

## Clinical Records

# Exostosis of the external auditory canal: an interesting histopathological finding

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### Abstract

Perforation of the tympanic membrane is a frequent complication of surgery for exostoses of the external auditory canal. We report an unusual histopathological finding in a temporal bone containing external canal exostoses which suggests that some of these perforations may be unavoidable.

### Introduction

Exostoses are the most frequently encountered bony 'tumours' of the external auditory canal. Unlike osteomas which are unilateral, solitary and pedunculated, exostoses of the external canal are typically bilateral, multiple and sessile (Sheehy, 1982). Exostoses are composed of dense compact bone and arise in the deep part of the bony external canal.

The aetiology of exostoses is still uncertain though periosteal irritation caused by penetration of cold water into the deep part of the external auditory canal is believed to be responsible (Van Gilse, 1938; Harrison, 1962). This periosteal irritation is thought to stimulate the periosteum to lay down new bone and repeated irritation results in the formation of exostoses.

Exostoses arise from the anterior and posterior walls of the deep part of the bony external auditory canal and in severe cases the lumen of the canal may be reduced to no more than a vertical slit. Less commonly an exostosis may arise from the roof of the canal and together with anterior and posterior tumours produces a characteristic triangular narrowing of the deep canal. The size of the lumen of the external canal, which is inversely proportional to the size of the exostoses, determines the severity of the symptoms. Large exostoses encourage the accumulation of squamous debris in the deep part of the external canal with consequent obstruction and infection (Seftel, 1977). Hearing loss is surprisingly uncommon even with large exostoses unless impaction of debris occurs.

The majority of exostoses of the external auditory canal remain small and asymptomatic and are diagnosed incidentally during routine otoscopic examination. Only a small proportion of all exostoses produce symptoms severe enough to require surgical treatment. Surgical removal of exostoses is consequently rarely required (Sheehy, 1958). Excision is recommended for symptomatic patients who develop troublesome obstruction of the ear or repeated attacks of otitis externa (Kemink and Graham, 1982).

Exostoses may be removed transmeatally (Seftel, 1977) or through a post-auricular approach (Kemink and Graham, 1982; Sheehy, 1982). With both approaches the meatal skin flaps are elevated and preserved while the sessile bony swellings are drilled out. Details of the surgical technique have been described elsewhere (Kemink and Graham, 1982; Sheehy, 1982). Exostoses, particularly those on the anterior meatal wall, may be very difficult to remove. Perforation of the tympanic membrane may occur during removal of the medial ends of the

tumours because of their very close proximity to the tympanic membrane (Seftel, 1977).

We describe an unusual histopathological finding which may in part account for the damage to the tympanic membrane during surgery for some exostoses of the external auditory canal.

### Report

A horizontally sectioned temporal bone which contained anterior and posterior exostoses of the external auditory canal was examined. The bone forms part of the temporal bone collection in the Ear Pathology Research Laboratory of the Departments of Otolaryngology and Pathology of the University of Toronto. The bone had previously been decalcified with Sodium (Tetra) Ethylenediamine Tetraacetate (EDTA), dehydrated and embedded in celloidin. The bone was serially sectioned at a thickness of 24  $\mu$  (microns) and every tenth section was stained with haematoxylin and eosin prior to mounting for light microscopy.

Moderately large sessile exostoses were present on the anterior and posterior walls of the deep part of the bony external auditory canal and extended medially as far as the tympanic annulus. Both exostoses were covered with a thin layer of stratified squamous keratinizing epithelium. The anterior exostosis was the larger and was in contact with the anterior quarter of the tympanic membrane. The posterior exostosis was not as close to the tympanic membrane (Fig. 1).

Low power light microscopy showed adhesion of the skin of the anterior quarter of the tympanic membrane to the adjacent skin overlying the anterior exostosis. This resulted in posterior displacement of the anterior tympano-meatal angle and obliteration of the sulcus between the anterior exostosis and the tympanic membrane. A strip of squamous epithelium formed by this adhesion was buried in connective tissue between the exostosis and the tympanic membrane (Fig. 2).

Examination under higher magnification showed five small epidermal inclusion cysts, two of which contained keratin, within the buried strip of stratified squamous epithelium (Fig. 3). The classic bony architecture of the exostosis which was composed of several subperiosteal layers of dense compact bone was also clearly demonstrated.

### Discussion

Exostoses arise in the medial end of the external auditory

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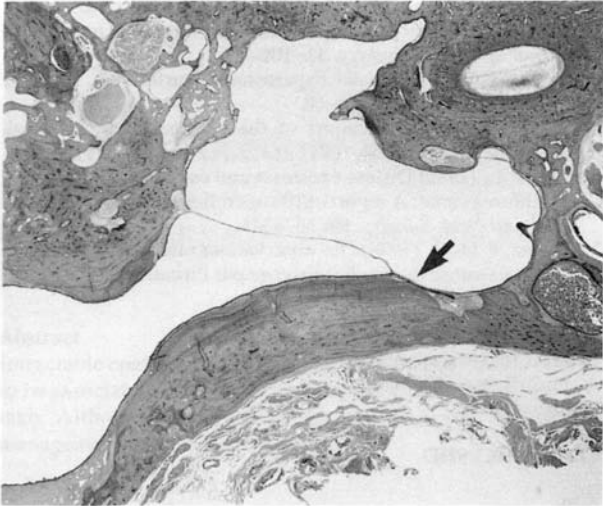


FIG. 1

Horizontally sectioned right temporal bone showing anterior and posterior exostoses. The anterior exostosis is very close to the tympanic membrane (arrow). (H&E stain).

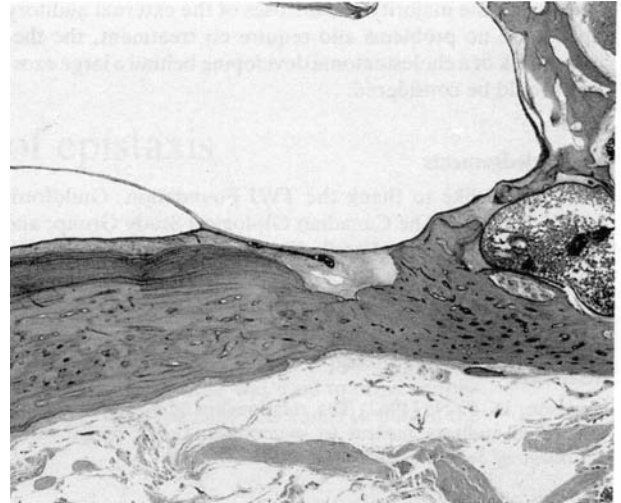


FIG. 2

Low-power view showing posterior displacement of the anterior tympanomeatal angle and a buried strip of squamous epithelium reaching the tympanic annulus anteriorly. (H&E stain).

canal and their medial surface may be in intimate contact with the tympanic membrane. This is especially likely in the case of anterior exostoses which occupy the narrow angle between the anterior meatal wall and the tympanic membrane. The close proximity of the exostoses to the tympanic membrane leads to frequent trauma and perforation of the tympanic membrane during removal of exostoses despite careful technique (Seftel, 1977).

The tympanic membrane is at greatest risk of injury during removal of the medial ends of the exostoses. In an attempt to reduce the risk of damage to the tympanic membrane, Seftel (1977) described an improvement to the standard surgical technique. A circular piece of 0.01in. Silastic® sheet is placed over the surface of the tympanic membrane at the start of the operation. This shields the tympanic membrane from the approaching drill during removal of the medial end of the exostosis.

The histopathological finding in this case raises doubts about the possibility of avoiding damage to the tympanic membrane in every case. Clearly, the adhesion between the tympanic membrane and the anterior exostosis would have prevented correct placement of the Silastic sheet at operation. Any attempt to separate the tympanic membrane from the external canal skin would undoubtedly have resulted in injury to the tympanic membrane (Fig. 4). It is very unlikely that removal of the exostosis would have been achieved in this case without perforation of the tympanic membrane.

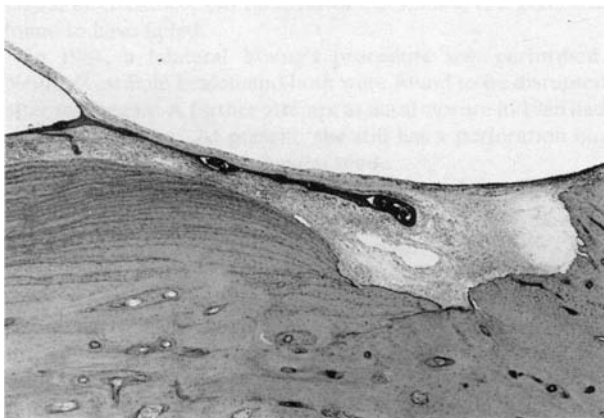


FIG. 3

Higher magnification showing five epidermal inclusion cysts, two of which contain keratin, within the strip of buried skin. The laminated appearance of the exostosis is clearly seen. (H&E stain).

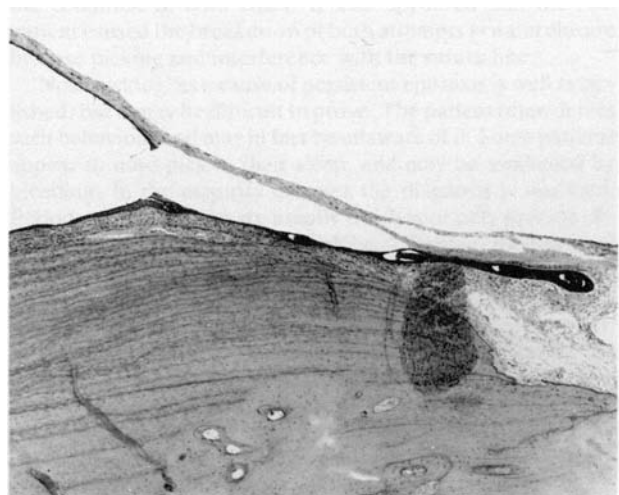


FIG. 4

Different section from the same temporal bone. An artifactual tear in the tympanic membrane demonstrates the likely injury at operation. (H&E stain).

The findings in this temporal bone raise the possibility of another potential complication. Adhesions between the skin of the external canal and the tympanic membrane probably developed at sites of ulceration on the two skin surfaces. Ulceration of the skin surfaces was most probably inflammatory or traumatic (e.g. caused by the movement of the tympanic membrane) and appears to have been patchy. The incomplete adhesion between the two layers of skin resulted in entrapment of islets of keratin-producing cells within the buried strip of squamous epithelium and in the formation of small epidermal inclusion cysts. It is possible that these inclusion cysts would have enlarged and may have developed into a cholesteatoma. The presence of the large exostoses in the external canal would have made early otoscopic diagnosis of such a complication very difficult.

**Conclusion**

Adhesions between the skin overlying an external auditory canal exostosis and the tympanic membrane may explain some of the perforations that occur during the surgical removal of exostoses. In such cases damage to the tympanic membrane with possible perforation may be inevitable despite technical expertise.

Although the majority of exostoses of the external auditory canal cause no problems and require no treatment, the theoretical risk of a cholesteatoma developing behind a large exostosis should be considered.

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