Clinical records

Malignant otitis externa

By D. A. Dawson (Plymouth, England)

Malignant otitis externa is a rare disease occurring in elderly diabetics and caused by the organism Pseudomonas aeruginosa. It is a grave disorder and published reports indicate a frequent remorseless progression to a fatal outcome.

The following case showed all the classical features of the disease and was cured by a combination of intensive medical and surgical treatment.

Case report

Mr. W.S., aged 64. Retired. First attendance 19.8.75.

H.P.C. Three weeks before his first attendance the patient had been on holiday in Spain and, after swimming, complained of pain and discharge from the left ear.

During this period he also developed a head cold which was followed by rigors, sore throat and dysphagia, and the patient lost consciousness for one hour. A lung infection was diagnosed and a course of Ampicillin was given, followed by a course of Septrin. His condition steadily improved during his journey home by car but the left earache and otorrhoea persisted.

Past history

Twelve years previously the patient had had a myocardial infarction from which he had made a good recovery. He had then stopped smoking and his weight had increased.

There was also a history of mild diabetes for about fifteen years. This was not treated with Insulin or special diet but the patient avoided sweet things and had been taking Diabinase.

Examination

Left ear: There was discharge in the canal, the soft tissues of the canal were grossly oedematous and granulations were present. There was no view of the drumhead. Hearing was impaired. The auricle was not involved.

Bacteriology. Pseudomonas aeruginosa sensitive to Gentamicin, Colistin, Carbenicillin and Tobramycin.

The initial treatment consisted of local application of Fluocinolone on gauze, ichthyol and glycerine, and magnesium sulphate. No improvement resulted and fluctuant swellings developed in the external canal. Incision of these yielded thin pus.

Pain in the left ear increased and there was associated tenderness. The meatal lumen was occluded by very marked swelling, especially posteriorly and anteriorly. Some of the swelling was fluctuant. The auricle, concha and tragus were not involved.

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On 23 August, the patient was admitted to the E.N.T. Ward. Local treatment was changed to Gentamicin wicks and systemic Tobramycin was started—80 mg I.M. 8 hourly—this treatment being monitored by serum Tobramycin assays and also serum creatinine levels to assess renal function.

A medical opinion on the treatment of the diabetes was obtained. The previous treatment with Diabinase 250 mg daily was stopped. Insulin was started and the dose related to the level of glycosuria. Initially this level was 2 per cent and Insulin 12 units b.d. was given. The dose was finally stabilized at 16 units in the morning and 12 units in the evening. A ten-portion diet was given.

Mastoid X-rays at this stage showed no abnormality.

Hb, W.B.C. and plasma viscosity were normal.

By 28 August the left ear showed some signs of improvement. Swelling had diminished but granulations had appeared in the meatal wall and, through these, exposed cartilage could be felt posteriorly.

Earache and discharge continued, the pain becoming more localized inferiorly in the post-aural region.

The granulations were now most prominent on the floor and anterior wall of the canal, and bone or cartilage could be felt with a probe at the junction of the bony and cartilaginous canal. There were also granulations on the drumhead. These appearances persisted in spite of treatment and there developed some tenderness to pressure over the mastoid just above its tip.

A diagnosis of malignant otitis externa had been made, the condition now having all the classical features of this rare disease. Intensive conservative treatment was not producing an adequate response and there was now minimal evidence of involvement of the mastoid bone. Early surgical intervention has been advocated in this condition (Chandler, 1968) and it was considered that mastoidectomy was indicated in this case.

Operation

On 8 September the left mastoid was opened through a post-aural incision. The surface of the bone had a pitted appearance and the first gouge stroke produced a gush of thin, clear yellowish pus. Culture of this yielded a growth of Pseudomonas aeruginosa sensitive to Tobramycin.

The mastoid bone was very cellular, the bone itself being soft, mushy and vascular. The cells contained thin granulations. The middle fossa dura, lateral sinus and digastric groove were exposed. All involved cells were cleared away, including a gallery extending into the petrous bone.

The aditus was explored and cleared but the bridge and deeper part of the posterior meatal wall were left intact. The incus was not seen.

The skin covering the floor of the cartilaginous meatus was elevated and necrotic soft tissue was cleared away. Underlying bone was removed from the tympanic plate with the drill.

A wide conchoplasty was fashioned and the meatal sleeve of skin was divided posteriorly. The incision was closed without drainage.

Post-operative progress was satisfactory. Some serous discharge occurred from the meatus but culture was sterile.

On 17 September the cavity looked very satisfactory with scanty granulations only. Neocortef wicks were inserted. A left ear swab was sterile. On 18 September the Tobramycin therapy was discontinued.

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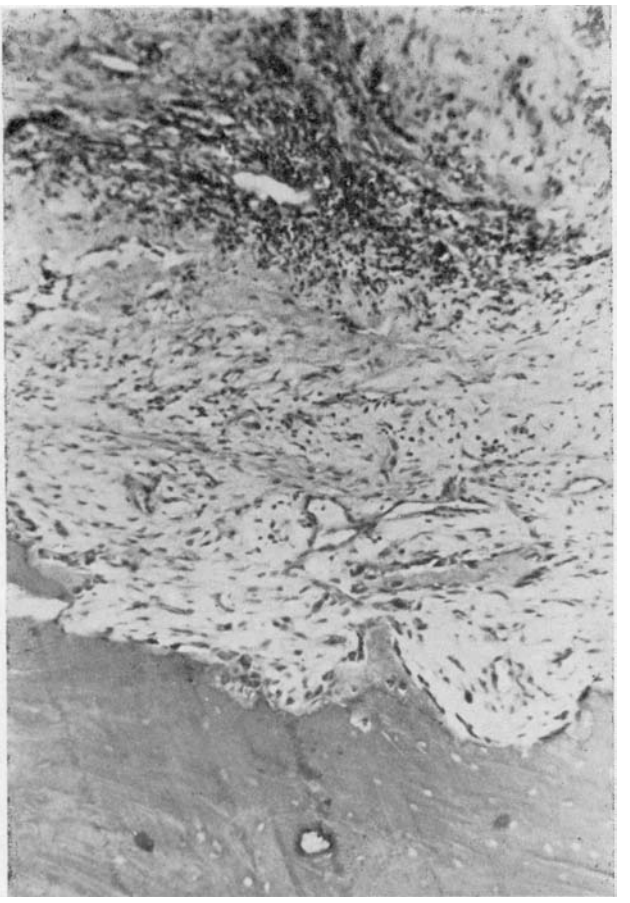


FIG. 1

Tissue removed from mastoid showing dead bone and inflammatory infiltration.

On 19 September the patient was discharged home and subsequently followed up in the Out-Patient Department. The ear condition progressed satisfactorily and by 14 October the cavity was epithelializing well.

Two minor hypoglycaemic attacks occurred and the Insulin was stopped. An eight-portion carbohydrate diet was advised and, if indicated by thirst or polyuria, Chlorpropamide 250 mg daily.

By 2 December granulations were appearing in the mastoid cavity and by 9 December copious pus was present, with swelling and granulations. Pseudomonas aeruginosa was isolated.

The patient was readmitted to the ward. Insulin was recommenced and Gentisone packs inserted into the cavity. Systemic Tobramycin was given for eight days, monitored by serum level estimations.

Thereafter the condition of the ear remained satisfactory with a clean, dry cavity and only occasionally a few granulations which responded to simple local measures.

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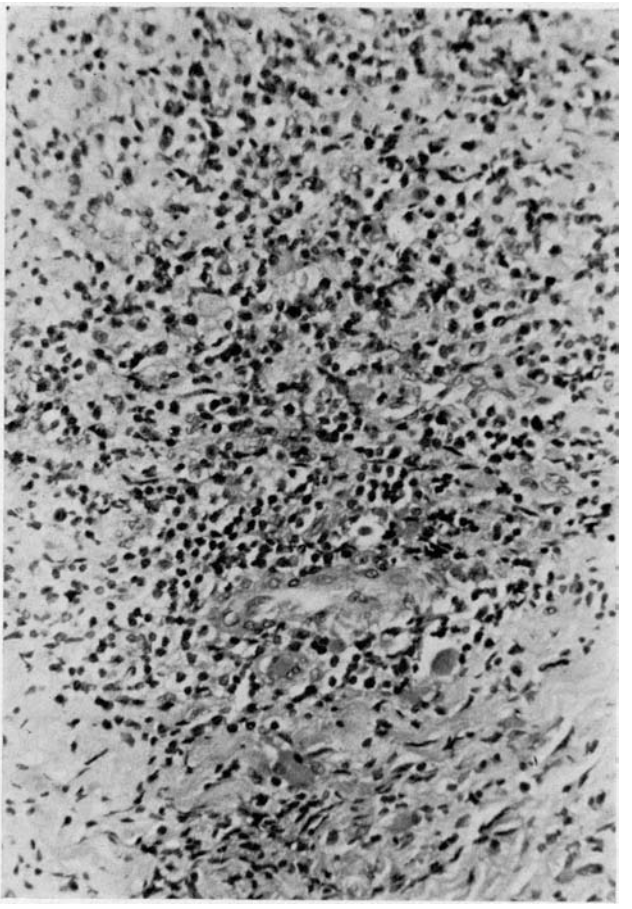


FIG. 2
Higher power view of general inflammatory cell infiltration.

Discussion

Malignant otitis externa is a progressive necrotizing inflammatory lesion of the external auditory canal and the diagnosis is based on the following criteria:

1. The presence of a severe, intractable otitis externa.
2. The isolation of Pseudomonas aeruginosa as the causal organism.
3. The diabetic condition of the patient.

The case described in this paper satisfies these criteria and also showed three other characteristics commonly found in this potentially lethal condition:

4. The patient is usually elderly.
5. The diabetes, though often mild, is usually not well controlled.
6. There is often a history of cardiac disease with previous coronary infarction.

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The ear lesion

There is a marked swelling of the meatal soft tissues and this is associated with pain and purulent discharge.

The skin and soft tissues may undergo necrosis and then underlying bone and cartilage will be exposed. Granulation formation is a frequent feature and, in the case reported here, was most marked on the anterior and inferior aspects of the canal wall. The detection of such granulations is of diagnostic importance. They occur not, as in the milder forms of otitis externa, on or near the drumhead, but at the cartilaginous-bony junction. This sign has been described and emphasized by Evans and Richards (1973) and by Chandler (1968).

Extension of disease

It is in the remorseless, invasive nature of the disease that its danger chiefly lies and it is this characteristic that justifies the term 'malignant'. This term simply denotes extreme virulence and clearly establishes the life-endangering nature of the disease. Its replacement by the term 'necrotizing', as advocated by Evans and Richards, seems unjustified on grounds both of descriptive merit and of usage.

The infection tends eventually to involve the adjacent temporal bone and may then prove fatal because of intracranial extension or involvement of the carotid artery or jugular vein. The lowering of local tissue resistance by diabetes and the vascular effects (chiefly atherosclerosis and thrombosis) of the diabetes and infection are no doubt important contributory factors in this extension.

Extension to the temporal bone may be associated with involvement of the facial nerve, causing ipsilateral facial paralysis. Other cranial nerves (1X, X, X1, X11) may also be involved, and Chandler (1972) and others have adduced such involvement as a poor prognostic sign. None of these cranial nerves was involved in the case described. Some writers (Meyerhoff, Gates and Montalbo, 1976) have suggested recently that cranial nerve involvement may be due partly to a neurotoxin produced by some strains of the Pseudomonas organism. They also note that some organisms produce a mucoid surface on culture and this signifies greater virulence because such organisms are more resistant to phagocyte activity.

It is the presence of a mastoiditis which endangers life and some authors have recently emphasized this fact by naming the condition 'masked diabetic mastoiditis' (Badrawy, Abou-Bieh and Taha, 1975) and 'Pseudomonas mastoiditis' (Meyerhoff, Gates and Montalbo, 1976). The former authors believe that the condition originates as an otitis media, not as an otitis externa. Their theory is based on mastoid air-cell anatomy, and the external ear changes are considered to be a pointing of the disease process in the ear canal from the underlying mastoid infection.

The latter authors consider that the mastoiditis may be secondary to either an otitis media or an otitis externa and describe cases illustrating both forms of the disease. Those cases starting as otitis media all had central drum head perforations and radiological evidence of mastoiditis.

If the canal lesion was always secondary to mastoiditis, then radiological changes should be present whereas, in the case described here, although external ear changes were very marked, mastoid X-rays were normal. Had X-rays been taken at a later stage, no doubt the changes of mastoiditis would have been

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demonstrated. Moreover, a drumhead perforation discharging pus was not seen although granulations were present on the membrane at one stage, further evidence against a primary middle ear infection. It seems likely that the primary infection may be either in the middle or the external ear. In the latter case the secondary mastoid involvement is possibly related to the characteristics of the organism and disordered tissue resistance resulting from the diabetes.

Treatment

The prognosis in this disease worsens as extension becomes more widespread. Early and intensive treatment is therefore essential and surgical intervention should, if possible, be instituted before such dire manifestations as cranial nerve palsies supervene.

It is noteworthy that Meyerhoff, Gates and Montalbo (1976) have found 62 cases of malignant otitis externa reported in the English literature since 1959, and that the mortality rate has fallen from 55 to 23 per cent since the employment of carbenicillin and gentamicin in treatment. They discern an increase in frequency of the condition and certainly an increasing number of reports are to be seen in the literature which, at the same time, record an improving cure rate even in advanced cases (Prasad, 1976). Treatment must include general and local measures, both modalities being of equal importance in the control and cure of this dangerous disease.

General treatment

Diabetes. This condition is always present and it is often poorly controlled. Its effective management is of the utmost importance in dealing successfully with the ear condition.

In the case described the diabetes was poorly controlled at the onset. Strict control by diet and Insulin contributed to the successful treatment of the otitis externa and mastoiditis. Significantly, when the Insulin was stopped at one stage during treatment, there was an abrupt recurrence of suppuration in the mastoidectomy cavity together with the formation of granulations. The return to Insulin therapy resulted in the resolution of the local condition.

Cardiac condition. There is very often a history of myocardial ischaemia and infarction and any necessary treatment for the cardiac state should be employed.

Systemic antibiotics. The organism isolated from the aural discharge is always Pseudomonas aeruginosa but its sensitivities must be identified in the usual way and an appropriate antibiotic given.

Gentamicin or carbenicillin is the usual choice but, in the case described here, the organism was sensitive to Tobramycin and, at the suggestion of the bacteriologist, this antibiotic was given.

Tobramycin sulphate is an aminoglycoside antibiotic. It is bactericidal and effective against many gram-negative bacteria, including Pseudomonas aeruginosa. It is given by intramuscular injection. Like other aminoglycosides it has ototoxic potentialities, the cochlea being mainly involved, with damage to the outer hair cells of the basal turn. These dangers are greater in the presence of impaired renal functions. Use of Tobramycin must therefore be monitored by serum assays and it has been recommended that concentrations should not rise

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above 12 mcg/ml. In the case reported here all recorded serum levels were below 6 mcg/ml.

Renal function tests are also carried out at intervals, serum creatinine levels being estimated for this purpose. Occasional white cell counts should be made.

A watch is kept for ototoxic manifestations such as hearing loss, tinnitus and vertigo.

The dose of Tobramycin, in the presence of normal renal function, varies from 50 mg to 80 mg, given 8-hourly. In the case reported the antibiotic was given for 27 days on the first occasion and 8 days on the second.

Local treatment

Although clinical evidence of mastoiditis in the case described was quite minimal, histological examination of tissue removed from the mastoid bone confirmed the presence of a necrotizing inflammatory response to infection with an inflammatory cell infiltration, dead bone and osteoclast activity (see Figs. 1 and 2). These changes indicate the urgency with which surgical exploration is required once mastoid involvement is suspected, the destructive bone lesion representing a constant threat to important related structures and, consequently, to the life of the patient.

The extent of the disease will determine the amount of surgical exenteration and, in the case described, widespread clearance of the mastoid was required without removal of the bridge but with exteriorization of the mastoid region into the external canal and with widening of the meatus by conchoplasty. By this means a stable, dry ear was obtained with satisfactory function and ready access for follow-up purposes.

Summary

A case is described of malignant otitis externa which was cured by a regime of general and local treatment, including the use of the antibiotic Tobramycin and timely mastoid surgery.

The origins, progression, diagnosis and treatment of the disease are discussed with reference to some of the increasingly numerous reports in the literature. Reports disclose an increasing incidence and also an improved prognosis. The former is probably related to the survival of more elderly diabetics and the latter to a better understanding of the disease process and to early medical and, if necessary, surgical treatment. An important feature regarding treatment has been the advent of powerful specific antibiotics including Tobramycin.

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REFERENCES

BADRAWY, R., ABOU-BIEH, A., and TAHA, A. (1975) *Journal of Laryngology and Otology*, **89**, 815.
CHANDLER, J. R. (1968) *Laryngoscope*, **78**, 1257.
CHANDLER, J. R. (1972) *Annals of Otology, Rhinology and Laryngology*, **81**, 648.
EVANS, I. T. G., and RICHARDS, S. H. (1973) *Journal of Laryngology and Otology*, **87**, 13.
MEYERHOFF, W. L., GATES, G. A. and MONTALBO, P. J. (1976) *Laryngoscope*, **86**, 483.
PRASAD, U. (1976) *Journal of Laryngology and Otology*, **90**, 963.

D. A. Dawson,
Department of Otolaryngology
Plymouth General Hospital,
Greenbank Road,
Plymouth.

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