

## Original Research Article

# A study of factors affecting the success rate of type-1 tympanoplasty

Bhoomi Bhadesia<sup>1</sup>, Hetal Joshi<sup>2</sup>, Nisarg Desai<sup>2</sup>, Narendra Hirani<sup>2</sup>,  
Ajeet Kumar Khilnani<sup>2\*</sup>, Rashmi Sorathiya<sup>2</sup>

<sup>1</sup>ENT Consultant, Bhadesia Hospital, Morbi, Gujarat, India

<sup>2</sup>Department of Otorhinolaryngology, Gujarat Adani Institute of Medical Sciences and GK General Hospital, Bhuj, Kachchh, Gujarat, India

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### \*Correspondence:

Dr. Ajeet Kumar Khilnani,

E-mail: [ajeetkhilnani@gmail.com](mailto:ajeetkhilnani@gmail.com)

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## ABSTRACT

**Background:** Chronic otitis media (COM) (tubo-tympanic) is a common ear pathology for which tympanoplasty is done. Factors that affect the success rate of tympanoplasty can be patient related (age, gender, socio-economic status), disease related (duration and severity of symptoms) or technique related (equipment and surgical approaches). This study was undertaken to know the factors affecting success rate of type-1 tympanoplasty at our institute.

**Methods:** This was a prospective observational study conducted at ENT Department of Gujarat Adani Institute of Medical Sciences, Bhuj, from October 2017 to July 2019. All patients between 20 and 60 years of age with inactive mucosal COM operated for type-1 tympanoplasty were included in the study. Pre-operative, intra-operative and post-operative details were recorded as per the pre validated proforma and evaluated using Chi-square and paired t-test.

**Results:** 100 patients were included in our study. Females were more commonly affected (61%) than males (39%). In 78% of patients one ear was affected (left 40%, right 38%). Ear discharge was the most common symptom (99%). Maximum patients (55%) had a moderate perforation. The perforation was central in all cases. Microscopic surgery was done in 79% of patients. Post aural approach (Wilde's incision) was the most common approach used (70%). The most common graft material used was temporalis fascia (96%). In 61% of patients graft was kept by underlay technique.

**Conclusions:** In our study, the success rate of tympanoplasty was significantly more when duration of discharge was less, microscope was used for surgery and post aural approach was used. Success rate was less when there was history of any previous nasal pathology. Other factors, like age, gender, socio-economic class, occupation, side of involvement of ear, size and site of perforation and grafting techniques, did not affect the success rate of tympanoplasty.

**Keywords:** Chronic suppurative otitis media, Otitis media, Temporalis fascia, Tympanoplasty

## INTRODUCTION

Chronic Otitis Media (COM) is a common ear pathology in India with a prevalence of around 8%. It can be either of mucosal type or squamosal type. The surgical treatment of choice for mucosal type of COM is tympanoplasty. The success of tympanoplasty depends on multiple factors that can be patient related, disease related, and procedure related. With the advent of operating microscopes and endoscopes the success rate of tympanoplasty has significantly improved. Studies have been done to know

the effect of these factors on success of tympanoplasty. Insight into the clinical features and socio demographic factors in COM can improve a clinician's diagnostic and therapeutic capabilities by enabling more rational decisions regarding selection of cases and surgical techniques to optimize outcome of surgery.

In a study done in Taiwan in 2014, results suggested that patients with large perforation had continuous hearing improvement and air-bone gap (ABG) closure for more than one year in contrast to small perforation.<sup>1</sup> In a 2012

Mexican study the success rate of paediatric tympanoplasty was 81%.<sup>2</sup> In an Iranian study of 2016, the authors did not find any factor that affected the outcome of tympanoplasty.<sup>3</sup> In an Indian study conducted in 2006 at Darjeeling, it was found that type-I tympanoplasty with underlay technique and temporalis fascia graft showed high success, and presence of bilateral perforation lowers the success rate.<sup>4</sup> Another study from Nepal done in 2017 suggested that diseased contralateral ear was a statistically poor prognostic factor for graft uptake after myringoplasty.<sup>5</sup> An Indian study done in 2015 showed that site of perforation did not affect the results of tympanoplasty.<sup>6</sup>

Our hospital caters to a vast population of Kachchh district of western Gujarat. We have many patients coming to our outpatient department (OPD) with chronic suppurative otitis media, and tympanoplasty is a regular procedure performed at our institute. This study was done with the aim to determine the role of different variables related to disease, patient, and technique, that can affect the outcome of tympanoplasty. This will provide a surgeon with a predictability meter/scale to prognosticate the success of surgery.

**METHODS**

This was a prospective observational study conducted at ENT Department of Gujarat Adani Institute of Medical Sciences, Bhuj, from October 2017 to July 2019. Institutional Ethics Committee (IEC) approval was taken before starting this study.

**Inclusion criteria**

All patients between 20 and 60 years of age with inactive mucosal COM operated for type-1 tympanoplasty.

**Exclusion criteria**

Patients with pre-operative sensorineural hearing loss, patients with ossicular necrosis discovered during surgery, patients with systemic illness rendering them unfit for surgery and patients not willing to get enrolled in the study.

A written and informed consent was taken from the participants of the study. All patients were evaluated as per the pre-designed proforma. A detailed history was taken and thorough examination (general and ENT) was done. Pure tone audiogram (PTA) was done for all patients to know the type and degree of hearing loss. All patients were pre-operatively examined under microscope to know the details of middle ear. X-Ray mastoids was done for all patients. During surgery, the middle ear findings were noted. Type of incision given, graft material used, equipment used (microscope or endoscope) and technique used (underlay or overlay) were recorded. The patients were discharged on next day and followed up at weekly intervals for 1 month and then monthly up to 3 months. At

3 months follow-up, the status of the graft was noted, and PTA was done to know the hearing status.

The data was recorded in Microsoft excel sheets and Statistical package for social sciences (SPSS) trial version 21 was used for statistical analysis. Statistical analysis was done using Chi-square test and paired t-test. A p value of less than 0.05 was considered significant.

**RESULTS**

A total of 100 patients were included in our study during the study period. As shown in table 1, 57% patients were between 20 and 30 years of age. Females were more commonly affected (61%) than males (39%).

**Table 1: Age and gender of the patients.**

Age group	Male (%)	Female (%)
21 to 30 years	22	35
31 to 40 years	8	12
41 to 50 years	5	13
51 to 60 years	4	1
<b>Total</b>	<b>100</b>	

In 78% of patients one ear was affected (left 40%, right 38%). Bilateral ear involvement was seen in 22% of patients (table 2). Out of 100 patients, 2 patients had double perforation in their left ear, rest all had single perforation.

**Table 2: Side of the affected ear.**

Side of affected ear	Number of patients (%)
<b>Left</b>	40 (40)
<b>Right</b>	38 (38)
<b>Bilateral</b>	22 (22)
<b>Total</b>	<b>100</b>

**Table 3: Distribution of patients according to the symptoms.**

Symptom	Number of patients (%)
<b>Ear discharge</b>	99 (99)
<b>Earache</b>	97 (97)
<b>Deafness</b>	94 (94)
<b>Vertigo</b>	17 (17)
<b>Tinnitus</b>	16 (16)
<b>Headache</b>	4 (4)

Amongst the symptoms, ear discharge was most common (99%), followed by earache (97%), deafness (94%), vertigo (17%), tinnitus (16%), and headache (4%) (Table 3).

Maximum patients (55%) had a moderate perforation. The perforation was central in all cases, with involvement of different quadrants as shown in Table 4.

**Table 4: Patient distribution according to size and site of perforation.**

Size of perforation	Size of perforation			Site of perforation		
	Small	Moderate	Large	Anterior	Posterior	Anterior + posterior
<b>Number of patients</b>	4	55	41	12	37	51

**Table 5: Details of the surgical techniques.**

Variables	Number of patients
<b>Equipment used</b>	
Microscope	79
Endoscope	21
<b>Approach taken</b>	
Post aural	70
End aural	20
Per meatal	10
<b>Graft material used</b>	
Temporalis fascia	96
Fascia Lata	2
Tragal cartilage	1
Fat	1
<b>Technique of grafting</b>	
Underlay	61
Interlay	24
Overlay	15

**Table 6: Factors affecting the graft uptake.**

Factor		Graft taken up (N)	Graft rejected (N)	P value
<b>Gender</b>	Male	32	7	0.075775
	Female	57	4	
<b>Age (years)</b>	20-30	51	6	0.831993
	31-40	18	3	
	41-50	15	2	
	51-60	5	0	
<b>Socio-economic class</b>	Low	60	9	0.329875
	Mid	29	2	
<b>Occupation</b>	Laborer	23	5	0.450978
	Housewife	46	3	
	Students	13	2	
	Others	7	1	
<b>Side of affected ear</b>	Right	35	4	0.888715
	Left	34	5	
	Both	20	2	
<b>Duration of ear discharge (years)</b>	Up to 2	57	4	0.017046
	3-5	11	2	
	6-10	4	3	
	>10	7	0	
<b>Size of perforation</b>	Small	3	1	0.65744
	Moderate	44	5	
	Large	42	5	
<b>Site of perforation</b>	Anterior	12	0	0.405466
	Posterior	31	5	
	Central	46	6	

Continued.

Factor		Graft taken up (N)	Graft rejected (N)	P value
Nose examination	Any previous nasal pathology present	21	6	0.029164
	Normal	68	5	
Equipment used	Endoscopic	16	5	0.034793
	Microscopic	73	6	
Approach	Post aural	66	4	0.035524
	End aural	16	5	
	Per metal	7	2	
Grafting technique	Overlay	12	3	0.196122
	Underlay	57	4	
	Interlay	20	4	

Table 5 shows the equipment used, the approach taken, the graft materials used and technique of grafting in our study. Microscopic surgery was done in 79% of patients. Post aural approach (Wilde’s incision) was the most common approach used (70%). The most common graft material used was temporalis fascia (96%). In 61% of patients graft was kept by underlay technique.

Table 6 shows the significance of various factors with respect to graft uptake at 3 months follow-up. There was no significant difference in graft uptake at 3 months with respect to gender, age, socio-economic class, occupation, side of affected ear, size and site of perforation, and grafting technique. In our study, the graft uptake was significantly more when the duration of discharge was less, when there was no previous nasal pathology, when surgery was done using microscope, and when post aural approach was used.

Paired t-test was used to compare the pre and post-operative air bone gap (average of air-bone gap at 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz). All patients had a post-operative air-bone gap of less than 20 dB at 3 months of follow-up (Table 7).

**Table 7: Comparison of pre and post-operative air-bone gap.**

Average air-bone gap (dB)	Pre-operative (N)	Post-operative (at 3 months follow-up) (N)
0-20	88	100
41-55	11	0
56-70	1	0

**DISCUSSION**

This study consisted of 100 cases, with tubotympanic COM, requiring type-1 tympanoplasty, conducted at ENT Department of Gujarat Adani Institute of Medical Sciences, Bhuj, from October 2017 to July 2019.

In our study, females contributed to 61% of cases (Male: Female=0.63:1). Female predominance was also noted in

previous studies by Dinesh et al (Male: Female=0.53:1), Masoud et al (Male: Female=1:2), and Kripa et al (Male: Female=0.8:1).<sup>3,5,7</sup> In our study, the youngest patient was of 20 years and oldest patient was of 60 years. Mean age was 32.36±11.02 years. COM cases were more common in 2nd decade (57%). These findings are similar to Dinesh et al (2nd decade), Arindam et al (2nd decade), Ashok et al (2nd decade), Harugop et al (2nd and 3rd decade).<sup>4,6,7,8</sup> In our study unilateral disease (right ear 38%, left ear 40%) was more common than bilateral disease (22%). Similarly, in studies by Ashok et al, Pradipta et al, and Dinesh et al, unilateral ear was affected more commonly.<sup>4,7,9</sup>

In current study, as shown in table 3, most common symptoms were ear discharge (99%), ear-ache (97%), and hearing loss (94%). Other symptoms were vertigo, tinnitus and headache. No patient had history of facial asymmetry and fever. Pradipta et al reported most common symptoms as ear discharge (31.66 %), hearing loss (31.66%), and earache (15%). In a study by Arunbha et al, 25% patients had ear discharge, 57.5% had ear discharge and hearings loss, 12.5% had hearing loss alone.<sup>9,10</sup> In our study most patients had onset of ear discharge since last 2 years. In an Iranian study of 2016 results showed that in contrast to common perception that tympanoplasty results in the patient with wet ear is poorer than those with dry ear, there was little difference in the results of the operations performed on dry and wet ears.<sup>11</sup> In 2006, a study done in Bangalore suggested that graft take up rate is better in wet central perforation than dry ones.<sup>12</sup> In our study, the graft take up was better when the duration of discharge was less than 2 years. Ear discharge was most commonly watery in consistency (71%), profuse in amount (64%), yellowish in color (59%), and non-foul smelling (63%).

In current study, the most common size of perforation was moderate (55%), followed by large (41%) and small (4%). In a study by Lakpathi et al, 46.66% patients had a small perforation, 45% had moderate and 8.33% patients had a large perforation.<sup>13</sup> In Arindam et al study, small, moderate and large perforation was present in 33% patients each.<sup>6</sup> In our study, most common site of perforation was central (51%), followed by posterior (37%) and anterior (12%). Central perforation was also commonly seen with Arindam et al (39%) and Singh BJ et al (41.81%).<sup>6,14</sup>

Dinesh et al reported perforation in inferior quadrant most commonly (37.78%).<sup>7</sup> In our study most common approach used for tympanoplasty was postaural (70%), followed by endaural (20%) and permealal (10%). In Kripa et al study, permealal approach was used more commonly.<sup>5</sup> In our study, the most common technique used for grafting was underlay (61%), followed by overlay (24%), and interlay (15%). In a study by Sergi et al, overlay technique of grafting was most commonly used and results showed a better hearing gain in the underlay group.<sup>15</sup> We used temporalis fascia as the preferred graft material in 96% patients, followed by fascia lata (2%), tragal cartilage (1%) and ear lobule fat (1%). Jyoti et al study suggested that temporalis fascia and tragal perichondrium are accessible near the operative site, available in adequate amount, have excellent contour, can be thinned down and possess excellent survival capacity.<sup>16</sup> A comparative study done in Kolkata, in 2009, suggested that best hearing improvement was seen using temporalis fascia.<sup>14</sup> A study done at Puducherry, in 2013, suggested that temporalis fascia and vein graft are equally effective in terms of graft uptake and hearing improvement.<sup>9</sup>

The post aural techniques have excellent surgical view, placing of graft is also easy with this approach. End aural approaches require less time than post aural approaches but do not give as good exposure for anterior perforation. With per mealal approach there is difficulty in placing graft.<sup>7</sup> In our study, the success rate of tympanoplasty was more with microscope than with endoscope. Endoscopic assisted tympanoplasty is minimal invasive surgery. It has advantage of avoiding external incisions and soft tissue dissections. But microscope has advantage of binocular vision along with an excellent magnified surgical view. Using a microscope, two handed surgery is possible, which is extremely useful to remove blood from the operation field. However, visualization of deep and hidden spaces involving sinus tympani, epitympanum, facial recess, and the attic area are limited with a microscope.<sup>17</sup> An American study of 2015 concluded that endoscopes have been used as an observational adjunct to the microscope to improve visualization of tympanic cavity.<sup>18</sup> A comparative study done in Hyderabad suggested that shortened operative duration and excellent cosmetic result is an advantage of endoscopic myringoplasty.<sup>13</sup>

## CONCLUSION

This study was a prospective observational study, conducted from October 2017 to July 2019, at Department of ENT, GAIMS, Bhuj, in 100 patients affected with COM who were operated for type-I Tympanoplasty. The success rate of tympanoplasty was more when duration of discharge was less, microscope was used for surgery and post aural approach was used. Success rate was less when there was history of any previous nasal pathology. Other factors like age, gender, social class, occupation, side of involvement of ear, size and site of perforation and grafting techniques did not affect the success rate of tympanoplasty.

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