Diseases and injuries of the ear / by Wm. B. Dalby.

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BY

SIR WM. B. DALBY, F.R.C.S., M.B.CANTAB.

CONSULTING AURAL SURGEON TO ST. GEORGE'S HOSPITAL.

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PREFACE

TO THE

FOURTH EDITION

In issuing a fourth edition which contains so much additional matter, and which has been so thoroughly revised, I have abandoned the conversational form in which the Lectures were originally delivered at St George's Hospital. The book, therefore is now published as a Manual of Aural Surgery. In order to make this complete, the parts which deal with foreign bodies in the ear, bony growths in the external auditory canal, and adenoid growths in the pharynx have been almost entirely rewritten. In whatever direction surgical interference or medical treatment has in recent years been suggested, and where universal experience has discarded such measures as useless, the reader has been spared the details, and generally even a passing mention of them. Thus, in order to make the manual concise, there is introduced nothing beyond what it is considered ought to be known upon

the subject. At the same time it is hoped that nothing useful has been omitted, and that all real advances in the surgical treatment of the ear have received due recognition.

Besides several new woodcuts I have added eight chromo-lithographs to illustrate typical pathological conditions of the tympanic membrane; the drawings from which these were copied were done for me by Mr Collings, and are absolutely faithful representations of appearances which may be seen every day in the course of practice. They are, therefore, more useful for comparison with cases under examination than would be drawings of diseased appearances that are comparatively rare. To illustrate the latter would require an atlas, and the beautifully executed water-colour drawings published as 'An Atlas of the Membrana Tympani' by the late Mr Hinton in 1874 serve this purpose so perfectly that they stand unrivalled for accuracy and delicacy of detail. Briefly, then, the Author's aim in offering to the Medical Profession this fourth edition is to supply as complete and concise an account of diseases and injuries of the ear as the form of a manual permits.

W. B. DALBY.

London, 1893.

PREFACE

TO THE

THIRD EDITION

THE present edition should have been published a year ago, but press of work has delayed its issue.

Some portions of the lectures have been re-written in accordance with the advance of knowledge in certain particulars, and an enlarged experience. Another lecture has been added upon the morbid conditions of the pharynx and nasal passages which precede and are associated with catarrh of the middle ear, especial reference being made to adenoid growths in the naso-pharynx. Improved and more accurate measurements of hearing and variations in hearing are detailed, and several new illustrations of instruments have been added. The subject of perforation of the mastoid cells is more thoroughly dealt with, inasmuch as the author has found that this operation is required in a class of cases which hitherto have not been submitted to this proceeding. The conversational manner in which these lectures were originally

delivered is still maintained, and the same cases which appeared in the first and second editions are still related. It has been thought best to do this, inasmuch as whenever a case is mentioned it was, and now is, chosen as one which represents the kind which is constantly occurring in ordinary practice. This has been done, since unusual and remarkable cases are more adapted to an exhaustive treatise than to a text-book on a department in surgery. No points, however, which are of practical importance in aural surgery have been omitted. Very few references to the individual opinions of other authors have been given, as in the first place this would have increased the size of the book beyond the limits of a text-book; and in the second place, as the lectures were given to a hospital class, the author has been content to narrate what has actually fallen under his own observation, and to lay down rules which his experience has taught him to adopt as rules for himself in the treatment of diseases and injuries of the ear.

Still the author trusts that the book in its present form may be regarded as a manual of the subject.

London, 1885.

PREFACE

TO THE

SECOND EDITION

The publication of these lectures met with so favorable a reception from the profession that I regret the issue of a second edition has been unavoidably delayed so long after the first has been exhausted.

With few exceptions, in the present edition the original text has been adhered to.

In the lecture upon the external ear a brief notice has been given to branchial fistula. Some further remarks are added upon the extraction of foreign bodies from the ear, and the subject of bony growths in the external canal has been dealt with in a more exhaustive manner. Whatever alterations or additions are found under the heading of diseases of the middle ear will give evidence of an increasing belief in the importance of the tympanic membrane as a protective membrane and as a ligamentous support to the chain of ossicles, and a corresponding belief in the unimportance of any changes in it which do not invalidate

these functions. At the same time the true causes of all symptoms (whether subjective or objective) of disease in any part of the middle ear are shown to be due to morbid conditions behind the membrane rather than in this structure.

Additional information is given upon the clinical history of these cases of inflammation of the tympanum and mastoid cells which terminate fatally, and the possibility of occasionally averting this end by a timely perforation of the mastoid process is more strongly insisted upon.

Two cases of malignant disease of the ear are recorded, and some of the prominent symptoms in nervous disorders of the auditory apparatus are attempted to be explained by considering the intimate relations which exist between the auditory and the pneumogastric nerves.

LONDON;
September, 1880.

PREFACE

TO THE

FIRST EDITION

An abstract of these lectures appeared in the 'Lancet' during the latter half of the year 1872, and with some additions and alterations they are now published as originally delivered.

The lectures were given in a conversational manner in the out-patients' department, and as opportunities occurred were illustrated by cases under observation at the time. In republishing them an attempt has been made to describe as shortly and clearly as possible the pathology and symptoms of diseases of the ear, and in directing attention to the treatment of these affections to place before the reader the general results to be expected from remedial measures. Mr Toynbee's book on 'Diseases of the Ear,' and, more recently, Mr Hinton's article in 'Holmes' System of Surgery,' may be considered the two most complete accounts of this subject in English. Whilst fully recognising the immense value of the late Mr Toynbee's researches on

the pathology of diseases of each portion of the ear, it must be allowed that since his book was written considerable additions have been made to our knowledge.

This observation is particularly applicable in the instance of non-purulent catarrh of the middle ear and morbid growths within the tympanum, so that in such cases it will be observed the treatment I have recommended is considerably different from that usually pursued by Mr Toynbee. The article by Mr Hinton referred to will be found to contain the opinions of the highest authorities in this branch of surgery.

It is hoped that this course of lectures may take a place intermediate between these two, and so in some measure serve as a text-book for diseases and injuries of the ear.

By permission of the publishers I have made use of five of Mr Toynbee's woodcuts, and I am indebted to my friend and colleague Dr Whipham for the beautifully executed drawings showing the structure of polypi of the ear.

W. B. DALBY.

LONDON;
June, 1873.

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DISEASES AND INJURIES OF THE EAR

INTRODUCTORY

At the present time when the teaching of aural surgery is recognised at every general hospital in Europe and America, and the literature of the subject is so considerable, it is strange to reflect that so little attention was at one time bestowed by surgeons in this country on diseases of the ear until Mr Pilcher, Mr Toynbee, Sir Wm. Wilde, and a few others devoted their energies to this subject, and that the treatment of these affections was in a great measure conducted by those who spoke of deafness as if it were a disease, and professed to cure it. Pathology has long since taught us how very exceptional are the instances in which physicians and surgeons may be said to cure disease; still less do they cure symptoms, and impaired hearing is merely a symptom of disease. The object of all treatment, so far as I know, is to relieve symptoms, and to place patients under circumstances most favorable to recovery. Still, even now it is safer to look with some suspicion on books which profess to deal with deafness, inasmuch as they are obviously intended to

attract the attention of the public rather than to instruct the student. To those who wish to consult treatises on the surgery of the ear, more elaborate in their character than the present, I may here say that the 'Text-Book of Diseases of the Ear' by Professor Adam Politzer, of Vienna (translated by Dr Cassells), is, perhaps, the most trustworthy and complete at the present time, 1892. As I proceed I hope to be able to point out that when that portion of the auditory apparatus which serves for the conduction of sound is the seat of the disease, it shows under favorable conditions and under surgical treatment a tendency to recovery similar to what is observed when other parts of the body are affected, and that when the nervous structures of the ear are subjected to morbid changes we can at least estimate with tolerable accuracy what progress and termination may be anticipated for the case.

I shall confine my remarks on the anatomy of the ear to those points which will be found practically of use in considering the changes produced in it by accident or disease, so far as they can be observed by examination, both on the living and the dead subject, and so far as they interfere with the function of hearing and endanger life. More complete and minute descriptions can be found in plenty in works on anatomy. At the same time it is necessary to be so perfectly familiar with some anatomical facts connected with the form and relations of the external and middle ear, that I shall draw attention to them when they apply to the parts of the ear under consideration.

With regard to the middle and internal ear it is out of the question to expect to get anything beyond the most confused ideas on the subject by reading even the best text-books on anatomy, unless the parts have been frequently seen and handled. If this is done, I think perhaps the clearest and most reliable account of the auditory apparatus in the English language to work with will be found in the last edition of Sharpey and Quain's 'Anatomy.'

The dissection of the internal ear is extremely difficult; and to understand the minute structure of this part, sections of the labyrinth under the microscope should be examined. These are accessible at various hospitals. To learn well the anatomy of the tympanum it is only necessary to get a few temporal bones recently sawed out of the subject, and gradually to chip them to pieces with a pair of bone nippers until every part has been seen and examined with the help of the anatomical book that is employed. Apart, however, from the anatomical portion of the subject, I propose to describe all the diseases and injuries to which the ear is liable in as brief and intelligible a manner as I can; to give my own experiences as to treatment and its effects, and to designedly not occupy space by repeating what various authors have from time to time suggested as remedies, but which after a fair trial have been discarded. At the same time I hope to leave nothing out which is really known and which it is useful to know.

This I conceive to be the best way in which I can make serviceable to others the experience of the past

twenty years in hospital and private practice. The work done and the experience gained have, at any rate, been very considerable, whatever may be the effect produced as regards knowledge of the subject. This I leave to the judgment of my readers.

CHAPTER I

Affections of the ear naturally divide themselves into those of the external, middle, or internal ear. The external ear consists of the auricle and external auditory meatus, and is separated from the middle ear by the tympanic membrane. Although in some of the vertebrate animals the auricle is an eminently useful appendage, it seems open to question, where the loss of one auricle in man through an accident has afforded opportunities of comparing the two ears, whether it contributes in any considerable degree towards collecting the waves of sound in their passage to the meatus.

In the course of the year 1872 I was able to satisfy myself upon this point in the case of a man, W. H—, æt. 21, who came to the hospital in consequence of a wound received in a public-house disturbance. The man with whom he was fighting, after knocking him down, while he was on the ground bit off his left ear. Except the lobe which remained, the ear was bitten off close to the head. After the wound had healed, I found, on testing the hearing, that it was not appreciably impaired for sounds proceeding from a point to the left side of the patient, but that the hearing of the right side was slightly the better of the

two for sounds which proceded from either in front of or behind him. However, the difference was so small as not to be worth consideration.

The auricle is subject to an affection to which the term hæmatoma is applied. It is an effusion of blood between the cartilage of the ear and the perichondrium, and appears as a large swelling. At one time owing to its frequent occurrence amongst the insane it was considered to be peculiar to them. This, from my own observations, although I have not seen a great number of cases, is, I am sure, not correct. There is no doubt that it is generally the result of violent treatment of the ear, either by pulling on it, or by a blow. Still there is sufficient evidence in the literature of the subject to show that this affection may arise irrespectively of violence. Dr Roosa, of New York, has written an excellent account of the disease, and his views have been lately confirmed by Professor Politzer and others.

The appearance which these tumours present is so very characteristic, that when once seen they are not liable to be mistaken. They chiefly occupy the concha, but spread over the auricle, altogether destroying the outline of the ear. A large deep red smooth swelling sometimes of the size of a plover's egg. It is hot and painful, and evidently is a blood tumour that has been formed in a few hours or at the most in a few days. Thus, the history will determine whether it is of traumatic origin, or is a morbid condition which has come on without apparent cause. But supposing the cause to be not at once discover-

able, it will generally be found that it is associated with congestion of the vessels of the head, and this in some measure may possibly be a reason why the idiopathic variety is so common with the insane; for the care with which this class of patient is now treated would preclude the idea that the inmates of asylums are more liable than others to be subjected to rough handling. Altogether the evidence of most observers is an agreement with the view which I have expressed, viz. that it is not confined to those suffering from mental disorders.

The treatment of these tumours is the same as for other blood tumours. An attempt should be made by the application of cooling lotions to induce absorption, and this is occasionally successful. Sometimes the collection of blood suppurates, and then it should be treated as an abscess, *i. e.* laid very freely open and drained. At other times when the tumour shows no signs of absorption or of suppuration, it should be laid open longitudinally from end to end, and healing from the bottom encouraged. Filling it up with antiseptic cotton should form part of the dressing, and as much pressure as can be comfortably borne should be applied by a compress.

The external ear is sometimes the seat of malformations, as instanced in an imperfectly formed auricle and meatus, the latter being sometimes so small as only to admit of a probe being passed into it, and occasionally being absent altogether. Children have been born with four ears, two on either side; and I once saw an adult, in other respects properly formed,

in whom the auricles were so small that they measured barely one inch from the tip of the helix to the extremity of the lobe.

A curious deformity of this kind was reported in 1870 by Mr Moxon, of Reading.* A young girl had in addition to two perfect ears, three rudimentary auricles on the right side and two on the left.

In many of the cases of malformed, or, more strictly speaking, rudimentary ears, which I had seen up to the year 1877, I had noticed a small opening with an oozing discharge, and had considered it to be the opening which led to the external auditory canal. In November, 1877, Sir James Paget read a paper, which may be found in the sixty-first volume of the 'Transactions of the Royal Medical and Chirurgical Society,' "On Cases of Branchial Fistulæ in the External Ears." Those who read this paper will find what had escaped my observation, viz. that these openings are frequently branchial fistulæ, in other words, the openings are "due to incomplete closure of the upper or first post-oral fissure; or, rather, of that part of it which is not utilised in the formation of the Eustachian tube, tympanum, and meatus."

In a rudimentary ear lobe which I removed in 1875 on account of its unsightly appearance, this opening was well marked. It may be seen in the Museum of the College of Surgeons.

Although it is not within the scope of this book to discuss the question, I may say that, as the result of observation, I cannot escape the conviction that

* 'British Medical Journal' for Nov. 12, 1870.

intermarriages between blood relatives exercise a very considerable influence towards inducing malformations or instances of arrested development in the various parts of the auditory apparatus.

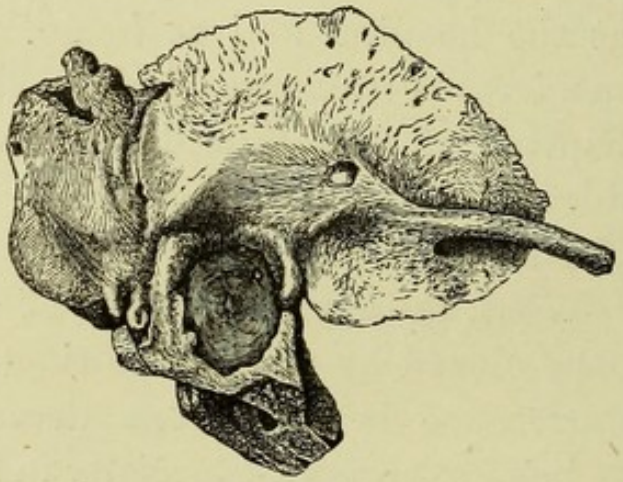
I am pretty conscious that in making this statement I am challenging criticism, but I do so deliberately, having had very considerable opportunities of forming an opinion on the subject. For over twenty years (speaking in 1892) I have personally examined every deaf child before its admission into a large school for the education of the deaf and dumb, besides seeing large numbers in the routine of daily work, to determine the question of their hearing or the reverse, and this both at the hospital and at home. Regarding the very considerable numbers of these children who were the offspring of fathers and mothers who were related by blood (such as being cousins), it has been impossible for me to arrive at any other conclusion on this point. When the external orifice of the meatus is found to be closed by connective tissue and skin, surgical interference is not often demanded, and where it has been exercised, especially in instances of rudimentary meatus, the results have not been satisfactory; this being chiefly due to the fact that where the external division of the ear has been defective, the middle or internal one has been so as well.

This rule is not invariable, and a case has been recorded by Dr Morland, of Boston,* in which the external auditory meatus of the left side was closed by a cutaneous layer. An aperture was made with the

* 'Transactions of Otological Society of America,' 1870.

knife, kept open for a time with sponge-tents, and a small gold tube worn in the meatus until the wound had healed. This was followed by considerable and permanent improvement to the hearing. Such examples as this are encouraging, inasmuch as they go towards showing that the parts more deeply situate are not always useless for purposes of hearing. No rule, then, as to the value of operative proceedings can be laid down for these cases, but at any rate an exploratory incision should be made, if any hearing

FIG. 1.—THE OSSEOUS MEATUS EXTERNUS OF AN INFANT (*Toynbee*).



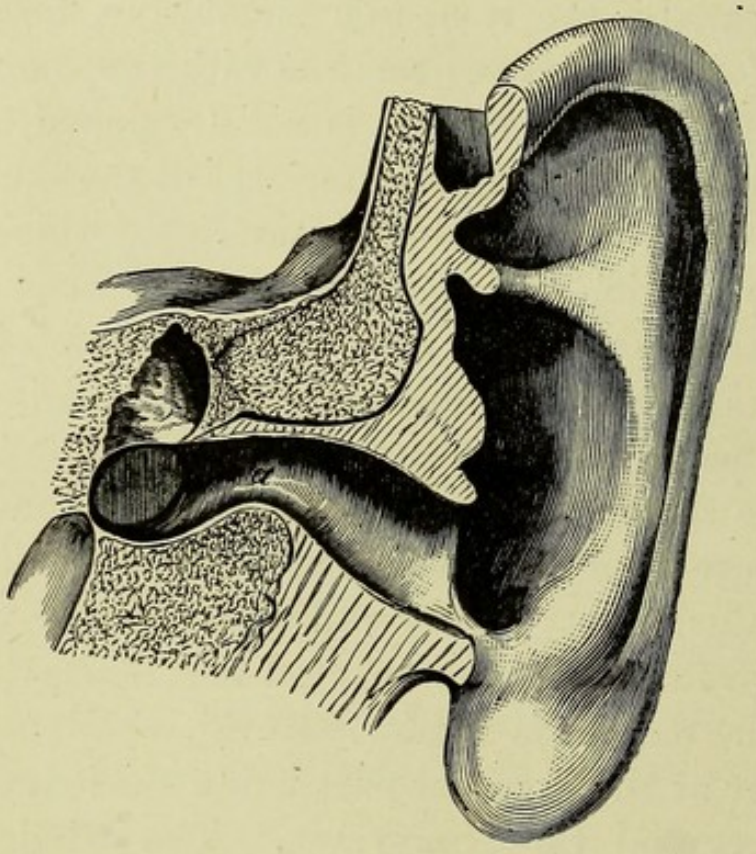
power is present, lest perchance there be more below the surface than might be supposed from the usual results of such attempts at relief.

When this is done the best means to keep the opening patent will be found to consist in the wearing of sheet-lead tubing which can be easily rolled to fit the canal. This must be worn constantly for many weeks until not only complete cicatrisation has taken

place, but until the opening shows no further disposition to close, a disposition which is often of so determined a character that many months should pass by until the use of the tube is discontinued. The length of the external auditory meatus, although varying in different individuals, is about one inch and a quarter, and the calibre is greater in some than in others. It consists of two parts, the external cartilaginous, comprising one third, and the other two thirds being an osseous canal in the temporal bone. At the bottom of this canal is the tympanic membrane, forming an angle of 45 degrees or nearly so with the floor. With infants the osseous meatus is not developed, and the membrane is fixed at the outer part of the skull, being thus nearly horizontal in position. At this time of life the portion which eventually becomes bony is membranous, and later in life the freedom of motion which is permitted between the cartilaginous and osseous part of the meatus when the auricle is raised, is due to some slight remains of the membranous part. Great care then should be exercised in dealing with the meatus of very young children, especially in the case of a foreign body impacted in this situation. In shape the meatus is somewhat oval, the longitudinal diameter at the external part being the longer, but at the other end the transverse. The whole meatus takes a gentle curve forwards. The upper wall of the osseous portion is nearly horizontal: but proceeding inwards from the middle, the floor dips downwards, and on this account, and from the angle which the tympanic membrane makes with it, it follows that the

floor is longer than the roof. It is partly for this reason, and partly because the calibre is smallest about the middle, that a foreign body which has passed this point is so liable to be pressed onwards in the efforts which are sometimes made to extract it; and again, it is for this reason that, in using the speculum, it must be tilted a little in order to obtain a complete view of the membrane.

FIG. 2.—VERTICAL SECTION OF EXTERNAL AUDITORY MEATUS.



The meatus is lined throughout with skin, which is continuous with that of the auricle; that part which covers the cartilaginous portion is much thicker and firmer than that which covers the bony division, and

a thin layer of it is prolonged over the tympanic membrane.

In calibre the external meatus varies extremely in individuals. With some it is so considerable that a large pea might be rolled into it, and the membrane can easily be brought into view without any assistance from the speculum. Such a formation renders its possessor unusually prone to an accidental rupture of the membrane by any object which enters the canal either by chance or whilst the ear is being picked. With a meatus of this size, also, the water most freely enters the ear and remains in contact with the membrane during bathing or washing. It is, perhaps, also owing to this want of protection that so many persons with unusually capacious meatus appear for one cause or another at the clinique. With others, the canal both in its bony and cartilaginous parts is very narrow. It becomes in such cases very difficult to apply any form of artificial membrane (when this may be required), or, indeed, any local remedies to a perforate tympanum. Sometimes in advanced life the cartilaginous part undergoes a shrinking until it is reduced to a mere slit, but this is a pathological condition to which reference will be made further on.

The method of examining the external auditory meatus and the tympanic membrane, which is now almost universally employed, was originally introduced some years ago by Dr. von Tröltsch, the Professor of Aural Surgery in Wurtzburg. It seems almost strange that so simple and effective a plan had

not been thought of before, in place of the imperfect methods previously in use.

If it were necessary to examine the interior of any curved tube closed at one end, the best way by which to obtain a view would be—1stly, to straighten the tube as much as possible; and, 2ndly, to illuminate the interior. For some time in the case of the ear the first of these conditions was fulfilled by introducing a straight tube into the meatus; and the second, by taking the patient to a window and turning the side to be examined towards the light.

It was found that a patient was not always moved with facility into a convenient position, and that when the light passed into the speculum the surgeon's head was often in the way as he attempted to look down it. The next improvement was Miller's lamp, by the aid of which light from a candle was thrown into the speculum from a steel reflector.

The plan referred to as being practised in the present day is at the same time simple and effective. It consists in reflecting light from a concave perforated mirror down a funnel-shaped speculum of the kind first known as Gruber's. In consequence of the variety in the size of the meatus, several specula should be at hand (perhaps half a dozen), the straight tubular part being oval in shape, and having varying calibres. The straight portion is generally made too long: it should never measure more than half an inch, and the whole length of the speculum should not exceed an inch and a half. If longer than this, not only has the light to be sent down a greater distance, and

therefore the reflector be held farther off, not so good a view being in this way obtained, for the eye is thus placed so much farther from the object, but it is found to be in the way when an instrument is being used, as in removing a polypus. It is not very important whether the speculum be made of silver or vulcanite; the latter kind, perhaps, from the contrast in colour, renders slight changes in this respect on the tympanic membrane more strongly marked; but unless the meatus is of a fair average calibre the silver speculum will give the better view, as it does not occupy so much space in the canal. This element is most important when it is necessary to use instruments. In short, it will be found that all surgeons who work much in aural surgery use silver specula. I personally very much prefer them. Both kinds remain in the ear without holding. With regard to the specula which are made to dilate with a screw, and the speculum of Kramer, which opens out with handles after it has been introduced, it is idle to suppose that the meatus under ordinary circumstances will admit of dilatation, and therefore for general occasions they are useless. There are some cases where a dilating speculum might be serviceable, and these are those in which the tragus is situated in a more advanced position than natural, and the anterior and posterior boundaries of the cartilaginous part approximated more than usual, giving rise to a narrowing of this part, so that the orifice is more like a slit than the ordinary shape. But these are exceptional instances, and the peculiarity is readily over-

FIG. 3.—HAND MIRROR.

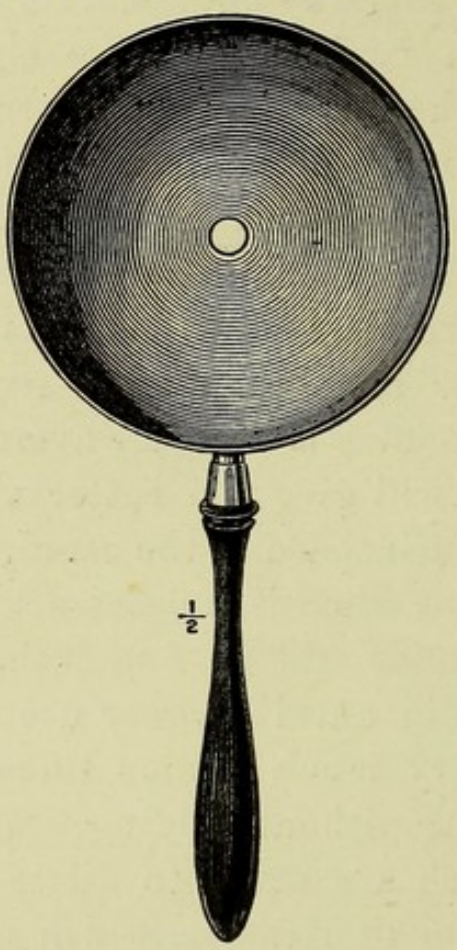
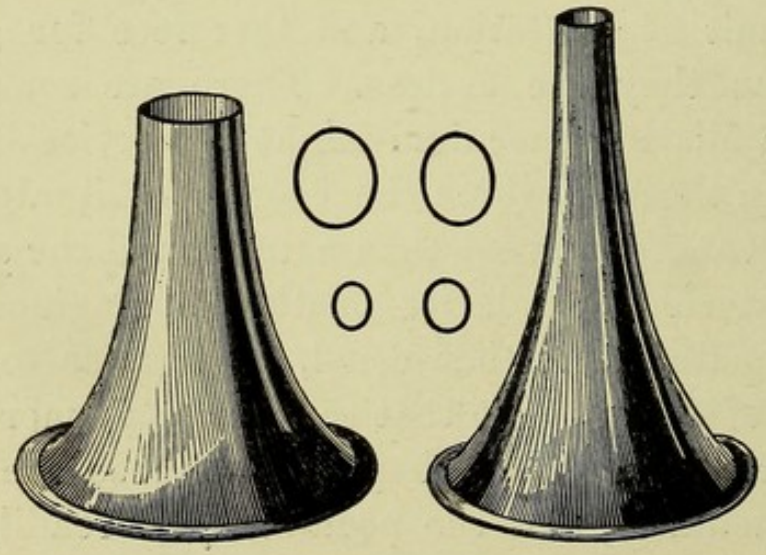


FIG. 4.—EAR SPECULA.



come by using a small-sized speculum. The object in using a speculum is, not to dilate, but to make a straight tunnel for light, and as the tunnel can be moved about, a complete view of the meatus and the tympanic membrane can in this way be obtained.

In introducing a speculum into the ear the auricle should be pulled upwards by the left hand, as this will raise the external moveable part of the meatus to a level with the rest of it. I call attention to the necessity of exercising great gentleness in using the ear speculum, but especially on the first occasion of seeing a patient, for even when the meatus is not affected in any way, some persons are peculiarly sensitive in this part. A feeling of faintness is often induced during an examination.

Also amongst a large number of cases some persons will be found in whom an uncontrollable cough is induced by the presence of the speculum. This is due to reflex action excited by irritation of the auricular branch of the pneumogastric nerve, and this personal peculiarity, so to speak, depends upon a more than usually superficial distribution of this branch in the meatus. I have met with many cases in which some local irritation in the external auditory canal has been the cause of cough, which has persisted for years, and ceased after the removal of the local trouble. This has happened especially when there has been a polypus in the canal. Sometimes the irritating influence of discharge passing from the tympanum over the canal will induce a cough; the fact of the cough and the discharge ceasing or returning synchronously

with the absence or presence of the irritation will point to the cause and effect.

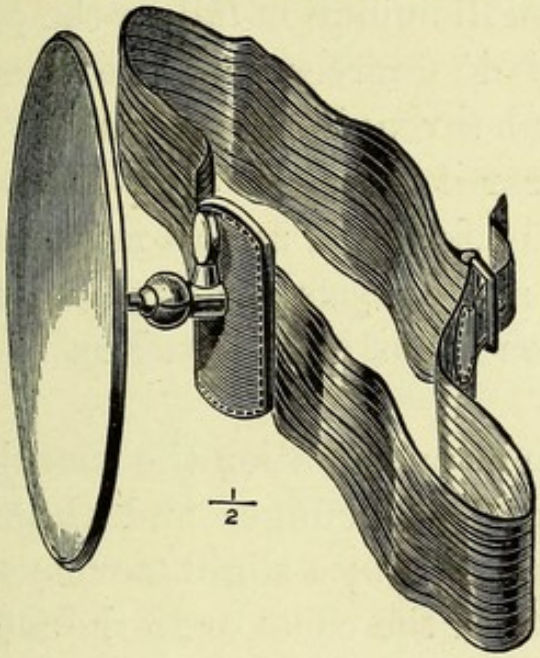
In common with others I have also observed many cases where a distressing cough has persisted for years and defied all treatment, until by some happy circumstance attention has been called to the ear, the foreign body removed, and the symptom of cough has disappeared.

On three separate occasions when I have examined patients for some temporary trouble of one ear, I have found in the other ear a foreign body, removed it, and so relieved the patient of what had caused an intractable cough—on one occasion a small stone, on another a piece of wooden match, and on another an oat.

In simple examination the reflector is held in the right hand, and when it is desirable for both hands to be free, as in any operative proceeding, it is worn on the forehead and fastened round the head with a band in the same way as in examining the throat with a laryngoscope. Thus two kinds of reflectors should be at hand. The best light for minute examination of any object is a bright diffused daylight, and this applies as much to the external auditory meatus and tympanic membrane as to any other. The patient should either be seated or stand close up to a window, with the head inclined a little downwards, and the side to be examined turned away from the light, but somewhat sideways. If the day is too dark for a good view, as unfortunately it often is in this country, the light may be reflected from a bull's-eye lamp, lit

with gas, fixed to a stand which admits of its being moved up and down so as to be on a level with the patient's ear when he or she is seated near. This artificial light is not nearly so good as daylight, as, from the translucency of the membrane, a some-

FIG. 5.—MIRROR WITH FRONTAL BAND.



what yellow tinge is imparted to this structure which is not natural to it. If the patient be in bed, a moderator lamp is a convenient source from which to obtain light, or one of the many little hand lamps that may be obtained at the instrument makers, the light being derived from benzine.

At the present time, however, wherever it is obtainable, electric light has superseded all other forms, and every aural surgeon should have a light of this kind, such as can be used for examining the ear or throat, fixed to the wall in his consulting-room, and out-

patient room at his hospital. In practice it has become of late years my habit to employ this to the exclusion of any other means of illumination, and in large towns where the electric light can be obtained this custom is becoming very general. The patient who is submitted to examination being seated in the position mentioned, the rays of light from the window or the artificial illumination fall on the concave mirror at an angle of 45 degrees, and are directed into the external canal through the speculum. In placing this into the ear it is well to draw the auricle slightly upwards and backwards, as this movement brings the cartilaginous and osseous parts into a line, so that the rays of light can thus be directed on to the tympanic membrane.

At the time of examination the speculum should be held between the forefinger and thumb of the left hand, as it can then by a slight movement be directed to all the parts of the canal or to the membrane. To any one in the daily habit of examining ears, not only does the inspection of the ear become easy, but any manipulation in the canal under reflected light from the frontal mirror becomes as simple as using an instrument on an exposed surface.

This, however, presupposes that the canal is of the normally capacious size; and it should be borne in mind that the calibre and shape of the external meatus vary immensely in individuals, and this quite irrespective of the age or size of the individual, or, indeed, of pathological changes. In fact, there is often a natural narrowness of the cartilaginous or osseous

part of the canal; and especially if the anterior wall of the osseous canal makes a greater curve than usual, the speculum has to be moved about a great deal before every part of the canal or the membrane is brought into view. It is also necessary often to clear away by syringing small pieces of epidermis or cerumen which obstruct the view.

Another impediment in some old persons is a large quantity of hair, which has to be carefully pressed aside by the speculum. At times the exuberance of hairs becomes almost a disease, forming not only an obstruction in itself, but a *locale* for cerumen, which mixes with it, and so is an impediment to sound as well as to a view of the membrane. In some cases I have repeatedly had to pluck out masses of hair in order to clear the canal; after a few months, however, they grow as strongly as ever. Thus there are ears which are easy to examine and manipulate, whilst others are difficult, and in the case of the difficult any mistakes in appearances should be excused when they are made by those of limited experience.

CHAPTER II

HAVING become acquainted with a means by which the external meatus and tympanic membrane can be readily examined, we shall not at any rate attempt to extract foreign bodies from the meatus, or syringe the ear with the object of removing cerumen, until we have satisfied ourselves that either the one or the other is present; and though this may appear a needless caution to impose upon ourselves, and not very complimentary to our intelligence, I think it necessary to mention it, inasmuch as it is not a very unusual occurrence in the out-patients' room for children to present themselves whose ears have been sedulously probed to ascertain whether the story given of something being in the ear is true, and adults whose ears have been perseveringly syringed in order to relieve them of cerumen, when the meatus has been quite free from this secretion; the treatment pursued in either case not proving useful, and sometimes very much the reverse.

Foreign bodies in the meatus are generally put there by children at play, and are chiefly stones, beads, peas, and the like—in short, anything that comes to hand of a size that can be placed there either by the child itself or by its companions.

As it is an unvarying rule in surgery, that before a

patient be cut for stone, while he is on the operating table the presence of the stone should be unquestionably demonstrated, so it ought to be a no less unvarying rule in the case of a foreign body in the ear that its presence should be demonstrated by sight before any attempts are made to extract it, and more than this, the operator should have a full view of what he is doing during the whole time he is endeavouring to extract it. This may be unreservedly accepted as a maxim never to be departed from. For, in the first place, as the meatus is lined by skin continuous with that of the auricle, provided the edges of the objects are not sharp, they may remain there for an indefinite period and do no harm. In the second place, very considerable injury is often done by injudicious efforts which are made to extract them.

I cannot whilst on this subject help endeavouring to point out the importance of care in these cases. On two successive days at St. George's Hospital I had the unhappiness of seeing four instances in which the tympanic membrane had been ruptured by attempts of this kind, and in two of these an examination proved that there had been no foreign body in the ear. This is about the average proportion in which damage of so serious a nature is done in such cases. It is, in truth, difficult to speak on this subject without a feeling of shame and indignation if this were not relieved by the conviction that, owing to the teaching of aural surgery in our general hospitals of late years, none will soon be found capable of adopting

what used to be the usual and is still a not very uncommon proceeding. It is as follows: when a child has or is supposed to have a foreign body in the ear it is laid upon the unaffected side; some kind of forceps are inserted with the idea of grasping the foreign body. If one is there it slips down the canal on to the membrane. The pain thus produced causes the child to struggle, the membrane is ruptured, and some bleeding takes place. In order to keep the child quiet chloroform is given and the operator proceeds in his destructive search without further embarrassment. What the extent of destruction as regards the hearing apparatus is likely to be, and indeed according to experience is, I leave to be imagined when forceps are freely employed in the cavity of the tympanum. But I may add that not so very long ago I had my attention directed to a still more striking example in which the patient died during attempts to extract from the ear what a post-mortem examination proved had only existed in the conjoint imagination of the parents of the child and the operator.

As to the complete harmlessness of foreign bodies in the ear so long as they are not interfered with, I have found a piece of slate pencil that had been in the canal for thirty years, and a stone for over fifty years. Both were encased in cerumen: they were accidentally discovered in examining the ear, and their production brought forward their history to the mind of the patient. Politzer, Lucæ, Zanfal, Reim, Barr have had similar experiences, discovering respectively a piece of slate pencil that had laid in the ear for fifty years,

a cherry-stone forty years, a cherry-stone forty-two years, a pea twenty-seven years, a coral bead forty-five years.

Mothers often bring their children and ask to have various things taken out of their ears, and on examination it is found that there is nothing in them at all. In the case of adults, it is quite surprising what mental distress they appear to suffer from the notion that there is anything in the ear, and it is occasionally, when there is nothing there, very difficult to persuade them of their mistake.

A foreign body having been clearly demonstrated in the ear, its size, shape, consistence, and position examined, then it should be removed. But, to repeat again, no instruments should be used, excepting when, with the mirror on his forehead, light is reflected down the meatus, and the operator, with both hands free, can see what he is doing. Then and not till then he may exercise his ingenuity as to the method of removing it.

It may be of such a form that it can be closed upon by the ring polypus forceps, or one which presents such a surface that the forceps can get a hold upon a portion of it—that is, when it is of a soft nature or uneven shape. A loop of silver wire may sometimes be passed beyond it, and by pulling at this it may be moved outwards ; or the noose of a Wilde's snare may be used, and the body sometimes by this means be secured and extracted. I once removed a cherry-stone in this way from a child's ear. Young children must have an anæsthetic, not because they are being hurt,

FIG. 6.—RING POLYPUS FORCEPS.

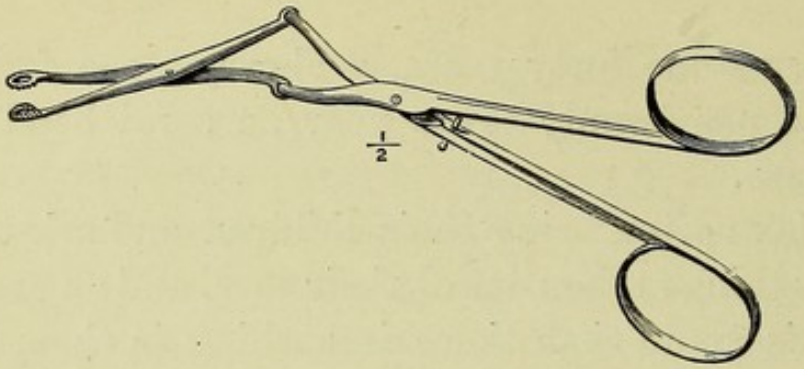
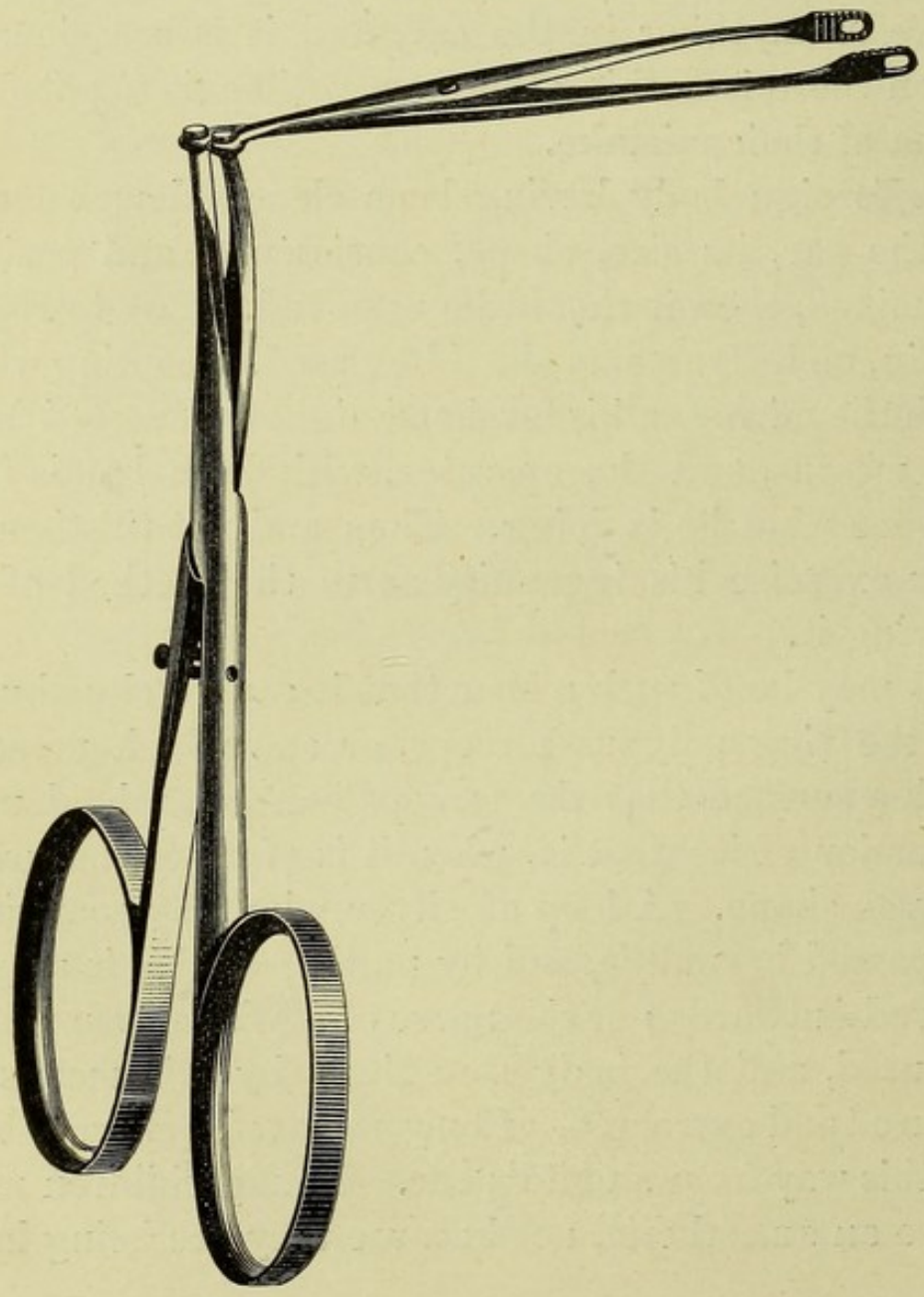


FIG. 7.—FORCEPS TO CLOSE COMPLETELY ON A PORTION OF A FOREIGN BODY OF UNEVEN SHAPE.



but because they cannot keep quiet; and without this it is impossible to do any good. Adults will sit still in a chair, as they are not put to any pain. A very useful and simple little instrument, and one which I have used constantly for the last fourteen years, and indeed have scarcely employed any other, is a small piece of steel, not thicker than a fine wire, and slightly bent at one end so as to form a very minute hook; the other end is fixed into a handle. With this little hook the object may be lightly touched, turned round, and drawn towards the external opening of the canal. If the foreign body cannot be removed in one of these ways, or if have passed more than half-way down, for the reason shown when speaking of the shape of the meatus, any further attempts will assuredly only have the effect of sending it further in, and will frequently result in a rupture of the tympanic membrane. The ear should be occasionally syringed, and the foreign body will gradually approach nearer and nearer the orifice, until it finally drops out. It may be weeks, or even months, before this happens, but if it be left alone it will do no harm. If the tympanic membrane be unfortunately ruptured before the patient has been seen, this is generally followed by suppuration in the cavity of the tympanum, a discharge from the ear lasting a long time, and more or less permanent deafness. After such an accident, if there be much swelling of the meatus and pain, a few leeches in front of the tragus, followed by fomentations, will be advisable; and when by-and-by the offending body has come away, the case must be treated in the way

Fig. 8.—Hook for removing Foreign Bodies from the Ear.

I shall speak of when dealing with perforations of the tympanic membrane. A most clever method for removing foreign bodies from the ear when they are in actual contact with the membrane has been suggested and successfully practised by Dr. Löwenberg of Paris. The end of a rod is dipped into melted glue; the point thus armed is held in contact with the foreign body until the glue has hardened (about twenty minutes suffices for this); the rod is then withdrawn, bringing away with it the foreign body.

Anything more energetic than the treatment I suggest in these cases I believe not only to be unnecessary but harmful; and I must confess to looking with disfavour on any of the numerous instruments which have been brought forward, it is said, with the special object of getting behind the foreign body and removing it, for I have never met with any cases where I think they would succeed when the more simple means fail; and, on the other hand, I have frequently seen injury to follow their employment. I cannot, therefore do wrong in advising that any who have not acquired considerable facility in operating with reflected light should trust to simple syringing; so this ought to be the rule except in the case of aural surgeons. At the

FIG. 9.—FOREIGN BODY IN FIRST POSITION BEING REMOVED BY HOOK.

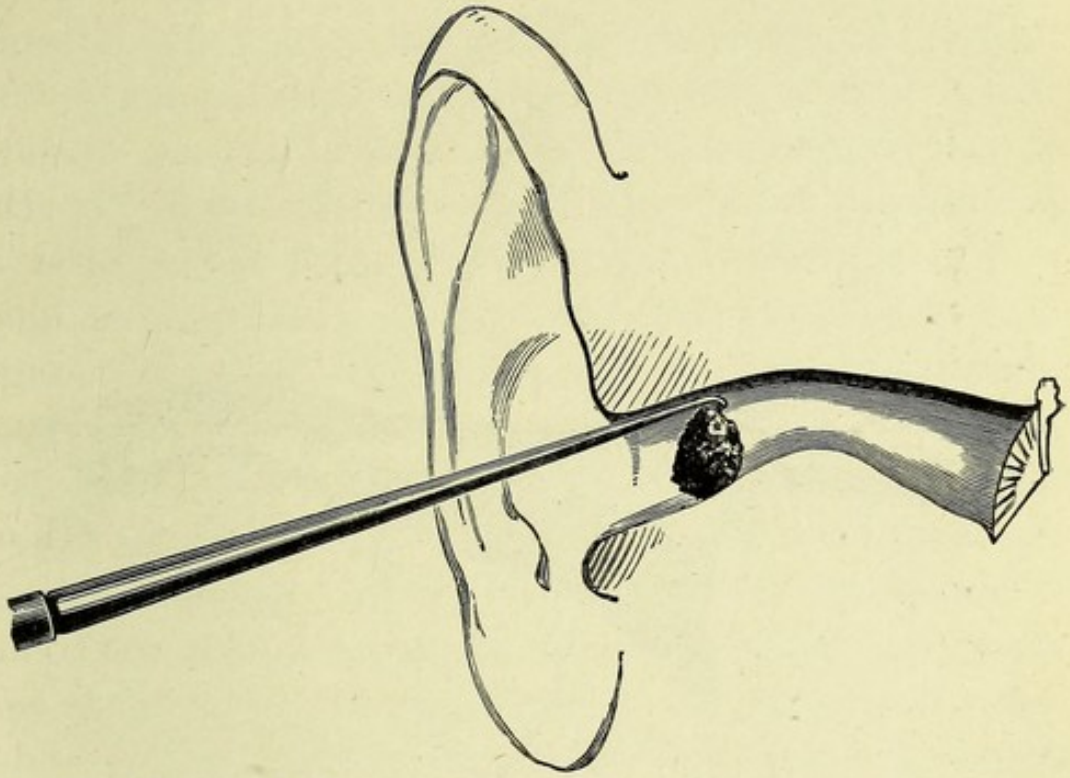


FIG. 10.—FOREIGN BODY IN SECOND POSITION BEING REMOVED BY HOOK.

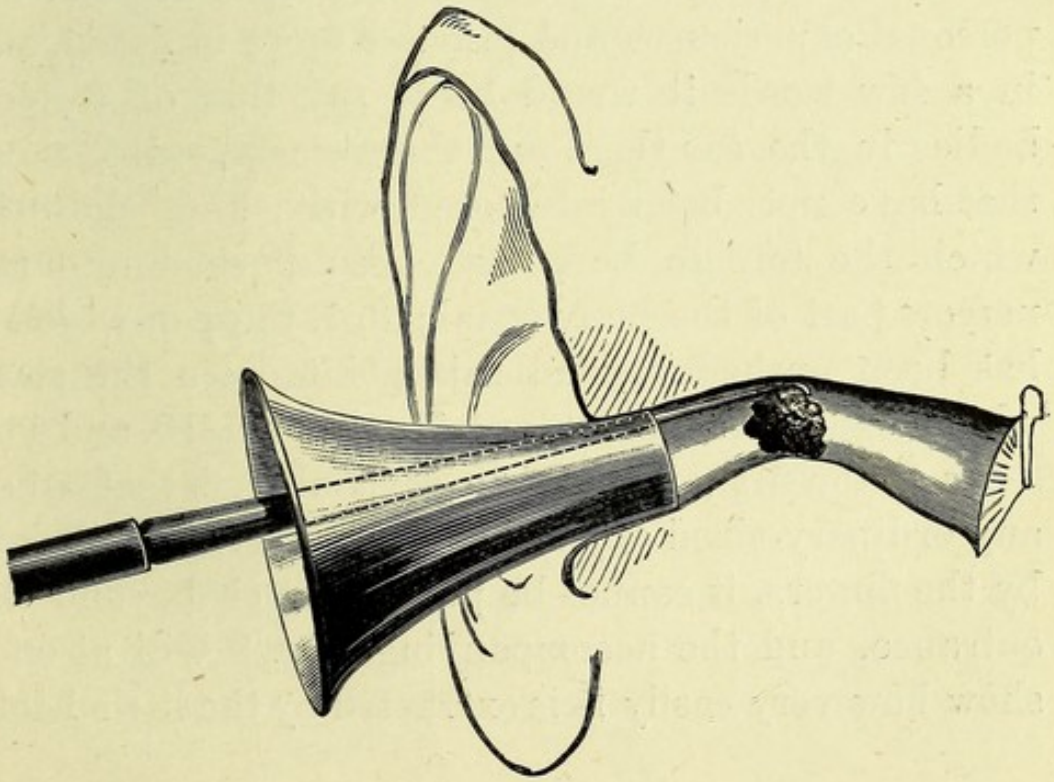
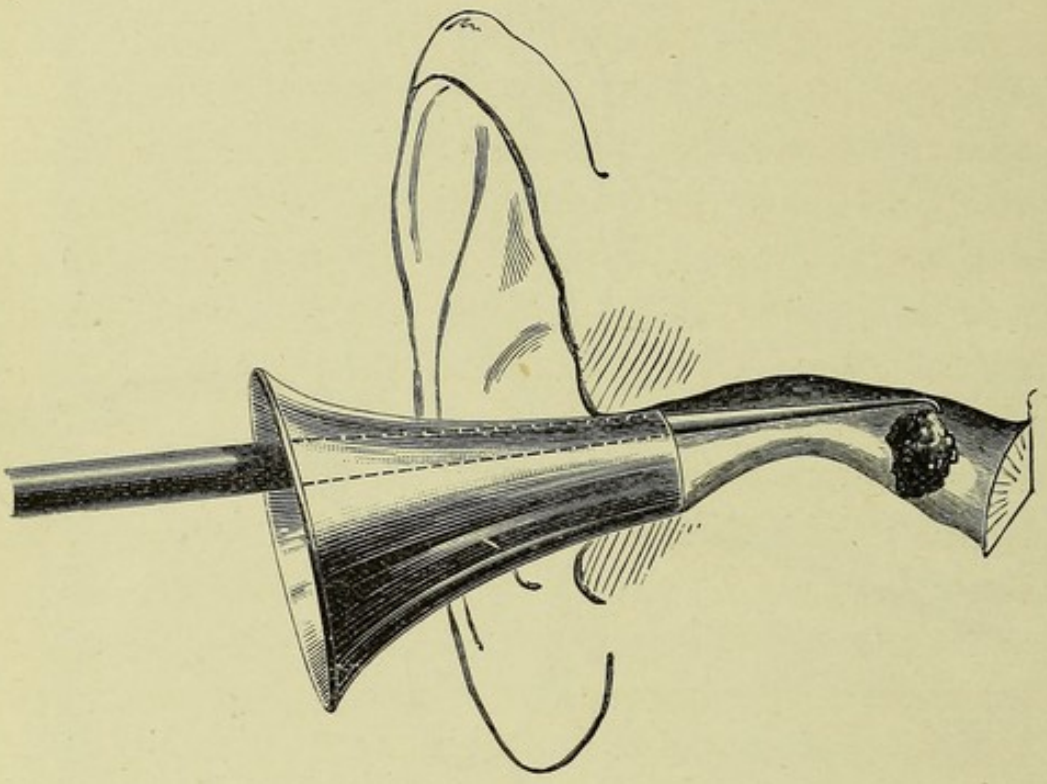


FIG. 11.—FOREIGN BODY IN THIRD POSITION BEING REMOVED BY HOOK.



same time it is but due to others to give some of my personal experiences and practice more in detail, and in a few words it would be to say that of foreign bodies in the ear there are three classes—1st, those that have not been interfered with; 2nd, those in which the foreign body has been pushed into the narrow part of the bony canal; 3rd, those in which it has been pushed beyond this point down the slant which leads to the membrane (see Figs. 9, 10, and 11).

As to the first, it must be remembered that when any ordinary-sized object has been inserted in the ear by the fingers, it cannot be pushed much beyond the entrance, and the accompanying Fig. 9 will at once show how very easily it is extracted by the little hook.

In the second and third class, the difficulties have (as they always have) been made. Still the hook by lightly touching it and rolling it towards the orifice will get it out with some difficulty if it is still in the narrow part of the canal and has not slipped downwards. In this latter case, if it is not too large to roll easily through the narrow portion, it can also in this way be extracted. If, however, it is (to use a homely phrase) "a tight fit" in this part and has been pushed through, it will be extremely difficult to get back again, and had better be left alone. No manipulation ought to cause the least pain. If it does it will surely excite swelling. Even if the object is left alone it will some day come away, as has been said, by gentle syringing, and the tendency is for it to work outwards. The question might naturally be asked, Ought syringing always to be tried in the first place? To this I have already replied, in the case of those who are not in the habit of operating on the ear, that it should be the first, the last, and only method used. It will have been noted that when the object is near the orifice it can be readily hooked out. Now if it is first subjected to the syringe, this might, and does, readily drive it further inwards, and make a difficulty that had not previously existed.

How few, however, are the cases in which someone has not attempted to remove the foreign body before it comes under the hands of the aural surgeons! Politzer says only 10 per cent. of the cases he has seen. Certainly syringing should never be employed in the case of a bean or pea in the ear, for the moisture thus

introduced causes the object to swell, and then it becomes necessary to pick it out piecemeal; and it may be added that in order to avoid any swelling of this sort due to water getting into the ear, an object of such a kind should be removed without unnecessary delay.

If an insect should crawl into the ear it gives rise to most unpleasant sensations; and the patient and his friends generally resort to a variety of expedients to kill it—tobacco smoke, &c. A few drops of oil or water poured into the ear will either kill the insect or make it creep out, or at any rate a little gentle use of the syringe will always bring it away. I remember once having seen a highly nervous condition to follow a case of this kind in a young lady, who gave an account of a spider crawling into her right ear twelve months before. The spider, after many and various kinds of attempts had been made to get it out, was at last, so she said, extracted with forceps, but not before it had remained in the ear for four days. Ever since then she had suffered from painfully acute hearing; the sound of her voice was disagreeable to her, and after every sound she continued, for some seconds, to have a ringing in the ear.

I have only known one example in which I have found the traditional earwig in the situation from whence it derives its name.

Most of the objects which may get access to the ear have now been named, and their conditions as regards size, position, and shape have been referred to, but it is well to remember that nothing is more

likely than the unexpected when it applies to difficulties, and the subject under discussion is no exception to the rule. To demonstrate this it is only necessary to refer to two very remarkable cases. One may be found in the 'Clinical Society's Transactions,' vol. viii, where I have given in detail a case in which plaster of Paris in a liquid state was poured in the ear by an artist whilst taking a cast of a head, and on hardening formed a solid mass filling the external canal. How this was got away by employing the chemical reaction between acetate of lead and sulphate of lime may be learned by the reader who is interested in this matter by reference to the paper mentioned. Another case, in which also chemical action was resorted to, is related in the 'Lancet' of April, 1892, by Mr. Sheild. Here the action of mercury was most ingeniously and successfully employed by Mr. Sheild upon lead tightly impacted in the canal, tympanum, and Eustachian tube. Indeed, the molten lead passed through the middle ear, and pieces of lead were (Mr. Shield informed me) subsequently removed from the nares. In both of these cases, as will be obvious to the reader, it was imperative to remove the foreign body, notwithstanding the great difficulties which this problem presented. The question, therefore, almost at once arises, under what conditions may it be necessary to resort to more energetic and resolute measures than those hitherto mentioned? And I think the answer to this may be briefly given as follows:—If a case should be found in which, owing to previous manipulation, a

foreign body has become so wedged into the tympanic cavity as to become the source of cerebral irritation, it should be removed by the operation of detaching the auricle from behind the ear. This will materially lessen the distance of the operator from the object; and when the latter has been removed, the auricle can be readily replaced and fixed with sutures. This idea is as old as Hippocrates, who mentions it, and it is referred to by subsequent writers. It has been found necessary to employ it by Dr St. John Rossa, Schwartze, Dr Orme Green, and Dr Buck. The account of these cases, which may be found in the respective works on the ear by their authors, is full of interest, and they are excellent examples of the conditions under which the operation named may and should be resorted to.

Among the remarkable things met with in the meatus I may mention that Dr J. Green, of St Louis, at a meeting of the Otological Society of America in 1870, related a case of aspergillus, which from the history would seem to have remained in the ear for two years; and Dr Blake, of Boston, two years later, reported two cases of living larvæ in the ear.

The first detailed accounts of this fungus in the external canal were given by Schwartze and Wreden. The commonest varieties of fungus that have been found seem to be the *Aspergillus nigricans* and *A. flavescens*. The spores reach the ear from the atmosphere in damp districts, and are identical with the mould on walls. The symptoms complained of are sensations of heat and irritation in the canal, which, if

allowed to proceed unchecked, progress till the lining of the meatus is much inflamed. Politzer states that he has seen even the membrane to be perforated from this cause. This has not, so far as I know, occurred within my experience. Thorough cleansing with a syringe and a weak solution of alcohol, followed by the occasional application of weak mercurial ointment, is all the treatment that is needed. The cases which have come under my notice have, strangely enough, always occurred in the ears of persons who have resided in the West Indies or in Egypt, and I have seen them shortly after their arrival in this country. Although the irritation and heat have been very great, they have very readily yielded to the simple treatment I have mentioned.

With regard to cerumen in the ear, the first symptom of its presence is generally a loss of hearing power. This symptom sometimes comes on gradually on account of increased secretion until the meatus becomes blocked up with it; or it may, which is the more general way, come on suddenly. And this occurs in the following manner:—The cerumen, from being secreted too abundantly on the walls of the meatus, gradually narrows the passage by which sonorous vibrations proceed to the tympanic membrane. By a change of position of some portion of the cerumen, caused either by water getting into the ear, the patient putting his finger into the meatus, picking the ear, or using the twisted end of a towel to clean the ear (this bad practice is often followed by nurses with children), the already narrowed passage becomes alto-

gether closed. Some other movement in like manner may for the time bring back the hearing by restoring the passage. Another symptom often evoked by cerumen in the meatus is tinnitus, and it is sometimes of the most distressing character. Anything which causes undue pressure of the stapes on to the fenestra ovalis, and so on the labyrinth, will produce it, and in this case it is brought about by a hard plug of wax directly in apposition with the tympanic membrane, thus transmitting pressure through the malleus and incus on to the stapes. The same exciting cause will often induce attacks of giddiness, and I have known the symptom to have existed even for years without eliciting suspicion of its cause, and the patient to have been submitted to all sorts of treatment for its relief, without of course receiving any benefit. This arose from the fact that there was no accompanying deafness to point to a cause, for in these cases the hard plug of cerumen does not always entirely cover the membrane, and so there is ample room for sonorous vibrations to fall upon it, and thus be transmitted as before. As a rule, however, there is deafness as well.

One case I was very much struck with some years ago, where an old lady had had rather alarming attacks of giddiness at various times for more than three years, and not until she had become deaf (I suppose from a little more cerumen completely covering the membrane) had attention been drawn to the ear. The giddiness and deafness both disappeared with the removal of the wax.

Accumulations of hardened cerumen from continued

pressure on the membrane will occasionally produce ulceration of this structure, thus becoming the direct cause of a perforation; and in the same way they have occasionally induced partial absorption of the bony walls of the meatus.*

The only legitimate way of removing cerumen is by the use of the syringe, and the best form is one where the nozzle is very small and can be removed from the other part by bayonet action. In using this kind time is saved, as the syringe is quickly filled, and from the small size of the nozzle the meatus is not blocked up

FIG. 12.—NOZZLE OF SYRINGE (ordinary size).

as it is in most of the syringes made. It is only necessary to use warm water of a pleasant temperature. In so simple an operation as syringing the ears there is a skilful and an unskilful method of doing it; the first is of course the more effective one, and it is from not taking the trouble to learn it that some persons are so long in getting out cerumen, which a few syringefuls of water, properly applied, will at once expel. The auricle should be drawn upwards between two fingers of the left hand, so as to put the whole meatus in a straight line, and the nozzle of the syringe should

* There are some preparations showing this in the Museum of the College of Surgeons.

be kept in close contact with the roof of the meatus. In ordinary cases the mass will be easily dislodged, but if it has lain there for a long time, perhaps several years, and become, as it will do sometimes, of almost stony hardness, its removal is not so easily effected. In such a case the patient should lie on the opposite side for a time and have the ear filled with water, so as to let the cerumen soak and become softened. It will, however, occasionally be so hard as to render it necessary to pour in water or oil (it does not matter which) for two or three nights successively. It is well not to use the syringe too long at a time; and at intervals, during the proceeding, the ear should be examined with the speculum, to see if the canal is clear, for, if it is so, considerable irritation may be set up by syringing directly on the membrane; indeed, it is not very rare to meet with patients (I have seen several) whose ears have been syringed vigorously when there was nothing to bring away, and they have had inflammation of the membrane, and subsequently a perforation. The wholesale way, therefore, in which people get their ears syringed as soon as they feel deaf is not altogether without its drawbacks, and there are some points that are worth attention even in cases of wax in the ear. When the cartilaginous part of the meatus has become narrowed to a mere slit, by approximation of the anterior and posterior boundaries, it is sometimes extremely difficult to get away cerumen; and I remember one old woman (and, by the way, a meatus of this kind is generally met with in elderly persons, for the reason

I before mentioned) who had to come on five different occasions to the out-patient room before the secretion was entirely removed. This alteration from the natural shape of the meatus will sometimes amount to almost complete closure, and then become the cause of deafness. In these cases assistance may be given to the hearing by wearing a small silver tube which will keep the opposed sides apart.

CHAPTER III

If I attempted to describe all the affections of the external auditory meatus that will be found classified in some of the text-books on aural surgery, I should not only be confusing my reader, but I should, in their recital, become very confused myself. For example, I fail altogether to understand what the late Mr Toynbee meant when he described a number of cases as "simple chronic inflammation of the dermoid meatus," "chronic catarrhal inflammation of the dermoid meatus," and "catarrhal inflammation of the dermoid layer of the external meatus, with caries of the posterior wall." To say the truth, I do not know what is meant by catarrhal inflammation, except as applied to mucous membrane, and can only say that the external auditory canal is subject to inflammation; that at one time the integument is alone affected, at another the periosteum and bone are involved; and I will try to describe the way in which commonly patients suffer, and the most convenient mode of relieving them. 1stly, then, if the area of inflammation be strictly circumscribed, there will be boils and abscesses in the meatus. 2ndly, if such an area is not circumscribed, a larger and less definable part of the

ear will be affected, and the term "diffused" may be applied to it.

Boils in the meatus give the subjects of them a great deal of pain and trouble. If they are situated near the external orifice, they are not nearly so painful as when they are somewhat farther in the meatus. In both cases it is almost always advisable to open them, as the sufferings of the patient are thus very much shortened. The local treatment is sufficiently simple, and may be said to be as follows:—Fomentations until the boil is ready to be opened, or the boil discharges itself. But this is only a small part of the treatment. The difficult and most essential matter is to change the condition of health or the habit of life which induces the boils, for they seldom occur singly. Generally, a few days after one is well, another will form either in the same ear or the other one, and so on sometimes for weeks or months (crops of boils). It is also a rather singular fact that patients with this affection scarcely ever have boils in any other part of the body. I cannot say either that they are confined to persons who may be said to be unhealthy or weakly.

The most obstinate case I ever saw occurred in a young man, an exceptionally strong person, who spent the best part of his time in field sports and athletic exercises, lived almost by rule, and was in training generally two or three times in the course of the year. For three years he had never been one week quite free from a boil in either ear. With cases of this kind —and I have seen large numbers of a similar though less determined type—there is some habit of life

which wants correcting; the surgeon must find this out if he wants to give permanent relief to his patient, and it will sometimes tax his ingenuity to do it. In the instance I mention the patient was accustomed to drink beer—about one pint in the day; this was left off, and no stimulants allowed beyond a little claret. Small doses of Carlsbad water were taken every day, and he got quite well; thus, apparently very slight change in his diet was made, but it was quite enough to free him from the inconvenience he had so long suffered from. Another case, perhaps, will require entirely different management; in short, constitutional treatment—a term which includes so much: exercise in the fresh air, stimulants for those who require them, an absence of stimulants for those who take too much, appropriate diet, and medicines to suit each case.

Cases of abscess in the meatus are sometimes very troublesome, and require a good deal of care and management. The first symptom is pain in the ear, which in a few hours becomes so acute as to put sleep out of the question. After twenty-four hours or so the meatus in its entire extent will be swollen; sometimes the whole external ear will be enlarged, red, and tender to the touch. The movements of the jaw occasion great pain. There is more or less deafness in proportion to the swelling. If the patient be seen within a day or two of the commencement of the attack, the greatest benefit may be afforded by two or three leeches placed in front of the tragus, just over the articulation of the lower jaw, and followed by fomentations; in this way the affection may be cut

short occasionally. When the leeches are applied the meatus should be filled with cotton, to prevent the blood getting in. If not checked in the early stage, the state of things described will increase in severity for several days, and, on examining with a probe, one part will be felt to be far more acutely tender than any other part of the meatus. The whole meatus is so swollen that it is not possible to see the position of the abscess with a speculum. This point having been distinctly localised, the sooner an incision is made into it the better, as by this the tension of the parts, to which the agonising pain is due, is relieved. The best knife to use is a curved sharp-pointed bistoury, and a free iucision should be made as it is withdrawn. After this the patient gets well in a few days. Very frequently, however, he is no sooner well of one abscess than another commences to form, and all the suffering has to be endured again. It is this recurrence that makes the affection such a troublesome one. Sometimes six or seven abscesses will occur successively in the same patient, obliging him to remain in the house for as many weeks, and causing an amount of suffering altogether disproportionate to the gravity of the illness. In recognising this occasional peculiarity in these cases it is well to observe caution in promising a patient that he or she will be well within a certain time; and to warn them of the possibility of a recurrence of the abscesses, for unless this be done they will be very apt to think that the incision made for the relief of the first abscess was imperfectly performed.

I ought, perhaps, to mention that a solitary abscess is often found external to a piece of dried cerumen which has set up the irritation. This class of abscess does *not* return after the cerumen has been removed.

The diffused form of inflammation of the external auditory meatus differs from the circumscribed inasmuch as it does not terminate in abscess, and, as its name implies, in being diffused throughout the integument of the canal. Since the outer cuticular layer of the tympanic membrane is continuous with that lining the meatus, there is always a certain amount of risk lest this membrane become implicated, and for this reason the affection is more serious than the one just considered. It is not strictly correct to describe it as being of two kinds—viz. acute and chronic; because, although the attacks are acute at one time and chronic at another, their gradations so insensibly pass into one another that an artificial division is practically useless. Children are especially liable to it; and as it is generally neglected among the poorer classes, with them it is not unfrequently the origin of a perforation of the tympanic membrane. It often succeeds the exanthemata, but not nearly so commonly as does purulent catarrh of the middle ear, spreading along the mucous membrane from the throat. The diffused form of inflammation of the external meatus commences with a feeling of uneasiness and itching just within the orifice, which very soon becomes red, tender, and swollen; and there is pain during mastication. The whole ear is red and swollen, and has the appearance of standing

out (so to speak) from the head. These symptoms increase in severity until, with the appearance of a discharge, the pain ceases, and the swelling gradually subsides.

Such is briefly an account of its acute stage, which usually occupies a week or ten days. The treatment is palliative—viz. leeches and fomentations; but as this affection does not occur to persons in a good state of health, the diet should be attended to, and a change of air, if possible, be resorted to, for it is most desirable not to let this condition become a chronic one, as it is most apt to do.

After the appearance of the discharge, which is generally not very copious, the meatus should be kept carefully cleansed by syringing every day, and afterwards a mild astringent lotion may be used. After an attack of this kind, as the external layer of the tympanic membrane has shared in the general condition of the lining of the meatus, the natural translucency of the membrane is lost, but this in no way interferes with its functions.

I repeat it is most undesirable to allow this condition of inflammation of the external meatus to become chronic, for if it does, it leads to narrowing of the meatus. This I have known frequently to be so great as only to admit of the smallest eye probe, and sometimes not even that. There is another peculiar state which sometimes follows this affection; it is a rim of connective tissue about the juncture of the cartilaginous with the bony meatus, which is perforated with a minute opening. When this takes

place it is necessary to destroy the connective tissue with a caustic, and to keep in its position something which will permit granulation to take place on a level with the canal. The most satisfactory substance I have found, after repeated trials, is a small piece of lead tubing. The same plan I have employed with great success in cases where, after inflammation of the canal, the external orifice has been closed with a firm layer of connective tissue, in the centre of which is also, as in the other case, a minute hole. I would refer those who are interested in this subject to the 'Lancet' of January 22nd, 1876, in which is a detailed account of this affection. All sorts of plans have been tried to keep the opening permanent, but until I made use of the sheet lead I was unable to effect a permanent opening.

There are, however, certain cases in which no permanent or even temporary passage can be made, and there are those in which at some period there has been very considerable caries of the bony part of the canal. For example, it is not uncommon after scarlet fever to find not only complete disorganisation of the tympanum and its contents attended with caries of this part, but also a continuation of the caries in the bony meatus. Here large pieces of dead bone come away, and an almost complete collapse (involving closure) of the canal takes place. It is, however, to be noted that this closure does not occur until the tympanic mischief has subsided, so that the obstacle to the escape of discharge is not so dangerous as might be expected. In both, the dis-

charge from the tympanum has ceased. Inasmuch as there is in these cases no hearing left, there can be no object in attempting to effect a passage. Indeed, it would also be impossible to do this, for the canal has, so to speak, closed by a process of granulation from the cavity of the tympanum.

Injuries to, and morbid growths of the auricle present no especial points of interest to distinguish them from the same conditions elsewhere. This will also apply to skin diseases in this situation. Eczema, perhaps, as being a common affection of the outer ear, calls for a few words of notice. It may be acute or chronic. After repeated attacks (for a patient who has once suffered from it will be very liable to it again) the auricle becomes very much thickened, and the entire meatus shares in the same condition. If there is any deafness, it is only so far as may be accounted for by the narrowing of the canal, which takes place when the disease has lasted for a long time. Like eczema in any other part, it is very obstinate; but if the patients will consent to keep to rules of diet, including an absence of stimulants, they will get well. This is more important than any external applications. Of these, very mild mercurial ointments are, perhaps, the most useful; and before they are applied the parts must be carefully dried.

In approaching the subject of bony growths in the external auditory canal, I am anxious not to occupy too much space, but it is impossible to dismiss the subject briefly, inasmuch as during recent years the matter has occupied a great deal of my attention, and

the treatment of these cases may be said to be completely revolutionised. In regard to the origin of bony growths, it was pointed out at the International Medical Congress held in London, in a paper by the late Dr Cassells of Glasgow, that there were two practically distinct forms in the ear, and of quite different origin : in the first place, exostoses, in the second, hyperostoses. He explained that the exostosis was a solitary growth arising from the junction of the cartilaginous with the bony meatus, and arose as follows. "At the outset a subperiosteal abscess forms over the mastoid, and makes its way out and into the meatus by way of the line of least resistance, ordinarily coming out between the cartilaginous and osseous portions of the canal, sometimes even through the cartilage of the canal, discharging itself and continuing to do so for some time. By-and-by highly vascular, granular-like growths spread from the opening of the abscess and go on increasing in size, while at the same time they are being gradually changed into bony tissue in their interior by the gradual conversion of their cells into bone-cells." Thus, then, an exostosis is a true bony growth of inflammatory origin, with more or less of a pedicle or narrow base, and very slightly moveable. It is enough of this to say that when it is found it should be removed, because it obstructs sound, and, what is more important, it may in case of inflammation of the middle ear, form an obstruction to the escape of discharge, and so endanger life.

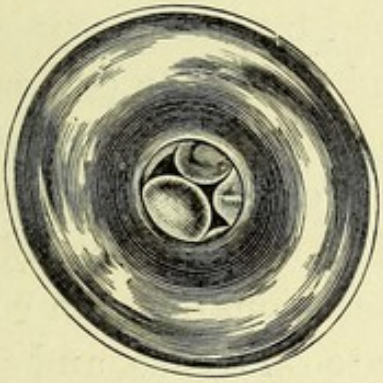
To remove a true exostosis is a comparatively easy

matter. When the patient is under an anæsthetic, its base can be cut through with a gouge, and it can be taken out of the meatus with a hook or forceps.

It is altogether a different matter when the next form is met with, viz. the hyperostoses.

They are not unfrequently met with in the external auditory meatus, and are not confined to any situation in the course of the osseous part of the canal. They are solid bony growths of the hardness of ivory, covered with periosteum. Although sometimes they are solitary, at others there are two or three at one

FIG. 13.—THREE IVORY HYPEROSTOSES MEETING EACH OTHER, SEEN THROUGH THE SPECULUM.



time, and they scarcely ever have a pedicle. On this account, and from their position, they are not easily removed by an operation. Fortunately this is not very often necessary, as they seldom entirely close the meatus, and so do not interfere very materially by their presence with the hearing, but do so indirectly by secretion of cerumen and epidermis collecting between or behind them, and in this way may be very troublesome, for, besides acting as a mechanical

obstruction, the constant pressure of hardened secretion upon the tympanic membrane may induce ulceration of this part.

The ear may in some cases require the most careful syringing from time to time, and it is sometimes extremely difficult to get the point of the syringe between the growth and the wall of the meatus. Moreover it is not always a desirable proceeding to syringe the ear, inasmuch as there is a difficulty in drying the canal completely, and if a little water is left behind the growth it may become the source of irritation; any secretion may, therefore, be better removed by the small hook used to extract foreign bodies if possible. On examining an ear the external canal may be found to be nearly closed by the meeting of three growths (see Fig. 13), and the other ear, perhaps, will represent the exact counterpart of its fellow, no history of any kind giving a clue to the origin of such changes. Examples of this kind are possibly congenital; and that they are so occasionally I am convinced, for I had occasion to operate on a case, and some years later, on the brother of this patient. Later still I saw the father of these with precisely the same condition. On the other hand, however, when one ear alone is affected, a history of a discharge from the ear, dating, perhaps, from many years previously, may often be elicited. I am very much inclined to think that the exciting cause of the growth is the passage of the irritating discharge along the canal. Dr. Roosa, of New York, seems to be of this opinion, too, in the account of five cases which he has recorded in his translation of Dr

von Tröltsch's book on the ear; he there gives a very good chapter on this affection, and says that these bony formations should be considered "rather as general enlargements of the periosteum and bone structure immediately beneath, than tumours, true exostoses" (a view I entirely agree with). Mr Toynbee considered them to be a result of gouty or rheumatic diathesis. I cannot say that this explanation will bear any close investigation over a great number of cases. Dr Gruber has noticed in syphilitic patients a general enlargement of that part of the temporal bone which forms the external canal. When, however, the enlargement is only in the one external canal, Virchow's view in seeking for a local impression as an origin of such hyperostoses appears to me more rational than putting it down to any constitutional affection. This local impression may take the form of discharge passing over the canal, or the repeated presence of boils or small abscesses. In connection with the origin of these enlargements I may mention that at the International Medical Congress, held in London, I called attention to the fact that in a very large proportion of these cases the subjects of the growths had been for many years addicted to sea bathing. This occurred so frequently as to become something more than a coincidence. Further experience has confirmed me in the conviction that the frequent passage of sea water over the canal has been the local irritation which excited the growths. For again and again patients with this affection have been great divers, whilst others all their life put their head

under water when in their bath. On the occasion of the Congress there was a prolonged discussion of this subject, and those who were present agreed altogether as to the views which I expressed in regard to the local irritation being productive of the enlargements.

No doubt these growths may remain, and do remain for long periods without attracting notice, until some slight accumulation, by completing the closure of the canal, calls attention to their existence. If this secretion can be taken away, it is better that no more severe measures should be adopted, but it occasionally becomes imperative that the growths should be removed. For example, if behind the bony enlargement there is a perforation of the membrane, and the discharge cannot pass outwards, or if from the tympanic cavity a polypus arises, in either of these cases the life of the patient may be in jeopardy. I am quite certain that the rate of growth is very slow, for I have seen many at intervals of several years, and I am equally certain that to some there arrives a period when they do not increase. That this is the case may be opined from the fact that with a great many it has become a necessity to clear the canal about every six months; and in looking back over a period of some eight or ten years no perceptible increase can be observed. It is most important to bear this in mind when an operation is contemplated, for if these simple measures are enough to give comfort and hearing to a person beyond middle life, no surgeon of sound judgment would recommend operative interference.

The questions now present themselves, When

should hyperostoses be removed? and what method should be employed? Without any sort of doubt it becomes imperative to operate when one or more growths block up the canal, and by their presence prevent the escape of pus which may be coming from a perforation of the membrana tympani.

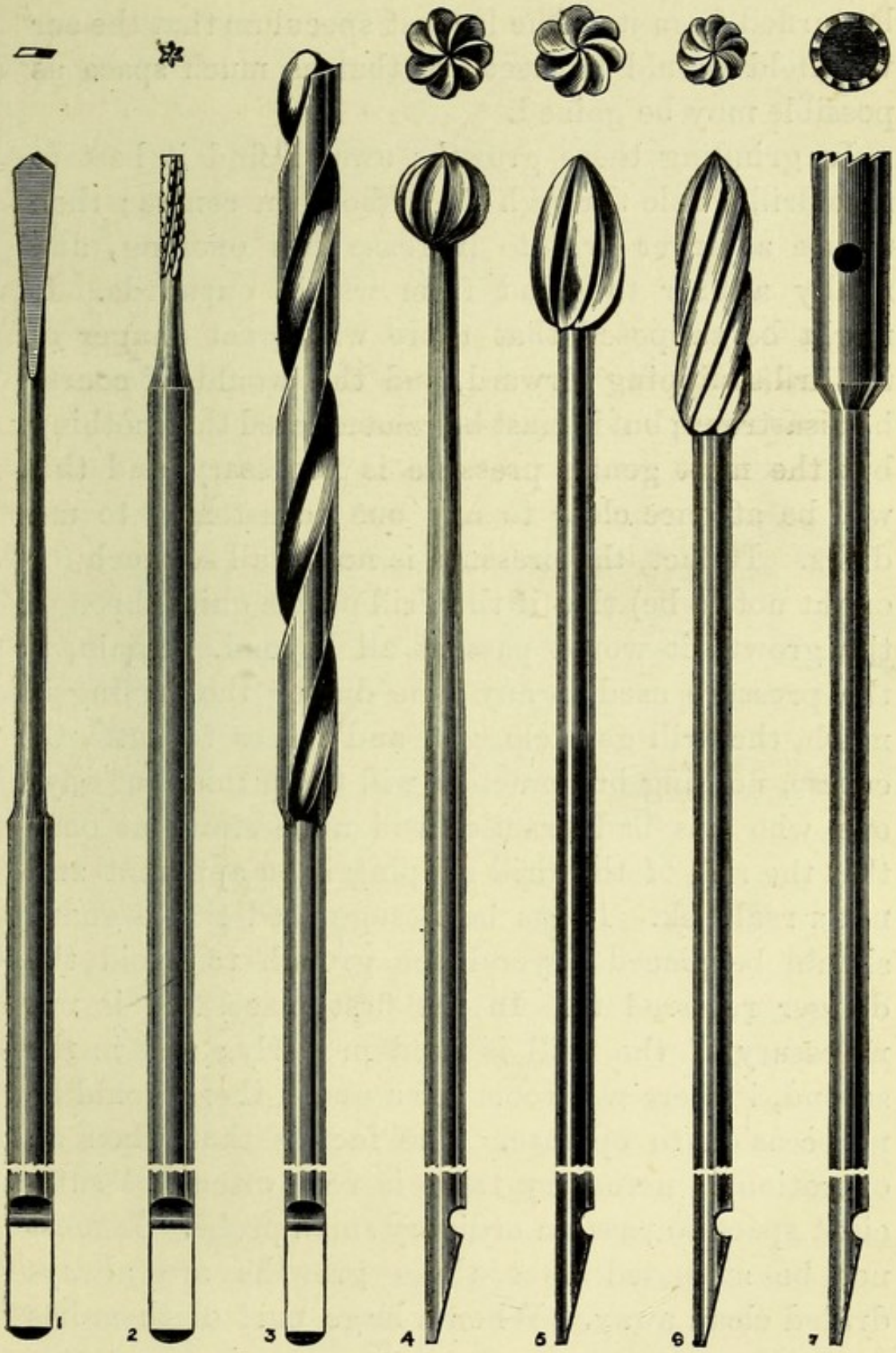
It was this condition which forced me (so to speak) to remove by a dentist's drill a bony growth in January, 1875. This was the first occasion in which this method was employed, and it was described in the 'Lancet' in January, 1876. The second case may be found described by Dr Mathewson in the 'Transactions of the Otological Society' of 1877, as having occurred in 1876. Since that time this plan has been pursued by others.

In my first case there had been a perforation of the membrane since four years of age, and the subject was then thirty. The canal was practically closed by one large bony growth, and thick purulent matter was exuding. There were pain, headache, constitutional disturbance, and giddiness. It was, therefore, evident that unless an escape for matter was speedily provided, meningitis or cerebral abscess was highly probable. The patient being under ether, with the help of Mr Edgelow, who provided the dental engine and drills, I succeeded in grinding away three fourths of the bony growth, and giving an exit for the discharge. After this all head symptoms were relieved.

Since that time an enlarged experience has suggested many changes and many points in this proceeding which deserve mention. In the earlier cases

a dental engine turned with the foot was employed, and the whole process was exceedingly tedious. It sometimes occupied as much as fifty minutes to grind away enough of the growth as was necessary to make a fair-sized canal. Part of the tedium was due to the fact that the use of the drills caused a constant oozing of blood, which from time to time had to be dried with absorbent cotton before it was possible to proceed. I now employ an engine turned by electricity, which admits of 3000 revolutions in a minute. It is found, however, better not to use such great velocity, as the heat thus produced in the drills is so great that it causes the drills to lose their temper and so destroy their cutting power. The best speed is from 2000 to 2500 per minute. With this the drills cut perfectly and with extraordinary rapidity. Another point is that there is scarcely any bleeding, often none at all, for the great heat produced causes the albumen in the blood to coagulate; so time is again saved. In fact, what used to occupy nearly an hour is often now done in ten minutes. To the spindle of an ordinary Catriss electro-motor is attached a long flexible arm, which ends in a hand-piece so arranged as to hold any drill required. The drills must be made very long in the shank, so that the hand does not get in the light; for in these operations it is necessary to employ reflected light. The patient is laid on a couch, so raised that the operator can sit down and use daylight reflected from a mirror worn on his forehead. If the daylight is not sufficiently good, electric light or gas must be substituted; but from whatever source

FIG. 14.—DRILLS AND BURRS (double natural size).



it is derived it is obvious that the patient's head must be turned from it. The largest speculum that the ear will hold should be used, so that as much space as possible may be gained.

In grinding these growths away I find it best to first drill a hole through them about the centre; then to use a larger drill to increase this opening, and finally a burr to grind from within outwards. It might be supposed that there was great danger of the drills slipping forward, and this would of course be disastrous; but it must be remembered that nothing but the most gentle pressure is necessary, and this will be at once clear to any one accustomed to use drills. In fact, the pressure is not at all so much (or ought not to be) that if the drill passes quite through the growth it would pass at all beyond. Again, if the pressure used at any time during the drilling is much, the drill gets clogged and ceases to cut. Of course, nothing but practice will teach this, but anyone who has had practice will understand at once that the risk of the drill slipping is an apparent and not a real risk. It has been suggested that a guard should be placed beyond the growth to avoid the danger referred to. In the first place, this is not necessary if the drill is used properly; and in the second, if there was room for a guard there would be no occasion to operate. The fact is that when an operation is necessary there is very often not sufficient space to pass an ordinary small probe. It must not be supposed that these growths are always drilled clean away. When a large part of them has

been destroyed, the great heat generated by the friction kills the remainder, and many weeks afterwards it comes away as a piece of necrosed bone. Until

FIG. 15.—LARGE SINGLE HYPEROSTOSIS (which came away six weeks after it had been hollowed out by drilling).

anyone has operated frequently in these cases I do not think he can possibly appreciate the extraordinary ivory-like hardness which the bone possesses. In order to recognise this completely it is only necessary to act with the drills (turned with the engine I describe) upon a piece of ordinary bone. It will then be seen how the drills tear through the bone on the slightest touch, in a very different way from what they do with the ivory growths.

As a rule the bases of these tumours are very broad, and hence the reason for acting in the way mentioned; but occasionally a solitary growth will be found to have a pedicle, and then this can be cut through with a drill, and the whole picked out with a hook. The greatest difficulty amongst many which this operation offers is when it happens that the external meatus is small, and will only admit a small-sized speculum. It must be confessed that this difficulty is a very serious one, as the space in which to work being so small, it is most embarrassing. This is much aggravated if the growth is deeper than usual in the canal.

It is under such circumstances that the question may arise as to the advisability of detaching the auricle from behind, and turning it forward before attempting to remove the tumour. This proceeding was successfully practised by Mr Sheild in a case related by him at the Medical Society, and in which he cut off a large bony tumour with a gouge. No doubt the auricle being out of the way brings the operator into closer quarters with the object to be removed, and I can imagine cases in which this may be as necessary as it was in his case.

In using the drills it is most necessary to avoid any wabbling motion, as this not only destroys the efficiency of the drill, but will tear the surrounding tissue. This is the reason why it is best to begin with a small drill, so that when a small opening is made the larger drill can be used without this movement taking place. So far as the employment of a gouge is concerned, it is no doubt possible to use it if the growth be solitary and have a pedicle, but there are other and many cases where it is not practicable—for example, if three growths with broad bases meet at their apices in the centre of the canal. When it becomes necessary to give to this condition an opening sufficient to allow the escape of discharge and the passage of sound, the method which I have adopted is to grind off the apices and so enlarge (as much as may be required) the channel with burrs.

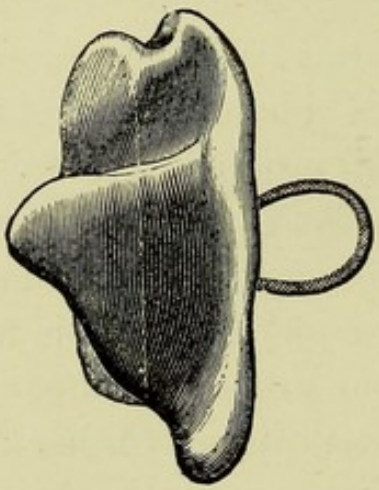
This, rather than the entire removal of the growths, is sufficient. It is not uncommon to find one large globular hyperostosis filling the canal. This, when

the middle ear is healthy, merely causes deafness. If such a closure is complete, it will be advisable to remove the tumour for a twofold reason: firstly, on account of the deafness; but secondly, because at some future time it might become an urgency if inflammation took place in the middle ear or anywhere behind the growth. It is also a much simpler matter to remove a bony growth when the surrounding parts are in a quiet and healthy state than when they are swollen. Indeed, in this case it is often impossible, as the meatus is so narrowed as not to admit a speculum. With the exception of the conditions already named as necessitating an operation, bony growths of even considerable size require no operative treatment; for in the large proportion of them there is not only plenty of room for the passage of sonorous vibrations, but also for the exit of discharge, so that they form an example where meddlesome surgery should be especially guarded against. Men are much more liable to bony growths in the ear than women. This is partly accounted for by the fact that men bathe and dive more than women; but this is not enough to explain the very great preponderance of male patients. Whenever any attempts have been made to excite the absorption of bony growths, the only effect, so far as my experience goes, has been to excite inflammation behind them and on their surface, and so render their removal an immediate necessity. Such treatment is about as intelligent as the ear drops which are sold at chemists', and which have much the same effect so far as harmfulness is concerned.

Before an operation is undertaken for the removal of bony growths it is important to explain to the patients that they should not expect immediate relief to hearing, inasmuch as there is a good deal of swelling afterwards, and during the separation of the dead bone a quantity of bone granulation, which for some weeks more or less blocks up the canal by its presence and its accompanying discharge. A little further use of the drill may occasionally be required.

The successful termination of these cases is gratifying when it is remembered that previously to 1875 they were unrelieved, and that in many cases the true condition was not made plain until it was revealed by a post-mortem examination, which succeeded to

FIG. 16.—PLUG TO PREVENT WATER GETTING INTO EAR (left side).



meningitis. It is most important to warn patients who are the subjects of bony enlargements in the external canal that they should not bathe; or if they do, that they should make use of some appliance that will absolutely prevent any water getting into the ear, as if it does it cannot get out, and is liable to set up

irritation behind the growths. In order to prevent water getting into the ear Mr Hawkesley has constructed for me a plug which may be made to accurately fit any ear, a wax impression having previously been taken of it.

When syphilis shows itself in the outer ear, it does so as condylomata in the meatus, or, more correctly speaking, mucous tubercles, or secondary eruptions on the auricle. These call for no especial treatment beyond what is necessary for similar conditions when they are met with in other parts. The manner in which syphilis affects the middle and internal ear will be considered by-and-by.

It may be mentioned incidentally that I have once seen in a girl a nævus in the outer part of the external auditory canal, and that this was accustomed to bleed profusely during the catamenial period. I destroyed it with an electric cautery.

The external ear is occasionally the seat of malignant disease. Sir W. Wilde mentions two fatal cases: one in a woman aged fifty, where death occurred three weeks after the appearance of the fungous growth; and another in a boy of seven, in whom the cancerous growth had affected the petrous and mastoid portions of the temporal bone. It would seem that generally when malignant disease is situate in the ear it commences in the mucous membrane lining the tympanum, so that this subject will be considered with diseases of the middle ear.

CHAPTER IV

To make a dissection of the tympanum it is well to use a temporal bone as soon as possible after its removal from the subject, as the muscles very soon get dry, and their action cannot be seen on dragging on them with forceps. The whole of the osseous part of the meatus should be chipped away with a pair of bone-cutters, the roof of the tympanum picked off with forceps, and the tympanic membrane carefully cut away from its attachments. In this way the cavity of the tympanum is well seen with its contents.

Looking from without, straight into the cavity, it will be seen that the chain of ossicles is not in the middle line of the tympanum, but is placed nearer to the roof. The first object on the inner wall that strikes the eye is the promontory, the shape of which is expressed by its name. It is a rounded prominence of bone corresponding to the first turn of the cochlea, and in the dry preparation is seen to be marked with grooves for the tympanic plexus of nerves; at its posterior part is a large hole, the fenestra rotunda, which opens into the cochlea, and is separated from this in the recent state by a membranous septum.

Above the promontory is seen the stapes, the stirrup-shaped bone, the base of which marks the position of the fenestra ovalis. The longest diameter of this fenestra is from before backwards, and it is, like the other, separated by membrane from the labyrinth. It opens into the vestibule.

The chain of ossicles and the fenestra ovalis, therefore, are situated above the promontory; and again above them is a ridge marking the position of the aqueduct of Fallopius, in which is contained the portio dura. Higher still is the roof of the tympanum; this is a very thin plate of bone (by the way, it is much thinner in some subjects than in others), which separates the cavity of the tympanum from that of the cranium. This relation it is of great importance to bear in mind, as will be seen in considering disease of the tympanum spreading to the brain. The relations to the tympanum of the lateral sinus, the jugular fossa, the carotid artery, and the mastoid cells should be noted. These cells communicate very freely with the cavity of the tympanum.

A little behind the stapes on the posterior wall is a nipple-like process, whose apex presents a foramen. This object is called the pyramid, and is the bony canal which protects the stapedius muscle. I call attention particularly to this muscle as it emerges from its canal, and the direction a force would take if acting in a line with the muscle which by its other extremity is attached to the head of the stapes. If two bristles are passed one on either side of the processus cochleariformis they will be observed to enter

at the anterior wall of the tympanum. The upper one indicates the position of the tensor tympani muscle, whose direction at first is right across the tympanum (both the tympanic muscles are thus protected by bone); the lower one is the Eustachian tube. The passages leading out of the tympanum are considerably above the floor of the cavity.

The processus gracilis of the malleus is fixed into the Glasserian fissure at the anterior part of the tympanum; the short process of the incus into the mastoid cells at the posterior part of the tympanum. A line drawn through the two will represent the axis around which the chain of bones rotate, so that any rotation from without inwards will press in the stapes and at the same time drag inwards the tympanic membrane; while any rotation in the reverse direction will drag on the stapes and press the tympanic membrane outwards. Rotation, however, in this latter direction as affected by muscular force, or, to speak correctly, muscular relaxation, is confined to simply a return of the tympanic membrane and ossicles to their original position, as will be evident if we consider the attachment of the muscles and their action. Rotation from without inwards is effected by contraction of the tensor tympani muscle, whose position as it enters the tympanum has been seen to be at first horizontally backwards. At the termination of the canal it takes a turn outwards, and sliding on the edge of the processus cochleariformis is inserted into the malleus at that point where the handle joins the neck of the bone. This point lies below the axis around which

the chain of bones rotates. From this it results that the mode of action of the muscle is as follows :

Upon its contraction the handle of the malleus is drawn inwards, and if motion in this direction could be continued, the extremity of the handle of the malleus would at last touch the promontory. The leverage obtained by the muscle in its action is, however, not very great, as the insertion of the muscle is so little below the axis or fulcrum. When the malleus is drawn inwards the tympanic membrane goes with it ; this movement at the same time rotates the incus, and thus the stapes will be pressed on to the fenestra ovalis. But as the movements of the stapes in this direction are necessarily of a very limited character, any contraction of the tensor tympani which continues after this required pressure is produced has the effect of rotating the malleus on the incus. This further action of the muscle (so to speak) continues to draw in the tympanic membrane, so that there is proportionately more movement admissible for the membrane than for the stapes.

It seems to be pretty generally agreed among physiologists that the stapedius muscle affects the voluntary act of listening. It appears to me probable that the contraction of the muscle produces a tilting movement of the stapes, with the result of pressing the posterior part of the bone into the fenestra ovalis, and lifting away the anterior part. If this be so, whatever pressure on the labyrinth may be taken away by the withdrawal of the anterior part is compensated for by the inward movement of the posterior

part. Thus, the effect of each contraction of the muscle cannot be to remove pressure from the fenestra ovalis any more than to induce it; at any rate, the movement of the stapes must of necessity induce a corresponding movement in the fluid contents of the labyrinth. May it not be possible that this general motion imparted to the fluid in the labyrinth should make the nerve more sensitive to sound? An ingenious suggestion was made to me by Mr Stewart, the curator of the Museum of the College of Surgeons, with regard to this question. He thinks it likely that the change in position of the base of the stapes, which follows contraction of the muscle, may cause the waves of sound to have an increased effect upon the anterior part of the labyrinth, in which the cochlea is placed. There are in works on physiology and anatomy many other explanations on this point, which at present does not seem to be settled among physiologists. Until muscular fibre has been demonstrated in the structure termed laxator tympani we may regard it as a ligament.

The bony portion of the Eustachian tube (about three quarters of an inch in length) will just admit a small probe. The cartilaginous part (about one inch long) increases in calibre until it reaches the pharynx; we can see this opening in a vertical section of the head (a moist preparation) on a level with and just behind the inferior meatus of the nose. The chief points to remember about this tube, which with the tympanum makes up the middle ear, are that the surfaces of the mucous membrane which lines it are in

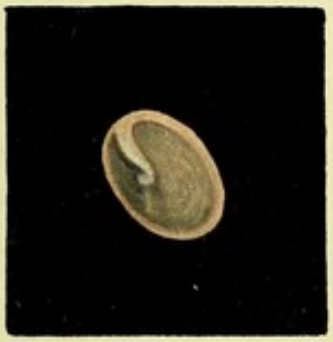
contact; that during respiration air passes into the tympanic cavity; that during the act of swallowing the sides of the faucial opening are drawn apart by the palate muscles; that its lining mucous membrane, beginning from the pharynx, gradually becomes more delicate, until, as it lines the tympanum, it is extremely fine in structure, is closely attached to the walls of this cavity, invests the ossicles, covers the fenestra rotunda, lines the mastoid cells, and forms the inner layer of the tympanic membrane.

The tympanic membrane has for an external layer a continuation of the skin which lines the meatus. Between these two comes the membrane proper, composed of outer radiating fibres derived from the periosteal lining of the external meatus, and inner circular fibres from the periosteum of the tympanum. The curvature of the membrane is not, strictly speaking, a concavity, but rather a tucking in; for the parts not dragged upon by the handle of the malleus show an inclination rather the other way.

Very soon after death the membrane loses its lustre, so that examinations conducted with a view of contrasting healthy with diseased appearances must be made on the living. As light is reflected down a speculum in the ear there is seen the tympanic membrane at the bottom of the auditory canal. It is translucent, lustrous, and of a bright slate colour. At the upper part is the short process of the malleus shining through and pressing on the membrane, and just above this process, that is, at the superior and anterior portion of the membrane, must be noticed a

small depression. This is termed the membrane of Schrapnell, and covers a small space which communicates more or less with the tympanic cavity. This small space and the membrane covering it have an especial importance, as will be seen in considering the results of inflammation of the tympanum. Passing down the middle from above is the handle of the malleus, terminating in what is called the umbo. From this downwards and forwards is seen what is spoken of as the bright spot. This appearance, observed on looking down a speculum with reflected light, is due, according to Politzer, to the inclination given to the membrane by the traction of the malleus; for the light, being cast upon the membrane, is for the most part reflected on to the lower part of the meatus, but on the spot signified is reflected directly to the eye of the observer. A wave of sound falling upon the tympanic membrane will set in motion the air within the tympanum, and these vibrations will affect the membrane of the fenestra rotunda. Furthermore, there are the vibrations which act upon the chain of ossicles. These bones are so arranged as to make their vibrations, as a whole, so much more effective than those of their particles, that these subsidiary vibrations may be put out of consideration. The fluid contents of the labyrinth being thus set in motion, the terminations of the auditory nerve are excited; in other words, hearing is effected. Whatever circumstances, therefore, interfere with the proper performance of the functions of this conducting apparatus (and in it must be included the Eus-

PLATE I.



Normal Tympanic Membrane. Left Ear.

West, Newman chromo.

tachian tube, whose office appears to be, by admitting air from the pharynx, to ensure the same pressure from air within the tympanum as from the air external to the membrane) will come under the head of diseases of the middle ear.

In commencing the subject of diseases of the middle ear, if it is borne in mind that this part of the ear, closed as it is at one end by the tympanic membrane, and opening at the other into the pharynx, is lined throughout by mucous membrane which is subject to the same affections in this situation as in any other part of the body (within certain limits), and that here the course of inflammation, the changes attending it, and its products, are no different than when the same morbid action takes place elsewhere, all the obscurity that generally surrounds these diseases will disappear.

To take an illustration of the simplest kind. The occurrence of an ordinary nasal catarrh, or a sore throat, will sometimes in its course involve the faucial opening of one of the Eustachian tubes. It has been seen how small the calibre of the tube soon becomes after it leaves the pharynx. A very moderate degree of swelling of the submucous areolar tissue and an increased secretion from the surface will, it can be easily understood, suffice to prevent the free passage of air from the pharynx into the tympanum. In such a case the air in the Eustachian tube and tympanum (not being replenished as usual by a constant supply passing in by the faucial opening of the tube) becomes subject to more or less absorption, the density of the

air within the tympanum is diminished, the pressure of air from without the tympanic membrane remaining the same, the inward curvature of the membrane is increased, the chain of ossicles is rotated somewhat inwards, thus increasing the pressure of the stapes on the fenestra ovalis, and sonorous vibrations impinging on the tympanic membrane do not produce the same effect on the labyrinth as heretofore. In other words, there is deafness from obstruction of the Eustachian tube. If the balance of air is restored by suitable means, the normal hearing power instantly returns, and, supposing the inflammation to subside, the patient gets well. To take another illustration of a more severe kind. Suppose inflammatory action in the cavity of the tympanum to have proceeded to the formation of pus. If the purulent matter cannot find an exit through the Eustachian tube into the pharynx (at this time the lining membrane of the tympanum is so swelled that the opening of this tube into the tympanum is closed) it will make for itself an escape by a process of ulceration through the tympanic membrane, and there will be more or less disorganisation of the tympanum, according to the length and severity of the attack, before the matter has found its way out. A series of gradations between these two extremes will give a very fair representation of diseases of the middle ear, each form possessing some characteristics of its own and varying in the effects which it leaves behind. In short, it may be said to include all diseases of the middle ear which are of inflammatory origin, but it will not include

the chronic proliferous catarrh, which will be mentioned later on.

The term catarrh is used in speaking of affections of the middle ear—non-purulent or purulent as the increased secretion has retained its mucous character or become pus. More frequently than not, catarrh of either kind begins at the faucial end of the Eustachian tube, and very often only a short part of the tube is involved. A chronic affection of this portion of the middle ear may remain for months without proceeding any further, in precisely the same way that a bronchitis will at one time be confined to the larger divisions of the bronchi; and as sometimes in a few hours the inflammation may spread to the capillary divisions of the bronchial tubes, and be attended with purulent expectoration, so may pus be secreted from the lining membrane of the tympanum in a few hours, when (as in scarlet fever) inflammation has spread from the throat up the Eustachian tube. Other affections of the middle ear commence in, and are confined throughout their course to the cavity of the tympanum.

The illustration I have just made use of, where an adult becomes deaf during a cold, is an example of non-purulent catarrh being confined to the faucial opening of the Eustachian tube, and sometimes the subjects of this will get well in two or three days without any treatment. The return to good hearing is, in such a case, generally sudden and attended with a click in the ears, the explanation of which is that as the sides of the tube, which were in apposition, become separated, the air rushes into the tympanum,

and the membrane, which was before drawn in on account of the unequal pressure of the air from without, resumes its natural curvature as soon as the balance of air on either side is restored. This is the mechanical change which we attempt to bring about and endeavour to render permanent in all treatment of impaired hearing arising from such causes.

The means which we have at our command to mechanically overcome obstructions in the course of the Eustachian tube are in chief part two: viz. Politzer's method, and the catheter. The first of these two was introduced some years ago by Dr Adam Politzer, of Vienna. In consists in passing a stream of air through the inferior meatus of the nose during the act of swallowing (at this moment the opposed sides of the faucial orifice are drawn apart by the palate muscles), when the air will rush up the tubes into the tympana, and is described by Dr Politzer as follows:—"The patient, being seated, takes some water into his mouth, to be swallowed at a given signal. The surgeon, placing himself conveniently to the right of the patient, grasps with his right hand an india-rubber bag, about as large as the two fists, and introduces the nozzle of a somewhat curved, hard, india-rubber tube, movably connected with it, about half an inch into the nostril, so that its concavity is in contact with the floor of the nares. The signal to swallow is now given; both alæ are at the same time closed air-tight over the instrument with the thumb and forefinger of the left hand, and, by a forcible

pressure of the right hand, the air is driven out of the bag into the now shut nasal cavity."

FIG. 17.—POLITZER'S METHOD OF INFLATING THE TYMPANA.

This proceeding is perfectly devoid of pain for the patient; it is of course not agreeable, neither is it very disagreeable, and it is beyond everything simple. The tube is passed about one inch into the left nostril of the patient, the forefinger of the left

hand compresses the right nostril, the thumb completing the closure of the left nostril. Having done this, the patient is quite conscious from the feeling in his ears that the inflation was a successful one. With a patient who is having this done for the first time the operator might perhaps have failed at the first attempt; the patient might not have swallowed immediately he was told to do so; just as the bag was compressed he might have closed his mouth; the surgeon might not have completely closed the left nostril with his thumb, or perhaps, by including the tube in his thumb, have closed it. A little practice will soon overcome these very small difficulties. Although it is not, as I said, at all a painful affair, it is sometimes on the first occasion a little startling to the patient, especially if he is at all nervous; and as a perfect unison of action must exist between him and the operator, to ensure this I find it useful to let a new patient take a little water in the mouth, telling him to firmly shut it, and let him swallow at the given signal two or three times before the bag is used, taking care also to warn him of what is to be done with the bag, and at the same time assuring him that he will not be hurt. Little precautions of this kind just make the difference between a successful and an unsuccessful interview with a patient.

This applies with especial force in the case of young children. A large proportion of those who require this method of inflating the tympana are very young children, and if anyone frightens the child on its first

visit he will never afterwards succeed in persuading it to do what is wanted, viz. to swallow the water when it is told and keep its mouth shut. These little patients often require a great deal of coaxing, and if they are well managed on the first visit, they give no trouble afterwards. Children of four and five years of age come to me constantly and have the tympana inflated in this way without making any fuss about it.

In the place of the bag I very often with children use an india-rubber tube fitted with a mouth-piece at one end and a hard nozzle at the other, and blow through the tube as they swallow. The mode of action is of course the same, and the tube is less alarming to them than the bag. A diplomatic measure, by which the desired end is attained without any sacrifice of principle.

Politzer's method is now in constant use both for purposes of diagnosis and treatment. When it is being employed, what is somewhat wordily called by some authors an "otoscope" should be used with it. A more correct expression would be a diagnostic tube. The best kind is a simple piece of india-rubber tubing, about three feet long, one end resting in the external auditory meatus of the patient, and the other in that of the surgeon. By the help of this, the air, as it rushes into the tympana, can be heard by the surgeon to impinge on the tympanic membrane. To be able to recognise this sound some little practice is necessary; and it is also advisable that a bag be used which makes as little noise as possible when it is compressed. For this reason it is much better to

have the valve placed at the lower part of the bag than the upper.

If the surgeon fail to catch the sound, the question as to whether the air entered the tympana, or did not, is readily decided by the patient, who can distinctly feel the air to pass into the ears. An inspection of the membrane will also be a guide in this direction, for it will have resumed its normal curvature as the inflation took place.

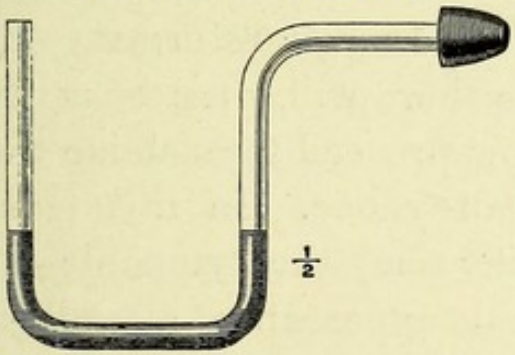
Until Politzer introduced this method, the Eustachian catheter (the uses of which I shall shortly consider) was the only available instrument for overcoming Eustachian obstruction. Its place has, therefore, been to some extent supplied, and it is not necessary to use it so frequently as it was some years ago.

When an Eustachian tube is pervious, as in health, if the patient blow into the tympana with his mouth and nose firmly closed, the air can be heard through the otoscope by the surgeon to fall upon the membrane with a "thud." This is spoken of as Valsalva's method of inflating the tympana, and is useful in estimating the extent of permeability or the reverse of the Eustachian tubes. It is especially valuable where a difference exists on the two sides; and if the difference amounts to perfect closure of one with normal patency of the other, it furnishes an unmistakable diagnostic sign. It is also useful in the evidence which it affords of secretion in abnormal quantity in the cavity of the tympanum, as shown by the sounds heard through the diagnostic tube, and the appearances

observable whilst inspecting the tympanic membrane as it is being done.

Some patients will succeed by this method in forcing air into the tympana on the first attempt, while others will try again and again, and fail each time. It is a good plan to explain to such patients that they are to blow through the nose when the mouth is closed, and while doing this let them hold their nose firmly between the fingers; they can hardly make any mistake about it then, and will feel the air rushing into the tympana. That at this moment the air not only enters the tympana, but that it is accompanied by an outward movement of the membrane, can be demonstrated by a very simple experiment suggested originally by Politzer. A piece of glass tubing curved in the shape of a horseshoe, and open at both ends, has fitted to one end an india-rubber nozzle. Some coloured solution is poured into the tube. The nozzle is fixed into the external auditory meatus, which it fits

FIG. 18.—MANOMETER.



air-tight. As the Valsalvan method is practised the fluid is seen to rise in the distant arm of the tube, and, upon the patient swallowing, to fall to the original

level. The movement of fluid is obviously due to the condensation of air between the tympanic membrane and fluid in the near arm, this being brought about by the outward movement of the membrane. This instrument is not of much practical use, as the diagnostic tube will demonstrate a pervious state of the Eustachian tube or the reverse.

Obstruction of the Eustachian tube due to catarrh of its lining membrane is a very common affection at almost all ages, but especially with children. As the affection in their case is, however, in several respects of a different character to what it is when adults are the subject of it, I will first consider the condition as met with in the latter class. With grown-up persons it is more usual to find one tube at a time affected.

The story which a man or woman who applies for relief will tell, is that at some prior date, a few weeks or months perhaps, they rapidly became deaf in one ear. By rapidly I mean, in the course of two or three days; that soon after this, occasionally, they heard a little better for a few hours, but that these intervals of better hearing have never returned. If the deafness is very extreme there will often be a little tinnitus as well. If we now proceed to examine the ears we first look at the healthy one. In this (I am presuming it to be a healthy one) the tympanic membrane will have the normal appearance already attempted by me to be described. On looking at the other ear the difference between this tympanic membrane and the other will be very marked. The healthy one looked, as indeed it is, stretched across the opening

of a cavity, but this will almost convey the idea of being stretched over objects behind it, and, in some places, in apposition to them. The outline of the malleus will be unusually distinct; very often a small artery injected with blood, and coursing from above downwards, will be visible. The short process will appear to be almost bursting through the membrane. From this point in the posterior section of the membrane will be noticed a distinct ridge separating the superior and inferior division of this half into two folds. I can compare this appearance to nothing better than if a sail of a boat (the foresail for example) was supported on its leeward side by a spar, one end of which was fixed against it about its middle. The puckering produced by this object would represent in a rough manner the puckering of the membrane.

The handle of the malleus is tilted backwards. These changes in the appearances of the tympanic membrane are spoken of as an increase of the inward curvature, and I have chosen a very severe case of obstruction of the tube to illustrate the alterations that are distinctive of the affection under consideration.

There will, however, be a very large number of cases in which these alterations in curvature are not nearly so well marked, and yet in which the hearing is considerably impaired; but with a membrane that was healthy before the catarrh of the Eustachian tube set in, there are in a greater or less degree these changes to be observed. Very slight alterations in curvature are extremely difficult to recognise, and this is because

the curvature of the membrane in healthy subjects varies to a certain extent.

If we now make use of Politzer's method of inflation, and succeed in passing a stream of air into both tympana, the patient will scarcely feel anything in the healthy ear, but there will be a very perceptible sensation and noise in the affected side, and the hearing will be in a great measure (sometimes completely) suddenly restored. The change which has taken place in the middle ear will be now quite evident upon inspection of the membrane. It will have been blown out to its proper state of tension, the folds will be gone, and it will have returned to its original plane. Before the inflation was practised, as may be supposed from the condition I have been describing, there will be undue pressure of the stapes on the fenestra ovalis; and this will sometimes induce tinnitus, which is, however, not generally of a very severe character, and by no means a constant accompaniment. When it is present, it disappears, like the deafness, simultaneously with the inflation of the tympana.

The patient then has experienced a sudden and great relief, and the questions arise, will this be permanent? and if not, what are the best means to make it so?

It is a most exceptional circumstance to find that the single inflation has been all that is necessary to permanently relieve the patient. I have not seen very many cases where the obstruction has lasted over a week in which it has not been necessary to repeat the air douche.

With healthy adults, if Eustachian obstruction occurs in the manner related, and persists after the nasal catarrh has got well, no other treatment beyond inflation of the tympana is necessary. The frequency with which it should be practised, and the length of time necessary to continue the treatment, will of course vary according to the severity of the case. The best guide in the matter will be the length of periods that the improvement in hearing remains after each occasion. This will sometimes only last a few hours (perhaps the morning following the inflation the patient will be as deaf as ever), and the case will then give some trouble. The good hearing may, however, remain for two or three days; and these patients will only require the air douche a few times.

This at least is the general progress of such cases, but of course no rule can be laid down, and every now and then a patient will be under treatment for many weeks, requiring not only constitutional treatment, but local treatment to the posterior nares and pharynx.

The portion of the tube first affected was, as we saw, the faucial opening, and in some instances the whole throat, including this part, will remain for a long time in the condition we are accustomed to speak of as relaxed. In such instances very great benefit often follows the use of astringent local applications to the throat, and in applying them the object should be to touch freely the orifice of the Eustachian tube. To accomplish this it is convenient to use a brush with a handle curved at right angles, the same kind indeed

as is used when the larynx is to be touched. Chloride of zinc ʒss to ʒj, or the salt perchloride of iron, ʒj to ʒj of water, are what I generally recommend. I dare say any powerful astringent would do equally well, but these are what I have found useful. In this class of cases it is almost needless to say that the throat should be always inspected. To gain facility in the examination of the posterior nares requires considerable practice, and it is certainly not so easy to see this part as it is to see the larynx. If the pharynx is of a good depth, measuring from before backwards, the orifice of the Eustachian tube is far more readily seen than if it is less capacious. If the pharynx is very short from before backwards it is extremely difficult to see the opening of the Eustachian tube; at least I find it so much so that in such cases I very often cannot manage to get a view of it at all. An enlarged tonsil will be in the way for this kind of examination. I advise those who wish to learn how to use this instrument to begin upon a trained patient; by this I mean one who has very often been examined before, for his pharynx will tolerate manipulation far better than a new case will be able to do.

The base of the tongue should be well depressed by the forefinger of the left hand. The mirror should face upwards and be placed between the tonsil and uvula, as low down as possible, and nearly, but not quite, touching the back of the pharynx. If it actually touch the pharynx the patient will retch. Let the mirror now be turned the least bit outwards, and the

reflection of the orifice of the Eustachian tube will be seen at the top of the mirror. This opening is triangular, the edges are well defined, and even in health there is very often a piece of mucus just at the orifice. If this part is relaxed the lips of the opening look raised and pouting.

A most useful adjunct to the occasional or regular use of Politzer's method of inflation will be found in the application of alkaline solutions through the nostrils. The most convenient method for patients to adopt is to simply make use of a small india-rubber syringe, the nozzle of which, about an inch and a half in length, is protected by a piece of india-rubber tubing. The nozzle of the syringe should be placed in the inferior meatus of the nose, and the fluid be very gently injected through to the posterior nares; some of this will pass out again through the opposite nostril, while some will enter the mouth, and should be spat out; the patient's head being bent somewhat forward and downwards. This is a better plan than one sometimes followed, viz. the use of the nasal douche, and for the very good reason that this is not altogether free from risk. In its application some of the fluid is apt to pass up into one of the tympana, and then inflammation may be excited in this cavity and the tympanic membrane may give way as a consequence. I have not infrequently been consulted by patients with whom this accident has occurred.

Whilst alluding to the local management of these cases, it must not be forgotten that what is of equal or

often of more importance is constitutional treatment directed to the state of health which has made the subject prone to the throat and ear trouble. Thus many persons who are affected in the way described will be found to be free livers who take no exercise. Purgatives should be given and the diet restricted, especially in regard to stimulants. Nothing tends to prolong the chronic condition of the mucous membrane so much as the free use of wine or, still worse, the taking of spirits. The action of the skin by plenty of exercise or even by Turkish baths has a most useful influence. In short, such general principles as would be dictated by an intelligent doctor must be enforced when the habits of the patient demand it, for unless the specialist adds this to his local treatment he ceases to be useful.

In estimating the variations in hearing power, the ticking of a watch, as being convenient and always at hand, is generally the sound employed. The facility with which this is heard, however, gives no proximate measure of the extent of deafness.

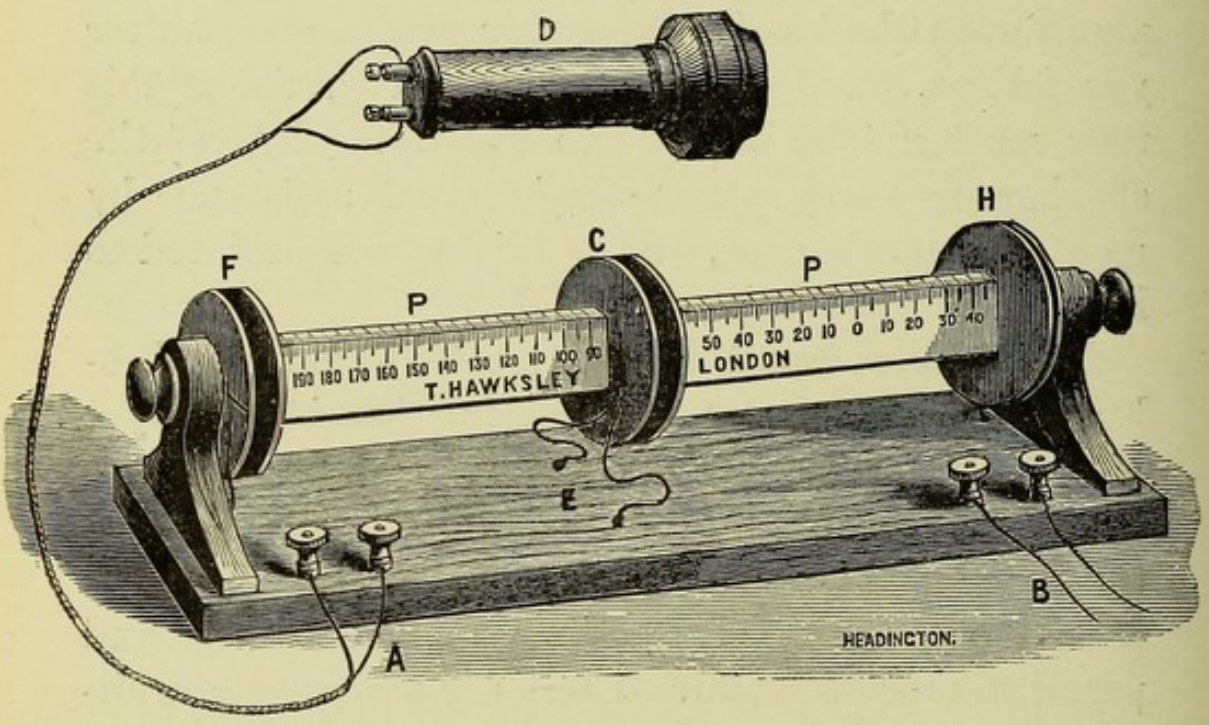
Persons will be found who, though unable to hear a loudly ticking watch more than a few inches from the ear, are not perceptibly deaf to conversation; and again, a person whose hearing is very considerably impaired for general sounds will sometimes be able to hear a watch at many feet from the ear. It is, therefore, only useful in estimating changes in degrees of hearing in a patient under treatment who is seen from time to time. Even then a more correct guide is the patient's own estimation of voices and

sounds which he is in the habit of hearing. With young children it is not easy to find out whether the hearing improves, or the reverse, and the most reliable proof of either is the manner in which they reply to questions which are put to them when their heads are averted, and they are not therefore expecting the trial. Both with children and adults it is a good plan to test the hearing by making them repeat after you letters, numbers, or words, and in doing this they must not be allowed to watch the lips of the speaker, as many persons gain great assistance by reading from the lips, and so might be considered to hear better than they really did.

It is, indeed, much to be regretted that no absolutely complete test for measuring hearing has yet been discovered. By a complete test I mean one that would include the whole range of hearing from the lower to the upper limits. This arises principally from the difficulty of deciding upon a reliable and practical unit of sound. There are many tests available for the middle and upper ranges of audition, but really none for the lower. Besides the imperfections I have referred to in testing hearing by the watch, the statements of children and nervous persons cannot be relied upon. It is, therefore, convenient when this test is used to employ a stop watch, and it should at first be placed beyond the distance at which it can be heard and then advanced towards the ear. If it is first heard and then drawn away, the patients, especially nervous persons or children, will fancy they hear it when they do not really do so.

In order to accurately measure and register variations in hearing with patients who are under treatment, or who only present themselves at intervals of months or years, the most perfect instrument that up to the present has been devised is Hughes's sonometer.

Fig. 19.



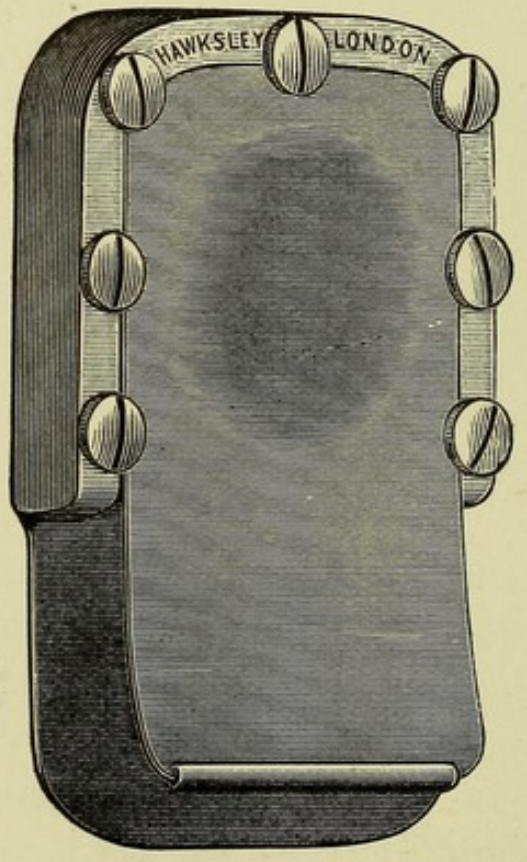
Hughes's Sonometer is a form of electrical balance in which the telephone is used to indicate to the ear when the electrical system is in equilibrium. Fig. 19 shows the more important parts of the apparatus. A rectangular bar or scale P P about twenty-five cc. in length is divided into centimetres and millimetres, the zero or notation point being near to one end. The divisions on the scale represent nothing more than convenient indications of the varying positions of the reel C in relation to the zero of the scale. F, C, and H are reels of the same diameter, and are wound with insulated copper wire, F and C with an equal length, but H with a much less quantity. The ends of the wire on the moveable coil C pass through the base of the instrument at E to the terminals at A, thence to the telephone D, so that the electrical effect heard in D is the induced current formed in C

from the coils F and H which may be regarded as primary coils. These coils are in connection with each other and the terminals at B, and from thence to a battery consisting of two Leclauche cells. In this circuit is introduced a microphone, which may consist of any means whereby the current from the cells is rapidly interrupted, and for this purpose a compact piece of mechanism is usually employed which includes a rotating interrupter, and it is the breaks in the current produced by this means that are heard in the telephone. The primary coils F and H containing unequal lengths of wire present fields of different electrical intensity when the current from the battery is passing through them, but there is a position between them where these effects are equal or neutral, and it is this point which determines the zero or point of silence on the scale, so that if the coil C is placed at zero and the ear be applied to the telephone no sound will be heard, as the electrical effects of the two coils F and H are equally balanced, and there is no induction in C; but on sliding C towards F this balance is destroyed, and the interruptions of the microphone begin to be heard in the telephone in proportion to the acuteness of the hearing power of the listener. To use this apparatus, after starting the microphone and putting the battery in circuit, place the telephone to the patient's ear, and put the coil just for a second near to F; by this means the patient will have the key of the sound he must listen for. Remove the telephone, place the coil C at zero, turn the patient with his back to the instrument and begin to slide the coil C towards F, asking for the first and faintest indications of the sound they have already heard. Having read off the distance in millimetres from the zero, replace the coil and begin testing the other ear.

It sometimes becomes desirable in cases where loss of hearing depends on changes within the nervous structure of the ear or within the cranium to determine whether the high notes are lost. They are generally lost in advancing years, and, indeed, few persons after middle life possess the hearing power for extremely high notes. For this purpose the best test that can be employed is—

Galton's Whistle.—This invention is intended for measuring the upper limits of audition in man and animals. It consists of a silver tube about 2 cm. long with a bore 1 mm. in diameter, sliding in which is a metal piston similar to a Wollaston's tube. The whistle is formed by a V-shaped opening at the upper end of the tube, and the piston when home is level with one side of the opening. Opposite to the piston is the aperture where the air enters, and this communicates with a rubber tube held in the mouth. On gently urging air into the whistle, and gradually withdrawing the piston, the first note will be heard; and the pitch of the note may be calculated from the depth of the tube formed by the end of the piston and the aperture of the whistle; this will give the number of vibrations per second. The test should be made from inaudibility to audibility. A millimetre scale applied to an adjustment outside the whistle gives the depth of the

FIG. 20.—DISTINETTE.



air cavity. Mr. Galton, in some recent researches, used pure hydrogen instead of air for these whistles. This gas raises the pitch of a given

cavity about four times higher than air, so that sounds may be produced of a vibration period of 300,000 or more per second.

It was for a long time difficult to find a sound producer sufficiently powerful to test the hearing of children supposed to be absolutely devoid of hearing.

The most convenient instrument for this purpose is one which I have employed for several years. It is a *Distinette.* This originally was a small instrument brought out by the Distin family to take the place of castanets at their concerts. The powerful instrument now used is a horseshoe-shaped steel bar, about ¼ in. thick. One side of this is enclosed or covered in by a stout steel plate; to the other side is attached a hardened steel plate, made slightly hollow. Its free edge is smoothed and rounded. On pressing this edge the plate is bent, and the concavity of the plate which is uppermost is suddenly transformed into a convexity, accompanied by a loud decisive snap or report. On releasing the end of the plate the shape of the plate is again reversed, and produces a similar detonating sound. The pitch of the note may be varied considerably by introducing a fluid between the plates. The instrument is readily held or concealed in the hand, a very slight motion of the thumb being all that is required to produce the effects described. (See Fig. 20.)

CHAPTER V

Inasmuch as a very large number of the conditions which affect the middle ear and are included under the general term catarrh are the direct consequence of a morbid state of the throat and nose, or, to speak more accurately, of the pharynx and naso-pharynx, it is important for the clear understanding of diseases of the ear to properly estimate and recognise these conditions. Moreover, diseases in this situation not only precede ear affections, but are very frequently co-existent with them during their entire course, sometimes extending over a period of many years. Before we attempt to acquaint ourselves with the chronic morbid states of the throat and nose, consider for a moment what are the circumstances under which the acute forms most usually come under the notice of medical men. Putting on one side for the moment syphilis, there remains inflammation as it appears associated with all the fevers, including diphtheria and whooping-cough. Thus we find that the seeds of most diseases of the throat and nose, except polypus, are generally laid in childhood, when the subjects of these troubles have suffered in early life from the exanthematous fevers to which they are so much exposed. In scarlet fever, measles, chicken-

pox, smallpox, diphtheria, and the like, that considerable area of mucous membrane which covers the pharynx and nasal passages is throughout affected, so that, as might be expected, long after these maladies have been recovered from, a greater or lesser part of this area is found to have undergone change. There is little doubt that if, during the acute stages of these fevers, more attention were paid to the local state of the nose, so many cases of troublesome chronic affections would not be seen. Very naturally at such times the more serious condition of the patient absorbs and demands all the care which can be given, and even during convalescence the state of the nostrils, although there is often a muco-purulent discharge from them, is not so strictly watched and treated as it might be. Hence, therefore, the great prevalence of chronic catarrh of the pharynx and nares, which, beginning at the time of the acute febrile state, remains for years, or even during the remainder of a life. Hence also the various conditions which lead to what is popularly called throat deafness, a safe and useful term to apply to a disorder if the cause and precise nature of it are imperfectly understood.

In examining a case of chronic catarrh of the middle ear, either with or without obstruction of the Eustachian tubes, we constantly see, on looking at the throat, thick tenacious mucus adhering to the upper part of the pharynx, and with this what is termed a granular pharynx—that is, the back of the pharynx is seen to be studded with separate granular bodies, which in severe forms of this state are so numerous

that two or three run into one. This appearance is due, according to Politzer and others, to swelling of the follicles in the submucous connective tissue. The morbid state often involves the posterior nares, the upper and back wall of the pharynx, and, by extension to the opening of the Eustachian tubes, causes obstruction to the passage of air to the tympanum. In this region—viz. in the upper and back wall of the pharynx—is found the adenoid tissue which was first described by His, and excessive development of this tissue takes the form of what are spoken of as adenoid vegetations or growths. To Meyer, of Copenhagen, in 1868, we are indebted for the first complete notice of this disease, which it is now generally admitted is the very frequent cause of imperfect nasal breathing, as well as obstruction of the Eustachian tubes. But even previously to this, isolated cases had been observed by Voltolini and Lowenberg. In regard to this matter I shall have something to say presently. Granular pharynx must not be confused with a condition which is found in persons who have been subjected to unhealthy and debilitating conditions, such as long hours of confinement in an unhealthy atmosphere, engaged in assiduous employment, and living under generally depressing influences; I mean an appearance of yellowish spots on the tonsils and pharynx. From these spots, if they are pressed, a sort of cheesy secretion may be forced out. In this state it is enough to say that a complete change, which embraces plenty of exercise in fresh good air, either at sea or in the country, will do more in a short time

than any sort of medicine or local treatment that can be prescribed. When the middle ear becomes involved in this condition of the throat, the catarrh is acute and the tympanic membrane is sometimes ruptured. Some of the most pronounced cases of true granular pharynx which have been associated with obstruction of the Eustachian tubes have occurred in my practice to those who pursue their calling in all atmospheres out of doors—dusty, cold, and damp; to auctioneers and betting men, the latter shouting for many hours daily, and relieving the intervals by the free use of alcoholic drinks.

It need be no matter of wonder that some alteration in tissue should follow such undue strains and undue exposure of a mucous surface—a very reasonable penalty for exceeding the intentions of nature. In regard to the treatment of this condition, attention to the general principles of health, including the giving up of stimulants, should precede everything. This having been effected, great benefit will follow the daily use of astringent applications. Amongst these may be reckoned the painting with a throat brush the whole of the pharynx with a saturated watery solution of perchloride of iron. This can be readily done by the patient if he stands in front of a mirror, or by an attendant. In very severe cases the granulations will require to be destroyed by caustic. As, however, the posterior nares share the general condition, the patient must use twice daily an alkaline solution through the nostrils with a small nasal syringe. As I have often said before (in various contributions to this subject),

this is to be preferred to the nasal douche, for there is no danger, as there is with the douche, of the fluid from the syringe rushing into the tympana, and exciting inflammation. As to the kind of solution, I have not as yet found anything better than the mixture of soda, borax, and chlorate of potash and sugar, which I introduced into our hospital pharmacopœia in 1873. By this treatment the mucus is expelled through the nostrils, and the patients are relieved from the unpleasant efforts to clear the throat, and the nasal breathing is re-established. Until this is done it is quite hopeless to expect that any local application can be of permanent service to the throat, as the external air, unless it is purified and warmed by passing through the nose, is one of the principal agents in keeping up this disorder. Adenoid growths in the naso-pharynx require a few words.

The paper on this matter by Meyer, already referred to, caused these growths to be very generally sought for whenever there was obstruction of nasal breathing associated with obstruction of the Eustachian tubes. Since that time the literature of the subject has been profuse, and the methods recommended of dealing with the growths have been as various as their somewhat hidden position might lead one to anticipate; but nothing material has been added to our knowledge of the subject, so far as the pathology is concerned, beyond what may be found in Dr Meyer's paper in the fifty-third volume of the 'Medico-Chirurgical Transactions.' This contains a most graphic and exhaustive account of the disease,

and it is not too much to say that its accuracy has been completely corroborated by all who have paid attention to this matter. The aspect of a child or young person who is deaf from obstruction of the Eustachian tubes, and unable to breathe through the nostrils, is very characteristic; the open mouth, the odd thick voice, the stupid look, and the fact of the patient's snoring when asleep, bespeak the condition; when this aspect is present, and when the tonsils are not found so very much enlarged, adenoid growths may be suspected, and should be sought for. It should, however, be observed that the two causes very often are found to exist together, so that it is quite possible to remove the tonsils and find the nasal obstruction still present. The search for these growths may be conducted in two ways: either by rhinoscopy or by examination with the finger.

Of the value of the first method and of its difficulties it is sufficient here to observe that in a large number of patients it is not only very difficult, but practically impossible, to obtain a reflection of the posterior nares. This applies especially to young children and to grown-up people in whom the pharynx is shallow. With these latter subjects there is not sufficient space between the soft palate and back wall of the pharynx to place the small laryngoscopic mirror without touching the pharynx and exciting retching. Under any circumstances it requires a good deal of practice to obtain a view. With a deep hollowed pharynx, in the manner which I have previously described, these growths may be partially brought into view.

I mention this proceeding, but in truth in ordinary practice there is not the slightest necessity to employ it. The subjects who have to be examined are children, and if this method could be readily used it would give most fragmentary and imperfect information of the condition of the pharynx. There is a far more easy method of finding these growths, and it may be added a far more surgical and complete way of examining the pharynx; one, also, that is open to every surgeon. If the patient is seated in a chair, and the mouth propped open with a Smith's gag, the forefinger of the right hand may easily be introduced behind the soft palate in an upward direction; the left hand should be placed on the occiput to support the patient's head. Adenoid growths may be readily recognised in this very simple manner by the fact that the pharynx is partially occupied by them, and by the sensation which they convey to the finger. It is as if the finger touched tissue like an enlarged tonsil. They also bleed when touched. In this way the whole cavity of the pharynx is examined; the amount of growth, its position, its consistence, and, in short, all about it can be perfectly estimated. Sometimes the growths, are so abundant as to completely fill the pharynx. At others the enlargement is confined to the upper and posterior part of the pharynx.

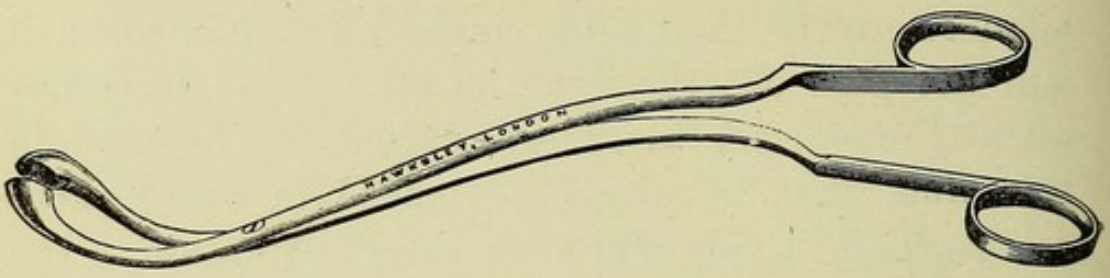
How completely the posterior nares are at times closed with growth can be felt when the finger can hardly be passed into the pharynx after it has gone beyond the soft palate in an upward direction. There is one other symptom of the presence of adenoid

vegetations in the vault of the pharynx, and it is one which is most distinctive of this condition. If fluid be syringed into the nostril in the inferior meatus it will either pass into the throat or come out by the other nostril. But when there is any great extent of adenoid growth, the fluid syringed through one nostril will not pass out through the other. As it is frequently necessary to order solutions to be used in this way, the difficulty experienced in using these solutions effectively will often direct attention to the presence of the adenoid growths. Indeed, where this difficulty is encountered the existence of these vegetations may be considered almost certain. It is still more so if the pinched appearance of the nose, which Dr Meyer speaks of, is present. Whilst making an examination, if the growths are small, they may be scraped off the upper wall of the pharynx by the finger-nail and spat out, and this is all that is often necessary; indeed, it has been said by some that they never fail to completely remove them in this way. For my own part I cannot understand this, for they are often in such quantity and size as to fill the vault of the pharynx, and of very tough consistence.

Up to quite a recent date a variety of methods were employed in the removal of adenoid growths, and amongst the most useful were the forceps invented by Löwenberg. In the use of them, or indeed of any forceps, it is necessary to have many sittings, which are tedious, rather painful, and in the case of young children most undesirable.

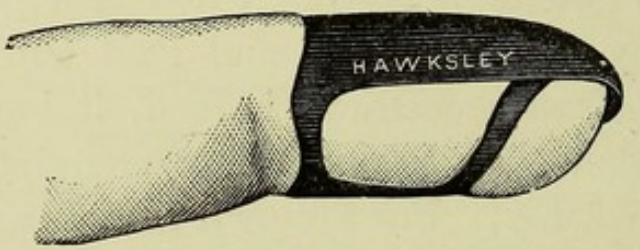
Löwenberg's forceps are very easily introduced behind the soft palate, and most patients will submit to their use without an anæsthetic: the handle is

Fig. 21.—Lowenberg's Forceps.



then depressed, and the growth plucked out piecemeal. For many years past I have adopted the plan of clearing the whole pharynx at once by means of a steel instrument fitting the top of the forefinger, and

Fig. 22.—Steel Nail for removing Adenoid Growths.



advancing just beyond the finger-nail, and closely resembling it in shape—in short, an artificial steel nail. The patient is placed under ether; when completely under its influence is bent forward at such an angle that all the blood flows out through the nostril. It is most important to maintain this position, as the bleeding is considerable. Now in this operation, which I have performed some hundreds of times, not the least quantity of blood has ever been inhaled,

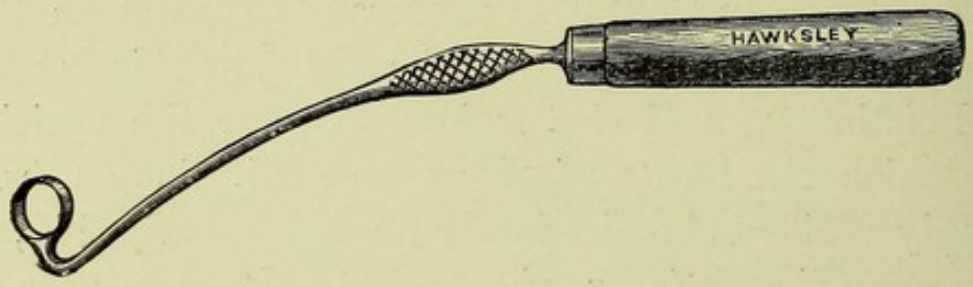
and, with the position I name, it never can pass into the larynx, but it must be obvious to anyone how dangerous it would be without this precaution. Other operators have adopted another position, viz. letting the head of the patient hang over the table on which he lies on his back. This position equally makes matters safe. In any other position than these there must be a risk of blood being inhaled by a sudden inspiration, and the patient then would be instantly suffocated. Indeed, it is necessary to insist on this point, as events have proved the reality of this danger.

It is but natural that I should prefer the position in which the patient is bent forward, since I have amply verified the absolutely perfect safety of it; at the same time it is but right to add that I can see no risk if the head is hung over the table. Without any question whatever, to attempt to remove adenoid growths from the pharynx from a patient lying on the back, with the head level or supported by a pillow, and under an anæsthetic, there must be, and is, a great risk.

Besides the steel nail there are several instruments that find favour with others, but all have the same object in view, viz. to completely empty the pharynx of the obstructing growths. The best of these I have found to be a curved ring knife which was made for me by Mr Hawksley. With this knife (see Fig. 23), the ring being passed up into the pharynx and behind the soft palate, the growth can be by a sweeping movement cut away. Not only very great, but almost immediate, relief to nasal obstruction follows the removal

of these growths, as well as improvement in hearing. It is advisable to continue the use of alkaline solutions through the nostrils for a time after an operation. It is satisfactory to notice that when once removed the growths do not return. Their structure is simply adenoid tissue, and is seen in the section kindly made and drawn by Dr Whipham of one large piece out of several which I removed (see Fig. 24).

Fig. 23.—Ring Knife for removing Adenoid Growths.



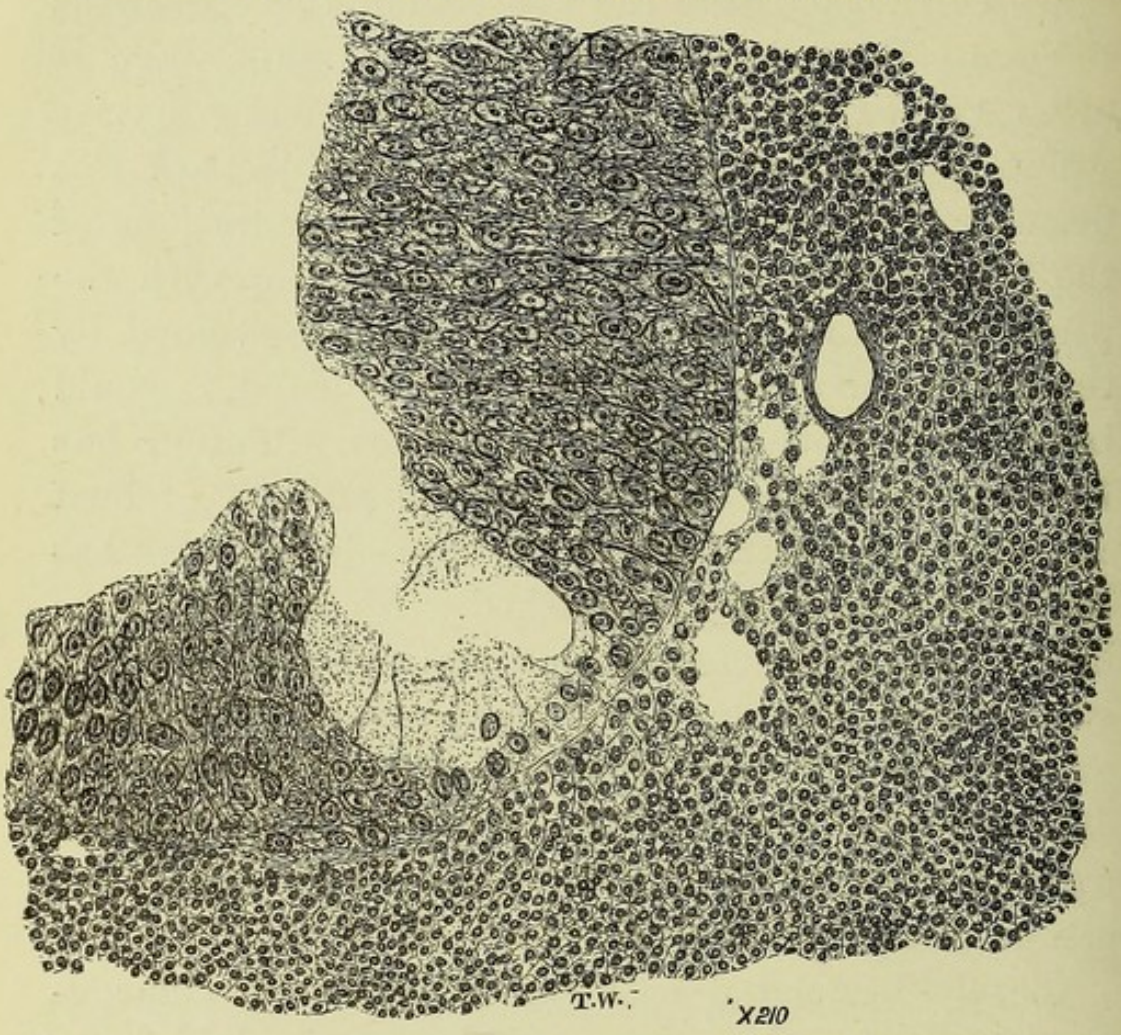
The complete change in the condition and appearance of a child a year or so after the pharynx has been cleared is very striking; not only does it breathe and hear well, but the chest, which was previously narrowed, is much expanded. It is also well to remember how much the presence of adenoid growths would complicate matters in the case of diphtheria or scarlet fever—another urgent reason for removing them.

As there is a natural tendency for the absorption of adenoid growths after the age of puberty, and as in adult life after the age of twenty-five they have disappeared, operative measures are only required in the case of children and young persons; but it is clear that it would be unwise to wait for absorption to take place, inasmuch as by that time irreparable damage would have taken place in the middle

ear. For not only are the subjects of these growths liable to Eustachian obstruction, but this stage is often passed into one where the tympanic cavity suffers from inflammation. Thus the subjects of this disorder frequently are found to have perforations of the tympanic membranes. This condition, with the permanent deafness appertaining to it, is avoided by the timely removal of the growths. Indeed, it would be no exaggeration to say that since attention has been directed to this subject the amount of deaf adults in the community of the immediate future has been very materially diminished. No one can have had a great experience in this matter without being struck with the family predisposition to adenoid growth. It seldom happens to myself that, having operated upon one of a large family, I am not called upon to do the same office at some future date upon one or more of the brothers and sisters.

Closely associated with this condition is enlargement of the tonsils. General rules may be laid down in regard to them. First, they often obstruct free breathing through the nostrils. Second, very frequently they not only do this, but also keep up the unhealthy condition of the pharynx, and so become an indirect cause of obstruction of the Eustachian tubes, not a direct cause, for from their position they can never, however large, form a mechanical obstruction to these tubes. In either or both cases they should be removed. The enlargement is a true hypertrophy, both of the body and follicles of the tonsil. There is a prevalent and popular idea that the tonsils

FIG. 24.—STRUCTURE OF ADENOID GROWTHS.

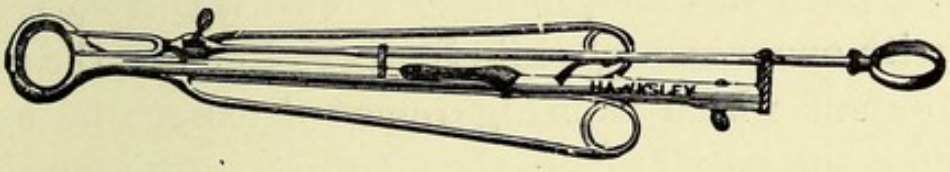


The tumour examined consisted of pure adenoid tissue, in many places the epithelium covering it was thick and hypertrophied. This is shown in the drawing.

should not be removed. This is due to the fact that in some instances, if the enlargement is not very great, they become smaller about the age of puberty. This is obviously no valid reason against their excision; for, in the first place, they generally do not follow this course, and if they did they are capable during the interval of being a very serious trouble. Indeed, it is often impossible to treat successfully the catarrh of the middle ear which accompanies them. If they

are cut through the body of the gland, taking away about three quarters of them, it is enough, for the rest contracts after the healing process is completed. As to the best means of removing tonsils, I never find that those whose practice renders it necessary to constantly remove tonsils use a bistoury and forceps. They employ a tonsillotome (No. I) or a guillotine (No. II). After many years of constant practice in this matter I have no hesitation in strongly recommending the guillotine which has been improved by Mr Ewens (No. III), and for the following reasons :— Although No. I is more simple in construction, in unpractised hands the tonsil is liable to drop backwards into the pharynx. It must then be spat out or coughed out. With No. II the patient is apt to close the teeth on the instrument whilst it is being used, and so obstruct a view of the extent of tonsil being excised. With No. III the bar prevents the mouth

FIG. 25.—EWENS' TONSIL GUILLOTINE.



being shut, and thus a complete view is obtained of what is being done, the precise extent of what is to be removed can be judged, and the tonsil being transfixed by the instrument, it cannot fall into the pharynx. These considerations are of great value in nervous persons, or especially with children, and outweigh any extra trouble there may be in cleaning and refixing the separate parts of the instrument.

So far as I can learn, if ever the internal carotid has been wounded in removing the tonsil, it has been done with a bistoury. With the guillotine there is generally very little bleeding, and if there is, it is not of a serious nature, and can readily be arrested if necessary by the local application of a saturated solution of perchloride of iron. I have only on two occasions known bleeding to be at all troublesome. Once some blood was swallowed, and the consequent act of vomiting constricted the vessels and stopped the oozing; another time the iron solution stopped it. If it is necessary to excise both tonsils, two guillotines should be at hand, and the second tonsil ought to be removed instantly after the first, in order that the bleeding from the first wound may not obscure the complete view of the other tonsil.

This complete view of the tonsil is of great importance, and the guillotine should never be closed until the amount of tonsil included in the ring is clearly seen. With the instrument I advise it can be seen, but with one which permits the jaws to close, the precise extent which is being removed cannot be estimated if the patient close the mouth. In this consists its great usefulness and safety. Having said this, it is scarcely necessary to add a caution against a proceeding which I have seen employed, viz. pressing the tonsil from without into the ring before the guillotine is closed. If this is done I am sure there is risk of cutting too deeply and causing hæmorrhage. It would be not strictly in accordance with facts to say that dangerous hæmorrhage after tonsillotomy is unknown,

since within a recent period it has been found necessary to tie the carotid after persistent and profuse hæmorrhage on two occasions. For this reason I have dwelt somewhat in detail on the question of how much to remove, and how to limit the amount. At the same time in the cases of hæmorrhage there was no reason to suppose that more than is usual had been excised.

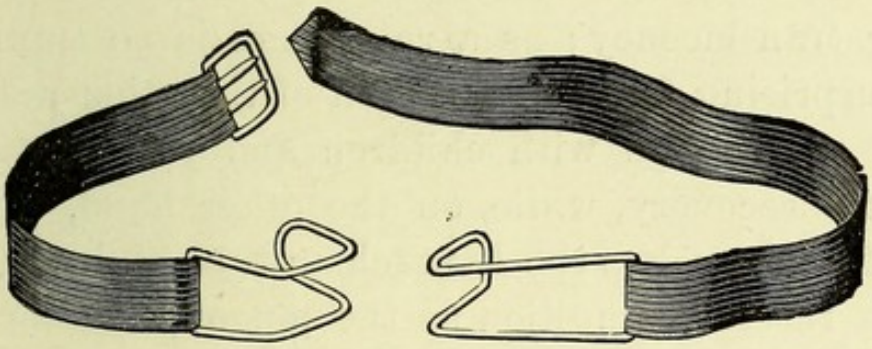
Although in most cases of catarrh of the middle ear, where they have arisen from a diseased condition of the mucous membrane of the pharynx and nares, there is an increased flow of mucus in the nasal cavities or pharynx, there is also a condition that is termed a dry catarrh of the lining membrane of the nose. In this, notwithstanding a certain stuffiness at the back of the nose and a difficulty of clearing their passages from mucus, the anterior nares are irritable and dry, and covered with little scabs, or dry yellow flakes. Now, this morbid state is almost peculiar to children and young people. If it has existed for some years, it is often impossible to point to a cause, but I have so often seen it at periods of a few months after measles or scarlet fever, and many times after whooping-cough, that I believe it more generally starts from one of these child's complaints than from any other immediate cause. Indeed, we know that catarrh of the middle ear often dates from whooping-cough, and some years ago I so often saw this dry catarrh a few months after whooping-cough in deaf children that I became accustomed to ask whether the child had recently had whooping-cough, or if not this, measles or scarlet fever. What seem at first apparently trifling

ailments so frequently succeed these diseases that they are not noticed for a long time afterwards, and their origin is unsuspected. But this is not a trifling ailment, for it is the beginning of ozæna, and when ozæna is once fairly established it is probably never cured. It may be kept in check by daily attention extending over many years, but it is not eradicated. It becomes, therefore, most necessary to recognise this dry catarrh as soon as it shows itself, for in its early stages it can be put an end to. The first consideration is to cleanse thoroughly the nares with warm alkaline washes, used with the nasal syringe. The patient's head must be bent forward, and the fluid which is passed up one nostril must pour out of the other. Until this is done the little patients cannot clear their nostrils by using a handkerchief. The nurse must be carefully instructed how to syringe the nose thoroughly. After this, when the nostrils are completely cleansed with the handkerchief, a very weak ointment, composed of yellow oxide of mercury and vaseline, should be applied inside the nostrils with a small camel-hair pencil. Under this local treatment I have found many cases of dry catarrh, in the early stage, before it had passed into ozæna, get well.

In the treatment of diseases of the middle ear it is desirable to be familiar with the fact that in a very large number of the community the septum of the nose is not placed in the middle of the organ, and that the inferior turbinated bone of one side is larger than on the other. If it therefore becomes important to use the Eustachian catheter, a certain proportion of

cases will be met with in which it is impossible for these reasons to do so. With others a small catheter may be passed when an ordinary-sized one cannot. It is also of some interest to notice that the narrowed meatus is oftener the left than the right, and when one ear only is affected in such persons it is generally the one which corresponds to the narrowed meatus. Other means besides the catheter are available for the treatment of diseases of the middle ear, so that when these deviations of the septum exist, or when the meatus is lessened by the undue size of the turbinated bones, it will, I believe, be well for the patient to

FIG. 26.—BABER'S NASAL SPECULUM.



submit to a slight inconvenience, rather than to incur the penalties which may follow any energy and enterprise of a surgical kind that might be thought likely to remove it.

In the examination of the nose the speculum suggested by Mr Baber is very useful.

Far more common than with adults is the Eustachian obstruction met with in children, especially those which are spoken of as being of a "strumous type." In these subjects a vast extent of mucous

membrane is in the same condition—the nares, fauces, and Eustachian tube being affected together. The mucous membrane throughout is thickened and tumid, and secretion from the surface is much more abundant than it should be. The tonsils are generally enlarged, and sometimes to a very considerable extent, and adenoid growths, mentioned previously, may frequently be found. Of such children it is hardly necessary to ask what is the matter. The stupid vacant look as they advance with open mouth, and their generally flabby appearance, proclaim their disease. They snore loudly in their sleep, and the deafness is generally severe. The tympanic membrane will be seen to be drawn in, but to retain its proper translucency; as a rule there is no tinnitus. It is surprising for what a length of time this state of things will go on with children and yet permit of complete recovery, while, on the other hand, in the case of adults, when the Eustachian tube is obstructed from a relaxed condition of the mucous membrane, the tympanum will generally become involved if they are not attended to soon after the deafness is noticed. The treatment to be adopted for these young patients is to remove adenoid growths if they are present, to syringe the nostrils with alkaline solutions, to apply astringent solutions locally to the fauces, tonic medicines (preparations of iron and the mineral acids), plenty of fresh air and exercise, together with the ordinary rational means of improving the health. The tonsils, I may again say, however much they may be enlarged, cannot operate mechanically by

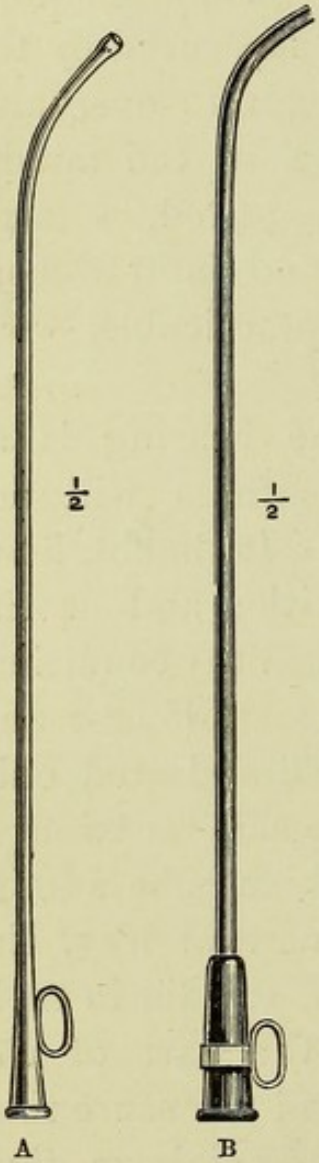
closing the Eustachian tube, but they may interfere with respiration, and, by presenting a large surface of thickened mucous membrane, assist in keeping up the unhealthy condition. These considerations should weigh in deciding whether they should be removed or not. Of all things it is important that the Eustachian tube should be regularly opened. To accomplish this, Politzer's is the best method. Measured by the good it has done, it would be difficult to overvalue this proceeding in treating diseases of the middle ear; for before this plan was suggested, a large number of cases, especially children and timid women, on whom catheterisation was not practicable, went unrelieved.

After the inflation, although the hearing is at once very much improved, the deafness will not unfrequently return in a few hours. It should, however, be assiduously persevered with; and as the mucous membrane gets into a more healthy condition, the periods of good hearing will become longer and longer, and improvements which at first lasted only for six hours will after a few times remain for twenty-four, and so on. When the Eustachian tube admits of air passing through it in the natural way, the ossicles and tympanic membrane will remain in their proper position. No trouble on the part of the patient and surgeon should be grudged to ensure this, as good results will assuredly repay labour thus bestowed. With some of these children it may suffice to inflate the tympana once or twice a week, while with others daily inflation for a few times may

be necessary; but, sooner or later, the hearing will be completely restored.

To my mind these cases most strikingly illustrate the great advances which have been made in treating disease of the middle ear of late years, and which may be said to be in a great measure due to the introduction of Politzer's method. Some years ago the attendance of the patient for inflation by the Eustachian catheter would have seemed both to him and the surgeon interminable; in all probability the one or the other would have given it up in disgust before much benefit had resulted, and the hearing would have relapsed into its former condition. But we have not done with the Eustachian catheter; on the contrary, its use is more than ever found to be necessary in appropriate cases, but as a rule the use of the Eustachian catheter is required more frequently in affections of the tympanum than in those of the Eustachian tube; but sometimes, when the obstruction of the tube is so severe as not to yield to other methods, it is necessary to employ it; and, in addition to inflation of the tympanum, by means of it, injections are sent into this cavity. The catheter may

FIG. 27.



be made of either silver or vulcanite. The first kind (see Fig. 27), A, can be bent to any curve required, and the latter, B, are inflexible except on being exposed to heat, when they can be curved as may be necessary, and become inflexible on cooling. So long as the catheter does not bend while being used, it is not important what it is made of. Four or five different sizes are quite enough. The metal ring shows the position of the instrument in passing it—whether the curve is turned to the right or left, upwards or downwards. The other end is made somewhat conical, so as to fit the nozzle of an india-rubber bag which is employed in injecting air or fluid into the middle ear.

The mode of passing the catheter is as follows :— Place the patient in a chair, and let him lean back in it; steady his head with the left hand firmly fixed on the top of it; hold the catheter lightly in the right hand, with the curve downwards, and pass it quickly in this position through the inferior meatus of the nose to the posterior wall of the pharynx. When this is felt, withdraw the catheter about half an inch, and tilt the point of the curved end rather upwards and to the left or right according to the side which is being operated upon. Now hold the catheter and end of the patient's nose steadily between the thumb and the first two fingers of the left hand. All this time the ear of the patient and surgeon is connected by the diagnostic tube. The point of the catheter is now supposed to be in the pharyngeal orifice of the Eustachian tube, but the only certain sign of this being the case is that air be heard through the otoscope to

impinge upon the tympanic membrane when a stream of air is passed down the catheter. (I am presuming that the Eustachian tube is not occluded.) This is the most common method of using the catheter, and I think it is the best.

A plan was suggested some time ago by Dr Löwenberg. The catheter was passed, as before, to the back of the pharynx; the point was then turned inwards, and withdrawn till it stopped by being hooked round the vomer; the catheter was then turned completely round, and so the position of the orifice of the tube determined. To learn to pass an Eustachian catheter, it should be done first on a vertical section of the head (a moist preparation) in the way first described, so that each movement can be watched, and the opening of the Eustachian tube seen. A cloth may then be arranged so as to hide the opening from view, and removed to see if the point of the catheter is in the right place. After this it should be practised on the living. The chief mistakes made by beginners are, not keeping the catheter close to the floor of the inferior meatus of the nose, thus getting it into the middle meatus, and when it has reached the pharynx, not withdrawing it sufficiently before it is turned outwards. It is well to get into the way of passing it through the meatus as rapidly as possible, for this is to the patient the most disagreeable part of the operation. It is remarkable how little discomfort it causes to some persons, and how much others object to it. Although a somewhat disagreeable, it is not a painful proceeding, and after the catheter has been

used a few times it is tolerated without much inconvenience.

A stream of air may be sent through the catheter by blowing through it with a small india-rubber bag, the nozzle of which is made to fit the open end of the catheter.

Occasionally some considerable difficulty is met with in introducing the catheter. This is chiefly the case when the septum of the nose is placed obliquely, and the deviation is generally towards the left side. If this be so much as to prevent altogether the passage of the catheter, and if it be imperative to use it for this side, the catheter must be bent to a greater curve, and introduced through the right inferior meatus of the nose. It is troublesome to manage it in this way, but it can be done, and is the only practicable method in such a case. If the inferior turbinated bone is much larger than usual, this will also make the meatus impassable for the catheter.

Before using a catheter it is well to make a rule of blowing through it, so we may be sure that it is not stopped up. There is no need, however, to smear it with oil, as the surface over which it has to pass is well lubricated with its natural secretion. One other caution, that is perhaps a needless one,—be careful that the catheter is always thoroughly washed after it has been used, for there have been instances in which patients have become syphilised through the neglect of this precaution.

The chief province of the Eustachian catheter is in the treatment of those affections of the middle ear for

which Politzer's method is not adapted. Such occasions are of daily occurrence: for instance, where one tympanum only is affected, and it is not advisable to inflate the other; where a prolonged stream of air is desirable in place of the sudden gust which results from Politzer's method, and for many other conditions which we shall consider as we go on, not only where the air douche is necessary, but as a medium through which further local treatment can be applied to the middle ear. How far its employment is necessary for purposes of diagnosis is a question which will be answered in a different manner by some from what it will be by others. Although in using it we often gain additional information as to the condition of the tympana, I must confess to thinking that in a general way it is seldom necessary for a correct diagnosis. It is a rare occasion where we are not able to discover by other means that have been mentioned (Valsalva's method or Politzer's) obstruction or occlusion of the Eustachian tube, and variations in the condition of the tympana from extreme dryness to collections of fluid in this cavity; after all it is the relative freedom or difficulty with which air enters the tympana, and proportionate degrees of and entire absence of secretion that are the chief points to be decided by auscultation of the middle ear. At the same time, since in most cases of chronic disease of the tympana the catheter is very frequently used in the course of treatment, as the case progresses changes in the sounds produced on inflation are oftentimes observable, and deserve careful attention; but I am quite unable to understand, or rather I should say appreciate,

such an opinion as the following given by Dr Kramer in speaking of this subject :—"The physical characters of these acoustic symptoms are far more clear and distinct than those which present themselves when the stethoscope is used for the diagnosis of the diseases of the respiratory organs."

The permanent effects to be apprehended from obstruction of the Eustachian tube, either at the faucial or tympanic orifice, are always due to neglect. Persons get deaf during a cold, remain so for a few days, and recover without treatment. In future, they or those who have witnessed this state of things very naturally argue that this is the usual course of events. It is not so. Any obstruction that has persisted for many days (this applies chiefly to adults) is liable to remain more or less, or at any rate to make necessary a long course of treatment which would not have been required if attention had in the first instance been given to the case. In other words, a few inflations of the tympanum at the commencement would have placed the patient in the way of recovery. It too often happens that weeks or months are allowed to pass by before relief is applied for, and it is then found that air passes by Politzer's method very imperfectly into the tympanum. Regular inflation should then be practised with the Eustachian catheter. After a little time air will pass more readily, and the hearing improve proportionately. In some instances I have known, after the catheter has been used for several days successively with only slight relief, almost perfect hearing has followed some single in-

flation. This has been noticed especially when a few drops of a warm solution of soda have been injected into the tympanum the day previously. It appears probable that, the obstruction being at the tympanic orifice of the Eustachian tube, there may have been a small plug of mucus, which, after having been softened by the injection, has been dislodged by the next inflation. It is in some degree confirmatory of this hypothesis that in these cases the hearing remains good without any further treatment. This is a highly mechanical explanation of the phenomenon, but it must be remembered that in these cases impaired hearing depends on a mechanical lesion, and that when we are dealing with what we cannot see some speculation as to cause and effect must be permitted.

CHAPTER VI

NON-PURULENT catarrh of the tympanum may commence in the manner described when speaking of Eustachian obstruction in adults dependent on a relaxed state of the mucous membrane of the throat, and thus the cavity of the tympanum may become involved by extension of the catarrh in this direction, or the tympanum may become affected independently of the Eustachian tube. In either case repeated attacks of this kind, if allowed to proceed unchecked, are among the commonest causes of confirmed deafness; this symptom being due principally to accumulations of mucus within the tympanum (fluid in the early stages, and becoming inspissated in the later), which by their presence interfere with the proper performance of the functions of the ossicles and tympanic membrane, and also with the conduction of sound through the tympanum to the labyrinth. The course of the affection is somewhat as follows (taken from the case-book),—and I select thus a typical case of almost daily experience in aural practice, for it is the common cases that are useful as illustrating principles rather than the rare. A healthy man, æt. 40, could always hear well until six days ago; he then became slightly deaf on the left side, with some pain in the

ear and a feeling of irritation in the meatus. In two or three days the pain, which was never severe, subsided. When seen he was very deaf to conversation, and could hear a loudly ticking watch at one inch from the ear. The tympanic membrane was opaque, and drawn in more than natural; the short process of the malleus was rather prominent, and a few injected vessels could be seen near the handle of the malleus. The meatus was red and rather tender on introducing the speculum. Gentle inflation was practised every day on Politzer's method, the hearing improving after each occasion, and in a week he had quite recovered. At first the air as it entered the tympanum did so on the affected side with rather a moist sound, but when he was dismissed it passed into both tympana alike. In this case the swollen state of the lining membrane had prevented the free ingress of air into the tympanum, and by keeping this cavity inflated until the inflammation had subsided any permanent injury to the hearing was prevented.

There are a few points which are noticeable as presenting a decided difference from what was seen when the Eustachian tube was affected to about the same extent as the tympanum was in this case,—the absence of any throat affection, the occasional and slight pain in the ear, the evidence of secretion in the tympanum as heard by the otoscope, the variation from translucency in the membrane, the injected state of its vessels, the redness and tenderness of the meatus. The inflammation beginning in the lining membrane of the tympanum is thus seen to involve in turn the

three layers of the tympanic membrane and the meatus. This is the general course of events: all affections of the tympanic membrane, with very rare exceptions, being secondary to morbid action which has begun either in the tympanum or the meatus. Another appearance seen in these cases is a lessening of the area of the tympanic membrane, which is due to the swelling of the external meatus immediately around, encroaching on the membrane. If the symptoms in the case just related had increased in severity, and the secretion been more copious, the pressure caused in this manner might have resulted in a rupture of the tympanic membrane, even if the secretion had still been strictly of a non-purulent character. One stage farther in the course of inflammation, and the secretion would have been purulent. Although sometimes the non-purulent merges into the purulent variety of catarrh of the tympanum, they are commonly described as separate diseases. Purulent catarrh generally accompanies one of the exanthemata, or it comes on without any apparent cause in a very sudden manner, and runs a very rapid course, the membrane giving way in a few hours.

The case which I have just taken by way of illustration was of an extremely mild character, very brief in its duration, and a complete recovery took place after treatment of the most simple kind. This rapid and complete recovery is very exceptional, and for the very good reason that the patients are very seldom seen at so early a stage of the affection. It is one thing to have to deal with a tympanum which has

been the seat of catarrh for a few days, in which the mucus secreted is slight in quantity and recently effused, and a tympanum that has only for a short time been deprived of the air with which in health it is filled; but a very different matter is it to have to treat a case where the supply of air in the tympanum has not been replenished for many weeks, and half filled perhaps with viscid mucus. Although, too, there was slight pain in the ear in this man's case, this symptom is not always present to warn the patient to seek advice; it is so, however, whenever the tympanic membrane shares the condition of the rest of the tympanum; and this would in the course of things be expected, for, as we know, it is a dense fibrous structure plentifully supplied with nerves.

Having premised so much, and given a sketch of Eustachian obstruction, and of an attack of non-purulent tympanic catarrh, commencing either in the tympanum or proceeding from the throat, what are the effects which have been observed to remain after death in persons who have been the subject of non-purulent catarrh of the middle ear? Speaking generally, these evidences of disease are more or less obstruction of the Eustachian tube, in some cases occlusion; thickening of the lining membrane of the tympanum; moist or dry mucus, either as collections around the ossicles, bands between the ossicles themselves, or between the ossicles and sides of the tympanum; anchylosis of the ossicles, either between each other or between the stapes and fenestra ovalis. Patients who apply for relief after successive attacks of non-purulent catarrh

give the same history with some variety of details; periods of deafness occurring at intervals when suffering from cold, or always worse hearing at such times, sometimes accompanied with slight pain in the affected ear; occasionally tinnitus. Not too much dependence must be placed on the latter symptom, as it will be shown in another chapter to be present under so many circumstances; but, as a rule, with these cases it is not a favorable symptom. The tympanic membrane will present certain alterations in curvature and translucency. It requires long practice to recognise changes in curvature. In placing side by side two patients, in one of whom the membrane is healthy and translucent, whilst in the other it is opaque, the first impression will be that the healthy is the more concave of the two, when in truth, perhaps, it is the reverse, the change in colour giving it a more flattened appearance. The curvature, too, varies somewhat in individuals, as also does the inclination of the membrane. Of all appearances indicating an abnormal concavity, the most easily recognised is an unusual prominence of the short process of the malleus. Opacities in the tympanic membrane depend upon thickening, and in proportion to the seat of this, so will opacity be valuable in diagnosis. As stated in a previous chapter, it is sufficient to regard the tympanic membrane as consisting of a fibrous layer, on either side of which is an external or dermoid layer continuous with the lining of the meatus, and a mucous layer continuous with the lining of the tympanum. In catarrh it is the last-named layer that is the seat of

thickening; but as either of the other two layers may be the one affected, an opacity, whether it be a general one or only involve a portion of the membrane, will not settle a question in diagnosis, but when taken in conjunction with other symptoms, and the history of the case, it is valuable as confirmatory evidence in arriving at an opinion in a case. A patient may have a thoroughly opaque tympanic membrane, produced, perhaps, many years before we see him, by a catarrhal condition, which was completely recovered from, leaving him with a good hearing, and none the worse except this change from translucency and lustre in the membrane of the tympanum: the impaired hearing, for which subsequently he applies for relief, depending upon a nervous lesion entirely unconnected with the tympanum.

I know that I shall be challenging criticism by saying that it is a point quite open to question whether thickening of the membrane is of itself ever a cause of impaired hearing. Physiologically speaking, a man with an abnormal increase in the substance of one tympanic membrane ought to have imperfect hearing as a consequence of such thickening; but what am I to say when I find that this structure is subject to the most extensive increase of its substance by the deposit of calcareous matter, and that this condition has been observed in many cases where the hearing has been quite good? Undoubtedly in most instances of such deposits (they consist of phosphate of lime) there has been a history of tympanic disease, and the patients are more or less deaf, some extremely so; but it

PLATE II.

Calcareous Deposit in lower part of Membrane. Right Ear.

West, Newman chromo.

appears probable that the loss of hearing is due to changes within the tympanum, and not in the membrane. At any rate, it seems fair to infer this when so many persons have these deposits in the tympanic membrane and hear well. This conclusion has been further strengthened where opportunities have been afforded of examination after death, of the ears of persons who have had such changes in the tympanum, and whose power of hearing has been noted. In these cases where there has been deafness, either slight or extreme, it has been amply accounted for by morbid conditions situated behind the membrane. This is particularly noticeable in a collection of pathological specimens in the General Hospital of Vienna, belonging to Professor Politzer, and which I had an opportunity of examining, and more recently when this gentleman paid on two occasions a visit to London, bringing with him a large collection of pathological preparations.

If I were asked, do patients ever recover altogether from the effects of chronic catarrh of the middle ear? and what do you think the best treatment in such cases? I think I should reply somewhat as follows:— To the first question, if patients are seen during the first attack of uncomplicated non-purulent catarrh of the middle ear, however severe the attack may be, provided the tympanic membrane has not given way; however great the impairment of hearing, with ordinary patience and care in conducting the treatment, it is a very exceptional circumstance for them not to recover the hearing, either completely or nearly so.

For the rest, those in whom recovery is only partial, or does not take place at all, are they who either have not been attended to during the first attack, or, perhaps, have had several in succession without being submitted to treatment.

To the second question I would reply that all treatment should have the same objects in view :—by inflation of the tympanum with Politzer's bag or the catheter, to overcome any obstruction to the free passage of air into the tympanum, and to keep this cavity supplied with air until the swelling of and extra secretion from the lining membrane (for it is this condition which causes the obstruction) shall have subsided; by the injection of fluids into the tympanum to improve the condition of its lining membrane; under appropriate circumstances by a timely incision in the tympanic membrane to prevent its rupture being caused by pressure from within, and taking advantage of the opening thus formed to bring about the expulsion of mucus which may be filling up the tympanum.

I do not think I should be far wrong in saying of tympanic affections that there are very few diseases in which the results of treatment have been more unsatisfactory up to a comparatively recent period, and this is in great measure to be accounted for by the fact that their pathology was imperfectly understood. The careful and laborious dissections of Mr Toynbee, by demonstrating the morbid appearances met with in the cavity of the tympana, have been of great service, and I cannot but think that in a very consider-

able degree they have been the means of suggesting to other surgeons rational measures for relieving such conditions; and here I may say that we are much indebted to the German surgeons for reform in the treatment of tympanic disease.

In the typical case of tympanic catarrh to which I directed attention the deafness was not very extreme, and the patient began to improve so soon as he was placed under conditions favorable to recovery, and he was well in the course of a week.

It is unusual to have so little trouble with these cases, and very often the patients are under treatment for several weeks. If the Politzer's inflation restores the hearing but imperfectly at the time and does not give a very thorough inflation to the tympanum, the air douche should be given with the catheter, and in doing this the bag should be compressed at least five or six times successively. The completeness of this measure will show itself by its immediate effect upon the hearing, and I can give no rules which will universally apply as to how often it will be necessary to use the catheter, except by saying that if the improved hearing is very transient it will require to be repeated more frequently than if it lasts for several days. Experience will guide us in this respect, and after treating a few cases we shall be able to judge pretty well how often the tympanum ought to be inflated in this way when a few days have elapsed after the first occasion on which the catheter has been used.

Some cases will gradually get well if nothing more than this treatment is pursued every third or fourth

day for a few weeks; with others more vigorous measures will be necessary, and here we must be guided chiefly by evidence which we can obtain as to the amount of secretion in the tympanum. If upon inflating the ear either by Valsalva's method or the catheter, a distinct mucous râle in the tympanum can be detected, very considerable benefit will follow the employment of a weak astringent injection into the tympanum.

The usual method of injecting solutions into the cavity of the tympanum is by means of the Eustachian catheter. This is passed in the ordinary way, and steadied with the left hand; about half a drachm of the solution is dropped into the open end of the catheter with a glass syringe; the india-rubber bag (which has been spoken of) is immediately fixed into the catheter and compressed. Although the level at which the Eustachian tube enters the tympanum is rather near the roof, it is not found that after the fluid has entered the tympanum in this way, enough collects at the bottom of this cavity to do any harm. It is not as if the fluid entered the tympanum in a stream. It leaves the catheter in a dispersed jet; some of it then is lost in its passage up the Eustachian tube, and by the time it has entered the tympanum, and moistened its walls and contents, there will not be much to sink down to the floor of the cavity. It is more useful to notice the results of this treatment than to theorise on what takes place. The fluid can be heard through the otoscope to enter the tympanum, and the patient is quite conscious of it so doing.

The cases adapted for astringent solutions are those in which there is an excess of secretion, as shown by the moist sounds conveyed through the otoscope on inflating the tympana. A very useful solution is one of sulphate of zinc, about one or two grains to the ounce of warm water. Anything stronger than this gives rise to pain. The injection should be repeated every three or four days, and continued for some time.

It is perhaps hardly necessary to say that great experience in the selection of cases, and great care in using tympanic injections, are absolute necessities. In inexperienced hands nothing is easier than to inject too much fluid into the tympanum, and with the result of exciting inflammation within this cavity. Indeed, it is within my own knowledge that facial palsy has been produced in this way in more than one instance. With due precautions, and practised by any one who has been carefully instructed, injections into the tympanum are painless and free from danger.

In the course of catarrh of the middle ear, when the secretion within the tympanum is very copious, the pressure which this produces will induce thinning of the membrane. In most cases this thinning will be general, but in others it will be circumscribed. In either there is a certain amount of risk lest the membrane give way, and it is partly to guard against this mishap, and partly to form an outlet for the mucus when it will not disappear under other plans of treatment, that an incision is sometimes made into the membrane, and the fluid evacuated through the cut upon passing air into the tympanum (I shall refer to

this treatment later on). Another symptom or effect of fluid in the cavity of the tympanum is that patients' hearing will vary much with changes of position. Thus, while lying down they will be able sometimes to hear fairly well, and on rising will in a few moments be as deaf as before. The head bent to one side or the other will often give rise to increased hearing, or the reverse. These effects appear to be due to a movement of the mucus in the tympanum, although the precise positions in this cavity which the mucus occupies in good hearing or the reverse have not been made out.

And, indeed, it is difficult to conceive how the matter could be determined during the life of the patient. I should suppose, however, that as the fenestræ are the parts most sensitive, so far as hearing is concerned, to any changes from health, mucus in contact with the internal wall of the tympanum would produce greater deafness than it would in any other situation. Be this as it may, I have on many occasions noticed how a change in position will affect the hearing of persons with the symptoms of mucus in a fluid condition in the tympanum. There is always a reasonable expectation that the hearing will in a great measure be restored so long as this fluid condition remains, but the cases of real difficulty are those in which nothing has been done for many months, perhaps, where the catarrh has subsided, leaving the mucus inspissated, with a thickened condition of the lining membrane of the tympanum. Under these circumstances the hearing remains stationary sometimes for years; it is not affected by inflation, and the

sounds heard through the otoscope are of a dry character. The treatment of these cases presents great difficulties. All sorts of vapours and fluids have from time to time been recommended to be injected through the catheter into the middle ear—ether, chloroform, iodine vapour, alkaline solutions of bicarbonate of soda, neutral solutions of iodide of potassium, astringent solutions of sulphate of zinc, and many others. When it is considered that in instances of inspissated mucus the results of treatment depend entirely upon the character, form, and situation that the dried collections have assumed, which it is, of course, impossible to recognise during life, it is not surprising that extensive improvements in hearing are met with in only a fair proportion of these cases.

One of the difficulties which beset us when this condition has been reached is to determine what are the prospects of success in undertaking a course of treatment. These cases, too, are very common, and for the very easily explained reason that persons, especially in the rank of life from which hospital patients come, are content to remain deaf on one side for a long time before they will exert themselves to get advice. By the time they apply to be treated, the period when relief could be given to them has in many instances passed by. It can readily be understood how in a little cavity like the tympanum a small quantity of mucus permitted to remain until it had become dried up would clog the movements of the ossicles, and how very slight alterations from health in the way of catarrh of the lining membrane would induce thick-

ening, and a consequently less sensitive condition of the fenestræ; and so it is. Case after case will come giving the same history—a complete account of catarrh of one side occurring years or months ago. On examination the tympanic membrane of the deaf side will give corroborative evidence of the character of the affection.

We know, then, that there has been a catarrhal condition of the tympanic cavity, and we have a general idea of the state behind the membrane; the sound which we hear as air passes into the tympanum tells us that it is in a dry state, at least that there is no moist excessive secretion; and this is about all we do know for certain. Beyond this any other evidence we have is purely negative in its nature, and consists in an absence of symptoms which point to a failure in the functions of the nervous apparatus. Thus, if there is excessive tinnitus, much worse hearing after fatigue, if a vibrating tuning-fork placed on the head is not heard more loudly on the affected side, we may be pretty sure that the deafness is not wholly due to catarrh.

Neither do I believe any one can tell on the first examination of such a case as I am describing whether the patient will receive much or any benefit from treatment; so we are forced to almost act in the dark and be guided by what has been the result of treatment in similar cases; not in any single case, but the general success or the failure of any line of treatment in many. So far as my experience is worth anything, I think that the warm alkaline injections most suit-

able are five grains of bicarbonate of soda, iodide of potassium, or hydrochlorate of ammonia, to the ounce of water, or simply warm water. If I were to take all the cases that I have treated for the last ten or fifteen years, they would display the greatest discrepancy as to results.

Sometimes I have had several cases in succession which have not received any benefit, and following these have been two or three in which the hearing has been very greatly and permanently improved. Putting side by side two individual cases, one of which has been a very successful one, and the other in which the effects of the treatment have been positively nothing, I am not able to account for this in any way. Possibly I have failed to observe some symptom by which I ought to have been led in my prognosis—I cannot say; what I have noticed, however, is that, when the hearing is going to be favorably affected by the injection, there is generally some appreciable change after it has been done a few times; not, as a rule, immediately afterwards (indeed, it not unfrequently increases the deafness for a few hours), but perhaps a day or a few days after the injection has been used. Even in the most successful cases of this kind, when the catarrh dates back for some years, and the secretion in the tympanum has become inspissated, the recovery is, so far as I know, never so complete that the patients regain perfect hearing, neither from the nature of the case is it at all likely that they should do so.

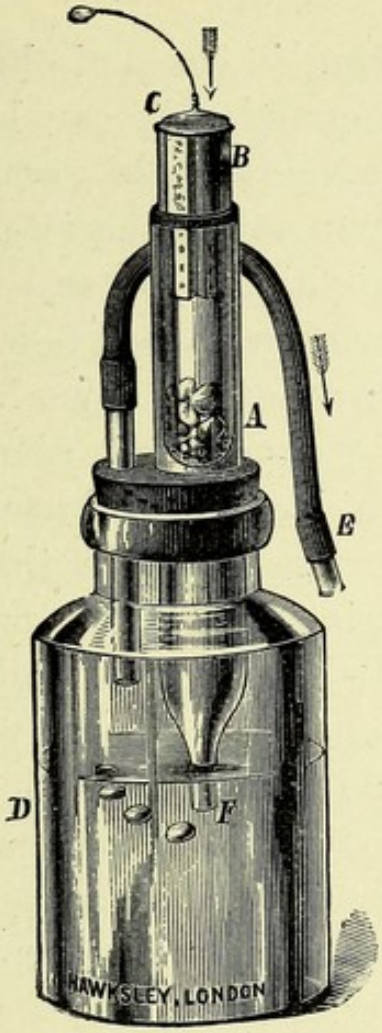
Two of the most successful results of this kind of

treatment in old-standing cases of catarrh that I have seen took place in a man of thirty-six and a boy of twenty. In both instances the first attack of catarrh occurred more than four years before I saw them. In the case of the man there was nothing to be seen beyond a general opacity of the membrane, and there had been some tinnitus for two months. He began to improve after the second injection. The ear was injected with solution of soda, five grains to the ounce, every other day for a fortnight, and twice again after an interval of a fortnight. The boy was treated in the same way for only a fortnight, and made an equally good recovery. In both instances the hearing twelve months afterwards for practical purposes was as good as could be wished, although when carefully tested it was not perfect. Both the cases were very exceptional, and generally under similar circumstances we have to rest content if the hearing can be said to have been decidedly improved.

The question as to the precise mode in which the injections act in the tympanum at once suggests itself first, is it the effect which they have upon inspissated mucus? It seems often incredible that such secretion can remain for years in position and be really mechanically affected. Possibly the stimulating effect which they have upon the chronically thickened state of the mucous membrane which lines the tympanic cavity may be the reason for the improvement noticed. It is obviously impossible to be certain upon this point.

I must not omit to mention one of the most useful

FIG. 28.



The Chloride of Ammonium Inhaler consists of a wide-mouthed bottle, D, which is filled about two thirds with cold water, and closed with a tightly fitting cork, through which two tubes, E and A, are passed. The tube E terminates in the air-chamber over the water. The tube A dips ¼ inch into the water, as shown in the drawing. The upper part of the tube A encloses another tube, B, perforated at its lower end, and fitting loosely therein is the absorbent plug C, to which is attached a piece of platinum wire. In using the apparatus the cork and tubes are removed, and cold water is poured into the bottle D up to the mark on its side, the tubes are replaced, and three or four small lumps of the Amm. Carb. are put into the inner tube B; the absorbent plug is then immersed in the Acid. Hydrochlor. (B. P.) for a few seconds by means of the platinum wire, and replaced into the tube B. On drawing air into the mouth through the pipe E, bubbles of dense white vapour will escape through the orifice of the large tube at F, and becoming purified by passing through the water, the vapour enters the upper chamber and is used as may be required. In order to inject the tympana with it, when the vapour is in the mouth, it is forced into the middle ear by blowing, the mouth and nose being closed, *i. e.* the Valsalva method.

methods of treatment in cases of chronic catarrh, and one which I can confidently say has been in large numbers of cases productive of great good. It is the injection of the vapour of muriate of ammonia. I commenced to use this at the end of the year 1874. Whether it was ever employed before for the middle ear I do not know; at least, I never heard of it. Since that time I have prescribed it almost daily, and it has gradually come into general use. It is especially adapted to those cases in which the hearing at once becomes worse during even slight nasal catarrh or in damp weather. It has the great advantage of being easily used by the patients themselves.

I must now direct attention to a mode of treatment in cases of tympanic affections more decided in its character than what I have as yet spoken of. Up to now we have been considering two separate morbid conditions of the tympanum, one in which the mucus is in a fluid or semi-fluid state, and the other where it has become dried.

In the supplement which Dr Millingen wrote to Dr Adam Politzer's work on the membrana tympani, in describing the practice of the last-named surgeon in cases of accumulations in the tympanic cavity, and their immediate dispersion by the air douche, he says, "Secretion is not always so fluid that it can be thus easily removed from the tympanic cavity, for when it has been retained for a long time, a gelatinous viscid matter is formed. This will either be absorbed in course of time, or removed by the employment of Politzer's air douche or by the catheter.

"In such cases, when the membrane was much shrunk and presented a dark greenish-yellow colour, Dr Politzer, after using the air douche with only temporary success, performed paracentesis, and immediately afterwards forced air through the ear by this method, thus driving the mucous matter out into the external meatus. The opening in the membrane usually closed by the following day, and the hearing, moreover, was restored to its normal standard or returned after several applications of the air douche."

During many years this plan of treatment has been employed in England with varied success, in some instances with considerable advantage. An account of it, with cases, was published by Mr Hinton in the 'Guy's Hospital Reports' for 1869 and 1870. While light is reflected down the speculum from a mirror fastened on the forehead of the operator, a vertical

FIG. 29.—KNIFE FOR MAKING INCISION IN THE TYMPANIC MEMBRANE.
(*Handle in figure half the length.*)

incision, about one eighth of an inch in length, is made behind the handle of the malleus with a small double-edged knife made for the purpose. If expulsion of the mucus does not follow the passage of air through the cut on Politzer's plan Mr Hinton advised that a weak solution of soda, or simply warm water, should be passed through the incision by means of a syringe, the nozzle of which fits the meatus (it was carefully protected by a rim of india rubber), the fluid passing through the tympanum and Eustachian tube

out at the inferior nares as the head of the patient is bent downwards. In this way any accumulation of mucus in the tympanum is dislodged from its situation. The opening made in the membrane is thus merely the preliminary step of the proceeding, and is simply a means to an end, so was in no way a revival of the operation practised by Sir Astley Cooper for the relief of Eustachian obstruction and the troublesome symptom of tinnitus. This at the best could only give very temporary benefit, as an incision at the tympanic membrane heals in from two to five days.

The object of the incision in these cases is not at all the same as when it is made in the course of purulent catarrh of the middle ear. In the latter instance it is done to provide an outlet for the pus which fills the cavity of the tympanum, and which, unless let out in this manner, causes rupture of the membrane and more or less disorganisation of the contents of the tympanum.

At the same time there is no doubt but that in the unpurulent variety of catarrh of the tympanum, when the secretion is very copious, the membrane will sometimes give way in consequence of pressure, and thus an opportune incision will prevent ulceration taking place. This, however, is not the principal or only object in adopting this practice as recommended by Mr Hinton.

A certain proportion of the cases in which it was done have unquestionably obtained improved hearing in consequence, whilst others were no better afterwards. If this can be shown to be the experience of

all who have practised this operation, there are certainly quite sufficient data to make at least some modification of the proceeding advisable. Whilst discussing the results of the operation as practised by the late Mr Hinton, I may here at once say that at the time when it was upon its trial I had unusual opportunities for seeing a very large number of the cases operated upon. Although improvement, as I said, followed in some cases, the general result was to my mind not encouraging. It always seemed to me that the syringing through the cut was a part of the proceeding which might well have been left out, and that it would have been productive of better results generally if after the incision the patient had simply expelled air by the Valsalva method through the cut; in short, that the syringing was damaging. This impression was so strong that I never practised it. I am now discussing the history of operations by incision of the tympanic membrane, and the circumstances under which such operations may be appropriate. Now what are these circumstances?

Unfortunately it is rare to meet with appearances in the tympanic membrane of so distinct a character as to enable us to say with certainty, "There is within that tympanum the remains of catarrh in the form of semi-fluid accumulations of mucus, which can be removed after an incision has been made into the membrane." Such appearances are described, in the report referred to, as spots of a brownish-yellow colour, due to dark-coloured fluid in contact with the inner surface, bulgings of the membrane in places,

especially at the posterior and superior part, and thin spots which can be made to bulge on inflating the tympanum.

In cases where these changes are noticeable the same history is given as in others where there is no more abnormality to be seen than a somewhat exaggerated inward curvature, or a general opacity which is merely indicative of previous attacks of catarrh. Hence the difficulty in deciding the question as to whether the opening should be made in the membrane or not. The most reliable sign, I believe, which we possess of the presence of fluid mucus in the cavity of the tympanum is the sound which accompanies inflation, and is heard through the otoscope. Occasionally, upon the patient's pressing air into the tympanum, there is a squeaking and bubbling sound most characteristic of the condition under notice. It is with such cases that I have never failed to obtain good results after incision of the membrane.

My own observations and experience, therefore, go to show that the cases favorable for this treatment are not necessarily either those in which the catarrh is recent or cases of very long standing, but that the condition of the tympanum which I spoke of as a dry condition must not have been reached.

Useful as this operation undoubtedly is in favorable instances, I need, perhaps, hardly say that it is a sufficiently serious one to make it necessary to exercise great care and judgment in the selection of cases, and it should not be resorted to until less severe

measures have had a fair trial. In coming to a decision on this question, the occurrence of any of those symptoms which point to a lesion of the labyrinth (which will be detailed later on) would counter-indicate the operation.

For if the nervous apparatus be faulty, it is but lost labour to improve the means by which impressions are conveyed to it.

Although we have so generally to seek for the cause of impaired hearing in morbid conditions behind the tympanic membrane, there is a condition of the structure sometimes to be met with which either directly or indirectly affects the hearing power. This is when there is a relaxation of the membrane, and irrespective of any appearance, we can almost diagnose it in the following way. The patients who are the subject of it have suffered from tympanic disease for many years, and upon putting the membrane on the stretch by inflating the tympanum they can hear for a few seconds pretty well, but as the membrane falls back again they are deaf.

It is, I believe, to this constant and almost habitual practise that the relaxation must be attributed, and attention must be directed to the primary affection, viz. the tympanic disease, before any good can be expected from treatment. The extremely transient nature of the improved hearing will distinguish the condition from the longer interval of good hearing (at least ten minutes), which is sometimes produced in the same way when the deafness is caused by obstruction of the Eustachian tube. On examination

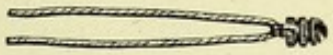
of these cases occasionally the exaggerated outward movement of the membrane following inflation can be clearly seen.

This appearance is occasionally of so marked a character, that as the air is forced into the tympanum, the relaxed and thinned portions of the membrane will be forced outwards until small bladder-like protrusions may be seen. Sometimes one of these protrusions will (in consequence of the very thinned state of the part of the membrane which forms it) give way, and the case is at once converted into one of perforation, for, the external air being admitted into the tympanum, the lining membrane of this cavity becomes a suppurating surface; in other words, the opening is a fistulous one. In order to obviate this I have occasionally had recourse to the following device. The patient is taught to make a small, flattened disc of moistened cotton, and to adjust this on to the membrane; the support thus formed is worn throughout the whole or a part of the day. After this plan has been pursued for some time it is not uncommon for the membrane to regain its tenseness, and thus the ligamentous support which it habitually gives to the malleus is restored.

As might be expected, from time to time many attempts have been made to establish a more or less permanent opening in the tympanic membrane in cases of long-standing chronic catarrh, for it has been found that better hearing has frequently followed an artificial orifice in this structure, but has not been maintained for more than a few days, owing to the ready way in

which incisions in the membrane heal. Small pieces have been cut out, but with a similar result. The nearest approach to success in this direction has been achieved by Dr Politzer, who after making an opening with a knife in the posterior section of the membrane, introduced a little eyelet made of hard rubber, and having a groove in which the edges of the cut membrane rested and thus held it in position. Into the eyelet is fixed a piece of silk which lies in the

FIG. 30.—POLITZER'S EYELET.



meatus, so that there is no fear, if the little instrument slipped into the cavity of the tympanum, of giving the trouble of recapturing it. In a good many cases the eyelet will remain for several weeks, and occasionally for months, in the position in which it has been placed, but it will sometimes be necessary to insert a fresh one, as the first more often than not slips out after a short time.

After the eyelet has been finally removed the small artificial perforation very rapidly heals, and it is this general tendency of the tympanic membrane to heal which makes all operations of this kind so uncertain in their permanent effects. Indeed, as a matter of fact this method has not been successful, and has been discontinued even by its originator, but it is necessary to refer to it as showing the direction which is taken in efforts to relieve pressure. Whilst on the subject of operations in chronic catarrh of the middle

ear, I may mention one that was in 1868 introduced and practised by Dr Weber-Liel of Berlin—division of the tensor tympanic muscle. Whenever there has been obstruction in the Eustachian tube or tympanum we have seen that the tympanic membrane becomes indrawn, the ossicles rotated more than usually inwards, and consequently the stapes unduly pressed against the fenestra ovalis. As a consequence of this, there will be intra-labyrinthine tension, and from the position assumed by the tympanic membrane it will follow that the tensor tympani may become subject to permanent shortening. The object in view in division of this muscle is plain, viz. to set free as far as possible the tympanic membrane from the effects produced by muscular contraction, and thus indirectly relieve tension within the labyrinth. It is now about twenty-two years ago (speaking in 1892) since the results of this operation were reported in detail. I have now to remark that what applies to every new operation in surgery applies to this, viz. that it is certain to obtain a fair trial, and if its results are good it will receive due recognition in the course of years. When the International Medical Congress met in London last, one of the subjects which was discussed by the leading aural surgeons of all countries was "the value of operations in which the tympanic membrane is incised." On that occasion there was no voice to say a word in its favour. The meeting was a very large one, and the subject was discussed in the most exhaustive manner; the result being a confirmation of the opinion which has been

expressed by Professor Politzer as follows: "Division of the tensor tympani is, therefore, one of those operations which not only are of but trifling use, but which sometimes also have a deleterious influence upon the function of hearing."

There is no doubt that in a certain proportion of cases of what is spoken of as proliferous catarrh, the dry state in which there is no excess of mucous secretion, the hearing power improves when a longitudinal incision is made in the posterior section of the membrane. A certain amount of relief in tension is given when the incision is made, it is not productive of harm, and the opening heals in a few days. The permanent effects are, however, not sufficient to afford reliable data. There is no question as to the relief afforded by incisions into the membrane in the cases where viscid secretion within the tympanum does not disappear under ordinary treatment, and where it can be expelled through the incision by the patient blowing through the opening with the mouth and nose closed. More than this it would not be right to say.

It is, comparatively speaking, a rare circumstance for the effused secretion in the tympanic cavity to remain for any lengthy period in a perfectly fluid condition, and it is still more rare to meet with cases in which the fluid state can be demonstrated by sight. A case is reported by me at some length in the 'Practitioner' for April, 1872. From the very clear account given by the patient the tympanum had been the seat of this change for at any rate three weeks, and possibly for much longer. The tympanic mem-

brane retained a perfectly healthy appearance. While the patient inflated the tympanum on the Valsalvan method there was the "most distinct appearance of fluid running slowly down the interior surface of the membrane. I can compare it to nothing better than drops of water collecting and running down a pane of glass that is being rained upon. After using Politzer's inflation the fluid seemed to be dispersed into drops and bubbles, and then to collect and roll down."

Instances of this kind may be regarded as merely unusual phases of catarrh of the tympanum, and their treatment demands no special notice. The patient I referred to recovered completely after the air douche, though the catheter had been used for only six times. In very obstinate cases it may possibly be found necessary to make an incision into the membrane, and thus bring about the evacuation of the fluid.

In all I have said on the subject of treatment no mention has been made of blisters as applied over the mastoid process. If I shared the opinion, still retained, I believe, by some, that the chief available resources for treating diseases of the ear consisted in the use of the syringe and blisters, I should have hesitated before I criticised unfavorably one of these agents, lest I should haplessly leave myself with only one to fall back upon. An exaggerated idea of the potency of blisters behind the ear is not altogether to be wondered at when we remember that it has been a time-honoured practice to advise this application for all acute, chronic, inflammatory, and non-inflam-

matory affections of the external, middle, and internal ear.

So common is it even now, that it is rare to meet with a patient suffering from disease of the ear of any long standing who has not, at one time or another, been subjected to this favourite and fortunately harmless remedy.

In an article on counter-irritation by Dr Dickinson in the 'St. George's Hospital Reports' for 1868 the empirical manner in which blisters are ordered by practitioners of successive generations is graphically shown. Wholesale blistering behind the ear must be added to the list of examples there recorded, where counter-irritation is prescribed in a truly irrational manner.

They are, I think, useful in the extremely uncommon condition of serum in the cavity of the tympanum, and this on the principle that the vesicated surface has a vascular connection with the cavity to be acted upon. In this way the withdrawal of serum by means of blisters may be expected to excite the resumption of the effused serum by the blood-vessels. This is probably the reason why they do good, as they certainly do, in cases where the facial nerve has been partially paralysed after an attack of inflammation of the tympanum, for it is to be remembered that the portio dura passes through the cavity and is protected by a thin plate of bone, which forms the aqueduct of Fallopius. This plate of bone is not only very thin, but is sometimes perforated by small holes. When in this state the nerve is more than usually exposed, and

so suffers during inflammation of the tympanum, which need not necessarily be so severe as to destroy its bony protection, but sufficiently so to affect the nerve.

Let us briefly review the difficulties which present themselves in forming a diagnosis of the condition of the middle ear in non-purulent catarrh, and giving an opinion as to the results to be expected from treatment. We have seen that simple Eustachian obstruction which has not involved the tympanum is alike easy of diagnosis and treatment, and that the subjects of this will get well if treated within reasonable time. That when the affection has extended to the whole of the middle ear, so long as it is not of very long standing, recovery may be expected, and that the treatment consists in the main in the air douche regularly applied with Politzer's inflation, or the Eustachian catheter, and solutions injected to the lining membrane throughout the middle ear. That if this unhealthy condition of the middle ear be allowed to exist unchecked for some time, as in the case of some other morbid processes, it may arrive at a state of quiescence, and that certain pathological products, having their seat in the tympanum, result in consequence, which products, having assumed various forms in this situation, will so act as to become impediments to the passage of sound to the labyrinth. That the forms which these products take are most varied; that it is frequently with the greatest difficulty they can be estimated during life, but that upon these forms depends the answer to the question whether the disease

is remediable or not. Lastly, that we must at times be content to act on certain general principles in such cases, in the confident expectation that in whatever proportion we can soften or remove these results of disease which are obstructing the passage of sound through the tympanum, so will the hearing power improve.

CHAPTER VII

The affection of the tympanum next in order is that in which inflammation of the mucous membrane has proceeded to the formation of pus; hence the term commonly applied to it—namely, acute purulent catarrh. The most usual circumstance under which this occurs is an attack of some one of the exanthemata, most commonly scarlet fever, the inflammation having spread up the Eustachian tube from the throat. It is also met with independently of these diseases, and often cannot be traced to any exciting cause, at least so far as can be discovered. In this case the inflammatory action begins in the tympanum. It commences with an earache; the pain increases in severity until it is of the most agonising and sickening character. General feverish symptoms soon set in. On examination of the tympanic membrane there is in the early stage little change to be seen beyond congestion of the vessels, and the external meatus is not affected. Inflation of the tympanum aggravates the pain, and there is more or less deafness. This latter symptom varies very much. Some patients are extremely deaf, and others very slightly so. There is nearly always tinnitus, and sometimes it is severe. The act of swallowing increases the pain, as does also

any movement of the head. If allowed to proceed unchecked, in from forty-eight hours to three or four days the membrane gives way, a discharge of pus appears, and the tension being thus relieved the pain ceases. Such is the ordinary course of an acute attack of inflammation of the tympanum. In scarlet fever the same process goes on; but, on account of the more serious symptoms which endanger life engrossing the attention of the friends (this especially with children), the symptoms referred to the ear are not regarded; and it appears, although no explanation has been offered for the fact, that, when accompanying the exanthemata, inflammation of the tympanum does not give rise to so much pain as in the catarrhal variety. It does not invariably happen that all cases of this kind eventuate in a perforation of the membrane. The pus may pass into the pharynx through the Eustachian tube; but this mode of escape is very seldom practicable, as there is so much swelling of the lining membrane of the tympanum that the tympanic opening of the Eustachian tube becomes obstructed. If a case is seen in the early stage, before the formation of pus, the attack may be cut short by putting on leeches in front of and behind the ear, followed by fomentations. The pain will sometimes subside after this, and the patients recover. If this does not happen, the injected condition of the vessels on the tympanic membrane is succeeded by a sodden appearance. Before the membrane gives way a distinct bulging of some part of the membrane may sometimes be detected. Whenever this can be seen no time should be lost in giving

free vent to the pus by making an incision in this situation; and even if this distinctive appearance is not observable, so long as there is sufficient evidence of purulent matter in the tympanic cavity, there can be no question of the propriety of making an opening. The incision should be about two lines long from above downwards, and may be made with the little straight-bladed knife which I have previously mentioned. Of course at the time the mirror will be worn upon the forehead, and light be thus directed down the speculum when the incision is made. If the membrane does not show symptoms of giving way in one particular spot, about the middle of the posterior section, and in a line with the handle of the malleus, is the position generally selected for the incision. After this the patient should be directed to expel the secretion through the opening by blowing with the mouth and nose firmly closed; then fomentations should be applied, and, if any discharge, the ear syringed frequently with warm water. To thus provide an exit for purulent matter in these cases is demanded by the recognised rules of surgery which guide us in similar instances; and if an examination of the tympanic membrane were more usually made, disorganisation of the tympanum and ulceration of the membrane causing partial or complete deafness, besides the later occurence of cerebral abscess and secondary deposits, would be more uncommon events than they are now.

As the external or dermoid layer of the tympanic membrane will then be the first to become involved in

PLATE III.

Suppuration in Cavity of Tympanum; Membrane bulging.
Left Ear.

West, Newman chromo.

the course of inflammation of the external auditory meatus, and the internal or mucous layer in the course of inflammation of the cavity of the tympanum, so the one or the other may proceed inwards or outwards, thus involving the middle or proper fibrous layer in its course. It is extremely unusual for the membrane to be primarily affected, and the disease spoken of as myringitis is for this reason, I believe (except when it has been locally irritated or subjected to a sudden blast of cold air), much rarer than what might be supposed from the accounts that have been written of an affection to which this name is applied. A case to which this term would perhaps apply occurred in a boy whom I saw a few hours after he was taken with pain in the ear after a *coup de vent*. The tympanic membrane was at that time injected, so that the filled vessels could be traced out in their course; the next day a very network of vessels, so that it looked almost purple; there was great tinnitus, acute pain, increased on inflating the tympanum. He was scarcely at all deaf. Leeches and fomentations formed the treatment, and in a week all unpleasant symptoms had gone, the handle of the malleus was again visible, and, excepting an absence of lustre, there was nothing unusual in the appearance of the tympanic membrane.

A very large number of the patients who come to the hospital for advice in the department for diseases of the ear are the subjects of a purulent discharge from either one or both ears. So common a symptom is this, that among the questions which are asked them in the ordinary routine, before an examination

is made, is the one of Have you ever had a discharge from the ear?

In case of any patient suffering from this symptom, which is spoken of by some writers as otorrhœa, in most instances it will be found to be accompanied by a perforation in the tympanic membrane. If this can be seen upon inspection, or if the patient can, with the mouth and nose closed, blow through the external meatus, or if, on syringing the ear, the water passes into the throat, the evidence is conclusive. Any one of these methods of examination may, however, for various reasons to be mentioned further on, fail in demonstrating a perforation, even if one be present, so that it will be necessary not to rely too completely on them individually. For example, it is sometimes impossible to detect a small perforation in the anterior and inferior part of the membrane. Some adults do not readily learn how to pass air through the Eustachian tube; and without the hole in the membrane be very large, in syringing, the water does not pass down the Eustachian tube; and, again, the passage into the pharynx may be obstructed.

Politzer's method will overcome any mere obstruction, and the air will pass out of the perforation with a squeaking sound that can hardly be mistaken. If the Eustachian tube be occluded this method for diagnosis is not available; but under these circumstances the perforation is generally large and of long standing, so that it can be easily seen. Even if its position is one that can be readily seen, occasionally, where the loss of tissue has been very slight, a perforation may escape

notice. In such a case as this, if, while the membrane is under observation, the patient be directed to blow through the rupture, the sides of the perforation will become separated, and on this movement being suspended, will be observed to fall back again into position.

An appearance that is not at all uncommon in these cases, and one that was originally pointed out by Sir William Wilde, is a pulsation taking place synchronously with that of the arteries. This, it would appear, is dependent on a drop of fluid being in contact with a blood-vessel on the swollen mucous membrane lining the tympanum, for it will disappear sometimes when the spot is carefully dried. The presence of fluid, however, is not always necessary for this appearance to be observed, and it will therefore occasionally be constant. Having established without doubt the presence of perforation, the next question is, To what does it owe its existence?

Of all causes of perforations the purulent catarrh of scarlet fever is the most frequent. The extent of disorganisation which the cavity and contents of the tympanum undergo will in a great degree be proportionate to the length of time which the catarrh may have lasted before the purulent matter has found an exit. If this event be long delayed the ossicles may all come away; there may be necrosis of the petrous part of the temporal bone; from time to time pieces of dead bone which in their entirety represented the labyrinth will become loose in the meatus, and may be drawn out; all this of course producing total deafness,

and in children being a fruitful source of deaf-mutism. The sooner, therefore, the tympanic membrane gives way, if it does so at all, the better; for when this takes place early in the course of the affection there will be less change wrought in the parts behind this structure. Less frequently than scarlet fever as a source of perforations are the other exanthemata, measles and erysipelas ranking perhaps highest in the list. Without any assignable cause infants are the subjects of purulent catarrh of the tympana, which passes unnoticed until shown by a discharge from the ear, and even then does not seem to give much anxiety to the parents, if we are to judge by the casual way in which this symptom is frequently mentioned as having gone on for years. There is little doubt, however, that the inflammation in the case of these little patients begins in the cavity of the tympanum, and they suffer from earache and cry, but are unable to direct attention to the seat of pain. The infantile tympanitis has been pointed out by Mr Hinton as being in all probability sometimes the unrecognised cause of convulsions. The extreme pain of the affection, the close proximity of the brain to the affected part, would be very much in favour of such an hypothesis.

With patients who have previously had attacks of non-purulent catarrh slight exciting causes are sufficient to lead to a rupture, as in their case the membrane has been the seat of various changes that have rendered it especially prone to give way under circumstances which in health would have been very inefficient to produce this lesion. It may be said generally

that perforations owe their origin to causes situated behind the membrane. Among the exceptions to this rule are accidental perforations, and those arising from diffuse inflammation of the external auditory meatus. This latter class is much rarer than is generally supposed; still more rare is what has been stated by some observers to result in a perforation—viz. minute abscesses situated in the substance of the membrane itself.

It must not be supposed that in every case of a perforation we can obtain a definite history to account for it. It is often impossible to get any history at all. Patients will sometimes say that they have gradually become deaf, and that a few days before they apply for relief they noticed a slight moisture at the external orifice, perhaps preceded by a feeling of uneasiness. Badly fed, unhealthy, tuberculous patients are sometimes in this case; and occasionally in the last stage of phthisis, a few days or hours before death, the tympanic membrane gives way without any premonitory pain.

Scalding will occasionally give rise to a perforation. I have seen several instances of this. One occurred in September, 1871, when a teapot of hot water was spilled over a child's head. The introduction of irritating lotions prescribed by quacks must not be omitted. I was once consulted by an apparently intelligent person, who for a temporary deafness, which, by the way, afterwards became permanent, had been induced to put urine into the ear; the effect of it was inflammation, and subsequently perforation,

of the membrane. These, however, should come under the category of perforations the result of accident, or rather of folly.

Having ascertained, then, as well as we can the causes of the loss of continuity of the tympanic membrane, on proceeding to examine a number of cases we shall find that the appearances present great variations as to size, shape, and position; while some are nothing more than a small circular hole, as if made by a pierce from a needle, almost complete absence of the membrane will be seen in others—not total destruction, as there will generally be a rim, however slight, which marks the position previously occupied by the healthy structure. Between these two degrees "an infinite variety."

But, notwithstanding this, in examining a large number of patients with perforations we cannot fail to be struck with the similarity which often one case will bear to another. I mean, we can at times say on looking at one patient, "This is very like the appearance in So-and-so's ear;" thus there will be typical perforations as well as typical disease of any other kind. It is almost unnecessary to say that the ear should be carefully syringed before anything at all can be made out in looking at a case for the first time where discharge has been allowed to go on for a long time without anything being done for it.

In the largest forms of perforation, that part of the meatus close to the membrane is very red and swollen with its granular surface continuous with the cavity of the tympanum, the mucous membrane lining this in

PLATE IV.

A Typical Perforation of Membrane, in which all Membrane has been lost; Malleus remaining. Right Ear.

West, Newman chromo.

like manner so red and swollen that it is impossible at first sight to distinguish any individual part, the whole looking like a cup-shaped cavity. On closely examining it a rounded prominence may be distinguished, the promontory; in front of this a depression indicating the direction which would lead into the Eustachian tube. This is about all that can be made out. If, however, under treatment, the spongy condition of the mucous membrane becomes more healthy, the upper part of the malleus may be detected (the handle in these cases is generally gone). It is not very uncommon where the malleus retains its position to find the posterior section nearly all gone; the posterior border of the malleus is then free, and the anterior section of the membrane remaining; or, again, triangular pieces of membrane may be absent, the apex of the triangle being represented by the umbo.

Whenever the support which the tympanic membrane gives to the malleus is removed by part or all of the membrane being lost from ulceration, the handle of this bone becomes drawn upon by the tensor tympani, so that the handle is seldom seen by itself dividing the opening into the tympanum in two halves as one might expect, but becomes tilted inwards, so that it is difficult to recognise it; but more generally than not where the loss of the membrane has been very extensive either the handle becomes detached or the whole bone is lost.

Again, where the destruction of the membrane has been very complete, and the malleus and incus have come away, it occasionally happens that the position

of the fenestra rotunda and the stapes (or rather a part of it) may be seen, the first being behind and the second above the promontory. Another common appearance is when the perforation has the shape of a kidney with perhaps clean sharp edges, the extremity of the handle of the malleus marking, so to speak, the hilus of the kidney. A slit-like opening, as if produced by an incision with a knife, or a little round hole, as if punched out of the membrane, either in front or behind the handle of the malleus, are also among the forms chiefly met with.

The experience of Sir William Wilde would lead him to think that the anterior section of the membrane is the more usual situation for a perforation than the posterior, and this because (he says) of the pressure of air from the Eustachian tube falling directly on to this part. For myself I have not noticed in those cases where the handle of the malleus has remained fixed in the membrane that the perforation is more frequently either anterior or posterior to this boundary line. The edges of a small perforation will be sometimes sharply and cleanly defined, at others rugged, with a red upraised edge, and the general appearance of a perforation will alter very considerably during the course of treatment. We can, however, fancy how multitudinous are the appearances, when at one time part of the malleus, at another the whole of this bone, at another part, or the whole of the incus as well, and sometimes the stapes, have come away. Added to this, that what remains of the tympanic membrane may, in part or altogether, have contracted

PLATE V.

A Typical Perforation of lower half of Membrane (reniform).
Left Ear.

West, Newman chromo.

adhesions to the walls of the tympanum, for so soon as the support which in health the malleus affords to the membrane is withdrawn, there is often a complete or partial collapse of the remaining portion of the membrane. Instead of describing in greater detail all the appearances that are met with, it will be more useful to observe them as they actually come under notice in the cases. I may add, however, that I have on several occasions observed a double perforation—by this I mean two small perforations in the same membrane—each time both perforations were in the same section of the membrane, *i. e.* either in front of, or behind, the malleus.

Leaving till later on the consideration of the fatal effects succeeding a perforation in consequence of the brain becoming affected, or pyæmic deposits taking place, I may say that it is for the discharge from the ear and the accompanying deafness that patients apply for relief.

In the course of scarlet fever, while suppuration is going on in the cavity of the tympanum, the labyrinth may be implicated, and in a few hours total deafness may result. If the bone becomes diseased, and the part forming the labyrinth necroses and comes away, the same effect will of course follow, and both states are, I need not say, irremediable. Generally, however, the deafness is not extreme—that is, not so much as to require a very loud voice close to the ear. The extent of this symptom cannot be measured by the size of the perforation. Very fair hearing will be found with almost total loss of the membrane, and

very considerable deafness with very small perforations. Indeed, the amount of tissue lost has, I have convinced myself, very little to do with the amount of hearing lost. On this point Dr Adam Politzer says, "The patient hears better as a rule when the perforations are of medium size than when they are very small, because in the former case the sonorous waves, avoiding the membrana tympani, malleus, and incus, pass through the perforation directly upon the base of the stapes, and may thus reach the labyrinth to quite an extent." And Sir W. Wilde says, "I have observed that when once the tympanal membrane has become permanently open, the larger the aperture the greater the amount of hearing, provided no further mischief has taken place, and that there is a slight ring or circle of the membrane still remaining."

The loss of hearing, I believe, almost entirely depends on the effects which the suppurative process has produced within the tympanum. The whole lining membrane of this cavity is altered; there may be anchylosis in any part of the chain of ossicles, or of the stapes into the fenestra ovalis (this produces very great deafness), absence of any part of or all the ossicles, the formation of adhesions connecting them to the walls of the tympanum, thickening of the membrane covering the fenestra rotunda, and a variety of other changes, all of which have been found on examination after death.

The constant discharge of pus (secreted from the lining membrane of the tympanum) through the per-

foration keeps it open, and if the secretion in the tympanum ceases, perforations gradually heal. The first consideration in the treatment of these cases should be to induce a healthy condition of the mucous membrane throughout the middle ear. This result may be accomplished in two ways. First, by the application of appropriate solutions to the whole of the lining membrane of the middle ear; and secondly, by the protection of the tympanic cavity from the external air. Before the application of any solution to the surface referred to, it is a most necessary preliminary step that the ear should be thoroughly cleansed (by syringing) of all accumulation of purulent matter. In order to accomplish this it is not only important that the patients should be supplied with a convenient form of syringe and taught how to use it, but they should also be instructed how to blow through the perforation whilst the stream of water is injected into the ear; for in this way the accumulations of pus and general *débris* are expelled from the tympanum and washed away.

Of course, in the case of children, the attendant must have charge of the syringe, and very young children are not readily taught how to blow through the ear. The same proceeding, viz. blowing through the perforation, must be adopted when the lotions that are used are placed in the meatus. As the fluid is thus made to bubble in the ear, if the blowing be suspended for a moment some of it will pass down the Eustachian tube into the throat, and be known to have done so by the taste. We may be sure, unless this takes place, that the remedies, whatever

they may be, have not been properly applied. At one time I, in common with most other surgeons, was in the habit of ordering solutions containing some mineral astringent such as sulphate of zinc. For many years past I have discontinued this practice, as experience has taught me that mineral astringents are not advisable; for although their employment will be found for a time to diminish the discharge, it will return in a short time after they are discontinued. Moreover the hearing power does not receive permanent benefit from such treatment; indeed, the reverse of this is the case. Amongst the best kind of applications will be found weak solutions of alcohol. These should be used at first very dilute, such as one drachm of spirit to a third of a tumblerful of warm water, and the strength may be gradually increased until a slight burning sensation in the ear follows the injection. Anything stronger than this, *i. e.* enough to cause pain, will be too strong. Some patients will in time bear as much as one part of spirit to the other of hot water, but not many.

It would serve no useful purpose to enumerate all the solutions or local applications that have been used and are used to the surface of the tympanum which is exposed to atmospheric influence by a perforation of its protective membrane, some with benefit and some with results very much the reverse, and this whether the application take the form of solution or powder. Suffice it to say that the very aspect and condition of the surface will suggest what is most likely to prove of service. Some perforations are irritable and painful

under manipulation, and intolerant of interference, showing this intolerance by pain and increased discharge. Others are insensitive, indifferent to manipulation, and no local application seems to irritate them. Thus, then, they require management rather than remedies, and experience looks very dubiously upon any new application that is recommended as of universal benefit to perforations.

I shall speak soon of the second and more important part of the treatment of perforations, viz. the protection of the tympanic cavity from the external air, but it should be mentioned that the dry management of perforations is often most useful. I refer to the insufflation of boracic acid finely powdered, gallic acid, and iodoform. Before using any of these the meatus must be carefully syringed, and the whole surface (including the perforation and tympanic cavity) dried with absorbent cotton fixed on the end of a probe. Of these powders it will be found that iodoform is frequently productive of pain, and so cannot be used; and that if this applies to the use of anything, whether it be powder or solution, it must be discontinued. Indeed, some perforations will not even bear syringing with simple warm water, and then they must be cleansed with absorbent cotton.

Another plan of applying solutions to the lining membrane of the middle ear was introduced by Dr J. Gruber, of Vienna. The patient bends his head to the affected side; he then with a small syringe injects some of the solution into the lower nasal meatus of that side, and, holding the nostrils firmly between his

fingers and keeping the mouth closed, blows the solution into the tympanum and through the perforation. This is not so complete and cleansing a process as the other, in which the solution is passed in a contrary direction; it requires more intelligence and trouble on the part of the patient than is always met with, and is inapplicable for children.

If there is a temporary obstruction of the Eustachian tube, it may be overcome sometimes by injecting a little water through the Eustachian catheter if it does not yield to the air douche.

There is an especial form of perforation of the tympanic membrane which, unless one is acquainted with it, may escape observation. It is perforation of that portion of the membrane which I mentioned as going by the name of Shrapnell's membrane, viz. the small area just above the head of the malleus. Shrapnell's membrane covers a little cavity in the bone, which communicates more or less with the general tympanic cavity proper. I have seen perforations of this part present with good hearing, as well as with indifferent hearing. In the former case the inflammatory process has been confined to the small space; in the latter both the small and general cavity have been simultaneously affected. Perforations of Shrapnell's membrane are often associated with a small area of dead bone, and this is not an unusual spot from which arises a polypus. Those also who are the subject of this form of perforation suffer occasionally from acute attacks of pain, especially severe at night. These attacks are liable to be mistaken for neuralgia by those who are not

PLATE VI.

Perforation of the Membrane of Shrapnell; the Membrane proper not affected. Left Ear.

West, Newman chromo.

familiar with this aspect of ear disease, and so the importance of the pain does not attract the attention which it merits; for when the position of the exposed surface is considered, it will be seen what an exceedingly important bearing it has to the always possible complications of intra-cranial inflammation. This question has repeatedly been brought before my notice in fatal cases which I have attended; for a post-mortem examination has shown that this has been the precise spot from which infection arose when cerebral abscess was found. The perforation, therefore, of Shrapnell's membrane possesses an interest and a gravity that has not been noticed as it deserves to be, and shows the desirability of extreme accuracy in examination of all perforations.

Having considered the general principles of treatment in cases of perforation of the tympanic membrane, there are some other matters connected with these cases which remain to be noticed in regard to the protection of the tympanic cavity from the external air and pressure on the ossicles.

It is not necessary here to refer to the history of the

FIG. 31.—THE ARTIFICIAL MEMBRANA TYMPANI (*Toynbee*).

introduction of the so-termed artificial membrane by Mr Toynbee and Dr Yearsley respectively. An account of the one can be seen in Mr Toynbee's

work on the ear, and of the other in the 'Lancet' for July 1st, 1848. The one consists of an india-rubber disc fixed to a piece of silver wire, and worn in the position occupied by the tympanic membrane; the other of a small plug of cotton moistened with water or glycerine, and adjusted by the patient with the

FIG. 32.—FORCEPS FOR ADJUSTING COTTON.

help of a pair of forceps to the same spot. The latter form is the more simple of the two, and when it produces equal improvements in hearing to what is done by the other it is by far the more preferable, its tendency being for good on the exposed surface of the tympanum, while the effect of the india-rubber disc if not unfrequently irritating, and increases the discharge. In a minor degree these remarks apply to any modifications of Toynbee's artificial tympanum that have been introduced. They must of their very nature be unclean, and it is of all things important that whatever substance is worn as an applicaiton to the exposed mucous membrane of the tympanum should be changed at least once in the twenty-four hours. Judging only by the appearances of a perforation, no amount of experience can detect for certain whether a case will be benefited by any form of artificial support. In each one the effect of applying it should be noted. After a few attempts the patient soon learns to adjust it, and, when he has had a little practice, can direct it to the exact spot requiring pres-

sure far more readily than any one can do it for him. The effects of this mechanical aid to hearing do not arise from supplying the place of the natural membrane as a surface on which to receive and through which to communicate vibrations of sound to the labyrinth, nor, as Mr Toynbee at first supposed, by confining the vibrations of sound to the tympanic cavity, but by exerting the requisite pressure on the stapes, and so on to the fenestra ovalis. So long as this be exerted it were better, so far as hearing is concerned, for the perforation not to be closed artificially, but to allow sonorous vibrations to pass directly through the tympanum ; for a piece of india rubber or a plug of cotton is the reverse of susceptible to vibrations of sound, and, as far as a conducting medium is concerned, is rather in the way than otherwise. In cases of perforation the normal pressure of the stapes becomes altered as the support which the tympanic membrane in health gives to the ossicles is more or less taken away, and in cases where the malleus is gone it is completely so. The increased hearing may therefore be said to be produced by approximating the articulations of the ossicles, or supplying their place when these bones are partially wanting.

This was in substance the explanation offered by Dr Yearsley, and subsequent experience has proved it to be a correct one.

There are possibly a few isolated cases in which the india-rubber disc will produce good effects on the hearing when the moistened cotton fails, and *vice versâ ;* but generally if the one succeeds the other

does so as well. Although I have known Toynbee's artificial membrane to be worn for years, it very often gives rise to great discomfort, and sometimes is intolerable to the patient, so that whenever the moistened cotton effects good hearing I always recommend it.

In applying Toynbee's artificial membrane or any modification of it, the disc should be cut as near as possible to the size of the natural membrane, moistened with warm water, and gently pressed down the meatus; when it has arrived at the right place there is generally a little click, and it comes to a stop. The sensations of the patients are also a guide in this respect, as, if it is successful, they instantly hear better. Great gentleness should be used in introducing this or the cotton. In the latter case the pledget of cotton should not be large enough to block up the meatus; there ought to be plenty of room between the cotton and the walls of the meatus for sound to pass to the tympanum. If by these means we can produce good hearing, the patients, be sure, can do as well and (as I said before) better, so that they must take the trouble to learn, and an intelligent person will not be very long in doing so. Instances out of number might be recorded where the subjects of perforation of the tympanic membrane, by using this simple contrivance, are enabled to hear quite sufficiently for ordinary purposes, and when not wearing it are quite useless for conversation.

We must not be too hasty in giving a decided opinion as to whether the hearing is likely to be improved by the cotton. If we do not succeed in making the

patient hear on the first attempt we may do so subsequently, and pressure should be made at the same sitting several times. If we too hastily say of a case, "This will not improve with a cotton pad," it is not altogether impossible that we may find some one else has succeeded where we have failed, and this because we perhaps, in our haste not having exerted pressure on the precise spot required, on the first attempt, have not tried again.

I may here say that, so far as the shape of the cotton support is concerned, there is room for very great ingenuity, not only as to the size and shape that may be most advisable, but also as to the manner in which pressure may be applied to the tympanum in such a way that the normal pressure on the stapes may be artificially imitated. Nothing short of the most patient and painstaking practice will give skill in this matter.

The principles, therefore, that should guide us in treating all cases of perforation when the conducting part of the auditory apparatus only is at fault, that is, when the labyrinth remains unaffected, may be summed up by saying that the cavity of the tympanum should be kept free from secretion, that the lining membrane of the middle ear should so far as possible be restored to health, and that the artificial support of which I have spoken should be tried. This routine will be found to apply, however long the patients may have suffered, or however recent the affection, and this irrespective of the amount of tissue destroyed by ulceration. Generally speaking, I find

that a perforation of large or moderate size receives greater benefit from treatment than a very small one, and this I attribute chiefly to the fact that in the former cases we can more easily treat the diseased part behind the membrane. In some remarks I made on the subject in the 'Lancet' of August 20th, 1870, is the following sentence:—"When the disease appears to be tympanic, but when after treatment the condition of the lining membrane of the tympanum and Eustachian tube has become satisfactory, without a corresponding change in the hearing, and when the artificial membrane of cotton has no effect, I cannot but think that if the history and symptoms be carefully investigated, there will generally be found a sufficient explanation in the co-existence of a nervous affection with the perforation and tympanic disease; and I would urge the importance of recognising this condition, as it is only by so doing that those cases which admit of treatment and those which do not can be properly separated." A sketch of a pronounced case of this kind will give an illustration.

A patient of from thirty to forty or fifty years of age, who is the subject of perforations which date for many years back, perhaps from childhood, has had moderately good hearing, with very slight variations, until within a few weeks of being seen. He may say that two months previously he became more deaf than usual, and that now his deafness is extreme; he has occasional fits of giddiness and constant noise in both ears; is getting worse. A vibrating tuning-fork placed on the head is not heard at all. It

requires very little questioning to recognise in this state of things an affection of the labyrinth of a kind which might have been present without any disease of the tympanum, and it is, of course, irremediable. In other words, there is an affection of the nervous structures in addition to that of the conducting apparatus. This is an exaggerated case, but in a minor degree any one or all of these symptoms may be discovered, and will account for the failure in the ordinary treatment. When we experience a disappointment in the effects of our remedies we must look for something beyond the middle ear. Try how the vibrations of a tuning-fork are heard on the head; they should be heard as well with a perforate as an imperforate membrane. Put the questions, "Are you more deaf after fatigue or excitement?" and "Have you been getting steadily worse since any particular date?" If local causes (by this I mean what are situate in the middle ear) will not account for such a change it is a bad sign. Tinnitus, especially severe tinnitus coming on and remaining constant with periodical attacks of giddiness, is among the unfavorable symptoms which will elucidate the painful nature of the case.

Questioning of this kind should in every case be put when a patient is seen for the first time, and the responses will influence any opinion that may be formed as to the chances of recovery from the impaired hearing.

The exposed surface of the tympanum, when there has been a perforation of long standing, will often be

covered with exuberant granulations. This state is not confined to the cavity of the tympanum, but it is not unfrequently seen on the surface of what remains of the membrane; also when the meatus has been the seat of inflammation I have seen the tympanic membrane unperforated and covered in the same way. Whatever the position of the granulations the same treatment will be found most useful.

After the ear has been syringed and carefully dried with absorbent cotton, a little powdered gallic acid may be blown with a small tube, easily made for the purpose, on the exposed tympanum. Or, perhaps, dilute solution of alcohol may be used twice daily. By these means, in a very short time, the granulations disappear and the surface becomes more healthy. A strong solution of nitrate of silver, ʒj to the ounce, applied on a brush in the same way has also sometimes a very good effect, but the patients should not be trusted with this, as they cannot apply it without painting the whole meatus with it each time, and this of course is not desirable. It must be applied by the surgeon through a speculum while the reflector is worn on the forehead. In using the solid nitrate of silver it is convenient to melt a little in a porcelain dish and dip the end of a probe into it, so that when it cools, the probe thus armed does for a caustic holder.

In the course of treatment of the perforations, it is necessary when it exists to relieve obstruction of the Eustachian tube either by Politzer's method or with the catheter; but if there is occlusion, neither of these

plans, of course, is likely to be useful. By "occlusion" is meant where cicatricial tissue completely closes the tube, the position of this being the tympanic orifice. This condition is never present unless there has been great disorganisation of the tympanum; and the extreme deafness in these cases in all probability depends on this rather than on the closed tube, and, as a rule, in such instances artificial support does not do much good. This is, however, subject to occasional exceptions.

Amongst these exceptions was a case I saw of a gentleman thirty-two years of age, who had an occluded Eustachian tube and a large perforation of the tympanic membrane on the left side, the result of scarlet fever in childhood. He had worn the cotton pad for ten years, and could with it hear conversation extremely well, but without it could not distinguish a word, even if spoken close to the ear. It was a fortunate circumstance for him, for he was on the right side totally deaf. But as a rule, with these cases, all we can do is to check the discharge and induce a healthy state of the tympanum. Even if no more is effected than this, it is by no means a small boon for a person who has suffered for a long time, years perhaps, from a discharge from the ear, to be free from it; and, putting out of consideration the comfort of the patient, it should never be forgotten that any person with a perforation of the tympanic membrane and a discharge from the ear is more or less in danger of losing his life. It is but a very thin plate of bone that separates (as we know) the tympanum from

the interior of the skull. Suppuration in the tympanic cavity may at any time give rise to caries of this septum, the effect of this being meningitis, abscess in the substance of the brain, or purulent deposits from pyæmia. It is, therefore, no less necessary to attend to the discharge than to the deafness, or, to speak more correctly, the local condition of the perforate tympanum from which the discharge proceeds. Another serious and a not uncommon complication is when the lining membrane of the mastoid cells becomes the seat of inflammation. This, if neglected, may lead to a fatal result; but I hope to show that with proper and well-directed attention such a conclusion to cases of this sort may be avoided. On comparing the temporal bone of a child under twelve months of age and one from an adult it will be seen that in the former case the mastoid process is imperfectly developed, and that the cells in this part are on a level with the tympanum, that a continuation of the same plate of bone separates that cavity and the mastoid cells from the interior of the skull; and that therefore in the infant, if disease proceeds inwards, or rather upwards, from the mastoid cells, the dura mater and the cerebrum are the parts that become affected. After two or three years, however, the bony septum is much thicker, and the mastoid process and cells become developed inferiorly and posteriorly, so that in a temporal bone of an adult, if we break into the mastoid cells from without and hold the bone up to the light, we shall see that the cells are separated from the lateral sulcus inside the skull, and therefore, on disease proceeding inwards, the lateral

sinus and cerebellum will, in adult life, be the parts involved.

As later on I shall speak of fatal cases I say no more on this subject at present; but to look back to an earlier part of the history of these patients, whether it be a child or an adult with a perforation of the membrane, where there is pain, swelling, redness, and pitting on pressure over the mastoid process, a high temperature, and more important still a rigor, a free incision should be made without delay down to the bone about an inch from where the ear joins the head, and the mastoid cells be freely laid open and drained. It is not uncommon in hospital practice to see cases which have been neglected, in which the pus has made for itself a mode of exit, and there has been an open wound behind the ear discharging pus it may be for several years; sometimes this closes up and again breaks out. Considering the fact that wounds of this kind remain troublesome for long periods, and that they do so probably not only on account of dead bone not being completely separated, but because the mastoid cells are peculiarly suited to retain purulent matter, and to remain more or less a suppurating surface, I have found the following detail in treatment very useful. When all dead bone has been removed, if the syringe be used with the nozzle blunt-pointed, covered with india rubber, and fitting the meatus, water will be made to pass through the tympanum and out of the opening behind the ear, very generally in a full stream, bringing away in its course any purulent matter and caseous deposits that may be at the time

lying in the tympanum and mastoid cells. This should be repeated daily, and after it has been done for some time its beneficial effects will be apparent, for before long the discharge will become less and less until it ceases, and the wound will heal soundly. Briefly, good drainage.

In the course of an otorrhœa, patients occasionally bring with them portions of the ossicles which have been discharged from the ear; very often the malleus without the processus gracilus, but generally the handle is the first portion to become detached.

I have as yet only made a passing allusion to the healing of perforations which have occurred from disease. When they have been the result of accident they sometimes heal very quickly. The converse is true of the other class, at least so far as regards adults. By far the larger proportion of these never heal at all, and it is not unusual to see in middle-aged and old people perforations which date from infancy; and, indeed, when their mode of production and the circumstances attending them are considered, it is what might be expected. An accumulation of purulent matter secreted from a mucous membrane lining a closed cavity (for at the time when the pus is first formed the tympanic orifice of the Eustachian tube is swollen and closed) makes its escape by a process of ulceration through the tympanic membrane; so long as the mucous membrane continues to secrete purulent matter, which is discharged through the orifice in the membrane, and which, from the configuration of the tympanic cavity, is especially liable to collect in con-

PLATE VII.

Showing Scar where Perforation has healed. Right Ear.

West, Newman chromo.

siderable quantity, it is impossible that the tissue lost in the ulcerative process should be reproduced. The circumstances favorable to this event would be, firstly, that the cavity be freed from morbid matter, which acts as a source of irritation; and secondly, that the mucous membrane ceased to secrete. In the case of these conditions being fulfilled, whether as a result of treatment (the object of which should always be to induce this) or from the unassisted reparative powers of nature, perforations heal. When once the healing process begins it proceeds very rapidly, and I have been surprised at times to see patients in whom a discharge which has lasted for years has lately stopped, and the perforation has healed in a few weeks afterwards.

It is most difficult to get an opportunity of watching this process, and so to make accurate observations on the subject. As a rule, when cicatrisation has taken place in the case of a perforation of long standing, the patient has been dismissed when the discharge has ceased, and is only seen again, perhaps, casually many months or years afterwards, when an inspection of the membrane will show what has happened. Even then there is often very little to be seen; the membrane can be observed to be entire throughout, and air will not pass through on inflating the tympanum, but it is most difficult to determine the position of the cicatrix. I have been often assisted in settling this point by referring to my case-book, in which I have, perhaps some years before, when I first saw the case, made a rough drawing of the size and position of the

perforation. The part which corresponded to this very commonly appears as a thinned spot, which bulges when the tympanum is inflated, and is paler in colour than the rest of the membrane.

In cases of tympanic disease without perforation, whether there is a history of discharge at any time or not, I constantly see what I regard as most likely to be scars; but in deciding this point it must be borne in mind that in such disease the internal layer of the membrane becomes affected, and that in many instances it is very much thickened and opaque, and presents an appearance altogether different from what it does in health; therefore it is necessary to use great caution in speaking decidedly of particular spots as being cicatricial: and on this question a most accurate observer, whose remarks I have quoted before on several occasions, viz. Dr Adam Politzer, says, "We can speak with certainty of cicatrices only when they have been formed under our own eyes after perforation. We can only conjecturally regard them as such when the patient says that there has been a previous discharge from the ear; while in cases in which there is no recollection of an otorrhœa the diagnosis between cicatrices and circumscribed atrophies is impossible."

In some cases that I have noted when the patient has been seen after an interval of from one to two years, where the membrane was perforated to as much as, or more than, a fourth of its entire extent, in the position previously occupied by the perforation there has been a calcareous deposit, but it is more usual to

find a cicatrix thinner than the rest of the membrane.

If a patient be seen within a few days of the membrane giving way, and the loss of substance has been very slight, provided that the tympanum is kept carefully free from secretion, the rupture will not unfrequently heal in a few days. If it does not do so very quickly the probabilities are greatly against it doing so at all.

To how great an extent large losses of substance in the tympanic membrane may, under favorable circumstances, be replaced by new tissue, seems uncertain; at any rate, occasionally to the extent of half the membrane. The probabilities of healing taking place when a perforation takes place in children is very much greater than with grown-up people, and such a probability is immensely increased when the subjects are infants. We know how very liable young children are to purulent catarrh of the middle ear, how constantly they are the subjects of a discharge from the ear, which ceases after a few weeks without any treatment, and how very often an examination proves that the membrane is entire. When opportunities of seeing these little patients arise I have, times out of number, observed a perforation, and some months or years afterwards have found an entire membrane. Provided that the ossicles maintain their position, and the part of the membrane to which the malleus is attached remains intact, the plane of the membrane will not be altered; but if neither of these conditions prevail the support afforded to the membrane will be

in part lost, and there will be more or less collapse. In this case adhesions may form between the walls of the tympanum and the membrane. From the advanced position of the promontory this is the part to which such adhesions are attached. This can be seen without difficulty when only a part of the membrane is involved, and the remainder is unattached or absent; but when there is what may be called a general adhesion, where the loss of substance has been central, the precise state is not so readily detected; for then, although a part of the membrane is in truth absent, the loss is now replaced by the promontory. Under such circumstances the deafness is extreme, and no treatment is likely to be of any service.

CHAPTER VIII

Having considered so far the subject of perforations of the tympanic membrane arising from disease, there remain injuries to the membrane. With patients who have fallen upon, or received severe blows on the head, bleeding from the ears is well known to be a common symptom; and this may occur whether there be fracture of the base of the skull, or the case be one only of concussion. In both instances the membrana tympani has been ruptured. If the patient live the rupture generally heals in a short time, leaving more or less deafness. If an incision be made with a sharp knife purposely by the surgeon, the wound quickly closes up, sometimes in two or three days. On the same principle, if the membrane be accidentally pierced with a sharp instrument healing rapidly takes place.

Several cases illustrating this have come under my notice at St. George's Hospital, and I have seen a great many others elsewhere. In one the accident happened to a man of thirty-six. While he was picking his ear with a pin his hand slipped, and the head of the pin went through the membrane. When he was seen, four days after the accident, he was still suffering pain, and had a good deal of tinnitus.

There was a perforation at the upper and posterior part of the membrane; he could hear a watch at four inches from the ear, but was very deaf to the voice. The membrane healed six weeks after the accident. In another case, when the point of a pair of scissors was pushed in a man's ear by his child at play, the portio dura was wounded, and caused instant facial palsy; the wound of the membrane healed very rapidly, leaving a moderate degree of deafness.* The most minute wound of this kind I ever saw was made in the membrane by a needle, as the subject of it, a girl of seventeen, was picking her ear. This healed in a few days, and left the hearing quite unimpaired.

If a blunt-pointed instrument be used the deafness remaining will be very considerable; inflammation will be set up in the tympanum, a purulent discharge will follow, and the same conditions which were observed when the perforation resulted from disease will interfere with the healing process. In September, 1884, a patient attended St. George's whose right tympanic membrane had been ruptured by a blade of straw thrust accidentally into the ear. The handle of the malleus was driven backwards, there was a purulent discharge from the tympanum, and he was very deaf. He only came once to the hospital, so I do not know how the case ended. The handle of the malleus has been fractured by an accident of this kind. Mr Toynbee relates a case where the chorda tympani was

* This case was reported at the Clinical Society; see 'Transactions of Clinical Society,' "Wound of Portio Dura, causing Facial Palsy."

injured, and I have met with another myself. I may here mention that it frequently happens to patients with perforation that they experience sensations in that part of the tongue supplied by the chorda tympani when the ear is syringed, or whilst attempts are being made to adjust some form of cotton support to the tympanum.

A loud explosion close to the ear will sometimes rupture the membrane, or a box on the ear, but this generally happens when the blow is unexpected. I have seen this injury repeatedly; once with a boy who unfortunately was totally deaf on the other side. While he was at play, another boy came behind him and gave him a sound box on the good ear (the right); the rupture extended in a line with the handle of the malleus. He remained very deaf, so much so as to require a raised voice close to the ear.* I have known the membrane to give way during fits of violent vomiting, often in a fit of whooping-cough, or while the nose was vigorously blowed; in all instances the deafness was very considerable, and there was suppuration in the tympanum.

In all the cases I have seen where the tympanic membrane has been accidentally ruptured, the extent of impairment which the hearing has suffered has been in a very great measure proportionate to the degree of violence used. Obviously more violence will be required to rupture the tympanic membrane when the force is applied from without, if the instrument causing such a rupture is a blunt-pointed one, than when it is

* The case was related in the 'Lancet,' 1870.

sharply pointed or edged; and in any case if the force is applied from within, as in vomiting or blowing the nose vigorously, or, again, in the example of a blow on the head or a box on the ear, the force employed must be considerable.

If the impaired hearing in these cases depended solely upon the rupture of the membrane, when healing takes place in a few days afterwards without any inflammation in the tympanum, one would expect very naturally that good hearing would succeed to the continuity of the membrane, but experience shows that it is not so. The true cause of the permanent deafness is, I believe, dependent upon the shock which the nervous structures (the labyrinth) have received at the time of the accident; and this view is rendered extremely probable since we notice that a similar extent of impaired hearing will follow the same kind of accident (a blow on the head or a box on the ear) when the tympanic membrane has not suffered at all.

Indeed, in my experience the loss of hearing is very generally greater when the membrane has not been ruptured than when it has. This is notably so in the case of damage from explosions. In some instances I have known the membrane to be ruptured by the explosion of a cannon, the perforation to heal, and very little loss of hearing to follow. On one occasion on which a cartridge had exploded whilst it was being taken out of the gun the membrane was ruptured in two places by the explosion, and after healing had taken place the hearing was quite good. Thus it would appear that the sonorous vibrations had ex-

pended themselves rather in the rupture of the membrane than in any shock to the nervous structures behind the tympanum.

The fact of the membrane being able to withstand shocks such as a violent explosion or a box on the ear when either was expected is probably due to contraction of the tensor tympani.

The treatment required for accidents of this kind is, in most cases, to leave them alone, and prevent the hurtful meddling of anxious friends who advise all sorts of things to be poured into the meatus, and generally with the result of exciting inflammation of the tympanum. If there is any bleeding the ear should be syringed with great gentleness; and if the pain following the accident does not shortly subside, three or four leeches may be placed in front of the tragus, and followed by fomentations. Should the wound not heal, and a discharge be established, the case will require the same management as a perforation after disease.

The results of accidental rupture of the tympanic membrane may be estimated by observing the notes of these cases. Out of twenty-two cases, the perforation did not heal in ten; eleven healed, and one was in process of healing when last seen: in six cases the hearing did not suffer at all; in the remaining sixteen it was more or less seriously impaired.*

We have not yet quite exhausted the subject of inflammation of the tympanic cavity and the many ills attendant on it. The position of the portio dura in

* *Vide* "Accidents to the Ear," 'Lancet,' 1875.

its course through the tympanum renders it especially liable to become affected when this cavity is the seat of inflammation, so that we not unfrequently find facial paralysis associated with a purulent discharge from the ear. The aspect presented by a patient suffering from facial palsy must be very familiar to all. The paralysed condition of the muscles supplied by the facial nerve, and the consequent effect of the muscles on the other side acting in antagonism to them, combine to give a most distinctive appearance to the subjects of this malady. There are three positions in which this nerve may be affected: 1st, when it is within the cranium; 2nd, in the temporal bone; or, 3rd, superficially after its exit from that bone. The last of these three forms of the paralysis is generally attributable to cold, and gets well sometimes in a few days, or at others it may last for many months. But it is the palsy that is caused by an affection of the nerve, while it is in the aqueduct of Fallopius, that we have just now to deal with. In the article on this subject in 'Reynolds' System of Medicine,' Romberg has stated that whenever the source of facial palsy is in the temporal bone the uvula of the patient invariably points to the paralysed side, and that there is always unilateral paralysis of the velum palati. From anatomical considerations such an effect would be almost anticipated, as the motor power of these parts is certainly derived from the facial nerve either directly or indirectly, through the great petrosal nerve, which is in close connection with the portio dura in the aqueduct of Fallopius. But be this as it may, I have certainly

seen a great number of cases of facial paralysis clearly depending upon tympanic disease, and have failed to detect any unusual deviation in the uvula. Where the disorganisation of the tympanum has gone to the extent of caries of the bone (this complication is generally in cases where scarlet fever has been the origin of all ear trouble) it is not likely that recovery will take place, and, so far as I know, no case where this has happened is on record; but when there has been profuse suppuration without any evidence of caries I have noticed on very many occasions considerable improvement when the condition of the tympanum has become more healthy; still I have never seen so complete recovery when there has been profuse suppuration but that with accurate observation a difference of the two sides of the face might not be noticed. The cases to which I wish particularly to direct attention are somewhat different from these; they are full of interest, and I am convinced that the cause of the paralysis is oftentimes overlooked. The reason why it is overlooked is that there is no discharge from the ear, and sometimes only very little deafness to call attention to the ear. The history of these cases is brief—an occasional earache with slightly impaired hearing, followed, after a few attacks, with facial palsy. Perhaps the patient is not seen for many months afterwards, the pains in the ear have been forgotten, and the slight one-sided deafness is not mentioned.

Now, if the narration of these two symptoms is not elicited from the patient, the conclusion which the

surgeon very naturally arrives at is that the facial palsy depends on a lesion of the nerve after its exit from the stylo-mastoid foramen, and in answer to inquiries as to the prospects of recovery gives a favorable opinion, tells the patient he may hope to be well within perhaps twelve months (the superficially induced local palsy seldom lasts longer than this), and the fallacy of his opinion is proved by time; for it is not a very unusual circumstance in the cases I am speaking about for the paralysis to be in some degree permanent. An example of this in which facial palsy happened some time ago to a friend of mine is a very fair instance of the manner in which the affection shows itself and progresses. I saw a gentleman in February, and he told me that on the previous Christmas Day he was in good health and heard well. For two days afterwards he had a slight pain in the left ear, was somewhat deaf, and on the second day he became paralysed on that side of the face. He had at intervals for a fortnight afterwards a deep-seated pain in the ear, and then it passed away. Occasionally since he had slight earache. The hearing was not much impaired on that side (the left); the tympanic membrane was opaque. He recovered in the course of six months, and it is the rule that when the tympanic membrane has not been ruptured the paralysis is not permanent.

The next subject in connection with perforations of the tympanic membrane is polypus of the ear. When a discharge from the ear has lasted for a long time, upon examination may sometimes be seen peering, as

PLATE VIII.

Small Circular Perforation of Membrane, through which small Polypus or Granulation-tissue protrudes. Right Ear.

West, Newman chromo.

it were, through the perforation an extremely small, fleshy, globular tumour, or a somewhat larger but otherwise similar growth may be in the position usually occupied by the tympanic membrane; or, again, it may be so large as to fill completely the external meatus, and project as an exuberant mass from the outer orifice of the ear. I have often removed a growth which would represent a cast of the entire meatus, beginning at the tympanum and ending at the external opening. In such examples the tumour is therefore of very considerable size, and then generally of very tough consistence. In any of these cases, and in the intermediate ones, the growth is spoken of as a polypus of the ear. It is quite the exception to meet with these tumours, unless there is a perforation of the membrane; when they are present without a perforation they seem to be the after effect of a periosteal inflammation of the external canal, and easily removed and eradicated. When there is a perforation it is to this condition, or, more correctly speaking, to the unhealthy state of the tympanum which is present in these cases, that polypi almost always owe their existence. Cases, however, have been placed on record where small polypi have been discovered after death in the cavity of the tympanum, the tympanic membrane being at the time entire.

If the polypus is a large one, and projects from the ear, it is either covered with epidermis or has a raspberry-like appearance that is very characteristic.

In looking down a speculum where the membrane

has been completely destroyed it is not always easy to decide at first sight whether the red mass at the bottom of the meatus is a small polypus or simply granulations on the lining membrane of the tympanum. This, however, is ascertained by examination with a probe, when a polypus will be found to move under the touch.

It is no doubt not easy to say in many cases whether the term polypus should be applied or not, for in truth many conditions which pass by the name of polypus are nothing more than bone granulation. Still this term is not applicable when a large tumour tightly fills the external canal, nor is it to many others of less size and definite shape.

In structure aural polypi are fibro-cellular, and in proportion to the age of the growth so will the fibrous element predominate; at least, this is the rule so far as my observations extend.

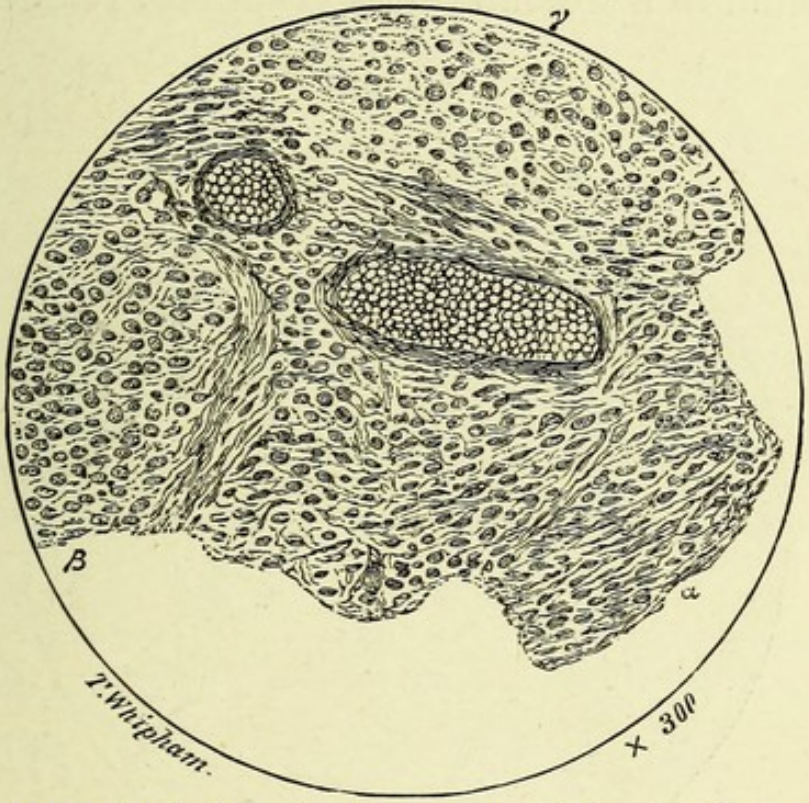
A section which has been made from a polypus that has been hardened with chromic acid will present very much the appearance of fibrous tissue in the course of development, and this seems to be true in the cases I have examined, whether the polypus arise from the lining membrane of the tympanum, the tympanic membrane itself, or the external auditory meatus.

Dr Whipham has been kind enough to examine a great number of the polypi which, from time to time, I have removed, and I cannot do better than first quote a description of two he gave me in 1871.

No. 1.—A polypus growing from the roof of the tympanic cavity, projecting from the meatus, and of

twelve months' growth. "A fibro-cellular growth, resembling the early form of fibrous tissue. Delicate fibrillated stroma, the fibrillæ having a tendency to arrange themselves in parallel lines. In some parts the stroma is finely granular; cells not very numerous —some round, some oval in shape, beginning to become elongated. Here and there in the section were scattered oil-globules."

FIG. 33.



α. Elongated and oat-shaped cells; stroma distinctly fibrous.
β. Round or oval shells, in a delicate fibrillated stroma.
γ. Round cells in a granular homogeneous stroma, in which slight traces of fibrillation appear occasionally.
Two vessels are represented in the centre of the field.

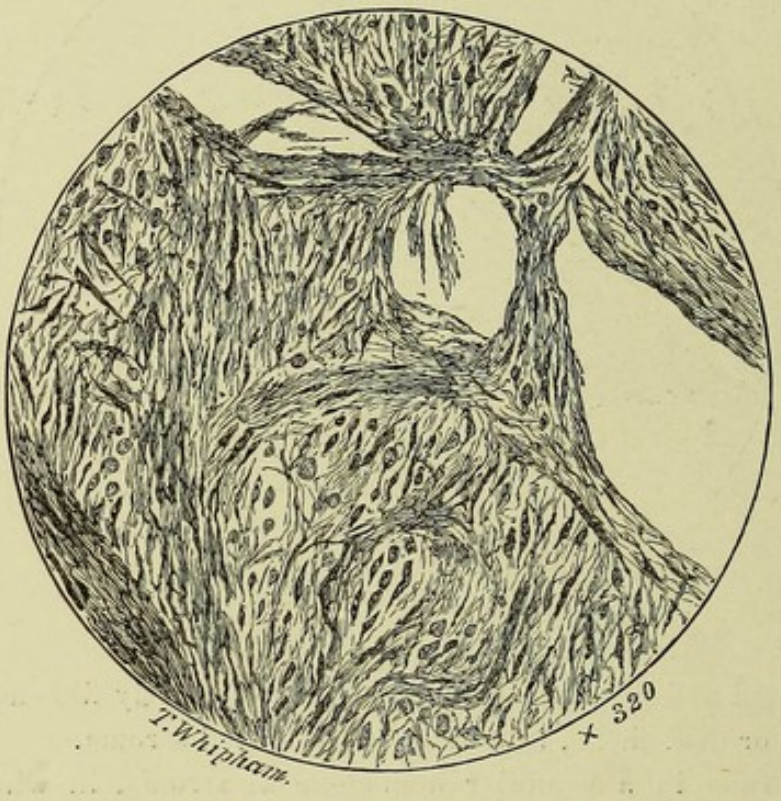
No. 2.—A small polypus of recent origin arising from the meatus, probably of two or three months'

growth. "Numerous small nuclei, scattered without much definite arrangement in a fibrous stroma, of scarcely so delicate structure as in the former case; here and there cells of considerable size, many distinctly elongated where the fibrous tissue is more advanced."

The two accompanying drawings show the structure of polypi of the ear most commonly met with.

Fig. 33 represents a section of a polypus from the tympanum in a woman thirty years old, removed five

Fig. 34.



months after the attack of tympanitis which gave rise to the perforation of the membrane. The growth, then, must have been of very recent origin, and the cellular character of it is well shown in the drawing.

Fig. 34 is taken from a section of a polypus evidently of greater age. The subject of this was a man, æt. 35, who had a discharge from the ear for fifteen years before I saw him, so that it is impossible to say at what time the polypus began to grow. Except in regard to age, however, it possesses very much the same characters as the one in Fig. 33.

"The microscopic appearances of this growth are briefly as follows:—The surface of the polypus is composed of round cells, embedded in a delicate fibrous network, but without any tendency to linear arrangement. At some little distance from the surface the cells become elongated or oval, and are placed in rows more or less parallel to one another. In the central parts of the growth the cells are considerably elongated or oat-shaped, and arranged in parallel lines. Perfectly formed fibrous tissue constitutes the chief portion of the centre of the polypus. These last appearances are represented in the sketch."—T. WHIPHAM.

Since this was written, similar structure has been found in all examined, except in the two following instances. The first case, Fig. 35, A and B, was a very large polypus which I removed from the ear of a girl æt. 20. The growth had been noticed for many years, and projected for some distance from the meatus, and arose from the lining membrane on the roof of the tympanum. I need hardly say that the membrane was gone.

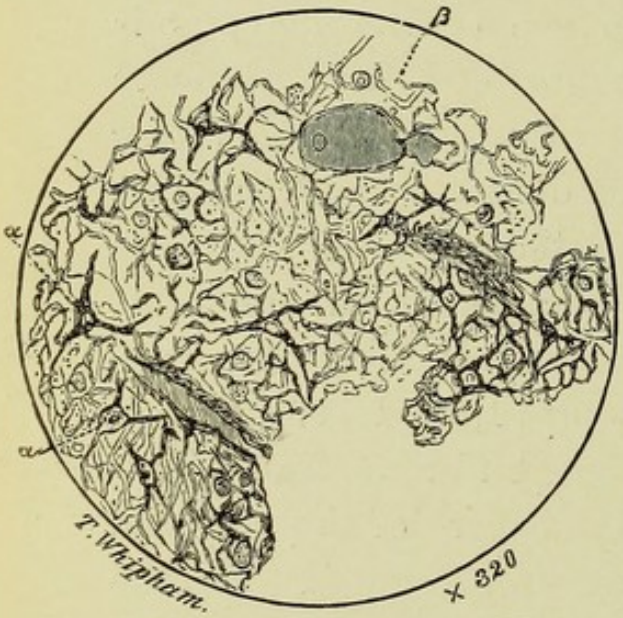
"This was an elongated, somewhat lobulated tumour, of a gelatinous semi-transparent appearance,

and very soft. It hardened rapidly in a solution of chromic acid.

"Sections examined under the microscope showed the tumour to consist of a fibrillated interlacing

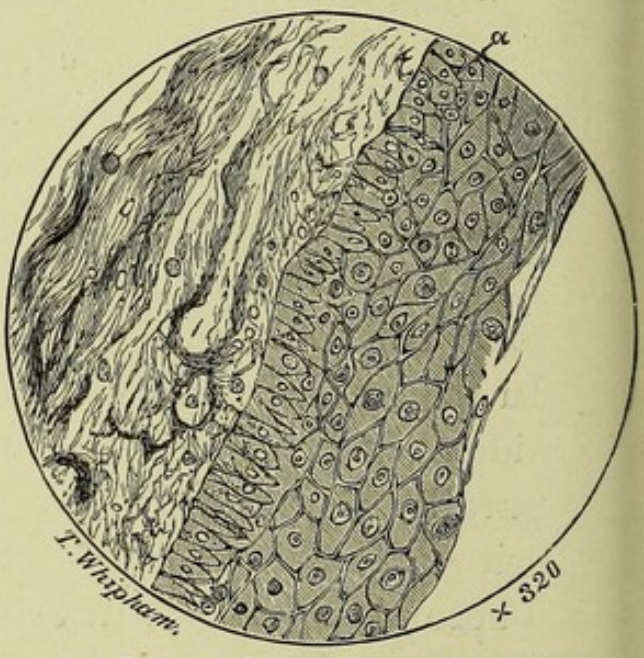
FIG. 35.

A.—Section from the central part of the growth.



α. Stellate cells.
β. Exudation of serum.

B.



α. Layer of epithelium limiting the growth.

stroma, which in some places was extremely delicate, while in others it was of a coarser texture. In the meshes were found, here and there, round cells, thinly scattered; and in other parts the branching anastomosing cells characteristic of myxoma. Occasionally fibres of yellow elastic tissue were present in considerable numbers, so that the growth answered in great measure to the description of myxoma containing elastic fibres, as given by Cornil and Ranvier at

p. 146 of their 'Manuel d'Histologie pathologique.' However, these elastic fibres in many parts were absent, and then the tumour presented the ordinary appearance of pure myxoma.

"Some qualification of this description is necessary, for although the above-mentioned are the chief characteristics of the growth, the stroma presented in some places a rather different appearance from that usually seen in myxoma; that is to say, the reticulum was finer and the meshes smaller, and the stroma resembled that seen in carefully pencilled sections of lymphadenoma. The absence of lymph-cells peculiar to lymphadenoma must, however, distinguish this tumour from growths of that nature. Bounding the tumour was a layer of epithelial cells, which formed in the sections a capsule for the growth. Externally, that is on the side farthest from the growth, the cells were ordinary, flat, epithelial cells; but on the side in contact with the tumour they were cylindrical, but, as far as could be made out, devoid of cilia. In other parts of the growth fibrous tissue predominated, to the exclusion of the myxomatous characteristics. Occasionally a homogeneous mass (which readily absorbed the carmine) was seen, and was probably due to an exudation of serum from the numerous vessels into the meshes of the tumour. The walls of the vessels were thin and delicate, and the striæ of the arteries clear and distinct."—T. Whipham.

Fig. 36, A and B, represent sections of a growth removed from the tympanum in a girl æt. 22; she had had a discharge from the right ear from childhood,

and succeeding to scarlet fever. During the past eight years she had a polypus removed on more than twelve occasions. It would seem from this that it was of a decidedly recurring type. I took away the polypus in September, applied the acid every day for three weeks, and I heard in the following March that there were no signs of regrowth. It remains yet to be seen whether it may be reproduced: so the case is at present incomplete, as showing the results of treatment, but interesting so far as it exhibits a variety of growth different from that usually met with.

"This tumour was composed of an abundant growth of small cells embedded in a reticulated stroma of extreme delicacy; so closely were the cells packed that it was only by careful pencilling of the section that this stroma was rendered visible. The cells were for the most part round, but occasionally among these one or two of oval shape were seen, no larger than the round ones. In one or two sections, however, tracts were found (running as it were into the proper structure of the tumour) in which the stroma was in some degree fibrillated, and enclosed distinctly nucleated cells, all of which were oval in shape, and at least three times the size of the round cells already described. These oval-celled tracts were, however, but rarely met with.

"These general appeances presented by tumour are sketched in Fig. A.

"Fig. B represents the appearances seen in certain parts of the growth. Tubes are seen lined with epithelium, and surrounded by the cell-growth consti-

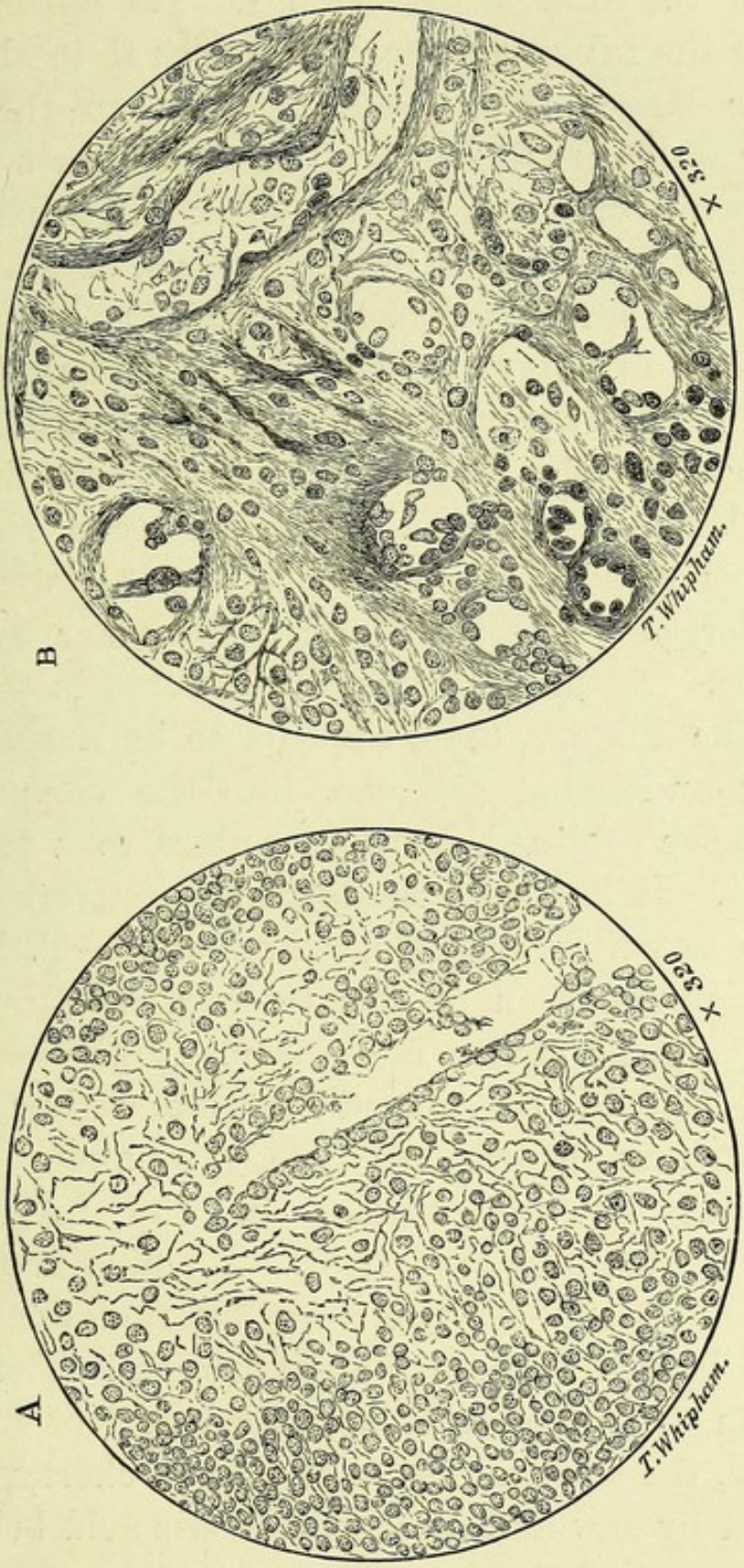


FIG. 36.

tuting the bulk of the tumour. The epithelial cells lining the tubes are more or less oval in shape, and rather larger than those peculiar to the growth. Their walls are fibrous, and in some cases very delicate, while in others they are thick and dense. These tubes have very much the appearance of gland ducts. They are represented in the sketch in transverse section, and in many of them the epithelial lining has been partially removed during preparation of the section. In the neighbourhood of these ducts delicate bands of fibrous tissue are seen running in various directions. The blood-vessels were few in number, and separated from one another by wide intervals. Nothing abnormal was noted in their walls.

"The tumour, then, appears to be a specimen of the round-celled sarcoma, into the composition of which the oval-celled variety enters to a very slight extent. It has more malignant characters than any I have examined from the tympanum."—T. WHIPHAM.

In juxtaposition to this tumour, as showing that the tympanic cavity is occasionally the seat of sarcoma, should be placed an interesting case of sarcomatous growth of the tympanum which is recorded by Mr Sheild in the 'Archives of Otology' for January, 1892. A young married lady had suffered all her life from left otorrhœa, and the exact length of time the growth had existed is uncertain. The growth, described as "of formidable aspect, the size and shape of a large cherry," was removed by saw and forceps, chromic acid being afterwards applied freely. The tumour was pronounced

to be a sarcoma by a distinguished pathologist, and its rapid recurrence lent aid to this view. It was removed a second time, the bone curetted, and the galvano-cautery freely applied. The second operation was quite successful, no recurrence being noted. The moral of this and similar cases seems to be, that too complete reliance should not be placed upon microscopical evidence alone.

My experience would lead me to the conclusion that the lining membrane of the tympanum is the most frequent situation from which polypi spring; next in frequency the meatus, and then the tympanic membrane. Whatever their size or structure, or from whatever situation they arise, the sooner they are removed the better. In the first place, they intercept the passage of sound to the labyrinth; in the second, they keep up a most unhealthy condition of the whole of the middle ear (there are thus two very efficient causes for the deafness); and in the third place, they may become indirectly the cause of death by preventing the free egress of discharge from the tympanum, thus inducing purulent absorption, meningitis, or abscess in the brain.

In undertaking the treatment of a case of polypus of the ear it is well at once to recognise its possible tediousness, and the necessary perseverance that may be required both on the part of the surgeon and patient to effect its complete eradication. As a rule it is perfectly useless to remove polypi and to do no more. No sooner are they taken away than they at once commence to grow again, and for this reason

their extraction should be regarded merely as the preliminary step in treatment.

Although, after removal, a few applications of some caustic will occasionally eradicate them, and this especially when they arise from the external meatus, the treatment will often extend over several weeks or even months, the time occupied depending upon the tendency to reproduction which the growth manifests.

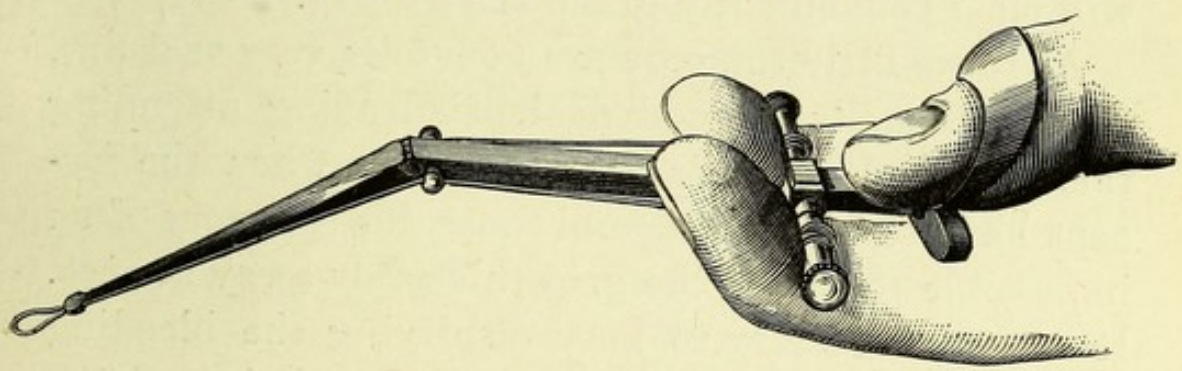
It is necessary to appreciate this, for it is very satisfactory to thoroughly relieve such an obstinate and troublesome affection as a polypus filling up the tympanum perhaps, and a profuse purulent discharge from the ear; but it is very unsatisfactory, both to the patient and surgeon, to find that a great deal of time and trouble has been expended, and perhaps pain endured all to no purpose; but if we are to judge from the cases which present themselves where polypi have been taken away from the ear on previous occasions, and have recurred only to be taken away again, and again to reappear, it would seem that the labour required to be expended on these cases has not until late years been fully recognised.

I do not wish it to be understood that all cases of polypus of the ear give so very much trouble. Occasionally a small growth of this kind will come away while the ear is being syringed, and never grow again; and in the case of a polypus which grows from the meatus unaccompanied by a perforation, it is just as easy to prevent its regrowth as it is difficult when it arises from the tympanic cavity with a perforation.

When the meatus has been syringed, light should

be reflected from a mirror worn on the head as in using the laryngoscope; both hands will thus be free. The growth should be carefully examined with a probe, to estimate as nearly as possible the exact spot from which it springs. If it be a large polypus a speculum will not be necessary, and a convenient instrument to use is a Wilde's snare. The noose should be made of fine fishing gimp, as this runs more easily through the rings than wire. When it is placed round the growth, and the point of the snare pressed as close to the root as possible, it should be made to cut its way through. If the polypus is not readily seen without a speculum, the largest one that the meatus will hold being placed in it, and the light re-

FIG. 37.—WILDE'S POLYPUS SNARE.



flected down it, the growth may be seized by a pair of rectangular ring forceps and pulled away. This is not always so easy a matter as it sounds, at least to get it cleanly away, and especially if the polypus is a very small one, situated in the cavity of the tympanum, and perhaps some of the perforate membrane remaining *in situ*. In such a case it is sometimes desirable with children that they should have an

anæsthetic, as they will not remain quiet without it (this is essential); and to ensure complete stillness and save pain in the instance of adults cocaine solution 20 per cent. should be always employed. In truth, the local application of cocaine is so useful and effective that an anæsthetic is only occasionally required with very young children.

I wish, however, that it be distinctly understood how very unimportant it is what sort of instrument is employed. As a matter of fact I am in the habit of using almost universally the rectangular ring polypus forceps. These may be made with blades at various angles, and the rings of several sizes and shapes, and it will be practically found that an examination of the tumour will at once suggest the instrument which will most conveniently grasp the growth.

As these little tumours are generally very vascular, there is usually a good deal of bleeding attending their removal, and this is troublesome when the forceps have to be used several times, for it is very often impossible to get all the growth cleanly away at once. It is then necessary to keep on drying the bleeding with pieces of cotton, so as to get a good view of the part to enclose in the teeth of the forceps. When every bit of the growth has been taken away from the part from which it sprang, a caustic should be regularly applied until it shows no further signs of regrowth. The caustic must be a strong one. Nitrate of silver is too weak. Potassa fusa and nitric acid are quite unmanageable, as they are apt to spread on to parts which it is not desirable should be touched.

I generally use chloro-acetic acid, and apply it with a small probe just tipped with cotton. Care must be taken not to touch any part of the meatus. If there is pain after using the caustic, it subsides immediately after using a syringeful of water. Eight or ten applications may be enough, but there can be no rule laid down for this. It is well to use it every day for a few times, and then less frequently. The general treatment will be the same as for an ordinary case of perforation of the tympanic membrane, and should commence immediately after the polypus has been removed. Such treatment is not confined to the meatus, but includes the entire middle ear, except when the Eustachian tube is occluded. No pains should be spared to keep the cavity of the tympanum thoroughly cleansed; and, in case of an adult, no trouble which has this in view should be grudged by the patient.

I believe that the chief causes of failure in the treatment of polypus of the ear may be found in the neglect of assiduous care in cleansing the middle ear and inducing a healthy condition of its lining membrane.

Observation teaches me to be quite as hopeful as to the results of treatment in cases of perforation when they are accompanied by polypi as when they are not. I cannot in any way account for this, any more than I am able to do—judging simply by appearances as regards size, shape, &c.—for the immense variations in improvements to hearing that are met with after treatment in all cases of perforation. When the lining membrane of the tympana and Eustachian

tubes becomes more healthy, the improvements that take place with regard to the hearing power are with some very great indeed, while with others they are scarcely perceptible. With these latter a careful examination with the tuning-fork, the history, and some subjective symptoms—tinnitus, worse hearing after fatigue, &c.—will frequently detect a nervous lesion accompanying the tympanic disease.

CHAPTER IX

THERE are several modes in which suppuration in the tympanic cavity may terminate fatally; and considering the anatomical relations of the tympanum and mastoid cells with reference to the interior of the cranium, it need not be a matter of surprise that occasionally suppuration in the cavity of the tympanum should excite inflammation in the cavity contiguous to it. The plate of bone which separates the tympanum from the dura mater is never very thick, and sometimes extremely thin. The mastoid cells have venous communication with the portion of bone which forms the sulcus in which is the lateral sinus, so that if any surprise is excited by fatal contingencies when there is a perforation of the tympanic membrane, it should be *not* that they occasionally occur, but that they do not do so more frequently.

In fatal examples of this kind it is more usual than not to find after death that the temporal bone is carious, but this is by no means always the case. The forms which the cases of infection from the ear (or, more strictly speaking, of propagation from the ear) take are *general pyæmia* with deposits in various parts of the body, *general meningitis, subdural abscess, abscess in the cerebrum, abscess in the cerebellum.* I

put them in the order of frequency, and, so far as my experience goes, general pyæmia is inordinately the most common and by far the least serious of them, for a very large number of them recover. Illustrative of this I have seen many cases of empyema from this cause recover after tapping the pleura ; others recover when the kidneys have been infected, and others when the abscesses have been so external as to admit of relief. I have also known the pericardium to have been affected ; septic pneumonia from this cause has been frequent and very fatal.

In some instances, though not in all, pyæmia is associated with a thrombosis of the lateral sinus. Cerebellar abscess is the least frequent, as shown by the post-mortem books of St George's Hospital ; and this coincides with the observations of Mr Barker, who puts the proportion of cerebral abscess to cerebellar as three to one. That the communication of septic matter takes place in most cases through veins from the tympanic cavity there is no doubt, but the communication is sometimes immediate without the intervention of veins, and the post-mortem examinations show that there are several routes. Thus, in the case of a man admitted into St George's during the night, previously delirious, and who died the next morning, the post-mortem note was as follows :

Post-mortem examination.—Lymph all over the surface of the brain beneath the arachnoid. Effusion of lymph at the base of the brain, especially thick over the optic commissures. The dura mater covering the upper surface of the right petrous bone was sepa-

rated from the adjacent osseous tissue for a considerable extent, and two small openings were found in the bone communicating with the cavity of the tympanum. The small bones of the ear were destroyed, and the surrounding parts of the petrous bone softened. The anterior lobes of the brain were softened, and the vessels of the posterior lobe gorged with blood.

Another fatal accident (so to speak) of tympanic disease is thrombus in the lateral sinus and internal jugular vein, giving rise to pyæmic deposits in various parts of the body. The account which Dr Dickinson wrote in the post-mortem in the following case shows in the most accurate manner how this may take place. The preparation is in the museum.

On December 17th, 1863, a young man, æt. 20, was admitted into the hospital under Dr Fuller with a history of discharge from his right ear dating four months back, and abscess over the mastoid process. He had suffered a good deal at times from pain in the head, and a week before his admission had an epileptiform fit, and this had since recurred four times. He remained in hospital eight days, had a succession of fits, and died on the 25th, eight days after admission. At the post-mortem the arachnoid cavity was found full of pus. The lateral sinus of the right side throughout was distended with a light-coloured plug, which under the microscope displayed only the materials of broken-down coagulum. The wall in contact with the temporal bone had given way in one place, so as to let out some of the contents of the

sinus, and opposite this extravasation and hole was a foramen in the bone situated in the groove for the lateral sinus, which conveyed a vein full of white matter into that vessel. A fine probe could be passed into this foramen, and on cutting away a part of the bone the end was seen in the tympanum, which contained sanious fluid.

Dr Dickinson, in writing out the case, adds, "It was therefore inferred that the matter had collected in the middle ear, had been taken up by the vein described, and conveyed into the lateral sinus, where it had excited suppuration and finally inflammation of the dura mater, deposition of new bone, and arachnitis." (The superficial deposit of bone alluded to was in the course of the longitudinal sinus.)

Mr Toynbee laid it down as a rule, and he quoted case after case in proof of it, that after three years of age, whenever the disease was situated in the mastoid cells or the posterior part of the petrous bone, the cerebellum was the part affected in cases of abscess of the brain, and that if it was the superior part of the petrous bone (the tympanum) the cerebrum was the situation of the abscess. That disease usually advances in this direction experience has amply verified, but it would seem that this is subject to occasional variation, as shown by the following case.

On September 26th, 1870, R. H—, æt. 21, was admitted under Mr Prescott Hewett, and on the same day I took the following note of the case:—Ten

months ago in good health, when he had pain for several days in left ear, followed by discharge and cessation of pain. Since then more or less discharge. Two weeks before admission, according to his account, the discharge ceased, severe pain came on in the ear and corresponding side of the head. For these symptoms he had been confined to the house ever since. The pain has increased. He has slept but very little, and then his sleep has been disturbed, moaning, and (his wife says) he has been delirious at times. At present there is a purulent discharge from the left ear. The tympauic membrane is perforated, a polypus protrudes from within the tympanum and fills up the perforation. Air which passed through the Eustachian tube in Politzer's method does not pass through the perforation. The portio dura is paralysed. There is no tenderness over *the mastoid process* or over the *carotid sheath on that side.* Three days ago had a little shivering, none since. Complains of constant and severe pain over the left temporal region. Intellect somewhat confused, but answers rationally. When spoken to moans. Squints, but says he has done so all his life. General feverish symptoms; skin dry; no sweats.

Mr Rouse was on that day attending the case for Mr Prescott Hewett, and after I had taken this note, at his request, I removed the polypus, which was about the size of a pea, and completely filled the tympanum; for there could be no doubt but that the polypus was and had been preventing the escape of discharge from the tympanum into the meatus. He

became gradually worse, and died in a comatose condition on October 15th.

The following is the report of the post-mortem examination at which I was present (it is taken from the post-mortem book):

"A large ragged abscess full of fœtid brown-coloured pus and *débris* occupied the greater part of the left lobe of the cerebellum, and projected on its upper surface. At the anterior surface of the petrous portion of the left temporal bone the dura mater was elevated into a prominence of about the size of a walnut, and the cavity thus formed contained fœtid grumous pus. The subjacent bone, though very white, was not softened. The left lateral sinus was occupied by an old clot, which extended to the commencement of the jugular vein, and as far as, or even into, the torcular herophili. No thrombus of any other sinus.

"A ragged abscess existed in the lower part of the upper lobe of the left lung, and had burst into the pleura, setting up much inflammation, and an effusion of recent lymph into the pulmonary pleura."

Thus, besides the brain mischief, there was the additional and sufficient cause for death, as seen in the pyæmic abscess in the lung.

Another mode in which the brain may become affected in these cases is by extension from the tympanum into the labyrinth, and thus through the internal auditory meatus into the cranial cavity.

This was the course which the disease took in the case of F. C—, a boy æt. 12, who was admitted

under Dr Fuller on 26th November, 1866. He had had a discharge from the right ear for three years. Ten days before admission he was brought from school with pain in the ear. On the eighth or ninth day after the seizure he had two rigors. When he was admitted he was pallid, with a pulse of 128; temperature 101·5° Fahr., and semi-comatose; a tympanitic belly; rapid breathing, and râles all over both lungs. He was delirious during the night. On the 27th he vomited several times, and died on the 28th.

Post-mortem examination.—The dura mater round the internal auditory meatus thickened and congested; between its layers an abscess full of green pus about the size of a nut, a superficial patch of pus on the cerebellum, and corresponding to this spot the petrous bone carious and softened. Tympanum, internal auditory meatus, and external ear full of pus.

Both pleuræ contained a large quantity of pus, and the surface of both lungs was covered with purulent lymph. Studded throughout were small abscesses, some the result apparently of softened tubercle, but many presented the appearance of secondary deposits.

It will be observed in the cases which I have related that there are several different courses which disease may take when spreading from the middle ear, and that the symptoms during the patient's life have varied considerably. The first premonitory symptom is very generally a rigor or severe pain in the head, on the same side as the ear affection. When the brain

shows signs of being involved some patients will have convulsions, others epileptiform fits, others are furiously delirious; but many that I have seen lay in a semi-comatose condition, moaning and putting their hands to the head, until by-and-by they became quite comatose, and died. From the nature of the disease, its course is rapid, a few days to a fortnight generally being about its duration; but sometimes these cases linger for much longer; one mentioned by the late Sir W. Gull lived fifty-three days.

If the dates of these cases, which are mentioned for the purpose of showing the course of the disease, the methods of termination, and the post-mortem appearances are observed, it will be seen that they occurred at a period long prior to the age of cerebral surgery, so no notice is taken of the treatment adopted; and now in approaching the subject of surgical interference, in cases where there is evidently inflammation within the cranium, inflammation which has for its starting-point the middle ear, I find myself bound to select one of two courses; either to discuss the entire subject at considerable length, or to content myself with some general observations. If I select the first course I should be passing beyond the bounds of a work on diseases of the ear; and so, besides adding very greatly to the bulk of the book, I should be encroaching on the domains of general surgery, and especially that portion of it which deals with intra-cranial surgery. This latter has of late years assumed proportions and made advances scarcely inferior to what in a previous period marked the

progress of abdominal surgery; and as one who claims no part in the inauguration of this benign revolution, I select the second course, of giving a few general observations on the subject. I refer my readers to the various contributions of Mr Victor Horsley and Mr Barker, and especially a discussion on cerebral abscess which took place in February, 1887, at the Medico-Chirurgical Society of Glasgow.

It may be said at once that even now as always a general meningitis admits of no relief, but that there are a sufficiently large number of cases in which abscesses of the cerebrum and cerebellum have been opened and drained, and in which the patients have recovered, to make it imperative that the cranium should be opened when symptoms point to their presence. Indeed, this is now usually the practice in general hospitals, and the success which has attended this procedure is such that it promises with increased experience to become much greater. It has now been proved pretty conclusively that the seat of cerebral abscess is usually in the middle or posterior part of the temporo-sphenoidal lobe. The point, then, which is selected for the trephine is one inch and a quarter above, and the same distance behind the centre of the bony meatus of the ear. The results of Mr. Barker's operations showed that the area covered by a large trephine, whose centre occupied this spot, would include in nine tenths of the cases of cerebral abscess the area of the abscess, and he also pointed out that they would equally include a subdural abscess. During life I do not think that it is always

possible to distinguish by symptoms between the existence of a subdural abscess or a cerebral abscess, except for the following fact, viz. that in the former case there has been pain over the mastoid with some œdema and tenderness on deep and continued pressure; this symptom may be present, but is not always with cerebral abscess. In such a case, therefore, a search for a subdural abscess should always precede that for a cerebral abscess. In either case, when finding the abscess it should be completely drained. There is no doubt sometimes a difficulty in distinguishing by the symptoms between an abscess and a general meningitis, but here clinical experience gives the most valuable assistance. In a paper in the 'Clinical Transactions,' vol. xvi, "On Examples of Two Classes of Cases in which Cerebral Abscess, Meningitis, and Pyæmia originate in Disease of the Ear," I endeavoured to show how the history, symptoms, and especially the onset of the symptoms, will frequently leave little or no reasonable doubt that one case is that of meningitis, whilst another is a cerebral abscess.

A person who, previously having healthy ears, is subject to an attack of acute inflammation of the middle ear, followed by suppuration with rupture of the membrane, and who within a short period afterwards is seized with a rigor, pains in the head, and afterwards becomes delirious and finally comatose, is usually the subject of a general meningitis, and this is not the history or course of a cerebral abscess. The abscess is found in the more chronic cases, in persons who have a discharge from the ear for long

periods, perhaps many years. A large proportion are found to have caries in the tympanic cavity, though this is not necessary for the occurrence of an abscess.

Now, although this chronic form of ear disease seems almost necessary for an abscess, it must also be remembered that it does end in meningitis sometimes rather than a cerebral abscess. It comes to this, then, that although meningitis may affect the old chronic cases, it is more usual to find with these an abscess, and it may be considered practically certain that in the very recent inflammatory attacks of a healthy ear, the intra-cranial inflammation takes the form of general meningitis. The knowledge of this fact is of the very highest importance in deciding the question of opening the head.

There is a rapidity about the whole course of meningitis that separates it very often, as it were, from the cases of abscess. Pain in the ear, discharge, pains in the head, a rigor, delirium, coma, and death follow each other very quickly in meningitis. In cerebral abscess, an old standing perforation, discharge for years, evidence of dead bone, a rigor, a general drowsiness and partial insensibility, ending in coma,—these characteristics roughly mark the difference. The very appearance after death of the abscess shows that it has often existed for a long time. It is not easy to describe these differences in symptoms, but looking back over a period of years they stand out very clearly to me. It is quite extraordinary how long an abscess may exist in the brain

without impairing its functions. I can recall two cases especially in which the subjects of cerebral abscess walked about for weeks, and afterwards became quite suddenly comatose and hemiplegic, and died in something like forty-eight hours.

So far, lately, has intra-cranial surgery advanced, that an operation was proposed by Mr Victor Horsley, and has since been successfully carried out by Mr Ballance in a case of thrombosis of the lateral sinus, and still further, this question has naturally followed, viz. if exploration does not discover cerebral abscess or subdural abscess should further investigation be continued to the cerebellum? This, too, has been successfully achieved by Mr Dean (the patient making an excellent recovery, *vide* 'Lancet,' July 30th, 1892), who has shown that this can readily be done by removing an additional portion of bone backwards and downwards with Hoffman's forceps.

Before dismissing this subject I must add a few words about the management of the cases which have not developed cerebral or pyæmic symptoms. Many patients who have died in the manner we have been considering have suffered from severe and sometimes excruciating pains in the ear and part of the head close around for several days before what we speak of as brain symptoms have set in. In some of these cases a polypus or bone granulations blocked up the tympanum, and after they had been taken away the pain subsided in a few hours.

Of course no one can say how these might have proceeded if nothing had been done, but it seems not

altogether improbable that they might have ended similarly to the case of R. H—, where I removed the polypus (but not until inflammation of the brain had become established). If my view of the subject be correct, whenever the tympanum or mastoid cells are the seat of suppuration, any circumstance which will prevent the escape of pus is liable indirectly to induce a fatal consequence.

What a polypus will do at one time, at another may be effected by adhesion of the tympanic membane to the promontory; or, again, a case has been recorded by Mr Toynbee, in which suppuration had taken place in the tympanum and mastoid cells, had not caused ulceration of the tympanic membrane, or sought an escape through the tissues over the mastoid process. In this way there had been no discharge externally to direct attention to the origin of the head symptoms, and the case was not cleared up till the post-mortem examination.

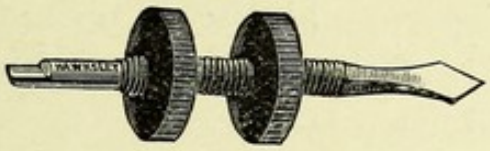
Being fully alive, then, to the dangers which beset the spread of inflammation from the mastoid cells to the brain, no time should ever be lost in providing an escape for pus in this situation whenever it is practicable. Pain and tenderness over the mastoid process should always demand immediate attention, and especially when the tympanic membrane is perforated. If in addition there should be redness or pitting upon firm pressure, with a rise in temperature or a well-marked rigor, it may be assumed with great confidence that there is pus in the mastoid cells. Whether this happens in a child or an adult, a vertical free and

deep incision through the periosteum should be made with a strong scalpel about one inch from where the ear joins the head. If the incision is not followed by a flow of pus, the point of the scalpel or a probe pressed into the bone will sometimes break down some diseased bone and let out the matter. This is especially the case with children. In cases of this kind it becomes a question whether in the event of the proceeding I describe not being sufficient to open the cells and so give relief, more energetic measures should be adopted. Provided that we can satisfy ourselves as to the presence of pus within the bone, there can be no question as to the pressing necessity of providing an outlet for it. In order to accomplish this a hole must be bored into the cells by means of a drill. The drill which I have had made for this purpose is provided with a stop, so that there is no fear of drilling too deeply. The fact that when the incision is made on to the bone it is found to be healthy should not deter the operator from using the drill. I have again and again found bone to be healthy, but the symptoms which induced the operation having been so serious that I felt certain of the presence of pus within the cells, I have proceeded to drill into them, and have been justified by the result.

The thickness through which it is necessary to bore is often considerable, and the hardness of the bone very great. So soon as the cells are entered a few drops of pus will well up through the wound, and whilst the instrument is being used it is advisable that from time to time the opening be explored with

a probe. On the day following the operation the patient will be able to blow through the wound if

FIG. 38.—DRILL FOR OPENING THE MASTOID CELLS.



both external meatus are firmly closed, and in so doing will expel the pus which has collected in the cells. This proceeding has often been, I am confident, the means of placing the patient's life in safety, and a detailed account of it will be found in a paper by me in the 'Medico-Chirurgical Transactions' entitled "Disease of the Mastoid Bone." But it is often desirable to do even more than simply give exit to pus. This exit should be *complete,* and to ensure this it is useful to employ a very small trephine, which will make a larger opening. The same trephine is useful if the presence of a subdural abscess is suspected, for if one thing is more certain than another, there must be a very complete drainage effected before the patient is in a position of safety.

In the course of an otorrhæa it is not very unusual for patients to suffer from symptoms of cerebral irritation, lasting for a few days and passing away, such as giddiness and pain in the head, confined to the same side as the affected ear; and in dissections which have been made of persons who have died from other causes, and have been the subjects of perforation, the dura mater lying over the roof of the tympanum has been found thickened. How near have

these been to a fatal termination of the disease! When the tympanum, then, has been the seat of suppuration, and when there is a perforation of the membrane, common disease though it be, it possesses points of interest beyond the impaired hearing. Of such it may be said that so long as the discharge has free egress, and care is taken to attend to the ear, there will probably be little cause to fear, but inattention to the discharge may at any time place the patient in a position of great peril. For this reason a discharge from the ear is regarded by some insurance companies as an element against granting a policy, or at any rate for demanding an increased premium. I can only say that, whenever it is not so regarded, the companies cannot be said to exercise very great care of their interests.

The last example in which disease of the middle ear may be a cause of death is cancer. I have only seen six cases in all. They were all epithelioma, and five of them arose from the cavity of the tympanum, one behind the mastoid process. In three they were preceded by a perforation of the membrane and long-continued discharge. At the commencement they had very much the same appearance as a small polypus springing from the tympanum, and they arose from the lining membrane of this cavity. Death occurred in all within six months of the discovery of the cancer. The character of the growth was shown not only by microscopical examination, but by its pulpy condition and its extreme fœtor. The patients died from general exhaustion or cerebral complications, and one from

rupture of the internal carotid. Previous to death the chief part of the temporal bone became involved, and in some the adjacent tissue. An account of these cases can be found in the 'Lancet' of June 2nd, 1892. Beyond these six, there are only recorded here and there a few solitary cases, so it may be said that the ear is very rarely the seat of cancer, and that the lining membrane of the tympanum is the starting-point of the new formation.

CHAPTER X

Perhaps the most important point to decide in examining the case of a patient suffering from deafness is, how far this symptom is dependent on an affection of the nervous or the conducting apparatus of the ear. Apart from the history and such symptoms as are peculiar to diseases of either part, considerable evidence is often afforded in this direction by the effects produced on the patient as to hearing by sonorous vibrations conveyed through the cranial bones directly to the labyrinth, without the intervention of the tympanum. Thus, let a vibrating tuning-fork be placed on the top of the head of a person with good hearing; after it has ceased to be heard in that position, if it be placed at a little distance from the external ear, it will be heard quite plainly, showing that sonorous vibrations make a greater impression on the auditory nerve when they are transmitted through the conducting apparatus than through the cranial bones. Again, if the tuning-fork be placed on the vertex, and the external auditory meatus on one side be closed, the sound will be heard more intensely on this side than on the other. This is also true in respect of the voice of the person on whom the experiment is being made, and in both cases is due to

the fact that, when the meatus is closed, the waves of sound, in their passage out from the tympanum through the meatus, are reflected again and again, and therefore their effect on the auditory nerves becomes intensified. Suppose the meatus to be closed with cerumen, or the tympanum to be obstructed with morbid products—the result of catarrh—the same effect will follow; and, in the case of a patient with the auditory nerve unaffected, he will hear the tuning-fork more loudly on the side which is deaf from these causes, as either interfere with the outward passage of sound. A person in whom the functions of one or both auditory nerves are impaired will hear the tuning-fork (on the vertex) less loudly than he should do in the one or in both ears, and in severe cases will not hear it at all. It follows that, if one ear only be deaf, the tuning-fork will be heard better on this side if the disease is in the middle ear, and worse if it be in the labyrinth. In every case the tuning-fork should be made use of; but in estimating the importance of this as an aid to diagnosis, it must be observed that instances are met with in which a person with normal hearing power finds some difficulty at first in hearing a tuning-fork placed on the head, and that some patients cannot at once decide on which side they hear it the louder. The first of these cases is so extremely rare, and the second is so soon overcome with a little trouble, that neither materially affects the value of this test. Still, in making use of this help to diagnosis some little patience is demanded, as at first reliable answers cannot always be obtained from

patients. They are apt to answer at random what they think ought to be, viz. that the sound is heard less loudly in the deaf ear. This test is no use in the case of young children.

Next to impairment of hearing, the most common symptom of disease of the ear is tinnitus. It is present in a great variety of affections, alike of the external, middle, and internal ear. It is always an important symptom in making a diagnosis, and although in some cases the cause of it is quite clear, it must be confessed that in others it is quite inexplicable. It seems that any condition which produces pressure on the labyrinth or tympanic membrane may give rise to this symptom. A piece of cerumen lying in contact with the membrane is a familiar example of one, and some cases of Eustachian obstruction of the other. In this latter instance the pressure of air on the external surface of the membrane being greater than on the internal (this was shown in a former chapter to be due to a partial absorbtion of air in the tympanum), the membrane is retracted, in its turn the handle of the malleus is drawn inwards, and the stapes in this way is unduly pressed on the fenestra ovalis. When the cerumen is removed in the one case, and the tympanum inflated in the other, in the immediate disappearance of the tinnitus we recognise cause and effect, and are able to explain the phenomenon.

At the same time it is quite possible, and indeed very frequently happens, that considerable obstruction of the Eustachian tube with a corresponding amount of deafness may exist without any tinnitus at all, so that

although this state unquestionably elicits the symptom in some cases, it does not do so in all. Politzer believes that it may depend on shortening of the "tensor tympani;" this is simply an effect of prolonged obstruction of the kind named.

If, in cases of catarrh of the middle ear, the tinnitus does not disappear after inflation of the tympanum, it is in all probability due either to a partial or complete anchylosis in some part of the chain of ossicles, or else is dependent on causes situated in the labyrinth. Considering that neither of these conditions is likely to be influenced by treatment, it must be regarded as an unfavorable symptom. Experience bears out this view; thus it is important to give to tinnitus in chronic catarrh its proper significance.

A slight noise in the ears, of which the patient is only conscious when everything around is still, and what might almost be described as furious tinnitus, represent the two extremes, between which are endless varieties in intensity. As a rule, when it is dependent on pressure due either to disease of the middle ear, to impacted cerumen, or foreign bodies in the meatus, it is not of that aggravated character which it assumes when its origin must be sought for in the deeper structures. The nature of the noises is described by patients as resembling recognisable sounds of all sorts, but nearly always they are of a disagreeable kind. Among the few exceptions met with are those who speak of the noise as a low singing of birds. With persons in whom there is no evidence whatever of catarrh, either from the history or from careful

examination of the middle ear, in whom the deafness has slowly come on and advanced to a high degree, tinnitus is a very common symptom; also in those cases of extreme and total deafness which are met with in the subjects of inherited syphilis. It may exist for a time with people in whom the hearing power is not perceptibly defective, and with these many causes may be sufficient to produce it, such as periods of annoyance and anxiety, mental fatigue, prolonged suckling of children, overwork, taking quinine in large doses: each of these will be sometimes sufficient to induce it. It is obvious that in such cases it is of nervous origin, and it will generally disappear with rest and constitutional treatment. In one case under notice of a lady, thirty years of age, who had from no apparent cause been subject during the previous year to occasional tinnitus, the noises in the ear came on with the greatest regularity every evening at eight o'clock, lasted for three or four hours, and went away, and I have seen others in whom the tinnitus was periodic.

Of all the cases I have seen of injury of the tympanic membrane I cannot recall to my mind one in which there has not been, at any rate for some time afterwards, a noise in the ear; and when the violence used in causing the rupture has been considerable, this symptom has been persistent. The same may be said of a great number of cases where deafness has followed blows on the head or ear, and violent explosions close to the ear.

It seems not altogether improbable that a little

blood may with these patients have been extravasated in the labyrinth, thereby producing pressure from within, but with the same result as when pressure proceeds from without.

Politzer attempts to explain it by supposing that a terminal expansion of the auditory nerve is brought out of its position of equilibrium, and is so placed in a temporary or permanent condition of irritation. Both hypotheses are, of course, mere conjecture.

The distress experienced from tinnitus of an aggravated character sometimes almost passes endurance, and, unhappily, in these extreme cases it does not admit of relief. Where there have been opportunities of examining such patients after death, where tinnitus has existed for a long time without any disease of the middle ear, the appearances that have been found on dissection of the petrous bone, by Menière, Politzer, Schwartz, and Hinton, are—disease of the semicircular canals, ecchymosis in the vestibule, hyperæmia of the cochlea, general enlargement and fulness of the vessels of the labyrinth. All these changes would point to distinct pressure within the labyrinth. On the other hand, however, in 1869 a case was related to me in the General Hospital at Vienna in which a man residing at Trieste had suffered for many years from tinnitus of so distressing a character that his life was rendered perfectly wretched. All the best aural surgeons in Germany had been consulted by him without any benefit. According to a request made in his will, that his ears should be examined after death, a most careful dissec-

tion was made of the temporal bones. No abnormal appearace of any kind was detected. In the face of this, and considering that opportunities of examination after death of persons who have been known to suffer from tinnitus are not frequent, we certainly are not in a position to give a satisfactory explanation of this symptom, except in a certain number of cases.

In conclusion, then, it seems fair to draw the following inferences :—that we find certain conditions coexisting with tinnitus, and so frequently that we may be permitted to recognise in them a sufficient cause ; that these conditions appear to produce these symptoms by exciting undue pressure on the fenestra ovalis (and so on the labyrinth), inasmuch as upon the removal by appropriate treatment the tinnitus disappears ; that we at times meet with similar conditions unaccompanied by tinnitus ; that this symptom undoubtedly exists at other times without any apparent cause, either manifested during life or on examination after death ; that in such cases as the latter we must be content at present to admit our ignorance of the cause, consoling ourselves with the reflection that the confession of ignorance is the first step to knowledge.

One of the commonest histories that will be given by patients who suffer from unmistakable affections of the nervous apparatus of hearing altogether independently of disease of the middle ear is somewhat as follows :

At some period of adult life they gradually lose the hearing of one or both ears, suffering generally more or less from tinnitus. The deafness will increase with

age, and after having reached a certain point become stationary. The tuning-fork placed on the head will be heard imperfectly or not at all.

On examination, the tympanic membrane will be found perhaps quite healthy, the Eustachian tubes pervious, no history of catarrh,—in short, no origin to the deafness can be discovered. The diagnosis is made then in a considerable degree on negative evidence; by this I mean that beyond the history, tests by the tuning-fork, and perhaps a few subjective nervous symptoms, so long as it is certain that the external ear, the tympana, and Eustachian tubes are quite healthy, it is plain that the lesion which produces the symptom of deafness is a nervous one.

Among other symptoms where impaired hearing is either in part or wholly due to a nervous cause is the fact that the subjects of the affection do not hear so well if they are excited or fatigued, and with women the hearing is very commonly worse during the catamenial periods. But on so many different exciting causes, and under such various circumstances is the power of hearing more or less at times suspended and at others lost, that it is only by carefully observing cases as they come under notice we are able by comparison to recognise separate groups of auditory nerve lesions.

The loss of hearing which follows blows or falls upon the head is clearly due to injury of nervous structure, and very little if at all dependent on rupture of the tympanic membrane, if that should take place at the time, for the hearing is impaired by the

accident whether the membrane is ruptured or not.

Allied to deafness caused by blows on the head is the lasting injury to hearing which takes place after violent explosions near the ear. Artillery men can thus very often trace the deafness which is so common with them to a single shot.

The same kind of accident I have known to happen to men when out shooting in the teeth of a high wind.

If it be true that in such instances as these the tensor tympani contracts when an explosion is expected, and then protects at the same time the tympanic membrane and the labyrinth from injury, this provision is at any rate an insufficient one for saving the hearing in the case of boiler-makers who are exposed to constantly repeated shocks, for a large number of these men notoriously become deaf after a few years' work. Without a *post-mortem* we can but speculate on the nature of the injury when a sudden explosion or blow on the head produces deafness, but again it seems not altogether unlikely, as in other instances named, that a little blood may be effused in the labyrinth, and the small clot from this have the effect upon hearing. The concussion occurring at the time of an explosion would be communicated through the tympanum on to the two fenestræ, and when the result of a blow on the head, it would be through the bones.

I have noticed that although the deafness following a violent explosion close to the ear is often very considerable, a far more extreme degree of it is likely to

follow if there have been any failure in hearing previous to the accident. I once saw a most unfortunate case of this kind in a man of fifty who was quite blind, and had been totally deaf in the right ear for many years (after scarlet fever). Twelve months before he was seen by me, the hearing of the left side began to fail, and he suffered from slight tinnitus; he was, however, only a very little deaf. One day a gun was accidentally discharged near to him in a small room where he was sitting. He became not totally deaf to sound, but quite deaf to all conversation. He said that at the time of the explosion he felt as if a blood-vessel had burst in his head (on the left side). I could not discover in the tympanic membrane any scar, although at the distance of time at which I saw him, some weeks after the occurrence detailed, if there had been a rupture of the membrane it was quite likely that it had left no trace.

Some persons lose their hearing during periods of mental excitement and depression. Generally the defect is symmetrical, and the patients can tell the precise time at which they became deaf—at least so far as this, that having gone to bed one night hearing well, they have awakened the next morning deaf. May it not be that the auditory nerve with such people is in a state which may be described as one predisposed to lose its functions, and that this actually takes place on the arrival of the mental shock? The sudden loss of a relative I have known to act in this way; and did I wish, I could enumerate many tragic incidents under the influence of which the hearing

has become almost entirely lost. The witnessing of a suicide, the sight of a dead relative, the news of a disaster, and other sad occurrences would figure in this way. As might be expected, women have been the subjects of such mental shocks as have resulted in instant deafness. Is not such a state of liability to lose hearing a state of debility, and thus one of disease? If so, we can hardly attribute the deafness to the incidental cause which awakes it into activity. How else can be explained—what is not of uncommon occurrence—deafness coming on during a confinement, or, what is still more frequent, during suckling? The loss of hearing which occurs during typhus, and is sometimes completely recovered from, and at others remains after convalescence, is a familiar example of nervous deafness. The tympanic membrane having all the appearance of health in these cases, distinguishes them at once from those others in which the whole tympanum and membrane have suffered destruction. In instances of this latter kind, where pieces of necrosed bone are discharged from the meatus, the marks of the cochlea occasionally can be seen.

In the seventh volume of the 'Transactions of the Pathological Society' there is an account of a case under Mr Shaw in the Middlesex Hospital where nearly the whole of the petrous bone came away after scarlet fever, and there is in the museum of St George's Hospital the complete temporal bone in a state of caries which I removed from a child whom I saw alive and well many years afterwards. Of course in such in-

stances the facial as well as the auditory nerve is paralysed. Perfect hearing may be exchanged for total deafness in the course of scarlet fever in a few hours. Thus a girl, æt. 17, who was seen by me. On the 15th day of the fever in the evening (Sunday) she could hear quite well, and on Monday morning she was totally deaf on both sides. Both membranes were quite destroyed, and there was a purulent discharge from the ears; very little time to permit of any remedial measures to the ears during the period before rupture of the membranes took place.

Excepting from such causes as the foregoing, it is not usual to meet with persons in whom, in adult life, the loss of hearing has become total, or, indeed, so severe that the patients cannot be made to understand a word spoken loudly and distinctly close to the ear. Occasionally, however, isolated cases present themselves where it is difficult to trace any cause for the deafness, when there is no history of fever or the like to account for it. The following is an example from a note taken in 1870:

J. D—, a man æt. 55, went to the West Coast of Africa in 1865, at that time being well. He returned in two years totally deaf. As he could neither write nor read it was impossible to ask him questions; but his wife said that upon his return he had given her a detailed account of everything he had done when away, and had not mentioned any illness, and from what she heard from people who were with him he had had none. He had lost his hearing in a few weeks, so he

said, "*but not with fever.*" The tympanic membranes were quite healthy.

On many occasions I have known partial or total deafness to take place during an attack of mumps, and inasmuch as this happens not unfrequently in the case of young children, mumps must be included amongst the causes which induce deaf-mutism.

It must, however, be understood that there are two perfectly distinct ways in which mumps may cause deafness. At a time when the earache (which is so common in this disorder) is present, the middle ear, or rather the tympanum, may become the seat of more or less inflammation, and, whilst producing the various results which have been mentioned in connection with this subject, cause impairment in the conduction of sound, so that the patient may be deaf from disease of the middle ear. But there is another and far more disastrous condition which may and does accompany mumps. It is that without the middle ear being at all involved, without any pain in the ear or other sensation, the subject of mumps becomes suddenly intensely or absolutely deaf in regard to one or both ears. This state of things I have frequently seen, and as a matter of course when both ears become so affected in early life (say before the age of six years) the speech rapidly fails, and the child becomes dumb. The explanation of this state of things is not easy, but without any kind of doubt it is the nervous and not the conducting media which suffer—the perception, and not the conduction of sound which fails. The

deafness from mumps, therefore, takes place side by side with that from typhus, or the meningitis of infants: so mumps becomes a possibly more serious disorder than is generally thought.

Some persons who are very deaf to conversation will say that when travelling in a carriage or cab, or by the railway, they hear much beter than usual. It has been attempted by some to explain that the improved hearing is imaginary, on the ground that people always raise their voices in order to counteract the surrounding noise. This may in some instances be a sufficient explanation, but in others it must be remembered that the speaker is only raising his voice sufficiently for good hearing persons; and I have proved, on more than one occasion, that the increased hearing has been real, and not imaginary, by having it tested with a watch in the carriage. The watch certainly does not change its tick, and a patient who could, under ordinary circumstances (in a room), hear it at one or two inches, has been able to hear it in the railway carriage at nearly two feet. Instances have been related where people who were very deaf could hear fairly well while near the noise of a mill, or in a blacksmith's shop when hammering was going on.

No satisfactory explanation has been given of this phenomenon, although many have been attempted. Before we accept any theories that it is dependent on changes in the tympanum or the tympanic membrane, it must be first shown that it does not occur when no traces of disease can be detected in these positions,

and there are, without doubt, many cases in which it is a prominent symptom under such circumstances. To judge from this, and from the fact that even where there has been catarrh of the tympanum the patients who thus hear better in a noise seldom receive much benefit from treatment, in all probability this symptom is in some way or other connected with a nervous lesion.

How much we are obliged to depend (independently of what we see) upon the history of the case, and the symptoms in the diagnosis of ear disease, when the seat of lesion is situated beyond the tympanum! In the examination of patients, how often I have elicited the statement that among the other symptoms which are present when the hearing begins to fail is the occurrence of attacks of giddiness! Of these, instance a healthy man, æt. 55, who became so deaf in three weeks that he required a shout near to each ear to understand what was said. During this time he had attacks of giddiness daily, sometimes twice in the day, so severely that he was obliged to lie down for an hour at a time. There was incessant tinnitus. No disease could be discovered in the middle ear. Another case, in which a woman of fifty years of age had similar attacks for two weeks, and during the time became nearly totally deaf in one ear. This symptom, which will be found recorded in the case-book over and over again, in the notes about patients who have no evidence of disease of the tympanum, does not generally persist beyond a period that may be counted by months. In fact, it may be expected that gradually the attacks

will be less severe and less frequent until they cease to manifest themselves.

In 1861 it was noticed by Menière to be of such frequent occurreuce that he gave the subject of vertigo, happening in the course of ear affections, his careful attention, and at the present time patients who exhibit a certain train of nervous symptoms are spoken of as being the subjects of Menière's disease. It is of great importance to be familiar with this affection, for otherwise we might suppose a patient suffering in this way to be the subject of a brain affection.

One of the most instructive cases of this kind I have seen occurred in the person of an active, vigorous, healthy lady, æt. 48 years. She was seized with an attack of giddiness while she was in a shop, and had to be assisted into another room, where she lay down for an hour and a half before she was sufficiently recovered to be driven home; this happened in November. When she got home she was placed in bed, and so remained for four days. During this time the only symptoms that she complained of were those of extreme giddiness coming on at the least attempt to move, and nausea. This gradually subsided, but for three weeks she could not trust herself to walk alone. On the day of the seizure she found that she had become very deaf on the right side, and had some tinnitus in that ear. I first saw this case in the following January, and in giving this clear account of herself she said that the deafness or tinnitus had not perceptibly increased since the first illness. The

middle ear presented no signs of disease, and a tuning-fork on the head was heard on the right side rather less well than on the other. In the April following, when I again saw this lady, there had been no change in the hearing, and no further attacks of vertigo.

A very much milder case, but evidently belonging to the same class of disorder, happened under my notice about the same time in a gentleman æt. 53. His hearing was perfectly good until an attack of giddiness, which came on while he was at breakfast, and lasted for about five minutes, leaving him very considerably deaf in the left ear. He had no further recurrence of the vertigo, and the deafness remained stationary afterwards.

A woman æt. 32, totally deaf with both ears, gave the following account, which was related in part by herself and in part by her sister.

One morning she awoke hearing well as usual, and on getting out of bed she was seized with an attack of giddiness; in the course of four or five hours she had lost all hearing power. For one month after this she could not walk without assistance, as the fits of giddiness recurred occasionally; the pains in the ears never troubled her after the attack. The external and middle ear were both healthy. Now these are fair samples of what is called Menière's disease, and the nervous lesion must be situate in the brain or in the labyrinth.

In the opinion of a great many observers the seat of disease in these cases is the semicircular canals. This

supposition is mainly, I may say almost entirely, based upon the results obtained by the well-known experiments of Fleurens in 1842, and subsequently of Goltz in 1870, which have been considered conclusively to show that any injury to the semicircular canals is always followed by loss of power in maintaining the equilibrium; so exact, indeed, were these results stated to be that certain definite kinds of movements followed the injury to the horizontal or vertical canals, or both conjointly. Quite lately, however, the results of all these experiments have been declared to be fallacious by Dr Böettcher, of Dorpat, who attributes the movements of the animals which followed the division of the semicircular canals to injury inflicted on the brain in the immediate vicinity of the canals during the course of the experiments; Dr Böettcher was able to divide one of the canals without affecting the equilibrium of the animal operated upon.

A circumstance which points very strongly to the fact that injury of the brain substance proper rather than to the semicircular canals is productive of inability to walk or run in a forward direction is one which I have, in common with many others, observed when a rabbit or hare is shot. Sometimes a few pellets only enter the brain, and the animal at once begins to run round and round in a small circle many times, and then tumbles down and stops; then he begins again running round in a circle at a great pace. Excepting by the entrance of the few pellets in the brain he does not appear to be injured. As he is approached he attempts to get away, but these

attempts only result in his again running in the same circle. He is then caught and killed. I have noticed this phenomenon times out of number for many years, and have found that the few shots have not damaged the ear at all, but entered the cerebellum. What, then, about the semicircular canals ?

Until, therefore, the functions of this part of the labyrinth have been more unanimously agreed upon by physiologists it is somewhat premature to speak with much confidence as to which is the exact position of the morbid change in these cases of disease.

It is only by obtaining a clear account of the symptoms during life, and examining the condition after death, that the question is likely to be settled in a satisfactory manner. Up to the present, owing to the difficulty of getting post-mortem examinations of persons who die of some other disorder, perhaps many years after the accession of deafness, this has not been done.

The practical lesson to be deduced from these few remarks on this subject is the importance which should be attached to a history of the case, as it will influence an opinion with regard to the chances of improvement taking place in the hearing, or, on the other hand, of the patients getting worse.

So far as I have noticed, when giddiness has been a prominent feature in deafness from nervous causes, where there has been a single severe attack of giddiness followed by impaired hearing, the deafness has been very considerable, and this whether one or both ears are at the time affected. Also, that where less

severe attacks of vertigo have succeeded one another, after each seizure in most cases the hearing has suffered diminution, and when these periodical fits of giddiness have discontinued the hearing has not suffered any further impairment.

Bearing in mind the intimate relation between the auditory and the pneumogastric nerves at their origin; remembering how the pneumogastric nerve may be excited by irritation of the ear—for example, in syringing the ear in cases of perforation, when the patient will occasionally suddenly vomit without any premonitory feeling of sickness; how irritation of the pneumogastric nerve will induce unsteadiness of gait with a feeling of nausea, I would suggest for consideration whether in these cases of so-called Menière's disease the lesion may not begin at the origin or in the course of the auditory nerve, and the symptoms of giddiness and sickness be due to reflex action excited in the pneumogastric nerve.

Lastly, in connection with these cases I am not acquainted with any treatment which is likely, with any degree of certainty, to ameliorate the deafness or tinnitus. Some of them have improved while the patients were taking bromide of potassium, or even under a drug quite different in its action, viz. strychnia; but whether it has been due to the medicine or to the influence of time is quite doubtful—I should think the latter. Amongst other medicines which have been suggested is quinine, and it seems to be about as useful as the rest. At any rate, for years past I seldom pass a day without seeing some patient who

complains of deafness mentioning in connection with this symptom that of giddiness.

It comes to this, that the term Menière's disease is in common use, and serves a purpose in the direction of utility. When a healthy person suffers from vertigo and nausea, or perhaps even vomiting; when this vertigo is often repeated, and by-and-by disappears; when it is accompanied with sudden loss of hearing and tinnitus which do not disappear; when disease of the brain can be safely excluded, he is said to be suffering from Menière's disease: whether it is the disease which attracted Menière does not appear at all clear; but it is at least clear that Menière's cases were subjected to a post-mortem examination, and that in the cases to which the term is so applied the subjects do not die of the disease, and so at least one satisfaction remains, viz. that an assurance of the absence of danger may be given to the patient. The position of the lesion is by no means settled, and when it is stated to be the labyrinth, there is no evidence for making this statement, it is mere conjecture. Up to now there are no means of studying the disease except by *the train of symptoms*, and the only certain conclusions are *that life is not endangered* by them, and that we know of no certain remedy. It may, however, be said that the use of alcohol will increase, or rather intensify them; that in the early stages complete rest should be insisted upon with a spare diet, and that bromides appear to control the giddiness.

Like many other nervous affections of the ear

which are beyond the reach of surgery, these cases have offered a seductive area upon which to practise a variety of remedies, whose only recommendation has been a groundless speculation in regard to their action; so we find that the subjects of so-called Menière diseases have served the purpose of demonstrating the futility of such treatment as pilocarpine injections and electricity. I should hesitate to speak so uncompromisingly of these agents were I not familiarised by daily experience with the fact that they are employed alike in cases which are uninfluenced by treatment, and in those where the tendency in the disease is to recover irrespective of injections or currents. In my views on pilocarpine I am in accordance with those expressed by Politzer, who originally made the experiments with it; and as to electricity as a remedial agent in diseases of the nervous portion of the ear, the profession have by this time had ample opportunities of forming a judgment.

CHAPTER XI

In 1863 Mr Hutchinson drew attention to the prevalence of deafness in patients affected with inherited syphilis.

Out of twenty-one cases which he relates, in the last six there was no indication of disease in the outer or middle ear which could account for the deafness, and the affection was therefore put down to disease of the auditory nerve. In the other fifteen cases the ears were not examined; but in many there was a history of otorrhœa, and to however small an extent the symptom of deafness may have been due to tympanic disease, there was at any rate sufficient evidence of its presence to prevent the cases from being classed as purely nervous.

Of the following cases of deafness in patients the subjects of inherited syphilis, in none was there any evidence of tympanic disease; for I think, in considering the pathology of the nerve affection, it is desirable to have cases from which all other sources of the deafness may be safely excluded. In these twelve, then, there was no history of catarrh, air freely entered the tympana by the Eustachian tubes, and the tympanic membranes were healthy.

I have selected them from a vast number in order to show not only the scanty history which is obtainable in these cases, but that the scanty history is sufficient for purposes of diagnosis, and also to show the variations in age and the periods which elapsed before complete deafness took place. It must be remembered, however, that many of these subjects arrive at a time of life when the deafness ceases to progress.

Case 1.—G. C—, a boy æt. 10. Keratitis at eight years of age; could hear well eighteen months ago; since then been getting deaf; now can hear a loud and distinct voice if close to the ears; typical teeth; tuning-fork on head not heard at all.

Case 2.—M. K—, a girl æt. 12. Thorough syphilitic physiognomy; teeth questionable; she could hear well two years ago, when she had keratitis in both eyes, and about the same time began to get deaf. She was not, however, very much so—that is, she could hear conversation fairly well until within four weeks before I saw her. During that month she became rapidly worse, and was then totally deaf to any sound.

Case 3.—J. P—, a boy æt. 13. Teeth well marked; three years ago keratitis, five months before could hear well; since then been gradually getting deaf; requires a loud voice in conversation; tuning-fork not heard at all through the cranial bones; watch not heard in contact with ears.

Case 4.—J. T—, a boy æt. 14. Quite blind from interstitial keratitis for several years; gradually getting deaf for a year on the left side, but up to two or three months ago could hear well with the right ear. The hearing now is perceptibly better on this side; but on both sides requires a raised voice to make him hear; the tuning-fork could not be heard on the head.

Case 5.—J. H—, a boy æt. 12, with well-marked syphilitic physiognomy and teeth. No keratitis; could hear well three years ago; gradually getting deaf; can hear tuning-fork if very loud on the head, and watch in close contact with either ear.

Case 6.—H. L—, a boy æt. 10. Syphilitic physiognomy and teeth; mother with scars of rupia on face; she had four miscarriages after she was married, and this boy is the only child. He has been getting deaf for five years; can just hear a loud shout close to ear.

Case 7.—L. M—, a woman æt. 26, at ten years of age had keratitis; three years ago could hear well, and in a few weeks became as she now is, totally deaf; suffers very much from tinnitus. The physiognomy of hereditary syphilis well marked.

Case 8.—K. W—, æt. 9, a girl. Typical teeth; keratitis five yeas ago; cornea now affected; slowly getting deaf for four years, and for last twelve months has not heard a sound.

Case 9.—M. A. W—, æt. 17, a girl with typical teeth; marks of rupial scars on the mother; could hear quite well three weeks before; now can hear loud clap of hands, but cannot distinguish a word; for all practical purposes totally deaf.

Case 10.—E. H—, æt. 13. Keratitis at three years of age; been getting deaf very gradually from that time; tinnitus constant and most distressing; tuning-fork not heard at all; requires a loud shout to make her understand a word; speaks very indistinctly owing to having been a little deaf at an early age, and the parents probably not taking pains to teach her to articulate properly; she has rather better hearing on the left side.

Case 11.—J. G—, a girl æt. 17. Three years ago could hear quite well; at this time she had keratitis, and simultaneously began to lose power of hearing; she is now totally blind and deaf. Teeth typical, and physiognomy of inherited syphilis.

Case 12.—A. H—, boy æt. 12, at ten years of age began to get deaf, and in eighteen months became stone deaf; typical teeth; interstitial keratitis. Mother been confined eight times; first child lived three hours, second lived one hour, third stillborn, fourth lived one hour and a half, fifth is present case, sixth, seventh, and eighth good hearing.

It will be observed that the most general time at which this affection shows itself is from five to fifteen years of age; the earliest time at which I have seen

it being three years, the latest twenty-three. The course of the disease varies, but in chief part it is rapid in its progress. In Case 9 the girl, from having perfect hearing, became totally deaf in three weeks. In others it is more slow, taking sometimes four or even five years to arrive at its most severe point. Cases of this kind are sufficiently easy of diagnosis by the history and course of the affection, by the absence of causes in the outer and middle ear for the deafness, by the distinct evidence of disease existing in the nerve as shown by the tuning-fork not being heard through the cranial bones, and by tinnitus.

This morbid condition of the auditory nervous structure would seem, therefore, to differ in some respects from the others most commonly met with; in the latter kind, with some very few exceptions, the deafness does not come on so early in life, seldom appearing before the age of puberty; neither does it advance so rapidly as in the syphilitic variety, nor, excepting in very rare cases, does it become so complete. It is important to recognise these points, for it frequently happens, in examining obscure cases of nervous affection, that by noticing such circumstances one is led to look for evidence of a syphilitic origin, and in case of discovering it to arrive at a satisfactory conclusion.

In his remarks on this affection Mr Hutchinson, after observing that the loss of hearing is always symmetrical (with one exception, No. 4, this held good in all the cases I have seen), classes them as analogues of syphilitic retinitis and white atrophy of

the optic nerves, and concludes by deprecating any treatment as likely to be useful. The experience of other observers as well as my own has since shown the correctness of this conclusion, and inherited syphilis as a cause of deafness is now fully recognised. Indeed, it is the exception for a week to pass by without seeing these cases in the out-patient room.

The subjects of constitutional acquired syphilis, during the course of what are spoken of as secondary symptoms, not unfrequently suffer from more or less deafness which disappears generally under the specific treatment adopted in these cases. The evidence that the symptom of deafness is dependent on the syphilitic poison is usually conclusive, and is twofold. In the first place, the middle ear being found on examination quite healthy, the vibrations of a tuning-fork on the vertex being heard indifferently or not at all, and the loss of hearing being symmetrical, points to a nervous lesion. In the second place, the hearing generally returns as the patients recover from the disease, no treatment having especial reference to the ears being required. As a rule the deafness is not very extreme—that is, the patients can hear if spoken to in a loud voice; to this rule I have, however, seen exceptions, and notably in the case of a man æt. 34, who, without a trace of disease in the external or middle ear, lost his hearing on the appearance of a syphilitic psoriasis, and recovered slowly in the course of six months.

At the time when he was most deaf it was almost impossible to make him hear a word. The only local

syphilitic affection of the middle ear I have noticed is an occasional obstruction of one or both Eustachian tubes (and this has readily yielded to simple measures, such as Politzer's inflation) at the time that there was secondary ulceration of the throat. It is not very uncommon for a patient with perforation of the tympanic membrane to develop mucous tubercles in the external canal if he becomes syphilised; and this, of course, is due to the fact that the discharge from the ear, becomes syphilitic when his constitution is imbued with the disease. This, under ordinary conditions, is the only local manifestation of syphilis in the external ear were it not for a notable exception in which I once saw a primary syphilitic sore just external to the meatus. But under the head of syphilis there is a third group, which appears in the very late or tertiary period of the disease; and this, like the deafness which comes to the subjects of secondary syphilis, is of a purely nervous character. Just as certainly, however, as the loss to perception of sound is recovered from in the secondary stage, so is the deafness not remediable when it comes on several years after the syphilitic infection, and it is exceedingly important to be aware of the different behaviour under remedies in the two kinds. Patients who have gone through many of the phases of syphilis, and who still show the taint after years of treatment, occasionally become deaf from intra-cranial change which obviously is of syphilitic origin. With these the constitutional remedies which restored the deafness in the secondary stage fail altogether to be of use.

However various may be the symptoms in nervous lesions of the auditory apparatus, at any rate the diseases of the middle ear present certain characteristics which are made sufficiently evident by the methods of examination at our command to enable us at once to separate into two distinct classes affections of the conducting and nervous parts of hearing. So at least we might think, but experience forbids me to overlook the occasional variance from this; very occasional, it is true, but on that account none the less necessary for us to be able to recognise as an undoubted fact that the two kinds are sometimes strangely mingled. Such cases are not a little embarrassing, and it is only by constantly and carefully examining case after case as they are brought under notice that we are enabled to detect them. An example of what I mean will be such as the following:

A young girl of 18 or 20, after a succession of colds, becomes somewhat deaf. The tympanic membranes have lost their translucency and are opaque. On the accession of colds the hearing is worse; some slight and transitory improvement will follow, perhaps, inflation of the tympana. The hearing will be worse in damp weather. The tuning-fork will be heard perfectly well on the vertex; any tinnitus, if present, will be temporary and trifling, and not more than is often present with an ordinary tympanic catarrh.

With such a case the usual methods of treatment

ought to relieve the patient, for the disease has not been of so long a duration that any remains in the tympanum of old secretion cannot reasonably be expected to be got rid of. Regular inflation and other treatment is perhaps practised for some time, but with no benefit. All this is disappointing to the patient, and scarcely less so to the surgeon. By-and-by we slowly learn (for it is not always easy to elicit information from nervous girls of this sort) that she is for a day or two during the catamenial period dreadfully deaf; that perhaps on coming home late from a ball after an evening of excitement she can scarcely hear anything that is said to her, and for the following day still remains very deaf. That peculiar aspect and manner which I cannot explain, but which is really symptomatic of some forms of nervous deafness, perhaps, is now noticed on some occasion. The patient goes away, and is seen no more for a time.

Now if the career of this girl (I am putting an imaginary case, but one the like of which I have constantly seen) could be followed out, it is in the highest degree probable that, supposing her to get married and to become a mother, she will during her first confinement suffer from an increase of deafness, and not improve after convalescence. Each successive confinement will be marked by a fresh accession of deafness, until at last it is very severe. Now the vibrations of a tuning-fork placed on the vertex are not heard well, and there is a good deal of tinnitus. On the first examination it was not at all easy to recognise the combination of the two kinds of affection, viz. the

tympanic and nervous. So far as the history and appearance of the membrane would serve as guides to a diagnosis, there was nothing discoverable beyond a tympanic catarrh. I do not mean to say that all these cases progress so sadly as the typical one I have mentioned, but they do sometimes, and therefore they deserve notice.

It would almost seem that with them, as in some others mentioned before, the auditory nerve was in a condition especially predisposed to lose its functions, and that upon any circumstance arising which suspends for a time perfect hearing, such as the tympanic catarrh, it becomes affected permanently. This may appear a lame way of accounting for what I can give no better explanation of, and another and apparently a more rational one will be given by some others by putting out of the question any nervous lesion, and attributing all the symptoms detailed to a local cause resulting from the catarrh, such as thickening of the lining membrane of the tympanum, and of the fenestræ rotunda and ovalis. I cannot accept this as a true explanation, and for this reason : at the time I speak of, when the patient is first seen, the disease of the tympanum is not only inactive, but all that interferes with the conduction of sound is strictly confined to what has been left behind after the subsidence of the catarrh. The deafness from this cause then ought to remain stationary, and it does so, excepting on the accession of some additional circumstance which does not reawaken the catarrh, but without doing this, or in any way interfering with the

conduction of sound to the labyrinth, induces a decrease in the hearing power.

Although in truth there is not much to be done in the way of treatment for these patients, and nothing of a local nature, they should be warned to avoid all habits or excesses which are of a nervously exhausting nature; and as apparently slight causes will sometimes plainly have a decided effect on the hearing, so will judicious care sometimes, so far as we can judge, act in a beneficial way in preventing an increase of the deafness. Sometimes I have thought a course of strychnine has helped matters, and on other occasions when the hearing has begun to fail under severe mental work I have known good hearing to return after a complete rest of a few weeks.

It is notorious that some families inherit deafness; by this I do not mean that the children are born with defective hearing, but that in early life they gradually become deaf in one or both ears without any discoverable cause for the fact. It has probably been only a coincidence, but I have more often than not observed this to run in the female line, and the most noticeable example of this was (and a very remarkable circumstance it is, too) in a family where for three generations nearly all the children on the female side became more or less deaf about twelve or fourteen years of age, the only exception being one set of cousins, and these having now reached adult life hear well.

What a confession of ignorance pervades this portion of the subject, so far as a complete knowledge of the pathology of some of these nervous affections

of the ear is concerned! What a confession of the impotence of surgery or medicine for their relief! One thing, however, I hope has been made clear, viz. how to recognise these conditions, to form a fair notion of whether they are of a progressive or of a stationary nature. If this be so, then the position may be explained with accuracy to patients, and they may be relieved from the miserable apprehensions of becoming worse when there is no cause for fear, and be saved from the additional annoyances they might suffer at the hands of charlatans, who with all the confidence of ignorance are profuse in their promises of what they call a cure.

In doing this, in guarding them from harm, in placing them under the most favorable conditions as regards general health, in advising diet and regimen in its largest sense, in advising the abstinence from useless drugs, the same will be done for them as is done by scientific physicians for a multitude of nervous and permanent diseases.

CHAPTER XII

Deaf-mutism is dependent on several different conditions; but, speaking generally, it may be said to be caused either by total or partial deafness, the result of congenital defect or of disease occurring during early life. I will take in order the various causes of mutism.

1. Of course, a child who has never heard cannot acquire language in the ordinary way, and therefore is dumb. The chief defects that have been found in the ears in congenitally mute children are a complete absence of the labyrinth; the cochlea with only one turn and a half; absence of the semicircular canals; one or two of the semicircular canals imperfect; the fenestra rotunda closed by bone.

If a completely deaf child be brought for examination, it is not always very easy to persuade the parents that their child has never heard, or, indeed, that it does not hear a little. The point may, however, readily be put at rest in the following way:— While the child's attention is taken up by some toy or the like, make a very loud sound, such as a whistle, behind it, or the Distinette referred to in a former chapter, at the same time taking care that your shadow

does not cross its field of vision, or your breath fall upon it.

If it does not show some sign of hearing, such as looking round, it may be considered totally deaf. Because the child makes some labial sounds, "Mam" and "Pap," its friends do not understand how these words can have been learned without they have been heard by the child. They forget, or rather they don't know, that by watching the lips, the two labials M and P are at once without any trouble learned by mutes, and that as these two words have been often repeated to the child the motion of the lips necessary to execute such sounds has been copied by it. Mute children, too, are singularly susceptible to vibrations, and will turn round when anyone enters a room or shuts a door, thus again giving rise to the fallacious idea that they hear, so that in practice it is well to be aware of this little difficulty.

2. It is not at all necessary that there should be a complete absence of hearing power in every case where a child has never spoken; a very moderate degree of deafness is quite enough to produce this misfortune. When it is remembered that children acquire language by hearing each word frequently repeated, and that every new word they learn is imitated imperfectly at first, and gradually the articulation is corrected after successive attempts, it will be readily understood how, in the case of a child who was rather deaf, the only way in which language could be acquired in the ordinary manner would be by repeating a word over and over again in a loud voice

close to the ear which is possessed of partial hearing power, and correcting the articulation of the child until it was perfected. This process not having been pursued, as a natural consequence the child is dumb.

3. The next example is where a child is born with good hearing power, and loses the hearing either totally or in a great measure before it is old enough to have acquired speech. Scarlet fever and other of the exanthemata are the most common causes of this.

4. A child may have learned to talk, and at the age of 3, 4, 5, 6, or even 7, may become totally or extremely deaf; in the course of a few weeks in the instance of a child of 3 or 4, in a few months if the child is older, it will be dumb.

The most fruitful causes of deaf-mutism induced by disease at this period of life are scarlet fever and inherited syphilis, but I have also known children to become nearly dumb when the Eustachian tubes have been obstructed very extensively and for long periods; thus a moderate degree of deafness sometimes quite suffices to act in the same way as complete absence of hearing power does at others. When children are in process of becoming dumb their articulation gets more and more indistinct, until by-and-by it is impossible to make out what they say, so that whenever a child who is at all deaf begins to speak thickly it is well to remember the danger which threatens, and without delay to turn attention to the condition of the ears; for it is surprising how quickly the power of articulate speech becomes lost when it once begins to fail. And the reason of this is sufficiently obvious;

the child not hearing what is said around very soon forgets the knowledge that it has not practised itself in exercising for a period long enough to make speech a confirmed habit. The same influences which make a child in this manner dumb will cause a child to lose one language while it is acquiring another. Thus a boy or girl of 4 or 5 years of age who has been brought up in India with a native nurse and taught as a first language Hindostanee, will in six months, if it is brought to England and does not hear this language spoken, have completely forgotten it.

After examining a case in which the speech has been lost or not acquired in consequence of impaired hearing, the first question to determine is whether any treatment is likely to improve the hearing, and, if so, to what extent it probably will be restored; for in case of a fair extent of hearing being arrived at, no further treatment or management of the child will be required, and in the natural course of events the child will learn to talk. An interesting case is recorded by me in the 'St George's Hospital Reports,' 1872, in which a child acquired speech in the ordinary way, became considerably deaf after scarlet fever with perforations of the tympanic membranes, rapidly lost all power of speech, and after recovering the hearing in a great measure under treatment learned to talk for the second time in her life in the course of six weeks. The rapid way in which this child, eight years of age, acquired the power of speech, is a great contrast to the slow and tedious process pursued by the same child when very young, and was due to the

increased superior development of her mental capacity due to her age. The whole subject of treatment of the ear affections has already been dwelt upon, so that for the present may be dismissed from consideration the cases in which the hearing can be benefited, and the management of dumb children who are either totally deaf, or are partially and incurably deaf, may be discussed. A question of very great importance to the parents of mutes is, which is the best system by which the child or children should be educated.

Up to comparatively recent times the plan adopted in this country has invariably been one by which children are taught to express themselves by the use of the finger alphabets (dactylology) and manual signs; in common parlance, to talk on their fingers. Mutes who have been taught on this principle, after instruction extending over a brief period, are able to converse with other mutes and those who know their language, and when they have acquired facility can hold a conversation almost as quickly as can speaking persons. Another system has for many years prevailed in Germany, Holland, Austria, Sweden, and some parts of the United States of America. The finger alphabet and artificial signs by gesture are not made use of, but the children are taught to use articulate speech, and by watching the lips of others understand what is being said. This is achieved by diligent cultivation of the powers of observation and imitation. It is the duty of every medical man to make himself acquainted (if opportunity offers) as far as possible with the results of both systems, so that

when he is asked which he recommends he may be able to give an opinion on the subject.

With regard to the plan usually pursued in England I have nothing to say, as the working of it may be seen by paying a visit to any deaf and dumb institution; but of the other, as it is not so familiar to every one, and as it is most desirable that all medical men should understand it, I cannot do better than quote from a speech which I delivered at Leeds in 1871 for the purpose of introducing the system into this country.

"The so-called German system of education of mutes may be briefly described as one where deaf and dumb children are taught to understand and employ language by observation and imitation of the articulation of others, the finger alphabet and all artificial signs being rigidly excluded.

"For this, as for any other system, it is of course necessary that the child's intellectual faculties be not more than usually deficient, and obviously where there is a cleft palate or other malformations of the organs of speech (which appears to exist in the proportion of one in one hundred mutes) it is not applicable. The age at which education commences is about seven years, and eight years are expended before the child can read from the lips of ordinary persons, and speak so as to be easily understood by them. Although artificial signs are excluded in the education, it is permitted, and indeed necessary at the very commencement, to attract the child's notice by pointing to the teacher's lips, and to various objects, in order to excite

and ultimately obtain its undivided attention, as it is from the exercise of this, and from the child's inherent power of imitation, that all its future education is to be derived.

"To begin at the earliest lesson of a mute of seven years, who has received no sort of instruction. He is brought into a room, when a hearing person is spoken to by the teacher. The child soon notices that as the teacher's lips move, the listener turns round and looks at him, and he thus learns to have his attention directed to the lips of his instructor. Without entering at any length upon the subject of sounds and letters as taught to mutes, it will with a little consideration be seen how, though at first sight it is a difficulty to elicit proper sounds from them by placing their lips and tongue into the necessary positions, it is by no means an insurmountable one, and that a very complete alphabet of sounds may be formed, so that as the pupil progresses with the alphabet he is taught in a short time by joining two sounds to articulate a word. As soon as this first step is accomplished, then the attention of the child being at once directed to some object or picture which represents the word pronounced, the object after a little time becomes associated in his mind with the sound which he has made to correspond to it.

"By way of illustration—one of the earliest lessons. The mouth of the child being opened, he is made to effect an expiration. This is done, firstly, by his imitating the teacher, and secondly, by the latter exerting at the same time a little pressure on the epi-

gastrium of the child. Thus the sound which corresponds in the phonetic alphabet to the letter *h* is evoked; and it is to be noticed, for reasons afterwards explained, that this is unattended by any vibration of the larynx. By opening the mouth widely and making a slight noise, without the expiratory movement, the sound 'ah' for the letter *a* is evoked; this being attended by a vibratory movement of the larynx which can be felt to be communicated to the fingers pressed upon it. At first the loud inharmonious animal noises that are made in attempt at speech require to be modulated. This is effected in two or three ways. The teacher himself, speaking in a low tone, calls the attention of the child to the quiet subdued motions of his chest and of the muscles around his mouth. He tightly holds the hand of the child in his own, and by depressing it the child learns to connect this movement with a lowering of its own voice. By placing the hand of the child on his (the teacher's) throat, and by placing his (the teacher's) hand on the child's throat, he will draw its attention to the slighter vibration of the larynx when the voice is lowered. By enforced attention of this kind, the child, as his education advances, soon learns that his progress depends on his actively cultivating his powers of imitation, and by copying these movements produces in this way a fall in the voice.

"Suppose the child to have produced the sound for *a*. By filling out the cheeks and making a puff, the sound which corresponds to the letter *p* is elicited. Let these two last movements be carried on consecu-

tively, and the word *ape* is produced. The attention of the child is then at once called to the object, a picture of, or better still, a stuffed ape. From that time forward he connects in his mind the idea of an ape with the sound which he has learned to make. Again, after making the sound for *a*, he is shown the letter written down; he then learns to write it himself, and is thus able, first, to recognise the word when spoken by his teacher; secondly, to speak it himself; thirdly, to understand its meaning; fourthly, to recognise it when written; and fifthly, to write it himself. Each of these branches of instruction, therefore, go together hand in hand. To perfect some of the sounds, it is necessary to make use sometimes of certain aids; for instance, in making the sound for the letter *p*, some children will not compress the lips sufficiently firmly, and thus they will produce the sound 'pooh' instead of 'pah.' By making the child blow away a little piece of paper for a few times when he is making his attempt, this mistake is avoided.

"When the lips are compressed with a slow expiration and advanced, the sound corresponding to *w* in English and *ou* in French is made. The lips closed in the position for *w* are opened quickly with a puff as said before, the sound for letter *p*, or opened slowly when the sound 'bah' or that for letter *b* will follow. We have then the three consonants *w*, *p*, and *b* of our alphabet, in which the two lips are alone employed. These for the present let us call bilabials.

"The upper incisors applied firmly to the lower lip,

and quickly separated, the sound corresponding to letter *f*, or, slowly separated, the sound for *v*, will be produced. These two letters, therefore, will, from their formation, be inciso-labials.

"The tongue being placed in apposition to the lower incisors, and the teeth closed with a quick expiration, the hissing sound for the letter *s* follows. The same with a slow expiration will produce the sound for *z*, with the difference that in the latter case the child's attention is drawn to the vibratory movements of the larynx, which are absent for the letter *s*. The tongue being placed between the teeth, with a quick expiration, the letter *th* like the Greek *θ*, as in the word *thin*, and with a slower expiration as in the word *thine*, is effected.

"The tongue being placed in apposition to the upper incisors, and moved quickly away, the sound for *t* is pronounced with a quick expiration, and for *d* with a slow expiration. These sounds or letters let us call inciso-lingual.

"The gutturals, such as *qu* or *k*, are sounded by expiration when the tongue is curved backwards and downwards, and this is assisted by a little pressure exercised on the child's larynx, between the two fingers of the teacher; or let the tongue be pressed back to the lower part of the mouth, and let the child be made to say the sound which he had learned before for *t*. The sound for *g* is the same as for *k*, with the difference that there is a greater and deeper movement of the larynx. The sound for *m* is made with closed lips, and expiring through the nose, while *n* is

effected as follows:—The teeth being firmly closed, the air is prevented from escaping between them by placing the tongue up against the upper incisors, and breathing through the nose. For the sound corresponding to *l* the tongue is made to move up and down quickly against the hard palate, the teeth being separated about a finger's breadth. In the sound *r* the tip of the tongue is kept vibrating against the hard palate, and the vibrations of the larynx are felt to be distinct.

"To go back to the letter *a*, which sounded *ah* as '*far*' is the first vowel taught. The mouth is opened, the tongue kept flat, and an expiration is made. The open mouth is then made a little smaller by bringing the corners nearer to each other, producing the sound *oo* as in hoop, and between these two comes the vowel *o*. These are the first three sounds taught in the vowels. In the sound for *e* the under jaw is pressed forward, the larynx raised a little, and *a* is attempted to be sounded, with the effect of producing *e*, or written *ea* in the child's phonetic alphabet.

i is composed of and produced by *a* and *e* rapidly run into one.
ou „ „ *a* „ *oo* „ „
oi „ „ *o* „ *e* „ „

Lastly, the sound for *y* cannot be learned until the sounds for vowels are perfectly mastered, but it will then be found to be composed of the two sounds equivalent to *e* and *a* rapidly succeeding each other without a pause, or rather run into one. To show this, the mute, if made to pronounce with rapidity a

sound written down as *eas*, would articulate the word '*yes*' as used by us.

"The spelling-book of the mute, therefore, will differ in some degree from that of an ordinary child, as he will not make use of or connect in his mind the same sound that we are accustomed to do in pronouncing the individual letters of our alphabet, but he will produce the very same word when the letters are joined together.

"To go back to the old example: *a p e* will spell *ape* for us and him alike, but each letter individually he will call by a different sound from that which we make when naming it. Strictly speaking, the mute's alphabet is more correct and less arbitrary than our own.

"The first year of the child's education is spent in reading the sounds of his alphabet and words of one syllable from the lips of the teacher and from the book, in articulating them, in writing them, and connecting the sounds he learns to produce with objects corresponding to them. It will be observed with infants, and children who have the power of hearing, that the first sounds which they make are labial ones, such as sounds beginning with *m* and *p*, &c.; and these will also be found in mutes to be those most easily learned at the commencement of their education. As age advances in the one and instruction with the other, the sounds next easily learned are those made with the lips and teeth.

"It is necessary in teaching the deaf and dumb to be particular as to the way in which the expirations are

made and concluded, for unless this be completely effected, the sounds will die away before they are perfectly emitted from the mouth. Indeed, one would suppose it quite likely to happen that the child might sometimes imitate exactly the motions of the lips, tongue, &c., necessary for articulation, without emitting any sound at all. This, however, practically does not occur; and more than this, the children who have had as much as two years of this education will detect the teacher or any one addressing them, if they should form the words with the lips and omit the sound. The second year's education is much the same as the first, progressing, however, from words of one syllable to words of two or three, and words where two or three consonants come before or after a vowel, as in the words *arms* or *straw*. Here the difficulty met with is that the child requires practice in repeating such words quickly, the tendency being to pronounce the consonants too separately, thus producing a sound like *ser ter aw* instead of straw, *per lace* instead of place.

"In words of two or more syllables, when the stress is to be laid on one syllable, this is accomplished by moving the child's hand quickly down as that syllable is being pronounced. In the second year the early parts of arithmetic are commenced to be taught, and it is obvious that as the education advances year by year, no matter what the subject-matter that is being learned, the practice of speaking and reading from the lips or books is at the same time continued equally for all.

"It may occur to some that the two systems of dactylology and lip-reading might be advantageously combined, that the benefits of each might be received, and their respective disadvantages left out. Let me say, once for all, that this is found to be impossible; more than this, it is of the greatest importance to check any disposition that the children may themselves evince to combine manual signs with vocal sounds. If this is once permitted, the child soon loses the power of keeping its attention undividedly fixed on the lips of the person speaking, and from that time begins to falter in its own diction.

"The advocates of the system of dactylology will be found, when speaking on this subject, to declare that only a certain number of children possess sufficient intelligence to learn articulation; and as instancing this, they will mention adults who are able to converse with facility on the fingers, and at the same time read from the lips and use articulate language. In all the cases of this kind which I have met with, on rigid examination I have found that they have first learned lip-reading and articulation, and that, having become proficient in this respect, they have subsequently learned to speak on the fingers. This, of course, is quite a different case from those I am speaking of. Here the finger-talking must be looked upon in the light of an accomplishment—of a second language, or as if acquired by hearing persons. The true physiological explanation of the indubitable fact that, if finger-talking and manual signs are attempted to be combined with articulate language before the children

have learned the latter method thoroughly, they will not be able to learn articulate speech, will, I think, be found to be the following.

"If the child can make its wants known by making signs, although its attention may be called to the lips of the teacher, it will not be able to maintain its attention with sufficient perseverance and care to permit of the full development of the fine muscular sense inherent in the tongue, lips, palate, and throat, which full development is, I believe, essential in order to give the child the power of imitating with exactness and precision the movements which it is being taught.

"So far we have been considering the case of children who are totally deaf, either congenitally, or having become so before they have learned to talk. In passing I may mention two or three somewhat different conditions. Firstly, where children have become incurably deaf before they have learned to talk; not so deaf but that they can hear moderately loud sounds, but sufficiently so to prevent their hearing enough of what is said to allow them to acquire speech; with these the little hearing which remains will prevent the harshness and want of euphony which characterises the voice of the totally deaf mute who has been taught on this plan. Secondly, a little further degree of hearing will be of immense advantage; for besides speaking euphoniously, if a word shouted close to the ear can be understood, this will serve to correct the articulation, and the child will, of course, not take so long to learn. Indeed, the more hearing that is left, although not enough for a child to learn to speak in

the ordinary way, the more quickly and better will language be acquired. Thirdly, in case of a child who has learned how to speak, and at an early age, say seven, has lost its hearing completely by scarlet fever or the like, it is well known that from the fact of its not hearing others speak it will not be tempted to make use of speech itself, will gradually depend more and more on signs, and in a short time will have lost all power of speaking. For such patients this system is invaluable, for if they are taken in hand as soon as they become deaf, they can with very little difficulty be made to learn lip-reading, and will thus retain their speech, or where it is beginning to be forgotten will rapidly re-learn.

"The early part of the education is in the highest degree laborious to the teacher, and besides the perseverance required, it is actually physically hard work. To perfect the sounds made by even quite the beginners, it is important as soon as possible to teach them such sounds as represent words corresponding to some visible object or constantly recurring sensation. The idea of the object or sensation having once become connected in the mind of the child with the motion of the lips by which he has learned to indicate it, he repeats it with great frequency and pleasure, thus giving opportunities to the teacher to correct any faults he may possess in pronunciation. Moreover it constantly happens, and I have myself observed it when paying visits to the children undergoing this course of instruction under Mr Van Praagh, that one child who is more advanced will correct one less so

when the latter makes mistakes. And again, from the very careful and *prononcé* way in which the children enact the movements of the lips and tongue, the smallest variations in these particulars are at once noticed by their companions and immediately imitated. It results, then, that a correction from the teacher which serves for the one pupil will indirectly affect the others in the class. Thus it is more advantageous than otherwise that numbers should be taught under the same roof. It must not, however, be understood from this that the separation of the mutes from speaking individuals is recommended. In fact, after the first year or two of instruction, the reverse is far the better plan; for the more the child can mix with the outside world, with its relatives and friends, the more do its observant powers become cultivated; and this end is assisted by change of persons and surrounding objects which interest it, rather than by keeping it entirely resident with its fellows. For this reason the institution of day schools seems to me to be likely to prove more beneficial, besides being less expensive, than asylums for this method of educating the deaf and dumb; the end and aim of this system being that the children, when grown up, should occupy positions of usefulness, where they will receive the ideas of others and communicate their own to ordinary men and women, rather than that they, like those who only talk on their fingers, should have occupations where their social intercourse is limited to those similarly affected as themselves.

"Among the advantages which this method of

teaching appears to possess over that of speaking by the use of the fingers and artificial signs, one of the chief is the following :—That when the children have acquired the power of talking by the dumb alphabet, however perfectly, and go out into the world, they are still deprived of all intercourse with their fellow-creatures, excepting in those very rare instances where they happen to meet with those who are able to converse in the same way as themselves, the proportion of such persons in ordinary life being so extremely small that, for the sake of argument, they might almost be put out of the question; or again on the supposition that a mute could only acquire the power of *reading* from the lips of others without being able himself to articulate, and thus convey his ideas to others, it becomes a question whether he would not, although he had to reply to everything by writing, be a more useful member of a community composed of ordinary speaking individuals than a mute who could only receive and convey his ideas to those similarly situated as himself, or be dependent for conversation on a chance meeting with some one who had acquired his peculiar language. If such a proposition bears a moment's reflection, it must be apparent how very considerable must be the advantage of that mute who possesses not only the power of receiving information conveyed in language familiar to all, but also of replying in the same manner. Both of these faculties, however, are, in the system under consideration, so intimately combined, that the one naturally follows the other.

"In the early part of the education this method, undoubtedly, is more slow than the other in the facility which it gives for conversing, either by the child or to the child; but this, I submit, ought to possess very little weight when compared with the results attained at the end of the course of instruction.

"The condition that the child is placed in with regard to its importance as a member of society when it leaves school, and the careers of usefulness that are then open to it, should, to my mind, be the chief points which ought to be kept in view when comparing the respective merits of the two systems. Of what importance is it if, at ten years of age, a child can talk well with its fellows—well with those who have learned its language—if, at fifteen years it still only possesses the power of communication with a few, while its companion (brother or sister, it may be) of the same age, who has been taught on the other plan, converses by means of and understands the language of the many? Looked at in this light, the position of the two children hardly admits of comparison. With regard to the ultimate chances of success with any child of ordinary intellectual powers, M. Saegert, the Inspector-General of the Education of Deaf Mutes in Prussia, in his report of 1856, says, 'Ninety-nine per cent. of deaf mutes have the organs of speech normal; they will speak if they have good sight and touch; the greater or less probability of success depends solely (*uniquement*) on the greater or less capacity of the master.'"

When this was written, in 1871, the oral method

was, excepting one small school, unknown in England, and it is needless to say that, like all others attempts at change, it met with great opposition. The gradual adoption of the oral method has now become a matter of history. The subject has been discussed at great length in the public press of this country, and a general acknowledgment of the superiority of the oral method has been given in the most ample manner at an International Congress at Milan, more recently at the Health Exhibition in London, and finally by the Report of the Royal Commission on the Education of the Deaf and Dumb and Blind. Suffice it to say that the adoption of the oral method is now general. In England this has been very largely due to the opinion which our profession has formed of it, and in consequence of it to the advice which medical men have given to patients who have sought it. I may be allowed to say that this has been a source of the greatest satisfaction to myself, inasmuch as I have taken a most active part in the discussions upon this question ; for although I was unable to accept a courteous proposal to serve on the Royal Commission, I was as a witness able to testify to the universal support which the medical profession had given to this system, and I had the gratification of knowing that this support had its proper and due influence.

I have only to add that when a child of five, six, seven years of age or upwards loses its hearing, if it is able to read, it should be made to do so without any delay two or three times during each day, for by such an exercise it will retain all words that it has previously

known, and so will be prevented losing speech. Its vocabulary will have to be increased, and the rest of its education conducted by instruction upon the method which I have referred to, especially in regard to lip-reading.

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