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DEFECTIVE HEARING



KEENE



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# DEFECTIVE HEARING:

ITS

CURABLE FORMS AND RATIONAL TREATMENT.

BY

JAMES KEENE, F.R.C.S., M.R.C.P.,

AURAL SURGEON TO THE WESTMINSTER HOSPITAL; LECTURER ON AURAL SURGERY  
AT THE WESTMINSTER HOSPITAL MEDICAL SCHOOL, ETC., ETC.

*FIFTH EDITION.*

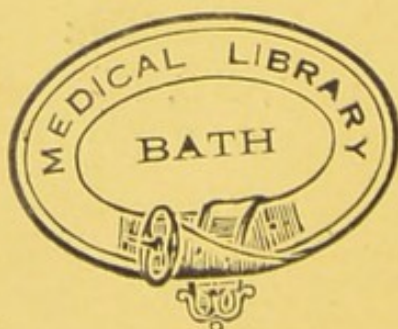


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## PREFACE

### TO THE FIFTH EDITION.

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A PORTION of the present essay formed the subject of a paper read before the Harveian Society, and was printed at the request of some of the Members.

During the seven years which have elapsed since the last edition was published, very great changes have taken place in the treatment of ear disease, and therefore the chapter devoted to this part of the subject has been almost entirely re-written.

The very favourable reception accorded to former editions will, I trust, be extended to the present one.

64, WELBECK STREET,  
CAVENDISH SQUARE,  
*June, 1883.*



*By the same Author.*

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A MANUAL OF  
AURAL SURGERY  
FOR THE  
USE OF STUDENTS AND PRACTITIONERS  
OF MEDICINE.

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OPINIONS OF THE PRESS.

"The language in which the author expresses himself is judiciously chosen, the style precise, and the method in which he treats his subject exhaustive. \* \* \*

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"Mr. Keene in the handy manual before us has fulfilled a want long felt by the student and practitioner. At once simple, clear, and concise, and yet at the same time containing all the most valuable results of the most recent advances in aural pathology and surgery, Mr. Keene's manual is the best introduction to the study of diseases of the ear we have seen. \* \* \*

"We are sure the work, from which we have given so many extracts, will fully bear out all the encomiums we have given of it in the beginning of our notice."—*Edinburgh Medical Journal*, December, 1873.

"This Book is well written and very readable."—*New York Medical Journal*, October, 1874.

"Mr. Keene's work, and still more recent pamphlet on the same subject, are characterised by a clear and lucid style, and a perfect command of his details."—*Indian Medical Gazette*, July 1st, 1875.

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*Nearly ready, with Illustrations.*

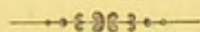
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HOW WE HEAR,  
AND  
WHY WE BECOME DEAF.

A Popular Description of the Organ of Hearing, and its diseases, with directions for the Prevention and Cure of Deafness, Noises in the Head, and other Affections of the Ear.



# DEFECTIVE HEARING.



## CHAPTER I.

*Affections of the Nose and Throat which cause  
Disease of the Middle Ear.*

**T**HE frequency with which persons are met with who talk thickly, and who do not pronounce nasal consonants correctly, cannot have escaped the most ordinary observation. Indeed, so common is the defect, that when once attention has been directed to it, few persons will fail to notice many cases during each day of intercourse with their fellow-men.

The diseases which give rise to this defect of speech—for we must at once dismiss the idea that it is a mere habit—occur at all ages, though more commonly in childhood and early life, and depend, as I shall endeavour to show, upon obstruction to the free passage of air through the nostrils. Augmented or thickened



nasal secretion, snoring, and loss of smell or taste, are likewise symptoms of these affections, which are not unfrequently accompanied or followed by defective hearing.

It will be at once perceived that these symptoms are usually present in an ordinary "*cold in the head*," to which cause they are generally attributed, and consequently neglected. To the aural surgeon, however, the persistence of such indications becomes of considerable importance, because he knows that the catarrhal and inflammatory affections upon which it depends are very liable to extend from the nose to the throat, and thence to the Eustachian tubes and middle ear, where they constitute the commonest causes of defective hearing.

A person who has the peculiarity of pronunciation to which I have alluded is, in common parlance, said "to speak through the nose," though, in point of fact, he is unable to do so by reason of obstruction of the nasal passages. I do not wish it to be understood that absolute closure of the nose is always, or even usually, present in these cases, but that a certain resistance to the *free* passage of air occurs, which the feeble expiratory effort accompanying the pronunciation of nasal consonants is insufficient to overcome.

Our alphabet contains two nasal consonants,



the M and the N. When these are deprived of the nasal expiration which should accompany their articulation, they become B and D respectively. This will be readily perceived by endeavouring to pronounce a word or monosyllable containing a nasal consonant, while the nose is closed. *Me* will then become *be*, *no do*, *moon bood*, *sun sud*, and so forth.

By placing a cold mirror below the apertures of the nostrils, in such a manner that its polished surface is directed upwards, and out of reach of the breath issuing from the mouth, we may readily satisfy ourselves that nasal expiration actually takes place during the pronunciation of syllables containing M and N, and with these only. In this manner we may repeat each of the consonants, in combination with each of the vowels, without any deposition of vapour taking place on the mirror, until the syllable contains *m* or *n*, which will at once become manifest by the appearance of a spot of dimness on the glass.

If we take into consideration the relative positions assumed by the organs of articulation—the tongue, lips, teeth, and palate—we shall perceive that they are the same for the pronunciation of *me* and *be*, *no* and *do*, and consequently we may infer that the difference between the sounds produced depends upon



the passage or non-passage of air through the nostrils.

Having thus arrived at the conclusion that nasal consonants can only be properly pronounced when air passes through the nose, it will be evident that any cause which gives rise to nasal obstruction will also give rise to the form of thickness of speech commonly, though improperly, termed "speaking through the nose."

The defect may vary in degree from an amount scarcely perceptible in some cases to the most aggravated and unpleasant extent in others; but, wherever present, it may be considered as a symptom of obstruction to the nasal air-passages, and indicates a diseased condition in some part of their course. Increase in quantity or tenacity of the nasal secretion, impairment of taste or smell, as well as heavy breathing and snoring, have a similar import, and some one of these indications will be found to have preceded most cases of deafness.

This is in no way surprising when we remember that at least four-fifths of all cases of defective hearing are due to disease of the middle ear, and of this number, in by far the largest proportion, the affection spreads to the Eustachian tubes from the naso-pharynx. The continuity of surface between the parts readily



explains this, and at the same time points out that, if we wish to attain success in aural practice, we must first acquire a thorough knowledge of nose and throat affections. For these reasons it has been deemed advisable to say a few words concerning the structure and functions of the nasal air-passages, as an introduction to the study of their pathology.

I have employed the term *nasal air-passages* in order to comprise the whole tract through which air passes in its way between the external apertures of the nostrils and the glottis. By this arrangement we shall include the whole of the interior of the nose, the upper portion of the gullet, to the level of the opening of the larynx, the soft palate, and the tonsils.

The mucous membrane which lines this tract is continuous with the general mucous surface of the body, and varies considerably in thickness in different parts. Near the exterior orifices of the nose and along the floor of the nostrils, where glandular tissue is absent or nearly so, the mucous membrane is thin and even. In the remaining portions mucous glands form an almost continuous layer, and the membrane is in consequence much thicker. Glands are most conspicuous at the upper part of the naso-pharynx, particularly in the neighbourhood of the Eustachian tubes, where they



form aggregations, known as the pharyngeal tonsils. The mucous membrane covering the inferior turbinated bones is corrugated and irregular, thick, and very vascular. Indeed, capillary vessels are so abundant in this situation that the part may be considered almost cavernous or erectile, and on this account is very liable to swell, constituting the principal cause of obstruction in nasal catarrh.

The olfactory portion of the nasal tract, or that part to which is distributed the nerve of smell, is limited to the superior and middle turbinated bones, and to the upper part of the septum narium. For the proper exercise of the sense of smell it is necessary that odorous particles suspended in the air should be brought into contact with the upper portion of the nasal cavity which must itself be in an efficient condition. Whenever, therefore, the nose becomes obstructed from any cause, these conditions are not fulfilled, and, consequently, smell is lost or impaired.

The same may also occur even when inspiration can be performed through the nose, whenever the current of air is diverted from the part in which resides the olfactory sense. Of this an interesting instance was lately brought before the Medical Society of London. A man who had lost the whole of his nose and palate,



as well as the anterior portion of his upper jaw, was, in consequence of this wholesale destruction of parts, deprived of the sense of smell. When he was fitted with an artificial nose, teeth, and palate, however, the sense returned, to disappear again immediately the gutta-percha nose was removed. In this case it was clear that the artificial nose guided the current of air to the olfactory region instead of permitting it to take the more direct course to the respiratory organs. More simple and frequent cases are of daily occurrence during and following colds in the head, when swelling of the mucous membrane covering the inferior turbinated bones suffices to cause loss of smell, by diverting the current of air from the superior fossæ of the nose.

We must bear in mind, therefore, that loss of smell does not always indicate an affection of the olfactory region, but that its cause is often seated in other portions of the nasal air passages, portions in more immediate connection with the auditory apparatus. The sense of taste is influenced by that of smell, and requires for its efficient exercise clearness of the nasal air-passages. This fact is practically impressed upon our minds from early infancy when we are taught to hold our noses in taking physic. Independently of smell, much of the delicacy of



taste resides in the soft palate, which is liable to suffer from the same diseases as the nose and throat. Impairment of taste must therefore be looked upon as a symptom in both nose and throat affections.

It will be apparent on the least reflection that these indications, though frequently overlooked by patients, or perhaps forgotten before they seek advice for defective hearing, are of considerable importance as premonitory signs. We know that the Eustachian tubes, which are prolongations of the middle ear, open into the throat immediately behind the internal aperture of the nostrils, and that the mucous membrane which lines the nose and throat is continuous, through the Eustachian tubes, with the interior of the tympanum. This continuity of surface causes the drum cavity to suffer from extension of the diseases which so frequently affect the nasal air-passages in this climate.

Having pointed out the important influence exercised by the nasal air-passages in causing disease of the ear, it will be almost superfluous to dwell upon the necessity of making a thorough examination of these parts. The nasal speculum enables us to examine the lower fossæ of the nose to a considerable depth, as well as the mucous membrane which covers the inferior turbinated bones. The soft palate,



fauces, tonsils, and a portion of the posterior pharyngeal wall may be readily seen by looking into the mouth. The parts situated above the velum palati can only be viewed with the aid of the rhinoscope—an examination which is attended with considerable difficulty in many patients, and in some cases cannot be performed successfully. Thus, too great proximity of the soft palate to the vertebral column, enlargement of the tonsils, a not unfrequent accompaniment of catarrh, and irritability of the throat, may each or all contribute to cause failure. It is true that in most instances, when the disease is advanced, the space is found large enough to enable us to use the mirror; but in the earlier stages of the affection, to which I wish more particularly to direct attention, this is frequently not the case.

In order to overcome these difficulties, a variety of hooks and retractors for the soft palate have been devised. I have tried many contrivances, and have been disappointed in them all. Patience and constant practice will do more than any apparatus; but, in spite of all, occasional failure will occur.

I will now proceed to describe the principal affections of the nasal air-passages which produce disease of the auditory apparatus and impairment of hearing. Of these, catarrh—com-



mening in the nose or pharynx, and spreading to the Eustachian tube and tympanum—is certainly the one most frequently met with in this country ; and if we take into consideration the acute and chronic forms of the disease, as well as the consequences to which it gives rise, this will be found to constitute a common, if not the commonest cause of defective hearing.

The symptoms which indicate acute nasal catarrh, or a common *cold in the head*, are too familiar to need much description. First comes the dry or sneezing stage, succeeded by the moist stage, characterised by a constant flow of thin transparent mucus. After a time this is followed by the third stage, in which the secretion becomes thicker and more tenacious and assumes a yellow or greenish colour. The affection often commences in one nostril, and is sometimes limited to this; more frequently, however, both are affected simultaneously or in rapid succession. If the disease does not extend beyond the nasal fossæ, altered secretion, thickness of speech, and breathing through the open mouth are the chief local symptoms observable. Most cases will likewise be accompanied by some general malaise, which will be greater when the sinuses are involved.

Post-nasal catarrh may result from extension backwards of the nasal affection, or it may



have its starting point in the throat or soft palate. When present, a feeling of discomfort or stiffness about the fauces and uvula will be complained of. This does not amount to actual pain, though it is decidedly uncomfortable, and leads to an inclination to swallow, hem, sniff, or perform some analogous action, in order to get rid of a sensation as of something adhering to the soft palate.

If we make an examination of the throat in a case of this kind, we shall probably find the uvula and pillars of the fauces presenting a reddened semi-transparent appearance, the redness being due to enlarged veins immediately beneath the mucous membrane. The parts appear to be infiltrated, and, as it were, œdematous, and a drop of mucus not unfrequently dips down below the point of the uvula. A very similar condition may be seen to exist on the posterior and upper portions of the pharynx, and when it extends to the Eustachian tubes, hearing will be considerably impaired. In the first instance this usually depends upon closure of the tubes either by adhering mucus or by swelling of the mucous membrane around their orifices. By extension further along the canal the cavity of the drum becomes involved and we have simple catarrh of the tympanum. This as it is met with in the course of an ordinary



cold in the head is what I believe to be simple acute catarrh of the middle ear, and distinct from acute inflammation of the part, which is a most severe and sometimes dangerous disease.

Time will not permit me to discuss the question whether catarrh be an early stage of inflammation as is generally taught, or whether it be a distinct affection. Whichever theory we may think proper to adopt, certain it is that the symptoms, appearances, and treatment of catarrh are altogether different from those of established inflammation, whether seated in the tympanum or elsewhere. If catarrh be but a stage of inflammation, in many, I may say in most cases, it goes no further, but proceeds to resolution, or assumes the chronic form without inflammatory exudation taking place.

In acute catarrh of the nasal air-passages the symptoms are usually transient and disappear of themselves. The affection of the Eustachian tubes frequently extends no further than their guttural orifices, and, like the nasal affection in which it originated, will, in general, spontaneously subside. Often, however, the mucous membrane which has been affected does not return to its normal condition and function for some time, and not unfrequently the third stage, such as I have described, persists, constituting chronic catarrh. The thick secretion and



tumefied mucous membrane continue, with occasional exacerbations and remissions, for an almost indefinite period of time, unless checked by appropriate treatment.

Chronic catarrh is often accompanied by enlargement of the glandular structures so abundant in these parts, and may be observed on the under surface of the soft palate in the form of minute semi-transparent swellings, of the size of pins' heads. These bear a striking resemblance to small vesicles, and for this reason the disease is spoken of by French writers as *herpetic*. On the uvula and posterior wall of the pharynx glandular enlargements attain greater proportions, and in these situations swellings may often be seen of the size of a pea, or even larger. Whether colds in the head act as causes in setting a latent condition into activity, or whether the first symptoms of incipient disease show themselves by nasal catarrh in its acute or chronic form, certain it is that we generally meet with them associated together. Weakly scrofulous children are very liable to discharge of mucus from the nose, enlargement of the pharyngeal glands, including the tonsils, and to more or less deafness. They are frequent attendants at the aural departments of our hospitals, and have such a peculiarly characteristic appearance that



they can be recognised directly they enter the room. The nasal obstruction from which these patients suffer causes them to open their mouths, and this, together with the deafness, gives them a vacant stupid appearance.

From the condition of glandular enlargement just described to that of adenoid vegetations, is but a question of degree. The latter affection, stated by Dr. Meyer to be so common in Copenhagen, chiefly involves the glands situated higher in the pharynx and would be more frequently observed in this country if more frequently looked for.

In some cases abnormal growths of glandular structure fill the naso-pharyngeal cavity, and may be felt by the finger introduced under the border of the soft palate. To the touch they resemble a bundle of worms, are of different consistence and form according to the situation from which they spring, and very readily bleed on being handled. We need not stop to consider the various shapes which these assume; it is, however, important to remember that some of the glands affected by the disease are in close proximity to, and in fact surround, the orifices of the Eustachian tubes. It is very common also to find deafness associated with adenoid vegetations, and thus the disease is one of interest in our present enquiry.



The signs which serve to indicate the presence of these morbid growths vary in degree with their extent, and are sometimes altogether absent even when the affection is so situated as to be most dangerous to hearing. Foremost among the symptoms should be mentioned a peculiar *deadness* of voice and inability to pronounce nasal consonants. It will be found, however, on examining the nose, that there is no unnatural redness within, and that the nostrils are generally contracted and pinched. The quality and quantity of secretion is also liable to considerable variation. In some cases the nose is almost dry, in others there is a greenish, red, or brown thick secretion which may either be discharged by the nostrils or run down the posterior wall of the pharynx. Not unfrequently blood appears in the mouth at times, and occasionally assumes the appearance of rusty pneumonic sputa. When the growths have attained certain proportions, a sensation of fulness as from the pressure of a foreign body in the upper part of the throat behind the posterior nares may likewise be experienced.

Chronic enlargement of the tonsils is very similar in character to the affection of the smaller glands, and due to similar causes. All these diseases affect the secreting structures of the mucous membrane, are catarrhal in their



nature, and are the most common affections met with in the nose and throat.

Swelling of the mucous membrane, covering the nasal air-passages, may likewise result from inflammation, and may likewise cause impairment of hearing. The cases differ, however, from those just described in many important particulars. The throat is the part most frequently affected, and it is rare for the disease to commence in the nose. The appearance of the mucous membrane is much redder and more angry looking. The parts are tender to the touch, and painful on movement, and the muscles contract spasmodically on attempting to make an examination. When secretion is present on the surface of the mucous membrane, it is generally more glary and transparent than the mucus of catarrh, and it is also less abundant.

Inflammation seems to attack the submucous areolar tissue rather than the secreting surface. It is, therefore, more deeply seated, and surrounds the muscles and nerves, which are situated here immediately beneath the surface. For this reason the disease is generally attended with pain, more particularly when the parts are moved.

Inflamed sore throat will not unfrequently proceed to ulceration or suppuration, whilst the



thickening of the parts is much greater and does not so readily disappear. In early life the commonest form of inflammation met with in the throat is the scarlatinal. This is sometimes followed by suppuration in the middle ear, and if neglected often results in total loss of hearing, together with dumbness, if the child has not learnt to speak thoroughly before it became deaf.

During adolescence and early manhood, inflammation usually attacks the tonsils or the tissues which surround them, and thus quinsy is the most usual form met with at this time of life. The syphilitic sore throat also belongs to this age, and causes deafness both by obstructing the Eustachian tubes and by extension of the affection to the cavity of the tympanum. The proportion of cases of defective hearing resulting from inflammatory diseases is small, however, when compared with those due to catarrh, and the effects are different.



## CHAPTER II.

*Mechanism of the Middle Ear, and the Diseases  
which affect it.*

THUS far I have confined my observations almost exclusively to the nasal air-passages, and have only incidentally alluded to affections of the middle ear. I have done this from a conviction that disease of the nose and throat is really the starting point of most cases of defective hearing. I will now say a few words concerning the mechanism by which sounds are conveyed to the brain, in order to explain how the function of hearing becomes disturbed by disease of the nasal air-passages.

Sonorous vibrations communicated to the air are collected by the external ear, and received by the membrane of the drum, which forms the outer wall of the tympanum. For the transmission of these vibrations to the brain, and consequently for the correct appreciation of sound, the tympanic membrane must possess a certain degree of tension and vibratile power.



The tension is maintained and regulated by atmospheric pressure and muscular action, whilst the vibratile power is due to the free suspension of the membrane between two bodies of air.

For the proper working of the mechanism of the middle ear and the correct performance of its functions, these forces require to be kept in a state of equilibrium. The middle ear may be considered as a box containing air, the density and tension of which is regulated by a safety valve—the Eustachian tube. Normally this is closed by its own elasticity, but opens readily when the pressure of air exceeds a definite amount. The perviousness of the tube can also be increased by the action of the salpingo-pharyngeus muscle, which removes the elastic pressure of its walls, and is set in action during swallowing.

The whole of the middle ear is lined with mucous membrane, and one of the properties of mucous membranes being to absorb the air which they inclose, that within the tympanum undergoes constant diminution. In order, therefore, to maintain a state of uniform pressure within the drum the air requires frequent renewal. This is effected during the act of swallowing, because at that time the closure of the Eustachian tube is reduced to a minimum,



and the quantity of air admitted is regulated by the demand.

In addition to the regular tension of the membrana tympani maintained by air within the drum, certain variations are produced, so as to adapt the membrane for the reception of different sounds. The regulation of tension under these circumstances is called *accommodation*, and is performed by muscular action.

The chief muscle concerned in accommodation is the tensor tympani. This is inserted into the malleus, which is itself firmly attached to the membrane of the drum. The action of this muscle is to draw the membrane inwards, and, therefore, to increase its tension. When obstruction of the Eustachian tube prevents the renewal of air to the tympanum, absorption, which is constantly taking place, reduces the quantity below its normal standard. From this results augmented concavity of the membrana tympani, and drawing inwards of the malleus handle. The consequence of this is diminution of the force opposed to the tensor tympani, which contracts so as to maintain a certain amount of pressure on the cushion of air within the drum.

The ossicles of the ear form a continuous chain, consequently drawing inwards of the malleus exerts pressure on the other bones.



The stapes, which is the last link of the chain, communicates with the labyrinth through the oval fenestra, and thus it happens that increased concavity of the tympanic membrane causes abnormal pressure on the auditory nerve which is distributed to the labyrinth. The altered position of the parts contained in the tympanum naturally interferes with their delicacy of movement, and shows itself by impairment of function. In addition to this compression of the nervous element produces tinnitus, as well as gradual diminution of nerve power, and therefore patients generally complain of noises in the head, and progressive diminution of hearing.

In the first instance, these symptoms can be readily relieved by supplying air to the tympanum, and a permanent cure may be effected by removing the cause which obstructs the Eustachian tube. If, however, the tube has continued impervious for a considerable time, the difficulty will increase in proportion to the time it has endured. The reason of this is obvious. The parts within the tympanum—muscles, bones, and ligaments—gradually accommodate themselves to the altered condition in which they have been placed, and will no longer return to their normal positions unless some force be applied to overcome the morbid contraction. Thus the tensor tympani muscle



becomes shortened, just as the muscles of the calf are shortened in a case of club foot. The ligaments of the articulations between the small bones become contracted, and a certain degree of rigidity results. For this reason, we find, even when the Eustachian tube has been rendered pervious, that indrawing of the malleus persists, and as a consequence of this, pressure on the nervous element contained in the labyrinth continues. In such cases we sometimes notice that inflation of the tympanum distends the membrane, but that the manubrium continues drawn inwards and slightly rotated, showing that the bone is kept in its abnormal position by muscular and ligamentous contraction rather than by atmospheric pressure, which caused it in the first instance.

In this manner, simple tubal catarrh, which, at the onset is so amenable to treatment, ultimately causes severe and obstinate deafness, aggravated by intolerable noises in the head. If these facts were better understood, the number of persons afflicted with impairment of hearing would be enormously decreased. We should no longer meet with the cases, now too numerous, of persons who, during the early stages of the affection, were treated by blisters and syringing until serious and often permanent mischief followed.



The symptoms which indicate the presence of catarrh of the Eustachian tube are due to obstruction. Assuming, as I wish to do, that the disease has not reached the cavity of the tympanum, the symptoms observable in the auditory apparatus will be entirely due to abnormal closure of the tubes. The first consequence of this will naturally be increased concavity of the membrana tympani, indicated by diminution of the light-spot. This no longer appears triangular in form, but becomes more or less rounded and diminished at the periphery. Sometimes it is reduced to a mere point. The short process of the malleus looks more prominent from the tightening of the membrane over it, and the manubrium seems shorter than natural because its lower extremity recedes from the eye of the observer and approaches the horizontal position. With this altered condition of parts, the membrane of the drum retains its normal transparency, and as its position will be nearer to the long process of the incus and to the stapes, these may sometimes be made out with more than usual distinctness.

The patient will generally complain of stuffiness in the ears, with more or less impairment of hearing, and not unfrequently tinnitus. These symptoms are liable to considerable variation in degree, and one may be present without the



other. Thus we very frequently see cases, more particularly in children and young people, in which the deafness is considerable, but no noises in the head are complained of. Occasionally tinnitus is very troublesome, and yet deafness is scarcely perceptible.

In addition to the defects of hearing, caused by obstruction of the Eustachian tube, catarrh of the nasal air-passages may extend through the tube to the cavity of the tympanum. When this part of the middle ear becomes affected its functions are considerably interfered with by swelling of the mucous membrane, as well as by the presence of augmented secretion. To these causes is usually added increased concavity of the membrana tympani, due to obstruction of the Eustachian tube, and in this manner the cavity of the drum, which is normally so small, becomes almost obliterated.

Simple catarrh, in its acute form, sometimes spreads from the nose to the tympanum. Though instances rarely come under the notice of aural surgeons, many of my readers have no doubt experienced this in their own persons. When suffering from a severe cold in the head it may sometimes be noticed that, on blowing the nose, a very moist sound is produced in the ear. This sound is not unlike that caused by walking in shoes which contain water. Acute-



ness of hearing is considerably interfered with, and the presence of thin secretion in the tympanum may sometimes be seen on examination with the speculum.

These symptoms, which are undoubtedly due to acute catarrh of the tympanum, will generally subside of themselves with the affection of the nose and throat in which they originated. At any rate the moist stage which I have described is very transient, and will have passed away before the patient will think it necessary to seek advice. For this reason, as I have said, catarrh in the acute form, rarely comes under our notice, and is not enumerated among diseases of the ear.

When the affection passes into the third stage the secretion of mucus within the drum becomes thicker and more tenacious, as it does in the nose. It does not readily escape by the Eustachian tube, but adheres to the ossicles or tympanic walls, and the delicate mechanism of the middle ear is still further interfered with. Should this continue for more than a brief period, the disease may be considered to have become chronic, and in this form, with repeated exacerbations and remissions, will not unfrequently accompany the patient through life unless he adopt proper measures for its cure.

Chronic catarrh, together with the con-



sequences to which it leads, are the most common causes of defective hearing, and constitute a large proportion of the cases which occur in practice. As it is important to be able to recognise this condition, I will give a brief outline of the symptoms by which it is characterised.

If we make a careful examination of such a case it is not unusual to find the hearing power for conversation greatly diminished. Often the watch can only be heard in contact, though the tuning-fork placed on the bridge of the nose will be well heard, and probably better on the side which is worse for ordinary purposes. Patients will tell us that they hear sounds well but that they are unable to disentangle conversation. Some words are much more difficult to understand than others, and it not unfrequently happens that all sounds have a muffled character and appear as if they were heard through some thick substance. These symptoms clearly point to an interference with the free movement of the parts contained in the middle ear, and are due either to the presence of thick secretion or to swelling of the lining membrane of the tympanum.

The membrana tympani has an opaque appearance in parts, and is generally abnormally concave with diminution in size and alteration



of form of the light-spot. The short process of the malleus is more prominent than natural, and the handle of the bone is drawn towards the promontory, and thus has the appearance of foreshortening. Around the hammer bone may frequently be observed a yellowish appearance, which is sometimes situated at the upper part and sometimes at the apex. Auscultation of the middle ear reveals in the earlier stages a gurgling sound, which gradually merges into a sort of squeaking as the mucous contents of the drum become thicker.

The hearing power of patients suffering from catarrhal affections of the middle ear, whether in the Eustachian tubes alone or in the tympanum, is liable to great variation. It is affected by temperature and barometric pressure as well as by stomachic derangements. We generally find that hearing improves during dry weather, either hot or cold, and that humidity aggravates the disorder. In like manner irritation of the digestive organs will often extend to the mucous membrane of the nasal air-passages, and from them to the middle ear. For this reason it is not uncommon to find that persons who suffer from catarrh are worse when their stomachs are out of order.

Catarrh of the tympanum may terminate in one of three ways,—1, by resolution in which



the parts return to their normal condition and function without any perceptible detriment; 2, by retention and inspissation of the mucus secreted in the middle ear; 3, by the accumulation of secretion causing perforation of the membrana tympani.

The first of these terminations is, apparently, at least, the most common in acute catarrh. The deafness, stuffiness, and noises in the head gradually disappear, and the patient is considered well again. If, however, the hearing power be carefully tested, it will not unfrequently be found to have suffered slight impairment. This shows that some mischief, however slight, has been left behind. Now we know that in this climate catarrh is an affection very liable to recur, and that on each recurrence the disease shows less inclination to depart until it finally establishes itself permanently in the part. After a certain number of attacks of catarrh of the tympanum the effect becomes manifest to ordinary observation, and the patient reluctantly acknowledges that he has become "hard of hearing."

By gradual and almost imperceptible degrees, a case of chronic catarrh of the tympanum may become one of inspissated mucus. The cohesive properties of the secretion increase, whilst its adhesive ones diminish, and so it happens



that the mucus forms tough gelatinous masses in the middle ear. These can often be moved from one part to another by inflating the tympanum, and patients are not unfrequently conscious of something moving in the ear when they shake their heads. Sometimes hearing can be so much improved in this way, that persons acquire a habit of giving a sudden shake of the head. It is not improbable, although, of course, insusceptible, of the proof of actual observation, that hearing is more impaired when a mass of inspissated mucus rests against the fenestra rotunda. If this supposition be correct, any sudden movement which dislodges the plug from this position, will naturally improve hearing. Persons suffering from the affection to which I allude will often tell us that they hear better in the morning—a fact which may on the same principle be explained by gravitation of the mucus during the recumbent position.

In some cases large masses of tough, elastic secretion have been removed from the middle ear, which, from their size, must have extended into the mastoid cells. Continued pressure, caused by this inspissated mucus in the tympanum, will occasionally give rise to perforation of the membrane and escape of the secretion.

Perforation of the tympanic membrane may



likewise result from accumulation of non-inspissated mucus. This is the commonest cause of ear-ache among children, and is distinct from the very severe form which accompanies acute inflammation, and which terminates usually in suppuration. The ear-ache of catarrh is mild in comparison with this, and in adults the symptoms are usually so inconsiderable as scarcely to deserve the name of pain.

After two or three days, slight discharge takes place from the ear, and is due to a perforation having occurred in the membrana tympani. On examination a small circular or oval opening with thickened and rounded edges may generally be seen. The pain, when any was present, is immediately relieved, and in a few days later the perforation closes. After this, hearing soon returns, if not to its normal state, at least to a very useful degree, and the patient is considered well again. Such is an outline of a case of perforation as it results from catarrh. These attacks do not occur, however, without producing a certain amount of mischief, though it may be imperceptible at the time, and relapses must be expected to occur.

I consider all these affections as purely catarrhal in their nature and distinct from inflammation. They appear to be seated in the secreting structure of the mucous membrane,



and do not give rise to the deposition of organised material in the tissues.

True inflammation, on the other hand, affects the submucous tissue, in which are situated the vessels and nerves. Leucocytes migrate from the interior to the exterior of the blood-vessels, and there become converted into organised material or degenerate into pus. Now the submucous tissue of the middle ear is likewise the periosteum or nutrient membrane of the bones, and consequently inflammation attacking this part is a periostitis.

Inflammation of the middle ear like catarrh may give rise to defective hearing either by causing obstruction of the Eustachian tube, or by extension of the disease to the tympanic cavity. In whichever of these parts it is situated, the affection may, as I have said, be plastic or suppurative in its nature—that is to say, it may either proceed to the deposition of organised material in the tissues, or it may terminate in the formation of pus. When inflammation is plastic, and attacks the Eustachian tube, we find that the resulting obstruction is firmer, and more resisting than in catarrh. So also, when the cavity of the tympanum is affected, fibrous deposits are formed in the lining membrane, including that of the fenestræ. As a consequence of this thickening and of progressive condensation of



the new material, fixation and rigidity of the parts take place. The periosteal character of the tissue affected sometimes leads to osseous or calcareous material being deposited, and thus thickening of the bone and ankylosis of the ossicles are produced.

When inflammation is suppurative, it may proceed to ulceration, caries, or necrosis, and it is in these cases that wholesale destruction of tissue occurs. The *membrana tympani* becomes perforated, the ossicles are loosened and destroyed, and caries of the petrous bone extending even to the interior of the skull, may be met with.

Acute inflammation of the middle ear is always accompanied by pain, perhaps the most severe which it is the lot of mortals to endure. A striking exception to this rule occurs, however, in the rapidly destructive form of inflammation met with in scarlatina. In these cases it commonly happens that the first indication of ear mischief is noticed when the accumulation of pus finds vent by rupturing the *membrana tympani*, and purulent matter flows from the meatus.

In most instances of acute inflammation of the middle ear, suppuration will take place if the symptoms are severe, and as the Eustachian tube is most frequently obstructed by



tumefaction of its walls, the purulent secretion will escape by perforation of the tympanic membrane. The tinnitus which accompanies this affection is generally of a pounding throbbing character, and there is usually considerable impairment of hearing. If the disease is limited to the Eustachian portion of the middle ear, the appearances noticeable on inspection are similar to those of catarrh of the tube; but when inflammation extends to the tympanic cavity intense redness of the promontory is reflected through the drum-head and gives to it an appearance as of polished copper. Soon the membrana tympani itself becomes implicated, and ceases to be transparent; the vessels which accompany the malleus handle become injected and turgid; other minute blood-vessels appear around the periphery and gradually the entire surface becomes red and velvety. As suppuration takes place the membrane becomes of an opaque yellowish grey colour, and ultimately perforation occurs, followed by relief of the symptoms.

Chronic inflammation is attended with very similar though less marked appearances. It sometimes happens in these cases that the membrana tympani continues unaffected, or nearly so, throughout, and the changes taking place within can be watched. Usually, how-



ever, the membrane becomes opaque, but the active redness and pain, described when speaking of the acute disease, are not present. In proportion to the mildness of the symptoms, it is more probable that thickening of tissue will take place than suppuration and discharge, and, although impairment of hearing is less in the first instance, more permanent damage often results.

After perforation of the membrana tympani, more particularly when due to suppurative causes, discharge from the ear may continue for months or years. Often it is accompanied by a most offensive smell, and sometimes by occasional bleeding. This form of otorrhœa, called internal because it proceeds from the parts within the tympanum, requires careful attention. It may depend upon the lining membrane of the middle ear continuing to secrete pus or excess of mucus, or upon ulceration, necrosis, or caries being present. When the discharge is mixed with blood, the disease will often be complicated by polypus, which may at any time prove a source of danger to life by obstructing the flow of matter from the ear. In this manner suppuration is sometimes made to extend inwards to the bones, and even to the skull cavity, causing death.



When otorrhœa is accompanied by caries or necrosis of the temporal bone, we can never consider a patient to be out of danger, as it is impossible to tell whether the disease will extend to the many vital parts which surround the ear. In this way the brain and its membranes, the petrosal and lateral sinuses of the dura mater, the jugular vein, and internal carotid artery, are all exposed to injury, and a fatal termination may depend upon extension of inflammation to any one of them.

Sudden cessation of discharge from the ear often precedes symptoms of a serious nature, and for this reason many persons, both doctors and patients, are afraid to cure otorrhœa. This fear is only well founded when the cessation is brought about by such means as tend to keep back the discharge, which thus becomes a source of irritation to the important structures around.

In addition to diseases of the middle ear, which have hitherto occupied our attention, defective hearing may depend upon obstruction, from various causes, situated in the meatus externus. These affections are not nearly so common as those which have been mentioned and are sufficiently evident on examination to render any description unnecessary.



## CHAPTER III.

*Treatment of Disease of the Nasal Air-passages.*

HAVING briefly alluded to the commonest causes of defective hearing, it only remains to point out the methods which appear to be most successful in the management of these cases. Before doing so, however, I will say a few words in order to explain why so many deaf persons are reputed incurable.

When a patient suffering from any bodily ailment consults a physician or surgeon, it is the custom to enquire whether he has already adopted any treatment for his complaint. If we apply this rule of practice to cases of defective hearing, a considerable number will tell us that when their hearing first became impaired they did not take professional advice. For this omission a variety of causes will be assigned—either that the case seemed too trivial,—that they expected to grow out of it,—that they were too old or too young,—that their doctor knew nothing about ears, or that they had employed domestic remedies or quack nos-



trums. Some will tell us that they consulted their ordinary medical attendant, who syringed the ears without bringing away anything from them, and then applied blisters. No improvement resulting from this, they were told that nothing more could be done, but that in time hearing would improve.

Thus it happens that patients neglect to submit to treatment in the early stages of ear disease, and valuable time is wasted while the affection is most curable. This is to be accounted for by want of confidence on the part of the public, and can hardly surprise us when we remember that very few years ago none of our hospitals possessed ear departments, and that aural surgery, untaught in our schools, was almost entirely in the hands of quacks. Although the labours of the late Joseph Toynbee did much to elevate this branch of study, we find, even at the present day, that works on general surgery contain very scanty and unreliable information on this subject, and thus, with very limited opportunities for observation, with little time at his command, and with no assistance, the medical practitioner continues in the belief, prevalent in his earlier days, that aural surgery is but a delusion and a snare. By the dissemination of these opinions want of confidence is engendered and becomes



one of the principal causes of failure which we have to contend against.

Both the profession and the public are too apt to forget that most of the cases of defective hearing which come before us are chronic. Many have been stationary or perhaps steadily getting worse for years, and we are resorted to as a sort of forlorn hope. It is well to remember that all chronic diseases are more difficult to manage in proportion to the time they have endured, and therefore we should not expect these to be exceptional. In some instances no doubt immediate benefit will follow judicious management, but we cannot shut our eyes to the fact that in many this will not be the case until after a prolonged course of treatment.

The forms of defective hearing chiefly described in this paper, and they are the commonest observed in practice, depend upon disturbed function of the middle ear. These are all seated in the conducting apparatus, and are consequently all amenable to treatment, provided that treatment be appropriate and not abandoned too soon. Some cases certainly give more trouble than others, but I repeat that so long as the tuning-fork shows that the nerve remains sensitive, we ought not to despair of being able to restore useful, if not perfect hearing. We may even go further, for it some-



times happens that persons whose hearing is moderately good do not hear a tuning-fork placed on the vertex, and for this reason, we are not justified in destroying a patient's hope on the evidence of this test without a very careful examination.

In those instances which require the treatment to be persevered in for many weeks, it is of considerable importance to adopt methods which patients can themselves carry out. This is quite practicable in most cases, and will be found very materially to assist the progress towards cure. It not unfrequently happens that the daily employment of remedies is called for during a considerable period, and it is hardly reasonable to expect that patients will spare the time and money to visit their surgeons, thus often more particularly if the progress they are making be not very perceptible. For this reason I have dwelt more especially on those forms of treatment which may be safely entrusted to patients themselves.\*

In considering the management of cases of defective hearing, I have thought it most convenient to commence with that of the nasal air-

\* The other methods are described in detail in my "Manual of Aural Surgery," to which the reader is referred for fuller particulars.



passages. This arrangement has been adopted, not only because affections of the nose and throat so frequently precede and act as causes of the ear disease, but also because it is only by way of the naso-pharynx that remedies can be applied to the middle ear.

The treatment of catarrh, whether seated in the nasal, buccal, or pharyngeal mucous membrane, should be stimulating. In the early stage of a cold in the head, it has been long known that smelling ammonia, acetic acid, camphor, chloroform, ether, iodine, carbolic acid, and other stimulating substances which give off vapour, will often effectually arrest the progress of the disease.\* I have frequently known a pinch or two of snuff to drive away a cold altogether if taken when the first symptoms appeared. It is true that these will sometimes return on the following evening to be again stopped by the same means, and perhaps return no more. It must be admitted that this plan will often fail, but it is, nevertheless, worthy of being tried. Though less effective in the second or moist stage, this treatment will often afford consider-

\* It will surprise some of my readers to learn that chloroform anæsthesia has been recommended to cure a cold in the head. Though this treatment should prove invariably successful few will consider the cure worth the risk incurred.



able temporary relief to the feeling of oppression and fulness in the head.

Dry air, whether hot or cold, will always during the moist stage of the affection relieve nasal obstruction. We all know the alleviation experienced when suffering from a severe cold, on going out during dry, frosty weather, and those who use the Turkish bath will bear testimony to the comfort of the hot room under similar circumstances.

When catarrh has reached the third stage, characterised by the secretion becoming less abundant though thick and tenacious, stimulants and tonics to the mucous membrane are indicated. The management of chronic catarrh should be conducted on the same principles.

Remedial agents may be applied to the nasal air-passages in the form of solid, liquid, or vapour. The first of these comprises powders used as snuffs, or for insufflation. In this manner we may employ various stimulant and astringent preparations, their strength being regulated by admixture with different proportions of inert powder. Powdered camphor and sugar in equal parts forms a useful snuff in some cases, and is generally appreciated by patients suffering from catarrh.\* Alum and sugar or

\* Messrs. Bullock and Reynolds, of Hanover Street, have made the preparation much more elegant, by sub-



iodoform and starch sometimes prove advantageous as snuff, or when blown up behind the soft palate with the apparatus of Rauchfuss.

One of the best methods for making liquid applications to the nasal air-passages, is by means of a douche which consists essentially of the following parts :—1, a reservoir, for which a jug, basin, or other convenient utensil, will answer the purpose ; 2, a syphon tube, by which the fluid is delivered in a constant stream, the force of which may be regulated by raising or lowering the reservoir ; 3, nozzles of various forms, so that the liquid may be applied to different portions of the nose and pharynx.

The first nozzle made to fit closely into the nostril will enable the stream to be directed into one side of the nose, whence it will pass round the septum and return by the other nostril. This is called Weber's douche, and the mode of using it is represented in Fig. 1. It will be found very useful in the treatment of disease of the nose and naso-pharynx. The patient should bend his head forward over a basin and

stituting powdered liquorice root for the sugar. In this form it will not become lumpy ; but it should be remembered that camphor gradually volatilizes, and, therefore, after a time, will disappear, leaving the liquorice powder. For this reason the snuff is always better freshly prepared.



breathe entirely by the mouth kept widely open for the purpose. When using this form of douche, it is important not to place the reservoir too high, as by so doing, it is possible to cause the liquid to enter the Eustachian tubes



FIG. 1.—WEBER'S NOSE-DOUCHE.

and inflict injury on the middle ear; of this accident several cases have been recorded. If the water have a fall of six or eight inches it will be quite sufficient, and danger will be avoided. As an additional precaution, the patient should be told not to swallow during



the operation, because we know that this opens the Eustachian tube. By adopting these simple precautions, I have never seen any ill effect from the use of Weber's douche, but on the contrary, the greatest advantage. The same nozzle will also serve for directing a gentle stream of warm water into the auditory canal for the relief of inflammatory pain, whether seated in the external or middle ear. When used for this purpose it should not be pushed into the meatus, as it would prevent the return current and cause pain.

A form of nozzle, which will be found of service when the upper portions of the nose are affected, consists of a tube slightly curved, and having on its convex side five or six perforations, 2 Fig. 2. This is intended for passing along the floor of the nose on either side to the extent of about three inches. The jets should be directed upwards, and they will play upon the upper and middle meatus of the nose.

A third nozzle by which liquids may be applied to the naso-pharynx, is formed by a tube terminating in a bulbous extremity perforated in various directions, 3 Fig. 2. This is intended to pass along the floor of the nose beyond the posterior nares, where the jets will wash the different portions of the space situated above the soft palate. It is more especially



useful in post-nasal catarrh, and reaches the orifices of the Eustachian tubes.

In the "Universal douche," Fig. 2, the reservoir consists of a graduated tin box, A, which serves to contain the rest of the apparatus.

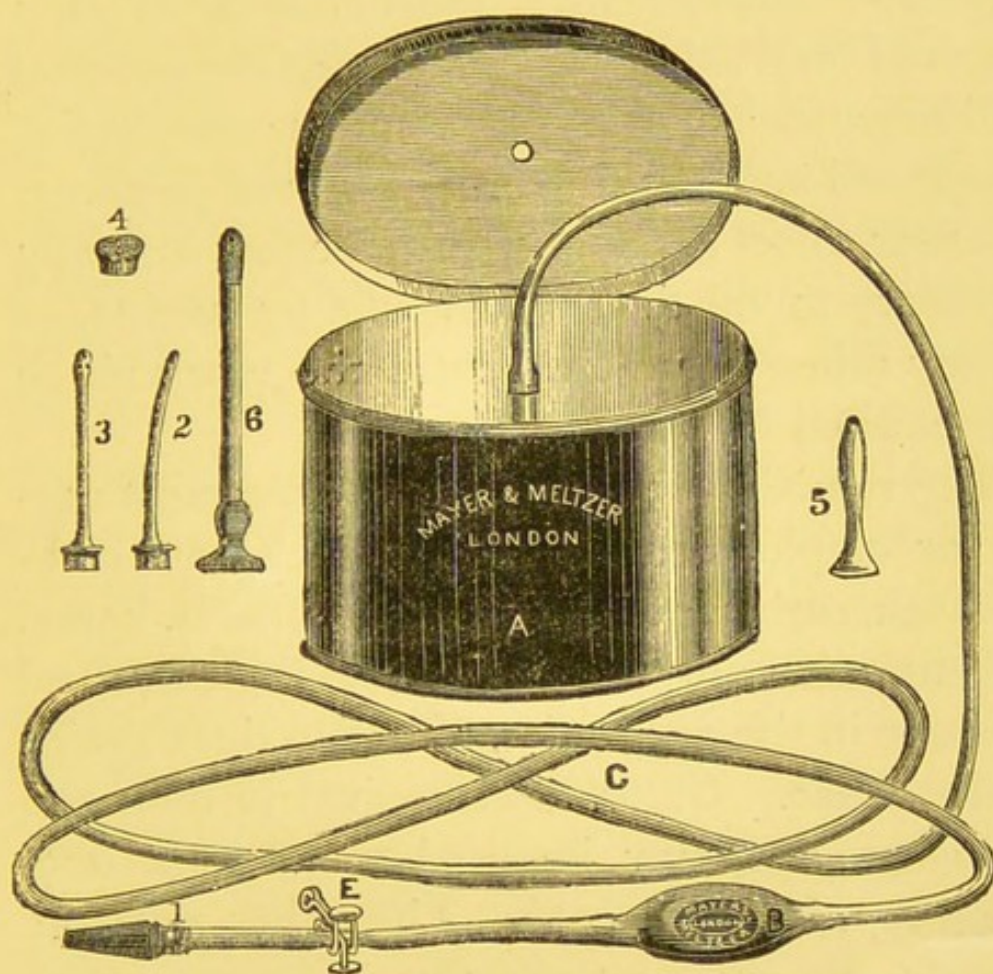


FIG. 2.—THE UNIVERSAL DOUCHE.

The syphon tube, c, is filled by compressing an india-rubber ball, B, instead of by suction with the mouth, and a small wire clip, E, serves to arrest the flow of liquid when desired. All these are refinements which, though very desirable, may be dispensed with, when economy



is an object, without in any way sacrificing the efficiency of the apparatus. Thus four or five feet of india-rubber tubing fitted on the end of a piece of curved composition gas pipe will answer every purpose, as well as the most expensive instrument. Indeed, if it is only required for Weber's douche or for the external auditory canal, a foot and a half or two feet of tubing will suffice to give the required pressure. In order to set the apparatus in action, it is only necessary to fill the syphon tube by suction, or by any other means, and raise the reservoir to the required height.

The remedies which I have found most useful for employment with the douche, are common salt, carbonate or phosphate of soda, borax, and carbolic acid. These should be dissolved in water in the proportion of two to three grains to the ounce. Chloride of sodium is tonic and stimulant, and may be used either at a temperature of  $90^{\circ}$  or cold. The other salts are solvent, and are most effective at a temperature of about  $100^{\circ}$ . Carbolic acid may be mixed with any of these; it is a most useful application, and appears to have an anæsthetic action as well as being stimulant and antiseptic. It is well to remember that simple water, particularly if used cold, is not a little irritating to the mucous membrane of the nose. It is less dis-



agreeable, however, if employed at a temperature of  $90^{\circ}$ , and if the specific gravity is raised by the addition of any of the salts I have mentioned it becomes quite pleasant and refreshing.

Astringent solutions are best used in smaller quantity than could be conveniently done with the douche. Two drachms will generally suffice for each application, and a small syringe or india-rubber bag will constitute a ready method of making the application. When it is deemed advisable to carry the lotion into the nasopharynx, without first coming in contact with the mucous membrane of the nose, a tube of sufficient length to reach the posterior wall of the pharynx should be attached to the syringe. In this manner we may employ a variety of stimulants and astringents, among which may be mentioned alum and iron-alum, sulphate and sulpho-carbolate of zinc, carbolic acid, iodine, iodide of potassium, and many more, either singly or in combination.

Another useful form in which liquid applications can be made to the nasal air-passages is in the shape of spray. This may be used by the patient himself, and may be introduced by the nose or by the mouth. The various forms of spray-producing apparatus, though sufficiently numerous, are not all equally suitable. The



spray should be fine, and the apparatus so constructed as to be easily cleaned. Fig. 3

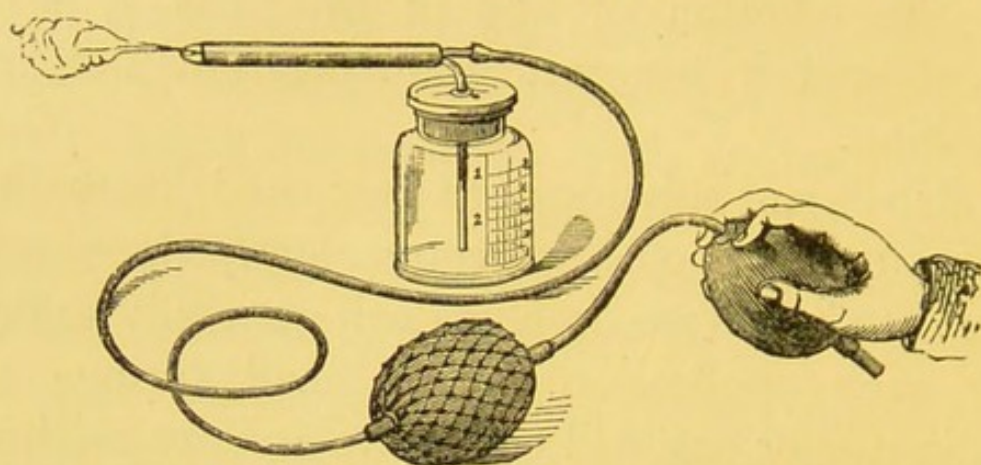


FIG. 3.

represents a very good instrument for the throat, but it is not convenient for use in the nose. With Fig. 4 the jet of spray may

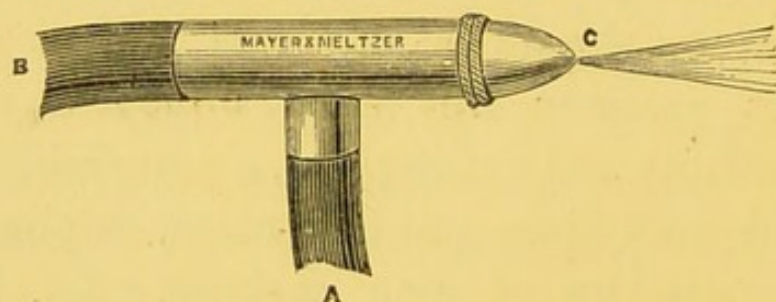


FIG. 4.

be directed at any angle; it is consequently applicable to both nose and throat. At A, an india-rubber tube is connected, which dips into the bottle containing the lotion. An inflating apparatus, as in Fig. 3, is attached at B, and the jet of spray issues at C. Fig. 5 shows the instrument with the jet removed; D represents the tube which conveys the liquid, and which



sometimes becomes choked, requiring the insertion of a fine wire to clear it. The lotions which may be used in the form of spray are the same as those just enumerated.

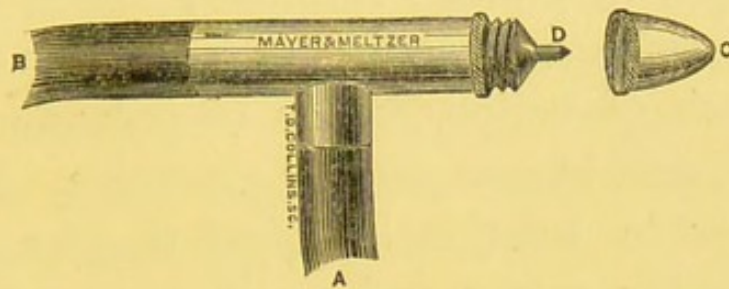


FIG. 5.

When it is considered undesirable to extend the effects of a remedy to the larynx, the current of spray should be stopped during inspiration. This will be most effectually guaranteed, when using the method through the nose, by substituting the lungs of the patient for the inflating bellows. In this way the jet being produced by the expiratory effort, will naturally cease during inspiration. If the tube of the apparatus is long enough to reach beyond the posterior nares, the spray may be directed on the parts contained in the naso-pharynx.

More concentrated solutions are better applied with a brush, which should be fixed on a handle in such a manner as to form with it a right angle. This kind of brush is intended to be passed by the mouth under the velum palati to the naso-pharynx, and to the orifices of the



Eustachian tubes. The solutions which are used in this way are chloride of zinc, 15—30 grains to the ounce; perchloride of iron, 60—120 grains; carbolic acid, 30 grains; sulphate of copper, 15 grains; nitrate of silver, 10—60 grains; tincture of iodine or a solution of one part each of iodine, iodide of potassium, and carbolic acid in 100 parts of glycerine. Nitrate of silver in solution is found to give rise to considerable spasm and cough in some cases; it is, therefore, preferable to use it in the solid form. For this purpose it may be fused on a stem of wire, bent at a right angle, and fixed into a wooden handle similar to that of the brush just described.

Chronic catarrh affecting the naso-pharynx may sometimes be rapidly cured by first using a nasal douche of salt and water, so as to remove the thick mucous secretion which adheres to the parts, and then applying a strong solution of nitrate of silver, 60 grains to 1 ounce, in glycerine, with a brush. This treatment, though sometimes severe, is not so infallible as its proposer, Dr. Mann, would lead us to suppose.

The application of vapour to the nasal air-passages is of very great utility in the treatment of disease of these parts, and deserves more extensive development. By this means we are enabled to use any of the gases, as well



as a large number of volatile substances, both solid and liquid. Several methods have been devised for the employment of vapour, the most familiar of which are, perhaps, the ordinary inhalers. In them the volatile substance is mixed with hot water, and may be inhaled either by the mouth or by the nose. This method necessitates the admixture of steam, which it is sometimes desirable to avoid.

Another plan by which vapour may be employed to the nasal air-passages is by passing a stream of air through a volatile liquid placed in a bottle. The cork of this should be pierced by two tubes—one terminating immediately inside the cork, the other extending nearly to the bottom of the bottle. In using the apparatus air should be propelled through the liquid by the longer tube, when it will pass out by the shorter one charged with vapour.

A third plan is that of placing a few drops of volatile liquid on a sponge enclosed in a box from each of the two opposite ends of which passes a tube. One of these is for the entrance of air, which, becoming charged with vapour in its passage through the sponge, emerges by the second tube. This form possesses the advantage of being applicable to the Politzer bag, and so enables us to inflate the middle ear with a medicated atmosphere.



The reason why remedies in the form of vapour have not been largely employed in the treatment of disease of the nasal air-passages appears to be due to the difficulty experienced in limiting their action to these parts. Many substances which act beneficially on the nasopharynx produce considerable irritation of the glottis when employed by inhalation. For the purpose of avoiding this evil, I venture to recommend a simple and inexpensive contrivance, which will be found very effectual. It consists of a **U**-shaped tube made of glass.

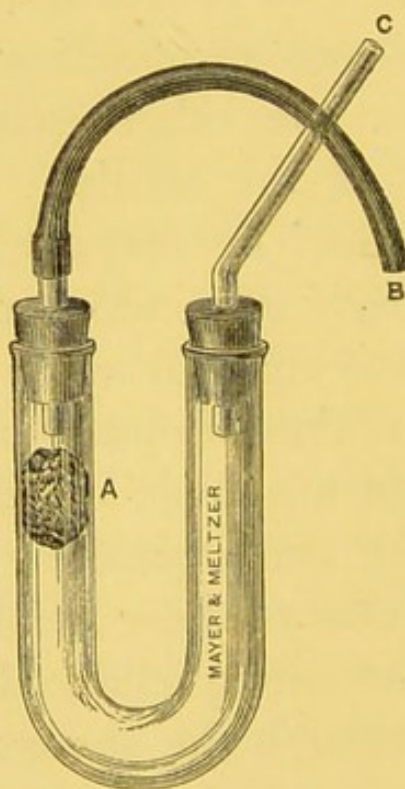


FIG. 6.

To each open extremity of this is fitted a cork, through which passes a tube. One of these



tubes (c) is bent at an obtuse angle, for the mouthpiece, the other is straight, and is prolonged by a few inches of india-rubber pipe (B). This is soft and flexible for insertion into the nose, or nose-pieces of various form may be attached if desired. Inside the cork of this side of the instrument is a piece of coarse sponge (A), which may either be charged with the volatile liquid, or it will serve to prevent any solid or liquid, placed in the bend of the **U**-tube, being blown into the nose. When the remedy requires warming, in order to disengage its volatile principle, the tube may be dipped in hot water or in a sand-bath.

To use the apparatus, the patient should introduce the nose-piece into one of his nostrils, he should then blow through the glass tube, placed in his mouth, and a stream of air, charged with vapour, will enter his nose. Inspiration should be performed through the open mouth, and thus none of the volatile principle will enter the wind-pipe. In this manner camphor, chloroform, carbolic acid, kreosote, ammonia, and several essential oils may be employed, and will prove useful stimulants to the mucous membrane.

The tendency of catarrhal affections to produce chronic enlargement of the glands contained in the nasal air-passages, points to iodine



as the remedy *par excellence* for these diseases. The metalloid, placed in the bottom of the **U**-tube, will, under the influence of slight heat, give off vapour, or we may employ it in the form of tincture.\* In either way it will often prove of great advantage, and patients may be directed to use the apparatus once or twice daily.

Catarrhal affections of the nasal air-passages are benefited by general as well as by local treatment. Thus sudorifics, stimulants, narcotics and diuretics if administered within twenty-four hours of the commencement of acute catarrh, will often cut short the attack. The chronic form, which comes more particularly within the domain of aural surgery, generally demands tonic treatment. By this I do not mean tonic medicine only, but equal, if not greater importance should be attached to hygienic methods. Habitual use of the cold bath is of great service, by promoting action of the skin, and so relieving the mucous membrane. Active exercise in the open air, the avoidance of close crowded rooms, and the proper ventilation of sleeping apartments, are also matters well deserving our attention in the

\* The tincture should be a saturated one, that is, 40 grains of iodine to the ounce of rectified spirit, no iodide of potassium being needed.



management of these cases. The sympathy which exists between the stomach and nasal air-passages, points out the necessity of regulating the digestive system, both by medicine and dietetics. Tonics and chalybeates will often prove of service, and in the scrofulous delicate children who so commonly suffer from catarrh of the nose and throat associated with deafness, cod-liver oil will likewise be called for.

Acute inflammation of the nasal air-passages is best treated by steam inhalation, or by the hot nasal douche. Vapours reach the nasopharynx and orifices of the Eustachian tubes more readily if inhaled through the nose, which may be done by stretching an india-rubber teat over the mouthpiece of an ordinary inhaler. A teaspoonful of compound tincture of benzoin, or two teaspoonfuls of succus conii with twenty grains of dry carbonate of soda, form soothing additions to the steam inhalation. A nose douche of hot water, to which may be added a teaspoonful of borax, phosphate of soda, or chlorate of potash to the pint, is likewise very grateful in some cases.

Guaiacum in the form of lozenges\* is of very

\* These formulæ, and many others mentioned in preceding pages, will be found in the Pharmacopœia of the Hospital for Diseases of the Throat.



great utility in the treatment of acute or sub-acute inflammation of the fauces, tonsils, and pharynx, and if employed before suppuration has taken place will generally prevent its occurrence. Such is my opinion of the value of this remedy in acute tonsillitis, that I always recommend persons who are subject to recurrent attacks of quinsy to keep the lozenges by them. Immediately the first symptoms appear one lozenge should be taken every two hours, until relief is manifest, when the dose may be taken less frequently. Saline purgatives are likewise of considerable service in these cases, and should be administered three or four times during the day at the onset of the attack. Tincture of aconite in frequently-repeated small doses also appears to exert a very marked influence over this, as over many other inflammations. If carefully watched it is quite free from danger, though it cannot, like the Guaiacum lozenge, be safely entrusted to patients themselves.

It was, at one time, supposed that enlarged tonsils exerted direct pressure upon the orifices of the Eustachian tubes ; and, with this belief, it became quite fashionable to remove the glands for the cure of deafness. More accurate observation has taught us the incorrectness of the theory upon which the practice was



founded ; and, in consequence, tonsillotomy has fallen into disuse in these cases.

If, however, the tonsils have become so enlarged as to impede respiration ; if they are so hard as to have lost their glandular structure, or if they are riddled with sinuses full of thick offensive smelling matter, they, undoubtedly, give rise to, and maintain an unhealthy condition of the naso-pharynx, and so operate injuriously on the mucous membrane of the middle ear. Under such altered conditions the organs no longer serve any useful purpose in the economy, but have become hurtful and offensive appendages, consequently their removal is desirable as well for the benefit of the general health as for the treatment of defective hearing.

In scarlatinal inflammation of the throat, which is so insidiously fatal to hearing, acetic acid inhalations are most useful. The inflamed sore throat of syphilis requires general treatment by iodide of potassium, with or without the addition of mercury. Local applications of nitrate of silver or of sulphate of copper to any ulcerated parts, and inhalation of kreosote or carbolic acid, will likewise form useful adjuncts to the constitutional remedies.

The prolonged action of chlorate of potash and of chloride of ammonium seems to exert a



beneficial influence on the throat in some cases. These salts are, however, very unpleasant to most persons, and therefore any method by which they can be rendered less objectionable, without lessening their good effect, is well worthy of our attention. I am in the habit of prescribing these drugs in the form of effervescing lozenge, prepared according to Mr. Cooper's process. In this shape these otherwise nauseous preparations are rendered as little objectionable as possible. Astringent lozenges of Eucalyptus or Rhatany are also of great utility in relaxation of the throat, and in the effervescing form are quite pleasant to take. In giving steel to children I not unfrequently recommend the phosphate of iron lozenges, and find that they are generally relished by patients, both little and big.



## CHAPTER IV.

*Treatment of Disease of the Ear.*

IT will be observed that a considerable space in this paper has been devoted to diseases of the nasal air-passages. I have done so because they are so very frequently at fault in cases of ear disease, and because we can only hope to cure defective hearing by restoring the nose and throat to a healthy condition. Having given an outline of the treatment to be adopted for this purpose, let us consider what should be done when the affection extends to the middle ear.

The first portion of this, commencing from the naso-pharynx, is the Eustachian tube, which, as I have already explained, becomes closed by relaxation or tumefaction of its lining membrane. In these cases impairment of hearing results from the non-admission of air into the tympanic cavity. If the disease be catarrhal, and have not extended further into the middle ear than the Eustachian tube, an occasional inflation of the drum by Valsalva's or Politzer's method will usually suffice, together



with applications to the throat, to restore hearing. In recent cases, more particularly with children, the effects of this treatment are very striking. The vacant, stupid appearance commonly observed in these patients will often be made to vanish by a single inflation, as if by magic. The face lights up, and hearing is restored, to the no small surprise and delight of the patient, and of any of his friends who may be present. This improvement, marked as it is at the time, will be but transient, however, unless measures are adopted to maintain the perviousness of the Eustachian tube. For this reason inflation will require to be practised once or twice daily until air is normally admitted into the tympanum by the act of swallowing.

In the treatment of tubal obstruction among children, it is often desirable to instruct their parents in the mode of inflating the tympanum with a flexible tube. Although they do not succeed thoroughly, I am satisfied that an attempt made two or three times daily will expedite the cure in most instances. Even if it is productive of no further benefit, little patients become gradually accustomed to the use of the instrument, and so become more manageable, because less alarmed. A form of inflating tube, which I often recommend in these cases, is



represented in Fig. 7. It consists of a piece of

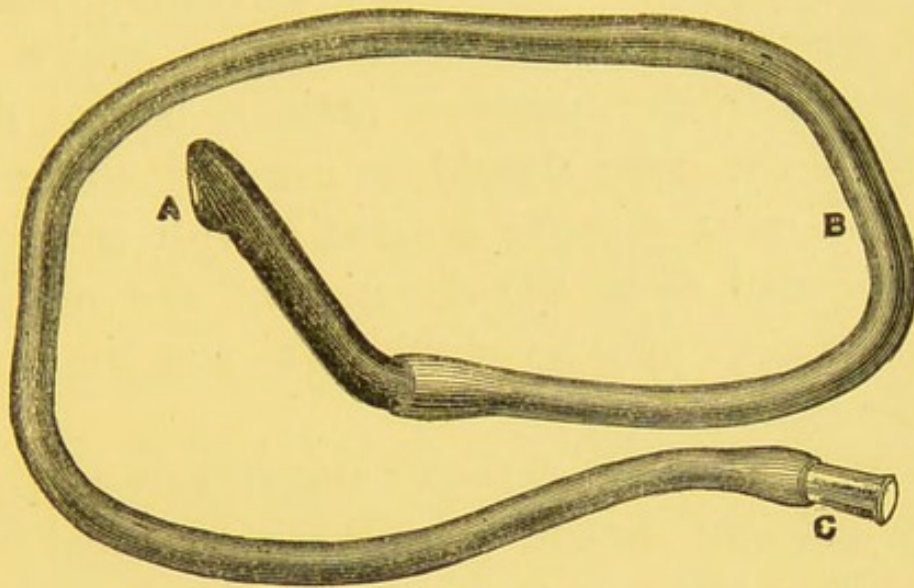


FIG. 7.

india-rubber tubing (B), about eighteen inches in length. Into one end of this is inserted a glass mouthpiece (C). The nose-piece (A), at the opposite extremity of the tube is of vulcanite; it is conical, and flattened from side to side so as to be easily introduced into the nostril without giving pain. The direction of the opening is almost backwards, and the lumen of the tube, which passes through it, is as large as possible, in order that it may offer no impediment to the passage of air. The hooked termination of the nose-piece lodges on the floor of the nostril, and serves to retain the instrument in position during inflation. For some time I have been using a nose-piece of this form with Politzer's bag, and find it answer



admirably. It is shaped after the model of the tip of the index finger which so readily enters the nose. One special advantage which it possesses in the hands of patients is that the point of the cone should be inserted upwards, because most persons unfamiliar with anatomy believe that to be the direction of the nostril. Various sizes may be obtained to suit the nose of the patient.

The Eustachian catheter supplies us another very efficient means of overcoming tubal obstruction. The instrument, though much less frequently employed than previous to the introduction of Politzer's method, is called for when that has failed. It will generally enable us to inflate the tympanum, and so relieve the symptoms due to closure of the Eustachian tube. When skilfully introduced the catheter should give no pain, and by its means we can apply medicated vapours and lotions to the Eustachian tube and tympanum.

I have pointed out how tubal obstruction causes displacement of the ossicles and contraction of the tensor tympani muscle; from this result pressure on the contents of the labyrinth, defective hearing, and tinnitus. Before the parts have become fixed in their altered position by long habit, the treatment I have described will suffice to restore them to their



normal position and function. When this is not the case the tubal obstruction is probably complicated by some adhesive mischief in the tympanic cavity, which we will consider further on.

The principal points to be remembered in the treatment of tubal obstruction are—in the first place, to reduce the tumefaction of the throat, which induces it, and secondly, whilst this is being effected, to inflate the tympanum regularly but effectively until the improvement of hearing is maintained.

Since the introduction of Politzer's method of inflation this has almost superseded every other. The Valsalsian operation is not only much less efficient, but has in addition many practical disadvantages. Thus when it is performed with any difficulty, as is usually the case in tubal obstruction, congestion of the tympanum in particular, as well as the head generally, is induced. Now the production of hyperæmia of the mucous membrane of the tympanic cavity is very liable to aggravate catarrh, or to cause its extension from the Eustachian tube; and the congestion of the head is particularly to be avoided if our patient has passed middle life, when the extra strain upon the cerebral blood-vessels might cause their rupture. With young children, too, the Valsalsian method is inapplicable, because it is impossible to teach them to



inflate ; and there is yet another objection, due to the extreme simplicity of the operation when once acquired, which, by leading to its frequent employment, may induce stretching, and consequent thinning and relaxation, of the *membrana tympani*. The last objection is especially liable to occur where, from tubal obstruction, rigidity of the chain of ossicles and contraction of the intrinsic muscles of the ear, have taken place. In these cases patients generally experience considerable benefit at first from inflating the drum, and acquire the habit of performing the operation whenever they wish to improve their hearing. After a time they find the improvement is less, and much more transient : this unconsciously makes them inflate more frequently, until at last scarcely any benefit is perceptible. For this reason, whenever the Valsalsian method of inflation is recommended, the patient should be cautioned against its continuance for an indefinite period, or mischief will undoubtedly follow. Politzer's method is not liable to the same objection, because the fact of having to use an apparatus will prevent a habit from being acquired, and whenever it is deemed advisable to place the treatment in the patient's own hands the frequency of inflation should be clearly laid down.

Whilst treating of inflation of the tympanum



I may mention some modifications of the original method of Politzer which are found to facilitate the operation in some cases. In these modifications the swallowing of water is superseded by lifting the root of the tongue against the posterior portion of the palate, which thus shuts off communication between the nasal and buccal cavities. The difficulty which patients would experience in performing this manœuvre may be overcome by causing them to pronounce certain words ;—Politzer recommends words of two syllables, such as *kœnig*, *vaarix* ; whilst Gruber proposes the monosyllables *hack*, *heck*, *hick*, *hock*, *hook*.

Another plan suggested to me by Dr. Weber-Liel, and which I frequently employ, is to direct the patient to blow forcibly through the mouth, the operator at the same moment compressing the Politzer bag. A musical patient once informed me that his tubal obstruction would often yield when singing a falsetto note, and acting on the suggestion I find this a most effective plan when practising Politzerization, though it is not susceptible of general application.

It is certainly an advantage to dispense with the swallowing of water in Politzer's inflation, as, among many other objections to its use, patients will occasionally, though rarely,



experience some pain in the epigastrium when the inflation is not exactly timed. This inconvenience I have never known to occur with the other methods, though they appear to be quite as efficacious in most instances.

When catarrh extends to the cavity of the tympanum but little change is required in the treatment. Inflation, which serves to open the Eustachian tube, acts likewise as an air-douche to the tympanic cavity, upon which, as well as upon the nasopharynx, it exerts the most beneficial influence. Thus in many cases this constitutes the only treatment necessary, all that is required being to apply it at proper and regular intervals. So long as the improvement produced one day is lost, or nearly so, on the next, inflation should be practised daily. After this every second day ; then twice a week until hearing is perfectly restored, or no further progress is made.

The natural tendency of catarrh is to produce augmented secretion, and when this is present in the tympanic cavity it is important to remove it as soon as possible, whilst it is still sufficiently fluid. Here again a very slight modification in the manner of practising Politzer inflation will be sufficient for our purpose. The patient, having taken a small quantity of water in his mouth, should incline



his head towards the opposite shoulder to the ear which we wish to inflate; he should then bend the body forwards, thus bringing the Eustachian tube into a vertical position. After remaining thus for a few seconds, that the mucus may gravitate towards the Eustachian tube, Politzeration should be performed in the usual way. The patient should not move for a few seconds after, when it will often be found that the fluid contents of the drum have been entirely or partially evacuated. If we consider the narrowness of the Eustachian tube, and that this is the only opening into the cavity of the drum, we shall readily understand the difficulty of clearing the tympanum by inflation when the mucus is thick and adhering to the ossicle. It is surprising, therefore, to observe the steady improvement which will sometimes follow simple inflation, either by Politzer's method or by the catheter in cases of simple catarrh. For this reason the injection of solvent lotions into the tympanum formerly practised is gradually falling into disuse. Without altogether endorsing the opinion of some aural surgeons that these injections only do harm, and that any benefit which takes place during their employment is due to the inflation of air which necessarily accompany them, I must confess that cases generally do very well without them.



The application of vapour to the tympanic cavity is sometimes useful, and is very easy of application where the substance to be vaporised is fluid and does not require heating. In these cases a few drops placed on sponge or bibulous paper, within the vapour box attached to the inflation bag, will be sufficient, whether we apply simple Politzeration or the catheter. Ether, chloroform, nitrate of amyl, turpentine, pine oil, spirit of camphor, benzole, and many other volatile oils and ethers may be readily applied in this way. Two or three drops of chloroform applied in this manner will often cause tubal obstruction to yield, and thus avoid the necessity of having recourse to catheterism. Turpentine and pine oil vapours are useful applications in catarrh of the tympanum, as they are in similar affections of the bronchial mucous membrane.

When it is desired to apply steam, or the vapour of any substance which requires heating, the bottle, with two tubes already described, should be employed. If this is placed in the circuit of the tube leading from the inflating bag to the catheter, the air which passes through it will become charged with the volatile principle contained in the bottle, and so enter the middle ear. It is important, however, to bear in mind that whenever the condition of the lining membrane of the tympanum is such as to require the



application of remedies by Politzeration, or by the catheter, whether they consist of the simple air-douche or other agents, the treatment, to be successful, must be regularly followed up. If this is not done we shall utterly fail to give satisfaction to our patient or to do justice to ourselves. A chronic catarrhal or inflammatory affection of the tympanum requires the application of remedies just as similar affection of the conjunctiva. And I ask if any surgeon would be satisfied with the use of lotions in these cases, once in a week or ten days, or at longer intervals? Although the eye is so placed that the treatment may be carried out by patients without requiring frequent assistance from the surgeon, that is no reason why the ear, which is a more intricate organ, should yield to treatment which would not suffice for the eye. It is to the neglect of these precautions that obstinate and intractable cases of deafness often owe their origin and progress.

Should the treatment described fail to remove mucous accumulations from the tympanum it may become necessary to puncture the membrana tympani, and to remove the secretion through the opening by means of inflation by Politzer's method, by the catheter, or by suction. These methods of clearing out the tympanum are preferable to the use of alkaline solutions



formerly recommended. Paracentesis of the membrana tympani is a very trivial operation; it rarely causes much pain, and I am not aware that it has ever produced permanent injury, even when it has failed to do good. Nevertheless it should not be performed until the more simple methods have proved ineffectual, and in practice it is very seldom called for. These punctures can rarely be kept open for more than three days, often considerably less: therefore it is important to clear out the drum cavity as soon as possible, in order to obviate the necessity for a repetition of the operation.

Under the treatment I have described, uncomplicated cases of catarrh of the middle ear recover perfectly, and the ear returns to a normal condition, the only mischief left behind being an increased liability to similar attacks when the patient has a cold. Even this liability is but slightly increased at first, and it is only after repeated attacks that susceptibility to the disease becomes formidable. The tendency is so greatly lessened if the attacks are properly treated that in by far the greatest majority of cases we may anticipate a complete restoration of hearing.

Although this is the result which may be legitimately expected to follow an attack of catarrh, it cannot be denied that many cases of



chronic deafness are attributed to catarrh of the tympanum, which, instead of progressing in the manner described, has been followed by steadily increasing deafness. This leads us to the consideration of an insidious form of disease known as adhesive inflammation of the tympanum. The affection very frequently dates its origin from catarrhal attacks, but it is possible that it may commence quite independently, and it is certain that it continues its pernicious course when catarrh has ceased to exist. It is easy to see how hyperæmia of the drum cavity, caused by the state of partial vacuum resulting from tubal obstruction, will favour exudation from the blood-vessels. This exudation becomes organised, and so forms bands or masses of fibrous material, which gradually contract and harden until the mobility of the chain of ossicles is seriously interfered with. In the progress of these pathological changes ossification of the new material not unfrequently takes place, and considerable deafness results. The displacement of the membrana tympani and ossicles inwards, which I have already explained, as a consequence of obstruction of the Eustachian tube, favours their becoming fixed in this abnormal position by the adhesive process which is going on, and in many instances treatment proves quite inadequate to restore the gradually decreasing hearing.



When we consider the pathology of this affection, it becomes manifest that treatment cannot be expected to induce absorption of the bony or fibrous tissues which bind the ossicula to each other and to the walls of the tympanic cavity if once these are fully formed. All we can hope to do is to preserve the mobility of the parts before it is too late, and to maintain them in as favourable a position as possible. In order to attain these objects Politzer inflation takes the first place. This should be practised regularly, and in conjunction with it exhaustion of the air in the external meatus is exceedingly useful. In this manner the membrana tympani is drawn outwards and traction is made on the chain of ossicles. Patients frequently express a sense of immediate relief from the operation, as well as improvement of hearing and cessation of tinnitus. Although this improvement is often transient, unless measures are adopted to maintain the parts in their altered position, it shows that the treatment is acting in a right direction, and affords encouragement to persevere.

For the purpose of rarefying the air in the auditory canal I never use anything but Siegle's pneumatic speculum. With it the amount of traction can be seen through the glass and regulated accordingly. The instrument is capable of raising fourteen inches of mercury, or



nearly half an atmosphere, and is therefore more than strong enough for our purpose. It is much safer than the reservoir of exhausted air, known by the euphonious title of "pneumatic tractor." This does not allow the operator to see what he is doing, and has not unfrequently been known to rupture the membrana tympani, and inflict serious damage on the delicate structures of the ear.

In many of the cases we are considering the posterior segment of the membrana tympani will be observed to be much thinned, so that it distends on inflation of the drum, whilst the part anterior to the malleus remains unmoved, as if it belonged to a distinct cavity. In this condition any immediate improvement which may result from the use of Siegle's speculum will rarely be maintained unless steps are taken to contract the weakened and relaxed drum-head, and at the same time keep up some traction on the tensor tympani muscle. The only means I know of by which this can be effected is carefully to paint the membrane with contractile collodion. I have followed this plan ever since it was first introduced by Dr. McKeown, and by combining it with the use of Siegle's speculum have been enabled to afford relief to many cases which had previously seemed incurable.



It is of course important in these cases to avoid distending the already weakened membrane, and the coating of collodion so far strengthens it that we may employ inflation and suction without injury. After allowing the collodion to dry, its protective influence may be readily seen in the restricted movement of the posterior segment of the drumhead, when the patient practises Valsalvian inflation, or when we exhaust the air in the external meatus.

Specimens of collodion vary much in their contractile qualities. I have had some which, painted over a surface of skin one inch in diameter, contracted to five-eighths. Others are almost devoid of contractile qualities. It seems to be a common practice nowadays, for what reason I know not, to add Canada balsam to the collodion. This may be readily detected by the smell, and renders the specimens quite worthless for our purpose.

Cases of adhesive inflammation within the tympanum may be considered much the same as stiff joints in the limbs. By inflation and the use of Siegle's pneumatic speculum the parts are as much as possible brought into a normal position, where they are retained by the coating of collodion on the drumhead. After a short interval the repetition of inflation and



suction applies gentle movement to the parts, and so preserves their flexibility. The success of the treatment of course depends upon the condition of the ossicles and fenestræ. If the foot-plate of the stapes is ankylosed by bony exudation to the walls of the fenestra ovalis, much relief cannot be expected; but if the parts are chiefly retained in their malposition by the tensor tympani muscle, or by weak adhesions, the greatest benefit will follow. In many instances where hearing is not improved tinnitus will be cured or relieved.

The chronic and intractable deafness resulting from the adhesive process within the tympanum has ever been the *bête noir* of aural surgeons, and endless attempts have been made to find a remedy. All sorts of operations have been advised and practised, chiefly abroad, but all without permanent benefit. Section of the posterior fold of the membrana tympani, of the anterior ligament, of the superior ligament, and division of the tensor muscle have been performed, and sometimes with temporary advantage, but this has invariably been of short duration.

Very marked improvement of hearing is sometimes observed during the continuance of a perforation in the membrana tympani—so great, indeed, as to render it very desirable that



a method should be discovered by which an opening may be maintained. Unfortunately, all attempts in this direction have hitherto failed. Perforations which have been made by the application of concentrated acid will remain patent for several days, or sometimes weeks, but they ultimately close. The insertion of an eyelet or canula into the aperture, the excision of a portion of the membrane, the application of the galvano-cautery, all of which have been recommended, prove equally unsuccessful. Indeed, in spite of all our endeavours, these artificial perforations close, and any improvement which may have been observed during their continuance disappears.

The internal administration of drugs seems to have no effect on the progress of adhesive inflammation of the middle ear; it will neither arrest the progress or promote the absorption of exudation. If we except syphilitic cases, in which iodide of potassium will often be attended with marked improvement, we must consider therapeutical treatment valueless. Our principal efforts must be directed to the early treatment of cases of catarrh as a means of preventing the adhesive process becoming established, and in those cases where it has already occurred we must, by prompt and persevering attention to intercurrent catarrh, endeavour to prevent its



further aggravation; we must also strive to regain, as far as possible, the mobility of the ossicular chain and preserve what still remains. In these attempts we shall sometimes prove unsuccessful, as the pathological conditions would lead us to expect; nevertheless no pains should be spared to prevent the occurrence of that high degree of deafness which renders life a misery, and in this we shall often succeed.

From the insidious and painless, though highly pernicious, form of inflammation of the middle ear, we will now pass on to acute inflammation, an affection generally attended by more or less suffering, which in some cases is very severe. The disease may terminate in resolution, or it may proceed to the formation and escape of pus by perforation of the membrana tympani. When the pain is very severe the latter form may generally be anticipated, and, indeed, will often occur when the suffering is very slight, as we see in cases of scarlatina, and some other forms of disease, where the first indication that acute inflammation of the drum cavity has taken place is discharge of pus from the meatus.

Where the attack is accompanied by great suffering this may often be relieved by the application of from two to four leeches immediately in front of the tragus. If resorted to sufficiently



early this treatment appears to check the progress of acute inflammation and stay the suppurative process. If, however, it is manifest from the first examination that suppuration must take place, the local abstraction of blood will be of no avail, and it is better at once to have recourse to such means as will assist the discharge of pus as soon as possible. With this object, warm water is applied in the auditory canal, either by means of a gentle douche or by pouring in with a spoon. Hot applications, either moist or dry, should also be made to the ear and surrounding parts, but poultices should be avoided.

The advocates for the douche claim for it the advantage of often arresting suppuration ; it is always very grateful to the patient, and should be employed at short intervals until the pain subsides, either by resolution or by escape of matter through the membrana tympani. The period at which this subsidence of pain takes place varies greatly in different cases, but when it occurs the treatment should be at once changed. During the painful period Politzer inflation should be avoided, as it only aggravates the sufferings of the patient, and the condition of hearing is not such as to demand its use. After this it should be employed at regular intervals—in the non-suppurative form until the hearing is restored to a normal state, and



where perforation has taken place, so as to remove the muco-purulent secretion from the tympanic cavity. In all these cases great gentleness should be observed in the inflation at first, so as to avoid bringing on the pain again, and the force may be gradually increased from day to day as the parts become less tender, and better able to bear it. When the inflammation has subsided by resolution, nothing further will be needed in most cases to bring about a perfect restoration of hearing; but where the inflammation terminates in suppuration and perforation of the drumhead, the regular cleansing of the tympanic cavity and auditory canal is called for. This may be effected by syringing and Politzeration, or by the dry method which I will now describe.

By this plan a great change has taken place in the manner of treating discharges from the tympanum, though the object of treatment is much the same. Instead of cleansing the ear as formerly by means of the syringe, this is effected by Politzeration and careful mopping with absorbent cotton, followed by the insufflation of disinfectant powder to deprive the purulent secretion of its irritating qualities and render the mucous surface more healthy in character. This mode of treatment will be found most useful, whether the perforation be large or small, recent



or of more ancient date. It requires, however, to be carefully carried out.

The mode of procedure which I usually follow in these cases is to wipe away all discharge from the auditory canal by the aid of the cotton-holder. After this has been done the tympanum is inflated by Politzer's method, and the meatus again wiped out with cotton wool. This proceeding should be continued until the whole of the secretion has been blown out of the drum cavity and wiped away. Very finely powdered boracic acid is then blown into the ear and packed in as far as the perforation by means of the cotton-holder. More powder is then blown into the ear and packed as before.

When the discharge is profuse the boracic powder will soon be dissolved and will flow out with the discharge. It should therefore be renewed by the patient as often as may be necessary, having previously wiped away as much of the secretion as he can with absorbing cotton. When there is only slight discharge from the ear the boracic acid may cake in the auditory canal and require removal. This is often the case on approaching a cure, but it must be remembered that in this the dry form of treatment, syringing ought to be avoided as much as possible, and should not be employed for four or five days after discharge has ceased,



or it will very likely bring it back again. When, by these or other measures, the perforation closes, the careful employment of Politzeration should be continued until hearing is restored. Considering the extreme severity of the symptoms in most cases of acute inflammation of the tympanum it will be gratifying to learn that, by judicious management, the termination will be satisfactory. Indeed, it is the rule, rather than the exception, for patients to recover almost perfect hearing.

Although perforations of the drumhead which accompany acute suppuration of the tympanum will often heal under the treatment described, it not unfrequently happens that in spite of all our efforts the opening remains. This is especially the case when the loss of substance is great, or when one or more of the ossicles separate and come away. Sometimes even small perforations refuse to heal, and the edges of the opening continue in the same condition for months. When we have satisfied ourselves that careful cleansing and the insufflation of boracic acid will not check the discharge and cause the opening to heal, we must try other remedies. The one which seems to be next in value is alcohol, and this may be dropped into the ear either alone or with the addition of boracic acid, part of which it will dissolve and



part it will retain suspended to deposit on the parts with which it comes in contact. Sometimes a 3 per cent. solution of carbolic acid in diluted alcohol, or drops containing sulphate of zinc from 1 to 2 per cent., will prove more successful. Sometimes a solution of nitrate of silver, as recommended by Schwartze, from 5 to 10 per cent., will produce rapid diminution of the discharge after two or three applications. It should never be used until the parts have been very carefully cleansed by syringing. After allowing the drops to remain three or four minutes in the ear, syringing should be repeated. When these various forms of treatment have been tried ineffectually it will not unfrequently happen that a return to boracic acid insufflation will be successful.

When the tympanum contains thick, cheesy, offensive-smelling matter, this requires to be softened by maceration, and carefully removed by syringing as well as inflation. We must not forget that pus, allowed to collect and putrify, is sure to keep up unhealthy action of the mucous membrane, and in some instances it causes death by giving rise to caries of the bones with cerebral abscess, or pyæmia. It is a popular belief, and a very erroneous one, that to stop aural discharges is a dangerous practice. When this is effected by the means I have described it is quite



free from risk, and the only real danger occurs when destructive suppuration is allowed to proceed unchecked in such close proximity to the brain and other vital organs.

In some cases of perforation, striking improvement of hearing, as well as diminution of discharge, follows the use of Yearsley's artificial membrane, a simple contrivance which consists of moistened cotton wool, adjusted at the bottom of the auditory canal. It probably acts by affording support to the ossicles, and thus maintaining a proper tension of the labyrinthine fluid. This explanation is confirmed by the fact that the artificial membrane will sometimes improve hearing when no perforation is present.

Some care is often required to adapt cotton wool in such a manner as to afford the greatest amount of benefit obtainable. Patients will soon learn to do this better than the surgeon, if the mode of adjustment is properly explained to them. It is often advisable to moisten the wool with an astringent or antiseptic lotion, and the addition of a small quantity of glycerine will prevent too rapid drying.

Although various attempts have been made to improve upon the original method of Yearsley it is, I think, generally admitted that nothing is so simple or so generally applicable as the moistened cotton. It is true that in a few isolated



cases a segment of an indiarubber tube, as recommended by Politzer, or the indiarubber disc of Toynbee, may give better results, but this is rare.

If, as a consequence of perforation and prolonged suppuration, a polypus has formed—and this is the manner in which they mostly originate—our first object should be to remove the growth. When this is of sufficient size it should be pulled away with forceps or with the snare. After which, or when the polypus is small, cauterization may be necessary. In many cases polypi have no tendency to return, and therefore the application of caustic is useless. Indeed, the experience of Knapp indicates that its employment often promotes more rapid growth. Soft granulations or polypi may frequently be caused to shrivel up and disappear by the employment of alcohol in the manner already mentioned. Sometimes a strong solution of subacetate of lead seems to act more effectively, or the galvano-cautery may be required.

After the removal of polypi, running from the ears, even of long standing, will often be cured; perforations close, and very useful, if not perfect hearing, returns. We must bear in mind, however, that in some instances the thorough destruction of polypus is attended with considerable difficulty, and therefore re-



quires much patience and perseverance on the part of both patient and surgeon. Treatment must not be abandoned until a cure is perfectly effected, or the growth will most probably return.

Another complication, which is occasionally met with as a consequence of suppuration of the tympanum, is disease of the bony structures of the ear. Thus caries or necrosis of one or more of the ossicles, or of some portion of the tympanic walls, or inflammation and abscess in the mastoid process, may take place. I need not point out that disease of this nature affecting the bones of the skull, which are separated from the dura mater, the cerebral sinuses, the brain, the carotid canal, and the jugular fossa, by the thinnest lamellæ, often cribriform, is of a most dangerous nature. Bearing this in mind it will be evident that treatment should be unremittingly persevered in until the progress of the affection is arrested. With this end in view the most scrupulous care should be taken to prevent accumulation of discharge within the ear, for we have seen that this aggravates the ulcerative process. Syringing must be frequently practised, using with the water some borax or boric acid or carbolic acid (2 to 3 per cent.) In order to wash out portions of the middle ear, inaccessible in the ordinary way, it is



sometimes necessary to use a syringe provided with a fine tube curved at the end ; or it may be desirable to inject, by way of the Eustachian tube, in the manner recommended by Politzer. Contraction of the meatus, often present in these cases, should be overcome by the insertion of indiarubber tubes or pledgets of cotton wool, and any other causes of obstruction to the free exit of pus, such as the presence of a sequestrum, or a mass of caseous secretion, should be removed.

When persistent pain, tenderness, and swelling in the mastoid region indicate suppurative inflammation within the bone, this may often be arrested by leeching followed by the application of cold to the part. If this fails after a few days' trial, an incision behind the ear down to the bone will be called for, and will often afford relief even though no pus be found. Should the inflammatory process continue in spite of this treatment, particularly if the symptoms are severe, it will be necessary to perforate the outer shell of the mastoid bone. By steadily following this line of treatment inflammation and caries of the bones of the ear will very rarely prove fatal by extension to the vital parts with which they are so closely related ; but a very serious responsibility is incurred by those who allow aural discharges to take their



course, and thus neglect the precautions necessary for preserving the lives, as well as the hearing, of their patients.

It will hardly be deemed orthodox to conclude a paper on defective hearing without alluding to blisters and the syringe among curative agents. These must undoubtedly be regarded as the sheet-anchors of routine practice, and consequently, a word or two concerning their use and abuse will not be out of place.

Though almost discarded by the modern school of aural surgery, it cannot be denied that blisters sometimes do considerable good. The discomfort and annoyance of the treatment are palpable enough, though it is often difficult to satisfy ourselves of its real advantages. For this reason the indiscriminate use of blisters must undoubtedly be condemned, but we ought not to set them aside as altogether useless, because we are unable to explain their *modus operandi*.

Syringing is only justifiable for the purpose of removing something from the ear; therefore it should never be resorted to until we have ascertained that there is something which requires removal. These observations may be deemed sufficient for the simple operation of syringing an ear, but, simple as the proceeding may appear, serious errors prevail con-



cerning it, and it is very frequently found to fail.

Syringing is called for when, *by an examination of the ear*, it is found to contain inspissated cerumen, hardened epidermis, parasitic growths discharge, or any other foreign body. The operation should be continued within moderate limits, so long only as any of the substance we seek to remove can be seen within the auditory canal. It is, therefore, necessary to make repeated examinations during the operation, or we shall incur the risk of either leaving it partially completed, or of continuing after it has ceased to be useful, and when it will consequently do harm.

Of both these errors we see almost daily, examples. It is of very common occurrence to find in the meatus of patients masses of hard cerumen, or epidermis, though we are assured that the ear has been recently and perhaps repeatedly syringed. On the other hand it is by no means unusual to hear of syringing being performed without the smallest justification—nothing having been removed from the ear and nothing being there to remove.

Impacted cerumen, or epidermis, pressing against the membrana tympani, will not unfrequently cause severe deafness and tinnitus as well as giddiness. These symptoms give rise to



considerable alarm, and patients are not unfrequently subjected to active medical treatment in consequence. The efficient use of the syringe will cure these cases, and is urgently called for as soon as the cause has been ascertained. To remove hardened cerumen from the auditory canal is often a matter of no small difficulty after such a mass has been retained for a considerable period. Even with the best appliances at our command it is not always possible to succeed at the first sitting, and therefore it is by no means surprising that syringing, as ordinarily practised, should prove unsuccessful. Although, in cases such as these, judicious syringing is called for, as a matter of routine it has repeatedly injured the delicate organs of hearing, and must be unhesitatingly condemned.

I have attempted in this paper to give a brief *résumé* of the principal affections of the ear, which constitute the most frequent causes, as well as the most curable forms, of defective hearing. The various modes of treatment which have proved successful in such cases have been pointed out, and it is hoped that the efficiency of the measures recommended has been made sufficiently manifest. There is one point to which too much importance cannot be attached, and that is the necessity for applying our remedies early. If ear disease is allowed



to progress unchecked, either without treatment or by temporising, as is done when syringing and blistering are practised without making a proper diagnosis, the patient's hearing incurs the risk of being irrevocably sacrificed. It is only when the profession, as well as the public, can be made to appreciate the importance of these facts that we can hope to prevent the frequent occurrence of incurable deafness.

Such are the aims of this little book, for which I now ask the indulgence of the reader.

