

## A Comparative Study of Tympanoplasty Type 1 - Endaural versus Postaural Approach

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### Abstract

**Background & Objectives:** Chronic otitis media is the inflammation of the mucoperiosteal lining of the middle ear cleft characterized by ear discharge, a permanent perforation of the tympanic membrane, and impairment in hearing. It is one of the most common ear diseases encountered in developing countries due to poor socio-economic standards, lack of health education, and unhygienic habits. The aim of the study is to evaluate and compare the surgical outcome in Endaural and Postaural approach for Type-1 Tympanoplasty.

**Methods:** The study was conducted in the department of ENT, Government ENT hospital, Andhra Medical College, Visakhapatnam among 100 patients from January 2018 to August 2019. Surgery was performed under local anesthesia by Endaural and Postaural approach. In 50 patients of Group A, Type 1 Tympanoplasty was done by the Postaural approach, in the remaining sample of 50 patients of Group B Type 1 Tympanoplasty was done by the Endaural approach. Pure tone audiometric tests were performed before surgery and 3 and 6 months postoperatively.

**Results:** Patients were followed up for an average period of 6-12months. Graft uptake, Hearing assessment and Cosmetic results were observed in the post-op follow up. In the Endaural approach myringoplasty, the graft uptake at the end of 6 months was 96%, with 96% success rate in achieving improvement in hearing and 94% patients had excellent cosmetic results. In the Postaural approach, the graft uptake was 94%, with 94% success rate in achieving improvement in hearing and 64% patients rated their cosmetic result as excellent.

**Conclusion:** The Endaural approach to middle ear surgery is suggested as a good alternative to the postaural approach. The results are almost equal in both approaches. The selection of approach depends on surgeon's expertise and patient's preference.

**Keywords:** Endaural approach, Postaural approach, Tympanoplasty.

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### Introduction

Chronic suppurative otitis media continues to be a significant otological problem accounting for a large number of outpatient cases in our country[1]. Patients with chronic otitis media of mucosal type with permanent perforation syndrome are disabled not only due to hearing loss but also from recurrent otorrhoea [2,3]. Tympanoplasty is one of the surgical techniques for the management of CSOM tubotympanic-type disease[4]. The middle ear cavity is approached surgically through permeal, endaural, or postaural approach[5,6]. This study aimed to evaluate and compare Endaural and Postaural approaches of myringoplasty and to study practical difficulties encountered in operative procedures, success rate, and complications associated with these approaches[7,8]. Hearing

improvement after myringoplasty and various factors influencing the surgical outcome was also studied [9,10,11]. As myringoplasty is a common surgical procedure analysis of these factors will certainly help in future selection and care of the patients[12].

### Methods

The present study was a hospital-based cross-sectional observational study conducted during the period from January 2018 to August 2019 in 100 patients attending OPD, Government ENT hospital, Visakhapatnam, with dry central perforation of tubotympanic type of CSOM. The study group included 100 patients, divided into two groups, 50 each based on the type of approach followed. It includes

47 (47%) males and 53 (53%) females. It was a predominantly female group. Patients of age group 18 to 55 years, with CSOM tubotympanic type with conductive hearing loss and dry ear for a minimum period of 6 weeks were included in the study. Patients below 6 years age who may not co-operate for audiometric procedures, above 55 years due to presbycusis, history of previous ear surgery, with sensor y neural hearing loss, with co-existing middle ear conditions like tympanosclerosis and ossicular fixation or ossicular discontinuity, with aural polyp, granulations, with the presence of positive fistula sign, with intracranial complications were excluded.

Prior permission was taken from the institutional ethics committee Andhra Medical College, Visakhapatnam. A written and informed consent was taken from each individual of the study. A thorough evaluation of 100 patients was done by taking a detailed history regarding the ear discharge, hard of hearing, otalgia, tinnitus, vertigo and a brief note on other symptoms. Preliminary hearing assessment was done by doing tuning fork tests which included Rinne's, Weber's and Absolute bone conduction tests initially; later the patient was subjected to investigations like Pure tone audiometry (PTA), impedance, otomicroscopy. Radiological assessment of temporal bone was done by X-ray of both mastoids and HRCT temporal bone (if required). The provisional diagnosis is made with the above clinical, audiological and radiological findings. Then surgery was performed with the consent of patients under local anesthesia by Endaural and Postaural approach.

In 50 patients of Group A, Type 1 Tympanoplasty was done by the Postaural approach, in the remaining sample of 50 patients of Group B, Type 1 Tympanoplasty was done by the Endaural approach. The endaural approach surgery required an average duration of 45minutes and postaural surgery required an average duration of 50 minutes. Pure tone audiometric tests were performed before surgery and 3 and 6 months postoperatively. Hearing thresholds, including air conduction and bone conduction measured at 0.5, 1.0, and 2.0 kHz, and the pure tone averages calculated. Air-Bone (A-B) gap at frequencies 500 Hz, 1 kHz, and 2 kHz noted, and hearing loss calculated by taking the average of three.

In all the Patients belonging to group A, surgery was done through the Postaural approach requires a 4 cm long post aural incision, 0.5cm behind the post aural groove. In patients belonging to group B, surgery was done through the Endaural approach. Two canal incisions were given. One from 12 o'clock to 6 o'clock, second incision connecting from 6 o'clock to extending to incisura terminalis externally and graft was taken through the same incision. The patient was premeditated half an hour before the procedure with 30mg Pentazocine and 25mg Phenergan given intramuscularly. All procedures were performed under Local Anesthesia. The patient was placed in the supine position with the head partially rotated to the opposite side. The post auricular infiltration with 2% Xylocaine with 1: 30,000 adrenaline. Canal wall infiltration was given by using Holmgren plester Selfretaining aural speculum. Temporalis fascia used as the graft material in all the 100 patients.

In the group A patients, graft was harvested through the same post auricular incision. In group B patients, graft was harvested through the same Endaural incision. Freshening of the perforation margins was done using a wide curved pick. An incision was given from 1 o'clock to 5 o'clock in the right ear and 11 o'clock to 7 o'clock in the left ear in the canal wall skin about 5mm away from the annulus. The Tympanomeatal flap was elevated, which was an anteriorly based flap. In order to confirm the continuity of the ossicular chain, the round window reflex was visualized. Underlay technique was followed in all the patients in the present study. The flap was placed on the graft to its original position. Gelfoam pieces soaked in antibiotic ear drops were placed over the skin flap to keep the skin in approximation to graft. Canal incision at graft site was sutured with silk. Only a small dressing was given to cover the external auditory canal. There was follow up of Postoperative treatment in Group A and Group B patients. The patients were counselled postoperatively about pulsation, popping, clicking, other sounds and a feeling of fullness in the ear. Patients were followed up for an average period of 6-12months.

## Results

**Table 1: Number of patients in each group**

Endaural approach	Postaural approach
50	50

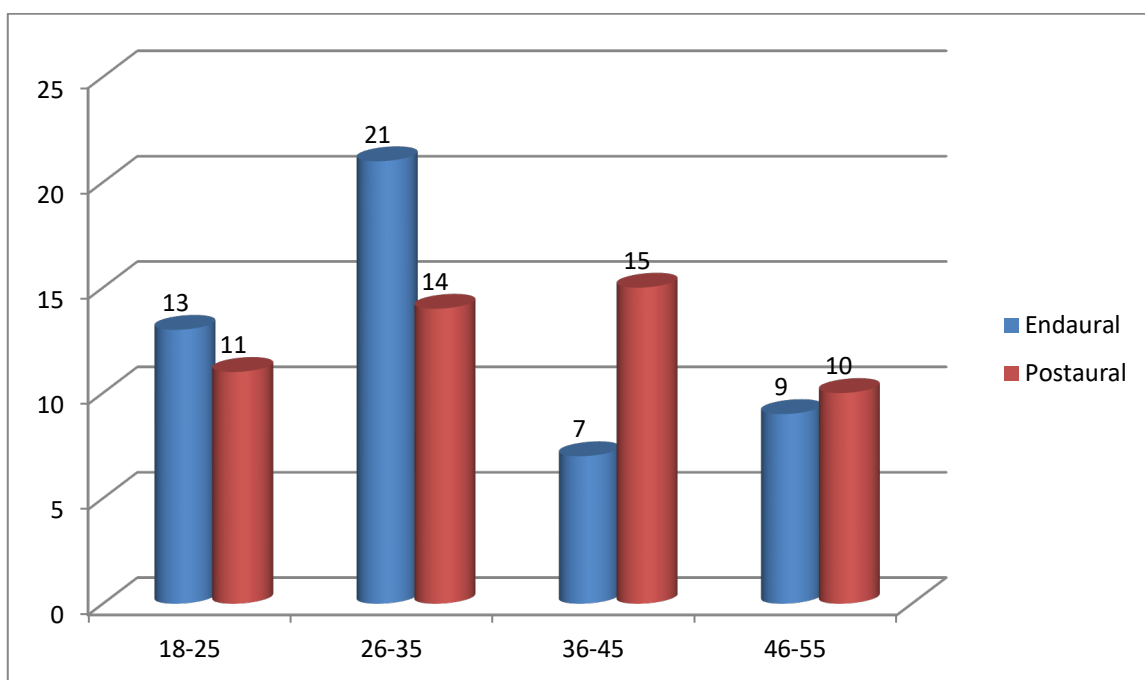
**Table 2: Sex distribution**

Sex	Endaural approach	Postaural approach
Males	20 (40%)	27 (54%)
Females	30 (60%)	23 (46%)
Total	50	50

The Endaural approach study group of the 50 patients includes 30 females (60%) and 20 males (40%). The Postaural approach study group of the 50 patients includes 23 females (46%) and 27 males (54%).

**Table 3: Age distribution in each group**

Age range	No. of patients in each group	
	Endaural approach	Postaural approach
18-25	13	11
26-35	21	14
36-45	7	15
46-55	9	10



**Figure 1: Age distribution in each group**

**Table 4: Symptom patterns in each group**

Type of Symptoms	Endaural	Postaural
Ear discharge	50	50
Hard of hearing	47	50
Ear pain	32	7
Ringing sensation	9	6

**Laterality of CSOM**

Among 100 patients, symptoms mostly localized to one ear in around 80%, predominantly right ear in 49 patients and left ear in 36 patients. The bilateral symptoms were least common in 13 patients.

**Table 5: Laterality of symptoms in each group**

Laterality	Endaural	Postaural
Right	25	27
Left	20	15
Bilateral	5	8

Most of the patients in the study group were having large central perforation (40 %), followed by medium (30%) and subtotal perforation (20%), and a very less number of patients having small central perforation (10%). No patient in the study group had a total perforation. 30 patients were having anterior perforation followed by posterior

perforation in 45 patients, and 25 patients were having the perforation which extended to both anterior and posterior regions of the tympanic membrane.

**Postoperative Results-Graft Status:** In the Endaural approach myringoplasty, the post-

operative graft status was followed at 1month, 3 months, and 6 months. The successful graft uptake was observed in 42 (84%), 45 (90%), and 48 (96%) patients, respectively. In the Postaural approach

myringoplasty, the post-operative graft status was followed at 1 month, 3 months, and 6 months. The successful graft uptake was observed in 40 (80%), 44(88%), and 47(94.0%) patients, respectively.

**Table 6: Graft uptake in both and in each group**

Duration of follow up	Graft intact	Wet ear	Graft intact	Wet ear
1 month	42(84%)	8(16%)	40(80%)	10(20%)
3 months	45(90%)	5(10%)	44(88%)	6(12%)
6 months	48 (96%)	2(4%)	47(94%)	3(6%)

#### Graft uptake rate (at the end of 6 months)

In the present study, the post-operative successful graft uptake at the end of 6 months in Endaural myringoplasty is 96 % when compared with the Postaural myringoplasty, which is around 94 %.

**Table 7: Comparative outcomes of results of graft uptake in both groups after 6 months**

Type of approach	Success	Failure	Total
Endaural	48 (96%)	2(4%)	50
Postaural	47(94%)	3(6%)	50
Total	95	5	100

**Statistical analysis of graft uptake between both groups:** The chi-square statistic is 0.2105. The p-value is 0.6464. This result is not significant at  $p < .05$ .

**Hearing improvement:** In the present study, the post-operative hearing assessment was done at 3, 6, and 12 months. The successful hearing improve-

ment, i.e., the post-operative AB gap <15 dB was achieved in the Endaural approach in 44 (88%), 46(92%), and 48(96%) patients at the end of 3, 6, and 12 months, respectively. In the Postaural approach, the successful hearing outcome was achieved in 42(84%), 45(90%), and 47(94%) patients at the end of 3, 6 and 12 months, respectively.

**Table 7: Comparative outcome of successful hearing improvement in both groups after 12 months**

Type of approach	Post op AB gap <15dB	Post-op AB gap >15 Db	Total	P-value
Endaural	48(96%)	2(4%)	50	0.6464
Postaural	47 (94%)	3(6%)	50	
Total	95	5	100	

**Statistical analysis of Post Operative hearing outcome:** The chi-square statistic is 0.2105. The p-value is 0.6464. This result is not significant at  $p < .05$ .

**Table 8: Comparison of Pre and Post OP Pure tone average in both groups**

Pure tone average	Endaural		Postaural		P value
	Pre op	Post op	Pre op	Post op	
10-20	0(0%)	30(60%)	0(0%)	14 (28%)	0.0
20-30	5(10%)	13(26%)	2(4%)	26(52%)	0.0572
30-40	32(64%)	5(10%)	24(48%)	8(16%)	0.2237
40-50	11(22%)	2(4%)	20(40%)	2(4%)	0.5718
50-60	2(4%)	0(0%)	4(8%)	0(0%)	0.0

#### Complications

In the present study of 50 patients of the Endaural approach, 48 patients achieved successful graft uptake, in which one patient has the medialisation of graft, and 2 patients with blunting of anterior angle found after 6 months follow up.

Whereas in the Postaural approach of 50 patients, 47 patients achieved successful graft uptake, in which one patient has the medialization of graft, and 2 patients with blunting of anterior angle found after 6 months follow up.

#### Statistical analysis of post-operative complications

The chi-square statistic is 0.0583. The p-value is 0.8091. This result is not significant at  $p < .05$ .

#### Cosmetic results

The cosmetic results observed were both subjective and objective methods. In the Endaural approach, 48 (96%) patients had excellent cosmetic results with less scar postoperatively, whereas in postaural group 8 (16%) patients rated their cosmetic result as poor, 20 (40%) patients rated the cosmetic result

as satisfactory and 22(64%) patients rated their cosmetic result as excellent.

### Discussion

This study was undertaken to determine the advantages and disadvantages of the Endaural approach when compared to the Postaural approach in myringoplasty surgery. Most of the patients in this present study belonging to the age group of 18 to 35 years. The age distribution of the study group is comparable to the BijanBasak et al.[13] who conducted a study to analyze the demographic and clinical aspects of CSOM in 1717 patients. In the study of Inwood et al[14] the male to female ratio reported is 1:2. The sex distribution of our study group is comparable to the Inwood et al results.

In the present study, 40(40%) patients presented with anterior central perforation, 30(30%) with posterior central, and 25(25%) involving both the quadrants. The more hearing loss was found in the large central perforation involving both the quadrants, whereas least in those with anterior central perforations. The observation was comparable to the Sharan Kumar Shetty[15] study.

The graft uptake rate in various studies through Endaural approach was 91% in Dawes[16], 99.4% in Seifi AE[17]. The result of the present study, i.e., 96% graft uptake rate, was comparable with the above studies. The graft uptake rate in various studies through post aural approach was 96% by Glasscock[18]. The results of the present study, i.e., 94% graft uptake rate, was comparable with the above study. In the present study, with regard to the difference in graft uptake rate by both the study groups, Endaural group was having the advantage of 2%, which was statistically insignificant. In the present study the success of hearing improvement is considered when the post-operative Air-Bone gap is less than 15 dB. In the Endaural approach, there was a successful improvement of hearing in 48 patients i.e: 96% success rate, which was comparable to the studies of Kerr[19], Roychaudhuri[20] whose success rate was about 92 %, 87% respectively. In the Postaural group, there was a successful improvement of hearing in 47 patients, i.e., 94% success rate, which was comparable to the studies of Sharan Kumar[15], whose success rate was 92%. There was no significant difference in the successful hearing improvement between both approaches in the present study. In the endaural group, the graft was harvested through the same Endaural incision, a 2cm extension into crus of helix, whereas the postaural approach required a 4 cm long post aural incision. Thus, in the endaural group, by avoiding the post aural incision, there was less dissection of healthy tissues, less intraoperative bleeding, less incidence of postoperative pain, less incidence of numbness, and the cosmetic result was better. Avoiding the postaural route had decreased the

chance of auricular displacement and asymmetry of the pinna. We found that positioning the graft was much easier and faster with the Endaural approach.

### Conclusion

From the present study, the following were the conclusions:

1. The graft uptake in the Endaural approach was almost comparable with the postaural approach myringoplasty.
2. The hearing improvement in the endaural approach was almost equal, with the postaural approach myringoplasty after one year.
3. In comparing the complications like medialisation, lateralization, and blunting of the anterior angle, no significant difference was observed.
4. The duration of surgery could have been little, shorter in Endaural approach.
5. In terms of cosmetic results, the Endaural approach is better in results due to the small incision extension. Due to the present era of less scar surgery, the endaural approach will help patients who want better cosmetic results.
6. The post-operative pain was very minimal due to very minimal tissue dissection, and no postaural skin incision can conclude the Endaural approach as a minimally invasive technique.
7. Hence concluding that hearing results, graft uptake, and duration of surgery were comparable, and the endaural approach will be considered an option in terms of better cosmetic results.

### Limitations of the present study

The period of the present study was relatively small, extending for two years. The sample size of the study was small, which was just enough for statistical analysis but not for generalizing the results to the entire population. The follow-up period for the patients was small.

### Recommendations of areas for further study

From this study, the Endaural approach middle ear surgery suggested as a good alternative to the postaural approach in tympanoplasty. The results are almost comparable in view of hearing improvement, graft take up, duration of surgery, and cosmesis. The patients will have less morbidity, less hospital stay, and early ambulation and also better cosmetic results.

It was suggested that ENT surgeons should include an endaural approach in middle ear surgery at least 10-20% of their routine surgical work so that further knowledge regarding the longevity of the graft, improvement in hearing, cosmesis, pinna numbness, and other long-term outcomes may be better studied.

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