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Clinical Records

Disaster avoided: otalgia warns of potential electrode extrusion

J. Tahery, F.R.C.S., M. I. J. Khan, F.R.C.S., R. T. Ramsden, F.R.C.S.

Abstract
Cochlear implantation is usually a safe procedure but, as in most surgical interventions, it can carry some risk of complications. These can be divided into major and minor that, in turn, in turn can present early or late. This case report highlights a potential late, major complication of cochlear implantation namely extrusion, which was averted by prompt intervention. The patient presented with a three months' history of otalgia some six years after successful implantation. The posterior half of the tympanic membrane was found to be retracted on the electrode, which appeared to be on the point of extruding through the drum. A tragal cartilage myringoplasty was performed to separate the electrode from the medial surface of the tympanic membrane. There was immediate and lasting relief of the otalgia, the electrode was well protected and performance with the device was unchanged.

The authors recommend reinforcing an atrophic tympanic membrane at the time of the cochlear implantation by a cartilage graft to avoid this potentially serious complication.

The case also highlights the need for regular otoscopy for all implanted patients.

Key words: Cochlear implants; Complications; Earache

Introduction

Cochlear implantation has been established as a safe and effective way of rehabilitation for certain profoundly hearing-impaired adults and children, who do not derive sufficient benefit from conventional hearing aids.[1,2]

As in most surgical procedures the cochlear implantation does carry some risk of complications. These can be divided into major and minor that, in turn, may present early or late. Major complications may conveniently be regarded as those that necessitate a further operation and include implant failure, facial nerve palsy, flap infection or necrosis leading to plastic surgical intervention or meningitis. The incidence of major complications has been reported to be in the range of three to 13 per cent.[3-8]

Minor complications are generally regarded as those that can be managed conservatively such as minor wound infection, minor degrees of non-auditory stimulation and taste disturbances from damage to the chorda tympani. An incidence of minor complications of seven to 37 per cent has been quoted.[1,7,8]

This case report highlights a rare potential, but serious, complication of cochlear implantation namely extrusion, which was averted by prompt revision surgery.

Case report

An 11-year-old girl was referred to the Cochlear Implant Programme at Manchester Royal Infirmary in 1997. She had been deaf in the right ear since birth and no cause had been identified. The left ear functioned more or less normally although she did have episodes of otitis media with effusion necessitating repeated grommet insertion and on one occasion the insertion of T-tubes. For no obvious reason she suddenly lost the hearing in that ear about 18 months prior to presentation. Despite extensive investigation no cause was found.

On examination the right tympanic membrane was seen to be intact if a little tympanosclerotic. The left drum was also intact with a tympanosclerotic area but, more significantly, there was thinning of the posterior part of the pars tensa with some retraction, although the middle-ear ventilation seemed reasonably good.

Audiometry and brain-stem evoked responses did not show a recordable hearing. Computed tomography (CT) scans indicated that both cochleae were normal. No dysplasia was identified. The decision was made to implant the left ear because the right had not been stimulated since birth.

A Nucleus 24M multi-channel cochlear implant was inserted on 15 January 1998. The surgeon recorded the presence of hyperaemic middle-ear mucus which bled briskly throughout the procedure. Nevertheless, full insertion of the device was possible through a cochleostomy in front of the round window niche. Muscle plugs were inserted into the cochleostomy and in the posterior tympanotomy to support the array.

From the Department of Otolaryngology, Manchester Royal Infirmary, Oxford Road, Manchester, UK.
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She was switched on about one month after the surgery and made excellent progress with the device during the course of the next six years with high levels of open set speech understanding and effortless communication. The modulation of her voice returned to normal.

In October 2003 she presented with a history of left-sided otalgia for some months' duration. This occurred irrespective of whether the implant was switched on or off. There had been no change in the mapping parameters of the device and she was still communicating easily. On examination the posterior part of the pars tensa was seen to be thin and retracted on to the electrode lead which looked in imminent danger of extruding through the drum (Figure 1) and on to the stapes head. She was advised to have the ear re-explored and the drum strengthened. This was performed on 12 November 2003. Through a tympanomeatal flap the middle ear was opened and the electrode lead found to be closely attached to the medial surface of the ear drum, which was very thin, and indeed perforated during elevation of the flap. The middle-ear mucosa was, however, healthy.

- **This paper reports a patient who had a cochlear implant and who then presented some years later with otalgia**
- **The tympanic membrane was found to be retracted to the electrode giving the appearance of extrusion**
- **The authors recommend regular otoscopy of all implanted ears and also suggest, in the light of this case, that patients with atrophy of the tympanic membrane should have the drum reinforced at the time of the initial surgery**

The electrode could be followed to the cochleostomy and there was suggestion that the device had moved from the cochleostomy where there was a marked fibrous reaction. A composite tragal cartilage/perichondrium graft was inserted between the electrode and the tympanic membrane with the perichondrium facing the drum. The posterior tympanomeatal flap was repositioned and the ear canal was filled with layers of spongeston and bismuth iodine paraffin pasted ribbon gauze. The endaural incision site was closed with two layers of absorbable vicryl stitches.

On out-patient follow up three weeks post-operatively the patient reported complete cure of her otalgia. Once the BIPP pack was removed the tympanic membrane was found to be intact and the cochlear implant array was not visible.

Discussion

Cochlear implantation (CI) is now widely recognized as a safe and effective method of rehabilitation for certain profoundly deaf patients who derive little benefit from conventional hearing aids. Cochlear implantation is relatively free from complications. These may be classified as major or minor and may present early (peri- or few days post-operatively) or late (weeks until years post-operatively). They are usually described as being major if the complication necessitates a further operation e.g. the removal of the implant or thinning of the skin flap or minor if they can be successfully resolved by simple conservative means.

The incidence of major complications in the literature is between three and 13 per cent.[3,5,6,8,9] A recent series from Green *et al*.,[9] the largest UK series reported, quotes an incidence of six per cent of which implant extrusion and sepsis were the most serious. There was no case of permanent facial weakness. One thick skin flap had to be thinned, and there was one case of non-auditory stimulation that could not be programmed out and the implant had to be removed.

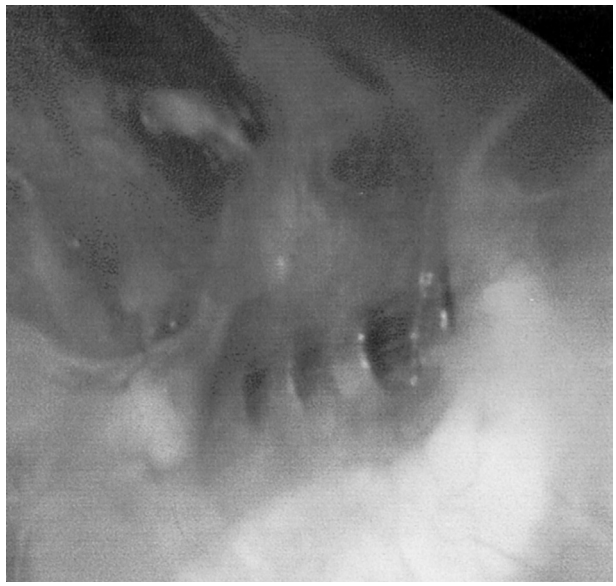

FIG. 1

The cochlear implant electrode visible through the thin tympanic membrane segment.

Minor complications are not uncommon with a quoted incidence between seven and 37 per cent.[1,7,8] By far the commonest is non-auditory stimulation (22 per cent) by a small number of channels but such is the redundancy in the system that the rogue electrodes can usually be removed from the map without any adverse effect on performance. Non-auditory effects are most commonly seen in cases of otosclerosis and skull base fracture when current may escape from the cochlea through a line of low electrical resistance and stimulate either the facial nerve or the sensory nerves of the tympanic plexus. Eight per cent experience some imbalance but nearly all settle with time. Worsening of tinnitus is seen in approximately one per cent and minor degrees of scalp or flap infection in two per cent. Taste disturbance is commented upon by under one per cent.

In the case reported here, the dreaded complication of extrusion was avoided because of the symptom of otalgia, which led the patient to seek attention, and the prompt surgical intervention that avoided the almost certain disaster of explantation. The thin area of the tympanic membrane was recognized at the time of the implant insertion, but the drum was not strengthened at that time. It is now the authors' policy to insert a cartilage graft to strengthen an atrophic drum at the time of initial surgery. The case also underlines the need for routine, probably annual otoscopy in implant patients until it is certain that the middle-ear status is stable. This is of special importance in all children and adults with a previous history, or otoscopic appearance of previous middle-ear disease.

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Address for correspondence:
Mr J. Tahery,
Department of Otolaryngology,
Manchester Royal Infirmary, Oxford Road,
Manchester M13 9WL, UK.

E-mail: jtahery@aol.com

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