Atrophic Tympanic Membrane and Hearing Assessment

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Received: 19 December 2010 / Accepted: 27 January 2011 / Published online: 23 February 2011
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Abstract The hearing threshold in atrophic tympanic membrane is assessed in 35 individuals. Assessment of hearing threshold in patients having atrophic tympanic membrane. Prospective clinical study. Tertiary referral centre. Thirty-five patients who had atrophic tympanic membrane in one ear and normal tympanic membrane of the other ear which was used as control, were selected. Hearing threshold of patients having atrophic tympanic membrane. Twenty-nine patients with atrophic tympanic membrane had absolutely normal PTA of the ear and the opposite ear with normal tympanic membrane had similar normal PTA. Majority of the patients with atrophic tympanic membrane have normal hearing.

Keywords Atrophic tympanic membrane · Pure tone audiogram

Introduction

Routinely in otorhinolaryngology clinics, we come across atrophic tympanic membrane which has healed on its own. The patients are usually asymptomatic. Atrophic tympanic membrane is an incidental finding in most of the cases. We undertook a study to assess hearing threshold among these patients who had atrophic tympanic membrane in one ear with the control as normal tympanic membrane of the opposite ear of the same patient. The necessity of such a study was required, because as and when an atrophic

tympanic membrane is come across, no surgical intervention is done.

Hypothesis Assessment of hearing threshold in patients having atrophic tympanic membrane.

Methods

Inclusion Criteria

Study group Patients who have atrophic tympanic membrane in three quadrants or more in one ear.

Control group The other ear of the same patient with normal tympanic membrane as control.

Exclusion Criteria

Patient having less than two quadrants of atrophic tympanic membrane, bilateral atrophic tympanic membrane, other middle ear pathologies, external ear pathologies, or presbycusis or any other conditions leading to decreased hearing.

Procedure

All the patients visiting the otorhinolaryngology department were routinely examined. The tympanic membrane was examined using an otoscope. Individuals having atrophic tympanic membrane in three or more quadrants in one ear were subjected to pure tone audiometry.

Result

Thirty-five patients who met our criteria were selected. Fourteen patients were male, 21 were female patients. They

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were in the age group of 15–45 years. Nineteen patients had atrophic tympanic membrane in the right ear and 16 in the left ear. The mean of the average speech frequency taken at 500, 1,000 and 2,000 Hz was 12.33 dB in the atrophic tympanic membrane and 9.86 dB in the normal tympanic membrane.

Of all these patients 29 had absolutely normal hearing except six patients who had 20 dB conductive loss on the ear with atrophic tympanic membrane. The opposite ear of the same patient had normal hearing.

Discussion

A simple perforation of the tympanic membrane has effects over the conduction of the sound in various ways.

Firstly, there is decreased area of TM vibration affecting the delicate transformer mechanism. The hearing loss also varies according to the size and site of the perforation. The posterior quadrant perforation has slightly more hearing loss than the anterior ones [1].

The other factors of the perforation of the tympanic membrane are that sound may hit the round window and the phase changing effect of intact tympanic membrane is not present.

In healthy tympanic membrane, the tympanic membrane has three layers. They are the outer epithelial layer, inner mucosal layer and middle fibrous layer.

In atrophic tympanic membrane the fibrous layer is deficient or totally absent which can be made out clinically by its translucency. Govaerts and co-workers found that this was due to thinning of the lamina propria from its normal thickness of 100 microns to approximately 2–3 microns [2]. This thinning of the lamina propria is due to inhibition of the fibroblasts. The exact cause of this inhibition of fibroblastic growth is not known.

We, in our setting had assessed hearing of the patients who had atrophic tympanic membrane in three and more than three quadrants. We found out that these 29 patients had normal hearing threshold. Even though the tympanic membrane is atrophic, the thinning had no effect on the transformer mechanism. Further in the conduction of sound the atrophic tympanic membrane is just as capable as a normal tympanic membrane in conduction of sound.

The atrophic tympanic membrane does not affect the conduction of sound, as it does not affect the transforming mechanism in any of the ways.

Statistical analysis was done using *t*-test and the result was $P > 0.05$. Therefore the difference between the two is not statistically significant.

In temporal bone study, it was found that radial collagen fibres in tympanic membrane play an important role in conduction of sound above 4 kHz [3].

Fig. 1 Mean of speech audiometric frequencies (500 Hz, 1 kHz, 2 kHz) of 35 patients

Atrophic tympanic membrane is capable as normal tympanic membrane in conduction of sound. Though it is not as stable and sturdy as a normal tympanic membrane, it is more prone to retract or adhere to promontory [4].

Importance of the Study

The fate of the graft in myringoplasty is that it takes the place of fibrous layer. The graft serves as a scaffold over which the epidermal layer can migrate and close the defect. The mesenchymal cells proliferate. The graft is thinned and possibly degraded and replaced when new collagen is produced [5]. Such a TM is adequate for purpose of conduction of sound [6].

From this, we understand that graft plays insignificant role in conduction of sound. In atrophic tympanic membrane, even though the fibrous layer is deficient, the conduction of sound is not disturbed.

We derive from this study that, atrophic tympanic membrane doesn't require any surgical intervention. It is as normal tympanic membrane in conduction of sound.

This article provides a scientific study for a surgeon to quote to a patient with an atrophic tympanic membrane, that he/she may not require any surgical intervention if he/she has no complaints (Fig. 1).

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