

Temporal Fascia Versus Tragal Perichondrial Graft in Myringoplasty and Tympanoplasty

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Abstract: The objective of this study is to compare the results of tympanoplasty with underlay technique with respect to graft uptake, hearing improvement and complications. The study was conducted between January 2006 & January 2018 at Haider clinic, Kulsum international Hospital Islamabad, Maroof International Hospital, Social security Hospital Islamabad and PAF hospital Islamabad. Sampling was done by non-probability convenient sampling type by random selection. Total of 1677 patients were selected had Tympanoplasty type 1. All had dry central perforations of different sizes for more than 3 months and conductive hearing loss of less than 40dB with patent Eustachian tube. Informed consent was taken from patients and ethical committee. Patients with sensorineural hearing loss and with severe nasal pathology were excluded. Patients were divided into 2 groups, A and B, were subjected to tympanoplasty by underlay technique by the same group of surgeons. In group A, temporalis fascia graft and in group B tragal perichondrial graft was used. Postoperative audiometry was done after 3 months in each case to calculate air bone gap. In our study there were 62% males and 38% females, mean age was 32.5. In Group A, 689 patients had tympanoplasty with temporalis fascia and in group B 988 patients with chondro-perichondrial graft. Medialization was seen in 30(4.3%) patients in Group A and in 10(1%) in group B. Persistent Perforations happened in 32(4.6%) patients in group A and in 8(0.8%) patients group B. Graft uptake success rate using temporalis fascia was 85.9% and was 97.4% with Chondro-perichondrial graft. Hearing improvement was seen in 627(91%) patients in group A and 970(98%) patients in group B. Statistical analysis of the data was done using SPSS 16. Temporalis fascia and tragal perichondrium both are excellent material to repair tympanic membrane. Graft uptake rate and hearing improvement are better in perichondrial graft.

Keywords: Tympanoplasty, Temporalis Fascia, Tragal Perichondrium

1. Introduction

Permanent perforation of tympanic membrane may be the sequelae of chronic suppurative otitis media, trauma and acute suppurative otitis media [1]. Dry ear with hearing loss is the indication of myringoplasty and tympanoplasty [1]. Myringoplasty can be used for small perforations. Tympanoplasty is repairing of tympanic membrane after having a look in the middle ear [2]. The first known attempt to close a perforation to improve hearing was made by Marcus Benzer in 1640. The fundamental principles of surgical procedure were first described by Wullstein [2]. Size

and location of perforation, tympanosclerosis, allergies, Eustachian tube dysfunction and active infection in ear must be considered to evaluate surgical outcome [3]. Various grafting materials can be used to reconstruct tympanic membrane. Among the autologous grafts temporalis fascia, perichondrium, cartilage, fat, fascia lata and skin have been used [1, 4]. Several allografts are mentioned in literature include duramater, temporalis fascia, pericardium, amniotic membrane, skin, peritoneum, cornea and vein [4]. Alloplastic graft materials like paper, absorbable gelatin sponge andacellular dermal matrix have also been used. Each of these grafts material has its own advantages and

disadvantages over each other. Healing of tympanic membrane perforation is due to ingrowth of connective tissue edges over which fresh edges of epithelium of membrane migrate over graft material. This fact proves that the graft of mesodermal origin (fascia, perichondrium, cartilage) is the best [5, 6]. As proved by literature ideal graft is one that is easy to take with less invasive procedures, with shorter hospitalization, less morbidity to donor area, less risk of infection, with no transfer of infectious disease as can be with allografts and costs less as synthetic grafts cost high [7]. The temporalis fascia is the most common graft to be used because it is abundant and easy to harvest, can be taken via same post auricular incision and can also be used in revision surgery [3, 8, 9]. Cartilage and perichondrium can be harvested either from the tragus or concha. Perichondrium can be used alone or with cartilage [9]. This graft is easy to take, no preparation of surgical area (shaving) is required, size is usually appropriate and incision carries a little morbidity [9].

This study was performed while considering all these facts to compare the results of tympanoplasty with two mesodermal tissue graft materials, temporalis fascia and perichondrium. The aim of this study is to compare the results of tympanoplasty with underlay technique in respect with graft uptake, hearing improvement and complications.

2. Material and Methods

A total of 1677 patients were selected for this study that had myringoplasty and Tympanoplasty type I done between January 2006 & January 2018 at Haider clinic Islamabad, Kulsum international Hospital Islamabad, Maro of International hospital Islamabad, Social Security hospital and PAF hospital Islamabad. Sampling technique used was non-probability convenient sampling. Random selection of patients presented with chronic suppurative otitis media with tubotympanic disease was done. Informed consent was taken from patients and written permission was taken from ethical committee. Hearing screening was done in all patients. Only those patients were included with safe tubotympanic disease and ear remained dry for at least 3 months, non-healed dry traumatic perforation, patients with dry central perforation

and conductive hearing loss of less than 40dB and patent Eustachian tube (checked subjectively by Valsalva and taste of ear drops felt in throat), only adults with age 15-50 years were included in the study.

Patients with unsafe ear, tubotympanic disease with active mucosal disease, tubotympanic disease with sensorineural hearing loss, patients having severe allergy and obvious nasal pathology like marked DNS, nasal polyps or recurrent sinusitis, patients less than 15 years of age, with only hearing ear, patients who refused to give consent and patients with very large, total, near total perforation and marginal were excluded from study. All the patients were evaluated, proper history was taken, otomicroscopic examination was performed to find out any hidden area of inflammation or

Cholesteatoma, clinical assessment of hearing was done by tuning fork tests, audiometry was performed in all cases. Pre op investigations for the sake of anesthesia fitness were ordered.

Patients were divided into 2 groups, A and B. All the patients were subjected to Tympanoplasty type I by underlay technique by the same group of surgeons.

In group A; temporalis fascia graft and in group B tragal perichondrial graft was used.

Monthly Post op follow up was done in every case for 6 months. Otomicroscopy and tuning fork tests were done in every follow up to evaluate graft, to rule out infection and to see improvement in hearing. Postoperative audiometry was done after 3 months in each case to calculate air bone gap. Results were recorded considering improvement in hearing, graft rejection, graft medialisation, postoperative infection and persistent perforation. Statistical analysis of data was done using SPSS 16. Paired t test was applied to compare two groups, P value < 0.05 was considered significant.

3. Results

In our study there were 62% were males and 38% were females. Male to female ratio was 1.6:1. Age limit in our study was between 15-50 years, mean age was 32.5. All the patients were clinically assessed; size of perforations was medium and central in 928 patients and was small and central in 749 cases as seen in Table 1.

Table 1. Table showing patients and perforation detail.

| Sr. no | | Group A Temporalis fascia | Group B Tragal perichondrium |
|--------|-----------------------|---------------------------|------------------------------|
| 1. | No. of patients | 689 | 988 |
| 2. | Age limit | 15-50 years | 15-50 years |
| 3. | Gender | | |
| | Male | 500 | 539 |
| | Female | 300 | 338 |
| 4. | A-B gap | | |
| | 20-25 dB | 400 | 850 |
| | 10-15 dB | 286 | 138 |
| | Medium | 315 | 613 |
| 5. | Type of perforation | | |
| | Small | 374 | 375 |
| 6. | Type of tympanoplasty | Type – I Underlay | Type – I Underlay |

Rinne was negative in 1250 and Weber was towards the same ear. In remaining, Rinne's was positive but Weber was lateralized to same ear. In 213 cases disease was bilateral, and both ears were operated with 6 months gap and two ears

were considered as separate cases. Ears were dry in all cases, no active mucosal disease was found in these cases. Audiometry results were recorded. In 1250 cases, hearing loss was between 30-35dB with air bone gap of 20-25dB. In

427 patients there was air bone gap of 10-15db. All cases In Group A, 689 patients; had tympanoplasty type I using temporalis fascia. Under lay technique was used with post aural approach. 374 patients had small and 315 patients had medium perforations. In group B, 988 patients had Myringoplasty or Type I tympanoplasty using chondro-perichondrial graft by under lay technique. Endaural or per

meatal approach was used keeping in consideration the width of meatal canal. In this group, 613 patients had medium and 375 patients had small perforations. Results were recorded considering post operative infection, medialisation, persistent perforation, hearing improvement and graft uptake as showed in Table 2.

Table 2. Table showing results of tympanoplasty and complications in group A and B.

| | Group A [Temporalis fascia] | Group B [Tragal perichondrium] |
|--------------------------|------------------------------------|---------------------------------------|
| Medialization | 30[4.3%] | 10[1%] |
| Post-operative infection | 35[5%] | 7[0.7%] |
| Persistent Perforations | 32[4.6%] | 8[0.8%] |
| Graft success rate | 591[85.9%] | 962[97.4%] |
| Hearing improvement | 627[91%] | 970[98%] |

Results of two groups were compared, shown in figure 1.

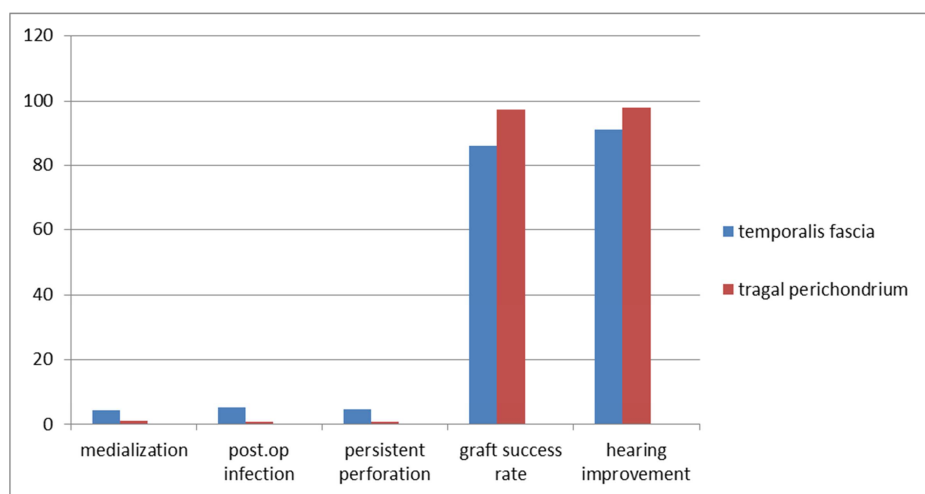


Figure 1. Figure showing comparison of results of tympanoplasty in group A and B.

3.1. Medialization

This was noted in 30 (4.3%) patients in Group A and 10 (1%) patients in group B.

3.2. Postoperative Infection

This was seen in 35 (5%) patients in group A, Postoperative and in 7 (0.7%) patients in group B.

3.3. Persistent Perforations

Persistent Perforations occurred in 32 (4.6%) patients in group A and in 8 patients (0.8%).

3.4. Graft uptake Success Rate

Temporalis fascia grafting: 85.9%.

Chondro-perichondrial grafting: 97.4%.

3.5. Hearing Improvement

Hearing improvement was seen in 627 (91%) patients in group A and 970 (98%) patients in group B.

Paired t test was applied to compare two groups, P value was <0.05, insignificant.

4. Discussion

Temporalis fascia graft has always been regarded as an ideal graft for the repair of tympanic membrane perforations for a long time. Later on it was found that this graft material couldn't withstand the middle ear negative pressure in the postoperative period [10]. It also had the disadvantage of crumbling & shrinkage when coming in contact with tissue fluids, hence leading to medialization, pockets formation and leaving perforation [10]. In revision surgery adequate graft may be difficult to obtain.

Prolonged healing rate leads to graft uptake failure. Since it has low basal metabolic rate and due to similarity in structure and thickness with the real tympanic membrane, It can be grafted successfully [11]. It is easily available in sufficient quantity and no separate incision is required. In contrast chondro-perichondrial graft is easy to obtain from tragus of the ear [11]. Its slow metabolic rate, makes it an ideal graft material [12]. It is sturdier, doesn't crumble and can withstand the postoperative middle ear negative pressure, discouraging medialization of graft or leaving a perforation [12]. In case of subtotal perforations, atelactatic ears,

retraction pockets, long term results of temporal fascia grafts may not be very satisfactory. To overcome this perichondrial cartilage grafts were used with good results [12, 13].

Because of structural similarities with the normal TM and it also provides firm support to prevent retraction, healing is much better with chondro-perichondrial graft than temporalis fascia [2, 14]. The greatest advantage of chondro-perichondrial graft has been thought to be its very low metabolic rate and it can resist deformation from pressure variations so medialisation of graft is less as compared to temporalis fascia. As seen in our study, with temporalis fascia graft medialisation was 4.3% and with chondroperichondrial was 1%. Cartilage takes its nourishment from perichondrium. That's the reason why chondroperichondrial graft lives longer for a better healing. So there are less chances of leaving perforation as compared to temporalis fascia. As seen in our study graft success rate was 85.9% and 97.4% respectively with temporalis fascia and chondroperichondrial graft. This is comparable with previous studies in which it was 80% and 96.7%. In one of the previous study graft uptake success rate has been 80% and 70% respectively for temporalis fascia and tragal cartilage.

Cartilage contributes minimally to an inflammatory tissue reaction and is well incorporated with tympanic membrane layers [4, 6, 15]. So there are less chances of infection as compared to temporalis fascia graft as seen in our study, 5% with temporalis fascia and 0.1% with chondroperichondrial graft. Ear packing after this procedure was done with ribbon gauze impregnated with Bismuth Iodine Paraffin Paste (BIPP) like any where in the world, for 2-4 weeks. That is the reason for decrease infection.

Previously it was shown in different studies that hearing improvement is less with chondroperichondrial graft as compared to temporalis fascia graft due to its thickness and stiffness reducing the vibrations of tympanic membrane mechanically [3, 16, 17]. As in one study performed in Mumbai hearing improvement was more with temporalis fascia 77.5% as compared to 75% seen with tragal perichondrium. Good hearing results with temporalis fascia were also seen in another study up to 90% and 88% with chondroperichondrial graft, these results are comparable with ours, in presenting study hearing improvement is more (98%) with chondroperichondrial graft as compared to temporalis fascia (91%). Reason might be due to fact that graft only provides platform for epithelium to regenerate over it and also better thinning of cartilage in the graft.

In our study like most of previous studies results were not dependent on size and site of perforation, results were same in small and medium perforations. Similar opinions were expressed by other surgeons in different studies that age of patient and size had no significant influence on success rate. Results of myringoplasty were independent of patients' age, sex, location and size of perforation. Preoperative dry ear should be considered for better results [3, 18]. Temporalis fascia and tragal cartilage can both be used effectively with no significant difference in success rate or audio

logical outcomes but in our study perichondrial cartilage graft was found to be superior considering graft uptake and hearing improvement [5]. Our success rate with tympanoplasty especially with chondroperichondrial graft was better than most institutes in our area and is almost similar to international figures. Graft was thinned down nicely, removing all the extra fat and connective tissue. This helped speedy bridging of perforation. We also made sure that the ears remained dry, free of any residual infection for more than 3 months. Upper respiratory inflammatory conditions were eliminated before we embarked on this procedure. As this is not an emergency procedure, we can't afford any risk of failure, as this will not only increase the cost but also disappointment.

5. Conclusion

Temporalis fascia and tragal perichondrium both are excellent material to repair tympanic membrane. Graft uptake rate and hearing improvement are better in perichondrial graft as compared to temporalis fascia. Success rate is not dependent on size and duration of perforation but ears must remain dry for at least 3 months prior to operation.

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