

Original Research article

Comparative study of temporalis fascia graft versus tragal cartilage – perichondrium graft for use in type -I tympanoplasty

Sonawale S.L¹ , Roy C.A² *, Darade A.S³, Chandanwale A⁴, Joshi S.V⁵, Borkar R⁶

- 1) Dr. Sanjay. L.Sonawale :Associate Professor , Dept.of E.N.T,BJMC Pune.
- 2) Dr. Cherry.A.Roy:(*Corresponding author)Assistant Professor, Dept. of E.N.T,BJMC Pune.
- 3) Dr.Abhilesh Shantaram Darade:III rd year Resident, Dept. of ENT,BJMC Pune.
- 4) Dr. Ajay Chandanwale: Professor & Dean, Dept of Orthopedics, BJMC Pune.
- 5) Dr.Samir .V. Joshi: Professor & Head, Dept.of ENT,BJMC Pune.
- 6) Dr.Rupali Borkar:II yr Resident,Dept.of ENT,BJMC Pune.

Corresponding author*

ABSTRACT:

Background: Permanent perforation of tympanic membrane due to chronic suppurative otitis media is a major cause of decreased hearing and this has been asserted by stalwarts since 3rd century B.C. The great physician Hippocrates has also asserted the same.Marcus Banzer in 1640 made first attempt to close the perforation using pig's bladder. Since then various graft material have been used like fish air bladder,splits- skin graft, fascia graft, vein graft, corneal graft.Healing of tympanic membrane is due to ingrowth of connective tissue edges over which the epithelium migrates to close the perforation.The present study has been taken up to compare the results of the two connective tissue graft- the temporalisfascia and tragal cartilage perichondrium.

Patient and method:50 patients were included in this study who attended ENT opd which from 1 august 2007-31st jan 2009. Inclusion criteria:1)safe type of CSOM.2)Dry ear for 1 month .3)Functioning ossicular chain 4) Patent Eustachian tube. Exclusion criteris:Cholesteatoma,any other ear pathology.Result:Temporalis fascia(TF) was used in 50% and tragal cartilage perichondrium(TP) in 50% .Graft was taken up well in 82% over all. TF graft showed improved hearing by 15.90 dB and TP by 15.35.

Conclusion: Both Temporalis fascia (TF) and tragal cartilage perichondrium (TP)are excellent graft material.TF graft uptake is better . Hearing improvement is independent graft used .

Keywords: temporalis fascia, tragal cartilage perichondrium,tympanoplasty-I

INTRODUCTION:

Perforation of tympanic membrane as a sequel of chronic suppurative otitis media is a major cause of deafness. Stalwarts from history dating as far as Age of Pericles -Hippocrates of kos have asserted the same. In the past decades, hundreds of papers have been published and c ontroversies arise at every step , right from incision to post operative packing. A great deal of experimental work often adds to contradictory results.

Markus Banzer in 1640 made first attempt to use pig's bladder as graft material for tympanic membrane(TM) perforation to improve hearing. Since then , fish air bladder,Threish skin graft, Splits skin graft(Wullstein and Zollner 1952-53), Pedicle skin graft (Frenckner 1955), Fascia graft(Heerman 1960), Sclera ,vein graft(Shea 1960) Corneal graft, tympanic membrane homograft and Perichondrium (Jansen 1963 Goodwill 1967)have been used. Each of these graft material has its own advantages and disadvantages. Healing of tympanic

membrane is due to the ingrowth of connective tissue edges over which the epithelium migrates to close the perforation. Understanding this physiological principle, it follows that connective tissue grafts i.e grafts of mesodermal origin like vein, perichondrium, or fascia prove superior to all other graft materials. Clinical investigations and animal experiment have shown that these connective tissues replace the missing fibrous element of the tympanic membrane and allow squamous epithelium and mucosal tissue to cover its medial and lateral surfaces(Wolferman 1970) .

Keeping in mind the above considerations, the present study has been taken up to compare the results of the two connective tissue graft material – temporalis fascia and tragal cartilage perichondrium.

Aim and objective:

Graft uptake rates and hearing improvement of temporalis fascia and tragal cartilage perichondrium

Patient and methods:

This study was carried out from 1 aug 2007 to 31 jan 2009 on the patients attending ENT out patient department our institute. The necessary permission and approval from ethical committee was taken. Informed written consent was taken from patients, according to the protocol approved by the ethical committee.

Inclusion criteria: 1)safe type of CSOM.2)Dry ear for 1 month .3)Functioning ossicular chain 4) Patent Eustachian tube. **Exclusion criteris:**cholesteatoma, any other ear pathology .

After proper history taking, oto-microscopy followed by Pure tone audiometry was done.

They were operated upon to improve hearing and avoid recurrent infections.

Surgical technique:

Tympanoplasty for reconstruction of tympanic membrane and correction of conductive hearing loss was performed through post auricular approach under general anaesthesia.

Positioning and preparation:Patient was positioned supine on the operating table, prepping –draping done,the post auricular crease was cleaned with betadine solution, after injecting local anaesthesia , post aural incision taken 5mm behind the skin crease. The temporalis fascia graft was harvested. For tragal cartilage , after infiltration an incision is made over tragal cartilage margin and skin flaps elevated. Cartilage is exposed and excised along with perichondrium attached to it.

Steps of surgery: after harvesting appropriate graft, periosteal flap is elevated freshening of the margins is done.Tympanomeatal flap is elevated followed by annulus. The ossicular status is assessed. Graft is placed by underlay technique.Tympanomeatal flap is repositioned. Packing with antibiotic soaked gel foam.Periosteal flap and skin is sutured. Mastoid dressing given. Postoperative stay in ward for 7 days during which antibiotics, analgesic and anti-inflammatory. Steroid-antibiotic ear drop instilled in ear after 3rd day. Patients were followed in OPD after 7 days for cleaning the ear.Patients were followed up on 15th, 21st,45th , then monthly. Puretone audiometry was done after 6th month of operation Observations were tabulated on a spread sheet. Statistical analysis was done with Student ‘t’ test and ‘z’ test. A’P value ’<0.05 was considered statistically significant.

Observation and result: 50 tympanoplasties were performed on indoor basis .

Age ranges from 15-50 years with mean age of 30.36 .

There were 22(44%) males and 28(56%) females with male to female ratio of 1:1.27.

TABLE 1:SEX DISTRIBUTION :

SEX	No. OF PATIENTS	PERCENTAGE
MALE	22	44%
FEMALE	28	56%
TOTAL	50	100%

TABLE 2:AGE DISTRIBUTION

AGE IN YEARS	NO.OF PATIENTS	PERCENTAGE
<20	09	18%
21-30	17	34%
31-40	16	32%
>40	08	16%
<u>TOTAL</u>	50	100%

TABLE 3:PREOPERATIVE HEARING LEVEL

TYPE OF GRAFT	Mean Levels of Hearing		
	Preoperative Hearing Levels	Post operative Hearing Levels	Postoperative change in Hearing
Temporalis Fascia	640/25=25.6	242.5/25=9.7	397.5/25=15.90
Tragal cartilage Perichondrium	580/25=23.2	193.75/25=7.75	383.75/25=15.35
Total	1220/50=24.4	436.25/50=8.725	781.25/50=15.625

Majority of the patients shows mild to moderate hearing loss.

46% had air- bone gap in the range of 0-20dB, 38% had air-bone gap in the range of 20-40dB and only 6% had air-bone gap above 40dB.

All surgeries were performed by post-aural approach and under lay technique was used.

25(50%)patients were operated using temporalis fascia and in 25(50%) patients tragal cartilage perichondrium was used. Patients were discharged on 3rd post- operative day after removal of mastoid dressing. Patients were followed up as per schedule. Maximum number patients(66%) were between 21-40 years .Graft was taken up well in 82% overall. Uptake rate was 84% with temporalis fascia and 80% with tragal cartilage perichondrium. Uptake rate was not influenced by duration of illness.

In post operative hearing analysis, 80% showed air-bone gap in the range of 0-10dB, 10% patients showed 11-20dB.

74% patients with temporalis fascia showed air-bone gap in 0-10dB and 84% with tragal cartilage perichondrium showed air-bone gap in the range of 0-10dB.

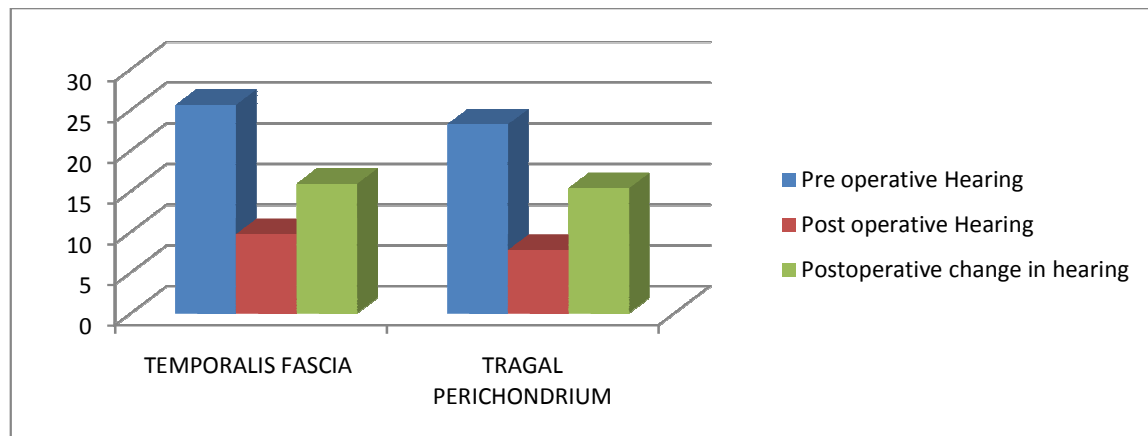
DISCUSSION:

This is the prospective study of 50 tympanoplasties on patients between the age of 16 to 50 years. Patients in this study were from the entire socioeconomic group, including patients referred from other general practitioners also. Conservative measures were first tried in all cases, particularly for small to moderately sized perforations. These included systemic antibiotics, trichloroacetic acid cauterization, repeated aural toilet in ears with active infections. Cases with bilateral ear disease with septic focus were operated with tonsillectomy, adenoidectomy, septoplasty etc. as needed.

TECHNICAL ASPECTS:

Tympanoplasty is technically more difficult in patients having a narrow canal, undergoing revision surgery by transcanal approach and in anterior perforations. Only few difficult cases were operated by senior ENT Surgeons. All other cases were operated by residents. Perhaps hearing result and graft uptake would have been expressed by Sade (1982).

Post auricular approach is commonly used in our institution, transcanal route is rarely used. End aural route is not used as we felt that risk of perichondritis with end aural approach outweighs any advantage it offers over post auricular approach.



HEARING RESULT:

88% of our cases showed improvement in hearing, while 12% of them either showed deterioration or no improvement at 6 month follow up period. About 88% cases operated with temporalis fascia showed hearing improvement while same percentage 88% of cases who were operated using tragal cartilage perichondrium showed improvement in hearing (statistically not significant $p >> 0.05$). Mean improvement in hearing using temporalis fascia was 15.9 dB and that with tragal cartilage perichondrium it is 15.35dB (statistically not

significant $p \gg 0.05$). These results compare well with Ophir D (1987) Terry RM (1988) results with fat myringoplasty (Francois M (1985) and Packer P (1982).

Wullestein H¹ 1952 published a method for split –skin covering of perforation of the drum by tympanoplasty operation in cases of CSOM. Zollner^{2,3} 1953 also described split-skin graft but later abandoned it because of its low resistance, preferring full thickness retro-auricular skin graft as it is thin and hairless. Wullstein H gave a systemisation of the tympanoplastic operation which has ever since been followed all over the world. Heermann H⁴ 1960 made a thorough description of a method for fascial grafting used by him. Jensen C⁵ 1963 used free tissue transplant of autogenous perichondrium of nasal septum or homoplastic septal perichondrium ,septal cartilage film, which have been preserved and embedded in plastic materials to create new tympanic membranes that preserve canal skin and supplies favourable nutrition to the transplants. Two types of perichondrium, autogenous or preserved homoplastic heals up easily and quickly, so that a normal looking functioning can be formed. With the exception of two cases all ears were dry within 3 weeks after the operation and required practically no post operative treatment. As compared to other free tissue transplants, the perichondrium is a thin membrane and has yielded for better results with regard to mobility of a new tympanic membrane. The obtainable perichondrium flap from the nasal septum is sufficient to cover even the largest perforation. Goodhill V⁶ 1967 used tragal cartilage perichondrium and cartilage for myringoplasty and tympanoplastic reconstruction. He showed that perichondrium and cartilage obtained from tragus provide viable autograft material for tympanoplastic reconstruction.

Papangelou (1973) has tragal cartilage perichondrium pedicle flap for repair of perforated tympanic membrane. The results showed that this method is not recommended in preference to other technique but it is useful in those cases where anterior perforation exists. Also adhesion to promontory is avoided . Kacker SK (1975) used tragal perichondrium as a graft material in 650 cases.

Packer P⁷ (1982) in his comparative study of fascia and dura reported average improvement in hearing at 6 months as 8dB for overlay fascia , 11.8 for underlay fascia and 10.2 dB for underlay dura. Ahad SA⁸ (1986) reported a success rate of 83.3% with homologous temporalis fascia, 76.4% success rate with autologous temporalis fascia. He used on-lay technique in 88.8% of cases. Isiah V⁹ (1986) reports his results in geriatric myringoplasty using tragal perichondrium by trans canal route. Majority of his cases achieved socially adequate hearing. Gordon HE¹⁰ (1986) in his review states that autologous fascia is one of the most commonly used tympanic membrane grafting material , having a success rate of 95% . According to him devitalised grafts primarily provides scaffolding for the migration of epithelium which ultimately closes the tympanic membrane effects. Gross CW¹¹ (1989) describes adipose plug myringoplasty in managing small tympanic membrane perforations in children. Hartwein J¹² (1992) described “crown –clock tympanoplasty “ for complete reconstruction of tympanic membrane, using autologous tragal composite graft claiming 100% success. Quareshi MS et al¹³ (1995) presented a study of myringoplasty ,in which tragal perichondrium grafts were placed primarily as a day care procedure in 32 patients . They compared with a control group , matched for age and for size of their perforations, in which temporalis fascia was grafted via an end-aural or postaural incision . The success was 94% in perichondrial groups compared with 84% in the control group. Supiyahun P, et al¹⁴ (1999) described a new myringoplasty technique describing only partial removal of skin on ear drum remnant followed by lateral placing of fascia and free skin graft with an overall cure rate of 97%. Pyykko I, et al¹⁵ (2000) studied applicability LASER assisted myringoplasty over traditional myringoplasty. Laser fuses

collagen fibers and weld collagen fibers to make a solid bond and allow tissue growth along bonded edges. Miodonski, Zollner and Wullstein inspired different materials and methods for tympanoplasty. Gierk T, et al¹⁶ (2004) did a study to demonstrate the anatomical and functional result of tympanoplasty in comparison with the material used. The study included 142 patients of which in 112 patients perichondrium and cartilage were used and in 30 patients temporalis fascia was used to close a defect of tympanic membrane.

Conclusion:

The results showed no significant difference between the two groups. Indorewala S¹⁷ did a retrospective analysis of tympanoplasties performed for large perforation using fascia lata or temporalis fascia showing no significant difference in improvement of the two groups.

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