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Original Research Article

Hospital Based Prospective Outcome Assessment Endoscopic Composite Cartilage Tympanoplasty in Patients Having Chronic Otitis Media with Safe Central Perforation

Jitendra Kumar[1], Badal Kumar[2]

[1]Senior Resident, Department of ENT, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India

[2]Senior Resident, Department of ENT, AIIMS, Raipur, Chhattisgarh, India

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Corresponding author: Dr. Badal Kumar

Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to determine the functional outcome of endoscopic composite cartilage tympanoplasty in patients having chronic otitis media with safe central perforation.

Methods: This prospective interventional study included 200 patients of chronic otitis media with dry and safe central perforation (small/medium), who underwent endoscopic composite cartilage tympanoplasty (type I) in the Department of ENT for 12 months

Results: In this study of 200 cases, there were 120 females and 80 males were observed. In this study, patients were selected above 12 years of age. There were 42 cases between 13-20 years of age, 68 cases between 21-30 years, 72 cases between 31-40 years of age, and 18 cases above 40 years. The mean age of patients in this study was 32.8±8.16 years. In our study, the duration of ear discharge ranged from less than 1 year to more than 5 years. Out of the total 200 cases, 30 cases had ear discharge for less than 1 year, 100 cases for 1-5 years, and 70 cases for more than 5 years. In this study, 64 cases reported decreased hearing for 1-5 years, and 116 cases had it for more than 5 years. The maximum number of subjects in our study was having medium size perforation 128 cases, whereas 72 patients had small perforation. In this study of 200 cases, 90 patients were operated on in the left ear and 110 case patients were operated on in the right ear. The pre-operative ACT was 45.5±6.4 dB whereas postoperatively it was 28.62±6.34 dB and the difference between the pre- operative and post-operative values was found to be statistically significant.

Conclusion: We concluded that endoscopic composite cartilage graft type I tympanoplasty is a feasible, safe, minimally invasive, and effective procedure with successful outcomes.

Keywords: Cartilage, Endoscopic ear surgery, Tympanoplasty type I

Introduction

Tragal cartilage for tympanoplasty was described by Duckert et al in 1959. [1] As compared to temporalis fascia which is composed of elastic fibres that are arranged in a disorderly fashion and tend to accumulate fibrous connective tissue which thickens and shrinks the graft over time, cartilage is more rigid and devoid of fibrous tissue. [2] Its robust nature helps in resisting negative middle ear pressures. Cartilage as an autologous graft can be harvested from the same surgical site, easy to fashion; extrusion rates are minimal, are economical and resists absorption. Unlike temporalis fascia, it receives nutrition by diffusion through its perichondrium, and hence has a good survival rate. [3] Studies comparing temporalis fascia with cartilage have not found a significant difference in sound conduction. [4-7] Tragal cartilage also holds an advantage in the fact that it has a natural curvature – which helps in positioning and securing the graft. Conchal cartilage on the other hand may be brittle and irregular. [8] Graft take up rate for temporalis fascia is 93-97% in primary tympanoplasties. [9] The method of slicing of cartilage causes contraction of its perichondrium and curling of cartilage to same side, and hence causing difficulty in placing it as an underlay graft. Also, cartilage graft, due to its opacity, may not allow detecting an iatrogenic cholesteatoma or post-op serous otitis media. [10]

In the underlay technique, the graft is placed medial to the TM remnant and malleus handle and is more suitable for posterior perforations. It is more commonly used worldwide, easier to perform, and less time consuming. However, disadvantages include decreased mesotympanic space,

medialization of graft, and less success rate for anterior perforation. [11] The modifications of underlay tympanoplasty for repairing anterior perforations of the TM include Medio lateral graft, window shade, anterior transcanal, loop overlay, and hammock techniques. [12] In the overlay technique, the epithelial layer is elevated precisely, and the graft is placed lateral to the fibrous layer of TM remnant and annulus. Although this technique has a higher success rate, it is technically demanding and has specific complications such as graft lateralization, anterior blunting, slow healing, stenosis of the external auditory canal (EAC), and iatrogenic cholesteatoma. [13]

The aim of the present study was to determine the functional outcome of endoscopic composite cartilage tympanoplasty in patients having chronic otitis media with safe central perforation (small or medium).

Materials and Methods

This prospective interventional study included 200 patients of chronic otitis media with dry and safe central perforation (small/medium), who underwent endoscopic composite cartilage tympanoplasty (type I) in the Department of ENT, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India for 12 months

The sample size was decided according to the estimated availability of the surgical cases over the next 18 months of study duration.

The inclusion criteria were: (a) patients aging above 12 years; (b) with chronic otitis media with dry and safe central perforation (small or medium) for at least one and a half months; (c) having conductive hearing loss (air conduction threshold <45 dB in the affected ear); and (d) good tubal function and dry middle ear mucosa. The exclusion criteria were: (a) large subtotal/total perforation; (b) with active squamosal/adhesive disease (unsafe ear); (c) with persistently discharging ear not responding to medication; (d) pure sensorineural and mixed hearing loss in the affected ear; and (e) revision cases.

All selected patients were subjected to a thorough history regarding presenting complaints, any chronic illness, any long- duration medication, or any systemic disorder. Clinical examination, otoscopy, oto-endoscopy, tuning fork tests, and X-ray (bilateral) mastoid (Schuller's view) were done in all patients. Hearing assessment by pure tone audiometry (PTA) was performed on all patients. The air conduction (ACT) and bone conduction (BCT) pure-tone average were calculated by averaging the thresholds at 0.5, 1, 2, and 4 kHz. All patients were followed up postoperatively at one month, three months, and six-month intervals and underwent audiometry and otoscopy. Functional results were evaluated by comparing the change in air conduction thresholds preoperatively and post-operatively.

Data were described in terms of range, preoperative ACT, and postoperative ACT (mean±SD), frequencies, and relative frequencies as appropriate. The comparison of quantitative variables was done using paired t-test. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using (Statistical package for the social science) SPSS, version 21 (SPSS Inc., Chicago, IL, USA).

Results

Table 1: Demographic data of the study

Variables	N	%
Age		
13-20	42	21
21-30	68	34
31-40	72	36
>40	18	9
Mean±SD	32.8±8.16	
Gender		
F	120	60
M	80	40
Duration of ear discharge		
< 1 year	30	15
1-5 year	100	50
>5 year	70	35
Decreased hearing		
< 1 year	20	10
1-5 year	64	32
>5 year	116	58

In this study of 200 cases, there were 120 females and 80 males were observed. In this study, patients

were selected above 12 years of age. There were 42 cases between 13-20 years of age, 68 cases between 21-30 years, 72 cases between 31-40 years of age, and 18 cases above 40 years. The mean age of patients in this study was 32.8±8.16 years. In our study, the duration of ear discharge ranged from less than 1 year to more than 5 years. Out of the total 200 cases, 30 cases had ear discharge for less than 1 year, 100 cases for 1-5 years, and 70 cases for more than 5 years. In this study, 64 cases reported decreased hearing for 1-5 years, and 116 cases had it for more than 5 years.

Table 2: Patients operated information

	N	%
Size of perforation		
Medium	128	64
Small	72	36
Operated site		
Left	90	45
Right	110	55

The maximum number of subjects in our study was having medium size perforation 128 cases, whereas 72 patients had small perforation. In this study of 200 cases, 90 patients were operated on in the left ear and 110 case patients were operated on in the right ear.

Table 3: ACT wise comparison of the study

	Mean	SD	P-value
Pre	45.5	6.4	<0.001
Post	28.62	6.34	

The pre-operative ACT was 45.5±6.4 dB whereas postoperatively it was 28.62±6.34 dB and the difference between the pre- operative and post-operative values was found to be statistically significant.

Discussion

Chronic otitis media is the chronic inflammation of the mucoperiosteal lining of the middle ear and mastoid cavity. It causes numerous pathological changes in the tympanic membrane and middle ear including perforation, ossicular destruction, myringosclerosis, and conductive hearing loss. The surgical treatment of chronic otitis media primarily aims to eradicate the disease process, reconstruct conductive hearing mechanism, and establish middle ear cleft ventilation. Since the 1950s, microscopic tympanoplasty has been the standard treatment for the reconstruction of a perforated tympanic membrane. [14] Using the endoscopic transcanal approach, many ear operations can be performed through a relatively narrow corridor without a large post-auricular incision. The tragal cartilage is an excellent graft, especially in the endoscopic tympanoplasties. The cartilage being relatively rigid is easier to place single-handedly with precision, and its fewer chances of graft rejection or failure prove it a perfect graft transplant while performing endoscopic tympanoplasty. [15] The transanal endoscopic approach is scarless and provides a bloodless field. The graft success rates in the endoscopic tympanoplasty and microscopic tympanoplasty groups have been reported at 100% and 95.8% respectively. [16]

In this study of 200 cases, there were 120 females and 80 males were observed. In this study, patients were selected above 12 years of age. The study conducted by Kaya et al on the results of endoscopic cartilage tympanoplasty in 87 cases, also found that 55 cases were females and 32 were males. [17] There were 42 cases between 13-20 years of age, 68 cases between 21-30 years, 72 cases between 31-40 years of age, and 18 cases above 40 years. The mean age of patients in this study was 32.8±8.16 years. Similar to our study, Daneshi et al included the patients with a mean age of 37.9 years in their study, performed on 9 patients. [18] In our study, the duration of ear discharge ranged from less than 1 year to more than 5 years. Out of the total 200 cases, 30 cases had ear discharge for less than 1 year, 100 cases for 1-5 years, and 70 cases for more than 5 years. In this study, 64 cases reported decreased hearing for 1-5 years, and 116 cases had it for more than 5 years.

The maximum number of subjects in our study was having medium size perforation 128 cases, whereas 72 patients had small perforation. A study by Gokgoz et al. and Tasli et al. on the results of endoscopic transcanal tympanoplasty was found to be very similar to ours. Like our study, theirs had 50 patients who all had endoscopic type I tympanoplasty with tragal cartilage graft and over-underlay technique. At 6 months after surgery, 94% of the grafts had worked. But, unlike our study, they ha both medium-sized and large-sized holes and more of them were on the left side. In their study, three patients had a perforation in the anterior quadrant that looked like a crescent after surgery. [19]

In this study of 200 cases, 90 patients were operated on in the left ear and 110 case patients

were operated on in the right ear. The pre-operative ACT was 45.5±6.4 dB whereas postoperatively it was 28.62±6.34 dB and the difference between the pre- operative and post-operative values was found to be statistically significant. In one study, where 53 cases underwent endoscopic composite cartilage tympanoplasty, available data of 39 patients revealed a mean pre-operative PTA of 42.8 dB (SD±16.7) and mean post-operative PTA of 25.7 dB (SD±15.9) with a statistically significant difference ($p<0.001$). [20] In another study where endoscopic cartilage tympanoplasty was done using full thickness and partial thickness tragal graft, the average preoperative hearing was 40.80±7.46 dB and 39.40±7.95 dB for full thickness and partial thickness cartilage groups, respectively. The post-operative PTA at 2 months showed an average hearing of 26.72±8.08 dB for full-thickness and 26.40±8.60 dB for the partial thickness group. The hearing improvement in both groups was comparable and statistically significant compared to their respective pre-operative hearing levels (p value=0.012 for full-thickness and p value=0.018 for partial thickness group). [21]

Conclusion

There was good uptake of graft along with improvement in the audiological profile of the patients. From this study, we concluded that endoscopic composite cartilage graft type I tympanoplasty is a feasible, safe, minimally invasive, and effective procedure with successful outcomes.

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