FENESTRATION POST-MORTEM HISTOLOGY

By R. THOMAS (York)

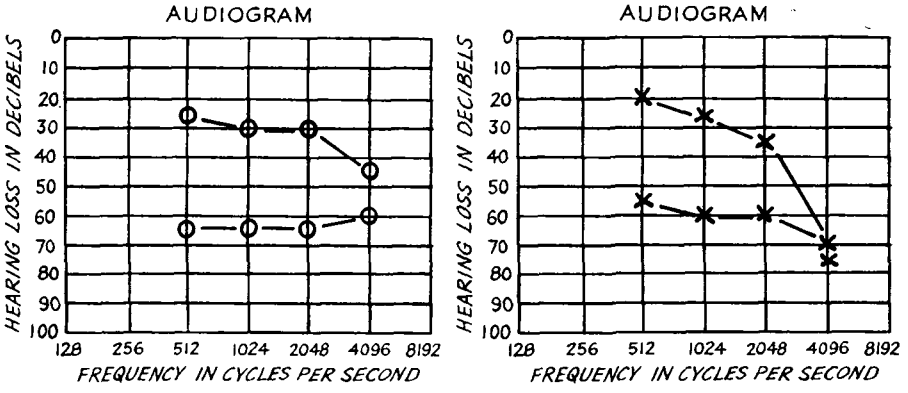
Two cases are presented. Coronary thrombosis was the cause of death in one, and a road accident in the other.

Case I. Female, Schoolteacher, age 51

She died within a few hours of coronary thrombosis and the specimens were obtained following my chance perusal of the death notices in the local evening newspaper.

Right ear. In 1949 (she had been deaf for 30 years and wore an aid), a right fenestration was performed by the technique described by me in this *Journal* (1951). The operation was uneventful except that the meatal skin was found to be very thin; possibly as a result of this the fenestra was easily visible when this case was shown at a meeting of the North of England Otolaryngological Society in York in 1950. At that time the ear was already discharging and a small knob of cholesteatoma could be seen in the attic. This ear continued to discharge until she died in 1956; but the fenestra was always visible. The improved hearing level was retained.

Left ear. In 1951, despite the good hearing in the right ear, the patient asked for operation on the other ear. This was done. The mastoid was again very cellular, the stapes "rock hard" and the meatal skin so thin that the fenestra became easily visible on this side too. Despite every possible care, this ear started to discharge some months after operation and continued to do so despite every treatment.



Audiograms showing best hearing improvement.

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The binaural hearing was so good that both she and her associates regarded it as normal. Furthermore, she stated that after the second operation she no longer had vertigo which, she said, had been due to turning her head so as to present her good ear towards her friends. She was delighted with her result and regarded her fairly frequent visits for aural toilet as a small price to pay for her practically normal hearing.

The histological pictures (coronal sections) should not only demonstrate the underlying condition for which the operations were performed and the mechanical reasons for their success; but also, since four years elapsed after the second operation, they should show the final reaction to the trauma of a successful fenestration operation.

Various Points Arise

1. *Thinness of flap.* This was noted at the operation and probably resulted in the fenestra being visible as a clear grey area. There is no calcification in the fenestra and the under surface of the flap is in places lined by endosteum and is sometimes adherent to the canal (Figs. 7 and 8).

2. *Edges of fenestra.* There is no greater regeneration of bone.

3. *Bone chips in the labyrinth.* There has been very little local reaction to some of these in the period of years, but in other places beyond the fenestra there is a considerable production of new bone and compression of the membranous labyrinth. It should be mentioned that this has taken place posterior to the fenestra and that it may have been due to the fact that I have hitherto not been too particular to remove all the chips from the posterior end of the fenestra. Bone dust can be seen embedded in fibrous tissue around the stapes (Fig. 8).

4. There appears to be little difference in the generalized otosclerotic foci which may be seen in both ears.

5. The development of *cholesteatoma* would appear to be related to the chronic infection within the remaining mastoid cells.

Case II. Male, Roadman, aged 49

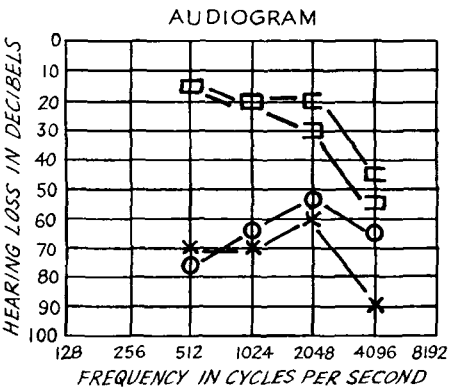
He died in 1957 of multiple injuries shortly after a motor accident. I was lucky to hear of this and the specimens were obtained.

He had been deaf and his ears had both discharged continuously for many years until, in 1946, a suction clearance of bilateral aural polypi was performed and both ears became dry. There were, however, large perforations and each middle ear contained much scar tissue. The hearing (see audiogram) remained poor and the patient complained bitterly of bilateral tinnitus. Unfortunately, despite the good bone conduction, he proved intolerant of the Medresco aid which was also unsuitable for his work as a roadman.

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In 1955 he pressed me to operate. I performed an operation on the left ear which could now be described as a type 5 tympanoplasty. The operation notes mention that both windows appeared full of scar tissue and it was thought that there was a membrane covering the round window (Fig. 17). There was considerable attic erosion. A fenestra was cut in the external semi-circular canal and a Thiersch graft applied, but not to the middle ear. An area of white bone was noted around the posterior part of the fenestra (Fig. 14).

The result of this rather speculative procedure was not immediately good; the cavity healed well, but he had the most violent and prolonged post-operative vertigo that I have encountered. He was certainly dizzy for three months. The final result was, however, excellent; his hearing improved to a conversational level. Unfortunately, as he lived 30 miles from York, his case was followed at a neighbouring Cottage Hospital where there is no audiometer. There is, therefore, no post-operative audiogram. The statement that his hearing was good could be substantiated by the letter from his wife written, after he died, thanking me for his hearing improvement.



In this case horizontal sections have been made of the cochlea and window regions. The rest of the block was then re-embedded and coronal sections cut to show the fenestra and skin-graft. The unoperated right ear has also been sectioned. The sections show that otosclerosis was largely responsible for the deafness, though infection has played a part. The dislocation of the stapes in the unoperated ear (Fig. 19) could have been due to rough treatment at suction clearance in 1946. In some of the sections (not shown here) there are small fractures and hæmorrhages due to the head injury. In general the sections demonstrate the effects of combined otosclerosis and chronic otitis media. If they are compared to the previous case it could be stated that the Thiersch graft has caused a little more reaction than the tympanomeatal flap. The section (Fig. 19) showing the

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cholesterol clefts in the stapes region and the dislocated footplate—in an ear that had been deaf and dry for nine years—is stimulating to one who is interested in both tympanoplasty and mobilization.

Summary and Conclusions

The histology of three persistent human fenestra novo-ovalis is presented. In two (from one patient) in whom both fenestra had been clearly visible, the fenestra had been covered with an exceptionally thin tympanomeatal flap. In the third the fenestra had been covered with a Thiersch graft. In the first patient the effects of otosclerosis and the subsequent infection of the fenestration cavities are demonstrated and in the other the results of chronic otitis media have evidently masked the unsuspected otosclerotic process.

To draw conclusions from two cases is premature, but further study of the sections (which are available) and comparison with subsequent material could be useful.

They do seem to support Lempert's (1951) contentions.

Acknowledgments

If these photographs have proved interesting, credit should be given, not to the writer who obtained the specimens by chance, but to the Ferens Institute of the Middlesex Hospital Medical School, London. I should like to thank Mr. J. P. Monkhouse, F.R.C.S., for his interest and help and Mr. D. Bishop, Senior Technician of the Institute, who spent so much time and trouble in preparation and annotation.

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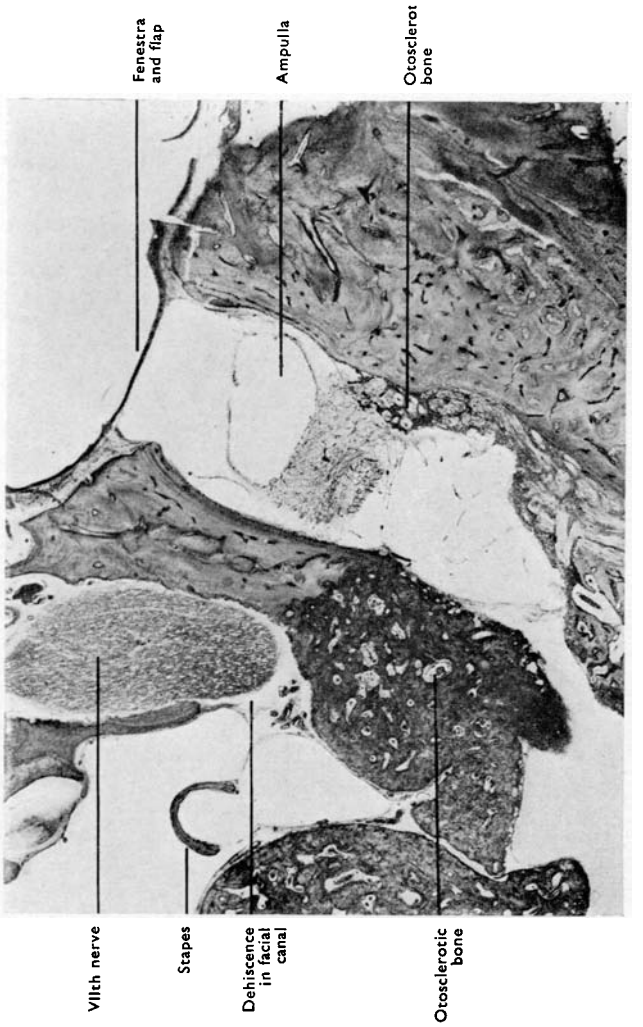


FIG. 1.

Case 1. Right ear. Coronal section × 18 (approx.). Showing fenestra anteriorly. Note: the coronal sections of each ear are in order antero-posteriorly. If the journal is held in the normal position, the patient would be facing the reader. The fenestra is therefore cut somewhat obliquely.

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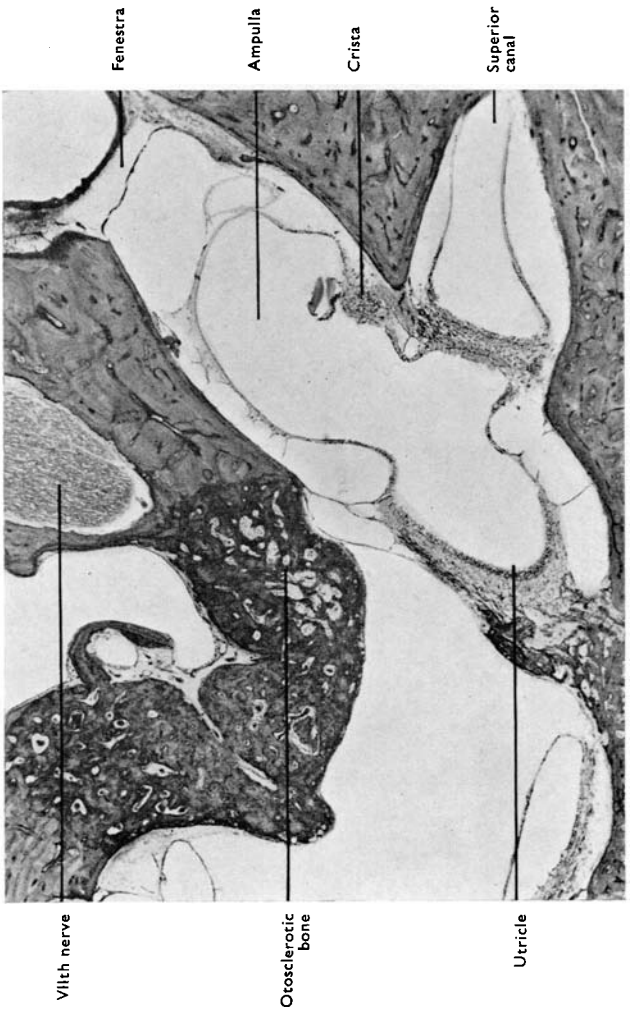


FIG. 2.
Case 1. Right ear. × 18 (approx.). Fenestra.

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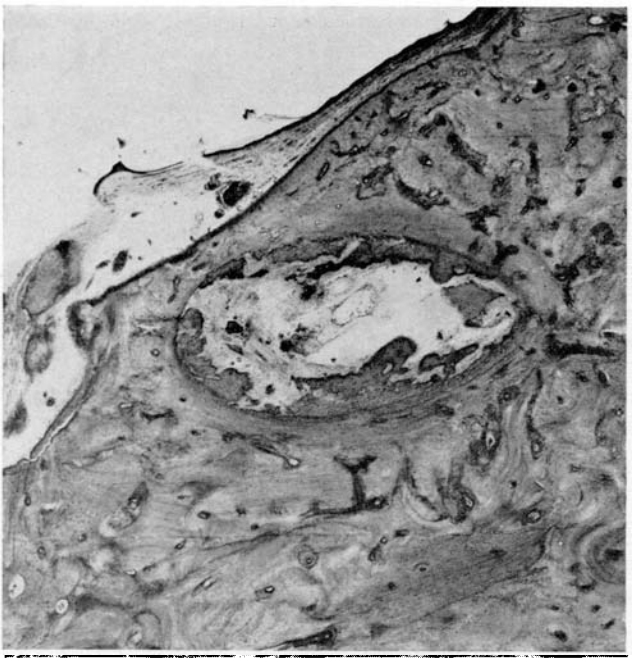


FIG. 3.

Case 1. Right ear. Reaction in horizontal canal just posterior to fenestra. New bone has formed and the membranous canal is compressed.

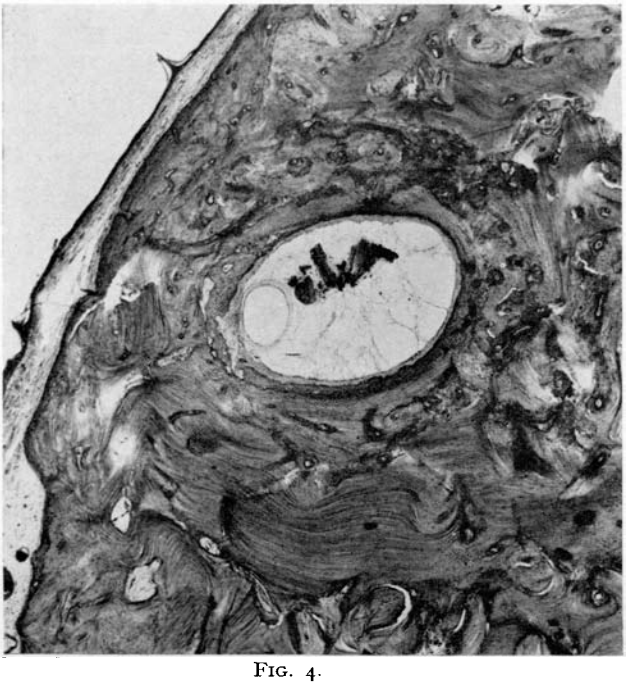


FIG. 4.

Case 1. Right ear. Further back. The canal is normal and there is very little reaction here to the bone chips after seven years.

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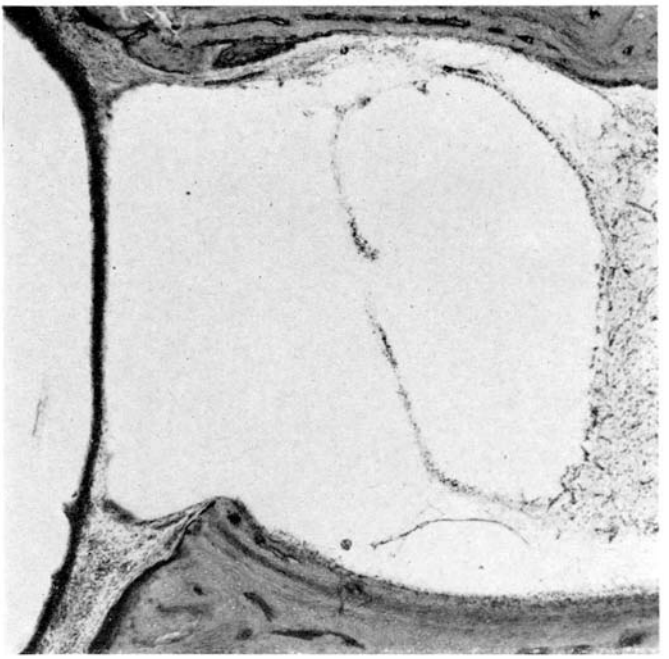


FIG. 5.
Case 1. Right ear. Fenestra × 44.



FIG. 6.
Case 1. Right ear. Fenestra × 44.

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Fig. 7.

Case 1. Left ear. Fenestra × 18 (approx). There is bone dust in the fibrous tissue around the stapes.

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Fig. 8.
Case 1. Left ear. Fenestra × 18 (approx.).

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FIG. 9.
Case 1. Left ear. Cells in the roof of the cavity contain granulation tissue.

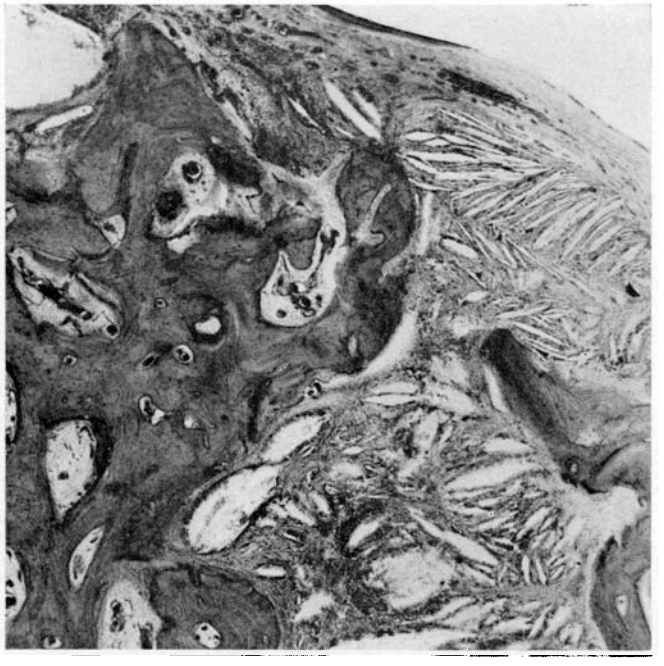


FIG. 10.
Case 1. Left ear. Cholesterol clefts and granulation tissue in fenestration cavity.

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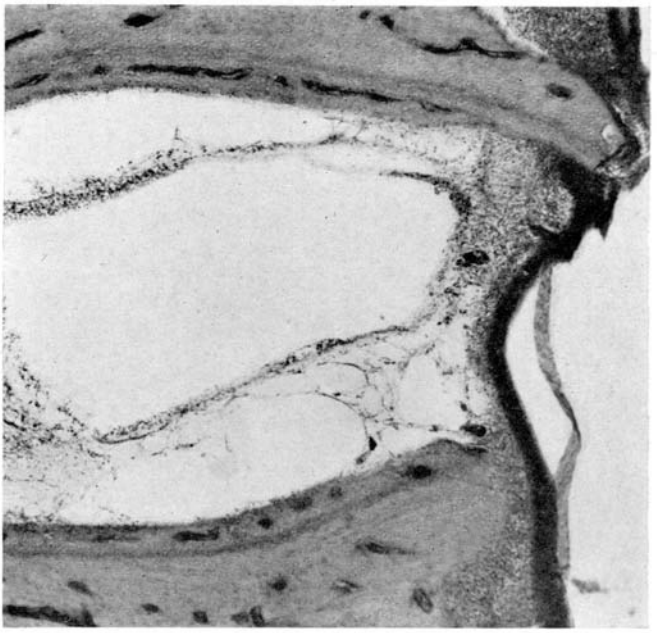


FIG. 11.
Case 1. Left ear. Fenestra × 44.

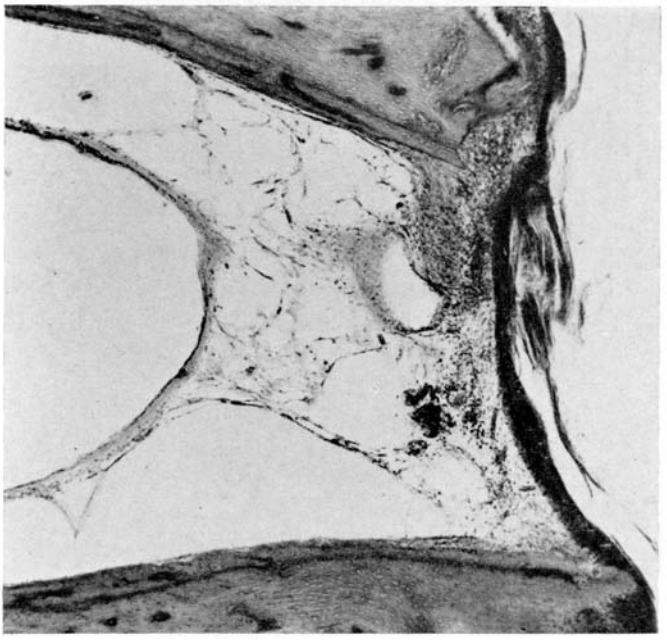


FIG. 12.
Case 1. Left ear. Fenestra × 44.

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FIG. 13.

Case 2. Left ear. Fenestra and granulation tissue under Thiersch graft. Normal orientation.

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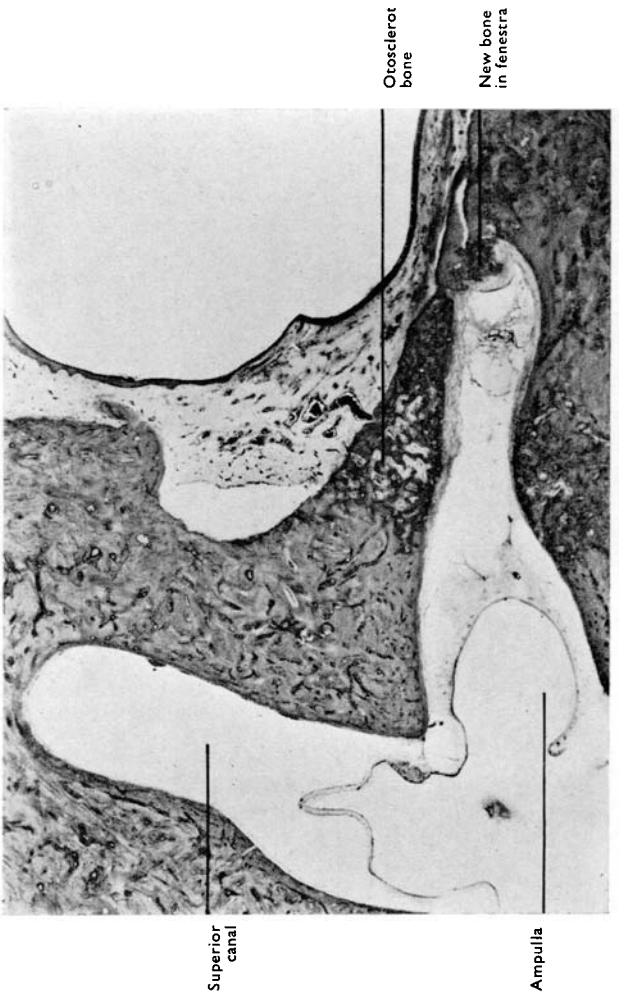


FIG. 14.
Case 2. Posterior part of fenestra closed by new bone with compression of membranous canal. Normal orientation.

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FIG. 16.
Case 2. Fenestra × 44. Showing closure.

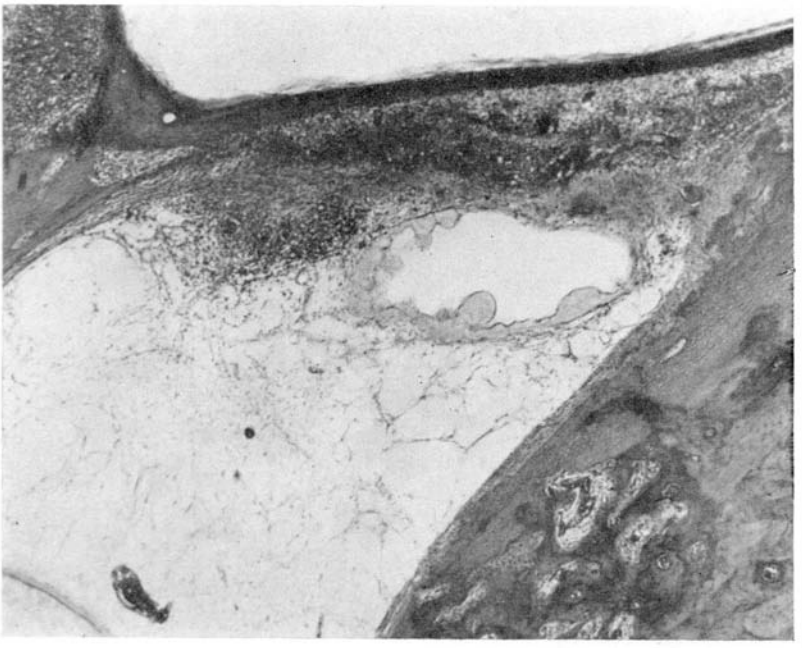


FIG. 15.
Case 2. Fenestra × 44.

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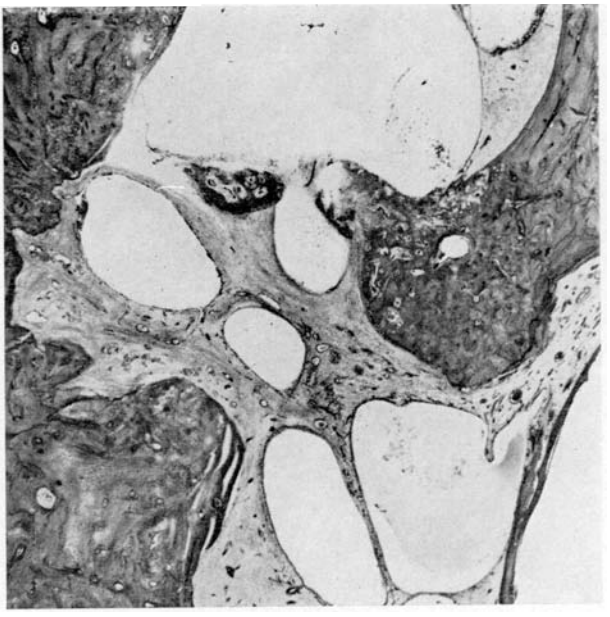


FIG. 17.
Case 2. Left ear. Horizontal Section × 20. Cystic condition at round window.



FIG. 18.
Case 2. Left ear. Cystic condition underlying squamous epithelium at oval window.

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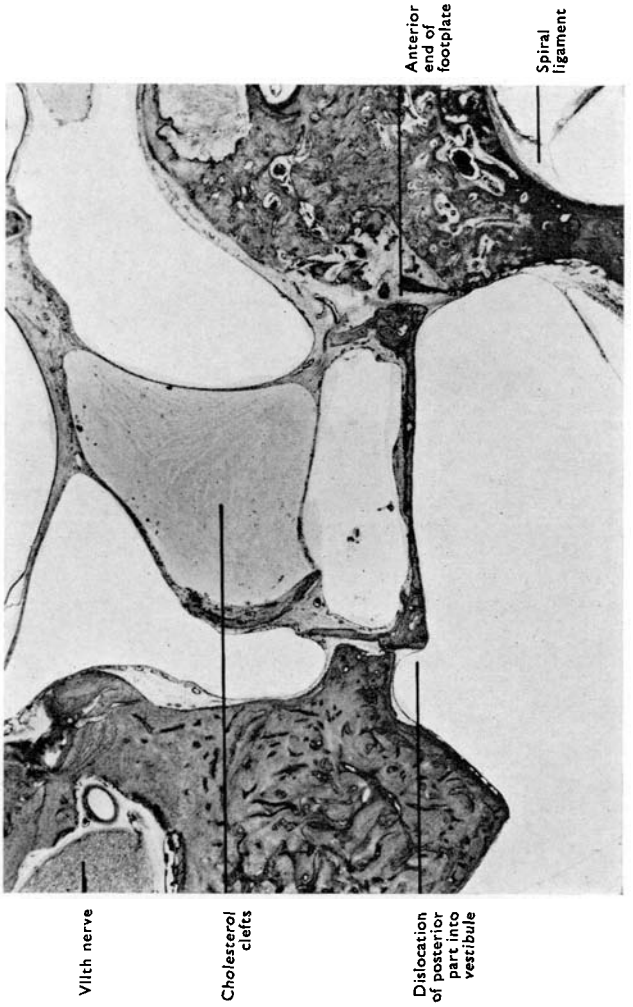


FIG. 19.

Case 2. Right (unoperated) ear. Partial dislocation of stapes footplate posteriorly, otosclerotic fixation anteriorly and cholesterol clefts in cyst.

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FIG. 20.

Case 2. Right ear. Lower part of drum and cystic condition of round window. Hæmorrhage due to head injury.

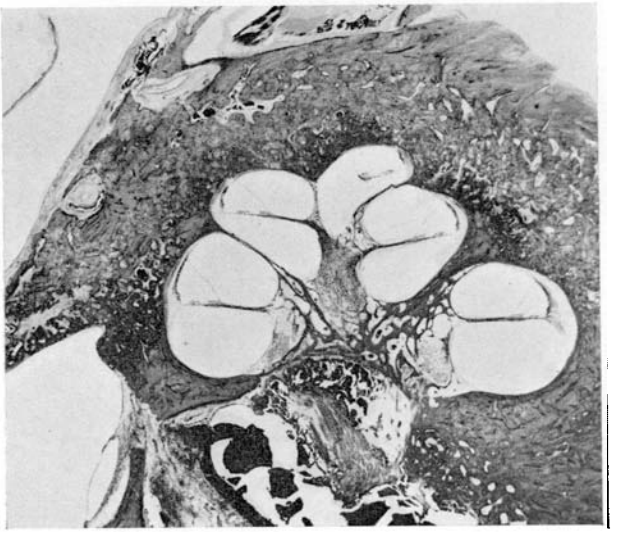


FIG. 21.

Case 2. Right ear. Cochlea × 10. Showing otosclerotic foci.

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