DIAGNOSIS AND TREATMENT OF ACUTE OTITIS MEDIA*

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Acute otitis media is a disease quite regularly described as either catarrhal or purulent in type, the first being a mild form of the second or perhaps its earlier stage. An allergic type should be kept in mind.¹ There is, however, a catarrhal variety which should be recognized as a definite clinical entity because fluid collects in the tympanum and is not easily dispelled—a *hydrops e vacuo*, perhaps, or at most the exudate of a mild inflammatory process. Pain is made little of, but fullness in the ear, deafness and head noises constitute the train of symptoms. This picture contrasts sharply with the typical attack of acute purulent otitis media with which the following observations are chiefly concerned.

ACUTE PURULENT OTITIS MEDIA

This as a rule is a definite bacterial infection. Pain, often excruciating, warns the unhappy subject, Nature crying out in alarm because a sense organ is in jeopardy. An invasion of the middle-ear cleft may mark the ruin of the auditory and vestibular systems and give rise to very serious intracranial and general complications. Such a gloomy picture with complications is fortunately the exception, but it obtrudes regularly enough to act as a stimulus and to encourage early operation in acute middle-ear disease.

Bacteriology

Of several microbic invaders a streptococcus is the common one. Smeall² quotes statistics of 120 swabs from the middle ear and mastoid from the ear, nose, and throat department of the Edinburgh Royal Infirmary as follows:

Haemolytic streptococcus ...	...	...	73	{ 90, or 75%
Other forms of streptococcus ...	...	...	17	
Pneumococcus ...	...	...	17	or 14.2%
Staphylococcus ...	...	...	11	or 9.2%
Diphtheroids ...	...	...	2	or 1.6%

Hadjopoulos³ classifies the usual streptococcic flora of the nasopharynx in terms of oxygen requirements. Under pathological conditions there is a reversal of the percentage in favour of the more pathogenic facultative aerobic types (*Pyogenes mitis* group), which is exactly the state of affairs when swabs taken at operation from cases of acute mastoiditis are examined. The pneumococcus fortunately was rarely found, and was then of Type 3 as a rule. This variety (often called the *Streptococcus mucosus encapsulatus*) invades, however, by stealth, an insidious onset leading to disaster at a later stage. After Type 1 infections, survival is more probable. The otologist will no doubt recall cases of pneumococcal meningitis in the presence of intact tympanic membranes but with a history of previous ear discharge, and there are also other examples of pneumococcal invasion of the meninges taking place almost at the same time as the onset of discharge from the middle ear.

Etiology

Among the causes of acute middle-ear inflammation the common cold takes an important place, as well as influenza and sinus disease awakened by the attack—in fact, any acute infection of the upper respiratory tract, sometimes even pneumonia, where invasion may take place along the

Eustachian tube or perhaps by way of the blood stream. Each summer an outbreak occurs in the bathing season. Infection passes via the Eustachian tube unless an old damaged ear allows access by way of the external meatus. The micro-organisms of public swimming baths and of the sea are blamed; but no doubt the upper respiratory passages of the victim supply the lurking streptococcus, and in such a manner, too, the enthusiastic user of the therapeutic nasal douche occasionally suffers. In the early stages of a cold in the head, it is as indiscreet to go swimming as it is to use the nasal douche.

Of the acute specific infectious diseases, scarlet fever and measles predominate as invaders of the middle-ear cleft. They stand supreme as sources of lasting and permanent damage. The former, a recognized streptococcal malady from the start, shows, when attacking the tympanum, signs of rapid destruction, though in the symptoms an element of contrast is lost because the patient is already debilitated and miserable from the original disease. Information received through some complaint of pain would, however, be supplemented by the fresh rise of temperature, though such information may be lacking altogether. Discharge from the ear may anticipate arrangements to open the drumhead, and particularly if the consent of the patient has not been previously obtained at the time of admission to a fever hospital.⁴ Fever hospitals have already taken charge of these cases for a considerable number of years, and the appointment (rather long delayed) of otologists to these institutions should provide a wider knowledge of the signs in the earlier stages of scarlatinal otitis media.

In measles the complication may take place at a later stage; pain, perhaps brief in duration, should leave the rising temperature curve as a useful guide, and so should a relapse in the general condition of the sufferer. A factor of indolence or latency in the middle-ear condition must not be forgotten, and the observer should anticipate this in his examination of the drumhead. Even a history of ear discharge of brief duration should not be allowed to deceive him. The sealed drumhead may need to be opened again. Kerr Love⁵ gives measles the first place, even above scarlet fever, as the origin of much chronic ear discharge in school children. Early recognition and treatment, therefore, in the acute stage might help to avoid this.

Other indolent or quasi-latent acute middle-ear attacks may take place throughout life. A typical mastoiditis acuta with an intact drumhead is sometimes a final stage, but it is in the infant that French observers have endeavoured to establish the presence of a particularly quiet type of the disease—latent otitis—and many otologists will remember the questionnaire circulated by Le Mee, Bloch, and Cazejust in 1924, and the monograph on this subject written by the two former.⁶

In infants very sharp attacks with screaming and meningism sometimes occur, but in the following description the symptoms are moderate and less clear. Acute middle-ear disease in the infant may be an embarrassing problem. The baby with a cold of perhaps a week or ten days' duration is noticed to be restless at night and to cry out, yet during the next day it would appear to be moderately well, but as bedtime returns the troubles of the previous night are repeated, and the temperature rises, though I have seen this rise delayed. As the disease progresses, changes in the colour of the face are noted—a pallor of the cheek on the side of the lesion and then a general sickly aspect. Interference is perhaps postponed and discharge eventually appears.

Examination of an infant's ear is no simple matter, and it would be as well to approach at feeding time when the attention is concentrated on the breast or bottle.

* Read in opening a discussion in the Section of Oto-Rhino-Laryngology at the Annual Meeting of the British Medical Association, Eastbourne, 1931.

Once crying or struggling takes place injection of the vessels of the drumhead and even a little bulging occur. Pressure in front of the tragus, which is said to cause pain, should be avoided, too. While the infant's tympanic membrane more or less equals in size that of the adult, the entrance to the meatus is small; having negotiated this, the drumhead, instead of being found to face the observer at a comparatively easy angle, as in the adult, is here somewhat on edge, and not easy to see. Surprisingly resistant to rupture at this age, it may first be seen when the disease has progressed sufficiently to disguise its pearly surface so that it appears to merge imperceptibly into the posterior meatal wall. Should trouble involve the other ear one may profit from the lesson taught by the first. The result of an early and successful paracentesis may be quite dramatic; the child falls asleep and progress is uneventful.

From infancy to childhood brings us to the time when enlargement of the respiratory tonsil leads to the condition called adenoids, and now and during the earlier days of school life this trouble in the nasopharynx receives much blame for damage in the middle ear. Fortunately as the years pass by, the length of the Eustachian tube increases and the tympanic cavity lies further away from the nasopharynx, the nasopharynx itself becoming more spacious. Such changes are favourable to the auditory organ, until we find the adult not so much a victim of recurring middle-ear mischief as a sufferer from less frequent but more definitely established attacks.

These remarks lead to the wide problem of predisposition, but space will allow only a few brief observations.

1. The hereditary factor, for example in acute middle-ear suppuration, has impressed me more than it has done in so-called chronic progressive middle-ear deafness.

2. Congenital defects should also be mentioned. In cleft velum palati it is difficult to recall from memory a case not showing perforated or damaged drumheads in later life or with a liability to further middle-ear trouble.

3. Atrophic disease brings further interest to the problem. In atrophic rhinopharyngitis one looks to find damaged drumheads or a liability to recurrent otitis media.

4. Finally, the maligned lymphadenoid tissue of the uppermost parts of the respiratory tract should not be looked upon as the origin of all middle-ear inflammation in children, for there are many who, in spite of a perfectly executed tonsil and adenoid operation, contract it later, developing perhaps acute mastoiditis, too, and suffering an occasional fatality from meningitis.

Clinical Signs

What is the changing picture of the drumhead in this acute disease? The blood vessels of the drumhead, usually collapsed and lacking in colour, stand out vividly. An aural microscope would probably show the main supply, which runs to the handle of the malleus, to come by way of the posterior fold, avoiding the membrana flaccida; less numerous vessels pass immediately below this group.⁷ Next, the inflamed tympanic mucosa shows through, casting a blush upon the face of the drumhead. The insertion of the membrane into the tympanic ring loses definition. The deep meatal wall, now growing angry, refuses to be distinguished easily from the drumskin itself, the pearly colour of which remains for a while in front of the umbo; even this disappears. The handle of the malleus is difficult to see; only its short process stands out as a landmark. The posterior superior quadrant may now begin to sag. It is, of course, this area which one sees blown out by inflation in the quiescent drumhead. Most probably the presence of abundant small vessels in the anterior part gives to it the very deep colour during inflammation; but just because it appears to bulge the best therapeutic

result will not by any means necessarily follow its incision in acute otitis media; and by entering the knife too high and rather nearer the short process of the hammer bone it is possible to sever and cause damage to the main blood supply of the drumhead (Potter). It is surely better for several reasons to incise the lower part.

Incision of Drumhead

When should the drumhead be divided? Pain, of course, is the symptom which calls most frequently for an early incision of the membrana tympani. If the patient has lost one night's sleep and seems likely to lose another, the operation should not be delayed, but if the bursting of superficial blebs on the membrane is accompanied by relief of pain, interference may not be needed. With pain less severe, the presence of pyrexia, the general condition of the patient, the appearances of the membrane, and the degree of deafness must help the decision. Blebs or bullae are by no means all of one kind; some arise from beneath the superficial epithelium of the deep meatus or at the margin of the annulus, and are of considerable size, advancing outwards. When opened they are seen to be filled with blood clot, and if arising in acute otitis media, unless the hidden drumhead is also pierced, relief will not be obtained.

An objection to early paracentesis tympani is the difficulty of the operation. The description of the proceeding sounds easy enough, but in actual practice to carry it out accurately is not so easy. Myers describes well the danger zones within the tympanum.⁸ An incision upwards into the superior quadrant may divide the chorda tympani nerve, and, in passing, strike the junction of incus and stapes; an incision downwards or across the lower quadrant appears safer. It is unlikely that the adjacent round window will be damaged by this method of approach, and an exposed jugular bulb will rarely be found. It is, of course, remotely possible to injure the carotid artery in the tubal area.

Ethyl chloride anaesthesia, rather than nitrous oxide narcosis, allows of a more deliberate operation, and when only chloroform or ether is available under difficult and undesirable conditions the operator at least need not complain. With the patient lying on his back on an operating table, and his head turned well to one or the other side to avoid the shoulder, conditions are certainly at their best. An acutely inflamed drumhead with the deep meatus inflamed in sympathy is not a too well-defined target, and the older method of pricking, which has given way to incising or cutting, is certainly much better treatment than no interference at all. The American instrument of Dintenfuss, which I intend to try in this way, is V-shaped in section, a miniature trowel with a sharp-pointed "business end."

The immediate results of incision of the drumhead in acute otitis media are most varied. The resistant drumhead gives way under the knife with a loud crack, and the hissing noise of abundant fluid or sero-pus under pressure, or there is a frank escape of creamy pus before blood obscures the view. Less striking is the escape of some muco-pus through the indolent drumhead, for example, in a case of measles. Or, again, the immediate result may be rather disappointing when dividing the fleshlike membrane guarding a tympanic cavity, the inflammatory contents of which feel semi-solid and resistant; a discharge of pus, however, takes place later. Allergic cases (Proetz) are said to be likewise resistant and give forth little discharge, urging the operator later to repeated incisions when inactivity would have been preferable. The allergic condition may be converted into a purulent one by such interference.

After-treatment

Whether in the after-treatment of the case the medical attendant favours the so-called dry method of mopping out, or the method of frequent washing out by syringing, irrigations must be employed if the discharge becomes tenacious, and even when discharge is free occasional relapse and disappointment can be overcome by a thorough but gently performed wash-out with a mild isotonic saline or alkaline lotion. Kerrison¹¹ strongly advocates washing out almost immediately after paracentesis, to avoid gumming up of the incision by blood clot or fibrin. In the later stage, too, irrigations with a mild mercurial lotion and the use of the suction speculum may result in resolution and avoid further operation as the time approaches to suggest drainage through the mastoid, namely, in three to six weeks.

Differential Diagnosis from Other Causes of Acute Earache

Acute pain felt in the ear may be caused by troubles at a distance, or by local troubles, not middle-ear inflammation:

Referred pain from a tuberculous laryngitis, malignant growths of the posterior parts and side of the tongue, malignant disease of the pyriform fossa—these are well known. More simple causes may be a carious molar tooth, and a partly erupted or impacted wisdom tooth must not be forgotten. Sharp pain in the ear is noted in acute tonsillitis, particularly when peritonsillar inflammation is added, but, of course, an actual middle-ear inflammation may follow as well. A tonsillolith may prove a hidden cause. Accessory sinus disease has also been blamed for pain referred to the ear, and in conclusion one does see a few cases, chiefly in young women, where no cause whatever can be discovered on examination.

There is, of course, the occasional case of mumps when middle-ear trouble or mastoiditis has been wrongly suspected. A dental abscess has been seen to discharge from the external meatus. But undoubtedly the commonest cause of pain, sometimes difficult to dissociate from a middle-ear attack, is infection in the skin of the meatus. I refer to furunculosis and to the dermatitis which we conveniently call eczematous, and occasionally the diagnosis presents very considerable difficulty. Undoubtedly the pain in such cases is often referred to the front of the ear, or below it, and when infection reaches the mastoid lymphatic gland a true mastoiditis may be wrongly suspected. The unpleasant condition of pediculi capitis has been responsible for an error of this kind.

Sometimes when cerumen becomes impacted in the deep meatus, but particularly in that stubborn form of impaction called keratosis obturans, very great pain may arise deep in the ear (not to forget collections medial to exostoses of the canal), and it may be exceedingly difficult to decide whether the inflammation of the drumhead has been set up by such mechanical conditions, or whether an acute otitis media lies beneath. The difficulty sometimes experienced in clearing the meatus for diagnosis, and the very great pain involved in any such manoeuvre, provide a situation extremely trying for both patient and doctor.

Foreign bodies, whether introduced from without or human material becoming foreign, as described above, may cause inflammation of the drumhead, or, to give a descriptive name, myringitis. Primary myringitis must be an uncommon disease, and such conditions as interlamellary abscesses described by Politzer would be considered by Ruttin⁹ as extensions from middle-ear infection and situated in a small space which he has described within the structure of the tympanic membrane—a miniature bursa of the handle of the malleus.

Herpes zoster oticus, a rare condition, provides another possible cause of ear pain, and perhaps it is but the severe manifestation of a syndrome which may exhibit polyneuritis meatus auditorii interni, or even so-called banal facial paresis alone.¹⁰

In conclusion, primary otitic erysipelas should be mentioned. In women the close-fitting hat may be the predisposing cause. The external meatus, the auricle and periauricular area may all be involved. In this disease, when a large blood-clot-filled bulla of the deep meatus obscures the drumhead, one might be tempted to diagnose an acute middle-ear attack as the origin. To open the deeply situated bulla would be permissible, but the result of an incision of the drumhead under such conditions might be far too unpleasant to contemplate.

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SUB-ACUTE OTITIS MEDIA *

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Inflammation in the middle-ear is always secondary to infection of the nasopharynx, and like the latter is always sub-acute in its beginning. It is the obstruction of the Eustachian tube which enhances the acuity of the inflammation and leads to the production of acute otitis media.

In acute otitis media, the immediate problem which confronts the surgeon is the potential danger to the patient's life. The occurrence of intracranial complications is circumvented by a myringotomy when the inflammation has not spread beyond the confines of the middle-ear, or by a mastoid operation when the well-known signs of mastoiditis are exhibited. After the drainage of the pus has been established the case becomes one of sub-acute otitis media, and the main problem is the conservation of the patient's hearing.

Sub-acute otitis media differs from the acute variety in the fact that the Eustachian tube is partially patent and that the pus drains down it. The acuity of the inflammation is generally in proportion to the degree of obstruction of the tube.

SUB-ACUTE OTITIS MEDIA IN CHILDREN

This is characterized by recurrent attacks of evanescent pain in which there may be slight discomfort when the child presses his mastoid against the surgeon's thumb and by a transient bulging of the membrane coincident with periods of pain. The alteration in the hearing is similar to that found in acute otitis media after a myringotomy or spontaneous perforation, and is believed to be due to oedema of the mucous membrane covering the round and oval windows. If the diminution of the hearing power is maintained after the period of pain

* Read in opening a discussion in the Section of Oto-Rhino-Laryngology at the Annual Meeting of the British Medical Association, Eastbourne, 1931.