

Evaluation of Audiological Profile and Graft Uptake by Endoscopic Composite Cartilage Graft Tympanoplasty in Chronic Otitis Media Patients

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Abstract

Background: The aim of the 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).

Methods: This prospective study was conducted on 100 chronic otitis media cases with safe central perforation (small/medium) in the ENT Department of Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. All the patients were selected as per the described inclusion and exclusion criteria. All cases underwent endoscopic composite cartilage graft tympanoplasty (type-I) under general anesthesia. Audiological outcomes were assessed by comparing mean pure tone average pre-and post-operatively and morphological results (successful graft uptake) were evaluated at 3 months.

Results: The result of this study showed graft uptake success in 94 cases and failure was seen in 6 cases. The pre-operative ACT was 44.8 ± 6.1 dB whereas postoperatively it was 29.61 ± 6.31 dB and the difference between the pre-operative and post-operative values was found to be statistically significant.

Conclusions: we conducted an endoscopic composite cartilage graft tympanoplasty (type-I) in 100 cases and observed a graft uptake success rate of 94%. There was good uptake of graft along with improvement in the audiological profile of the patients.

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Introduction

Chronic otitis media is an inflammation of the lining of the middle ear and mastoid cavity that lasts for a long time. It causes a lot of bad things to happen to the tympanic membrane and middle ear, like perforation, ossicular destruction, myringosclerosis, and hearing loss that

happens from the outside in. Chronic otitis media is usually treated with surgery. The main goals of surgery are to get rid of the disease, repair the hearing mechanism, and open up the cleft in the middle ear.

The change from classical microscopic tympanoplasty to endoscopic

tympanoplasty has happened slowly over time as better instruments and surgical techniques have been developed. People seem to be slow to use this technique because they don't know how to use the instruments and they can't use both hands. [1]

With the endoscopic transcanal approach, many ear surgeries can be done through a small hole without making a big cut behind the ear. When doing endoscopic tympanoplasties, the tragal cartilage is a great graft. Since cartilage is fairly stiff, it is easier to place it by hand with accuracy, and it is less likely to be rejected or fail, making it the perfect graft to use during endoscopic tympanoplasty. [2] The transanal endoscopic method leaves no scars and doesn't get any blood on the field. People who had endoscopic tympanoplasty or microscopic tympanoplasty had grafts that worked 100% of the time and 95.8% of the time, respectively. [3]

The aim of the 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).

Methods

This prospective interventional study included 100 patients of chronic otitis media with dry and safe central perforation (small/medium), who underwent endoscopic composite cartilage tympanoplasty (type I) in the Otolaryngology Department of Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India

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 postoperatively.

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

	N	%
Age		
13-20	20	20
21-30	33	33
31-40	35	35
>40	12	12
mean±SD	33.4±9.16	
Gender		
F	57	57
M	43	43
Duration of ear discharge		
< 1 year	14	14
1-5 year	50	50
>5 year	36	36
Decreased hearing		
< 1 year	8	8
1-5 year	62	62
>5 year	30	30
Operated site		
Left	46	46
Right	54	54

In this study of 100 cases, there were 57 females and 43 males, and a female: male ratio of 1.32:1 was observed. There was a uniform distribution of the subjects across the age groups. In this study, patients were selected above 12 years of age. There were 20 cases between 13-20 years of age, 33 cases between 21-30 years, 35 cases between 31-40 years of age, and 12 cases above 40 years. The age group with the highest incidence of disease was found to be 31 to 40 years of age (40%). The mean age of patients in this study was 33.4±9.16 years. In our study, the duration of ear discharge ranged from less than 1 year to more than 5 years. Out of the total 100 cases, 14 cases had ear discharge for less than 1 year, 50 cases for 1-5 years, and 36 cases for more than 5 years. The maximum number of subjects had a discharge history between 1-5 years (50%). In this study, 8

cases were found to have decreased hearing for less than 1 year, 62% cases reported decreased hearing for 1-5 years, and 30 cases had it for more than 5 years. Maximum cases were found to have a history of decreased hearing between 1-5 years duration. The maximum number of subjects in our study were having medium size perforation (less than 50%) i. e.; 62 cases, whereas 38 patients had small perforation (less than 25%). In our study 16 cases had diploic mastoid, 56 cases had pneumatised mastoid and 28 cases had sclerosed mastoid as revealed by X-ray mastoid. In this study of 100 cases, 46 patients were operated on in the left ear and 54 case patients were operated on in the right ear. The result of this study showed graft uptake success in 94 cases and failure was seen in 6 cases.

Table 2: patients operated information

	N	%
Size of perforation		
Medium	62	62
Small	38	38
Operated site		
Left	46	46
Right	54	54

Table 3 : ACT wise comparison of the study

	Mean	SD	P VALUE
Pre	44.8	6.1	
Post	29.61	6.31	

The pre-operative ACT was 44.8 ± 6.1 dB whereas postoperatively it was 29.61 ± 6.31 dB and the difference between the pre-operative and post-operative values was found to be statistically significant.

Discussion

This study was done over the course of 18 months at a Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. It had a total of 100 cases, which were chosen based on criteria for what to include and what to leave out, and after getting proper informed consent. Under general anesthesia, type I endoscopic composite cartilage graft tympanoplasty was done on all of the cases. Postoperatively, the graft took in 94 cases, and there was a statistically significant difference ($p=0.001$) between the pre- and post-operative mean air-conduction thresholds in terms of functional outcomes.

Composite cartilage tympanoplasty has been used for many years. When surgery is done endoscopically, the functional and anatomical results are the same as when surgery is done with a microscope. But the EES method has been shown to be better in terms of how it can be seen and how easy it is to use. Cartilage is strong enough to stand up to negative pressure in the middle ear, and when compared to temporalis fascia, there has been no

significant difference in how sound travels. [4-7] Factors that led to good graft uptake include taking advantage of the natural properties of the tragal cartilage through a specific grafting design that makes it harder for the graft to come loose and makes it easier to place with one hand. Also, this method reduces the need for packing the middle ear, which makes it less likely that an adhesion will form. [8]

In our study, There were 20 cases between 13-20 years of age, 33 cases between 21-30 years, 35 cases between 31-40 years of age, and 12 cases above 40 years. The age group with the highest incidence of disease was found to be 31 to 40 years of age (40%). The mean age of patients in this study was 33.4 ± 9.16 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. [9]

In our study, the prevalence of disease was more common in females as compared to males. Of the 100 cases, there were 57 females and 43 males, and a female: male ratio of 1.32:1 was observed. 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. [10]

In this study, 94 successful graft uptake rate was noticed and 6 cases had a residual perforation. In 2013, Ayache et al. wrote

about 30 endoscopic myringoplasties that went well 96% of the time. In his study, he found that two patients still had perforations that healed on their own. [11] 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 had 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. [8]

In our study, the mean air conduction threshold got better after surgery, and when compared to the thresholds before surgery, there was a statistically significant difference. In one study, 53 people had endoscopic composite cartilage tympanoplasty. Data from 39 patients showed that the average PTA before surgery was 42.8 dB (SD=16.7) and the average PTA after surgery was 25.7 dB (SD=15.9). This difference was statistically significant ($p < 0.001$). [12] In another study, full thickness and partial thickness tragal graft were used to do endoscopic cartilage tympanoplasty. The average hearing before surgery was 40.807.46 dB for the full thickness group and 39.407.95 dB for the partial thickness group. At 2 months after surgery, the average hearing in the full-thickness group was 26.728.08 dB and in the partial-thickness group it was 26.408.60 dB. When compared to their hearing levels before surgery, the improvement in hearing in both groups was similar and statistically significant (p value = 0.012 for full-thickness group and p value = 0.018 for partial thickness group). [13]

We thought that one of the problems with this study was that the sample size, randomization, and blinding were not done

well enough. The other problems with this study were that it was done in the past, the sample size was small, and the follow-up period was short. This study was done at a single institution, and the experience of a single surgeon may have been a factor. [14] The strength of this study, according to us, was that the morphological and audiological results were similar, and there were less problems during our learning curve phase. We think that a blinded, randomized study with a larger sample size, long-term results, complications, and comparisons with other surgical techniques will be needed to come to conclusions that are clinically relevant.

Conclusion

In our study, we conducted an endoscopic composite cartilage graft tympanoplasty (type-I) in 100 cases and observed a graft uptake success rate of 94%. There was good uptake of graft along with improvement in the audiological profile of the patients.

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