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A comparative study of using temporalis fascia autograft and dehydrated temporal fascia homograft in tympanoplasty

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ABSTRACT

Background: The objective of the present study was to compare the results of tympanoplasty operations performed using autograft temporalis fascia with those of dehydrated temporalis fascia homograft.
Methods: This prospective study was conducted in the department of ENT of Pacific Medical College and Hospital, Udaipur in duration from February 2014 to January 2015. The study included 90 patients of chronic suppurative otitis media with dry, central perforation of tympanic membrane. The patients were divided into two groups with 45 members in each group. In group A, temporalis fascia autograft was used and in group B, dehydrated temporalis fascia homograft was used for tympanoplasty. Results were evaluated in terms of graft uptake rate and hearing improvement.
Results: There were 50 male and 40 female patients in the study. Most of the patients (43.33%) were of the age group 21-30 years, followed by age group 31-40 years (24.44%). Post-operatively, 95.55% patients in group A and 91.11% patients in group B showed successful graft uptake. Mean preoperative AB gap in group A patients was 31.46±6.78 dB which was reduced to 13.01±5.61 dB postoperatively. Similarly, in group B patients, AB gap was reduced from 29.81±5.99 to 12.92±6.01 dB postoperatively. No statistically significant difference was observed between groups while comparing pre and postoperative AB gap.
Conclusions: The results of tympanoplasty done by using either homograft or autograft were the same so dehydrated temporalis fascia homograft can be used as an alternative graft material with the same success rate wherever possible with the advantage of reduction in duration of surgery.

Keywords: Tympanoplasty, Autograft, Homograft, Temporalis fascia, Tympanic membrane

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a long standing infection of a part or whole of the middle ear cleft. Clinically, CSOM is divided into two major types as tubotympanic CSOM i.e., 'safe' or 'benign' type of CSOM and atticoantral i.e., 'unsafe' or 'dangerous' type of CSOM.[1]

CSOM is a major problem globally since prehistoric times with more incidences in developing countries due to poor socio-economic status, poor nutrition, unhygienic habits and lack of health education.[2]

Treatment of CSOM is systemic and topical antibiotic therapy, aural toilet and surgery according to the disease type. Tympanoplasty surgery is routinely done for tubotympanic type of CSOM. It is the surgical procedure to repair the tympanic membrane perforation by placing a graft either medial or lateral to tympanic membrane annulus, with eradication of any middle ear disease if present.

Banzer was first to attempt the repair of perforated tympanic membrane in 1640 using small ivory tube covered with pig's bladder as lateral graft.[3] Since then, various graft materials have been used by surgeons to close the tympanic membrane perforation with variable results. Various autologous grafts used in tympanoplasty are temporalis fascia, perichondrium, cartilage, fascia lata, vein graft, dura, fatty tissue and skin etc.[4-12] Each of these graft materials have some advantages and disadvantages over each other.

Till now, the temporalis fascia is the most preferred graft material for surgeons because of various advantages like easy access through same incision, its translucency, durability and better uptake rate. The success rate of using temporalis fascia graft in tympanoplasty is more than 90% in literature. However the success rate decreases in cases of Eustachian dysfunction, recurrent perforation, total perforation and atelectatic memebrane.[13]

The use of various homografts in tympanoplasty has been described in literature but due to the difficulty in procurement and sterilization, the method did not gain much popularity.

Very few studies have been conducted till now about the use of dehydrated temporalis fascia homograft in tympanoplasty. The present study was conducted to evaluate the efficacy of dehydrated temporalis fascia homograft as an alternative graft material and the results were compared with that of autograft temporalis fascia use in tympanoplasty in terms of graft uptake rate and hearing improvement.

METHODS

The prospective study was conducted in the department of ENT of Pacific Medical College and Hospital, Udaipur during the period of two years from February 2014 to January 2016. Approval from institutional ethical committee was taken before starting the study.

A total of 90 patients were enrolled in the study with the clinical diagnosis of CSOM with dry, central perforation of small to medium size and intact ossicular chain. Patients with unsafe atticoantral disease, eustachian tube dysfunction, wet ear, ossicular dysfunction, large perforation and/ or sensorineural hearing loss were excluded from the study.

All the patients included in the study were divided into two groups. In group A (n=45), autograft temporalis fascia was used in tympanoplasty. In group B (n=45), dehydrated temporalis fascia homograft was used in tympanoplasty.

All the patients were thoroughly examined, clinical history was taken and routine laboratory investigations were performed including HIV/HBV/HCV testing to rule out any co morbid disease and pre anesthetic check-up was done.

In all the cases, pre-operative otomicroscopy and pure tone audiometry was performed. Mastoid x-ray (schuller' view) was taken in all the patients. Patients who did not meet the inclusion criteria or not willing to give informed written consent were excluded from the study. Ethical approval was granted from the college ethical committee.

Surgical procedure

Type I tympanoplasty by underlay technique via transcanal approach under general anesthesia was done in all the cases. After putting patient in surgical position, painting and draping was done. External auditory canal was infiltrated with 2% xylocaine and 1:2 lac adrenaline solutions. Large size temporalis fascia graft was harvested in group A patients with a small incision of 4-5 cm in supraauricular region. Extra size of fascia graft was dried and dehydrated to be used in group B patients as homograft. Extra piece of dehydrated graft was preserved in 70% absolute alcohol. Under microscopic visualization and using appropriate size aural speculum, margin of perforation was freshened and Rosen's incision kept. Posterior tympanomeatal flap was elevated. After complete examination of ossicular chain integrity, round window reflex and ventilation pathway, the graft was placed by underlay technique. Graft was stabilized by placing gel foam. Antibiotic wick was placed in the canal. Mastoid dressing was done. Postoperative antibiotic was started and patient was discharged day after the surgery.

Follow up

Patients were followed up at one week, two week, one month and three month after the surgery. On follow up, otoscopic examination was done to look for graft uptake. Pure tone audiogram was repeated at 3 months follow up to check the hearing improvement.

To compare the results, the 2×2 Chi-square test with Pearson's method and 2-tailed Fishers exact probability test was applied. P value<0.05 was considered as statistically significant.

RESULTS

A total of 90 patients of tubotympanic CSOM with dry, central perforation of pars tensa and intact ossicular chain were included in the study. All the patients were divided into two groups, each consisting of 45 members viz., group A in which autograft temporalis fascia was used to repair tympanic membrane perforation and group B in which dehydrated temporalis fascia homograft was used to close the perforation.

Age and sex of members of both the groups were matched. There were 50 male and 40 female patients in the study.

Maximum number of patients was from the age group 21-30 years (39), followed by 31-40 years (22), 41-50 years (16) and 14-20 years (13). Group wise distribution of sex and age are depicted in table 1 and table 2 respectively.

Table 1: Sex distribution of the study participants.

Sex	Group A (n=45)	Group B (n=45)	Total
			N (%)
Male	24	26	50 (55.55)
Female	21	19	40 (44.44)
Total	45	45	90 (100)

Table 2: Age wise distribution of the study participants.

Age group (in years)	Group A (n=45)	Group B (n=45)	Total
			N (%)
14-20	8	5	13 (14.44)
21-30	18	21	39 (43.33)
31-40	12	10	22 (24.44)
41-50	7	9	16 (17.77)
Total	45	45	90 (100)

43 (95.55%) out of 45 patients in group A showed successful graft uptake while in group B, 41 (91.11%) out of 45 showed successful graft uptake (Table 3). The two tailed p-value of the comparison of the results of two groups was 0.6766 suggestive of statistically insignificant result.

Table 3: Graft uptake percentage in both the groups of the study.

Graft uptake	Group A (n=45)	Group B (n=45)	Total	P-value
	N (%)	N (%)		
Successful	43 (95.55)	41 (91.11)	84	0.6766
Residual perforation	02 (4.44)	04 (8.88)	06	

At 3 months follow up, pure tone audiometry was repeated and post-operative air-bone gap (AB gap) was calculated and compared with preoperative air-bone gap.

Mean preoperative AB gap in group A patients was 31.46±6.78 dB which was reduced to 13.01±5.61 dB postoperatively. Similarly, in group B patients, AB gap was reduced from 29.81±5.99 to 12.92±6.01 dB postoperatively. No statistically significant difference was observed between groups while comparing pre and postoperative AB gap (Table 4).

Table 4: Functional outcome in terms of preoperative and postoperative AB gap in both the groups.

Air-bone gap	Group A (n=45)	Group B (n=45)	P-value
Preoperative AB gap (mean±SD)	31.46±6.78 dB	29.81±5.99 dB	0.2244
Postoperative AB gap (mean±SD)	13.01±5.61 dB	12.92±6.01 dB	0.9416
Postoperative gain	18.45±5.57 dB	16.89±5.60 dB	0.1886

No wound dehiscence, stitch abscess or persistent discharge was found postoperatively in either group.

DISCUSSION

Wullstein et al first described the term 'tympanoplasty' in early 1950s as an operation to be performed in chronic otitis media with a goal to improve hearing and protect the middle ear from the outside environment.[14,15]

Split thickness and full thickness skin grafts were being used in that period of time. But due to high failure rate, surgeons started searching for alternate graft material. Since then, various graft materials have been used by surgeons in tympanoplasty with variable results. Various autologous grafts used in tympanoplasty are temporalis fascia, perichondrium, cartilage, fascia lata, vein graft, dura, fatty tissue and skin etc.[4-12]

Temporalis fascia was first used as graft material by Heerman, after which it became the most preferred graft material by surgeons all over the world because of its

easy availability, low basal metabolic rate and high uptake rate.[16]

The idea of homograft in tympanoplasty was first given by Chalat who performed the first tympanoplasty using homograft tympanic membrane in US in 1964.[17] Later on; many surgeons tried the use of homograft with variable results.[3,18-21] Procurement and the sterilization were the main issues of concern in using homograft which blocks the proper development of this method.

The present prospective study was done to evaluate the efficacy of dehydrated temporalis fascia homograft as an alternative graft material in terms of its anatomical and functional outcomes during tympanoplasty surgery for tubotympanic type of CSOM with small to medium size central perforation. Total 90 patients were included in the study and were divided into two subgroups, each consisting of 45 patients who were matched with age, sex and disease pattern.

Group A used autogenous temporalis fascia graft while group B used dehydrated temporalis fascia homograft. The choice of graft material was explained in detail to each patient including advantages, disadvantages and risk of disease transmission. A written informed consent was taken from all the patients.

In present study, 43 (95.55%) out of 45 patients in group A showed successful graft uptake while in group B, 41 (91.11%) out of 45 showed successful graft uptake.

Similar study was done by Ahad in which he used temporalis fascia autograft in 110 patient and homograft temporalis fascia in 72 patients. 83.3% success rate was found with the use of homograft.[22]

Hong et al in Korea conducted the similar study with 81 patients.[23] The success rate of tympanic membrane graft was 85.1% in the first revision surgery (69/81 cases) and 93.8% with the second revision surgery (76/81 cases). This study suggested that the homologous temporalis fascia can be useful graft material in revision surgery.

Another study was done by Albera et al in which they used homologous temporalis fascia graft in 65 patients and the successful graft uptake was found in 82% cases.[24]

Sarac et al, conducted a similar study with 43 patients in which homograft temporalis fascia was used in 22 patients while autograft was used in 21 patients. The uptake rate was 90.9% in homograft group and 85.8% in autograft group.[25]

At three months follow up, the post-operative hearing gain in present study was 18.45±5.57 dB for group A and was 16.89±5.60 dB for group B. the comparison was statistically not significant (p=0.1886). The results were comparable with other similar studies in literature.[22-25]

CONCLUSION

The success rate of tympanoplasty is usually high irrespective of the graft material used. The dehydrated temporalis fascia homograft can be used as an alternative to autograft temporalis fascia with the similar success rate and functional outcome.

Use of homograft avoids external incision and reduces tissue manipulation for harvest of graft and thus reduce overall surgical time. A very minimal risk of transmission of viral and prion mediated diseases is always there and should be explained to patients properly while opting for this method.

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