

Prospective study on full cuff technique with fishmouth grafting in type 1 tympanoplasty and its hearing outcome.

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Abstract: Introduction: Chronic otitis media (COM) is a common health problem in developing world and has a major impact on patient in the form of hearing loss. Temporalis fascia is commonest graft material used for tympanoplasty as it is readily available through same post aural incision. The study was conducted with an aim to find out the effectiveness of full cuff technique with fish mouth grafting in terms of graft stability, graft uptake, hearing improvement and complications. **Materials and Method: Result:** The gain in hearing improved from 5 db to 10 db to 20 db in full cuff technique with fishing technique and 5 db to 7 db to 17 db in without full cuff technique w.r.t to follow up of 1, 3 and 6 months, residual perforation and medialization of graft was seen in 5, 7, 7 cases in full cuff technique with fishing technique and 6,8,10 cases in without full cuff technique w.r.t to follow up of 1, 3 and 6 months, Tympanosclerosis was found in 0,1,2 case in full cuff technique with fishing technique and 0,3 ,7 cases in without full cuff technique w.r.t to follow up of 1, 3 and 6 months whereas granulations were found in 0,4,6 cases in full cuff technique with fishing technique and 2,5,7 cases in without full cuff technique w.r.t to follow up of 1, 3 and 6 months. **Conclusion:** Full cuff technique has less chance of post operative tympanosclerosis and granulations and residual perforation. Full cuff technique has more chances of gain in hearing postoperatively.

Keywords: Full cuff technique; Fishing technique; Tympanoplasty

Introduction

Tympanoplasty is a surgical method, to eradicate middle ear infection and improve its function. A main part of tympanoplasty is repair of perforated tympanic membrane (TM) which results mainly from chronic otitis media (COM). Other etiologies include traumatic or neoplastic defects on the TM.¹ Chronic otitis media (COM) is characterized by recurrent natural discharge, hearing loss, tympanic membrane perforation due to chronic/long standing infection of middle ear cleft. COM is a common health problem in developing world and has a major impact on patient in form of hearing loss. COM is common among young and adult population in the developing countries due to malnutrition, lack of hygiene, respiratory tract infections and over population, associated with lack of healthcare facilities.² A majority of these perforations eventually heal spontaneously but the remaining chronic non healing perforations result in recurrent ear discharge and decreased hearing and will subsequently need tympanoplasty. Repairing the tympanic membrane perforation by performing tympanoplasty provides considerable benefits to the patient including prevention of ear infection, improvement in hearing and elimination of need to take water precautions.³

Different TM reconstruction techniques for tympanoplasty using different types of grafts, including temporalis fascia, perichondrium, palisade cartilage and Cartilage Island, have been described. While temporalis fascia has better functional outcome with respect to hearing, it is subject to poor dimensional stability. The poor dimensional stability of temporalis fascia grafts contributes to residual perforations following tympano-plasty, particularly in large TM perforations.⁴ In view of this, the present study is undertaken to find out the effectiveness of full cuff technique with fish mouth grafting in terms of graft stability, graft uptake, hearing improvement and complications

Material and Methods

The present prospective, observational study was conducted in the department of otorhinolaryngology among total 150 patients who were operated, out of which 75 were operated with full cuff technique and graft fishing while 75 were operated using conventional underlay technique over a duration of 2 years at tertiary health centre. Patients falling between the age group of 15 to 60 years, who presented to the outpatient department of otorhinolaryngology with, complaint of otorrhea and hearing loss were examined. Screening was done by taking a detailed clinical history and complete ENT examination along with otomicroscopy. The inclusion criteria consisted of patients with inactive mucosal type of COM associated with central perforation and pure conductive hearing loss whereas the exclusion criteria consisted of patients with ossicular pathology, trauma, cholesteatoma and mixed or sensory neural hearing loss.

After obtaining consent for participation, a written informed consent was obtained from the patient and/or his/her representative. Blood investigations (complete blood count (CBC), BSL, viral markers, blood urea/creatinine, serum electrolyte), urine examination, audiometry (puretone audiometry), pre anaesthetic check-up and consent for surgery was obtained pre-operatively.

For pre-operative assessment, otoscopic examination of ear, tuning fork tests- Rinne's test, Webers test, absolute bone conduction test, eustachian tube patency test in the form of Valsalva maneuver and a microscopy examination was performed to determine the size of the perforation, the middle ear mucosa, and the perforation borders. Wherever it was necessary, aural toileting was performed to remove debris and discharge and to keep the ear as dry as possible to avoid future difficulties. For each patient, routine blood investigations and other anaesthetic investigation, X- ray mastoid Schuller's View and pre- operative pure tone audiometry.

For surgical approach and preparation of graft, the patient is positioned supine with the face turned to one side and the operated ear up, clearly showing the critical surface markers required for the surgical approach after preparation and draping. It can be done under local or general anesthetic. Patients were premeditated half an hour before surgery if they were under local anesthetic. 3-Midazolam 0.03 mg/kg and Pentazocine 3-6 mg/kg injections were given. Atropine 0.6 mg is injected as a vagolytic and cardioprotective agent. Infiltration was done with 2% lignocaine with 1:1, 00,000 adrenaline using a 26x 1 1/2 gauge needle to provide hemostasis and local anaesthesia post auricularly.

The Temporalis Fascia graft was harvested measuring approximately 20×16 mm. Further graft was prepared by removing bits of soft tissue, fat and muscle tissue adhered to it along with trimming of its border. Graft was then placed on glass slide and 2-3 mm slit was made approximately 10 mm above the margin and 2mm away from superior margin towards the centre of graft. The purpose of making the slit in the graft is, to sleeve the graft through the slit on the handle of malleus (fishing) which in turn improve stability of graft and prevent medial/lateral displacement of graft. A T-Shaped periosteum deep incision was given over mastoid area, periosteal flap was elevated and posterior meatotomy done below the level of the spine of Henle. Mastoid self-retaining retractor applied. Refreshing the perforation's margins – The edges of the perforation are meticulously denuded with a small sickle knife or smooth curved pick under the microscope to ensure good capillary blood flow.

Full-Cuff technique:

Along the tympano-squamous and tympano-mastoid suture lines, incisions are created in the ear canal. The incision at 3'o'clock 5mm lateral anteriorly, incision will extend from 3'oclock to 11'o clock and other incision starting from 3'o clock 2mm lateral to previous incision extending till 7'o clock. As a result, there is small attachment at 3'o clock. Rosen's circular knife was used to elevate the Tympano-meatal flap to the fibrous annulus. The periosteum elevator was used to penetrate the middle ear from below the annulus. The malleus handle is skeletonized, with any fibrous threads or adhesions removed. Along the anterior canal wall, the annulus and tympano-meatal flap are also raised. The integrity and continuity of the ossicles were examined, as well as their motions. Round window reflex was visualized in all the cases. If there is any pathology in the middle ear, it is cleaned, gel foam soaked in the antibiotic solution kept in middle ear.



Figure 1: Temporalis fascia graft prepared for placement in middle ear under handle of malleus



Figure 2: Temporalis fascia graft with slit for Fishing technique of graft placement

Fishing technique of graft placement:

Temporalis fascia graft prepared and it is placed in middle ear under handle of malleus in such a way to ease the slit on graft to sleeve over the handle of malleus (Fishing) (figure 1 and 2) and enhance the spread of superior border of graft 2 mm over superior canal wall, inferior border of graft 2-3 mm over inferior canal wall, posterior border of graft 3-4 mm over posterior canal wall. After ensuring the appropriate extension and secure placement of graft, the external auditory canal was packed with antibiotic soaked gel foams. Incision was sutured in two layers and sterile mastoid dressing was done. No gel foam or any other material was placed under graft or middle ear in any case. Patients were discharged on 3rd post-operative day. All patients received two weeks of antibiotic (amoxycillin clavulanic acid two times a day), anti-histaminic (levocetirizine 5 mg once a day). Analgesics like diclofenac sodium 50 mg twice a day for 7 days. Patients were called for follow up on a weekly basis up to one month and every 15th day for next 2 months. The suture removal was done on 10th post-operative day and a combination of antibiotic steroid ear drop was advised for 1 month. Patients were assessed under microscope on each follow up to examine graft uptake and post-operative complications (if any). On 1month, 3month and 6 month follow -up, pure tone audiometry was performed to evaluate the improvement in hearing as compared to the pre-operative PTA recorded.

Results:

In our study total 150 patients were analyzed for the follow up period of 1 month and 3 month and 6 month and it was observed that graft was well accepted in 137 patients while in 13 patients residual anterior perforation was found.

Table 1. Post operative examination findings in full cuff technique with fishing technique

Findings	1 month	3 months	6 months
Blunting of anterior angle	0	2	4
Narrowing of external auditory canal	0	0	2
Gain in hearing	5db	10db	20db
Residual perforation and medialization of graft	5	7	7
Tympanosclerosis	0	1	2
Granulations	0	4	6

There was a significant improvement in hearing gain at the end of 6months follow up. On comparison of post operative examination findings in full cuff technique with fishing technique and in without full cuff technique (table 1 and 2) at follow up of 1, 3 and 6 months, blunting of anterior angle was found in 2 cases at 3 months and 4 cases at 6 months in full cuff technique with fishing technique and was found in 1 case at 3 months and 2 cases at 6 months in without full cuff technique, narrowing of external auditory canal in 2 cases months in full cuff technique with fishing technique and in 1 case months in without full cuff technique at 6 months, gain in hearing improved from 5 db to 10 db to 20 db in full cuff technique with fishing technique and 5 db to 7 db to 17 db in without full cuff technique w.r.t to follow up of 1, 3 and 6 months, residual perforation and medialization of graft was seen in 5, 7, 7 cases in full cuff technique with fishing technique and 6,8,10 cases in without full cuff technique w.r.t to follow up of 1, 3 and 6 months, Tympanosclerosis was found in 0,1,2 case in full cuff technique with fishing technique and 0,3 ,7 cases in without full cuff technique w.r.t to follow up of 1, 3 and 6 months whereas granulations were found in 0,4,6 cases in full cuff technique with fishing technique and 2,5,7 cases in without full cuff technique w.r.t to follow up of 1, 3 and 6 months.

Table 2. Post operative findings in without full cuff technique

Findings	1 month	3 month	6 month
Blunting of anterior angle	0	1	2
Narrowing of external auditory canal	0	0	1
Gain in hearing	5db	7db	17db
Residual perforation and medialization of graft	6	8	10
Tympanosclerosis	0	3	7
Granulations	2	5	7

Discussion

Tympanoplasty is a procedure which deals on repair of the tympanic membrane and reconstructing hearing mechanism. This procedure can be done via postaural, endaural or endomeatal route. Various grafts such as temporalis fascia, vein graft, perichondrium are used. The technique can be categorized as underlay, overlay, interlay or its combination depending on the

placement of the graft material.⁵ In our study, with fishing graft with temporalis fascia as a graft material showed good dimensional stability and gain in hearing was improved from 5 db to 10 db to 20 db in full cuff technique with fishing technique and 5 db to 7 db to 17 db in without full cuff technique w.r.t to follow up of 1, 3 and 6 months, therefore, the present study found that the full cuff technique with fishing method has less chance of post operative tympanosclerosis and granulations and residual perforation as compared to in without full cuff technique. Moreover, the full cuff technique with fishing method has better chances of gain in hearing postoperatively.

In a similar study conducted by Patni D et al,² analysis at end of 6 months showed good graft acceptance in 93.5% patients, in 4.8% patients' residual anterior perforation was seen and in 1.7% patients graft was rejected completely, showing an overall success rate of 93.5%.

Malpani Met al³ reported that tympanomeatal degloving technique has less chance of post operative tympanosclerosis and granulations and residual perforation as compared to conventional underlay technique. Tympanomeatal degloving technique has more chances of gain in hearing postoperatively.

Indorewala Set al⁴ reviewed a total of 789 tympanoplasties in total, 91% and 9% of tympanoplasties were performed without and with mastoidectomy, respectively. Complete graft take was observed in 98.6% of cases and over 86% of patients had improvement in their hearing function post-operatively.

Hosamani P et al⁶ assessed the efficacy of anterior tagging of graft material with respect to graft uptake and hearing results, in type I tympanoplasty and the type I tympanoplasty with anterior tagging of graft material is a suitable technique for anterior and subtotal perforations.

In another study by Sengupta A et al,⁵ reported that overall wound infection rate of 7.5%, granular myringitis in 10%, medialization and lateralization of graft in 7.5% each, and graft rejection in 12.5% patients. Lee P et al⁷ described a superiorly based flap for anterior or subtotal perforations with good results. In a study by Thakur G et al,⁸ blunting of angle, external auditory canal narrowing was more in full cuff technique whereas residual perforation, tympanosclerosis, and granulations were less in full cuff technique as compared to without full cuff technique.

In a study by Batni G et al, patients were assessed after 3, 6 months and 1 year for graft status and hearing outcome. Hearing evaluation was done using tuning fork tests and pure tone audiometry. In total, 88 out of 100 patients had intact and completely healed grafts at 1 year postoperatively (success rate of 88 %). The Hearing gain achieved was 14.55 dBs and the mean air bone gap reduction was 11.94 dBs. This reduction was statistically significant when compared to the pre operative hearing conditions.⁹ Blunting of angle, external auditory canal narrowing has been more in full cuff technique. But residual perforation, tympanosclerosis, and granulations are comparatively less in full cuff technique. Also, gain in hearing more in full cuff technique. Full cuff technique is a skilled technique which requires expertise. The technique can be done for small, moderate, large and subtotal perforations. Gradually, this technique is gaining importance. Post operative care, pre operative evaluation, skill of the surgeon and compliance of the patient—all these factors are important for the success of this technique.

Conclusions:

The present study found that the full cuff technique with fishing method has less chance of post operative tympanosclerosis and granulations and residual perforation as compared to in without full cuff technique. Therefore, Tympanoplasty with temporalis fascia graft using fishing with full cuff technique gave good dimensional stability to graft, preventing lateralization / medialization of graft. Full cuff technique requires expertise but it assures placement of graft correctly below the annulus from all sides ruling out the medialization of graft. It also has advantages in terms of gain in hearing, granulations and residual perforation. The full cuff technique appears more appealing during surgery, but the problems of granulations and canal wall sagging are more as compared to other techniques. The success rate is acceptable for full cuff, but the healing time is higher than the other techniques.

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