

# ENHANCED HEARING RADICAL MASTOIDECTOMY SECOND REPORT\*

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Though much studies have been made regarding the treatment of chronic suppurative otitis media, it has to be admitted that efforts have not been made to improve the function of the middle ear.

From June 1952, I have operated on over 300 patients with chronic suppurative otitis media by my method, and in a previous report<sup>1)</sup> I described the incentives and the course of studies followed for the operative treatment of chronic suppurative otitis media and its sequelae, with the aim of not only eliminating the pathological structures in the middle ear but also to improve the hearing as well.

I had, however, to continue studies to solve the problems encountered in the operative procedure arrangement and also to improve the operative method.

This report involves, first, the frequency characteristic in hearing gain by this operation; second, the experimental results of research upon the fate of the newly created middle ear cavity; and third, the search for a much better operative technique.

## THE FREQUENCY CHARACTERISTIC IN HEARING GAIN RESULTING FROM THE OPERATION

Hearing gain by this operation differs for each case, but the frequency

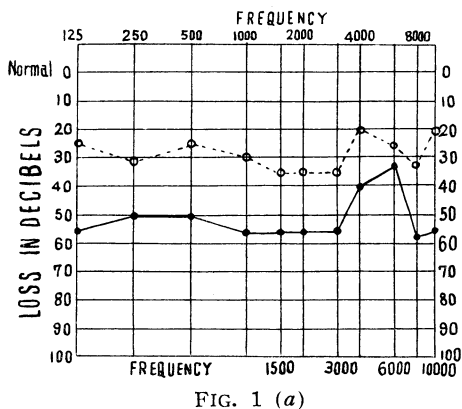


FIG. 1 (a)

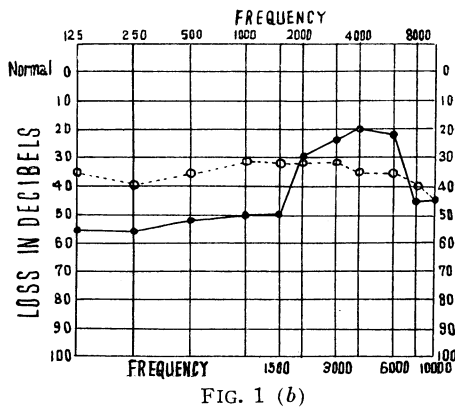


FIG. 1 (b)

Hearing threshold curves before and after operation (original method).

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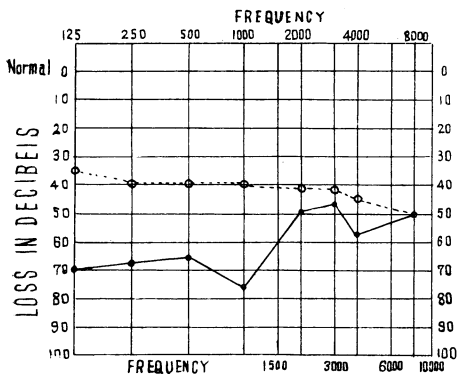


FIG. 2 (a)

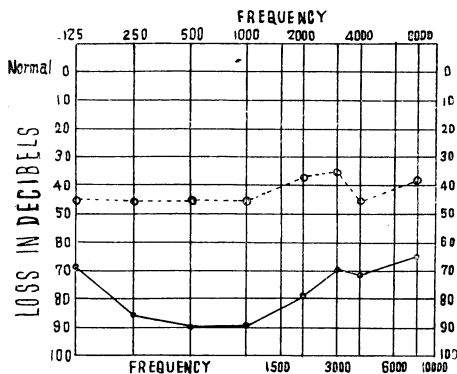


FIG. 2 (b)

Hearing threshold curves before and after operation (1st improved method)

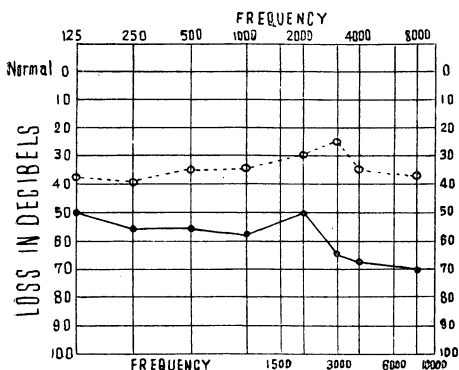


FIG. 3 (a)

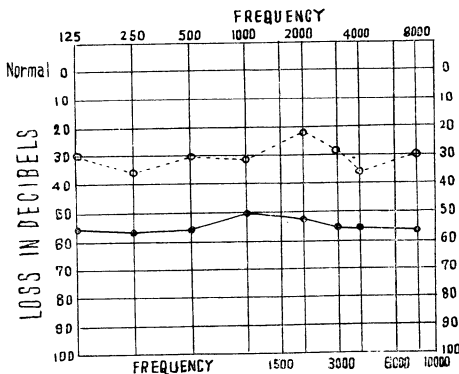


FIG. 3 (b)

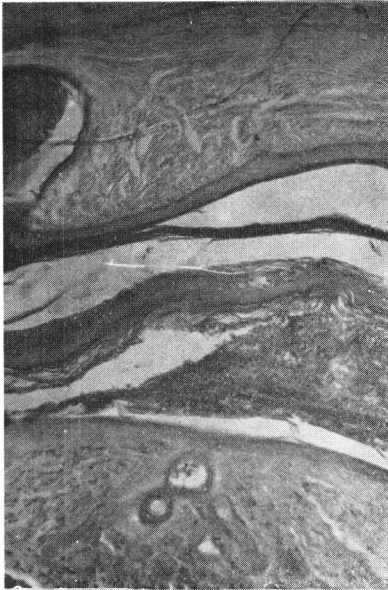
Hearing threshold curves before and after operation (2nd improved method)

characteristic in hearing gain is absent as 1-3 figures show: and the threshold curves run almost parallel to the Odb level.

ANIMAL EXPERIMENTS ON THE FATE OF THE NEWLY  
CREATED MIDDLE EAR CAVITY

The operative technique described in the previous report was followed on rabbits in order to examine the newly created tympanic cavity histologically.

10 days after the operation, without the use of varidase, the newly created tympanic cavity contains much pus, desquamated epithelial cells and hyaline substance, as figure 4 shows.



30 days after the operation, without use of varidase and 10 days after the operation with use of varidase, the newly created tympanic cavities look almost similar and contain practically no pus or other substances, as figure 5 shows.

What changes may occur in the epithelial layer of the turned up skin flap? This is a problem of second importance.

FIG. 4. Newly created tympanic cavity, 10 days after operation.

FIG. 5. 30 days after operation.

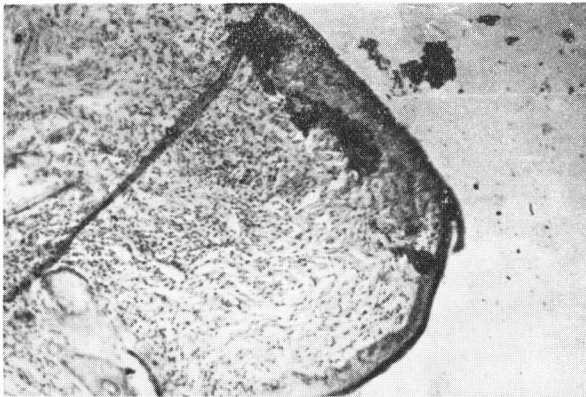
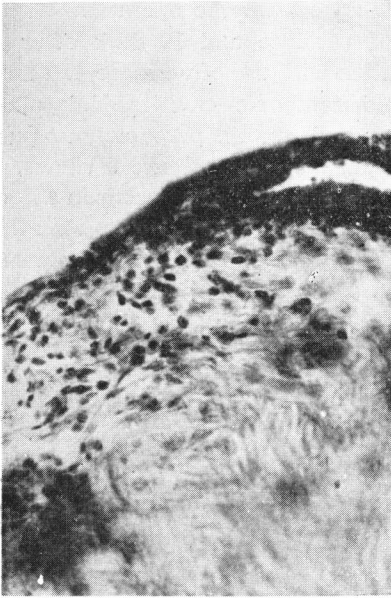


FIG. 6. Showing the covering of the epithelial layer by mucous membrane.



30 days after the operation without use of varidase, the epithelial layer cells were partially covered by the epithelium of the mucous membrane, as figures 6 and 7 show.

Namely, we are certain that varidase prevents the occurrence of infection and the epithelial layer of the turned up flap does not form cholesteatom.

FIG. 7. Microscopic photograph of the turned up skin flap, demonstrating epidermis burial.

#### FIRST IMPROVED OPERATION METHOD

Only a preauricular incision was made and the operation was extended to the turning of the skin flap of the external auditory canal, besides the original method described in the previous report. Then Thiersch's skin transplant was inserted into the operated cavity so as to cover the skin flap and the entire operated cavity.

This operation was performed as follows, as figures 8 to 22 show.

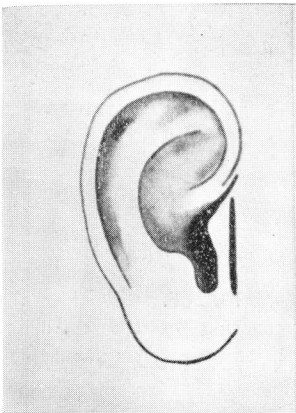


FIG. 8

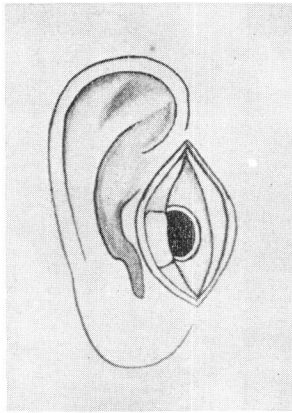


FIG. 9

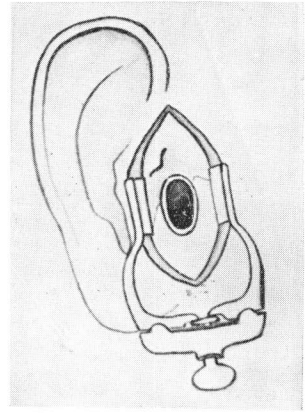


FIG. 10

FIG. 8. Skin incision (Popper's incision).

FIG. 9. External auditory canal was cut through between the soft and bony portions.

FIG. 10. Showing the operative field after cutting the external auditory canal.

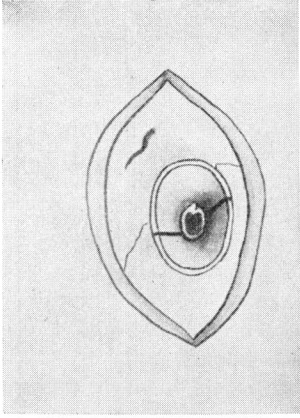


FIG. 11

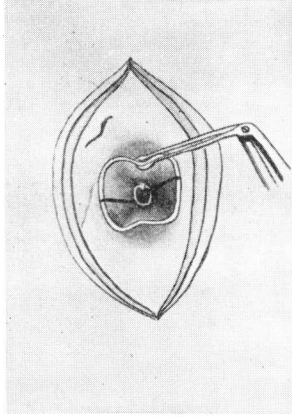


FIG. 12

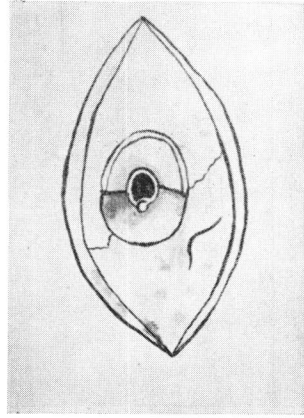


FIG. 13

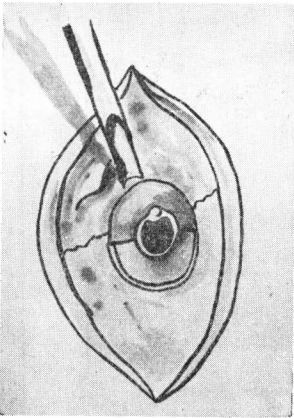


FIG. 14

FIG. 11. Incision was made through the bony auditory canal.

FIG. 12. Skin of the upper and posterior walls of the external bony auditory canal are cut off.

FIG. 13. After resection of the skin of the upper and posterior of the bony auditory canal.

FIG. 14. Start of the opening of aditus, antrum and pneumatic cells.

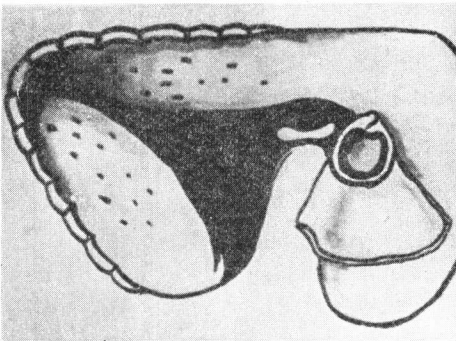


FIG. 15. After curettage of pneumatic cells.

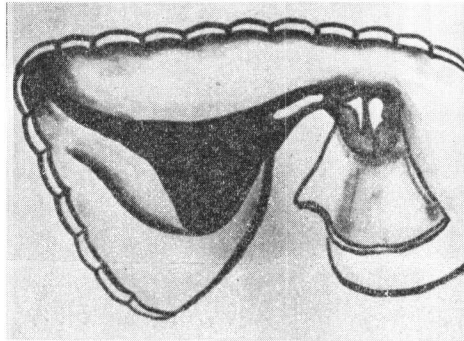


FIG. 16. Opening of epitympanum.

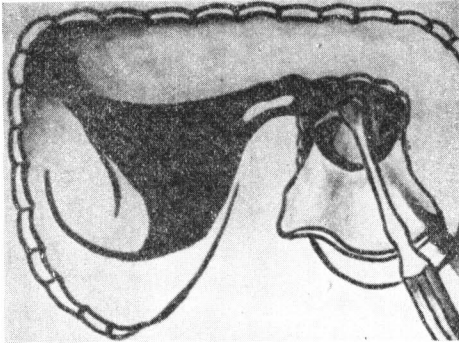


FIG. 17. Curettage of granulation, mucous membrane and carious bone in the middle ear.

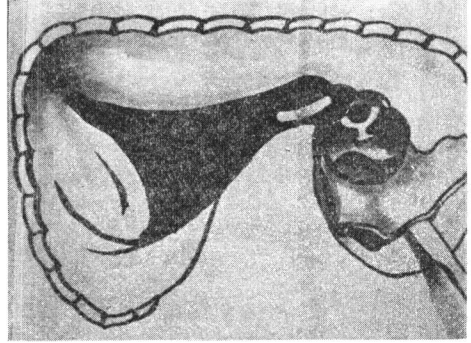


FIG. 18. Elevation of skin of the canal after curettage of tympanic cavity.

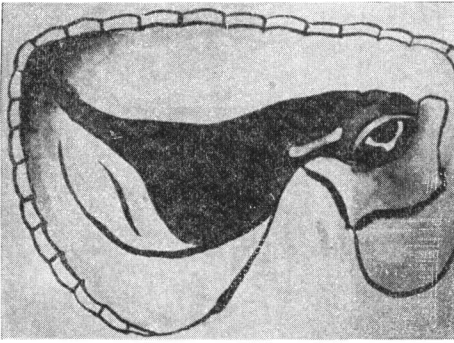


FIG. 19. After turning the skin flap.

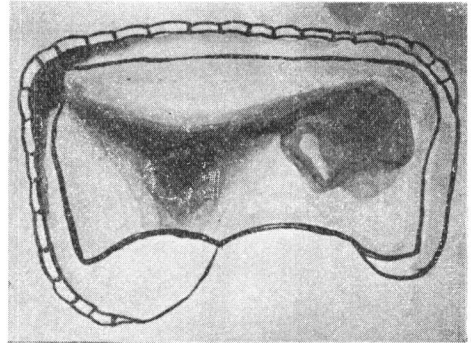


FIG. 20. Primary skin grafting over the operated cavity, and the turned up skin flap.

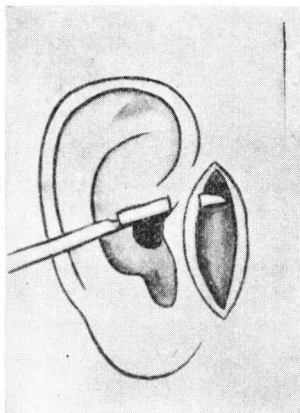


FIG. 21

FIG. 21. Partial cutting of soft tissue from external auditory canal in order to widen the auditory orifice.

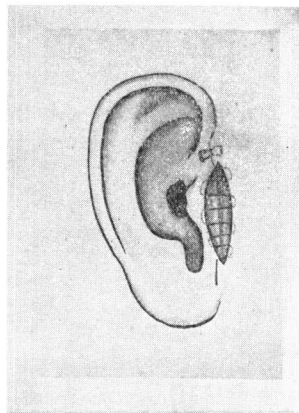


FIG. 22

FIG. 22. Suture of the skin incision.

This first improved method has the following advantages over the original method described in the previous report:

- 1) No formation of pedunculated skin flap from the postauricular region.
- 2) Accordingly, no formation of wound in the postauricular region.
- 3) Free skin graft was used instead of the pedunculated skin flap.
- 4) Primary free skin graft was transplanted over the entire operated bony cavity and the turned skin flap formed from the external canal.
- 5) Aftertreatment is painless.
- 6) Much less time than by the original method is necessary for aftertreatment.

#### SECOND IMPROVED OPERATION'S METHOD

Skin incision resembles Lempert's, but the external auditory canal is entirely crossed through between the soft and bony parts. Then a radical mastoidectomy is performed with complete curettage of the tympanic cavity. After curettage of the oval and round niches, free skin graft large enough to cover the operated bony and tympanic cavity is inserted so as to cover the bony operated cavity and to form a new tympanic cavity. In the newly formed tympanic cavity varidase is instilled, to dissolve blood and to prevent infection.

This operative procedure is as shown in figures 23-34.

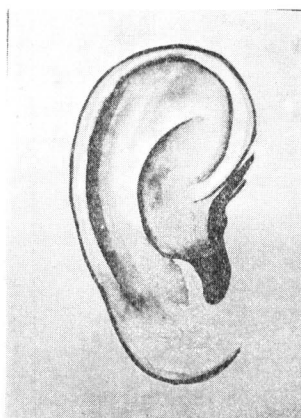


FIG. 23

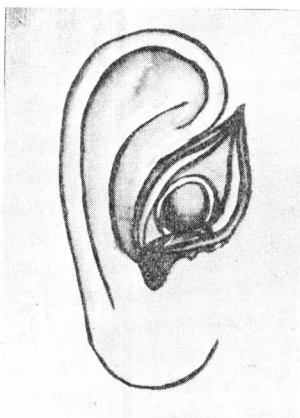


FIG. 24

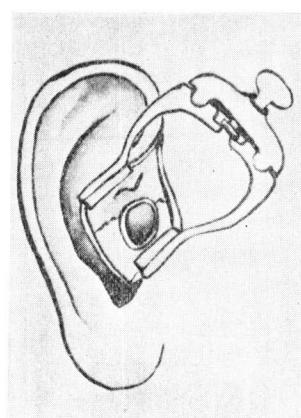


FIG. 25

FIG. 23. Skin incision (Resembling Lempert's incision).

FIG. 24. External auditory canal was cut through between the soft and bony portions.

FIG. 25. Disclosing the operative field after cutting the external auditory canal.



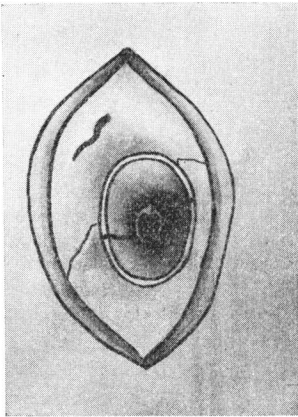


FIG. 26

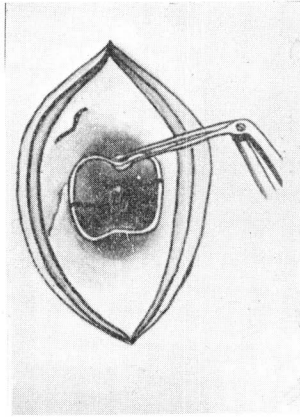


FIG. 27

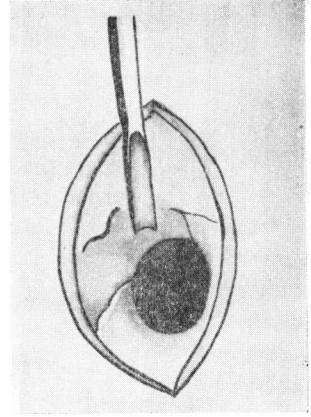


FIG. 28

FIG. 26. Incision was made through the bony auditory canal.

FIG. 27. Skin of the entire external bony canal is cut off.

FIG. 28. Start of opening of aditus, antrum and pneumatic cells.

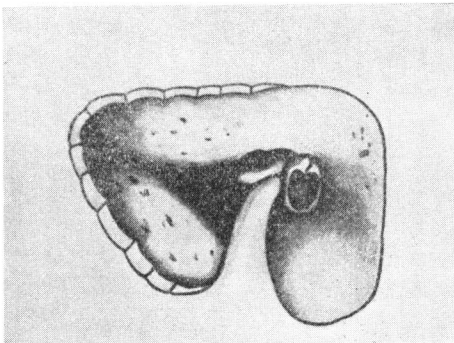


FIG. 29. After curettage of pneumatic cells.

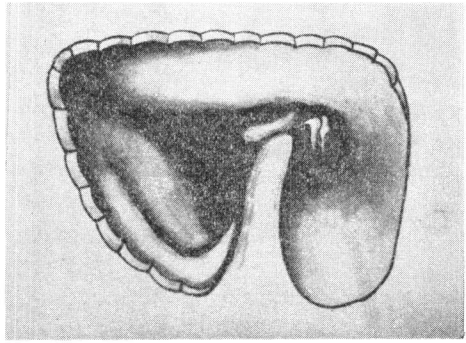


FIG. 30. Opening of epitympanum.

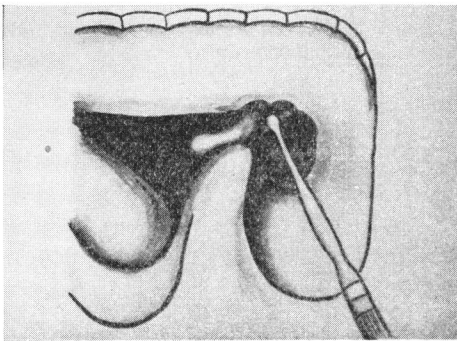


FIG. 31. Curettage of granulation, mucous membrane and carious bone in the middle ear cavity.

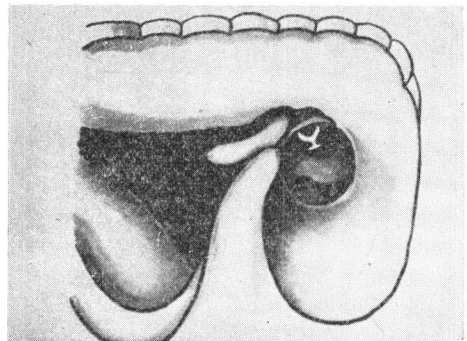


FIG. 32. After complete curettage of diseased tissues in the middle ear cavity.



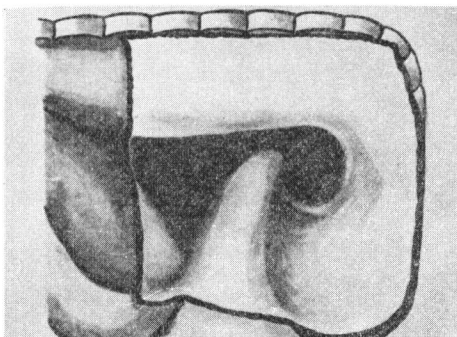


FIG. 33

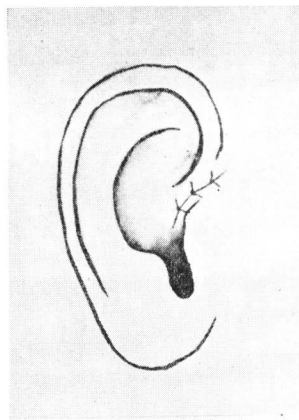


FIG. 34

FIG. 33. Primary skin grafting was made to cover directly the operated cavity and to prepare the tympanic membrane.

FIG. 34. Suture of the skin incision.

This second improved operative method has the following advantages and characteristics.

- 1) Skin of the bony external auditory canal was entirely removed.
- 2) Accordingly, pathological changes in the hypotympanum can be completely removed.
- 3) It is easy to treat the pathological conditions of the fossa rotundum, fossa ovalis and stapedius muscle.
- 4) New tympanic membrane is also formed by merely a free skin transplant.
- 5) The scar from this operation is almost negligible.

#### REFERENCES

- 1) S. GOTO. *Nagoya J. med. Sci.* **16**: 122, 1953.
- 2) S. GOTO. *Otolaryngology* **26**: 154-156 and 311-314, 1954 (Japanese).

