Post-stapedectomy incudo-prosthetic fixation

By Peter R. Samuel (Glasgow)

In 1956 Shea modified House's stapedectomy technique by covering the fenestrated oval window, first with 'a thin slice of connective tissue', and later with a vein graft from the back of the patient's hand, and connecting this to the incus with a polythene strut.

Since then, many operators have had the opportunity to re-explore stapedectomy patients' ears because of a recurrence of conductive hearing loss.

The causes of such late failures, where polythene struts have been used in the first operation, have been reported as due to osseous closure of the oval window by otosclerotic bone, to development of an incus or malleus ankylosis, to dislocation of the prosthesis from the incus, to necrosis of the tip of the long process of the incus, and to fixation of the prosthesis to the margin of the oval window.

The following case report deals with a revision stapedectomy following the use of a polythene strut and fat graft which revealed an unusual finding.

Case report

In 1964 a 25-years-old lady presented with progressive deafness and increasing tinnitus of two years standing. She also gave a family history of young-onset deafness. A diagnosis of otosclerosis was made, and an audiogram of her right ear at that time is shown in Figure 1.

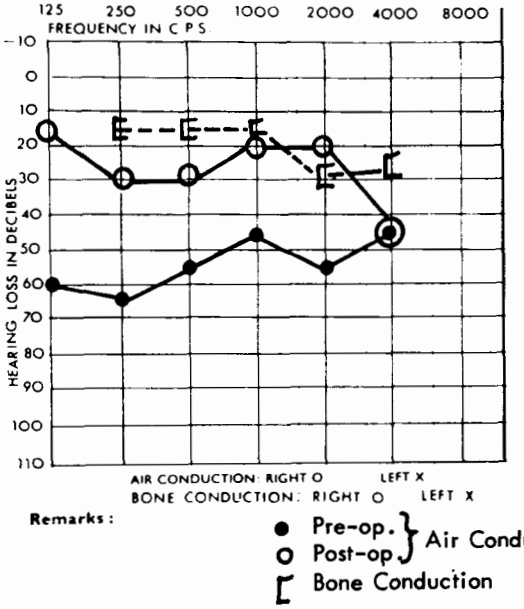


Fig. 1.

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She underwent a stapedectomy in the right ear the same year, when a thin stapes' footplate was found to be fixed anteriorly by an otosclerotic focus. The stapes was removed and replaced by a polythene strut and fat graft. The post-operative audiogram is shown in Figure 1.

By 1966, the patient had noticed that her hearing in the right ear was beginning to deteriorate and her audiogram by 1970 is shown in Figure 2.

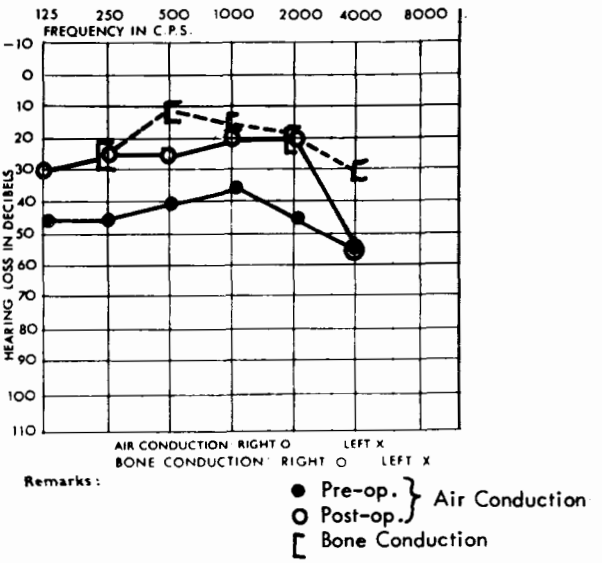


FIG. 2.

She consented to undergo a re-exploration of her right ear in 1971, when the following features were found:

(i) Ankylosis of the incudo-prosthetic joint,

(ii) Occlusion of the oval window by otosclerotic bone.

It was decided to remove the prosthesis and this was achieved with difficulty, by mobilizing the incudo-prosthetic joint. The distal tip of the strut did not appear to be embedded in the oval window bone.

On removal of the prosthesis, it was noted that the lumen of the strut was invaded by bony-hard material from its tip to its proximal end.

Some bone was removed from the oval window and a 4.5 mm. Teflon piston inserted, the distal end being packed with gelfoam.

The patient made an uneventful recovery postoperatively, and her audiogram one month later is shown in Figure 2 and has been maintained to date, four months postoperatively.

The polythene strut was submitted for histological examination and the presence of metaplastic bone within the lumen and around the proximal tip was described. Sections of the strut can be seen in Figures 3*a* and 3*b*.

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FIG. 3a.

Discussion

It is well known that trauma to the stapes and oval window can induce the formation of new bone, and Linthicum maintains that the use of the drill in and around the oval window niche stimulates the growth of new bone in this area.

Myers *et al.* recommend that if otosclerotic bone has reformed in the oval window, no attempt should be made to disturb the contents, as this would lead to recurring and severe hearing loss, both by air and bone conduction.

In the reported case, no drill had been used in the first operation, but new bone not only formed in the oval window, but induced the fibrous tissue core within the lumen of the strut and the fibrous tissue sheath to undergo metaplastic change to bone.

Linthicum, in 1965, reported finding two cases where the lumen of the

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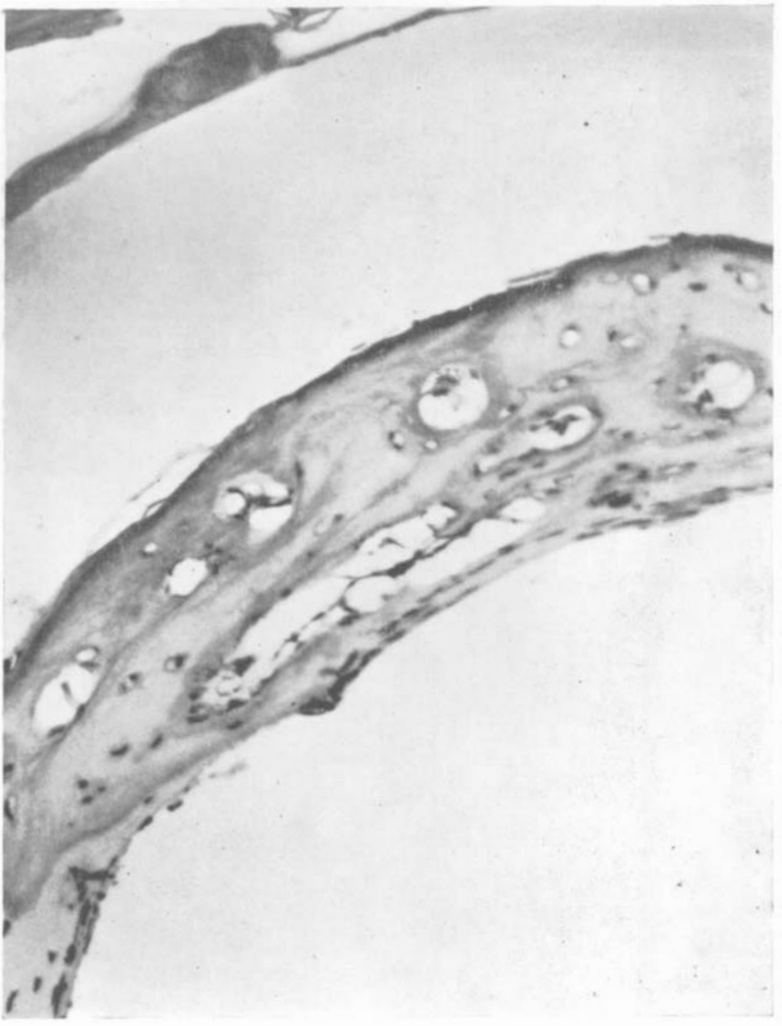


FIG. 3b.

polythene strut was invaded by *otosclerotic* bone. In both cases, a drill had been used at the initial operation and in one, an unsuccessful revision had followed.

Lindsay, in 1961, reported the histological findings in post-mortem cases which had undergone stapedectomy using polythene struts, and he found evidence of new bone formation in the oval window with the strut covered by a thin layer of connective tissue and epithelium in both ears of the same patient at eight and fourteen months postoperatively. Both ears had been treated by the Shea technique, using a drill to remove the footplate.

Schuknecht, in a personal communication, intimates that, in his experience of a large number of revision stapedectomies, he has never come across metaplastic bone replacing a fibrous core in a polythene strut. In his review of 154

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revision stapedectomy cases published in 1970, two were found to show regrowth of otosclerotic bone in the oval window.

Summary

From the above case report we can conclude that new bone formation can take place, even if a drill has not been used in the oval window niche. This bone can obliterate the oval window and replace a fibrous tissue core within a polythene strut causing a recurrence of conductive deafness.

The bone may not necessarily be otosclerotic and it, with the involved strut, can be removed and replaced with an alternative prosthesis leading to a satisfactory hearing result, at least in the short term.

Acknowledgements

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I also wish to thank Professor Schuknecht, of Boston, Mass., for his review of the histological specimen.

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