Original Research Article

Type I tympanoplasty with total annular excision; A single center prospective study

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Abstract

Introduction: CSOM (mucosal type) is characterized by the presence of tympanic membrane perforation with episodic ear discharge associated with URTI and associated conductive hearing loss. Such a condition is addressed surgically by tympanoplasty.

Aims: We aimed to study results of type I Tympanoplasty with Total Annular excision in mucosal type of CSOM. **Materials and methods:** Patients in this study (n= 20) had a central perforation of Tympanic membrane with history of intermittent episodes of ear discharge & hardness of hearing. Pre operative assessment with otoendoscopy done to rule out squamosal pattern of CSOM and hearing assessment was done to rule out SNHL. Routine steps of underlay technique of tympanoplasty were performed except for complete removal of Tympanic membrane with fibrous annulus was performed and grafting with temporalis fascia was done by placing the graft under handle of malleus and edges (360°) placed under EAC skin close to bony annulus. Routine post operative care given and patients followed up for a period of one year. **Results** : 18 out of 20 cases showed definitive graft uptake and improvement in conductive hearing loss. **Conclusion** : This technique allowed prevention of post op Mucosalisation which was not uncommon in post operative ears after tympanoplasty.

Keywords: TAE (Total Annular Excision) , Mucosalisation of Tympanic membrane , underlay technique

Introduction

Type 1 tympanoplasty is the routine surgical process for treating chronic tympanic membrane (TM) perforations, and temporalis fascia is the most common graft material. This can be done by either underlay or overlay technique. However, underlay fascia graft tympanoplasty has its own set of problems like anterior residual perforation due to inadequate anterior tucking of graft or post operative discharge or itching due to mucosal tissue on lateral surface of neo tympanic membrane. Overlay tympanoplasty is another technique particularly effective for large, anterior perforations. The primary disadvantages of this technique include increased technical demands of surgery and postoperative blunting or lateralization of the TM graft. Extensive disruption of the normal tissue relationships required in this procedure may lead to delayed healing or long-standing granular myringitis . A variety of surgical techniques have been developed to increase the surgical success of treating tympanic perforations [1,2,3,4]

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In routine underlay type of tympanic perforations freshening the margins of perforation and placing the graft under the residual tympanic membrane is norm. If adequate clearance of TM perforation margins was not done and overgrowth of mucosa of middle ear across the perforation margin on to the outer surface would lead to discharging ear in post operative period. To overcome this, entire tympanic membrane with annulus is removed and the new graft placed all around 360 ° on the bony meatal wall annulus under canal skin cuff,making it a definitive interlay technique of tympanoplasty. And the graft placed definitely acts as barrier separating middle ear mucosal layer from Outer epithelial layer of TM .We aimed to study results of Total Annular Excision for type I Tympanoplasty in mucosal type of CSOM.

Materials and methods

This was a prospective case series study performed from January 2019 to June 2021. The inclusion criteria were central perforations with mucosal type of chronic otitis media (COM), no suspicion of an ossicular chain defect, conductive hearing loss no greater than 40 dB in any frequency, and dry ears for at least 2 months prior to surgery. 20 cases age ranging between 19-49 years with no other comorbidities admitted in our department were included. Pre op evaluation with otoendoscopy and PTA was done to assess hearing loss.

Inclusion Criteria

Mucosal type of csom with conductive hearing loss were included in the study.

Exclusion criteria

Patients with active disease, typanosclerosis, revision myringoplasty, mixed hearing lossL, atticoantral type CSOM, ossicular chain fixation.

Surgical method

Under general anesthesia temporalis fascia graft harvesting from post auricular area was done. Elevation of TM flap as done for routine

tympanoplasty followed by elevation of anterior third of TM flap along with annulus from medial to lateral so as to make 360° flap elevation close to bony annulus . Crucial step of excision of residual tympanic membrane along with fibrous annulus was done leaving cuff of EAC skin close to bony annulus. Ossicular chain mobility assessment was done. Harvested graft was placed under handle of malleus with its edges placed on bony meatal wall under cuff of EAC flap. Graft is supported by gelfoam. All patients were given a course of antibiotic (amoxicillin plus clavulanic acid) postoperatively to prevent infection. Packing gauze soaked in antibiotic ointment for the EAC was removed 7 days postoperatively and biodegradable gelfoam fragments were aspirated from the EAC at 4 weeks postoperatively; this allowed the graft to be visualized. All patients were followed up in the ENT outpatient department at 1 weeks, 1 month, 3 months, and 6 months postoperatively. Endoscopic otological examinations were performed. The primary outcome was the graft success rate at 6 months postoperatively.

Statistical analyses were performed using SPSS version 20. The data are expressed as the mean (standard deviation [SD]) and percentage (%). Differences between preoperative and postoperative air–bone gaps were analysed.

Result

The study population consisted of 20 patients with unilateral central perforation with COM (15 females and 5 males; average age 19.2 ± 11.4 years). Overall, 12 patients had left side involvement and 8 had right side involvement, and the mean duration of perforation was 19.1 ± 10.4 years.

Perforations were small in 2 (10%) patients, medium in 5 (25%) patients, large in 10 (50%) patients, and subtotal and total in 3 (15%) patients. The perforation position was anterior in 10 (50%) patients, subtotal and total in 3 (15%) patients, and posterior in 7 (35%) patients. The mean operation time was 65.1 ± 12.3 min among the 20 patients.Patient was followed up at the end of 1st week, after 3rd week and once after 3rd month and after 1year. 15 out of 20 cases showed graft uptake by 3rd week with definitive neovascularisation all around and in 3 cases graft uptake with residual anterior perforation noted initially but healed completely by 3rd month follow up . PTA done after 3months showed conductive hearing loss improvement .

At 6 months, the graft success rate was 90% (18/20) and two residual perforation were seen . The mean ABG improved from 11 ± 9.3 dB preoperatively to 7 ± 2.4 dB postoperatively for small-and medium-sized perforations (P = 0.11); the mean ABG improved from 22 ± 8.9 dB preoperatively to 10 ± 2.5 dB postoperatively for large perforations (P < 0.05,); the mean ABG improved from 29 ± 6.8 dB preoperatively to 11 ± 4.1 dB postoperatively for subtotal and total perforations (P < 0.05). For the individual ABG closure percentages of perforation size,100% (2/ 2) had ABG closure within 10 dB in the small- and medium sized perforations; 80% (4/5) had ABG closure within 10 dB and 20% (2/10) had closure within 20 dB in the large perforations; 33%(1/3) had ABG closure within 10 dB.

Two cases were considered as failure because of anterior residual perforation (Due to improper placement of graft while performing procedure) . No Mucosalisation of TM was noted for any case at any level of follow up.

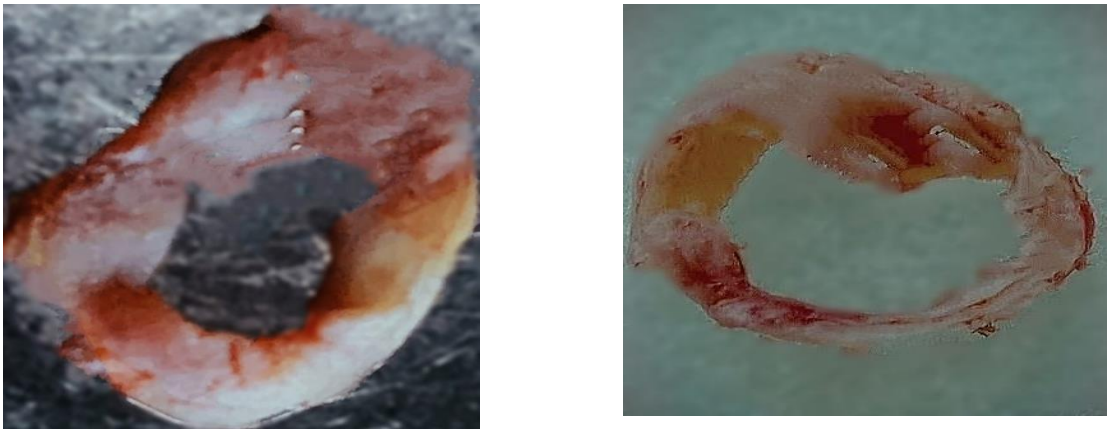

Fig 1: Specimen of excised tymapnic membrane with annulus

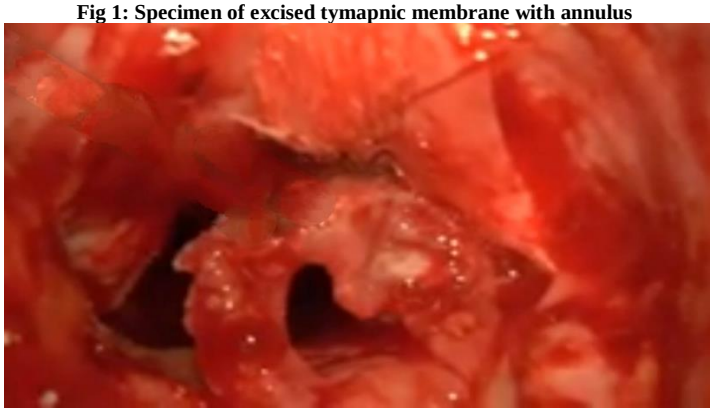

Fig 2: Intra operative picture of total annular excision of tympanic membrane

Fig 3:Post operative neo tympanic membrane

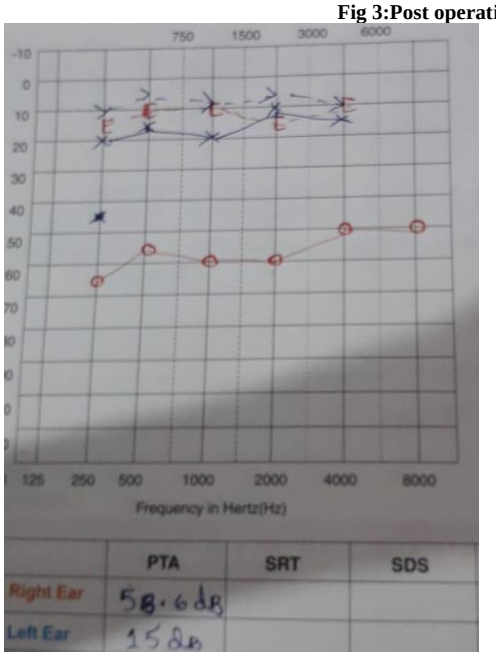

Fig 4: PTA of a patient with Right CSOM

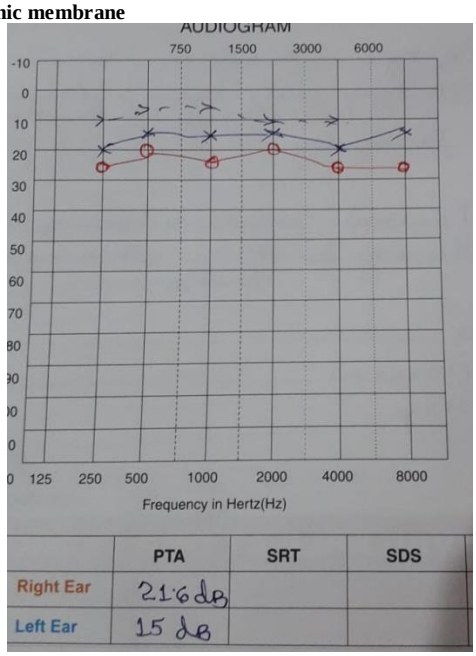

Fig 5: Post operative audiogram of same patient after right tympanoplasty l (By Total annular excision technique)

Discussion

Tympanoplasty – a routinely performed procedure for tympanic perforations with standard technique of grafting using temporalis fascia where graft is placed under the remnant tympanic membrane margins after tympano meatal flap elevation laterally. An important step in underlay procedure of tympanoplasty is freshening the epithelialised edges of perforation [5,6,7]

During this process , there is always a chance of residual mucous membrane under the epithelial surface of remnant tympanic membrane and post operative Mucosalisation of neo membrane on its lateral aspect is not uncommon problem. This is responsible for post operative discharge inspite of intact Tympanic membrane. This may appear either in the form of multiple islands of mucosal patches on drum or completely mucosalised lateral surface of tympanic membrane. It was managed medically by chemical cauterisation. This problem has been addressed by Total annular excision technique which was developed and propagated by Dr.K.P.S Prabhu of Kannur.

In this technique , entire tympanic membrane along with annulus is excised and graft is placed directly on bony annulus all around supported by handle of malleus medially and External auditory canal skin flaps on its edges laterally. This will completely separate mucosal and epithelial layers[8].TAE is a necessary adjunct because the annulus in the normal as well as the diseased eardrums harbour mucous membrane intimate with its surface with its surface- leaving the annulus will be at odds with the basic premise of this technique- which is to ensure that there is no mucus lateral to the graft laid for reconstructing the diseased ear drum. A double blinded randomized controlled trial done in SMS medical college at Jaipur ,India using TAE interlay tympanoplasty, results of which were presented in 14 th Asia-Oceania ORL-HNS congress has been shown to lessen the risk of the result of a post operative discharging red ear drum manifold. The end result after healing in this TAE interaky procedure is a trimeric tympanic membrane with equal thickness in all quadrants – and this trimeric tympanic memebrane covers the handle of malleus between the outer epithelium layer the inner mucous membrane layer, and the graft itself serves as faux fibrous layer[9].

By this procedure of a neo tympanic membrane creation, chances of mucosa on lateral surface and epithelium on medial surface is almost nil. It also simultaneously allow quick neo vascularisation of the membrane. This technique can be used for any kind of perforation irrespective of size and location. This can be practised by both endoscopic or microscopic ear surgeons (endaural or post aural approach)[10,11,12]. This procedure doesn't need any other extra instrument apart from regular instruments used for routine tympanoplasty. This is only a modification of standardised technique to address mucosalisation issue. As this procedure is neither associated with any complications per se nor a hindrance for graft uptake, it can be safely taken up as a definitive surgical procedure.

Conclusion

Total annular excision is a promising new interlay tympanoplasty technique because it provides a three-layered physiologically and anatomically near-natural membrane with good vibratory function and good vascularity while avoiding the mucosal islands that can occur with traditional underlay techniques.

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