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Different types of Tympanoplasty and their outcome- A clinical study

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Abstract: *The present study consists of 70 selected patients admitted in the Department of Otorhinolaryngology of Gauhati Medical College and Hospital within a period of one year from July 2017 to June 2018 who underwent tympanoplasty operation with or without mastoid exploration in a single setting. The aim was to study the type of tympanoplasty and to evaluate the hearing improvement following the surgery. Majority(48.57%) cases were in the group of young adults(16-30 yrs). 65.7% cases were from lower class, 41.4% cases had moderate conductive hearing loss. Intact canal wall mastoidectomy(57.1%) and modified radical mastoidectomy(39.2%) was undertaken where post-op graft healing was 93.7% and 100% respectively. In post-operative Audiometry, after a duration of 2 months AC≤30 dB was achieved in 68.8% cases of Type I Tympanoplasty It was observed that the post-operative AC threshold of ≤30 dB gave maximum satisfactory hearing to the patient(95.8%).*

Keywords- *Tympanoplasty, Chronic suppurative otitis media, Ossiculoplasty*

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I. Introduction

Hearing loss is a global problem with 360 million people worldwide having disabling hearing loss, accounting for 5% of the world's population. A person who is not able to hear as well as someone with normal hearing thresholds of 25 dB or greater in both ears, is said to have hearing loss. Tympanoplasty implies reconstruction of the tympanic membrane but also deals with pathology within the middle ear cleft, such as chronic infection, cholesteatoma or an ossicular chain problem. If it is done in conjunction with manipulation of ossicles it is known as tympanossiculoplasty and that includes manipulation of mastoids is known as tympanomastoidectomy. Chronic suppurative otitis media is the main indication for tympanoplasty with or without mastoid exploration.

II. Aims and Objectives

1. To study the type of tympanoplasty carried out in relation to the type of Chronic Suppurative Otitis Media.
2. To assess the elimination as well as prevent recurrence of disease to produce a safe and dry ear.
3. To evaluate the hearing improvement following the surgery and correlate it with the type of procedure and other influencing factors.

III. Material And Methods

The present study consists of 70 selected patients with Chronic suppurative otitis media with or without cholesteatoma admitted in the Department of Otorhinolaryngology of Gauhati Medical College and Hospital, Guwahati within a period of one year from July 2017 to June 2018 who underwent tympanoplasty operation with or without mastoid exploration in a single setting. Ossiculoplasty was also performed in some cases requiring hearing reconstruction.

Inclusion criteria-
Patient with both Mucosal and Squamosal type of Chronic otitis media(both active and inactive stage) with Conductive or Sensorineural or Mixed hearing loss undergoing tympanoplasty (with or without mastoidectomy) were included.

Exclusion criteria-
- Age less than 5 years and more than 65 years.
- Patients having multiple tympanic membrane perforations.
- Medical contraindications to undergo surgery.

Procedure methodology

Case selection was made on the basis of clinical findings, examination under microscope, audiometric and radiologic assessment. Achievement of dry ear before the operation was not a prerequisite in this study. Data was collected based on the following variables: Age, Sex, Socioeconomic status, Severity of deafness, Chief complaints, type of discharge, presence of cholesteatoma, type of perforation, Audiometry findings, no of ossicles involved, type of operative procedure performed, type of tympanoplasty, results of post-operative audiometry findings and relation with patient's satisfaction. Patient was discharged on 7th post-operative day and then followed up on 3rd week, 2nd month and 6th month intervals.

IV. Results and observations

Table 1. Age distribution of cases undergoing tympanoplasty

Out of 70 cases 11(15.7%) cases were in the age group of 5-15 yrs, 34(48.57%) cases were in the group of young adult, that is 16-30 years, 20 (28.57%) cases were in the middle age group of 31-50 years and 5 cases(7.1%) were in the age group of >50 years.

Age group in years	No. of cases	Percentage(%)
5-15	11	15.7
16-30	34	48.57
31-50	20	28.57
>50	5	7.1

Table 1

Table 2. Socioeconomic status

Out of 70 cases, 59 cases belonged to rural area and 11 cases belonged to urban area. In terms of socioeconomic status. 46(65.7%) cases were from lower class, 12(17.1%) cases from middle class and 12 cases (17.1%)from lower middle class.

Socioeconomic Status	No of patients	Percentage
Rural	59	84.28
Urban	11	15.7

Table 2

Table 3. Severity of deafness (According to patient's history)

Severity of deafness	No of patients	Percentage(%)
Mild	24	34.3
Moderate	29	41.4
Severe	17	24.3

Table 3

The table shows that patients graded their degree of hearing loss in their history as Mild in 24(34.3%) cases, Moderate in 29(41.4%) cases and Severe in 17(24.3%) cases.

Table 4. Chief complaints (Excluding ear discharge and hearing deficit)

Symptoms	No of patients	Percentage(%)
Earache	39	55.7
Tinnitus	47	67.1
Vertigo	29	41.4
Fever	8	11.4

Table 4

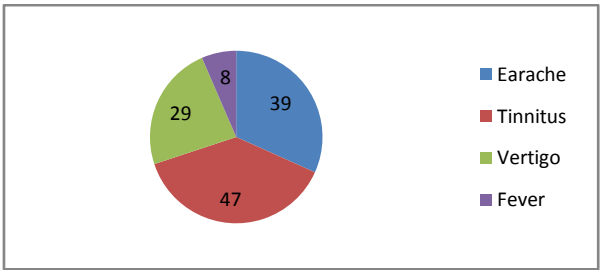

Chart 1

The table shows that other than ear discharge and hearing loss, most patients complained of Earache(55.7%) and Tinnitus(67.1%) , 29 cases(41.4%) presented with on and off vertigo which subsided on medication and 8 cases(11.4%) presented with fever, some of which had underlying upper respiratory tract infection and 4 cases presented with intracranial complications.

Table 5. Relation of disease with Amount and Character of ear discharge.

Discharge	Amount			Character				Blood	Foetid
Type of disease	Scanty	Moderate	Profuse	Purulent	Mucopurulent	Seromucinous	Serous		
Cholesteatoma (No)	28	4	5	29	8	-	-	20	35
%	75.6	10.8	13.5	78.3	21.6	-	-	54	94.5
Non Cholesteatoma (No)	10	8	9	11	5	2	10	8	10
%	30.3	24.2	27.2	33.3	15.15	6	30.3	24.2	30.3

Table 5

It is seen from the table that patients presenting with cholesteatoma mostly had scanty(75.6%), purulent(78.3%), foul smelling(94.5%) and blood stained(54%) discharge. Serous(30.3%) and seromucinous(6%) discharge was mainly seen in non- cholesteatoma cases. Blood stained(24.2%) and foetid(30.3%) were mainly seen in these cases presenting with polyp or granulation tissue. Cases with non-cholesteatoma mainly presented as inactive mucosal type as most of these cases were under oral premedication for last 2 to 3 months and the discharge had subsided.

Table 6. Tympanic membrane perforation

Type of perforation	No of patients	Percentage(%)
Central/Subtotal	47	67.1
Attic	4	5.7
Marginal/Total/PS	17	24.3

Table 6

Table 7. Results of preoperative Audiometry findings

Loss in db	AC Threshold (No. of patients)	BC Threshold (No. of patients)	AB Gap (No. of patients)	Percentage(%)
0-20	-	56	8	11.4
21-40	16	13	24	34.3
41-55	14	1	17	24.3
56-70	19	-	9	12.8
71-90	9	-	9	12.8
>90	12	-	3	4

Table 7

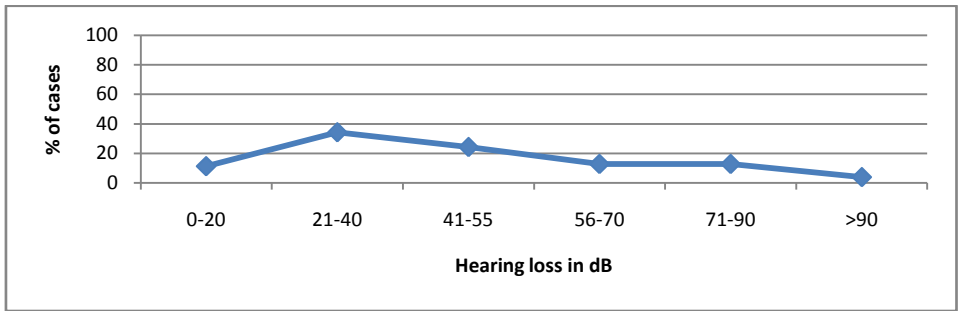

Chart 2

The above table shows that the no of patients and the degree of hearing loss interpreted from audiogram findings. 8 cases(11.4%) had normal, 24 cases(34.3%) had mild, 17 cases(24.3%) had moderate, 9 cases(12.8%) had moderately severe, 9 cases(12.8%) had severe and 3(4%) cases had profound hearing loss respectively. 20 cases presented with mixed hearing loss.

Table 8. Erosion of ossicles in relation to cholesteatoma/Non- cholesteatoma cases.

Diseased bone	Cholesteatoma		Non- Cholesteatoma		Total	%
	No.	%	No.	%		
Malleus	17	45.9	4	5.7	21	30
Incus	24	64.8	4	5.7	28	40
Stapes	20	54	-	-	20	28.6

Table 8

From the following table it can be interpreted that ossicles were mostly eroded in cases presenting with cholesteatoma. Incus was the first ossicle to be eroded in 28(40%) of cases, followed by stapes, mainly the suprastructure followed the footplate in 20(28.6%) cases and malleus in 21 cases(30%) respectively.

Table 9. Type of operative procedure performed for removal of disease and relation to graft healing

Type of operation	No of patients	%	Graft healing(%)
Middle ear exploration	70	100	100
Atticotomy	2	3.5	100
Tympanomastoidectomy (Canal wall up)	32	57.1	93.7
Modified Radical mastoidectomy (Canal wall down)	22	39.2%	100

Table 9

The above table shows that middle ear exploration was carried out in all cases while atticotomy in 3.5%, Canal wall up procedure in 57.1% and Canal wall down in 39.2% of cases. Graft healing was almost 100% in all cases except for 2 failure cases in canal wall up procedure resulting in graft healing rate of 93.7% respectively.

Table 10. Types of Tympanoplasty carried out with the Post operative Audiometric findings.

Type of Tympanoplasty	No of patients	%	Post operative AC≤30 db	%
Type I	45	64.2	31	68.8
Type II	3	4.2	2	66.6
Type III	16	22.8	8	62.5
Type IV	6	8.5	2	50

Table 10

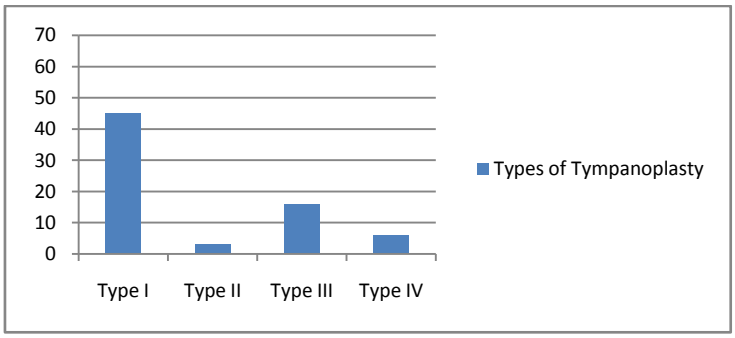

Chart 3

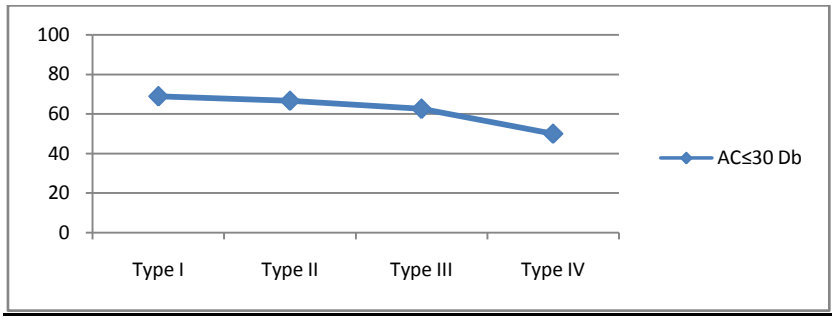

Chart 4

Charts 3 and 4 show that Type I Tympanoplasty was carried out in most cases(64.2%), followed by Type III Tympanoplasty(22.8%), then Type IV (8.5%) and Type II(4.2%) Tympanoplasty cases. IN post operative Audiometry, most cases after a duration of 2 months AC≤30 Db was achieved in 68.8% cases of Type I Tympanoplasty, 66.6% of Type II, 62.5% IN Type III and 50% cases of Type IV Tympanoplasty cases respectively.

Table 11,12. Results of Post operative Tymapnoplasty findings at 2nd and 6th month(Subjective findings+ Pure tone audiometry results)

Duration	Hearing Improvement (Subjective)		Dry Ear		Normal Anatomy	
	No. of patients	%	No. of patients	%	No. of patients	%
2 months	55	78	59	84.2	59	84.2
6 months	57	81.4	66	94.3	66	94.3

Table 11

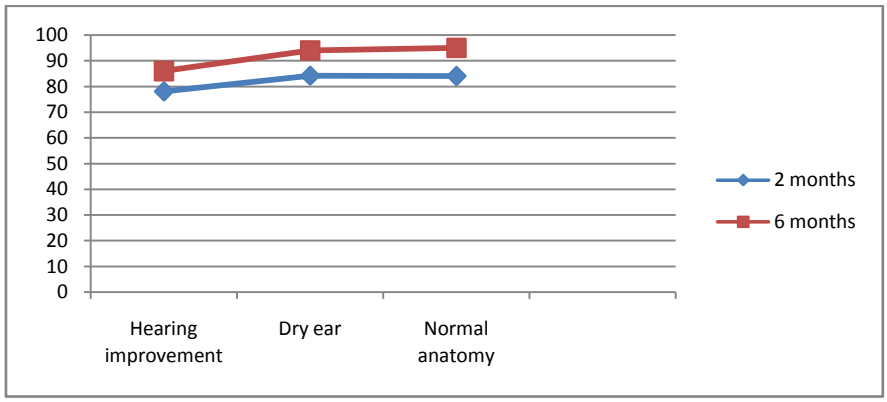

Chart 5

Duration	AC≤30 db		AC≤20 db		Hearing gain≥20 db		Hearing gain≥30 db		AB Gap ≤20db		AB Gap≤20 db		Overall Satisfaction	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
2 months	28	40	8	11.4	42	60	20	30	32	45.7	29	41.4	53	75
6 months	42	60	15	21.4	46	65	24	34.2	14	20	39	55.7	55	78.5

Table 12

From the tables 15 and 16 it can be inferred that majority (84.2%) of cases presented with a subjective sense of hearing improvement with dry ear(94.3%) and normal anatomy (94.3%) and a decrease in sympatoms of mainly of earache and tinnitus in the postoperative period after 6 months. 18 Patients are still on follow up at 6 months but most cases presented with overall satisfaction at 2 months period (75%). 60% of patients achieved an AC≤30db at 6 months and 65% of patients achieved a hearing gain of ≥20db at 6 months. An AB gap of ≤20 db was achieved in 55.7% of cases.

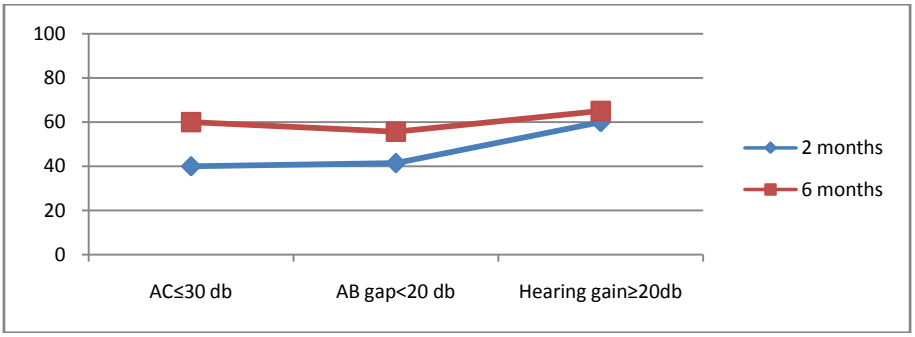

Chart 6

Table 13. Post operative audiometry findings in cases with ossicular reconstruction using autologous incus graft.

Total no. of cases -5

Findings	No of patients	%
AC≤30 db	4	66.6
Hearing gain≥20 db	5	83.3

Table 13

From the table it can be observed that 66.6% of cases presented with Air conduction ≤30 dB while 83.3% of cases attained a satisfactory hearing gain of ≥20 dB at the end of 6 months.

Table 14. Relationship of post operative hearing gain with patient's satisfaction.

AC Threshold	Total no of patients	Satisfactory hearing		Same or worse hearing	
		No. of patients	%	No. of patients	%
≤30 db	48	46	95.8	2	4.1
≤40 db	52	40	76.9	12	23.1
>40 db	18	8	44.4	10	55.5

Table 14

From the above table it can be observed that the post operative AC threshold of ≤30 db gave maximum satisfactory hearing to the patient (95.8%). While 76.9% got satisfactory hearing in AC≤40db, 44.4% when AC>40 db and 55.5% of pts in AC>40 db were not satisfied with the hearing outcome.

V. Discussion

In the present study, the mean age was 35±15.8 yrs, the age group of 21-40 yrs was the most affected group(36%).84.3% belonged to rural area and 15.7% cases belonged to urban area. A. Singh et al(2010) conducted a survey of ENT ailments in rural India and found the incidence to be higher in rural(85%) than in urban(15%) India. Majority of patients complained of moderate hearing loss(41.4%) in their history. 52.8% of cases presented with cholesteatoma and 47.1% cases without cholesteatoma. In the study of Y. Mohammed et al(2011), all ears with cholesteatoma had malodorous discharge(100%) of which 82.7% had scanty, 18.27% had profuse discharge and 14.5% had blood stained discharge. 57.1% of cases underwent intact canal wall mastoidectomy and 39.2% cases underwent Modified radical mastoidectomy. Majority of cases underwent type-I Tympanoplasty(68.8%). Overall an AB Gap of ≤20 dB was achieved in 55.7% of cases. Hence it could be correlated from the above observations with the study made by Dornhoffer and Gardner et al. who were able to show in 200 patients that the condition of the middle ear mucosa, the status of the ossicles (mainly the malleus handle), the surgical technique, the revision situation if required and otorrhoea, had a good correlation with the hearing result.

VI. Conclusion

From the study, we could infer that- A dry ear and adequate hearing improvement can be achieved in a single stage operation in most of the cases with proper preoperative planning as well as postoperative follow-up for a minimum period of 6 months, autologous incus graft was found to be a useful graft in ossicular reconstruction with satisfactory post-operative hearing outcome in selected cases. An AC threshold of ≤30 dB was seen to make an effective hearing improvement in majority of cases. Overall 78.5% of patients were satisfied with the operative procedure and approved with the surgeon in terms of attaining a disease free ear and hearing gain.

VII. Photographs

Fig 1. Wilde's incision **Fig 2.** Subtotal perforation **Fig 3.** Rawing of margins

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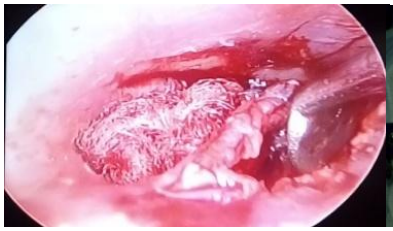
Fig 4. Elevation of tympanomeatal flap


Fig 5. Harvesting of graft

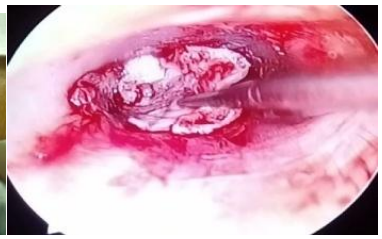
Fig 6. Placement of graft

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