OTITIS MEDIA IN CHILDREN

W.A. Sultana, M.D., B.Sc., D.L.O., F.I.C.S.

Otitis media in children is one of the more important problems of the diseases of the ear. So much of the future well-being of these children depends upon accurate diagnosis and prompt treatment, and so much harm may result from bad treatment that the condition should be familiar to every doctor. Indeed, many of these cases, if treated promptly and energetically by the family doctor, may not come to the otologist at all, except perhaps to assess if any damage has resulted from the disease or to treat a known causative factor.

In considering otitis media one should not think of the disease as limited to the tympanum, but as involving the whole middle ear cleft, viz, the tympanum, attic, antrum, and mastoid air cells. Moreover, in infants, this cleft extends from the pharynx to the mastoid, because their Eustachian tube is short, wider than in the adult and the isthmus does not exist. The mastoid antrum in infants is also comparatively larger than in the adult and, as Paul Bernard demonstrated radiologically, air cells may be present even at birth.

This intimate connection between the middle ear and the upper respiratory tract obviously plays an important role in the aetiology of otitis media. In fact, it can be said that the middle ear is involved to a greater or lesser extent in most conditions affecting the respiratory passages.

The commonest single cause of acute otitis media in children, especially in infants, is undoubtedly acute rhinitis. Next come the acute fevers, influenza, diphtheria, measles and scarlet fever, the latter two being especially prone to produce a virulent type of infection, often passing on to a mastoiditis, or, if inadequately treated, leading to a chronic suppurative otitis media. Whooping cough may also produce an obstinate type of infection.

Tuberculous otitis media was formerly regarded to be quite common in children, but is now rarely seen.

Trauma to the tympanic membrane, especially by foreign bodies or by ill-guided attempts at removal, is a frequent cause of otitis media in children.

Infection may also spread inwards from an otitis externa, especially from a furuncle.

Allergic reactions involving the nasal mucosa may involve the mucosal lining of the Eustachian tube and of the tympanum producing an intractable type of otitis media. Such cases are said to be especially common in young children and infants.

Chronic infection in the nasopharynx is by far the commonest predisposing factor in children; adenoids are undoubtedly the most important single cause. Septic tonsils are other causes, but less so than adenoids, especially in infants in whom obviously diseased tonsils are hardly ever encountered.

The relation of the sinuses to the middle ear is not definitely established, and it is debatable whether they should be investigated in all cases of otitis media if they are not causing any symptoms of their own. When obviously diseased, they should be treated not merely for their own sake but also on account of the ill-effects they have on the pharynx, lungs and ears.

All weakening conditions, such as anaemia, nephritis, diabetes and severe malnutrition are predisposing causes of otitis media.

The commonest organisms encountered are the Streptococcus haemolyticus (beta) and the Staphylococcus aureus. Others are Pneumococci, especially the Pneumococcus mucosus, the Staphylococcus albus and rarely Friedlander's bacillus.

The pathology of the disease is fortunately well known, and in a typical case follows a definite pattern. In the beginning, due to obstruction of the Eustachian orifice in the nasopharynx by an inflammatory oedema, the air in the middle ear is slowly absorbed and a negative pressure develops which causes dilatation of the blood

vessels of the tympanum and of the tympanic membrane; the latter, therefore, will appear congested and indrawn. This vasodilatation brings about a transudation of a clear, somewhat yellowish liquid containing lymphocytes and monocytes, but no, or only few, polymorphs; culture is sterile. In allergic cases, eosinophiles will be present. The mucous membrane of the middle ear will be intact and there will only be some oedema of the submucous layer. This stage has been given various names, viz., catarrhal otitis media, non-suppurative otitis media and various others.

If the obstruction in the Eustachian tube subsides, the fluid in the middle ear will drain out, equilibrium between the outside air and that in the tympanum will be established and the condition will resolve. But if the obstruction persists and infection reaches the middle ear, which it generally does via the lymphatics, but also rarely by direct continuity or by the blood vessels, then acute suppurative otitis media results. The pathology then is that of inflammation in general. Marked hyperaemia is followed by submucous infiltration with round and polymorphonuclear cells, and thickening of both mucous and submucous layers. There is exudation of fluid into the middle ear, rich in pus cells, mucus and fibrin. The drum is intensely hyperaemic, thickened and bulging from the pressure of the fluid in the tympanum. Culture of the fluid will reveal the causative organism. This process in children involves the whole of the middle ear cleft, and it is because of this that the disease may now take one of several courses. Resolution may occur once the inflammatory process is stopped and drainage established either via the Eustachian tube or via the drum through a perforation or a myringotomy incision. But if the inflammatory process is not checked, fluid will continue to accumulate which will press on the blood vessels and eventually cause pressure necrosis and ulceration of the mucosa. This will immediately expose the underlying bone to infection. The further evolution of the process depends on several factors, such as type and virulence of the invading organism, type of mastoid bone (well-pneumatised or sclerotic), resistance of the child, and several others. Briefly, the disease may either lead to an acute mastoiditis, to a chronic suppurative otitis media or to a complication, either extra or intra-cranial.

The signs and symptoms of otitis media differ markedly according to whether they occur in a child or in an infant, for while in the former the disease will show signs and symptoms referable to the ear, in the latter, because the Eustachian tube is comparatively wider and in more direct continuity with the nasopharynx, spontaneous perforation is less frequent and the condition may easily pass undiagnosed because the symptoms may be general and systemic and not aural.

In children, pain in the ear is the first and may be the only indication of the otitis media. It comes on suddenly, is located deep inside the ear and is generally described as throbbing in character. This pain is at first due to the negative pressure inside the middle ear, but later it will be due to the pressure exerted by the accumulated fluid on the drum. The temperature at this stage may or may not be raised. The otological signs will be either bulging or indrawing of the drum, according to whether fluid is present or not in the middle ear, but in either case there will be some loss of lustre of the membrane with injection of the blood vessels around the handle of the malleus. Mild deafness will be present, and there is often some mastoid tenderness, generally over the mastoid antrum, but it may also be present over the tip.

When suppuration occurs, the pain becomes more severe owing to the increase of fluid in the middle ear. The general condition of the child deteriorates somewhat; he becomes listless, cries out in pain and goes off his food. The temperature will be raised. The drum will now be uniformly red and bulging and the normal 'landmarks' cannot be made out. Rarely one can see a yellowish spot, generally in the antero-inferior quadrant of the drum, indicating the site where perforation will take place. Deafness is marked, and mastoid tenderness is almost always present. When perforation takes place, and this occurs as a result of pressure necrosis of a part of the drum, the pain suddenly dis-

appears and the condition of the child improves.

The character of the discharge is important because it may reveal how far the process has advanced, and may also give an idea of the causative organism. The Pneumococcus mucosus, for instance, will produce scanty but thick discharge, while the Streptococcus haemolyticus will produce thin but slightly haemorrhagic discharge. When a mastoiditis is developing, the discharge will be thick and creamy. Examination at this stage will show the site and size of a perforation and, if the process is still active, the discharge will be seen to pulsate. The size of the perforation is important because it will give an idea as to whether it is sufficient by itself for adequate drainage.

If the ordinary tuning fork tests are carried out, Rinne's test will be negative and Weber's test will be lateralized to the affected ear.

When resolution begins, the discharge will diminish and its character will alter, becoming thinner in consistency. The temperature rapidly returns to normal and the general condition of the child will improve considerably. The drum will either regain its natural position or be slightly indrawn; the 'landmarks' begin to show up and only a few injected blood vessels will be seen coursing through the membrane. The first 'landmark' to appear is generally the short process of the malleus followed in a short time by the handle. Next will be seen the so-called 'cart-wheel' injection of the membrane, which is a large blood vessel coursing round the periphery of the drum with smaller blood vessels radiating to it from the umbo. Injection of the posterior segment of the drum and of Shrapnell's membrane may persist for some time after the attack has subsided.

Deafness normally disappears entirely once the acute process has ceased, and this fact is important because persistence of deafness means either that the negative pressure in the middle ear is still present (if the drum is intact) or that adhesions have formed within the middle ear, or, more important, that there is still an active process going on, most probably within the mastoid process.

In infants, the otitis is frequently associated with some other disease which is in many instants the etiological agent. The otitis may remain latent for a long period, and it should be suspected when:

1. there is a febrile condition whose cause is not known;
2. although the cause of the febrile condition is known, yet the general condition of the infant does not improve with the subsidence of the local signs (e.g. in pneumonia);
3. the treatment of a digestive condition brings only partial relief;
4. the infants appears to be in pain or cannot sleep.

Marriot stated as early as 1927 that otitis media in infants was the most frequent infection responsible for nutritional disorders. An investigation carried out in 1947 on 880 children under 3 years suffering from acute otitis media, showed 238 of these to be suffering also from gastroenteritis. This shows the importance of examining the ears in all cases of infants suffering from diarrhoea or vomiting. On the other hand, the ears should not blamed for all cases of diarrhoea whose cause cannot be found, and the indiscriminate myringotomy sometimes advocated for such cases is not justifiable.

The temperature in infants suffering from otitis media is not reliable because it may be normal or even subnormal.

More reliable signs are uneasiness, rubbing of the ears, chewing and certain localised (especially ocular) or generalized convulsions.

The drum will be injected but its contour should not be decided on a first examination because, owing to the patency of the Eustachian tube, bulging of a normal drum may be seen when an infant is crying. If discharge is present, the diagnosis is of course obvious.

The treatment of otitis media should be divided into two parts: 1. Treatment of the attack; 2. prevention of recurrences.

The antibiotics have greatly simplified the treatment of an acute otitis media since the vast majority of cases are produced by organisms sensitive to them. Adequate doses of penicillin (or other broad spectrum antibiotic) should be given as soon as the diagnosis is made. In most cases the temperature rapidly returns to

normal, the pain subsides and the discharge stops. The deafness does not clear up so quickly but takes about a week to return to normal. This is important and, when possible, hearing should be tested frequently and regularly, because, when using an antibiotic, the hearing is a useful guide as to whether the disease has subsided or not. The pain, temperature and discharge may all disappear, but the deafness will still be present in those cases where the disease is still active, and so long as this is so, treatment should not be stopped. The so-called "masked mastoiditis" is often due to failure to detect this important sign.

The drum does not generally return to normal before 4 or 5 days, but in antibiotic-sensitive cases where the membrane was red and bulging, it will be seen that 24 to 48 hours after starting the antibiotic, the bulge will have completely disappeared and the injection will be limited to the posterior segments of the drum. It will also begin to move slightly on 'seigelization', indicating that the liquid in the middle ear is diminishing.

General nursing measures should not be neglected, and if there is temperature the child should be put to bed. If pain is present, aspirin should be given for the first 12 hrs. If there is discharge, the meatus should be cleaned out and wicks soaked in plain glycerin inserted, not merely because of a soothing effect, but also because of the hygroscopic action of glycerin, thus facilitating drainage. The use of local antibiotic drops are unnecessary and often harmful, especially if not combined with systemic antibiotics, since they may bring about resistance to these drugs. Moreover, allergic reactions are common.

Measures to diminish congestion in the nose and throat should be started without delay.

When the antibiotics are started early in the disease and the organisms are sensitive, all operative procedures are unnecessary in the treatment of acute otitis media. Certain surgeons maintain that a myringotomy should be done in all cases where the drum is bulging when first seen, but the results obtained by the use of the antibiotics alone are so good and resolution so rapid, that it is worth trying their effect first, rather than subjecting the child to an anaesthetic and an operation which in a large number of cases can be avoided.

Myringotomy should be considered:

1 When the pain in the ear persists for 12 hrs. after starting the antibiotic;
2 When the drum is still bulging after the antibiotic has been given for 24 hours.
3 When there is an increase in the deafness notwithstanding the use of the antibiotic.

Cases caused by antibiotic-resistant organisms present a greater problem, because in these the pain and temperature will still be present 24 hours after starting the antibiotic and, if the drum was bulging, it will either perforate, and in these cases the discharge will be pulsating, or if the drum is merely injected, the redness will still be present after the use of the antibiotic. In these cases, if there is no discharge, a myringotomy should be done. In either case, a swab should be taken for culture and sensitivity and the appropriate antibiotic started without delay.

Cases which do not respond to any of the antibiotics will require surgery as part of the treatment, generally a cortical mastoidectomy, because in these cases the process has usually gone beyond the middle ear and has localized itself in the mastoid process.

When the attack subsided, measures should be immediately taken in hand to prevent a recurrence of the condition. The child should be encouraged to lead an open healthy life. Decongestants should be continued and about a week to 10 days after all signs and symptoms have disappeared, politzerisation and auto-inflation of the middle ear should be started and continued for several days in order to prevent the formation of adhesions in the middle ear.

If adenoids are present, they should be removed at the earliest opportunity. Adenoid remnants should likewise be dealt with. If during the operation adenoid tissue is found to be present in that part of the Fossa of Rossenmuller just posterior to the opening of the Eustachian tube in the nasopharynx which cannot be removed surgically, consideration should be given to irradiation. Good results are said to be obtained in 60% of cases.

(*References on p.* 49).

Dr. W. A. Sultana: References.

St. Clair Thomson & Negus: *Diseases of the Nose and Throat.*

Morrison: *Diseases of the Ear, Nose and Throat.*

Logan Turner, A.: *Diseases of the Nose Throat and Ear.*

Ritchie Rodger T.: *Proc. roy. Soc. Med.* May 1937.

Le Meè, J.M.: *Proc. roy. Soc. Med,* May 1937.

Maxwell Ellis: *Encyclopedia of Medical Practice,* August 1950.

Chalmers Ballantyne J.: (1932) *J. Larying.* 749.

Torsten Skoog: *Acta otolarying.* (*Stockh.*), vol. xviii Fasc. 1-2.