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IP Journal of Otorhinology and Allied Science

Journal homepage: <https://www.joas.co.in/>

Original Research Article

Evaluating the outcome of type I Tympanoplasty with cortical mastoidectomy using temporalis fascia graft with and without tragal cartilage support

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ARTICLE INFO

Article history:

Received 04-11-2021

Accepted 09-11-2021

Available online 25-01-2022

Keywords:

Chronic otitis media
Tympanoplasty and Cortical mastoidectomy

ABSTRACT

Background: Type I tympanoplasty with graft helps in closure of perforation thereby arresting otorrhea and improvement in hearing. Selecting a graft in tympanoplasty with cortical mastoidectomy is still a debatable topic among ENT surgeons across the world. Cortical mastoidectomy is opted by many for good mastoid ventilation and disease clearance in chronic otitis media.

Objective: Evaluating postoperative outcomes of patients in graft uptake and hearing improvement in cortical mastoidectomy with type I tympanoplasty using temporalis fascia graft with and without tragal cartilage support in quiescent mucosal type of chronic otitis media with conductive hearing loss.

Materials and Methods: A retrospective study of 60 patients who underwent cortical mastoidectomy with type I tympanoplasty were screened and taken for study. Group A had 30 patients who had undergone tympanoplasty with temporalis fascia supported by cartilage and group B included 30 patients who underwent tympanoplasty with temporalis fascia alone. They were followed periodically for 6 months and the outcome of graft uptake and hearing improvement were compared.

Results: Successful Graft uptake in group A was 90% and group B was 93%. Hearing improvement in group A was 83% and group B was 87%.

Conclusions: Type I Tympanoplasty with cortical mastoidectomy gives a good outcome in terms of graft uptake and hearing improvement in chronic otitis media, but our study showed no significant difference between the two types of grafts used for tympanoplasties. The selection of patients, the condition of middle ear, postoperative aseptis and compliance of the patient and periodic follow up remains the crux in best outcome.

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1. Introduction

Chronic otitis media (COM) is a common ear disease all over the world. It is seen mostly among the patients in low socio economic group with poor nutrition and lack of health education.¹ COM is an inflammation of mucoperiosteal lining of middle ear cleft. Mucosal COM

presents with recurrent mucopurulent ear discharge through the tympanic membrane perforation.² Hearing impairment is mild to moderate of conductive type depending on the size of perforation and integrity of ossicular chain.³ Medical management consists of aural toileting, topical antibiotics, antihistaminics and systemic antibiotics as and when needed. Persistence of ear discharge after adequately clearing focal sepsis suggests a mastoid reservoir.⁴

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Sheehy suggested that mastoidectomy is helpful for both dry and discharging ears and recommends performing cortical mastoidectomy routinely for all tympanoplasties.⁵ Mastoidectomy is helpful in cases of chronic otitis media, which have been refractory to maximal antibiotic therapy.⁶ Many otolaryngologists routinely perform mastoidectomy with tympanoplasty as surgical creation of a mastoid bowl will improve outcome by providing a reservoir of air that can buffer pressure changes in the middle ear according to Boyle's law.⁷ In addition, mastoidectomy also helps in the disease clearance in the mastoid. The best surgical method of treating mucosal type of chronic otitis media with conductive hearing loss is tympanoplasty along with cortical mastoidectomy. The graft materials for tympanoplasties varies.

The aim of this study is to evaluate the benefits of the tympanoplasty with cortical mastoidectomy using temporalis fascia with and without tragal cartilage support in terms of graft uptake and hearing improvement 6 months post procedure

2. Materials and Methods

This retrospective study was conducted in the department of ENT in Karpagam Faculty of Medical Sciences and Research, Coimbatore from January 2018 to December 2019. Sixty patients were carefully screened and selected from those who underwent cortical mastoidectomy with type I tympanoplasty for mucosal type of chronic otitis media quiescent stage with conductive hearing loss. All patients aged from 15 to 55 years with a duration of disease from 6 months to 5 years with a minimum of 3 weeks dry ear prior to surgery with intact ossicular chain, moderate size central perforation with mild to moderate conductive hearing loss, patent eustachian tube and post operatively followed up for a minimum of 6 months were included in the study.

All those patients with active ear discharge or cholesteatoma or ossicular discontinuity or sensorineural hearing loss or mixed hearing loss or chronic immunocompressed status were excluded from the study.

2.1. Methodology

Using the selection criteria 60 patients were chosen and were divided into two groups. Group A consisted of 30 patients who underwent cortical mastoidectomy with type I tympanoplasty with temporalis fascia graft along with fashioned tragal cartilage without perichondrium and group B consisted of 30 patients who underwent cortical mastoidectomy with type I tympanoplasty with temporalis fascia graft alone.

A full clinical preoperative work up of history and Otological examination had been carried out. Focal sepsis



Fig. 1: Showing the images of the perforation documented prior to surgery.

in nose, para nasal sinuses and throat were ruled out.

All the patients had undergone pre operative pure tone audiograms to know the type and degree of deafness and radiological imaging for size of mastoid antrum. Preoperative anaesthetic clearance for general anaesthesia and consent for the proposed surgical procedure were obtained. Informed and written consents were obtained for all patients.

2.2. Surgical technique

All the sixty patients were operated under general anaesthesia using Carl Zeiss OPMI-pro microscope. Post-aural Wilde's incision was marked and made, temporalis fascia graft of size 2.5 x 3 cms harvested and kept for drying. "Reverse 7" periosteal incision made and flap elevated exposing the Henle's spine and the MacEwan's triangle. The mastoid cortex was exposed after placing suitable Mollison's and Jenson's retractors. Mastoid antrum was entered through MacEwan triangle with appropriate burrs. All accessible mastoid air cells were removed, cavity saucerized with smooth edges, Incus shadow demonstrated and aditus widened, patency between middle ear and mastoid confirmed with free flow of saline in either direction. In the group A patients, tragal cartilage was harvested, refashioned to size, placed in saline and its wound sutured with 3-0 Ethylon. Permeatal lateral vascular Palva flap elevated. Posterior meatotomy completed and pinna retracted. Tympanomeatal 12 to 6 o' clock flap marked and elevated. Ossicular chain integrity confirmed. Dried Temporalis fascia graft placed by underlay method which is then supported by refashioned tragal cartilage. In the group B patients all the above steps were carried out but only temporalis fascia graft placed by underlay technique

without using tragal cartilage. Medicated gel foam was used in all the patients. Standard post operative care for mastoid surgery was given to all sixty patients. Patients were discharged on the third post operative day with standard post operative advice for ear surgeries.



Fig. 2: Clockwise **a):** Tragus; **b):** Incision made for harvesting the cartilage; **c):** Exposing the tragal cartilage; **d):** Harvesting the cartilage; **e):** Refashioned cartilage before placement; **f):** Cartilage in place along with temporalis fascia.

Patients were followed up in the ENT out patient on 7th post operative day for sutures and pack removal, then every fortnightly until the 6th month for postoperative pure tone audiogram which is done on the 100th post operative day and postoperative neo membrane documentation.

3. Results

In group A patients, the age wise distribution was 10 patients (33%) in 25 to 35 years, 09 patients (30%) in 35 to 45 years, 06 patients (20%) in 15 to 25 years, 05 patients (17%) in 45 to 55 years. In group B patients, the age wise distribution was 12 patients (40%) in 25 to 35 years, 10 patients (33%) in 35 to 45 years, 05 patients (17%) in 15 to 25 years, 03 patients (10%) in 45 to 55 years. (Table 1)

Table 1: Age wise distribution in patients

Age group (In Years)	Group A (N=30) (%)	Group B (N=30) (%)
15-25	06 (20%)	05 (17%)
25-35	10 (33%)	12 (40%)
35-45	09 (30%)	10 (33%)
45-55	05 (17%)	03 (10%)

In group A patients 33% were male (10) and 67% were female patients (20). In group B patients : 30% were male (9) and 70% were female (21) patients. Table 2

Table 2: Gender distribution

Gender	Group A (N=30) (%)	Group B (N=30) (%)
Male	10 (33%)	09 (30%)
Female	20 (67%)	21 (70%)

In group A patients the duration of disease was around 6 months to 1 year in 16 patients (53%), 1 to 3 years in 09 patients (30%) and 3 to 5 years in 05 patients (17%). In group B patients the duration of disease was around 6 months to 1 year in 17 patients (57%), 1 to 3 years in 09 patients (30%) and 3 to 5 years in 04 patients (13%) (Table 3)

Table 3: Duration of the disease

Duration of disease	Group A (N=30) (%)	Group B (N=30) (%)
6 Months-1 Year	16 (53%)	17 (57%)
1 Year – 3 Years	09 (30%)	09 (30%)
3 Years- 5 Years	05 (17%)	04 (13%)

In group A patients successful neo membrane was formed graft taken up in 27 patients (90%), unsuccessful in 03 patients (10%) whereas in group B patients successful neo membrane was formed in 28 patients (93%), failure noticed in 02 patients (07%).(Table 4)

Table 4: Condition of graft after 6 months post operative time.

Condition of graft	Group A (N=30) (%)	Group B (N=30) (%)
Graft uptake	27 (90%)	28 (93%)
Graft failure	03 (10%)	02 (07%)

In group A patients, the hearing improvement taken into account with air bone gap closure of > 10 dB in 25 patients (83%), <10 dB in 05 patients (17%) whereas group B patients the hearing improvement with airborne gap closure is > 10 dB in 26 patients (87%), < 10 dB in 04 patients (13%) (Table 5)

Table 5: Hearing improvement.

Hearing improvement(dB)	Group A (N=30) (%)	Group B (N=30) (%)
>10dB	25 (83%)	26 (87%)
<10dB	05 (17%)	04 (13%)

Table 6: Outcome of hearing post operatively

Group	Mean pre-operative AB GAP	Mean post-operative AB GAP	Mean post-operative hearing gain percentage
A	17.44	10.43	74%
B	17.64	10.14	76%

4. Discussion

A retrospective study of 60 patients who underwent cortical mastoidectomy with tympanoplasty were included in the study. Cortical mastoidectomy was taken as a

common factor. As suggested by many authors cortical mastoidectomy helps in disease clearance, improvement in the middle ear & mastoid environment and ventilatory mechanism of an open mastoid system. The functional advantage of large aerated mastoid act as a buffer to the changes in pressure within middle ear as suggested by Holmquist and Bergstrom⁸ and later reiterated by Sade et al and Richards et al.^{9,10} The 60 patients in our study were divided into group A of 30 patients who underwent tympanoplasty using temporalis fascia with refashioned tragal cartilage support and group B of 30 patients who underwent tympanoplasty using temporalis fascia graft alone. Medicated gel foam was used in the patients, the use of which did not significantly change the outcome of tympanoplasty according to Vijay et al.¹¹

In the present study more number of patients were in the age of group 25 to 35 years, more with duration of the disease of 6 months to 1 year and more females were in both group A and B.

In group A 30 patients underwent tympanoplasty using refashioned tragal cartilage along with temporalis fascia graft as homograft cartilage is one of the materials that can be used to enhance graft.^{12,13} The perceived benefits of cartilage tympanoplasty is to prevent retraction pockets at the grafted sites even though many otolaryngologists accept that this technique may not deal with causal factors involved in the retraction process. There are many concerns that the stiffness and mass of cartilage graft may adversely affect hearing have not been substantiated in clinical reports so far but according to a study by Ramalingam et al¹³ use of 1mm thickness conchal cartilage graft gives a similar outcome to that of a temporalis fascia graft without altering the compliance of the hearing Temporalis apparatus. Advantages of cartilage graft are higher stability, faster healing, more resistance to negative middle ear pressure, sufficient elasticity for good sound conduction and resistance to resorption.^{12,14,15}

In group B 30 patients underwent tympanoplasty using temporalis fascia graft. Temporalis fascia graft is one of the best grafting material owing to its translucency, low metabolic rate, anatomic proximity and suppleness. However graft displacement, reperforation of the graft with chronic mucosal dysfunction and eustachian tube dysfunction can lead to atelectasis of the graft.^{11,16}

4.1. Graft uptake

In our present study in group A cartilage supported temporalis fascia graft, uptake rate was 90% and graft failure rate was 10%. In group B temporalis fascia graft alone, uptake rate was 93% and graft failure rate was 07%.

Our studies were similar to the studies conducted by the following researchers. The graft uptake rate in myringoplasty by tragal cartilage with simple mastoidectomy in the study conducted by Ahmed Gamal

Khafagy et al and Gun T et al was 88%.^{17,18} The graft uptake rate in cortical mastoidectomy with tympanoplasty using temporalis fascia graft in the studies conducted by Divya et al was 90%,¹⁹ Krishnan et al was 96.7%,²⁰ Albu et al was 82.8% (21), Mc Grew et al was 91.6%.²¹

4.2. Hearing improvement

In our present study, group A of tragal cartilage supported graft showed mean pre operative PTA - ABG of 17.44, mean post operative PTA - ABG of 10.43 and mean hearing gain of 74%. Group B of temporalis fascia graft showed mean pre operative PTA - ABG of 17.64, mean post operative PTA - ABG of 10.14 and mean hearing gain of 76%.

Our studies were similar to the studies conducted by Ahmed Gamal Khafagy for cartilage graft was 0.0843,¹⁷ for temporalis fascia graft by Shalini Singh Sisodia et al was 10.37 -+ 2.95.²² by Krishnan et al was 75% hearing gain.¹⁹

5. Conclusion

Even-though tympanoplasty with cortical mastoidectomy gives an overall improvement in terms of graft uptake and hearing, between the two types of grafting strategies used in tympanoplasties there was no significant difference. The selection of the patient, the condition of middle ear, postoperative follow up and compliance of patient to post operative care of the operated ear adds to the success of the procedure. A detailed study of the longterm outcomes will be needed to see the resorption rate of the tragal cartilage.

6. Limitations

Long term follow up of the healed tympanic membrane and resorption rate of tragal cartilage is needed.

7. Source of Funding

This work not supported in any foundation.

8. Conflict of Interest

The authors declare no potential conflicts of interest concerning the authorship and publication of this article.

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Cite this article: Subramaniam S, Ramalingam V, Rajeevan A, Thiyagarajan V, Sengodan, KKM, Murugan RK. Evaluating the outcome of type I Tympanoplasty with cortical mastoidectomy using temporalis fascia graft with and without tragal cartilage support. *IP J Otorhinolaryngol Allied Sci* 2021;4(4):134-138.