become manifest.

SYMPTOMS.—Exostoses do not cause symptoms unless the lumen of the meatus is completely obliterated; but if this occurs, either by swelling of the covering of the exostosis or by the accumulation of wax, deafness is complained of. When there is retention of pus in a case associated with middle-ear suppuration, severe symptoms will result. Occasionally the surface of the exostosis becomes slightly inflamed, and causes a feeling of great itchiness in the ear.

TREATMENT.—If exostoses are small and do not cause symptoms, no treatment is required; but if large and producing occasional attacks of deafness, the treatment depends on whether the condition is complicated by the presence of a middle-ear suppuration. In such cases, if there is a single large exostosis filling the meatus, it is wiser to remove it, but some caution should be exercised in giving a prognosis as to the hearing. In the multiple variety, operation should be avoided unless really necessary, as in this form complete obliteration of the meatus rarely occurs, and it may be very difficult to remove the tumours without damaging the membrane. A single exostosis may sometimes be removed through the meatus, local anaesthesia being induced by Neumann's method, but in the multiple variety an external operation is always preferable. Cartilaginous tumours, fibromata and papillomata have occasionally been found growing from the meatus.

CHAPTER XXV.

*DISEASES OF THE TYMPANIC MEMBRANE AND
ACUTE INFLAMMATION OF THE MIDDLE EAR.***INFLAMMATION OF THE MEMBRANE (Myringitis).**

INFLAMMATION of the membrane apart from acute middle-ear suppuration is a rare occurrence; in fact it is very difficult to prove in any given case that the middle ear does not participate in an inflammation affecting the membrane. The hearing is not, however, so much impaired in myringitis as in otitis media, and the pain is less severe. The appearances met with are the same as in a case of acute otitis media. The treatment is also similar.

RUPTURE OF THE MEMBRANE.

Rupture of the membrane may be caused accidentally by a knitting-needle, hair-pin, or some similar object. The history usually given is that the patient has been scratching the ear with one of the above implements, and that the hand or the instrument has slipped, with the result that the membrane has been perforated. Similar accidents have occurred through twigs entering the ear when the patient has been passing through a thick wood. Ruptures may also be produced by a box on the ear, a sudden explosion, inflation of the ear by the air douche, unskilful attempts to remove foreign bodies, and even by a kiss on the ear. They are also met with in fractures of the base of the skull.

SYMPTOMS.—At the moment of rupture, severe pain is felt, usually accompanied by loud tinnitus, and occasionally by faintness, vertigo, and nausea. When the shock of rupture has passed, the patient finds that his hearing is more or less impaired. If the labyrinth has not been affected, the deafness may be very slight, but if this is involved to any extent, the deafness is usually very marked and permanent.

APPEARANCES.—A perforation due to direct violence is generally found in the posterior part of the membrane, and may be of varying size and shape, while the edges may be irregular or ragged, the appearances depending on the nature of the body which made the perforation. When it is due to indirect violence, the perforation is usually slit-like or oval, and is found in the anterior half of the membrane. The edges of the perforation in both cases are of a red colour from extravasation of blood, and if the perforation is of any size, the pale glistening mucous lining of the promontory can be seen through it.

TREATMENT.—Much harm can be done by injudicious treatment in these cases, and nothing can be worse than to resort to active measures, such as the instillation of drops, or syringing the ear; accordingly, if the practitioner is fortunate enough to see the patient before any treatment has been adopted, he should confine himself to placing a plug of cotton-wool in the ear, and should warn the patient of the danger of allowing fluids to enter the meatus: alcohol and tobacco must be interdicted. It is advisable to inspect the ear from time to time, so that should any unfavourable sign arise, it may be detected. In a favourable case the perforation will heal, the symptoms will disappear, and the hearing will return to normal.

The **PROGNOSIS** as regards the hearing depends largely on whether the labyrinth is affected or not; this point may be determined by the tuning-fork tests. If suppuration ensues, permanent impairment of the hearing may result; the case then passes into the category of acute middle-ear suppuration, and must be treated as such.

ACUTE INFLAMMATION OF THE MIDDLE EAR.

Acute inflammation of the middle ear may be divided clinically into a mild form in which perforation does not occur—*otitis media acuta simplex*—and a more severe form associated with perforation—*otitis media acuta perforativa*.

ETIOLOGY.—Acute middle-ear inflammation may result from any inflammatory condition of the upper air-passages; hence it is a very common sequela of the exanthemata, especially measles and scarlet fever; it also occurs frequently in influenza, and in nasal and post-nasal catarrh. It may be caused by too vigorous syringing of the nose, and by operations on the nasal

cavities and the naso-pharynx; it may result from injuries to the ear, from the direct exposure of the ear to a cold wind, and from sea bathing. (In some of the cases due to bathing, the infection reaches the middle ear through the Eustachian tube.)

The chief predisposing causes are the presence of adenoid vegetations in the naso-pharynx, the existence of perforations of the membrane, and a hereditary disposition to tubercle and to suppuration in the ear.

BACTERIOLOGY.—The *Streptococcus pyogenes* has been shown to be the most common cause of acute middle-ear suppuration. The *Diplococcus catarrhalis* and the *Pneumococcus* are also frequently met with. The *Staphylococcus pyogenes aureus* and *albus*, the *Bacillus coli communis*, and *Bacillus proteus vulgaris* are more rarely found.

SYMPTOMS.—At the onset of an attack, pain is the chief symptom; it is usually worse at night, and is at first confined to the depths of the ear, but soon radiates over the side of the head, forwards towards the temple, and backwards towards the occiput. It is intensified by actions, such as yawning or sneezing, which tend to increase the intra-tympanic pressure. In the more severe forms, the pain may be almost unhearable, but it is generally much relieved when perforation of the membrane occurs; in influenzal cases associated with intense earache, the pain may remain unabated for some days after rupture of the membrane. In every case, in addition to the pain, there is some degree of tenderness on pressure over the mastoid process. It will be remembered that the antrum is part of the middle-ear cavity, and accordingly if there is pus in the tympanum, it will also be found in the antrum; hence this symptom does not necessarily mean that the mastoid process is involved in the inflammation: the evidence of this complication will be discussed later.

In mild cases affecting adults, there is only a slight rise of temperature, but in young children, at the onset of the attack there is often a sharp rise to 102° or 103° F. In the severe form, there may be a considerable degree of pyrexia in adults as well as in children.

In the early stages there is only slight impairment of hearing, but after a few days deafness usually becomes much more marked, especially if the inner ear is involved.

Tinnitus is also generally complained of, and is in most cases

of a throbbing character, due to the pulsation of the dilated vessels in the tympanum.

Vertigo is not a common symptom in acute inflammation.

Facial paralysis occurs in a small percentage of cases.

APPEARANCES.—In a mild case, the first changes to be noted in the membrane are injection of the handle of the malleus, and the appearance of fine vessels running from the umbo to the periphery, that is, a radial injection of vessels (*Plate VII, Fig. 63*). If the inflammatory condition progresses, the membrane loses its polish, the hyperæmia becomes general, and the membrane hulges (*Plate VII, Fig. 64*). The bulging is at first only apparent in the posterior half of the membrane; the hammer handle can still be distinguished, and the anterior half of the membrane, which lies more in shadow, has a bluish tinge. If the inflammation does not subside at this stage, it passes into the more severe form in which perforation is almost inevitable. The whole membrane becomes very red and convex, and the hammer handle can no longer be recognized. At one point, usually in the posterior half of the membrane, a yellow spot appears which, on careful examination, is often seen to pulsate; it is here that the membrane will give way. In some instances a nipple-shaped projection, surmounted by a yellow spot, appears on the membrane. In severe cases, hæmorrhagic bullæ may develop on the surface of the membrane; in course of time these burst, and discharge their contents into the meatus.

Appearances after Rupture of the Membrane.—In the first few days after rupture it is generally necessary to syringe the ear in order to obtain a view of the drum, as the discharge of pus is abundant. As a rule there is only one perforation, but in tuberculous cases there may be two or three. Where the perforation is single, it may be so small as to escape detection by the eye, but if the inspection of the membrane is continued for a short time, its position will be indicated by the appearance of a bead of pus which will be seen to pulsate vigorously. In some cases, especially in those resulting from scarlet fever, measles, and influenza, there is rapid destruction of the greater part of the membrane.

The discharge, at first abundant, gradually diminishes, and in favourable cases ceases after a period varying from a few days to seven or eight weeks. It may, however, continue

indefinitely; the condition then passes into the category of chronic middle-ear suppuration.

The above description refers to cases where the inflammation affects the tympanum proper; the inflammatory process is, however, sometimes restricted to the epi-tympanic recess or attic. An acute inflammation in this region resembles an ordinary case in its semeiology, with the exception that the hearing may be very little affected. Inspection of the ear shows that the membrana flaccida is red and bulged, while the rest of the membrane may retain a practically normal appearance (*Plate VII, Fig. 65*). The inflammation may progress until perforation occurs.

PROGNOSIS.—The prognosis in the large majority of cases is good, both as regards the cessation of discharge and the return of hearing; in mild cases without perforation, complete recovery may be confidently expected. When perforation has occurred, the outlook is not so favourable, particularly in those cases which arise in the course of the exanthemata, and which are especially liable to result in chronic otorrhœa associated with permanent impairment of the hearing. In other cases, though the discharge ceases, a dry perforation is left, and the hearing remains affected to some degree. In a small percentage, complications arise which may prove fatal. (See Chapter XXVII.)

TREATMENT.—In mild cases, the patient should be confined to the house, and if a child, should be kept in bed. The bowels should be cleared out by a dose of calomel at night, followed by a saline aperient in the morning. The pain in the ear may be relieved by the instillation of a few drops of glycerine of carbolic acid with cocaine (see Appendix), menthol in paroleine, or laudanum; the instillations may be repeated four-hourly if necessary. The application of dry heat is also of service in most cases, but poultices should be avoided. When the inflammation has subsided, the patient should undergo a course of inflation, either with the catheter or by Politzer's method; this will hasten the return of the hearing.

In severe cases of inflammation, where it is believed that perforation is certain to occur, paracentesis should be performed. In deciding on this step, the surgeon must be guided partly by the appearance of the drum head and partly by the symptoms. If, in spite of all palliative measures, the pain continues sufficiently severe to rob the patient of his sleep for one night,

paracentesis should certainly be performed, but when the appearance of the drum head from the first indicates a severe form of inflammation, the procedure should be carried out without delay. The incision causes extreme though momentary agony, so that it is desirable to employ a general anæsthetic in the case of children; adults may be given their choice between general and local anæsthesia. The latter is rarely efficient, but when it is employed Bonain's drops should be used. When general anæsthesia is decided upon, ethyl chloride will be found very serviceable. Paracentesis must be performed with due regard to cleanliness; the speculum and knife must be sterilized. The incision is made in the most bulged part of the membrane; it should be more than a puncture, and its direction may be either vertical or horizontal; the whole thickness of the membrane should be divided. If general anæsthesia is not employed, paracentesis must be performed rapidly, as the pain is so great that the most stoical individual can hardly refrain from moving. Beginners generally make the mistake of scratching the posterior meatal wall close to the drum membrane, or else they make a superficial scratch on the membrane and do not divide it. Paracentesis is as a rule followed by a discharge of pus which soon becomes abundant, and immediate relief from pain is experienced. When the ear begins to discharge, whether as a result of paracentesis or of a natural perforation, recourse must be had to syringing, for which purpose warm boracic lotion or sterile saline solution may be employed. The amount of discharge must determine how frequently the syringing should be repeated; it may be necessary every two hours. The ear should always be dried after syringing, and a plug of cotton-wool must be worn. When the earache persists after perforation, it may sometimes be relieved by direct syringing of the middle-ear cavities through the Eustachian tube. The syringing of the ear by the ordinary method should be continued until the discharge has entirely ceased, but at longer intervals as it diminishes.

In some cases, after paracentesis, the perforation closes before the inflammatory process has subsided, and it is necessary to make a second incision. This unfortunate result may best be avoided by making a free opening in the first instance, though this will not absolutely ensure against too early closure, for artificial perforations differ from the natural variety in having a much greater tendency to heal.

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Systematic inflation of the ear should be carried out as soon as the pain has ceased and the swelling of the membrane has subsided.

Bier's congestive treatment (see page 192) is adopted by some authorities in acute suppurative otitis media, a free incision being made in the drum membrane previous to the application of the bandage. The method should, however, only be carried out when the patient can be kept under very careful observation, and when he is within reach of surgical assistance.

In all cases complicated by the presence of adenoid vegetations in the naso-pharynx, their removal is called for as soon as the acute symptoms have subsided.

CHAPTER XXVI.

CHRONIC SUPPURATION OF THE MIDDLE EAR.

ETIOLOGY.—Chronic suppuration of the middle ear results from an attack of acute inflammation, and accordingly the causes are the same in both cases. Chronic suppuration is, however, especially liable to follow in cases due to scarlet fever, measles, and diphtheria, also in tuberculous infections, and in any case where the treatment of the acute attack has been neglected. The presence of adenoid vegetations in the nasopharynx is an additional and important factor in keeping up an aural discharge.

SEMEIOLOGY.—Impairment of hearing and a discharge from the ear are the chief symptoms of chronic middle-ear suppuration, but they both vary greatly in degree. The discharge may be very profuse, or may be so slight as entirely to escape the patient's notice; it may be extremely foetid, or devoid of smell. The impairment of hearing may also be so slight as to be negligible, or the deafness may be extreme; in the latter case, there is generally involvement of the stapedio-vestibular joint, or of the inner ear.

Tinnitus is an occasional symptom, but is rarely well marked.

Pain is nearly always a grave symptom. It may be due to defective drainage, or it may be evidence of the beginning of a serious or even fatal complication.

Vertigo is also occasionally present. It may be caused by pressure on the stapes, congestion of the labyrinth, or extension of the suppuration to that organ.

Disturbance of the sense of taste is complained of in some cases.

APPEARANCES.—The drum membrane is frequently hidden, owing to the presence of pus or of inspissated secretion; and in such cases the ear should be syringed in order to obtain a satisfactory view of the parts. On subsequent inspection of the ear, a perforation may frequently be seen, which varies greatly

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in size, in some cases being no larger than a pin-head, while others involve practically the whole area of the membrane. As a rule, the perforation is single (*Plate VII, Fig. 69*), but occasionally two or even three perforations may be present. The remaining membrane may be red and swollen, or merely thickened. The position of the perforation should be noted: whether it occupies the central portion of the membrane, or extends to the annulus tympanicus (marginal perforation), while perforation of the membrana flaccida should also be looked for.

PROGNOSIS.—The presence of a chronic middle-ear suppuration is always a source of risk to the patient. The danger is greater in childhood and early adult life than in middle and old age, for intra-cranial complications are more liable to occur in the young. The risks are greater in the lower than in the more cultured classes, owing to the prevalence among the uneducated of the idea that a discharge from the ear is a trivial matter, and the consequent lack of attention they pay to it. Hence we find that a much larger percentage of patients require mastoid operations in hospital than in private practice. Various other factors influence the prognosis; thus, in cases of tuberculous infection or in those arising in the course of the exanthemata, there is likely to be extensive destruction of the drum membrane and marked impairment of the hearing, while mastoid and other complications are more liable to occur. The position of the perforation is also of considerable importance. Perforations in Shrapnell's membrane, and marginal perforations in the posterior superior quadrant, are to be looked upon as more serious than those which are centrally placed: the first because they indicate an attic suppuration, and the second because they are generally associated with caries of the incus, and possibly also with erosion of the walls of the aditus and of the antrum.

TREATMENT.—One of the chief desiderata in the treatment of chronic middle-ear suppuration is cleanliness; this can best be secured by syringing the ear. The routine treatment which I usually prescribe is as follows: (1) Syringe the ear with warm boracic lotion (boric acid 1 drachm to a pint of boiled water); (2) Instil 10 to 15 drops of a solution of peroxide of hydrogen (10 vols.). The drops should be allowed to remain in the ear for five minutes or until they cease to bubble; (3) Dry the ear with sterile wool; (4) Inflate the ear by Politzer's

method ; (5) Dry the ear again with sterile wool. This process is repeated from one to three times a day according to the amount of discharge. When the secretion is very gelatinous, syringing the middle ear through the Eustachian tube is often efficacious, but this necessitates the aid of the surgeon.

If the discharge is very foetid, formaldehyde (40 per cent), 20 drops to a pint of boiled water, or one of the following lotions may be used for syringing: lysol (1 per cent), creoline (1 per cent), or perchloride of mercury (1-3000). When the tympanic mucous membrane is succulent, equal parts of rectified spirit may be added to the solution of peroxide of hydrogen usually prescribed for purposes of instillation.

When the perforation is situated in Shrapnell's membrane, the ordinary method of syringing is of little value, and it is advisable to employ the attic syringe (see page 189).

In cases where there is a large perforation associated with scanty discharge, treatment with powders is often efficacious. The ear is syringed and carefully dried ; sufficient powder is then insufflated to form a thin film on the perforation and membrane. Boric acid, aristol, orthoform, or zeroform may be used for the purpose. This treatment can be entrusted to the patient.

When the suppuration ceases, leaving a dry perforation, water should not be allowed to enter the meatus, as it may cause a recurrence of the suppuration ; sea bathing should therefore be prohibited, and a pledget of wool be worn in the ear when the patient has a bath. As it is very desirable that the perforation should heal, an attempt may be made in such cases to induce cicatrization by painting its edges with trichloroacetic acid. The impairment of hearing varies enormously in different cases ; it may be very slight even in the presence of large defects in the membrane ; but when marked, the effect of an artificial drum should be tried. The simplest and most effective form of drum (also fortunately the cheapest), consists of a pledget of cotton-wool. A small piece of wool is made into the shape of a pear, and moistened in liquid paraffin ; it is then placed against the perforation with a pair of forceps, which grasp the narrow end. If this improves the hearing, the patient should be taught to make and introduce the pledget, and in a short time he will probably be able to do it with more success than the surgeon. The artificial drum should be worn at first only for an hour or two at a time, but later it may be allowed to remain in the ear

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all day; it should, however, always be removed at night, a fresh piece being inserted each morning. The practice must be discontinued if a recrudescence of the suppuration occurs.

TUBERCULOUS DISEASE OF THE MIDDLE EAR.

Tuberculous disease of the middle ear has been shown by Milligan to be much more common than was supposed a few years ago. It is most frequently met with in infants and young children; and may occur as a primary affection, or be secondary to tuberculous lesions in other parts of the body, especially in the lungs. The infection may reach the middle ear by the Eustachian tube, or by the blood or lymph channels.

SYMPTOMS.—The case may begin acutely, and present the symptoms of an acute otitis media, except that the pain is never so severe. It is far more common, however, for the course of the disease to be insidious from the outset, the first symptom being a watery discharge from the ear, usually fairly abundant and frequently very fœtid. More than one perforation may be present, and these may coalesce and result in the destruction of the greater part of the membrane; when this occurs, the middle ear is often found to be full of pale œdematous granulations. The course of the disease differs from that of chronic suppuration in the early development of facial paralysis; in the enlargement of the peri-auricular, and later of the cervical lymphatic glands; the frequency of a labyrinthine infection; and in extensive necrosis of bone, associated with the formation of sequestra.

DIAGNOSIS.—While the diagnosis may be suggested by the symptoms described above, it can only be confirmed by the detection of tubercle bacilli either in the discharge or in the granulation tissue. This is often a very difficult matter; information may, however, be gained by the histological examination of the granulation tissue, in which giant cells and areas of caseation may be found; von Pirquet's cutaneous reaction, or inoculation experiments on guinea-pigs, may also be tried.

TREATMENT.—The general treatment of tuberculous disease should be adopted. The local treatment consists in the ordinary antiseptic measures, and in removal by operation of all diseased bone and of the tuberculous glands, if the disease is not too

far advanced and the general health of the patient will allow of this being done. In young children the operation should generally be carried out in stages.

CHOLESTEATOMA.

Cholesteatoma is usually associated with a chronic middle-ear suppuration, but in rare cases it occurs without suppuration as a primary formation, developmental in origin. A cholesteatoma consists of masses of squamous epithelium concentrically arranged, with here and there crystals of cholesterin. To the naked eye it generally appears as a smooth glistening and pearly body, but in other cases it looks like a mass of putty. The layers of epithelium, which are produced by metaplasia, accumulate, and exercise pressure on the surrounding bone and erode it; on removing the cholesteatoma, the underlying bone is found to be smooth and highly polished. The cholesteatoma may invade the labyrinth and the middle and posterior fossæ of the skull; the mass may be extruded through the meatus, and occasionally leaves an appearance as if nature had performed the radical mastoid operation.

SEMEIOLOGY.—The condition may be dormant for years, but the pressure always constitutes a risk to the patient, as suppuration round the cholesteatoma is easily induced. Giddiness and pain are frequently present, but the symptoms vary greatly.

DIAGNOSIS.—This is not always easy, but the extrusion of masses of epithelium through a perforation is characteristic, and the frequent washing out of epithelial scales by the intra-tympanic syringe is suggestive. Milligan has drawn attention to the presence of acid-fast squames in the discharge as a point of value in diagnosis.

TREATMENT.—The ordinary treatment of chronic otitis media is not effective in cases of cholesteatoma, and either recourse must be had to intra-tympanic syringing, by which the masses of epithelium may be dislodged, or, if this fails to relieve the symptoms, the radical mastoid operation should be performed.

CHAPTER XXVII.

*COMPLICATIONS OF MIDDLE-EAR SUPPURATION.***COMPLICATIONS OF ACUTE SUPPURATION.**

Inflammation of the Mastoid Process.—It has already been pointed out that, though pus finds its way into the antrum in every case of acute suppuration in the middle ear, the inflammation rarely involves the mastoid process, and the pus is usually absorbed without producing symptoms of a mastoid complication. The inflammatory process may, however, spread to the mastoid cells, or may reach the surface and produce periostitis, the infection in the latter case passing along the perivascular sheaths, or in children by way of the squamo-mastoid suture. Resolution may occur before pus has formed, if the iter ad antrum is not blocked and if there is free drainage through the membrane. The condition may, however, go on to suppuration, with the formation of a mastoid or sub-periosteal abscess. If untreated, the abscess may burst (1) through the skin, (2) into the meatus (3) into the inner ear, (4) into the middle or posterior cerebral fossa, (5) through the inner aspect of the tip of the mastoid process into the digastric fossa (Bezold's mastoiditis).

SYMPTOMS.—The presence of pus in the antrum is suggested by some degree of tenderness on pressure over the base of the mastoid process, but if the inflammation actually involves these parts, the symptoms become more marked, and usually overshadow those depending on the intra-tympanic suppuration; the pain in these cases is generally severe, and the temperature may rise one or two degrees, while the pulse-rate is quickened; the tenderness also becomes much more marked, and may be extreme.

In the case of periostitis, œdema of the soft parts develops, and the auricle is displaced downwards and outwards; this is

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described as erection of the auricle. The change in position may best be detected if the head is viewed from behind. If a sub-periosteal abscess forms, a fluctuating swelling appears behind the ear.

When the inflammation is more deeply situated, the pain is deep and boring in character; the tenderness on pressure is most marked over the tip of the process or over the antrum, and if an abscess forms and spreads towards the surface, œdema and erection of the auricle are produced as in the case of periostitis, while if it extends towards the meatus, bulging of the posterior meatal wall occurs close to the drum membrane. The discharge from the ear is usually abundant, but in some cases a mastoid inflammation occurs after the discharge from the middle ear has ceased and the perforation has healed. This is most likely to take place in cases due to an infection by the *Diplococcus pneumoniae* or the *Streptococcus mucosus*.

DIAGNOSIS.—The diagnosis of periostitis and mastoid inflammation is generally easy, but in some cases there may be doubt whether the condition has passed the catarrhal stage and gone on to actual pus formation, as there may be no pyrexia and no increase of the pulse-rate, while the pain may be slight and the objective appearances indefinite. In such cases, considerable information may be obtained from a skiagram taken to show the mastoid region of the skull. For this purpose the tube is placed so that the rays pass obliquely through the sides of the head. Both sides are photographed, for the purpose of comparison. The skiagram shows the type of mastoid process, and if cellular, the distribution of the cells; it also demonstrates the position of the lateral sinus, antrum, etc. Pus, if present, will be indicated by an area of cloudiness, while the outlines of the cells in a cellular mastoid will also be blurred. Although this method of investigation has been but little used in this country, Dr. Logan Turner and I have found it of considerable service, and it is worthy of more general employment. As in the case of skiagraphy of the accessory sinuses of the nose, some experience is required in the interpretation of the pictures which are obtained. Further information may be gained by a leucocyte count, a marked degree of leucocytosis (over 20,000) being evidence of a suppurative process.

TREATMENT.—When symptoms of inflammation of the mastoid process supervene, the patient should be sent to bed,

and if the condition is not urgent, palliative measures should be adopted in the first place. Free drainage through the drum membrane is essential, and paracentesis must be performed if the perforation is not already sufficiently large to permit of this. The bowels may also be cleared out by a dose of calomel at night (gr. iii-v), followed by a saline cathartic in the morning. Some authorities advocate the use of Bier's congestion, but if this line of treatment is adopted the patient must be kept under the most careful observation, for though the symptoms are usually alleviated, the progress of the disease is not always checked, and fatal intra-cranial complications may arise. The pain may be relieved by the application of cold by means of an ice-bag or by running iced water through Leiter's tubes.

Operation is indicated if the inflammatory process does not subside after three or four days, or if there is evidence of pus formation or threatening of an intra-cranial complication (see page 225). In doubtful cases it is wiser to operate early, as the prognosis, both as regards return of hearing and cessation of discharge, is much better in these circumstances. The operation, which is known as Schwartz's or the "classical" operation, consists in opening the antrum and clearing out all diseased bone through a curved incision which is made a quarter of an inch behind the attachment of the auricle. The wound is left open and allowed to granulate. The duration of the after-treatment may be shortened in many cases by secondary closure of the wound, which may be carried out in from ten days to three weeks after the operation, if the perforation in the drum membrane has healed.

Intra-cranial Complications will be considered later (see page 225).

COMPLICATIONS OF CHRONIC SUPPURATION.

Granulations and Polypi.—These are frequently met with in chronic suppuration, and much more rarely in acute inflammation. Polypi arise from granulation tissue, which is a lowly organized connective tissue. Granulations may spring from the tympanum or the attic, or may proceed from a sinus in the bone external to the membrane. The distinction between granulations and polypi is somewhat arbitrary. Granulations are sessile red growths which bleed readily when touched. Polypi vary greatly in size and appearance; they may be little

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larger than a pin's head, or they may entirely fill the meatus and even project beyond it (*Plate VII, Fig. 71*): one or more may be met with, and unless very small, they are usually pear-shaped, being constricted where they pass through the tympanic membrane. In rare instances they become adherent to the walls of the meatus, and cause complete stenosis. They may be bright red in colour, or have a bluish tinge; they are covered with epithelium, which is usually of the stratified squamous type, and are supplied with blood-vessels.

SYMPTOMS.—Granulations and polypi frequently do not produce any symptoms apart from those due to the chronic otorrhœa to which they owe their origin, but in some cases a history of bleeding from the ear is given. Pain is not a common symptom, and occurs only when there is retention of secretion. The amount of deafness varies greatly, and depends largely upon the size of the growth and its position, as well as upon the amount of destruction of tympanic structures caused by the original otitis media.

DIAGNOSIS.—This is usually made without difficulty. If there is much secretion, it may be necessary to syringe the ear in order to obtain a view of the deeper parts. On inspecting the ear after this has been done, a granulation appears as a red sessile growth, usually situated on the inner wall of the tympanum, and sometimes filling a perforation in the drum membrane and apparently growing from it. In the case of granulations springing from the posterior meatal wall, it is usually possible by means of a probe to detect carious bone underlying the growth, or to locate the mouth of a sinus leading into the mastoid cells. Polypi, if large, appear as red, raspberry-like bodies, or as smooth tumours of a bluish-grey colour which partially or entirely fill the meatus. A polypus may possibly be mistaken for an exostosis, or a red and bulged membrane; if there is doubt as to the nature of the condition, the use of a probe will clear up the diagnosis. A polypus is characterized by its soft consistence and mobility, and by the fact that it does not spring from the meatal walls but from the depths of the ear; the exact attachment cannot be detected before removal, but this is of no consequence. Polypi, if small, appear globular or pear-shaped, are usually attached by a pedicle, and are of a pink or red colour.

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TREATMENT.—The treatment of granulations and polypi must be combined with that of the chronic suppuration in the middle ear. When there is very little granulation tissue, the treatment may be confined to the instillation of rectified spirit every time the ear is syringed. If the granulations are not destroyed, or are too plentiful to respond to such mild measures, they may be burnt by the application of solid silver nitrate, a chromic acid bead, or the electric cautery; or they may be removed by means of a curette or ring knife. The electric cautery is very efficacious, but should be used only by one thoroughly conversant with the technique of intra-meatal operations. Whatever method is adopted, local anæsthesia must first be induced, either by the use of Bonain's drops or by Neumann's method (see page 191).

When dealing with a polypus, the simplest and easiest method of removal is by means of an aural snare, such as Blake's, which is threaded with fine iron wire. The ear is anæsthetized by Bonain's drops or by Neumann's method, and the loop of wire, introduced through a speculum, is passed over the polypus and carried inwards as far as possible. The wire is then tightened, and the polypus is withdrawn with a twisting motion. There is generally free hæmorrhage, though this is much diminished by the use of Bonain's drops. When the bleeding has been stopped (this is easily done by packing the meatus), the ear must be inspected, and if the polypus has not been completely removed, the snare must be employed again, or the stump may be curetted. In the after-treatment, in addition to syringing the ear, it is desirable to use spirit drops, either pure or mixed with an equal quantity of peroxide of hydrogen in solution (10 vols.).

When granulations are associated with a sinus in the bone, their mere removal is of little use, as in a few days they grow as large as before; this is an indication that more active interference is necessary, such as the performance of the radical or the modified radical mastoid operation.

FACIAL PARALYSIS.

Facial paralysis is not a very common complication of middle-ear suppuration, and is much more rare in acute than in chronic cases. As has been already stated, it is especially liable to occur

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in tuberculous infections, and it is also common in malignant disease. It is sometimes produced by injury or division of the nerve during an operation, or by the pressure of packing on an exposed nerve during the after-treatment. Facial paralysis occurring in the course of a middle-ear suppuration may be due to erosion of the bony canal in which the nerve is carried (aqueductus Fallopii), resulting in perineuritis; or there may be a congenital opening in the canal. The latter is usually the explanation of facial paralysis occurring in the course of an acute otitis media.

TREATMENT.—When facial paralysis occurs in the course of a chronic suppuration, it is an indication for the radical mastoid operation, as removal of carious bone and of any granulations surrounding the nerve will frequently be followed by recovery of function. In cases of acute suppuration, it is usually sufficient to provide for free drainage, as the nerve will generally recover when the inflammation subsides. Post-operative cases due to pressure of packing are usually transient, but when the paralysis does not pass off, further operative treatment should be delayed for six months; the facial nerve may then be exposed in the middle ear by opening up the aqueductus Fallopii, as recommended by Alt. The nerve is freed from pressure, and if it has been divided, the ends are placed in apposition. If this fails, an anastomosis may be made between the facial and the hypoglossal or spinal accessory nerve. As long as the nerve remains paralyzed, massage of the face and faradization should be employed.

MALIGNANT DISEASE.

Malignant disease rarely affects the middle ear, though both carcinoma and sarcoma are occasionally met with, the former in the middle-aged and old, the latter most often in children: in either case there is as a rule a history of chronic otorrhœa. Malignant disease is usually associated with severe pain in the ear, copious and generally very foetid secretion, and exuberant granulations which rapidly recur after removal. Facial paralysis is, as a rule, an early sign, but the cervical lymphatic glands are not usually involved. Death takes place from exhaustion, meningitis, or lateral sinus thrombosis.

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DIAGNOSIS.—When malignant disease is suspected, the diagnosis may be confirmed by microscopic examination of the granulation tissue.

The **PROGNOSIS** is bad.

TREATMENT.—If possible the disease must be eradicated by operation; some information of its extent may be obtained beforehand by taking a skiagram. In inoperable cases, palliatives must be employed, such as antiseptic syringing, morphia, etc.

CARIES AND NECROSIS.

Caries and necrosis of the ossicles and temporal bone may occur in chronic suppuration; they are much more rarely met with in acute suppuration of the middle ear. It has already been stated that the ossicles are especially liable to destruction in otitis media due to the exanthemata and to influenza; while necrosis of the temporal bone is very common in tuberculous infections, scarlatina, influenza, and diabetes. The mastoid process and the posterior wall of the external meatus are the parts of the temporal bone most frequently affected, but the external wall of the attic, the inner wall, the roof and floor of the tympanum, and the posterior wall of the carotid canal may also be attacked.

SYMPTOMS.—The symptoms vary with the parts affected; pain is the most constant, and is generally to be explained by the retention of secretion. Vertigo is present as a rule in caries of the labyrinthine capsule. More stress is, however, to be laid on the objective than on the subjective signs; but these vary in different cases and depend largely on the position of the caries. The discharge is generally foetid; it may be abundant and creamy, or thin, bloodstained, and very offensive, and on microscopic examination may be found to contain myelocytes or osteoblasts. The presence of exuberant granulations which grow again with great rapidity after removal, is very suggestive of caries; they should be carefully probed with the object of detecting bare or carious bone. Bulging of the posterior wall of the meatus, with subsequent breaking down of the swelling and the formation of a sinus in the bone, is occasionally met with. Fistulae may also be found behind the ear, leading to an aperture in the cortex of the mastoid. In some cases a large defect is met with in the outer wall of the attic, while in others facial

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paralysis develops. Caries may result in the formation of sequestra, especially in tuberculous and scarlatinal cases; the size and shape depend on the extent of the caries, and more than one sequestrum may be present. Portions of the mastoid process, the cochlea, the semicircular canals, the annulus tympanicus (in the case of children), and even the entire labyrinth may be exfoliated.

Caries of the ossicles may be met with alone or may be associated with caries of the temporal bone. The incus most frequently becomes affected, especially when there is a perforation in the posterior superior quadrant; it may be associated with caries of the head of the malleus. The long process of the incus, and the head and crura of the stapes, are also frequently involved.

DIAGNOSIS.—While in some cases the diagnosis of caries may be made with certainty from the signs detailed above, in those where the caries is deep-seated it is difficult to arrive at a definite conclusion. A history of frequently recurring pain, an obstinate discharge which remains very fœtid in spite of treatment, and exuberant granulations which return rapidly after removal, all point to the presence of carious bone. In some cases it is possible to diagnose areas of necrosis in the mastoid process by changes in the shadow of the skiagram, an area of necrosis showing darker on the negative, as it permits of a freer passage of rays than does the healthy bone.

TREATMENT.—The presence of caries of the temporal bone is nearly always an indication for a mastoid operation, and as a rule the radical operation has to be performed. It depends on the severity of the condition whether it is allowable to temporize in the first instance, and limit the treatment to antiseptic measures and such minor surgical procedures as the removal of granulations. When however such means fail to relieve the pain, or when the discharge remains fœtid and granulations recur soon after their removal, operation should be advised.

Ossiculectomy, or removal of the malleus and incus, is an alternative procedure in cases in which the caries is limited to the ossicles, and in which the hearing is considerably impaired; also in cases of attic suppuration associated with a considerable degree of deafness. This operation is, however, not performed nearly so often now, the reasons for this being: (1) It is generally impossible to say whether the caries may not involve

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the temporal bone as well as the ossicles, in which case another operation may become necessary; (2) The hearing after the radical operation is no worse than it is after ossiculectomy; (3) It has occasionally been found that cases which at first did well after ossiculectomy have returned later, requiring the major operation.

INDICATIONS FOR OPERATION ON THE MASTOID PROCESS.

The chief complications of chronic suppuration of the middle ear having been discussed (with the exception of labyrinthine suppuration and intra-cranial complications to be considered later), it is convenient at this stage to sum up the indications for operations on the mastoid process which may arise in the course of chronic suppuration. It is perhaps advisable to state in the first place that the presence of a long-standing chronic suppuration in the middle ear, unaccompanied by symptoms and in which the discharge is not foetid, is not an indication for operation; firstly, because it is impossible to promise that after the operation the discharge will entirely cease, and secondly, because the operation is not devoid of risk. Certain symptoms, however, point to the necessity of operation, the most important of these being pain. Vertigo, either constant or intermittent, is another indication for operation, also any symptoms pointing to an intra-cranial complication, such as vomiting.

The chief objective signs which afford an indication for operation are: (1) A discharge which remains foetid in spite of antiseptic treatment, and which, on cytological examination, is found to contain numerous lymphocytes, myelocytes, or acid-fast squames (Milligan); (2) Granulations which recur rapidly after removal; (3) Sinuses in the bone, which open on the surface or in the meatus; (4) Facial paralysis; (5) Cholesteatoma; (6) Tuberculous disease of the middle ear; (7) Stenosis of the meatus, or an exostosis interfering with proper drainage; (8) Recurrent acute exacerbations of a chronic suppuration; (9) Evidence of deep-seated caries; (10) Evidence of labyrinthine suppuration or intra-cranial complications (see below).

The operation which is performed in chronic suppuration is the radical or complete post-aural operation. It differs from

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the classical operation in that the antrum and tympanum are thrown into one cavity. This is done after opening the antrum by removal of the bridge of bone superficial to the aditus, the bridge being really part of the posterior meatal wall. In the complete operation, the ossicles, with the exception of the stapes, are also removed, as is the outer wall of the attic. The post-aural wound is closed, and the after-treatment is carried out through the meatus, which is permanently enlarged by some form of plastic operation. To give details of the operation is outside the limits of this book.

In some cases it is possible to do a modified radical operation, by means of which the ossicles are left, though the bridge of bone is removed. It is indicated in those cases where the chief pathological changes are found in the mastoid process, and where the ossicular chain is intact.

The AFTER-TREATMENT of the complete operation usually lasts for from six weeks to three months, and is complete when the operation cavity is covered with epidermis. In a certain proportion of cases the cavity never dries up, and antiseptic treatment has to be carried out indefinitely. Even when complete epidermization takes place, the cavity should be syringed once a week, and a solution of peroxide of hydrogen (10 vols.) instilled, as otherwise crusts tend to form, under which suppuration is liable to occur.

The PROGNOSIS as regards hearing must be guarded. Where the hearing is good before the operation, it is liable to become worse, but when it is bad, improvement may follow, provided that the footplate of the stapes is intact; if the hearing is but moderately impaired, little change may take place. Occasionally remarkably good hearing is preserved after this operation, and I have recorded a case in which a low whisper was audible at a distance of six yards: in an ordinary case the result may be considered satisfactory when a whisper can be heard at two yards.

SUPPURATION OF THE LABYRINTH.

Suppuration of the labyrinth is usually caused by the extension of a middle-ear suppuration through the inner wall of the tympanum, either by way of the fenestra ovalis or rotunda, or through a fistula in the external semicircular canal or the promontory. In the majority of cases it follows a chronic

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affection, especially tuberculous disease or cholesteatoma. If the result of acute disease, it is generally met with in scarlatinal-diphtheritic cases. Apart from middle-ear disease, suppuration of the labyrinth may be caused by fracture of the base of the skull, by ill-directed attempts to remove a foreign body, and by basal meningitis.

SYMPTOMS.—Labyrinthine suppuration may begin acutely, with severe deep-seated boring pain, a rise of temperature and of the pulse-rate, marked giddiness, nausea, vomiting, tinnitus, and a high degree of deafness. Nystagmus is present at first, and is directed towards the side affected, but later towards the sound side. The nystagmus, vertigo, and nausea tend to pass off in a few days, and in serous cases the hearing may be restored. The condition may, however, end fatally as a result of basal meningitis, set up by the spread of infection through the internal auditory meatus.

Chronic labyrinthine suppuration may be very insidious both in its origin and course, and may only be diagnosed during a radical mastoid operation. Vertigo is a very common symptom, and there is often a tendency to fall over towards the diseased side. Deafness is usually present in some degree and may be absolute, but where the labyrinthine infection is limited to the semicircular canals and vestibule, the hearing may not be impaired.

DIAGNOSIS.—The diagnosis of suppuration in the labyrinth cannot be made from the symptoms alone except in the acute cases, and a careful functional examination must always be carried out. The loss of the upper tone limit, shortened bone conduction, positive Rin  , and lateralization of the tuning-fork to the healthy ear on employing Weber's test, are all signs pointing to implication of the labyrinth. The static sense must also be tested; Rombergism is usually present, and there is inability to walk along a straight line. In diffuse suppuration, nystagmus may be present in all positions of the eye, while in cases limited to the external semicircular canal, it may be elicited only on looking towards the diseased side. In cases where there is an erosion of the external semicircular canal without implication of the membranous labyrinth, the fistula symptom is found (see page 176). The vestibular tests vary according to the stage of the disease: before actual destruction has taken place, the reaction to the rotation and caloric tests

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is more active than normal, while at later stages in the disease the reaction becomes slower and is finally lost. There may be considerable difficulty in differentiating between a labyrinthine and a cerebellar lesion, but the following points will help to distinguish between these conditions: Spontaneous nystagmus, if present, is directed towards the diseased side in labyrinthitis, and towards the healthy side in cerebellar abscess; moreover, as the disease progresses, the nystagmus tends to disappear in the former, and to become more marked in the latter affection. The patient tends to fall to the healthy side in labyrinthine suppuration, and to the diseased side in cerebellar abscess.

PROGNOSIS.—The prognosis of suppurative labyrinthitis is always grave; complete deafness may follow in both the acute and the chronic form, and intra-cranial complications, such as meningitis, serous or purulent, cerebellar or temporo-sphenoidal abscess, and thrombosis of the lateral sinus, may also occur, usually with a fatal issue.

TREATMENT.—The treatment of suppurative labyrinthitis is mainly operative, but whether or not the labyrinth should be opened, depends largely on the extent of the changes found during operation; the presence of an erosion of the external semicircular canal does not in itself justify the step. It is chiefly in cases of cholesteatoma or tuberculous disease with evidence of destruction of the labyrinth, or in cases where symptoms of meningitis are present, that the labyrinth should be explored and drained. The vestibule may be opened after performing the radical mastoid operation, through the external semicircular canal or by enlarging the fenestra ovalis, and the cochlea is exposed by removing the promontory. Jansen was the first to open the vestibule for disease.

INTRA-CRANIAL COMPLICATIONS.

The intra-cranial complications of otogenic origin are:—

1. *Affections of the Meninges.*—This includes pachymeningitis (extra-dural abscess); pachymeningitis interna; leptomeningitis serosa; leptomeningitis purulenta.
2. *Affections of the Brain.*—Abscess of the temporo-sphenoidal lobe; cerebellar abscess; encephalitis.
3. *Venous Infections.*—Including thrombo-phlebitis of the lateral sinus and of the petrosal and cavernous sinuses.
4. *Combinations of the above.*

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It is not intended to give more than the merest sketch of the otitic intra-cranial complications, but the importance of their early recognition can hardly be exaggerated, for the advances made in the last few years in the surgical treatment of these affections has been very gratifying; recoveries have been recorded even in cases of purulent meningitis, a condition previously looked upon as invariably fatal. It is, however, only by early operative interference that a successful result can be hoped for, and it is the duty of the practitioner to be on the look-out for the onset of an intra-cranial complication, and to call in the specialist while there is a prospect of successful interference.

Extra-dural Abscess.—An extra-dural abscess consists in a collection of pus between the bone and the dura mater. It is more frequently found in the posterior than in the middle cerebral fossa, and occurs more commonly in acute than in chronic middle-ear suppuration; in the latter it is met with chiefly in cases of cholesteatoma and in acute exacerbations of a chronic suppuration. The extent of the abscess varies greatly; it may be quite small, or in chronic cases it may attain an enormous size.

SEMEIOLOGY.—The symptoms are rarely characteristic, but the condition is associated with deep-seated boring pain, and if the abscess is large, there may be evidence of compression of the brain. There are rarely any localizing symptoms, though occasionally paresis of the sixth nerve may be met with.

DIAGNOSIS.—This is not easy as a rule. The relief of pain by the spontaneous evacuation of a large quantity of pus, or the aspiration of a considerable quantity of pus by rarefaction of the air in the external meatus (Politzer), will aid the diagnosis. The continuance of pain, pyrexia, and a raised pulse-rate after an operation for a mastoid complication should suggest the probability of the presence of a deeper-seated collection of pus.

The **TREATMENT** consists in the opening of the abscess and the evacuation of its contents, by removal of the bony wall.

Leptomeningitis may be serous or purulent, localized or diffuse, and may run an acute or a chronic course. It may be the result of either acute or chronic suppuration of the ear, and the infection may pass through an erosion of the bone

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situated in the tegmen tympani, the tegmen antri, the groove of the lateral sinus, or the posterior surface of the petrous bone. It may also arise, in the absence of defects in the bone, by infection through the inner ear and internal auditory meatus, or through the sheaths of the vessels which run between the middle ear and the meninges.

SYMPTOMS.—In the earlier stages, the symptoms are not definite. Pain is the first, and is localized at the beginning to the side of the head, but later becomes general. Accompanying the headache are photophobia, and marked irritability of temper; vomiting may also occur. The patient often lies curled up, with the knees drawn up to the chest, and with his head turned away from the light. Periods of excitement come on at times, or he may cry out or talk incoherently; delirium is common in children, and convulsions are not infrequent. The muscles of the neck may be rigid, and occasionally severe pain in the back is complained of. An inability to extend the knee when the thigh is flexed (Kernig's sign) is generally present. The temperature is high; it may be intermittent at first; but later it is constant, and towards the end may rise to 106° or 107° F. The pulse, at first strong, soon becomes weak and fast, and the blood-pressure becomes very low. In the final stages paralysis may develop, and may affect various parts of the body and also some of the cranial nerves, especially the third, sixth, seventh, and eighth. Optic neuritis is frequently met with, while the pupils are contracted and equal, and react sluggishly. Meningitis ends fatally in the great majority, but cures have been recorded not only in serous but also in purulent cases, and it is to be hoped that the statistics of treatment will in the future further improve.

DIAGNOSIS.—The diagnosis of meningitis is not always simple, as it is often combined with other intra-cranial complications; nor is it possible in all cases in which meningitis is diagnosed to say whether it is serous or purulent. When meningitis is suspected, lumbar puncture should be carried out, as it gives a great deal of information. If the cerebrospinal fluid is under tension, but is clear, and the cell elements on examination are not found to be increased and the fluid is sterile, a serous meningitis is probably present; on the other hand, if the fluid is under pressure, is turbid from the presence of leucocytes,

and organisms are found which grow on culture, a purulent meningitis may usually be diagnosed. Too much stress should not, however, be laid on the changes found in the cerebrospinal fluid alone, for it may be clear and sterile even in purulent meningitis, especially if localized to the middle cerebral fossa; and it may be turbid even in the absence of meningitis when a cerebral abscess has burst into the ventricles. The temperature curve in uncomplicated meningitis is of considerable diagnostic importance, as it maintains a consistently high level; whereas in sinus thrombosis the temperature is very irregular, showing rapid rises and equally rapid falls, and in brain abscess it is often subnormal. The diagnosis is, however, frequently complicated by the presence of other intra-cranial lesions, especially thrombosis of the lateral sinus.

TREATMENT.—The treatment consists in removal of the primary focus of disease, and in draining the sub-dural space. Accordingly, in acute cases the classical operation is performed, and in chronic cases the radical. If the infection has spread through the inner ear, trans-labyrinthine drainage should be provided for by opening up the labyrinth. In other cases, the dura should be widely exposed, a crucial incision made in it, and drains inserted in the sub-dural space. Drainage may also be aided by frequent lumbar puncture; 20 to 30 c.c. may be removed at a time.

Serous Meningitis differs from purulent meningitis only in degree, so that a special description is unnecessary; the symptoms in the former are less severe. A definite diagnosis must often be delayed until the effect of treatment has been observed; if a cure results, the meningitis was probably of the serous type.

Abscess of the Brain.—An otitic brain abscess is usually found close to the disease which causes it (McBride, Körner), and is therefore situated in the vast majority of cases in the temporo-sphenoidal lobe or in the cerebellum of the diseased side, the former being the more common according to most authorities. In some cases an abscess is found on the healthy side, or in the frontal or occipital lobe; these are to be looked upon as metastatic in origin. An otitic brain abscess is usually single, though more than one may be present. It occurs as a rule between the ages of ten and thirty; it is more common in males than in females, and is much

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more frequently the result of chronic than of acute suppuration. Cerebellar abscess is commonly due to disease of the labyrinth or pars petrosa, and temporo-sphenoidal abscess to the spread of the infection through the tegmen tympani or antri. Abscess of the brain may be associated with sinus thrombosis or meningitis.

SYMPTOMS.—A brain abscess may be divided clinically into four stages: initial, latent, manifest, and terminal. In the first two stages, there are no symptoms, or they are indefinite. In the third stage, the symptoms are in part due to compression of the brain, and in part to the process of suppuration; in addition there may be localizing symptoms depending on the part of the brain affected. In the final stage, coma develops and continues till the end. Symptoms due to compression comprise headache, nausea, vomiting, optic neuritis, slow pulse, and sub-normal temperature. The headache is one of the earliest symptoms, and lasts as long as consciousness persists. The nausea and vomiting are unconnected with the ingestion of food, and may recur several times a day. The pulse, at first rather quick, gradually becomes slower, and may drop to 40 or 50. The temperature also becomes sub-normal unless the condition is masked by coexisting meningitis or sinus thrombosis; but even in these cases the pulse remains relatively slow. The symptoms due to the suppurative process are rapid exhaustion and very rapid emaciation; there is also a peculiar and very disagreeable odour about the breath, the tongue is thickly furred, and sordes form on the teeth.

DIAGNOSIS.—While in many cases it is possible from the signs and symptoms described above to say with some degree of certainty that a brain abscess exists, it is much more difficult, and sometimes impossible, to locate it, for there may be no focal symptoms. There are, however, certain signs which, if present, point to a definite situation of the abscess. These will now be briefly considered.

Abscess in the Temporo-sphenoidal Lobe.—When the abscess is sufficiently large to cause pressure on the internal capsule, paresis may develop in certain of the groups of muscles of the opposite side of the body, and even hemiplegia may arise. In such cases there is dorsiflexion on eliciting the plantar reflex. Ptosis may also be met with, due to pressure on the third nerve,

while crossed deafness and crossed facial paralysis sometimes occur. If the abscess is situated on the left side, either motor or sensory aphasia may be found. Anosmia is also sometimes detected, but it is a symptom which may readily escape notice unless specially looked for.

Cerebellar Abscess is occasionally ushered in by a rigor. Vomiting is a more common symptom in cerebellar than in cerebral abscess; vertigo and cerebellar ataxia may also be present, the patient staggering towards the diseased side. Another localizing sign is "dysdiadokokinesia" (Babinski). In testing for this, the forearms are alternately and quickly pronated and supinated; if present, fatigue is rapidly induced in the arm on the diseased side. Nystagmus may be found; it is generally directed towards the affected side and becomes more marked as the disease progresses (compare nystagmus in Labyrinthine Disease, see page 225).

COURSE AND TERMINATION.—If untreated, a brain abscess invariably ends fatally. The patient at first becomes stuporose, but can still be roused, though his response to external stimuli is very slow; he may even fall asleep while attempting to eat. The stupor deepens to coma, which continues till death. Occasionally death results from sudden cardiac or respiratory failure.

PROGNOSIS.—The prognosis of abscess of the brain is very grave. The statistics of various authorities differ, but not more than 25 per cent of cases are saved. Those cases are least hopeful in which more than one abscess is present, or which are complicated by meningitis or sinus thrombosis.

TREATMENT.—The treatment of brain abscess is operative. The first step is the performance of the radical mastoid operation. In acute cases with urgent symptoms it may suffice to perform the classical mastoid operation. If temporo-sphenoidal abscess is suspected, the tegmen antri is removed and a large area of the dura lining the middle cerebral fossa is exposed. The dura is then incised, and the brain explored by sinus forceps or Horsley's pus seeker. If found, the abscess is drained by one or two rubber tubes placed alongside, or one within the other (Horsley). In the case of suspected cerebellar abscess, the dura lining the posterior fossa is exposed by removing the bone internal to the lateral sinus, and the exploration is carried out as in the case of cerebral abscess. When the lateral sinus is situated far forward, it will be necessary to expose the dura

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behind the sinus, if there is insufficient room in front of it to permit of satisfactory drainage.

Venous Infections.—The lateral or sigmoid sinus is the venous channel most frequently affected by purulent inflammation, and from it the disease may spread to the superior and inferior petrosal sinuses and the cavernous sinus, or to the hulf and the jugular vein in the neck. Thrombophlebitis of a venous sinus is one of the most common of otitic intra-cranial complications, and occurs in both acute and chronic suppurations, though more frequently in the latter. The infection passes through the bone to the walls of the sinus, where a peri-sinus abscess may be formed (extra-dural), or the organisms may pass through the walls of the sinus into the blood-stream, and phlebitis, and later thrombosis, be induced. If the process continues, the vessel becomes occluded, and an abscess may form from the breaking down of the clot, portions of which may pass into the blood-stream and set up abscesses in distant parts of the body.

SYMPTOMS.—A sinus thrombosis may run its course without symptoms, but in most cases it is characterized by the occurrence of rigors, in which the temperature rises suddenly to 103° or 104° F., and falls again as rapidly, the fall being accompanied by profuse sweating. There may be only a single rigor, or several may occur in a day. The pulse rises with the temperature. In the intervals between the rigors, the patient may be free from symptoms; but in some cases, and especially later in the disease, the temperature remains elevated. Headache and vomiting are sometimes met with; optic neuritis also occurs in a considerable proportion of cases, and occasionally œdema becomes manifest in the neighbourhood of the mastoid emissary vein (Griesinger). When the thrombosis extends into the neck, torticollis may be found, and tenderness may be complained of along the line of the jugular vein, while a swelling, due to inflammatory enlargement of the cervical lymphatic glands, can frequently be detected. If the thrombosis extends to the cavernous sinus, protrusion of the eyeball results, with ptosis, ophthalmoplegia, engorgement of the retinal vessels, and retinal hæmorrhages (*Fig. 77*). As a result of the escape of portions of the clot into the general circulation, septic pneumonia may arise, and metastatic abscesses may appear in other parts of the body.

A sinus thrombosis, if untreated, ends fatally; the process may take only a few days, but sometimes it is very slow, and death may not occur until after an interval of months, during which the patient's health appeared normal.

DIAGNOSIS.—The diagnosis is suggested by the occurrence of rigors in the course of a middle-ear suppuration; it is more difficult if the condition is complicated by the presence of meningitis or brain abscess. Sinus thrombosis may occur in cases where a middle-ear suppuration is not suspected, and has then sometimes been mistaken for malaria or typhoid fever.



Fig. 77.—Thrombosis of cavernous sinus secondary to lateral sinus thrombosis.

This error is not likely to arise if the condition of the ears is inquired into; additional help may be obtained from a blood-count, a leucocytosis of over 15,000 being in favour of sinus thrombosis.

PROGNOSIS.—The prognosis of lateral sinus thrombosis is more favourable than that of brain abscess, if an operation is performed before systemic infection has occurred and if there is no other intra-cranial complication; but if the case is seen later there is little hope of a successful issue.

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TREATMENT.—The treatment consists in removing the primary focus of disease, by performing the classical operation in cases due to acute middle-ear suppuration, and the radical operation in cases of chronic otorrhœa. The lateral sinus is then widely exposed, and if there is doubt as to the diagnosis, aspiration may be carried out; if blood does not escape, the vein should be opened and the clot cleared out. Most authorities make a routine practice of exposing and dividing the jugular vein in the neck, with a view to preventing systemic infection. In any case this should be done when it is found impossible to clear out the whole of the clot from above. In the after-treatment, syringing is carried out through the bulb and vein. Vaccines, preferably autogenous, should also be employed: in some cases they appear to have a beneficial action.

CHAPTER XXVIII.

OTITIS MEDIA CATARRHALIS AND OTOSCLEROSIS.

CATARRHAL inflammation of the middle ear may run an acute or a chronic course.

ACUTE MIDDLE-EAR CATARRH.

(*Syn.* Exudativa Catarrh, Sero-mucous Catarrh, Catarrh of the Middle Ear and Eustachian Tube.)

Acute middle-ear catarrh is produced by the extension of a catarrhal inflammation of the naso-pharynx along the Eustachian tube to the tympanum; hence it is commonly met with in children suffering from adenoid vegetations, and may occur in an ordinary cold in the head, in the exanthemata, influenza, syphilis, and Bright's disease. It is also found in cases of new growths of the naso-pharynx which press on the mouth of the Eustachian tube, and in diphtheritic paralysis of the soft palate. In the last two conditions there is merely a transudation of serous fluid which is free from bacteria (hydrops ex vacuo). The inflammation in most cases extends to the whole of the middle-ear cleft; it may however be limited to the inner end of the Eustachian tube, which becomes temporarily blocked—Eustachian obstruction. The fluid exuded may be either watery or viscid.

SYMPTOMS.—The condition is not usually associated with pain, though this symptom is sometimes met with, especially in children. There is generally a sense of fullness or numbness in the head, and the patient often complains that he feels stupid and as if there were water in his ear. Deafness may be very marked, but in some cases it is hardly noticeable. The degree of deafness depends largely on the amount of exudation, and it may be subject to great variations, sudden and marked improvements sometimes occurring after the ear is felt to crack. It is also influenced by the state of the weather, being worse on damp

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foggy days than in a dry atmosphere. Autophony, or an undue resonance of the patient's own voice, is sometimes present, and may cause great discomfort. Tinnitus is generally apparent, and may continue after the other symptoms have subsided, but its persistence is usually an unfavourable sign. In bilateral cases in children, due to the presence of adenoid vegetations, there is often a disability to concentrate the attention (Guye's aprosexia).

APPEARANCES.—The drum membrane presents varying appearances. Where there is merely Eustachian obstruction, it may show but little change from the normal; there is generally, however, some degree of indrawing of the handle of the malleus, with slight projection of its short process, and the membrane may be congested. When the process involves the whole of the middle-ear cleft, it is accompanied by exudation into the tympanum: the appearances depend on the amount of fluid present, and on the transparency of the membrane. The condition is most difficult to detect when the tympanum is full of fluid; the membrane then has a distinctly yellow tinge, and also a peculiar glistening appearance, as if a drop of oil had spread itself over the surface; the handle of the malleus, and frequently the long process of the incus, are unusually clearly defined (*Plate VII. Fig. 66*). The appearances are much more readily recognized when the fluid does not fill the tympanum: its upper limit then appears as a hair-like line running across the drum membrane; this line is concave or convex owing to capillary action. The membrane below the line appears yellow, while above it has a grey tinge. Occasionally, bubbles are seen behind the drum membrane; these are produced by the presence of air in the fluid, and may be noticed immediately after inflation when the exudate has been only partially expelled. The air douche produces an even more marked change if the fluid is completely dispersed; the whole membrane then becomes grey, and loses its glistening moist appearance. The changes described above cannot be detected if the membrane is thickened; the presence of fluid in such cases can be inferred by the effects of inflation, but can be demonstrated only by paracentesis.

DIAGNOSIS.—The diagnosis of acute catarrh of the middle ear is easily made by one who can recognize the otoscopic appearances described above; it must be admitted, however, that the

beginner usually fails to detect these rather delicate changes, but in most cases he can form a correct diagnosis from the results of the tuning-fork tests, and from the effects of inflation on the hearing. The tuning-fork tests point to an affection of the sound-conducting apparatus: Rinne's test is negative, bone conduction is lengthened, and on applying Weber's test the sound is referred to the affected ear. The lowest tones are not heard by air conduction, while the highest notes are retained. In uncomplicated cases, the effects of successful inflation are most striking: the fluid in the tympanum is dispersed, and the pressure within the tympanum is equalized to the atmospheric pressure, with the result that the hearing is at once restored. A similar effect is produced in cases of Eustachian obstruction in which there is no exudation into the middle ear.

PROGNOSIS.—The prognosis is good in recent cases, and in those due to the presence of adenoid vegetation, but there is a great tendency to recurrence when the causal condition cannot be cured, and on each occasion the condition is more resistant to treatment. The prognosis is less favourable when the air douche does not cause a marked improvement in the hearing, while in cases which recur frequently, changes take place in the middle ear which may result in permanent impairment of hearing (chronic catarrh).

TREATMENT.—The first step is to get rid of the fluid in the tympanum, and the most satisfactory method of doing this is inflation of the ear by Politzer's method. The inflation must be repeated every second day until the exudate ceases to reappear. In addition to the politzerization, the mastoid process should be massaged for five minutes once or twice daily; the massage should be carried out from above downwards, the skin having been lubricated with a little vaseline to prevent irritation. If the fluid cannot be dispersed by politzerization, or if after a week the exudate is not diminishing, the membrane should be incised under very careful aseptic precautions (see p. 207). The importance of the strictest asepsis cannot be exaggerated, for the slightest carelessness may result in the case becoming one of acute suppurative otitis media. After the paracentesis, politzerization should immediately be undertaken in order to drive the fluid from the tympanum, and when this is very viscid and cannot be completely expelled, suction may also be employed, by means of Siegle's speculum

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or Sondermann's apparatus. The fluid which has been driven into the meatus should be mopped up with sterile wool or a strip of sterile gauze, and a pledget of wool should be worn in the ear. There is a great tendency for the perforation to close, and to obviate this the patient should perform Valsalva's experiment three or four times a day, while politzerization should be practised daily, and the mastoid process massaged, as described above, until the fluid ceases to accumulate. When the perforation heals too soon in spite of these precautions, a second incision should be made, or the membrane may be pierced with the galvano-cautery point, as a perforation made in this way tends to remain open longer than an incision made with a knife, but it should not be attempted by anyone not conversant with aural technique. If a cure is not effected after a month, politzerization must be discontinued for at least two weeks. The causal condition in the naso-pharynx should receive appropriate treatment, and if an operation for the removal of adenoid vegetations is necessary, it should on no account be postponed.

CHRONIC MIDDLE-EAR CATARRH.

(*Syn. Otitis Media Catarrhalis Chronica, Chronic Adhesive Catarrh.*)

Chronic middle-ear catarrh may be due to: (1) Repeated attacks of acute catarrh; (2) The paralysis of the muscles of the soft palate and tube which occurs in post-diphtheritic paralysis; (3) Hereditary disposition; (4) Abuse of alcohol and tobacco; (5) Certain general diseases, such as syphilis, tuberculosis, and Bright's disease; (6) Pregnancy, and the puerperium.

Chronic catarrh of the middle ear is found in the middle-aged and the old, and is generally bilateral. The pathological changes may be localized, or extend over the whole of the middle ear; if localized, the fenestræ or the articulations of the ossicles are the parts most liable to be affected. The changes consist in the new formation of connective tissue which may fill the fenestræ, cause ankylosis of the ossicles, or form adhesions between the membrane and the inner wall of the tympanum. If the Eustachian tube is implicated by them, narrowing of the lumen results—chronic Eustachian obstruction.

SYMPTOMS.—The degree of deafness varies; the hearing is much worse for speech than for noises, and is better in a noise. The deafness is increased by bodily or mental

fatigue, anxiety, the excessive use of alcohol and tobacco, and damp weather; it is also generally worse at night. As a rule it is progressive, but occasionally temporary improvement is met with independent of treatment, and in rare instances a decided improvement follows an attack of acute otitis media. Tinnitus is nearly always present, and may be very distressing, robbing the patient of sleep and causing great mental depression, and even suicidal tendencies. Pain is rarely complained of, but often loud noises are painful (hyperæsthesia acoustica).

APPEARANCES.—The drum membrane may appear uniformly thickened, or the thickening may be partial, while other parts of it are atrophied. An atrophied portion of membrane resembles a cicatrix, except that it has not such a well-marked outline. Sometimes irregular calcareous patches are seen, chalky-white in colour and sometimes crescentic in shape. Indrawing of the membrane is commonly met with, and may be extreme; in marked cases the short process is very prominent, and the posterior fold running back from it appears sickle-shaped; the anterior fold is also prominent. On performing Valsalva's experiment, the membrane is usually found to have lost its mobility, and adhesions may have formed between it and the inner wall of the tympanum. On politzerization, atrophic and indrawn areas of the membrane occasionally may be made to balloon out. If the changes are limited to the middle ear, the tuning-fork tests show: Rinne negative, Schwabach lengthened, and loss of the lower tone limit. In some cases, however, there is evidence of involvement of the inner ear. Bone conduction in such cases is shortened, the perception of the highest notes is lost, and on performing Rinne's test, bone conduction and air conduction are found to be about equal. These cases of "mixed" deafness have a much worse prognosis.

DIAGNOSIS.—Generally the diagnosis is easily made from the appearances of the membrane, and from the history and symptoms of the case. The condition has to be differentiated from otosclerosis, but in the latter affection the membrane is normal or shows a flamingo-red tint, and on catheterization air passes freely into the tympanum, whereas in chronic catarrh the Eustachian tube is frequently narrowed and the changes in the middle ear make the auscultatory phenomena much less distinct than in a normal ear.

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PROGNOSIS.—The prognosis is unsatisfactory; the condition at best remains stationary, but usually tends to progress. When one ear alone is affected, the other is liable to follow suit, and after a comparatively short period to become worse than the one primarily involved. The prognosis is less favourable in cases in which the tuning-fork tests point to involvement of the labyrinth. It also depends very largely on the effect of inflation on the hearing. If there is only a slight improvement, or if it lasts only a few hours, the prognosis is much more serious than where there is a considerable improvement which continues more than twenty-four hours. Cases in which tinnitus is a marked feature are also less favourable.

TREATMENT.—The patient must be warned to be extremely moderate in all things, especially in the use of alcohol and tobacco. Excessive fatigue, business worries, and over-work should all be avoided if possible. The effect of politzerization should also be tried; if any improvement results, the inflation may be repeated every second day for a month or six weeks, after which it should be discontinued. If it is impossible to inflate the ear by Politzer's method, the catheter must be made use of, and when that fails an attempt may be made to pass a bougie (see p. 185). Some authorities advocate the injection of medicaments per tubam, but it is questionable if much benefit is to be gained by their use. Muriate of pilocarpine gr. iii- $\bar{3}$ j, potassium iodide gr. ii- $\bar{3}$ j, or bicarbonate of soda gr. iii- $\bar{3}$ j, may be employed for this purpose; not more than five or six drops should be injected. This treatment is frequently combined with alternate rarefaction and condensation of air in the external auditory meatus, or with the use of Luca's pressure probe. The injection of warm air under pressure, combined with massage, has also been advocated. Fibrolysin has been used as an injection per tubam, and also subcutaneously; most of those who have tried it, however, have found it to be of no value.

In anæmic or debilitated individuals, iron and arsenic may be administered. Treatment should not be persisted in after improvement has ceased; it is much wiser to have one or two short courses of treatment every year. The seaside will not be found beneficial, but a mountain resort will generally have a good effect, especially in cases of exudative catarrh.

Operative treatment, at one time freely resorted to in cases of chronic catarrh, has now fortunately been abandoned by nearly every aurist. The operations undertaken were: artificial perforation of the membrane, division of the posterior fold, tenotomy of the tensor tympani and stapedius muscles, removal of the ossicles, and mobilization or extraction of the stapes.

STRICTURE OF THE EUSTACHIAN TUBE.

Stricture of the Eustachian tube may be either temporary or permanent. Temporary stricture is met with in a catarrhal process limited to its inner end or involving the whole middle-ear cleft; this variety has already been considered.

Permanent stricture may result from long-standing middle-ear catarrh, from the pressure of a new growth in the naso-pharynx, or from ulceration of the walls of the naso-pharynx. The seat of the constriction is said to be more frequently in the cartilaginous than in the bony portion of the tube.

The SYMPTOMS complained of are deafness, tinnitus, and sometimes a sense of fullness in the head. Objective signs: the drum membrane is indrawn, and inflation of the ear is difficult and sometimes unsuccessful. In using the catheter, the auscultation sounds may be inaudible, or faint, distant, and accompanied by râles, while the act of swallowing does not aid the passage of air along the tube.

DIAGNOSIS.—The diagnosis depends partly on the effects of attempted inflation, and partly on the information gained from passing a bougie (see p. 185). If resistance is met with, the bougie should be pushed forward with the greatest caution, and if a constriction is passed the bougie should be left *in situ* for ten to fifteen minutes in order to effect a dilatation; on removing the bougie, inflation must be carried out. In a successful case, the air is heard to enter the tympanum more freely than before. In that event the treatment should be repeated two or three times a week, until the air enters the tympanic cavity freely. In certain cases no improvement follows the passage of the bougie, or inflation becomes even more difficult; in these instances further use of the bougie should be abandoned.

OTOSCLEROSIS.

Otosclerosis is an affection, characterized by progressive deafness, in which there are changes in the bony capsule of the labyrinth. The changes consist in the formation of spongy bone; this process may involve various parts of the labyrinthine capsule, but it has a special predilection for the oval window, thereby causing stapes ankylosis. The tympanic mucous membrane is not affected. Various theories have been advanced to account for these pathological changes: Politzer and Bezold look upon the condition as a primary disease (osteitis) of the osseous labyrinth; Habermann and Katze believe that it is secondary to an inflammation of the tympanic mucous membrane, while A. Gray considers that the first stage is the death of localized areas of bone and cartilage, which are then absorbed and are replaced by the deposition of spongy bone.

ETIOLOGY.—Heredity is an important factor in the etiology of otosclerosis, while gout, anæmia, and syphilis have been looked upon as predisposing factors; there is, however, no evidence of a syphilitic origin of the disease. Otosclerosis may also manifest itself during the puerperium, and it is not uncommon in patients who suffer from ozæna: it is also sometimes associated with chronic catarrhal changes in the middle ear. Otosclerosis is more common in women than in men; in the hereditary form it may occur early in life (ten to fifteen years), but it is most frequently met with between the ages of twenty and fifty (Denker). It usually affects both ears.

SYMPTOMS.—Deafness is one of the first symptoms; it is gradual in its onset, and progresses slowly until the hearing is entirely lost. But although this is the ordinary course of events, the process is sometimes arrested before the stage of complete deafness is reached, and in other cases there is a very rapid deterioration of the hearing. Temporary exacerbations of deafness may be caused by fatigue or anxiety. In women, the hearing tends to become markedly worse after each pregnancy. Tinnitus is a very constant symptom; it may precede the deafness, and may continue after complete loss of hearing. Paracusis Willisii is nearly always present. Vertigo is not often met with.

The tuning-fork tests show: (1) Loss of the lower tone limit; (2) Negative Rinne; (3) Lengthened bone conduction. These

constitute Bezold's triad of symptoms. The upper tone limit is retained even in marked deafness. In the later stages, when the cochlea becomes affected, the tuning-fork tests give different results, Rinne's test becoming positive, and bone conduction being gradually shortened. In unilateral cases, Weber's test is lateralized to the affected ear, while in bilateral cases with marked disparity in the hearing of the two sides, it is referred to the deafer ear.

APPEARANCES.—In uncomplicated cases, the drum membrane is normal or presents a flamingo-red tint.

DIAGNOSIS.—Otosclerosis may be diagnosed with certainty in a case of deafness presenting the following features: a normal membrane, a patent Eustachian tube, and tuning-fork tests characteristic of a lesion of the sound-conducting apparatus. In cases complicated by catarrhal processes in the middle ear, a definite diagnosis cannot be given.

PROGNOSIS.—The prognosis is bad, particularly so when the progress of the deafness is rapid, where there is a hereditary history of the disease, or when it is complicated by syphilis.

TREATMENT.—Unfortunately no treatment is known which can influence the course of the disease, for intra-tympanic injections are valueless, and operative interference on the nose or naso-pharynx is to be deprecated, as it is usually followed by an increase of deafness. In mixed cases, however, where there are catarrhal changes in the middle ear, appropriate treatment should be employed. In uncomplicated cases, all that can be done is to advise the patient to live a quiet life and to avoid excesses of any kind. The administration of phosphorus, strychnine, and thyroid extract has been recommended, but they are valueless, and operations on the ossicles are not justifiable.

NEUROSES OF THE EAR.

Neuralgia.—Earache is sometimes complained of when the ear is healthy; in such cases a careful inspection should be made of the teeth, the pharynx, and the larynx. Carious teeth frequently cause earache, although not themselves painful. If the teeth are not diseased, the pharynx and larynx must be examined, for ulcerative processes in either of these regions may cause earache. It is obviously necessary in such cases to treat the cause, as local treatment of the ear is unavailing. Neuralgia

may also be caused by cold, neurasthenia, and sexual disturbances. A persistent pain is occasionally experienced over the mastoid process after operations; it is due to the pressure of a firm cicatrix.

Spasm of the Tensor Tympani Muscle.—Spastic contraction of the tensor tympani muscle may be recognized by movement of the drum, and subjectively, by a loud crackling noise in the ear.

Clonic Spasms of the muscles of the Eustachian tube have also been observed giving rise to similar symptoms.

THE RELATION BETWEEN DISEASES OF THE NOSE AND THROAT, AND OF THE EAR.

It has been shown that various morbid conditions in the naso-pharynx predispose to ear affections, and that both have to be treated; but it may not be out of place, before passing from the subject of the diseases of the middle ear, to utter a warning against exaggerating the effect of intra-nasal conditions in predisposing to ear affections. It is a common experience to find a nose full of polypi or a marked deviation of the septum without any impairment of the hearing. Again, in many cases of choanal atresia in which *a priori* an aural complication might be expected, there is no evidence that the ears are in any way affected. We may go so far as to say that to operate on minor intra-nasal abnormalities in order to improve the hearing, is rarely justifiable, while operations undertaken for this purpose in otosclerosis are directly harmful.

CHAPTER XXIX.

THE AUDITORY NERVE AND LABYRINTH.

IN considering diseases of the labyrinth, it must be remembered that that organ consists of two distinct structures, the *vestibule* and the *cochlea*, the former being an organ of equilibration, the latter alone being concerned with hearing. Disturbances in the vestibule produce symptoms of giddiness, nausea, and nystagmus, while affections of the cochlea result in deafness and tinnitus. Both portions of the labyrinth may be simultaneously affected, in which case all these symptoms may be present.

Although the pathological changes in labyrinthine affections have been the subject of much laborious investigation, our knowledge of this subject is still very incomplete, and for this reason a clinical classification has been adopted in the following chapter.

**PRIMARY DISORDERS OF THE LABYRINTH
AND NERVE.**

Congenital defects of the labyrinth and nerve have been met with; they may be associated with abnormalities of other parts of the ear, though frequently these parts are normal. Complete absence of the labyrinth has also been described.

Presbycusis.—In old age the hearing usually becomes impaired to some extent; there is, as a rule, lowering of the upper tone limit, while bone conduction is shortened and Rinne's test is positive. The onset of the deafness is generally very insidious and the progress slow. I have had the opportunity on several occasions of testing the hearing of patients, subjects of presbycusis, who had been examined by Dr. McBride ten or more years previously, and I found on reference to his notes that there was but little alteration for the worse. That the loss of the highest notes may occur suddenly, seems probable

from a case related to me by Prof. Crum Brown, in which the noise of crickets was audible one day, and could not be heard the following day or ever again.

**MENIÈRE'S DISEASE,
AND MENIÈRE'S SYMPTOM-COMPLEX.**

Menière, in 1861, described the case of a young girl who was attacked by sudden deafness, intense giddiness, and vomiting. She died on the fifth day of her illness, and at the autopsy it was found that the semicircular canals and the vestibule contained blood. The cause of death was not discovered. The term "Menière's disease" has been rather loosely employed; it should be reserved for cases presenting the symptom-complex of deafness limited to one ear, giddiness, and vomiting, in which the onset has been sudden, and in which there was no previous disease in the ear. By the expression "Menière's symptom-complex" we understand the sudden onset of these symptoms, but do not give any indication as to their pathogenesis; and it must be borne in mind that any condition which suddenly interferes with the functions of the labyrinth will give rise to these symptoms, whether hæmorrhage occurs or not. In some of these cases there is old-standing middle-ear suppuration, and the symptoms are induced by a sudden spread of the process to the labyrinth (see p. 224). In addition to the symptoms of deafness, giddiness, and vomiting, there may be loss of consciousness, while nystagmus and tinnitus are nearly always present. Menière's disease attacks adults who are in apparently perfect health; in some cases there is only one severe attack, while in others there are several at varying intervals. As causes of this affection may be mentioned exposure to intense heat, leukæmia, Bright's disease, and pernicious anæmia, but in many instances the etiology is obscure. The majority of cases in which the inner ear has been examined microscopically have been leukæmic. The examination of the ear shows no change in the membrane or in the Eustachian tube: the hearing may be entirely lost, but if the deafness is only partial it is found that the upper tone limit is lowered, bone conduction is diminished, and Rinne's test is positive.

DIAGNOSIS.—The diagnosis is made from the symptom-complex described above and from the absence of paralysis of

the other cranial nerves. The late Dr. Alex. Bruce and Dr. J. S. Fraser have, however, recorded a case presenting Menière's symptoms with facial paralysis. No history of vomiting was obtained, but there was extreme giddiness, with deafness and tinnitus in the left ear, all of sudden onset. Dr. Bruce made a diagnosis of neuritis of the facial and auditory nerves in the internal auditory meatus, and hæmorrhage was mentioned as a probable cause of the symptoms. The patient died four months after the attack. The temporal bone was examined microscopically by Dr. Fraser, who found that the inner ear was almost normal. There was a considerable amount of hæmorrhage in the internal auditory meatus, between the epineurium of the seventh and eighth nerves. Von Frankl-Hochwart has recorded two cases of Menière's symptoms in which there was facial paralysis.

PROGNOSIS.—The prognosis as regards hearing is bad, for it is the exception for improvement to occur. The giddiness, on the other hand, tends to improve, and may entirely disappear after some months, while the nausea and vomiting continue only for a day or two. The possibility of a second attack must, however, be kept in mind, and the patient should be warned to avoid localities where an attack of giddiness would be dangerous.

TREATMENT.—In the early stages the patient must remain in bed, and the bowels be evacuated with calomel (gr. iij-v) given at night, followed by a saline cathartic in the morning. Cold may be applied to the head by means of Leiter's tubes. The administration of pilocarpine, either internally in the form of a pill or hypodermically, should be begun as soon as the general symptoms permit, i.e., about the end of the first week; the bromides are of value in the early stages. Quinine has also been recommended, but in view of its toxic effects this drug should not be employed (von Frankl-Hochwart, McBride). The diet should be limited at first, and alcohol, tea, and coffee should be forbidden. A course of potassium iodide may be given later.

PRIMARY INFLAMMATION OF THE LABYRINTH.

This is a rare condition, but it undoubtedly does occur, and it is most commonly met with in children. The disease has a sudden onset, with a rise of temperature and vomiting, followed

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by loss of consciousness and convulsions. These symptoms resemble those of an acute meningal infection, but they pass off in a few days, leaving the child deaf and with a staggering gait. The diagnosis is based chiefly on the short duration of the meningal symptoms.

AFFECTIONS OF THE LABYRINTH SECONDARY TO AFFECTIONS OF THE MIDDLE EAR.

Labyrinthine Suppuration.—This subject has been discussed in the preceding chapter.

AFFECTIONS OF THE LABYRINTH AND NERVE DUE TO GENERAL DISEASES.

In **Leukæmia** and **Pernicious Anæmia** sudden deafness may occur, associated with Menière's symptom-complex. Bright's disease, diabetes, influenza, typhoid and scarlet fever, and small-pox may also be followed by deafness of the labyrinth type.

Epidemic Cerebrospinal Meningitis is a frequent cause of deafness; the impairment of hearing is noticed when the acute symptoms have passed off. It is permanent, commonly of a high degree, and bilateral; hence, if it occurs in a child under seven years of age, deaf-mutism generally results. In addition to the deafness there is disturbance of equilibration, but this symptom usually disappears after several months. The infection may reach the inner ear through the aqueduct of the cochlea or the internal auditory meatus, and the membranous labyrinth is rapidly disorganized by the resulting purulent inflammation. Treatment of the deafness is of little avail, but hypodermic injections of pilocarpine may be given (gr. $\frac{1}{2}$, or if by the mouth, gr. $\frac{1}{4}$).

Mumps may produce labyrinthine deafness; the pathology of the condition is not known. As a rule only one ear is affected, and the deafness is permanent.

Syphilis is one of the most frequent causes of labyrinthine deafness. In the acquired form it may occur at any period, but it is generally found in the later stages of the disease. It may arise suddenly, accompanied by Menière's symptoms, while in other cases deafness and tinnitus may alone be complained of. In many instances only one ear is affected, but in others both are involved.

In *hereditary syphilis* labyrinthine deafness is a common complication (according to Hutchinson and Jackson it occurs in 10 per cent of all cases of inherited syphilis.) It is nearly always bilateral, is more often met with in females than in males, and generally occurs in the second decade of life. It is frequently associated with interstitial keratitis and iritis, or it may appear as keratitis is disappearing.

The onset of the deafness is usually sudden; giddiness and tinnitus may also be present at the first, but the giddiness generally passes off, though the tinnitus persists, and may indeed continue after the hearing has been entirely lost.

Changes are commonly found in the middle ear, indicating the presence of chronic catarrh.

The results of the tuning-fork tests point to a lesion of the inner ear; thus there is found lowering of the upper tone limit, shortened bone conduction, and positive Rinné. The lowest tones are also gradually lost. J. S. Fraser has examined the vestibular irritability in twenty-five cases; the reaction was lost in fourteen cases, slight in seven, and normal in four cases.

DIAGNOSIS.—The diagnosis of syphilitic labyrinthitis in children is generally made without difficulty from the presence of other syphilitic lesions, such as keratitis, Hutchinson's teeth, etc. In adults it may be more difficult, especially if the deafness has developed gradually, and if other evidence of syphilis is not obtained.

TREATMENT.—Unfortunately the treatment is not often attended by success; but an energetic course of mercury and iodide of potassium should be instituted at once, and pilocarpine should also be administered, preferably by the hypodermic method; if begun at once, the latter drug may save the hearing.

OPERATIVE TREATMENT OF NON-SUPPURATIVE DISEASES OF THE LABYRINTH.

In rare instances it is justifiable to operate on the labyrinth in non-suppurative diseases of that organ. The indications for operation are unbearable tinnitus or intense giddiness, which so prostrates the patient that he is unable to work and may even contemplate suicide. Operative interference should, however, only be resorted to when all other forms of treatment have

failed, and the patient must be warned that the operation is not devoid of risk to life, that the hearing will be destroyed, and that the tinnitus may not disappear.

The surgeon has the choice of two operations: (1) Division of the auditory nerve at the internal auditory meatus; (2) Extirpation of the cochlea, the semicircular canals, and vestibule. Division of the auditory nerve has been abandoned by most authorities owing to the high death-rate. Extirpation of the cochlea is carried out, after performing the radical mastoid operation, by removing the inner wall of the middle ear; this exposes the modiolus, which is also taken away. Partial or total ablation of the semicircular canals and vestibule may be carried out at the same time. Successful cases have been recorded by Lake and Milligan.

Tumours of the Cerebellum and of the Pons, and Intracranial Aneurysms, may all cause loss of hearing.

DEAFNESS DUE TO DRUGS.

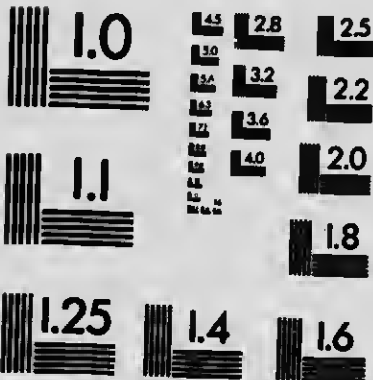
It is well known that quinine and the salicylates may cause deafness, which is generally accompanied by tinnitus and sometimes by vertigo. In rare cases, tobacco and alcohol, if used to excess, may cause impairment of the hearing. It is accordingly advisable to prohibit their use in cases of nerve deafness in which no other cause can be ascertained, and in which excessive consumption of alcohol or tobacco is admitted. Abstinence is frequently followed by improvement of the hearing.

Since salvarsan has come into general use, attention has been drawn to a possible secondary action which it may have on the eighth nerve. The disturbances may be confined to the cochlear or to the vestibular division, or both portions of the nerve may be affected. In some cases the changes are not limited to the eighth nerve, but may also involve other cranial nerves. Valentin has collected reports of forty-five cases of affection of the nerve which occurred after the exhibition of salvarsan. He points out that the question arises whether the deafness is due to the syphilis or to the drug. In support of the former theory it has been shown by Frey that affections of the eighth nerve in the early stages of syphilis were not less common before the days of salvarsan. Ehrlich also believes that the lesions of the cranial nerves after the administration of salvarsan are due



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to syphilitic recurrences. In many cases of neuro-recurrence in the eighth nerve the hearing had been previously affected (Beck, Felix, David); these authors accordingly recommend that the hearing should be carefully examined in every case before the administration, and Valentin advises that those whose occupation subjects them to loud noises should desist from their work for a time. As the number of neuro-recurrences is so small in comparison with the enormous number of patients who have been treated with salvarsan, and as it is by no means certain that the arsenic is the cause of these lesions, we may conclude that this danger is not a contra-indication to the use of salvarsan, except possibly when there is already a non-syphilitic lesion of the ear.

TRAUMATIC AFFECTIONS OF THE AUDITORY NERVE AND LABYRINTH.

The labyrinth may be affected as the result of direct injuries, such as ill-directed attempts to remove a foreign body, or by the passage of a sharp implement, such as a knitting needle, through the external auditory meatus and one of the fenestræ, into the inner ear. Deafness, giddiness, and nausea supervene at once, facial paralysis is also met with frequently, and acute suppuration results in many cases. The local treatment is the same as in the case of injuries to the middle ear (see page 202), while rest in bed is also indicated as long as the giddiness lasts.

Blows or falls on the head may be followed by deafness, which is due to concussion of the labyrinth. Explosions, or sudden and very loud noises, may have a similar effect. The hearing in many cases is partially, or entirely, restored.

Fractures of the base of the skull involving the petrous bone are followed by deafness, which is often permanent. Giddiness and tinnitus may accompany the deafness, but the giddiness usually disappears after a time.

Constant exposure to loud noises is a well-known cause of labyrinthine deafness. It is met with in boilermakers, coopers, factory workers, artillerymen, and sailors in the Royal Navy. The deafness increases gradually, and is not as a rule accompanied by tinnitus. Sportsmen occasionally suffer from deafness in one ear—as a rule the left.

TREATMENT.—Treatment in all these cases is unavailing, but as

a prophylactic measure, a plug of cotton-wool, or an obturator, should be worn in the ears during exposure to the noises.

Caisson workers are liable to nerve deafness, if compression or decompression is carried out too rapidly. The symptoms manifest themselves after the patient has left the caisson; the onset is acute, the deafness being accompanied by giddiness, tinnitus, and vomiting. The deafness is rarely permanent. The pathological changes are due either to a hæmorrhage into the labyrinth, or to the development of air emboli in that organ. Airmen, mountaineers, and divers are liable to similar lesions.

Deafness may be met with in hysteria; it is not as a rule attended by tinnitus or giddiness. The deafness may come on without obvious cause, and is subject to marked variations; it is sometimes transferred from one side to the other. The results of the tuning-fork tests are variable, and evidence of hysteria can generally be found, such as the presence of areas of anaesthesia, or the loss or impairment of smell or taste on the same side as the deafness. The treatment in these cases must be carried out on general principles.

DEAF-MUTISM.

Deaf-mutism is a condition in which speech is absent owing to a high degree of deafness: it may be congenital or acquired. In the latter form, speech has at one time been present, but has been lost owing to deafness developing at an early period of life, usually before the age of seven. Congenital deaf-mutism is hereditary, and is most commonly met with in mountainous countries, where the population is sparse, and where, in consequence, consanguineous marriages are common. It is more rarely found in low-lying and populous countries. Statistics show that the highest rate (including the congenital and acquired forms) is found in Switzerland (24.5 to 10,000), and the lowest in Holland (3.35 to 10,000). In England the rate is 5 to 10,000, and in Scotland 5.7 to 10,000. In the majority of cases, acquired deaf-mutism is the result of meningitis (especially cerebrospinal meningitis), measles, or scarlet fever. Congenital syphilis and enteric and other fevers are also fairly common causes of this affection. In congenital deaf-mutism the pathological changes are degeneration of the cochlear nerve, ganglia, and terminations, with general enlargement of the labyrinth.

DISEASES OF THE EAR

In young children the diagnosis of marked deafness requires some care, and a definite opinion should not be given until the child is a year old. To test the hearing, a loud noise is made behind the child's back, either by ringing a bell or blowing a whistle; if the patient hears the sound he will turn his head. Noises which cause much vibration—for example, stamping on the floor—must not be made use of. When the patient is several years old the diagnosis is easily made, but in some cases the question arises whether the absence of response is due to deafness or to idiocy: the true deaf-mute child is, however, generally mentally alert and inquisitive. Complete deafness is the exception in the congenital deaf-mute; the residue of hearing takes the form of "islands," which are, as a rule, outside the speech area of the scale.

The drum membrane in congenital cases is not infrequently normal, but in some there is retraction of the membrane due to Eustachian obstruction. In the acquired cases, the appearances of the membrane are those of the disease which causes the deafness.

TREATMENT.—Little can be hoped for from local treatment, but any existing ear disease should receive attention. The education of the deaf child is of the greatest importance. The chief objects are to enable him to become self-supporting in adult life, and to make it possible for him to communicate with his fellows. Education may be by the oral or by the manual (finger-spelling) method, or by a combination of the two. The former is the ideal method, for, if successful, it enables the child to have intercourse by speech with hearing people, and to lip-read what they say. The child taught by the manual method can only communicate in writing with those who cannot use the manual alphabet. The oral method is not, however, universally applicable; it is out of the question in the mentally defective (15 per cent), and it is unsuccessful in 10 to 30 per cent of average deaf-mutes: moreover, deaf-mutes who have never heard, speak in an unnatural manner which is very difficult to understand. The oral system is the more suitable for the semi-deaf and semi-mute who have some remains of hearing and of speech (20 to 30 per cent), and for the deaf-mutes who are oral successes (30 per cent). The oral system of teaching takes at least eight years, and necessitates classes of not more than twelve.

DEAFNESS

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AIDS TO HEARING.

When deafness in an adult becomes so marked that ordinary conversation cannot be heard, some aid to hearing is required. In such cases it is best to advise the patient to take lessons in lip-reading (at least thirty are required, besides practice at home). If, however, the sight is defective, he must have recourse to some artificial aid. A speaking-tube is most effective for ordinary conversation; one end is placed in the patient's ear, while the speaker holds the other to his mouth. The speaking-tube is of no value in churches, theatres, or other public places. In order to hear at a distance a bell-shaped instrument is required, but its size is a great disadvantage, as it attracts attention to the patient's disability. In women with well-preserved bone conduction the fan-shaped audiphone is sometimes of service; when in use, the edge of the fan is held against the teeth. The micro-telephone has been much advocated as an aid to hearing, its use being suggested by the fact that deaf persons often hear telephones well. In many cases, however, it is not of much service, and causes the patient great annoyance by producing a considerable amount of secondary noise. Speaking generally, it is impossible to say without trial which aid to hearing, if any, will benefit a particular patient. It is therefore imperative that he should himself go to the makers, and test various appliances before deciding.

APPENDIX.

MOUTH WASHES.

R	Lotio Boracis, 1-40	-	-	-	-	℥ viij
R	Potassii Permanganatis	-	-	-	-	gr. j
	Aq. dest.	-	-	-	-	ad ℥ viij
R	Sol. Hydrogenii Peroxidi (10 vols.)	-	-	-	-	℥ ij
	Aq. dest.	-	-	-	-	ad ℥ x
R	Potassii Chloratis	-	-	-	-	℥ ij
	Aluminis	-	-	-	-	℥ ij
	Aq. dest.	-	-	-	-	ad ℥ viij
R	Sol. Hydrargyri Perchloridi (1-2000)	-	-	-	-	℥ x

PIGMENTS.

MANDL'S PIGMENT.

R	Iodi	-	-	-	-	gr. v
	Potassii Iodidi	-	-	-	-	gr. xxv
	Olei Menthæ Piperitæ	-	-	-	-	℥ v
	Glycerinum	-	-	-	-	ad ℥ j

ASTRINGENT PIGMENTS.

R	Cupri Sulphatis	-	-	-	-	gr. xv
	Aq.	-	-	-	-	ad ℥ j
R	Ferri Perchloridi	-	-	-	-	℥ j
	Aq. dest.	-	-	-	-	ad ℥ j
R	Ferri Sulphatis	-	-	-	-	℥ j
	Aq.	-	-	-	-	ad ℥ j
R	Zinci Chloridi	-	-	-	-	gr. xv-xxx
	Acidi Hydrochloridi Dil.	-	-	-	-	℥ ij
	Aq. dest.	-	-	-	-	ad ℥ j
R	Acidi Tannici	-	-	-	-	℥ gr. xxx
	Acidi Carbolici	-	-	-	-	ad ℥ j
	Glycerinum	-	-	-	-	ad ℥ j

APPENDIX

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ANTISEPTIC AND SEDATIVE PIGMENTS.

R	Acidi Carbolic	-	-	-	-	-	gr. xx-xxx
	Glycerinum	-	-	-	-	-	ad ʒj
R	Boroglyceridi	-	-	-	-	-	ʒiiss
	Glycerinum	-	-	-	-	-	ad ʒj

CAUSTICS.

R	Acidi Chromici	-	-	-	-	-	gr. x
	Aq. dest.	-	-	-	-	-	ad ʒj
R	Acidi Lactici (20%-80%)	-	-	-	-	-	ʒj
R	Argenti Nitrat	-	-	-	-	-	gr. xxx-ʒj
	Aq. dest.	-	-	-	-	-	ad ʒj

SPRAYS.

R	Acidi Tannici	-	-	-	-	-	gr. iv-x
	Aq.	-	-	-	-	-	ad ʒj
R	Aluminis	-	-	-	-	-	gr. iij-x
	Aq.	-	-	-	-	-	ad ʒj
R	Ferri Perchloridi	-	-	-	-	-	ʒj
	Aq. dest.	-	-	-	-	-	ad ʒj
R	Zinci Chloridi	-	-	-	-	-	gr. xx
	Acidi Hydrochloridi Dil.	-	-	-	-	-	ʒiij
	Aq. dest.	-	-	-	-	-	ad ʒj
R	Ichthyol (3% aqueous solution)	-	-	-	-	-	ʒij
R	Sol. Hydrogenii Peroxidi (10 vols.)	-	-	-	-	-	ʒj
	Aq. dest.	-	-	-	-	-	ad ʒiij
R	Sol. Cocainæ Hydrochloridi (2-5%)	-	-	-	-	-	ʒss
R	Spiritus Rectificati	-	-	-	-	-	ʒij

This should be diluted at first to 1 in 5 of water and gradually strengthened as tolerance is acquired.

OILY SOLUTIONS WHICH REQUIRE AERIZER OR NEBULIZER.

R	Menthol (3%-10%))	-	-	-	-	ʒij
	Paraffini Liquidi (B.P.))	-	-	-	-	
R	Cocainæ Hydrochloridi	-	-	-	-	-	gr. v
	Menthol	-	-	-	-	-	gr. xx
	Paraffini Liquidi (B.P.)	-	-	-	-	-	ʒj

APPENDIX

INHALATIONS.

R Tinct. Benzoini Co. - - - - - ℥j

SIG.—A teaspoonful to be put in a pint of hot water
(140° F.) for each inhalation.

R Ol. Pini Sylvestris - - - - - ℥xl
Magnesii Carbonatis Levis - - - - - gr. xx
Aq. - - - - - ad ℥j

SIG.: A teaspoonful to be put in a pint of hot water
(140° F.) for each inhalation.

R Creasoti - - - - - ℥lxxx
Magnesii Carbonatis Levis - - - - - gr. xxx
Aq. - - - - - ad ℥j

M. SIG.: A teaspoonful to be put in a pint of hot water
(140° F.) for each inhalation.

R Ol. Eucalypti - - - - - ℥xx
Magnesii Carbonatis Levis - - - - - gr. x
Aq. - - - - - ad ℥j

M. SIG.: A teaspoonful to be put in a pint of hot water
(140° F.) for each inhalation.

R Menthol - - - - - gr. xvj
Spiritus Rectificati - - - - - ℥ij
Magnesii Carbonatis Levis - - - - - gr. x
Aq. - - - - - ad ℥j

M. SIG.: A teaspoonful to be put in a pint of hot water
(140° F.) for each inhalation.

R Menthol - - - - - gr. xx
Spiritus Rectificati - - - - - ℥j

M. SIG.: A teaspoonful to be put in a pint of hot water
(140° F.) for each inhalation.

LOZENGES.

Trochiscus Menthol - - - - - gr. ¼
Trochiscus Bismuthi - - - - - gr. iij
Trochiscus Cocainæ - - - - - gr. ʒ̄
Trochiscus Morphinæ - - - - - gr. ʒ̄
Trochiscus Acidi Benzoici - - - - - gr. ½
Trochiscus Potassii Chloratis - - - - - gr. iij

APPENDIX

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INSUFFLATIONS.

R	Orthoformi	3ij
R	Orthoformi Anæsthesin	aa 3j
R	Pulv. Iodoformi Pulv. Acid ⁱ Borici	aa 3ij
R	Iodol Pulv. Acidi Borici	aa 3ij
R	Aristol	3ij
R	Menthol Pulv. Acidi Borici	3j 3j

FERRIER'S SNUFF.

R	Morphina: Hydrochloridi	gr. ij
	Bismuthi Subnitrat ⁱ	3vj
	Pulv. Gummi Acaciæ	3ij

NOSE WASHES.

Any of the following may be used as nose washes in the strength of one drachm to a pint of water;—

Sodium Chloride Pur. ; Sodium Bicarbonate ; Ammonium Chloride ; Borax ; Potassium Chlorate ; Boric Acid ; Aluminium Aceto-tartrate (50% aqueous Solution).

OINTMENTS FOR THE NOSE.

R	Ung. Hydrargyri Nitratis	3ss
	Paraffini Mollis	3ss

After the application of the cautery, or in cases of epistaxis proceeding from the anterior part of the septum, Sterile Vaseline may be employed. or the following prescription, suggested by Dr. Allan Jameson, of Edinburgh.

R	Eucerin. c. aqua	3v
	Ol. Amygdalæ	3ijj
	Pulv. Acidi Borici	gr. x

STRANDBERG'S FORMULÆ FOR THE TREATMENT OF LUPUS OF THE NOSE BY PFANNENSTILL'S METHOD.

*Oxydol		3 parts
Ferri Perchloridi	5 parts) - 2 parts
Acidi Hydrochloridi (25%)	2½ pts.	
Aq. dest.	500 parts	

To be used until there is a marked reaction.

*Oxydol is a proprietary preparation of Peroxide of Hydrogen in solution.

Oxydol		3 parts
Acidi Acetici		1 part
Aq. dest.		96 parts

To be used after there is a reaction.

D.T.

SOLUTIONS FOR SYRINGING THE EAR.

Sterile Saline Solution; Boric Acid Crystals, two teaspoonfuls in a pint of boiled water; Lysol, ʒss in a pint of boiled water; Creolin, 1 to 2 per cent; Mercuric Chloride (1-3000), use distilled water; Formaldehyde (40%), 20 drops to a pint.

A very pleasant but more expensive preparation is Compound Solution of Thymol, 1 to 3 of water.

MEICATEO SOLUTIONS FOR INTRODUCTION INTO THE MEATUS.

R	Sol. Hydrogenii Peroxidi (10 vols.)	-	-	-	ʒj
B	Spiritus Rectificati	-	-	-	ʒj
B	Sol. Hydrogenii Peroxidi (10 vols.)	-	-	-	ʒss
	Spiritus Rectificati	-	-	-	ʒss
B	Sodii Bicarbonatis	-	-	-	gr. x
	Aq.	-	-	-	ad ʒj

IN ACUTE INFLAMMATORY CONDITIONS THE FOLLOWING MAY BE USED:

B	Cocainæ Hydrochloridi	-	-	-	gr. ij
	Acidi Carbolici	-	-	-	gr. v
	Glycerini	-	-	-	ʒj
B	Menthol	-	-	-	ʒj
	Paraffini Liquidi (B.P.) (10%)	-	-	-	ʒj

GRAY'S DROPS FOR INDUCING LOCAL ANÆSTHESIA.

15 per cent Solution of Cocaine in equal parts of Rectified Spirit and Anilin Oil.

BONAIN'S DROPS.

Acidi Carbolici	-	-	-	} of each 1 gram
Menthol	-	-	-	
Cocainæ Hydrochloridi	-	-	-	} 1 mgram
Adrenalin Chloridi	-	-	-	

Laryngitis
50% adrenalin in Bonic aq. sol. (sat.)

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