

## CASE REPORT

# Electrode extrusion through the tympanic membrane in a pediatric patient

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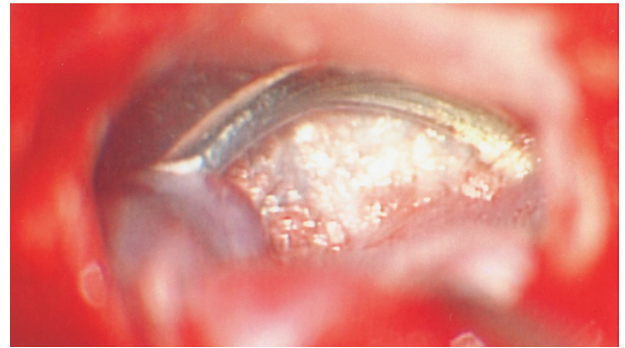
The medical literature contains an increasing number of reports that establish the safety of cochlear implantation in both adults and children. Complications, however, are not inexistent, with reported rates between 3% and 13% for major complications and 7% to 37% for minor complications.<sup>1</sup> Though the exact definitions vary between series, major complications are generally defined as those that require surgical intervention or result in permanent disability, whereas minor complications include those managed conservatively or with a simple procedure (eg, aspiration).<sup>1–3</sup>

Although device exposure through the postauricular skin flap is not uncommon, only a limited number of reports describe extrusion of the electrode through the tympanic membrane. In this case report, we present a child who developed a retraction pocket with electrode extrusion six years after implantation.

The patient is a 17-year-old girl who presented to our clinic at age 13, two years after right cochlear implantation at a different institution for progressive hearing loss.

The patient was then lost to follow-up for three years when she presented with right otalgia. She denied any history of recent infections and had no signs of implant malfunction. Examination of her right ear revealed an anterior-inferior retraction pocket, with obvious visualization of the cochlear implant electrode through the tympanic membrane.

After informed consent was obtained, the patient was taken back to the operating room for exploration. This revealed a retraction pocket with the electrode extruding through the membrane into the external canal in a loop fashion (Fig 1). The middle ear was full of granulation tissue. The stimulating electrode had advanced through the facial recess into the mesotympanum, eroding the malleus and the tympanic membrane and protruding into the canal (Fig 2). All 22 leads were still in the cochlea. The device was carefully freed of the surrounding scar tissue and repositioned back into the mastoid cavity. A cartilage tympanoplasty was then performed. The internal receiver was in place and did not require manipulation. One year after the procedure, the tympanic membrane appears intact with no evidence of retraction or cholesteatoma.



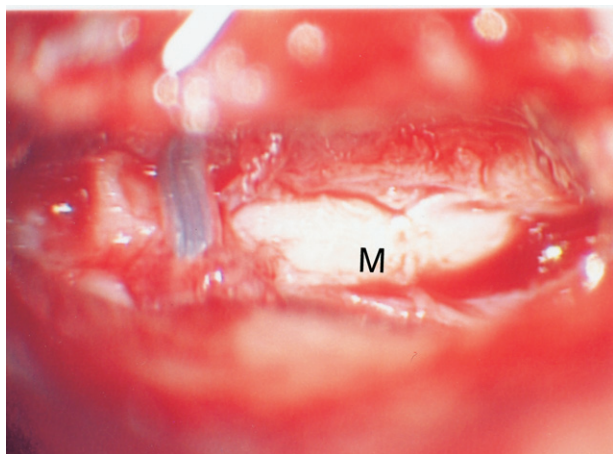
**Figure 1** Inspection of the ear through a postauricular approach reveals a loop of electrode extruding through the membrane.

## DISCUSSION

The incidence of electrode complications that relate to tympanic membrane retraction varies between 0% and 2% in different series.<sup>1–3</sup> The presentation varies from a simple retraction pocket to formation of a cholesteatoma to actual migration of the electrode through the drum. Different theories have been advanced to explain this complication. Patient-related factors include persistent eustachian tube dysfunction as well as skull growth. Other factors include a previously thinned tympanic membrane as a result of recurrent infections, damage to the tympanic membrane or annular ligament during the procedure, as well as excessive thinning or dehiscence of the posterior wall of the external auditory canal (EAC).

Eustachian tube dysfunction and the resultant risk of persistent or recurrent infections remains a concern in children with cochlear implants. Episodes of otitis media should be treated aggressively with antibiotics. Retraction pockets and cholesteatomas mandate surgical exploration and repair. Every attempt should be made at preservation of the electrode array, if possible. Bhatia et al<sup>2</sup> describe three cases of cholesteatomas that occurred after cochlear implantation. The implant was successfully preserved in all three patients despite the multiple interventions that were sometimes required to eradicate the disease.

Received March 15, 2007; accepted April 26, 2007.



**Figure 2** After the tympanic membrane is reflected anteriorly over the malleus (M), the electrode is seen lying against and eroding the handle of the malleus.

Skull growth in pediatric patients has been advanced as one possible explanation for electrode migration. However, in a series of 27 children with cochlear implantation followed radiographically over five years, Roland et al<sup>4</sup> report no migration of the electrode array. Furthermore, in an analysis of human temporal bones that included measurements between different landmarks, Dahm et al<sup>5</sup> reported no increase in distance between the fossa incudis and round window area with age. Essentially all of the growth of the temporal bone was translated in the distance between the sinodural angle and the fossa incudis.

Findings of a thin or damaged tympanic membrane during surgery mandate tympanoplasty, preferably with cartilage reinforcement<sup>1,2</sup>; this strengthens the drum and minimizes the risk of retraction. Defects of the posterior canal wall can occur during surgery. Bhatia et al<sup>2</sup> report nine such cases in their series of 300 children. These defects were all reinforced with cartilage and bone paste, with only one case of flap infection that required explantation. Along the same line, excessive thinning of the posterior wall can occur

during the procedure and go unnoticed. With time, the remaining bone can be eroded resulting in a dehiscence through which a retraction pocket can form.

The current report highlights the importance of vigilant long-term follow-up in pediatric cochlear implant patients and of proper patient education. Complications can indeed occur several years after implantation.

## AUTHOR INFORMATION

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## AUTHOR CONTRIBUTIONS

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## FINANCIAL DISCLOSURE

None.

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