ORIGINAL ARTICLE

OTOENDOSCOPIC REPAIR OF TRAUMATIC PERFORATION OF TYMPANIC MEMBRANE

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ABSTRACT

Objective: To assess the closure rates and time required for closure of traumatic perforation of tympanic membrane using otoendoscopes and compare with existing data.

Patients and Methods: Seven patients of slap trauma leading to perforation of Pars Tensa of Tympanic Membrane divided into type A with no loss of TM surface area and type B with definite loss of TM surface area. Edge approximation and gelfoam reinforcement for type A and gelfoam packing and paper patch reinforcement for type B perforation was done.

Results: Both the groups had better rates of closer and less time required for closure than the reported data. Group A had excellent healing.

Conclusion: Using otoendoscopes and intervening in traumatic perforation cases has beneficial effects.

KEY WORDS – Otoendoscope, traumatic perforation, Tympanic Membrane

SOURCE OF SUPPORT – None

CONFLICT OF INTEREST – None

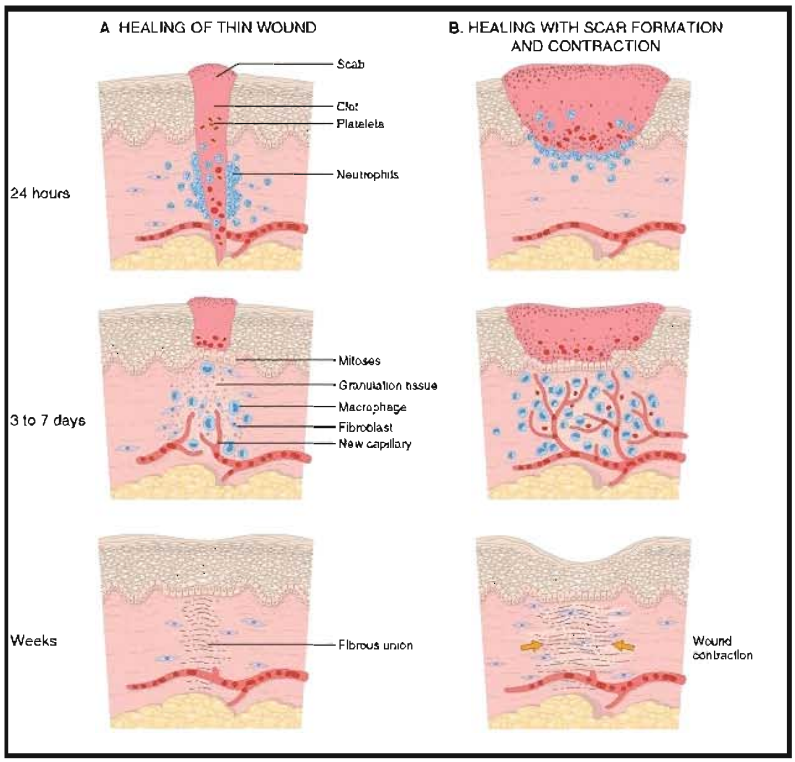

Fig 1 : – Wound healing and scar formation. A, Healing of wound that caused little loss of tissue: note the small amount of granulation tissue, and formation of a thin scar with minimal contraction. B, Healing of large wound: note large amounts of granulation tissue and scar tissue, and wound contraction.[2]

INTRODUCTION

Traumatic perforations carry good chances of recovery even if left untreated. If treated promptly, in the manner described here, chances for complete closure of defect become still better. In our series of seven cases of tympanic membrane perforation caused by slap trauma, we used a zero degree 4mm telescope for inspecting the tympanic cavity and performing the procedure. We minimally intervened by providing a scaffold for growth of membrane. Healing was found to get speeded up and the rates of closure were better.

Otoendoscopic examination of tympanic cavity was performed to inspect the tympanic cavity. Otoendoscopic surgery is the latest addition to the bouquet of currently available management options for otologic conditions. Endoscope with its better image quality and access to difficult areas is on a rising trend.

PATIENTS AND METHODS

This study is a prospective observational study from August 2013 to January 2014. A diagnosis of traumatic perforation was made if there was a definite history of trauma and a breach of pars tensa could be demonstrated by otoendoscopy. Patients having previous history of ear discharge were excluded from the study. On examination, if discontinuity of ossicles was observed or any fracture line in the temporal bone was visualized then those cases were not included in the study. A thorough search of tympanic cavity for retained foreign body was done in each case. If any foreign body was found, it was removed using microinstruments and the further management was not altered.

The patients included in the study were divided into two groups on the basis of status of tympanic membrane. Those cases, where there was no loss of tympanic membrane, were classified as type A. Cases where definite loss of tympanic membrane surface area was seen, were grouped as type B. This division of cases into type A and B was made, knowing the trends of healing of skin wounds (Fig. 1). Type A cases were similar to healing by primary union and type B cases were similar to healing by secondary union.[1,2]

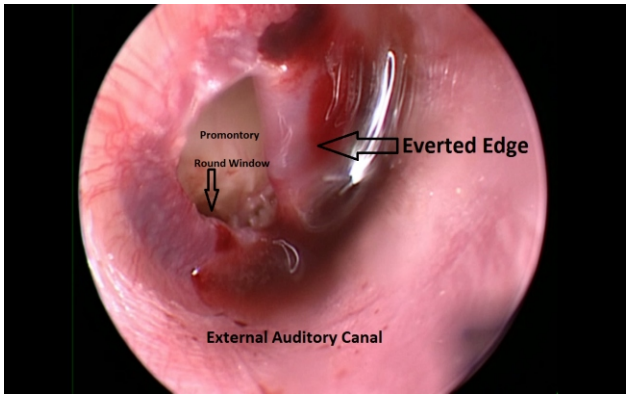

Fig 2 : – Otoendoscopic picture showing type A traumatic perforation with everted edge forming a flap

Patients who presented after one month of trauma were not included in the study. Earliest case to present was a patient three days after trauma and the one presenting most delayed was 21 days after trauma. History, physical examination and pure-tone audiometry were conducted for each patient apart from otoendoscopic examination.

In patients of group A (Fig. 2) where there was no loss of surface area of tympanic membrane , approximation of edges was attempted. After approximation of edges, gelfoam soaked in paraffin based neomycin ointment was applied over the membrane, to keep it in place (Fig. 3). No gelfoam packing was used in the middle ear cavity, regardless of the inversion or eversion of perforation edges.

In patients of group B, there was loss of some portion of tympanic membrane. These patients follow healing by second intention. In these cases also, similar procedure was followed as in type A patients, but management differed. First point of difference was packing of middle ear cavity with gelfoam in these patients. Second point of difference was the external scaffold, which was a patch, obtained from the cover of silk sutures, used routinely for other surgeries. The paper was preserved in sterile container after cutting into oval pieces roughly 8mm by 6mm. This patch was then reinforced with gelfoam soaked in paraffin based neomycin ointment. Third point of difference was that these patients were advised oral antibiotics, Cefpodoxime 200mg tablets twice daily for ten days, as these cases were supposed to have some infection component.

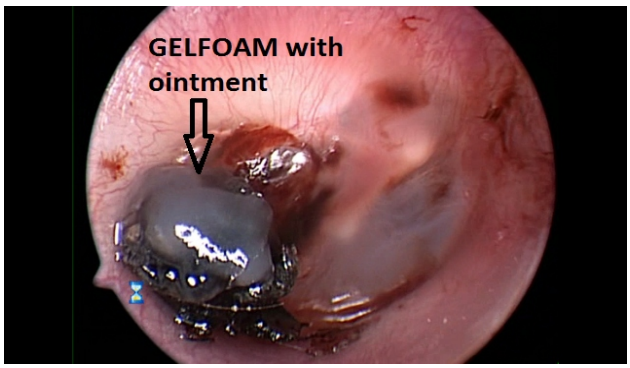

Fig 3 : – Otoendoscopic picture showing type A traumatic perforation reinforced with gelfoam after approximating the everted flap at 10 days post procedure follow up.

The patients were called for follow up regularly. First visit was quite early, which was scheduled three days after the procedure. The purpose of this early visit was to ascertain that the scaffold is in place and the flap of type A perforations is approximated well. Subsequent four visits

were at weekly intervals, completing a month (Fig. 3). Thereafter patients were called fortnightly, till the completion of three months. After three months conservative management was aborted and tympanoplasty was planned if required.

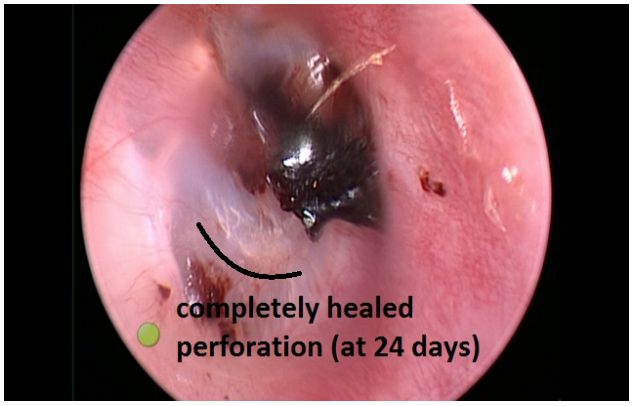

Fig 4 : – Otoendoscopic picture showing type A traumatic perforation at fourth follow up visit i.e. 24 days after the procedure. Hard blood clot is seen which is separate from the tympanic membrane and removal is not required.

RESULTS

Total of seven cases were enrolled in the study. Out of seven cases, 4 were females and 3 males. Mean age was 25.57 years. The seven patients, who were enrolled in the study, fell in either of the two groups: group A with no loss of tympanic membrane surface area which was treated by simple flap approximation along with gelfoam reinforcement (n = 3) and group B with definite loss of tympanic membrane surface area which was treated with gelfoam packing and paper scaffolding (n = 4). Complete closure of perforation was seen in all three cases of group A i.e. 100% rate of closure. While in group B complete closure was seen in 3 out of four cases at the end of three months i.e. 75% rate of closure. One of the patient in group B developed ear infection due to water entry into the ear, with subsequent development of discharge.

An average gain in PTA of 19 dB was observed. Mean time required for closure of perforation in group A was 7.67 days (Fig. 4). In group B mean time for closure was 21.67 days, excluding the fourth case which developed infection. As compared to time required for spontaneous healing i.e. 27.4 days[3], our both the groups healed up more rapidly.

DISCUSSION

Trauma to the tympanic membrane and the middle ear can be caused by (1) overpressure, (2) thermal or caustic burns, (3) blunt or penetrating injuries, and (4) barotrauma. Overpressure is by far the most common mechanism of trauma to the tympanic membrane. The major causes of overpressure include slap injuries and blast injuries. Most of these perforations cause mild hearing loss, aural fullness, and mild tinnitus. Irrigation and pneumatic otoscopy should be specifically avoided in these patients. A complete neurotologic examination should also be performed in these patients to document the status of the cranial nerves including the facial nerve and the vestibular nerve as well as the central nervous system.[4]

If there is drainage through the tympanic membrane perforation, the clinician should determine and note if the drainage is consistent with cerebrospinal fluid (CSF). If a CSF leak is suspected, immediate CT scan of the temporal bone should be obtained to rule out a fracture. If the drainage is not consistent with CSF, oral antibiotics should be prescribed. A history of vertigo or nausea and vomiting and an audiogram showing a conductive hearing loss of more than 30 dB suggest disruption of the ossicular chain. Profound sensorineural loss also may signify oval window or cochlear damage.[4]

Post-traumatic ossicular chain abnormalities include incudostapedial joint separation, dislocation of the incus, fracture and dislocation of the stapes, massive dislocation of the entire chain, and ossicular fixation owing to scarring or ossification. Incudostapedial joint separation is the most common ossicular abnormality. In patients in whom significant conductive hearing loss (ie, greater than 25 dB) is found, incudostapedial joint separation or incus dislocation should be suspected.4 Angled telescopes are very helpful in this situation. Even zero degree telescopes can be used to visualize incudostapedial joint with some difficulty.

In 1967, Mer used endoscope in cadaver ear.[5] Transtympanic middle ear endoscopy was initially reported by Nomura[6] and Takahashi and colleagues[7] Poe and Bottrill used transtympanic endoscopy for the confirmation of perilymphatic fistula and the identification of other middle ear pathologic conditions. Kakehata used microendoscopy and transtympanic endoscopy for evaluation of conductive hearing loss and inspection of retraction pockets.[8]

Thomassin and colleagues reported on operative ear endoscopy for mastoid cavities and designed an instrument set to be used for that purpose.[9] Badrel-Dine and El-Messelaty reported on the value of endoscopy as an adjunct in cholesteatoma surgery and documented a reduced risk of recurrence when the endoscope was used. Abdel Baki reported on using endoscopic technique to evaluate disease within the sinus tympani.[10] Mattox reported on endoscopy-assisted surgery of the petrous apex. More recently, Presutti and Marchioni, have described primary transcanal endoscopic ear surgery.[11]

Although it has been two decades since the first use of operative endoscopy for the exploration of old mastoid

cavities, the endoscope is still used infrequently in the day to day surgical management of ear disease around the globe.[9]

Microscopes offer the advantage of bimanual control and have been in use for quite a long time. Hands and eyes of ENT surgeons are tuned with microscope. On the other hand endoscope with its wide viewing angle is able to show unreachable areas of middle ear with ease. The image quality obtained with endoscopes is very fine and the magnification can be increased and decreased with just the movement of endoscope near or far from the structures. Tympanic membrane, annulus and the ear canal, all can be seen in a single view, which gives excellent orientation to the surgeon. Even the presence of canal overhangs does not obscures the vision and the entire tympanic membrane is visible. The problem of depth perception is overcome by continuous movement of endoscope. Definitely some expertise and training is required to be able to use endoscope for ear surgeries.

CONCLUSION

Traumatic perforations should be treated because the rates of closure are higher with treatment and also the closure is earlier in the treatment group. Providing a scaffold speeds up healing. Using endoscope has a dual advantage of thorough inspection of tympanic cavity and ossicles and also the procedure can be performed in the same sitting.

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