condition. Though it may take some time for the millennium to arrive, a great deal might be done, and in some places is being done, to diminish the dissemination of the disease by systematic inspection and treatment. It is well known that the disease is specially liable to spread in communities such as public schools, universities, sanatoria, etc. In these places systematic examination of the feet and treatment might be much more completely carried out than it is at present.

Assuming, therefore, as we must, that there are always a number of infected persons amongst us, we now have to consider how infection of the non-infected can be prevented. It is probable that most fungus infection is picked up by the toes from the floors of bathrooms, swimming baths, changing rooms, etc.—in fact, any place where infected persons may stand with bare feet and so leave scales about. There are two main methods of prophylaxis available: first, by preventing the naked foot from coming into contact with the floor, either by wearing rubber shoes or by having separate bath mats for each person; and, secondly, by using some antiseptic after contact with a possibly infected floor. For hotels and private houses the use of separate towels and bath mats would probably go a long way towards preventing infection, while the employment of rubber shoes in swimming baths might well be made compulsory. In America this question has been studied very carefully by a number of observers.

To quote only one published paper: R. T. Legge, L. Bonar, and H. J. Tempington (*Journal of the American Medical Association*, July 20th, 1929, p. 170), examining the feet of 3,100 entrants to the University of California in one session, found 53.3 per cent. of the men and 15.3 per cent. of the women had foot ringworm. At the end of a year they again examined 1,000 of these men and 997 of the women who had access to the showers, swimming pools, and gymnasiums. Of these, 78.6 per cent. of the men and 17.3 per cent. of the women were found infected. The increase in the case of the men is striking. The authors point out that the women students occupied a gymnasium with every known sanitary device. The women students and attendants were obliged to wear rubber shoes, and in no circumstances were they permitted to walk with bare feet on the floors or runways leading to the swimming pools or gymnasiums. On the other hand, the men occupied an antiquated gymnasium, where, on account of the lack or non-use of bathing shoes, and inferior sanitary facilities, the students constantly walked on their bare feet and became infected.

With regard to the use of antiseptics in public bathing establishments, these have been tried with considerable success in America. W. L. Gould (*Journal of the American Medical Association*, October 18th, 1931, p. 1300) recommends baths of 10 to 15 per cent. sodium thiosulphate solution to be placed in such a way that all users of the baths must walk through them on their way to their dressing rooms. E. D. Osborne and B. S. Hitchcock (*ibid.*, August 13th, 1931, p. 453) and E. D. Osborne, E. D. Putman, and R. J. Rickloff (*ibid.*, November 1st, 1933) in the same way use 1 per cent. sodium hypochlorite. Both claim to have prevented any spread of the disease by these methods. Needless to add, the proper flooring, and cleaning of dormitory floors, bathrooms, swimming baths, etc., adds materially to a reduction in the risks of spreading infection.

Conclusion

To sum up, we are dealing with a very common affection which, though it does not terminate fatally, and therefore appear in the Registrar-General's returns, may cause a good deal of suffering and loss of work. Owing to its insidious onset a great number of cases escape detection, and, even when detected and treated, for various

reasons do not get completely cured. We have to face the fact, therefore, that for the present there will be a large number of individuals infecting the floors of our private bathrooms, public bathing places, etc. I have pointed out that a good deal could be done to limit the spread of infection in such places, but in order to get such measures adopted on a large scale the public would have to be educated, and this can only be done through the medical profession, and the profession as a whole is still barely aware that the problem exists. Possibly the solution of the problem really rests with the dermatologist. I find myself very much in agreement with Weidman, who, in a discussion on the subject in America, made the following remarks:

"The hygiene of the problem is so complicated that I doubt whether the difficulty can be met by that route. It is impossible to sterilize all the wearing apparel of the patient; even so, there would still remain the floor coverings in our homes, hotels, shower baths, etc. It seems to me that the real approach to the millennium in the way of treatment is to establish conditions in the intertriginous locations in which the fungi work and mobilize, which will make these locations undesirable to the fungus."

May it not be that in this direction lies the solution of our problem?

MUCO-PURULENT TUBO-TYMPANIC INFECTIONS*

BY

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When the president suggested for this discussion the subject of tubo-tympanic infections I understand he had in mind its limitation to the class of ear case in which we have reason to believe that the anterior part of the tympanum is mainly involved—cases in which the perforation, if any, is present, is demonstrable, is anteriorly placed, and the discharge, if any, is predominantly mucoid or muco-purulent. We have to include also, of course, cases of low-grade infection in which perforation of the membrane does not occur, although from the appearances, the impairment of function, and the auscultatory signs on inflation we are able to presume the presence of secretion in this part of the middle ear. Further, the president suggested that we might include in the category those unsatisfactory cases exhibiting a continued or recurring muco-purulent discharge from the anterior part of the cavity after the radical mastoid operation.

We are not directly concerned on this occasion with the acute otitis media arising in the course of common colds, influenza, and the exanthemata, nor with chronic otitis media showing more or less destruction of the posterior part of the membrane with perhaps granulations or polypus. The differentiation cannot be very rigid, however, as many cases properly included may have begun as conditions indistinguishable from the cases we are excluding, and may be looked upon as residuals from the latter.

Why should a middle-ear infection spend its energies on the anterior part of the cavity in preference to the posterior, or (as may be the more correct form of the question for some cases) why should the infection of the anterior part of the cavity continue when it has subsided in the posterior part?

* Read in opening a discussion in the Section of Oto-rhinolaryngology at the Annual Meeting of the British Medical Association, Bournemouth, 1934.

Infection by Direct Spread or by Blood Stream

We are probably all agreed that in the great majority of cases infection reaches the tympanum by direct spread along the Eustachian tube, whose mucous membrane is continuous with that of the nasopharynx on the one hand and the middle ear on the other. The fact that otitis media most commonly arises as a complication of influenza or a common cold, or of those of the exanthemata which in their early stages attack the upper respiratory tract, seems to make such a conclusion incontrovertible. It is comparatively seldom that we do not get a history of sore throat or nasal catarrh antedating the onset of the middle-ear signs. In a large group of cases the Eustachian tube serves merely as an avenue of approach, its inflammatory condition passing off as quickly and completely as the nasopharyngitis which was its precursor. The distinguishing point of the group we are considering to-day is that the Eustachian tube remains prominently in the picture.

On the other hand, there seems to be some basis for the view that sometimes the infection in otitis media, and particularly in mastoiditis, may be blood-borne and quite independent of the Eustachian tube. Killian held that infection of the paranasal sinuses in scarlet fever is blood-borne, and if so why not the mastoiditis which is much more common in this disease? The middle-ear complications of typhoid fever, said to occur in 7 per cent. of cases, are likely to be blood-borne, as nasopharyngitis is not a feature of this disease.

Some observers from experimental work on animals have concluded that pneumonia may be a blood-borne infection, and not an extension down the mucosa of the bronchial tree. They found the pneumococci in the blood during the incubation period, but when consolidation had occurred in the lung the organisms were found to have migrated there and the blood stream was free of them. The hypothesis is that when the pneumococcus gains entrance, usually by the pharynx, the alveolar tissue of the lung, for which the toxins of this organism have an affinity, becomes sensitized. At the end of the incubation period the pneumococci migrate to the tissue thus prepared for them. Possibly the same may occur in influenza and the exanthemata, in which diseases we have abundant reason to suppose that the causative organisms have a special predilection for the mucosa of the middle-ear cleft.

A few months ago I had an opportunity of observing more closely than is usually possible the onset of the ear symptoms in an extremely severe epidemic of measles in a preparatory school, and some of the cases were very suggestive of a blood-borne infection. The inflammatory signs appeared first in the posterior-superior part of the membrane, while the lower part retained its lustre, even as far as not to have lost the light reflex. When, after a few hours or, at most, a day or two, the redness extended over the whole membrane, and myringotomy was performed, only a thin serous fluid escaped. The mastoid operation was necessary in most of the cases in which myringotomy was done, and although it was never delayed beyond two or three days, the advanced stage of the mastoid disintegration suggested that the mastoid infection had ante-dated rather than post-dated that of the middle ear. The medical officer of the school, indeed, suggested a blood stream infection of another kind. He went very carefully into the history of all the boys affected, and found that most of those who developed mastoiditis had been contacts of another boy whom he suspected of being a scarlet fever carrier. This boy actually had, during the measles epidemic, a recurrence of suppuration in a mastoid operated upon after scarlet fever eighteen months previously. The theory, in which the medical officer is supported by a distinguished bacteriologist to whom he presented the data, is that these boys contracted a streptococcal mastoiditis from a latent scarlet fever infection when their resistance was lowered by measles.

However, while recording the opinion that in some cases an acute middle-ear or mastoid infection may be blood-borne, I am not suggesting that in this fact we have the distinction between tubo-tympanic infections and those involving the posterior part of the cavity. Probably only a comparatively small number of cases of otitis media can be even suspected of being blood stream infections. The Eustachian tube must be looked upon as the usual pathway of infection.

Why, then, should the infection sometimes confine its energies to the anterior part of the cavity and at other times skip this, or pass lightly over it, and produce a more severe condition, often with bone involvement, in the posterior part?

Variation of Mucosa in the Middle Ear

The variations in the mucous membrane distributed over the walls of the tympanum may provide part of the explanation. In the anterior part of the floor of the cavity and on its anterior wall where the Eustachian tube enters, the lining is of ciliated cylindrical epithelium. Over the promontory it is cuboidal-celled, and over the attic squamous-celled, this type being continued through the aditus into the mastoid antrum and further cells.

We know that particular organismal types show a predilection for one type of epithelium over another, so that the question whether an ear infection is to become a posterior and mastoid infection rather than one confined to the anterior part of the tympanum may depend on the particular organism involved. I have not been able to trace any bacteriological research into the types of organism predominantly found associated with anterior perforations—obviously the flora is likely to be very mixed by the time a case comes under observation—but it is well known that in the acute cases affecting the posterior part of the cavity and going on to mastoid operation, one or other of the many types of streptococcus is most commonly involved. We also know from clinical experience that the streptococcus is much more liable to attack the squamous epithelium of the pharynx than the ciliated epithelium of the nose. We are not surprised, therefore, to find it selecting for attack that part of the middle-ear cleft which is lined by squamous epithelium.

Degree of Virulence of Organism

There is also the question whether the degree of virulence of the organism, whatever its type, may determine the site of its action, or its maximum action, in the middle ear. Influenza varies enormously in its virulence in different epidemics, although presumably the same organism is always involved. In the milder epidemics just as we have fewer sinus suppurations complicating the nasal symptoms, so also in the ear we have the milder anterior type of otitis media predominating over the posterior more severe type. During the winter of 1925-6 we had, in my area, two distinct visitations of this disease, one in December and the other in March. The former was mild, and of the myringotomies I personally performed only 1 in 10 required the mastoid operation. In the later epidemic, which was a severe one in all respects, one-third of the myringotomies were followed by mastoidectomy.

We have the same variations in the virulence of other epidemic diseases. I looked up my old copy of Osler and Macrae's *System of Medicine* of twenty-five years ago and found the ear complications of measles thus described:

"An acute catarrh of the middle ear is not infrequent from extension of the inflammation in the nasopharynx along the Eustachian tube. It may cause earache, slight deafness, or tinnitus. Occasionally the inflammation becomes purulent and the ear drums rupture. Mastoid abscess rarely complicates the middle-ear disease."

If this represents the incidence of ear symptoms in measles in America at that period, the disease in this country at the same time must have been more fruitful of such complications, as a large proportion of the chronic otitis media cases we see among young adults and people of early middle age are stated to date from measles in childhood. Then in still greater contrast we have the recent very severe epidemic which occurred in several parts of this country with an unusually high incidence of mastoid complications. In the small school epidemic I have already referred to the ears were affected in nearly 50 per cent. of cases, and of the affected ears nearly 50 per cent. required the mastoid operation.

There seems, therefore, to be some ground for thinking that the degree of virulence of an infection may determine the question whether one part or another of the tympanum is more likely to be affected.

Changes in the Floor of Middle Ear

There is also the question whether, owing to the dependent position of the floor of the middle ear, changes ulcerative or otherwise may occur in the mucosa, tending to chronicity. An analogy is to be found in the anterior inner angle of the maxillary antrum, where the mucosa is so frequently polypoid and unhealthy to a degree greatly in excess of any changes present in other parts of the cavity.

Professor Nager holds the view that the anterior perforation with mucoid discharge frequently indicates a tuberculous ulceration of the mucosa, and that this is often proved by the history, by von Pirquet's reaction, and by the presence of the scars of broken-down glands.

The Eustachian Tube

Then we have to reckon with the possibility of pathological changes in the Eustachian tube itself, keeping up an infective discharge from it into the middle ear—the so-called tuborrhoea. The Eustachian tube consists of three parts—a short upper end enclosed in a bony canal, a longer lower end in a cartilaginous funnel, and, between, a short isthmus, supported only by fibrous tissue. In this middle part the walls of the tube are in contact except when, by the act of swallowing, air is forced up the tube into the tympanum. Theoretically, after an acute inflammation of the tube, ulceration and consequent adhesions in this area might produce a condition analogous to stricture of the urethra and gleet, and it is possible that some of the rare cases in which inflation of the ear through the tube cannot be achieved may be so explained. What is still more likely to occur is that after an inflammatory condition in the tube has been established for some time the epithelium loses its cilia, as happens in similar circumstances in the nose and nasal sinuses, and this is probably the explanation of the persistence of tuborrhoea in those disappointing cases which resist treatment in every form.

The Nasopharynx

I am strongly of the opinion, however, that most frequently the determining cause of tubo-tympanic infections is not to be found in the particular organism concerned, nor in its degree of virulence, nor yet in any chronic or permanent change in the mucosa of the floor of the middle ear or of the tube, but in some pathological condition beyond the lower limit of the tube. The original cause and, in most cases, the continuing cause of an unhealthy Eustachian tube is to be looked for in its adnexa—the nasopharynx, the nose, or the paranasal sinuses—and it is mainly there we have to direct our attention with a view to the cure and the prevention of the condition we are discussing to-day.

The Question of Adenoids

As far as children are concerned—and the bulk of our cases of tubo-tympanic infections occur in children—sepsis and hypertrophy of the adenoid tissue of the nasopharynx take first place. It might almost be called the Golden Rule of Otolaryngology that in every case of ear discharge or catarrhal deafness in children the question of adenoids must be investigated, and yet one is constantly seeing cases in which the rule has been forgotten over a long period of local treatment.

I have described, in a communication read elsewhere, how when I started an aural clinic in connexion with a school medical service eight years ago I had at first to deal with scores of cases which had attended for local treatment of the ears for long periods, sometimes for years, and which cleared up in two weeks or less after removal of adenoids. No doubt everyone present has had a similar experience, and is finding it still repeated, although, happily, in diminishing degree.

The question of the presence or absence of adenoids should be settled in every case—without qualification. It is not sufficient to accept the mother's statement that there is no snoring or mouth breathing. Nor must we be satisfied with an assurance that the tonsils and adenoids have been removed—not even if we have done the operation ourselves. Even if inspection of the pharynx shows that the tonsils have been completely enucleated we have no right to assume, without an adequate view in the mirror, or, failing that, palpation with the finger, that the nasopharynx is equally free from excess of lymphoid tissue. Many operators seem to be more careful about the efficiency of the tonsil part of the operation than about the complete removal of the adenoids, and do not trouble to finish up with the finger after the curette, to make sure that everything has been removed, especially in the region of the Eustachian orifices and the choanal entrances. Apart from this, no one can guarantee that adenoids will not recur even after efficient removal. In the case of the tonsils, if we remove the capsules completely we can promise that they will not grow again, but we can give no such guarantee as regards adenoids, of which we merely scrape away the excrescence. It is true that recurrence after complete removal does not often take place, and that when any considerable mass of adenoids is found after a previous operation, examination of it generally proves it to be virgin tissue which has obviously escaped the curette before. It is not uncommon, however, to find an overgrowth of unhealthy granulations in the adenoid area—and the child with a chronic or recurring ear discharge cannot afford to harbour anything unhealthy in the vicinity of the Eustachian tube.

With a view to the *prevention* of a chronic tubo-tympanic infection it is equally necessary to keep this question of adenoids prominently before us in every case of *acute* otitis media. To embark on the local treatment of an acute ear which has spontaneously ruptured, or to do a myringotomy or mastoid operation where such is indicated, without making sure whether or not the nasopharynx is free from the sepsis or obstruction of adenoid tissue, is not giving our work the best conditions for success.

I have made it a rule for some years that every case of acute mastoiditis admitted to the children's ward must have adenoids removed a week or so after the emergency operation if any adenoids at all are present. If on examination before the mastoid operation the tonsils are found to be healthy or to have been removed, it is a good plan to palpate the nasopharynx at the close of the mastoid operation. If adenoids are present they can be scraped away there and then without adding

appreciably to the patient's discomfort. If, however, the tonsils also require removal, the combined tonsil and adenoid operation should be done within a week, so that the length of stay in hospital is scarcely prolonged. The same applies to cases admitted for myringotomy—adenoids alone may be removed when the myringotomy is done, or the complete tonsil and adenoid operation is done a week later if the tonsils also require removal. I believe that by this procedure cases of prolonged discharge after the mastoid operation or after myringotomy are reduced to a minimum.

Before leaving the question of adenoids perhaps a word should be said about the part the tonsils may play in keeping up a Eustachian tube catarrh. It is admittedly a very minor role compared with that of adenoid growths, but it is obvious that the proximity is close enough to demand consideration. Unhealthy tonsils must predispose to a nasopharyngitis, and so to the enlargement of adenoids or the growth of granulations where adenoids have already been removed. One generally finds in young people that with imperfectly removed tonsils adenoids or granulations are also present. This may, of course, only mean that the adenoid removal has been as badly done as the tonsillectomy, but it may also mean that recurring inflammation in the tonsil stumps leads to hypertrophy in the upper part of Waldeyer's ring. On the whole, I think on these grounds it is better to remove unhealthy tonsils in tubo-tympanic infections.

Relevant Intranasal Conditions

Let us now consider conditions in the nose itself which may cause or predispose to Eustachian tube infections.

1. *Foreign bodies* may cause a persistent rhinitis. Some time ago I saw a boy of 9 years with a history of recurring otorrhoea since babyhood. Conservative measures seemed to be successful for short periods, and particularly encouraging for a time after the removal of tonsils and adenoids, but recurrence always took place. I found a bead in the middle meatus of one side of the nose, and after its removal the ear quickly dried up. As a boy of 9 is not likely to put a bead in his nose, we presumed that the foreign body had been there as long as the ear discharge had lasted.

2. *Nasal obstruction* interferes with the efficient ventilation of the Eustachian tubes, and so predisposes to tubal catarrh. The most common cause of such obstruction in adults is a deviation or spur of the septum. In addition to blocking the airway, indeed sometimes without much blocking at all, this gives rise to a post-nasal phlegm, which trickles back over the spur and collects in the nasopharynx. The spur or knuckle causes contact of surfaces which should not be in contact, and produces a kind of nasal intertrigo with irritation of the mucous glands. In a case of tubo-tympanic infection the examination of the nose should be conducted with thoroughness. Cocaine and adrenaline should be applied in every case, as the spur is frequently situated far back and not visible to a casual examination without shrinking of the mucosa. We shall, in any case, probably want to test the patency of the Eustachian tube with the catheter, and the preparation with cocaine will not come amiss for that procedure. A septal deformity is so easily corrected that if we conclude that it has a bearing on the case there can be no excuse in most cases for leaving it untreated. Palliative measures are unsatisfactory. The operation can be done with local anaesthesia, with or without a previous medication sufficient to put the patient to sleep. A mucilage of cocaine with adrenaline added is painted carefully over every part of the septum on both sides, and the sphenopalatine ganglion is blocked by the application of a single drop of 90 per cent. cocaine held against the ganglion for one minute on a cotton-wool

mop. This should be done just before commencing the operation, when the localizing effect of the adrenaline already applied prevents absorption of the strong solution of cocaine. The operation is then practically bloodless, and if we discard post-operative plugs and merely paint the wound and the septal mucosa with Whitehead's varnish, discomfort is reduced to a minimum.

3. *Nasal polypi*, besides being a frequent cause of nasal obstruction and interfering with the due ventilation of the Eustachian tube in the same way as do septal spurs, have an added danger in so far as they are always associated with some degree of sepsis in the ethmoid or other paranasal cells. The discharge bathing the nasopharynx is therefore more pathogenic than the phlegm associated with septal deformity. In the kind of ear case we are considering nasal polypi should always be removed, and an attempt made to eradicate the sepsis from which they arise.

Sinusitis

Apart from the obstruction caused by polypi, any of the paranasal sinuses may by its being the seat of suppuration—that is, without polypus formation—cause or keep up an infective condition in the Eustachian tube. I have recently given more attention than I had previously done to this relationship, and have found so many cases in which the antrum of Highmore especially was infected, not only in cases of recurring ear discharge, but in acute cases demanding myringotomy, that I have come to the conclusion that no examination of an inflammatory ear, either acute or chronic, is complete unless it includes the most thorough investigation of the nasal sinuses. Transillumination is admittedly unreliable and should be depended upon only if it yields on both sides an equally bright infra-orbital crescent and pupil illumination, and if there is no suggestion of pus or boggiess in the middle meatus. If there is the slightest doubt x-ray examination or exploration should be resorted to. I have several times in recent months when called to do a myringotomy on an acute ear found an antrum opaque on transillumination, and have washed out pus from it under general anaesthesia after doing the myringotomy. If, after inserting the trocar, the patient is placed so that the face is turned three-quarters downwards over the edge of the table there is no danger of fluid passing into the trachea. Such acute cases do not properly come into our discussion to-day, but are admissible from the point of view of prevention, as it is extremely likely that a large proportion of them would not clear up after myringotomy, but would drift into the class of tubo-tympanic catarrh if the nasal sinus were left untreated.

Further Points in Treatment

I quite expect that some will disagree with me over this question of treating an infected antrum in an adult or removing adenoids in a child at the same time as the operation for myringotomy. I make no point of it, but I find it works. The essential point is not to miss anything in the nose or nasopharynx which may be either an exciting or a predisposing cause of the ear condition, and to make sure that it is effectively treated in good time so as not to prejudice our direct treatment of the ear. Septal deflections, polypi, and ethmoid or frontal sinus conditions should be treated as soon as the acute condition in the ear has been relieved.

We must not allow ourselves to be hesitant at doing less than restoring the environs of the Eustachian tube to a condition as near to the ideal as surgical measures or other treatment will achieve. We may have prejudices to overcome, as the patient—and sometimes the practitioner—may not appreciate the connexion, but it is our business to educate them. It has taken almost a genera-

tion to teach the public the relation between adenoids and ear suppurations. It may take as long to convince people that anything at all interfering with the proper ventilation or aseptis of the Eustachian orifices is of scarcely less importance.

Special mention should now be made of the less frequent case in which the middle-ear infection is so mild that rupture of the tympanic membrane does not occur and the changes visible in it are not such as seem, judging by the ordinary standards, to demand myringotomy. The subjective signs may be a feeling of fullness or wooliness in the ear with a greater or less degree of deafness, and perhaps crackling noises. Pain is not severe and may be absent altogether. On objective examination the tympanic membrane may be a dull red or only lustreless. Bone conduction may be greater than air conduction, but only if the deafness is of considerable degree. D'agnostic inflation, by the catheter with the aid of the otoscopic tube, is our most reliable guide, and may reveal some blocking of the Eustachian tube and some whistling rales suggestive of moisture in the tube, or finer bubbling rales indicative of fluid in the tympanum, or both kinds of rales may be heard. There is nothing in the condition at first to distinguish it from a mild catarrhal otitis media, such as might pass off in a few days without treatment, but in spite of inhalations and repeated inflation it persists. Probably most of us have occasionally watched these cases for weeks. I think we should intervene earlier—doing a myringotomy under strict aseptic precautions and inflating by the catheter immediately afterwards to expel through the incision the thick mucoid discharge. The patient will, in most cases, be able to continue the expulsion by Valsalva's method. I shall quote only two cases as examples.

H. W., a male aged 57, had had ticking and singing noises in the right ear for one month; the membrane was injected and lustreless, bone conduction was increased, and a whisper was not heard close up. Bubbling noises were heard on inflation, using the otoscope. Inhalations and catheterization were employed for five weeks without appreciable improvement. Myringotomy was then performed, and while he was still under the anaesthetic the Eustachian tube was catheterized. Sticky muco-pus was ejected, and on mopping appeared like a glistening bead on the cotton-wool. The ear was kept clean by boric acid in spirit and the opening remained patent for twelve days, the blow-through sounding dry for a few days before closure. By that time a whisper was heard at 12 inches, but it took two months for complete restoration of hearing. I am of the opinion that had myringotomy been done two or three weeks earlier recovery of hearing would have been more rapid. In this case a marked deflection of the septum was the probable predisposing cause, but in view of his age I did not suggest operation. In this class of case, however, as in the frankly suppurative cases, any abnormal condition in the nose or nasopharynx should be attended to.

The second patient was a female, aged 60. The right ear had been completely deaf for many years, the tuning-fork tests indicating a nerve deafness. Recently the left ear had also become quite deaf, following on a complete blocking of the nose, from what her medical adviser took to be an allergic condition. The membrane was lustreless but not bulging, bone conduction was increased, and a whisper was not heard close up. Both antra were dim on transillumination and yielded copious pus on lavage. Inflation of the left Eustachian tube revealed bubbling after initial blocking was overcome, and the hearing was greatly improved. After lavage had been repeated five times the nasal airways were good and the hearing restored to normal, but the antra still yielded some pus. There could be no question in this case about the connexion between the antral suppuration and the tubo-tympanic catarrh.

It remains to me to refer to the question of tuborrhoea after the radical mastoid operation. Even in the hands of the best operators a certain proportion of operations

fail to achieve complete cessation of the discharge, and it is generally the anterior end of the cavity that is at fault. As a rule, on inflation by Valsalva's method, muco-pus appears at the Eustachian tube end, indicating that, despite all our care in curetting or cauterizing, nature has not favoured us with complete atresia of the upper end of the tube. The operation is not a failure, but it may appear to the patient as such. We are satisfied that we have excavated the cells of the danger area and put the patient in a position of safety, but he was probably more concerned about the annoying discharge, and this continues.

In these cases also, may it not sometimes be the other end of the Eustachian tube we have neglected? Every case of chronic otorrhoea should be carefully studied from every point of view before the mastoid operation is undertaken, and if there is anything in the nose or nasopharynx which might interfere with the health of the Eustachian tube correction of this should be included in the scheme of treatment. If the case is not urgent, I begin with the minor conditions while instituting careful intensive local treatment of the ear, and one is quite frequently surprised to find that the mastoid operation is not required although long periods of local treatment have hitherto been unsuccessful, the case thus proving to be mainly a tubo-tympanic infection when it had all the appearances of a chronic mastoiditis. If the discharge does not dry up we go on to the mastoid operation with confidence that everything is in as good train as may be for a satisfactory outcome. In the numerous cases in which pain, pyrexia, or other signs indicate the need for an immediate mastoid operation, the unhealthy condition in the nose or nasopharynx should be rectified as soon as the patient is fit. Here again, as in the cases referred to earlier, the length of stay in hospital is not prolonged if the minor operations are timed to take place about a week after the mastoidectomy.

Concluding Remarks

In conclusion, I do not wish to seem to minimize the importance of the local treatment of the ear—this must be assiduous as long as may be necessary. I favour the dry treatment as a rule, doing intratympanic irrigation or meatal syringing only as often as is required for removal of debris. After each irrigation the middle ear and meatus should be completely dried by successive mops, aided by catheterization or Valsalva's method. The meatus is then filled with dry boric powder or with the powder suspended in spirit. Nor do I belittle the help that some claim to get from intratubal treatment, but I think the centre of gravity lies at the other end of the Eustachian tube, and that the nasopharynx, with its adjacent cavities, should be explored in every case of tubo-tympanic infection.

In its latest publication, *Standard Code of Industrial Hygiene*, the International Labour Office turns its attention to the lot of workers employed in factories, workshops, etc., who, without incurring specific risks, are nevertheless exposed to the dangers resulting from unhygienic working conditions. There are forty-six clauses in the *Code* covering all matters affecting the health of workers in premises at and above ground level, workrooms below ground level, work under shelters, pent-houses, etc., and unhealthy or offensive trades. It is not intended that the *Code* should serve as a standard system of regulations for general adoption, but rather as a guide for those concerned with the health of the industrial worker. The pamphlet may be obtained from the publishers, P. S. King and Son, Ltd., Orchard House, Westminster, S.W.1, price 1s. 6d.