# Stapedectomy[1]

By Ian P. Munro (Glasgow)

Stapedectomy remains the operation of choice in the surgery of otosclerosis. No standard technique has yet been adopted. Stapedectomy may be total, partial or a piston type operation. Each operation has its advocates but I think it is worth while noting that John Shea, who introduced the piston operation, has now reverted to the vein graft seal over the oval window and reserves the piston operation for some very thick or obliterative footplates. His reason for abandoning the piston operation for all cases and I quote, 'Results have been good but complications, especially fistulas, are more frequent, than when the oval window is sealed with a vein graft.'

The techniques of total and partial stapedectomy are well known. I would like to comment on polythene tubes, secondary bony closure and reparative granulomas. *Polythene tubes* have now been abandoned by most surgeons because of their danger at both ends, avascular necrosis of the long process and the lenticular process of the incus at the upper end, graft penetration at the lower end.

## Secondary bony closure

In the type of footplate pathology where the greater area of the footplate is normal, I feel the risk of bony closure of the oval window by new bone at a later date is very small and this, I think, is supported by Farrior's (1963) observations on the footplate pathology in geriatric patients. In 70·1 per cent of the group of these patients the greater area of the stapedial footplate appeared normal. It would be interesting to know the footplate pathology in the 8 per cent of cases of late bony closure that Philip Beales reported in his series of 200 platinectomies.

Audiograms (1–3). Case of secondary bony closure.

## Reparative granulomas

Kaufman and Schuknecht (1967) have recently pointed out the dangers of reparative granulomas as one of the common causes of sensori-neural loss following stapedectomy, and that early diagnosis of this condition would save some ears. The formation of these granulomas does not appear to be related to the graft material used and Gelfoam has also been incriminated. They reported an incidence of 1·3 per cent of sensorineural loss in a series

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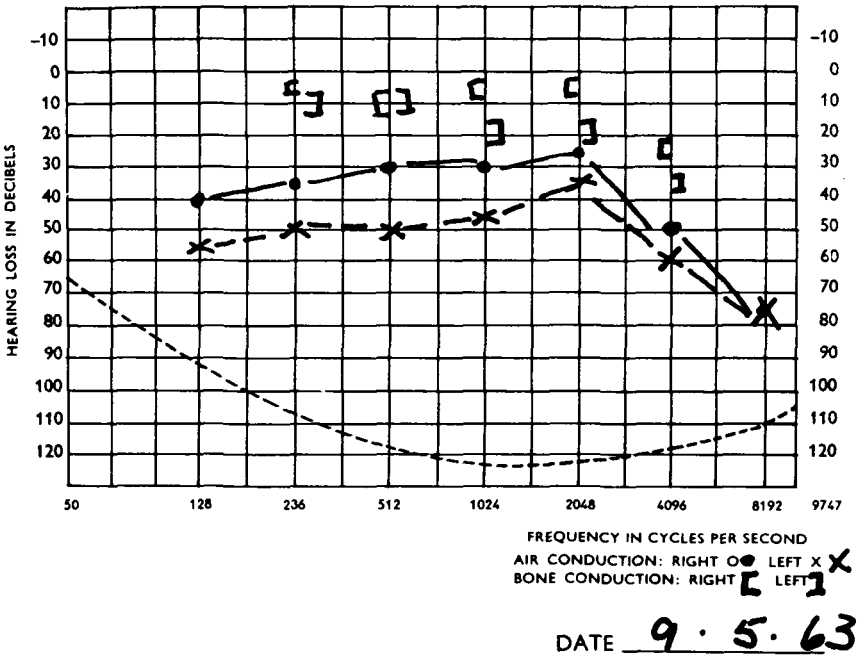



FIG. 1.

*Audiogram 9.5.63.* Case of stapedectomy right ear with complete removal of thick footplate and fat graft—steel pin prosthesis done in February 1962.

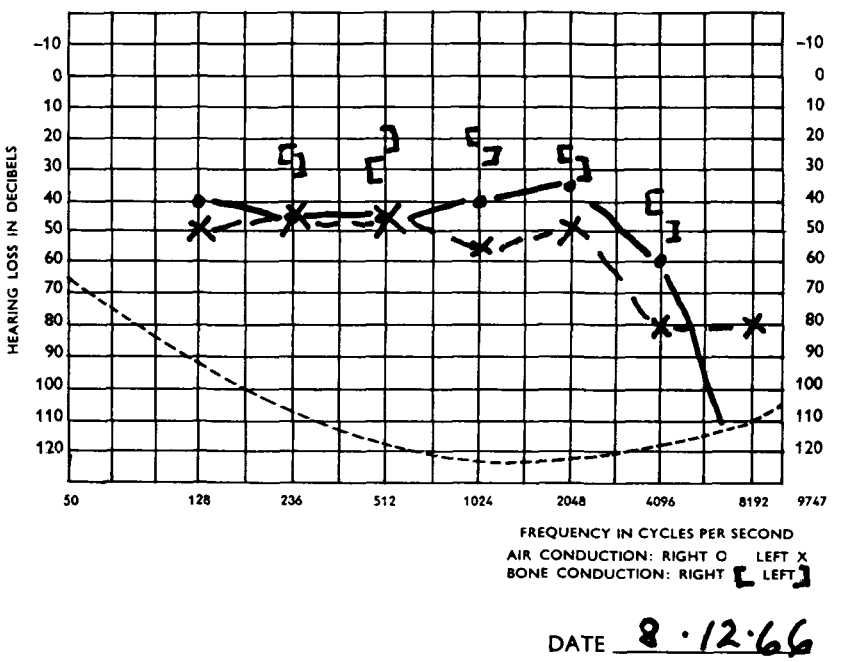



FIG. 2.

*Audiogram 8.12.66.* Showing hearing deteriorating in right ear.

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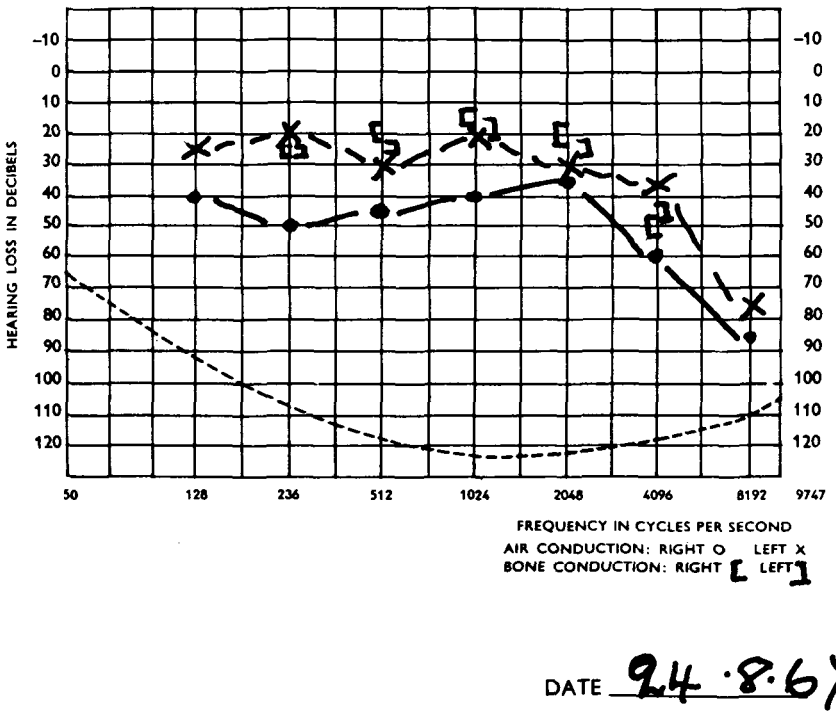



FIG. 3.

*Audiogram 24.8.67*. Showing hearing in right ear five years after stapedectomy. Teflon Piston Operation performed in left ear on 12.12.66. Thick foot-plate present.

of 780 stapedectomies. In the ten cases of post-stapedectomy granuloma that they described, nine developed symptoms within the first 6 weeks and the lesson to be learned from this report is that patients following stapedectomy and who after an initial improvement in hearing finds his hearing gradually or suddenly deteriorating should be treated as a surgical emergency and explored at once.

### Teflon piston operation

The piston operation has, I think, the following advantages.

1. The simplest to perform.
2. Least traumatic.
3. Least likely to have secondary bony closure although this can occur.
4. Can be done in practically all cases.

I think this operation is contra-indicated in patients whose occupations subject them to middle-ear pressure changes, such as pilots, or where there is marked leak of perilymph after making the small opening through the



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footplate. The main disadvantage, of course, is that this operation appears more likely to cause a fistula. There also appears to be an increased risk of late sensorineural loss associated with upper respiratory infections, presumably viral.

I would like to report on 100 consecutive teflon piston operations I did in 1966/67, the follow-up being from 2 years and 5 months to 6 months. The series was started because of the large number of thick footplates encountered.

Many of these patients had been attending the Hearing Aid Centre in Glasgow for a long time and wore hearing aids. The micro-drill was used in 31 per cent of these cases and there were three cases of obliterative otosclerosis, two of which were done in two stages. In the first stage the oval window was outlined and the footplate thinned. The second stage done 2–3 months later, the footplate was further thinned and a small part picked out with a hook, and then the piston inserted. The three cases did very well. The micro-drill in this series of cases did not appear to produce any sensorineural losses.

In this series 93 per cent had a hearing result which pleased both patient and surgeon and was satisfactory in terms of air-bone gap closure. Three further cases were improved but should have been better, an air-bone gap of more than 10 db. persisted.

In one case there was no change in the hearing and it is possible the piston was too short. In one of the cases with a satisfactory hearing result the piston was extruded 8 months after operation, and gradually appeared through a small perforation in the drum and was later picked out of the external auditory meatus. Audiograms (4–8) are audiograms of this patient.

There was one case of immediate severe sensorineural loss. The patient had a myringotomy done three months before the piston operation. The surgeon who performed the operation reported there was no fluid in the middle ear. The piston operation was technically easy to do. The footplate was blue in the posterior half. He had more vertigo than usual post-operatively and his hearing did not improve at all. An audiogram done a month later showed a 'dead ear' with absent caloric responses. The result must be attributed to surgical trauma or infection.

### Delayed sensorineural loss

There were two cases of delayed sensorineural loss. The first was a revision operation. The history was that the patient had a satisfactory result following a fat-graft-polythene tube stapedectomy done 3 years previously. This patient was involved in a fight and was struck a severe blow on the jaw. That night he noticed his hearing had deteriorated in the ear which had been operated on. He had some tinnitus in the ear and an audiogram showed a considerable drop in his hearing but there was a



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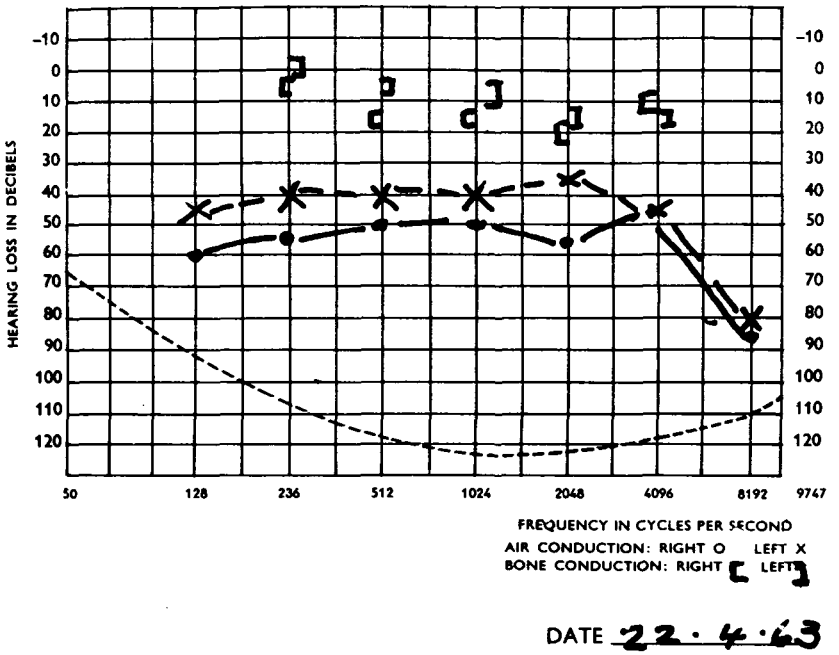



FIG. 4.

*Audiogram 22.4.63.* Pre-operative audiogram.

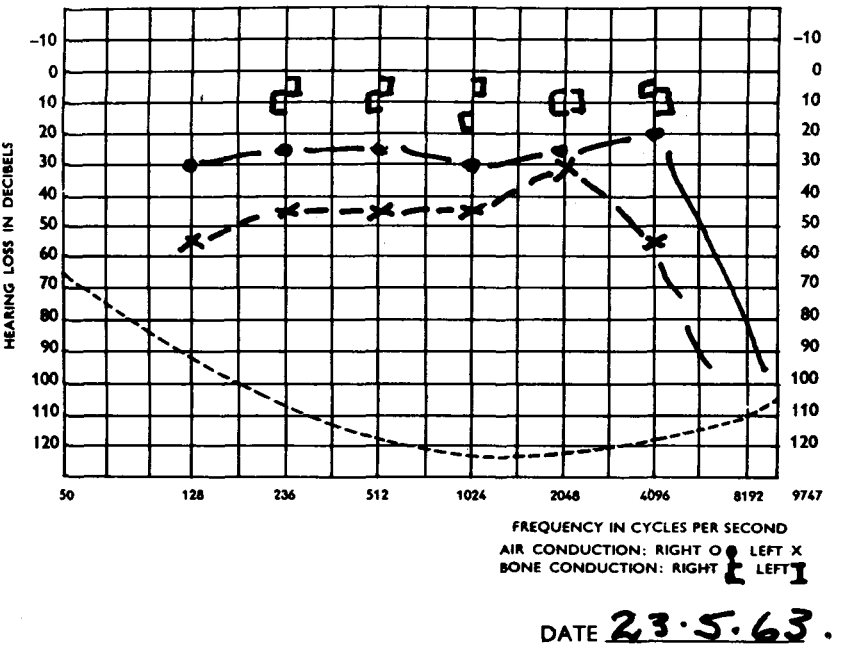



FIG. 5.

*Audiogram 23.5.63.* Post-operative audiogram—stapedectomy right ear—fat-graft-polythene tube. Thick footplate.

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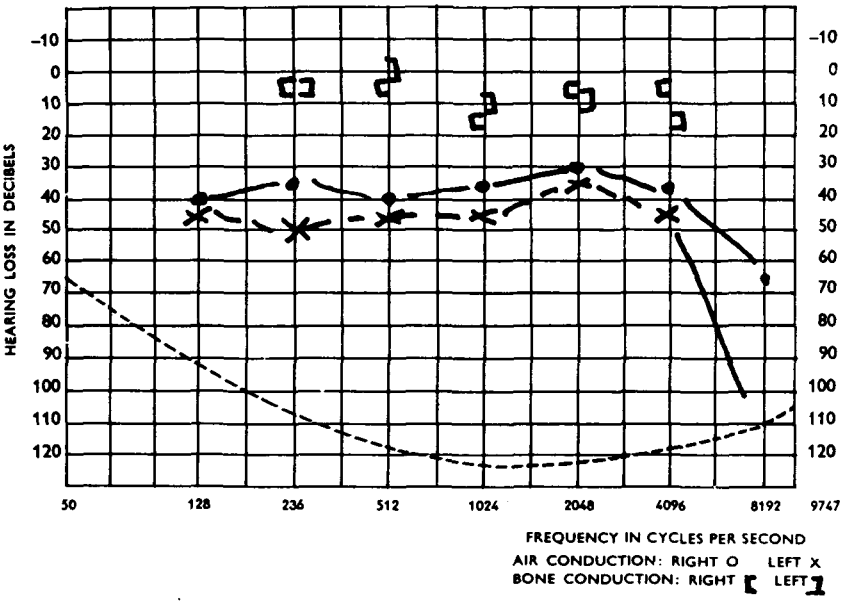



FIG. 6.

*Audiogram 27.4.67*. Showing deterioration in hearing in the right ear.

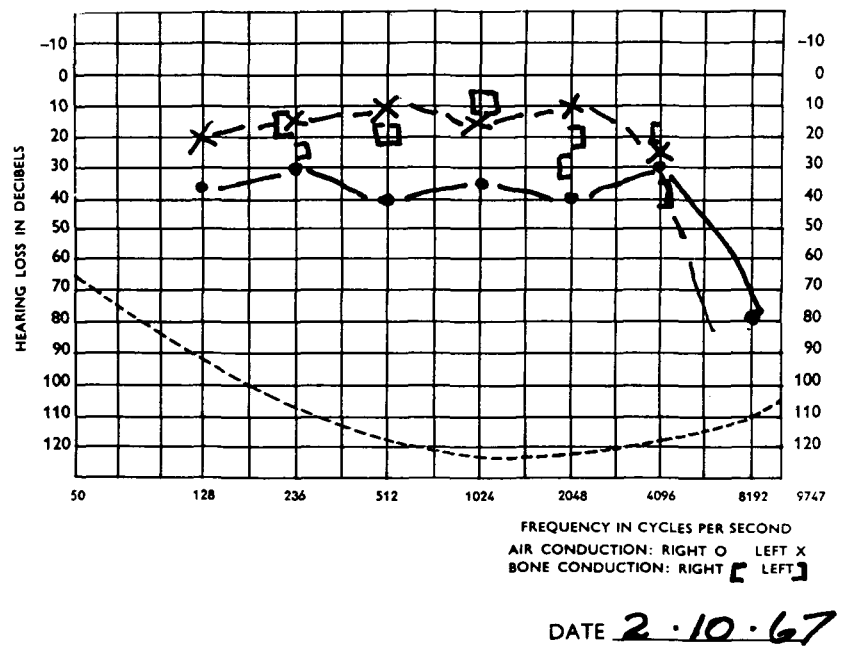



FIG. 7.

*Audiogram 2.10.67*. Showing hearing results 6 months after teflon piston operation left ear. Posterior one-half of footplate was removed.

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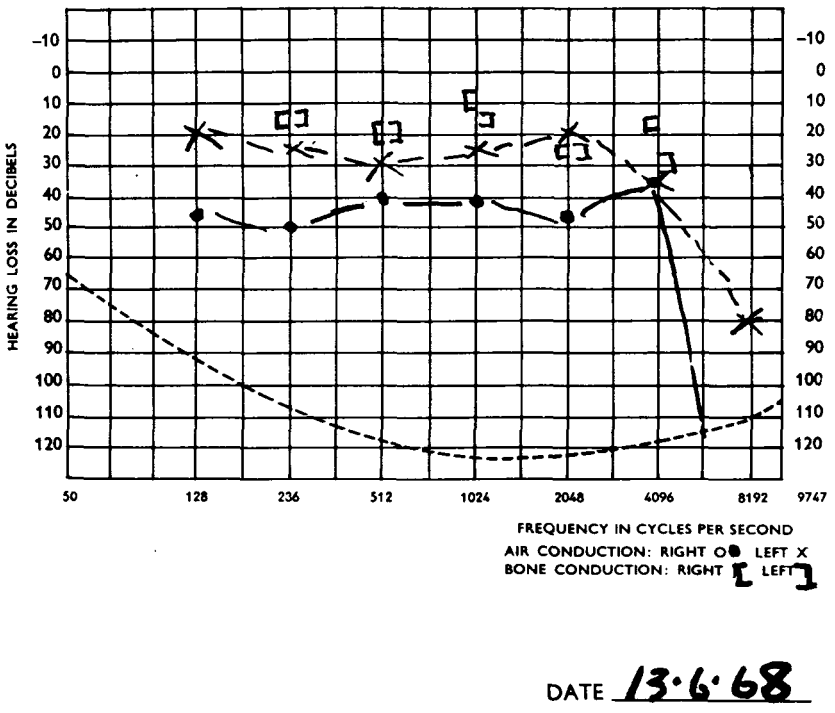



FIG. 8.

*Audiogram 13.6.68.* Showing result at present—teflon piston has been extruded. Adhesions have presumably formed between the long process of incus and membrane covering posterior half of oval window.

fairly good air-bone gap. The ear was explored and it was found that the polythene tube had come off the incus and was lying on what appeared to be an intact membrane over the oval window. The polythene tube was replaced by a teflon piston which was inserted into the vestibule through a small incision in the membrane. His hearing improved for 3 months and then following an upper respiratory infection his hearing deteriorated and he now has a severe sensorineural loss.

The second case with delayed sensorineural loss was a patient who had a piston operation done in the left ear in March 1966. He had a satisfactory hearing result until February 1968, when following a severe upper respiratory infection, which was associated with occipital headaches and dizziness, his hearing deteriorated. The dizziness cleared up very quickly. The right ear that was not operated on is completely deaf, and the hearing in the left ear that had the piston operation done 2 years previously has also deteriorated very severely. Caloric tests show normal responses. Audiograms (9–11) are audiograms of this case.



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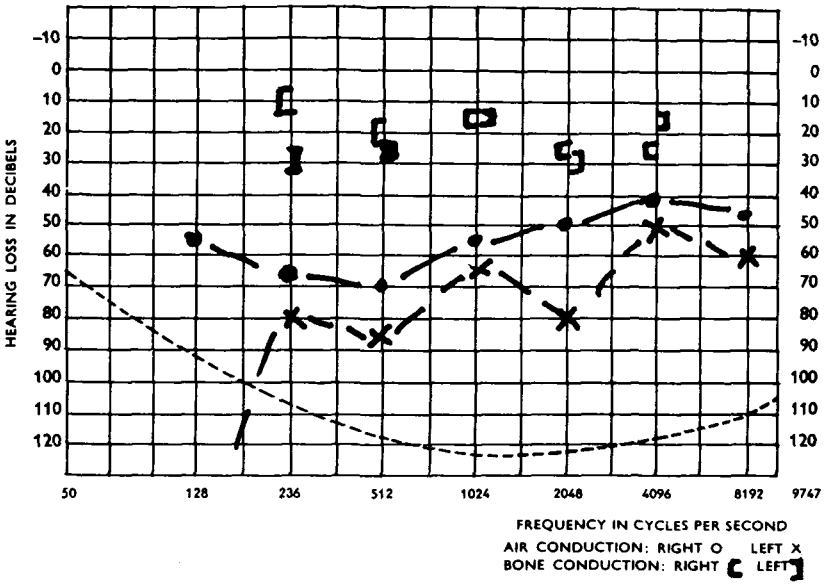



FIG. 9.

*Audiogram 14.12.64.* Pre-operative audiogram.

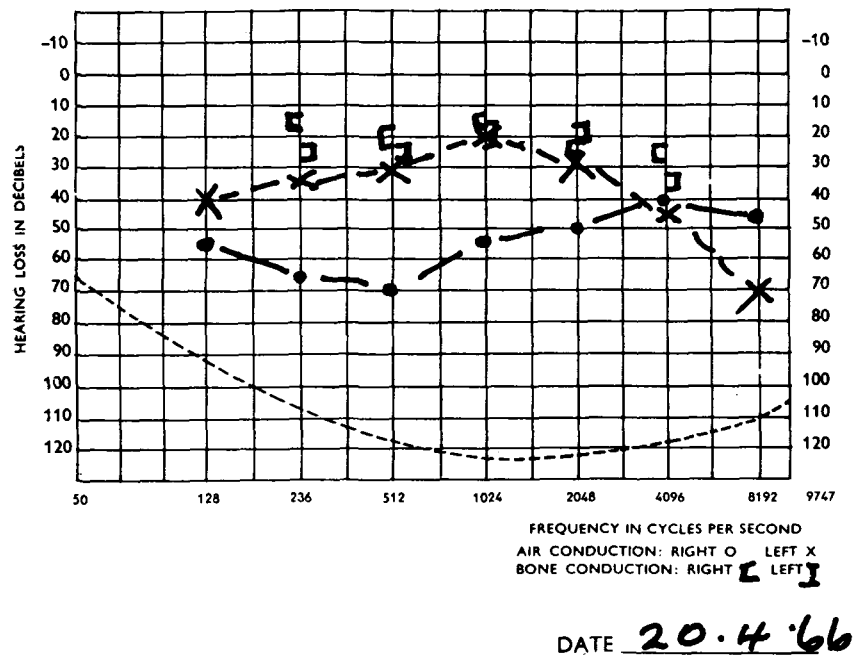



FIG. 10.

*Audiogram 20.4.66.* Post-operative audiogram, 5 weeks after teflon piston operation done in left ear.

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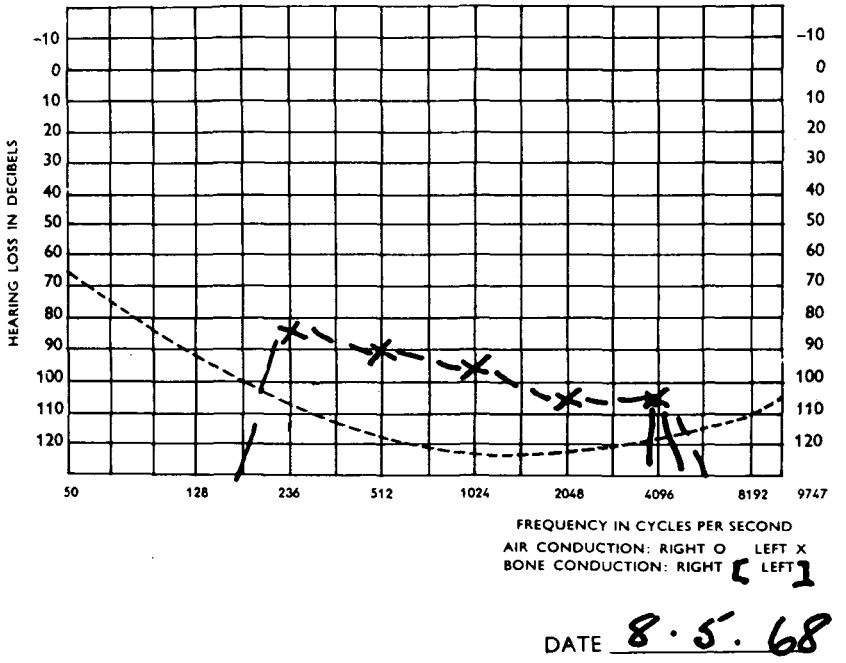



FIG. 11.
*Audiogram 8.5.68.* Audiogram showing present hearing level, 3 months after severe upper respiratory infection.

## Dizziness

Three cases had problems with dizziness. The first case is the patient who developed a 'dead ear' and loss of vestibular function, absent caloric responses and all the problems associated with such a loss. However, it is over a year now since the operation and he has compensated well.

The second case is a woman who had improved hearing but did not close the air-bone gap. She was operated on more than a year ago. The dizziness is not associated with nausea or vomiting but is persistent. There is no depression in the hearing during the attack and no tinnitus. Caloric tests show normal responses.

The third case is a young woman now aged 20 who has a satisfactory hearing result. She has had three attacks of vertigo with diminution in hearing. She was operated on 2 years ago. The dizziness lasts only a short time and she is never nauseated or sick. Caloric responses are normal. She associates the attacks with 'head colds'. She may have a fistula and is being kept under close observation.

## Other complications

A patient who had a successful piston operation done on 20 September 1966 and suffered a grand-mal attack 2 days after operation. He had a similar attack in October 1962 and was investigated by the Neuro-



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Surgeons. The investigations were negative apart from electro-encephalography which showed a generalized dysrhythmia with a shifting focus of epileptogenic activity. He has remained well and has had no further attacks of grand-mal.

The other complication encountered was a woman aged 70 whose two sons had been operated on successfully in Edinburgh, many years previously. One son had had a fenestration operation and the other a stapedectomy. Both had good hearing results. She was determined to have an operation and a teflon piston operation was done. The hearing result was satisfactory. However, on the seventh day she developed a coronary thrombosis with a myocardial infarction and on the eleventh day a cerebral embolism. She made a good recovery with no residual paresis. Her hearing has remained satisfactory although her sons tell me mentally she is not as alert as she was prior to operation.

**Otogenic Meningitis**

I would like to report on a case of otogenic meningitis following stapedectomy. This woman had a successful stapedectomy done in the right ear in 1962. A polythene tube had been used on top of Gelfoam. In July 1966 she had an upper respiratory infection, went deaf in the right ear and felt dizzy. She had no pain in the ear. The dizziness cleared up quickly but she remained deaf in the right ear. She did not come to see me until October of that year and when I examined her she had a severe sensorineural loss with absent caloric responses. The ear was not explored as she was not suffering from any vertigo and at the time I thought she might have had a viral labyrinthitis. On 30 March 1968 she was admitted to the hospital complaining of severe headache, pain in her right ear, dizziness and vomiting. The symptoms had started the previous evening, and she had an upper respiratory infection. She became unconscious 2 hours after admission with signs of cerebral irritation and when I saw her at this time she had an acute otitis media in the right ear and I thought meningitis. She was given Ceporin intramuscularly and transferred to the Neuro-Surgical Unit.

*Bilateral carotid angiograms* were done and these showed no evidence of any expanding lesion or hydrocephalus.

*The cerebral spinal fluid* was turbid and there were 2,500 nucleated cells per cubic mm.

*The film* showed no organisms present, mainly polymorphs with a few mononuclears.

*Culture.* No growth after seventy-two hours incubation.

*The ventriculogram* showed no apparent abnormality.

The patient was treated with systemic Ceporin and intrathecal penicillin and streptomycin. She made a good recovery.

The right middle ear was explored on 26 April 1968 and my impression



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was that everything looked fine. The membrane appeared intact over the oval window and the polythene tube was firmly attached to the incus and centrally placed on the oval window membrane. However, on removing the tube there was a very small granulation which had grown through the distal end of the polythene tube and a minute granulation in the centre of the membrane which was presumably the route of entry of the infection. Histological examination of this tissue showed chronic inflammation. The membrane covering the oval window was removed and the vestibule did not show any obvious fibrosis. The oval window was then covered with a fat-connective tissue graft and she made an uneventful recovery and has remained well. The interesting feature about these findings is that if the ear had been explored in 1966, unless the polythene tube had been removed, one would not have observed any obvious pathology.

In conclusion, I think a total or partial stapedectomy is probably indicated in cases where the greater area of the footplate appears normal and they should be watched closely for reparative granulomas. For the young patient and the patients with thick and obliterative footplates I think the piston operation is the method I shall still adopt, hoping to avoid secondary bony closure. The incidence of fistulae following the piston operation and the effect of viral infections will have to be closely observed.

## References

BEALES, P. H. (1968) *J. Laryng.*, **82,** 551.
FARRIOR, J. B. (1963) *Laryngoscope* (*St. Louis*), **73,** 1084.
KAUFMAN, R. S., and SCHUKNECHT, H. F. (1967) *Ann Otol.* (*St. Louis*), **76,** 1008.
SHEA, J. (June 1967) Personal communication.

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