

Long Term Final Outcome of Type III Tympanoplasty Procedures in Terms of Auditory Gain: A Cross Sectional StudyNunepalli Geetanjali¹, S. Muneeruddin Ahmed², M. Mahendra Kumar³, R. Bhanumurthy⁴¹Postgraduate Student (JR), Viswabharathi Medical College and Hospital, Kurnool²Professor, Department of ENT, Viswabharathi Medical College and Hospital, Kurnool³Professor, Department of ENT, Viswabharathi Medical College and Hospital, Kurnool⁴Professor and HOD of ENT, Viswabharathi Medical College and Hospital, Kurnool

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Conflict of interest: Nil

Abstract:**Background:** In Cholesteatoma of the ear the ossicles are damaged to a great extent, sometimes leaving only the foot plate of stapes. Type III Tympanoplasty only remains the choice of method for restoring the hearing mechanism. The present study aims to assess the final long term hearing gain in different aged patients undergoing Type III Tympanoplasty procedure.**Aims and objectives of the study:** To assess and analyze the final long term hearing outcomes in patients undergoing canal wall down mastoidectomy with Type III Tympanoplasty procedure using stapes columella graft; to determine the graft success rate, and recurrence of Cholesteatoma.**Materials:** This study examined patients undergoing Type III Tympanoplasty with stapes columella grafting in 62 patients undergoing canal wall down Mastoidectomy for Cholesteatoma. Demographic data, Clinical findings of retraction pockets in Tympanic membrane, X-Ray, CT scan findings, ossicular damage and type of ossicular prosthesis used were analyzed. Auditory assessment before and after surgery in terms of Air, Bone conduction values, PTA and air bone gap were taken as success criteria. Hearing acuity was assessed at 03 monthly intervals to observe the auditory gain in terms of air bone closure and PTA.**Results:** 62 patients with CSOM with CH, satisfying the inclusion criteria were included. Males were 69.35% and females were 30.64%. The male to female ratio was 2.26:1. Patients were aged 20 to 50 years with mean age of 29.65±8.08 years. The mean values of PTA were 22.14± 4.23 in 31 (50%) patients, 30.20± 2.15 in 29 (46.77%) patients and 33.18± 3.10 in 02 (03.22%) patients at the end of 12 months; the air, bone conduction, air bone gap, PTA values were statistical significance, as the p value was <0.05.**Conclusion:** Type III Tympanoplasty procedure is an ideal method of eradicating CH and restoring the hearing to optimal levels. The status of ossicles following erosion by the disease determines the method of reconstruction and auditory gain. The type of ossicular prosthesis used has no significant role in achieving the auditory gain. The present study has presented a small data but it reflected the literature reviews of the benefit of Type III Tympanoplasty in CH management with low recurrence rates and long term auditory gains for the patients. A larger surgical series would confirm further the benefits of such procedure.**Keywords:** Cholesteatoma, Hearing loss, Tympanoplasty, a-b Gap, Canal down mastoidectomy and ossiculoplasty.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Cholesteatoma (CH) is a disease of the middle ear cleft characterized by bony erosion, ossicular damage and functionally producing varying degrees of hearing loss. The prevalence of CH was reported as 6 to 9 per 100 000 in developed countries and 11 to 14 per 100 000 in India. [1] The prevalence tends to be higher in children of temperate climates [2]. However many countries have showed a fall in the prevalence of CH. [3] Males are more commonly affected by CH and the

reasons are debatable. [4] CH is a disease of middle ear cleft, starting with a retraction pocket in the tympanic membrane (TM) due to Eustachian tube obstruction; the pocket increases in size with collection of keratin material; loses its self-cleansing mechanism and starts eroding the neighbouring structures including ossicles. [5] It also erodes facial nerve canal, tegmen tympani and sinus plate producing intra cranial complications. [6] CH also can arise from acquired chronic

infection of a tubotympanic CSOM with central perforation, congenital type with intact TM, and post-operative CH. [7] Tympanoplasty procedures adopted in case of surgical management of ossicular damage and left over middle ear cleft after eradicating the CH disease was described by Wullstein in 1956. They were Type I: reconstruction of TM with a completely intact ossicular chain; Type II: retention of an ossicular chain with mild defects; Type III: reconstruction of the defects of the malleus and incus; Type IV: reconstruction of total destruction of ossicular chain with an intact stapedius foot plate; and Type V: reconstruction of a total destruction of ossicular chain with a fixed stapedius foot plate [8].

The auditory gain achieved in post-operative Tympanoplasty III patients depends upon many factors such as the nature of the implant used (such as cartilage, autologous remnant ossicles, and biomaterials), [9], single sitting surgery or two stage surgery performed [10], status of the posterior canal wall [11], Residual CH, [12] middle ear mucosal status, [13] and presence of malleus and incus remnant, [14] and finally presence of movable foot plate of stapes. [15]

The present study was conducted in a tertiary care Hospital to assess and analyze the final long term hearing outcomes in patients undergoing canal wall down mastoidectomy with Type III Tympanoplasty procedure using stapes columella graft; to determine the graft success rate, and recurrence of Cholesteatoma.

Materials:

Study Design: A cross sectional analytical study

Study Setting: Department of ENT, Viswabharathi Medical College Hospital, Kurnool

Study Duration: 19 months (May 2022 to December 2023)

Study Population: All the patients diagnosed with Cholesteatoma of the middle ear cleft attending the Department of ENT of Viswabharathi Medical College Hospital, Kurnool.

Sampling sample size: Sample size is calculated by the formula

$$N = \frac{4pq}{d^2};$$

Where $p = 25\%$, prevalence taken from the study, $q = 62\%$, $d = 10$, Hence $n = 62$

Materials: Between May 2022 and December 2023, 62 patients underwent type Tympanoplasty III procedure for CH. An institution ethics committee was approached for approval and the committee approved proforma was used for the study.

Inclusion Criteria: All the patients aged between 20 and 50 years were included. Patients of

both the genders were included. Patients diagnosed as CSOM with CH were included. Patients with all types of TM perforations with CH were included. Patients with CT scan signs of CH were included. Patients with loss of hearing ranging from 25 dB to 60 dB were included.

Exclusion Criteria: Patients aged below 20 years and above 50 years were excluded. Patients with CH and intra cranial complications were excluded. Patients with tinnitus, vertigo and facial palsy were excluded. Patients with previous history of ossiculoplasty were excluded. Patients undergone canal wall up Mastoidectomy were excluded. All the patients were elicited of thorough clinical history, ENT examination, oto-endoscopy to note the TM status and presence of CH. Examination under the microscope was done to know the bony erosions, ossicular continuity, and the extent of the retraction pockets. All the patients were subjected to X-ray and CT scan of both the mastoids and the presence of CH in the middle ear cleft; bony erosion, status of tegmen, sinus plate, facial nerve canal, and the labyrinth were noted.

All the patients were subjected to audiological investigations and Air conduction, Bone conduction a-b gap and PTA were recorded and analyzed. All the variables were expressed as percentages, mean values with standard deviation. T test calculator for single sample was used to find the statistical significance, the age and gender variables were found to be significant as the p value was < 0.05 . The remaining variables were not significant in this study. Surgical procedure: All the patients with CH or retraction pocket were operated under general anesthesia.

Approach was through a post auricular incision. Access was through Mastoidectomy and depending upon the extent of disease canal wall down was done to remove the CH meticulously. Large Temporalis muscle fascia was harvested earlier and kept dried. TM defect was repaired after excising the retraction pocket using temporalis muscle fascia graft in an underlay technique. In some cases the graft was supported by using tragal cartilage slices. In all the patients Eustachian tubal opening was checked and cleared of disease and wherever necessary tuboplasty done.

Facial ridge lowered and mastoid antrum was filled with cartilage and muscle to obliterate. In ossiculoplasty was done using autologous Incus, tragal cartilage, heterograft obtained from previous septal surgeries and stored in absolute alcohol. TORP and PORP were used made of Teflon material.

Results

62 patients attending the department of ENT, Viswabharathi Medical College, Kurnool with a

diagnosis of CH, unilateral or bilateral were included in the study. Patients were aged between 20 and 50 years with a mean age of 29.65 ± 8.08 years. 41.93% of the patients were in the age group of 20 to 30 years. 38.70% were aged between 31 and 40 years. 19.35% were aged between 41 and 50 years. 69.35% of the patients were males and 30.64% of the patients were females with a male to female ratio of 2.26:1. 62.90% of the patients were from urban areas and 37.09% of the patients were

from rural areas. 50% of the patients were belonged to low socio-economic group, 27.41% belonged to the middle income group and 22.58% of the patients belonged to the high income group. (Table 1) T test calculator for single sample was used to find the statistical significance, the age and gender variables were found to be significant as the p value was <0.05 . The remaining variables were not significant in this study.

Table 1: Showing the age, gender incidences and demographic data of the subjects (n-62)

Observation	Number	Percentage	P value
Age			
20 to 30	26	41.93	0.001
31 to 40	24	38.70	
41 to 50	12	19.35	
Gender			0.001
Male	43	69.35	
Female	19	30.64	
Living			0.143
Urban	39	62.90	
Rural	23	37.09	
Socio-economy			0.151
Low	31	50.00	
Middle	17	27.41	
High	14	22.58	

Among the 62 patients 57 (91.93%) complained of discharge from the ear, and 62 (100%) patients of hearing loss. Pars flaccid retraction pocket with discharge was seen in 31 (950%) patients, Postero-superior quadrant retraction pocket in 14 (22.58%), Marginal perforation in 07 (11.29%), Prussack's space retraction in 05 (08.06%), Central perforation in 04 (06.45%) and Subtotal perforation in 01 (01.61%) patients. (Table 2) X-ray of temporal bones showed findings of acellular mastoids in 47 (75.80%) patients, Cellular mastoids in 09 (14.51%) patients, Hypocellular mastoids in 04 (06.45%) patients, and Contracted Antrum in 02 (03.22%) patients. CT scan temporal bones showed Soft tissue mass in middle ear in 26 (41.93%), Ossicular erosion in 19 (30.93%), Total Ossicular loss in 07 (11.29%), Erosion of facial canal in 02 (03.22%), and Erosion L. s. c. c in 02 (03.22%) patients. (Table 2) Air conduction thresholds of 15 to 25 dB with a mean value of 23.85 ± 2.10 was recorded in 03 (04.83%) patients, 25 to 35 dB with

a mean value of 34.15 ± 3.35 noted in 12 (19.35%) patients, 35 to 45 dB with a mean value of 41.60 ± 4.37 in 20 (32.25%) patients, 45 to 55 dB with a mean value of 50.46 ± 5.85 in 13 (20.96%) patients, 55 to 60 dB with a mean value of 52.85 ± 2.10 in 14 (22.58%) patients. (Table 2) The mean bone conduction values were 19.50 ± 7.75 in 04 (06.45%) patients, 14.85 ± 9.15 in 27 (43.54%) patients, 28.59 ± 8.25 in 16 (25.80%) patients, 34.38 ± 6.05 in 08 (12.90%) patients, and 38.29 ± 4.62 in 01 (01.81%) patients. (Table 2) The mean air bone gap was 16.74 ± 5.15 in 05 (908.08%) patients, 29.12 ± 3.85 in 17 (27.41%) patients and 37.64 ± 4.45 in 40 (64.51%) patients. (Table 2) The mean PTA values were 23.24 ± 8.15 in 11 (17.74%) patients, 34.50 ± 3.45 in 23 (37.09%) patients and 43.28 ± 6.16 in 28 (45.16%) patients. (Table 2) T test calculator for single sample was used to find the statistical significance; the mean values of the air, bone conduction, air bone gap and PTA were found to be significant as the p value was <0.05 .

Table 2: Showing the clinical features, signs and preoperative audiological assessment of the subjects (n-62). (Lateral semicircular canal)

Observation	Number	Percentage	P value
Symptoms			0.001
Discharge from the ear	57	91.93	
Hearing loss	62	100	
Retraction pocket on Otoscopy			0.001
Pars flaccida	31	50.00	
Posterosuperior quadrant	14	22.58	
Marginal perforation	07	11.29	

Prussack's space	05	08.06	
Central perforation	04	06.45	
Subtotal perforation	01	01.61	
X-Ray			0.001
Acellular mastoids	47	75.80	
Cellular mastoids	09	14.51	
Hypocellular mastoids	04	06.45	
Contracted Antrum	02	03.22	
CT scan findings			0.001
Soft tissue mass in middle ear	26	41.93	
Ossicular erosion	19	30.64	
Total Ossicular loss	07	11.29	
Erosion facial canal	02	03.22	
Erosion L. s. c. c	02	03.22	
Audiological assessment			0.001
Mean Air conduction values			
15 to 25 dB (23.85±2.10)	03	04.83	
25 to 35 dB (34.15±3.35)	12	19.35	
35 to 45dB (41.60±4.37)	20	32.25	
45 to 55 dB (50.46±5.85)	13	20.96	
55 to 60 dB (52.85±2.10)	14	22.58	
Mean Bone conduction values			0.001
05 to 10 dB (19.50±7.75)	04	06.45	
10 to 15 dB (14.85±9.15)	27	43.54	
15 to 20 dB (28.59±8.25)	16	25.80	
20 to 25 dB (34.38±6.05)	08	12.90	
25 to 30 dB (38.29±4.62)	01	01.61	
a-b Gap			0.001
10 to 20 dB (16.74± 5.15)	05	08.06	
20 to 30 dB (29.12± 3.85)	17	27.41	
30 to 40 dB (37.64± 4.45)	40	64.51	
PTA			0.001
15 TO 25 dB (23.24± 8.15)	11	17.74	
25 TO 35 dB (34.50± 3.45)	23	37.09	
35 TO 45 dB (43.28± 6.16)	28	45.16	

Intra-operative findings of ossicular status in the study was noted that Incus was totally eroded and absent in 14 (22.58%) of the patients, erosion of entire Long process of Incus was noted in 30 (48.38%) of the patients, erosion of handle of malleus was noted in 09 (14.51%) of the patients, Superstructure of the stapes was eroded totally in

06 (9.67%) of patients and erosion of entire long process of Incus and head of stapes was noted in 03 (4.83%) of the patients. (Table 3)) T test calculator for single sample was used to find the statistical significance, the different ossicular status of patients were found to be significant as the p value was <0.05.

Table 3: Showing the status of ossicular chain in the study (n-62)

Ossicular status	Number	Percentage	p value
Absent Incus	14	22.58	0.001
Eroded entire Long process of Incus	30	48.38	0.001
Eroded handle of malleus	09	14.51	0.001
Absent superstructure of stapes	06	9.67	0.001
Eroded entire long process, head of stapes	03	4.83	0.001

At the end of 03 months the mean values of Air conduction thresholds in dB was 17.85±2.10 in 22 (35.48%) patients, 29.15±3.35 in 25 (40.32%) patients, 38.60±4.37 in 11 (17.74%) patients, and 44.46±5.85 in 03 (4.83%) patients and 47.85±1.50 in 01 (01.61%) patients. (Table 4) The mean values of Bone conduction thresholds in dB were 11.12±2.10 in 28 (45.16%) patients, 13.05±3.25 in

26 (41.93%) patients, and 18.30±3.15 in 08 (12.90%). (Table 4) The mean values of air bone gap in dB were 13.13± 2.17 in 34 (54.83%) patients, 17.26± 2.40 in 21 (33.87%) patients and 23.31± 3.10 in 07 (11.29%) patients. (Table 4) The mean values of PTA were 22.14± 4.23 in 31 (50%) patients, 30.20± 2.15 in 29 (46.77%) patients and 33.18± 3.10 in 02 (03.22%) patients. (Table 4) T

test calculator for single sample was used to find the postoperative mean values of air, bone

conduction, air bone gap and PTA were found to be significant as the p value was <0.05. (Table 4)

Table 4: Showing the clinical features, signs and preoperative audiological assessment of the subjects after 03 months (n-62)

Audiological assessment	Number	Percentage	p value
Mean Air conduction values			0.001
15 to 25 dB (17.85±2.10)	22	35.48	
25 to 35 dB (29.15±3.35)	25	40.32	
35 to 45 dB (38.60±4.37)	11	17.74	
45 to 55 dB (44.46±5.85)	03	04.83	
55 to 60 dB (47.85±1.50)	01	01.61	
Mean Bone conduction values			0.001
05 to 10 dB (11.12±2.10)	28	45.16	
10 to 15 dB (13.05±3.25)	26	41.93	
15 to 20 dB (18.30±3.15)	08	12.90	
20 to 25 dB (22.18±2.55)	0	0	
25 to 30 dB (25.19±3.02)	0	0	
a-b Gap			0.001
10 to 15 dB (13.13± 2.17)	34	54.83	
15 to 20 dB (17.26± 2.40)	21	33.87	
25 to 30 dB (23.31± 3.10)	07	11.29	
PTA			0.001
15 TO 25 dB (22.14± 4.23)	31	50	
25 TO 35 dB (30.20± 2.15)	29	46.77	
35 TO 45 dB (33.18± 3.10)	02	03.22	

Ossiculoplasty in 34 (54.63%) patients was completed using the autologous Incus, In 18 (29.03%) patients tragal cartilage was used, in 11 (17.74%) patients TORP and in 09 (14.51%) patients PORP was used. (Table 5)

Table 5:

Ossicular replacement	Number	Percentage
autologous Incus	34	54.83
Tragal cartilage	18	29.03
TORP	11	17.74
PORP	09	14.51

At the end of 12 months the mean values of Air conduction thresholds in dB was 17.85±2.10 in 22 (35.48%) patients, 29.15±3.35 in 25 (40.32%) patients, 38.60±4.37 in 11 (17.74%) patients, and 44.46±5.85 in 03 (04.83%) patients and 47.85±1.50 in 01 (01.61%) patients. (Table 6) The mean values of Bone conduction thresholds in dB were 11.12±2.10 in 28 (45.16%) patients, 13.05±3.25 in 26 (41.93%) patients, and 18.30±3.15 in 08 (12.90%). (Table 6) The mean values of air bone gap in dB were 13.13± 2.17 in 34 (54.83%)

patients, 17.26± 2.40 in 21 (33.87%) patients and 23.31± 3.10 in 07 (11.29%) patients. (Table 5) The mean values of PTA were 22.14± 4.23 in 31 (50%) patients, 30.20± 2.15 in 29 (46.77%) patients and 33.18± 3.10 in 02 (03.22%) patients. (Table 6) T test calculator for single sample was used to find the postoperative mean values after 03 months; air, bone conduction, air bone gap, PTA values were statistical significance, the age and gender variables were found to be significant as the p value was <0.05. (Table 6)

Table 6: Showing the post-operative audiological assessment of the subjects after 12 months (n-62)

Audiological assessment	Number	Percentage	p value
Mean Air conduction values			0.001
15 to 25 dB (15.85±2.05)	41	66.12	
25 to 35 dB (25.05±2.15)	21	33.87	
35 to 45 dB (35.10±2.45)	0	0	
45 to 55 dB (42.13±3.11)	0	0	
55 to 60 dB (17.85±2.10)	0	0	
Mean Bone conduction values			0.001
15 to 20 dB (19.50±7.75)	42	67.74	
20 to 25 dB (14.85±9.15)	20	32.25	

25 to 30 dB (28.59±8.25)	0	0	
30 to 35 dB (34.38±6.05)	0	0	
35 to 40 dB (38.29±4.62)	0	0	
a-b Gap			0.001
10 to 20 dB (16.74± 5.15)	51	82.25	
20 to 30 dB (29.12± 3.85)	11	17.74	
30 to 40 dB (37.64± 4.45)	0	0	
PTA			0.001
15 TO 25 dB (23.24± 8.15)	54	06.45	
25 TO 35 dB (34.50± 3.45)	04	87.09	
35 TO 45 dB (43.28± 6.16)	04	06.45	

The present study showed over all auditory gain in PTA from 15 to 25 dB was observed in 87.06% of the patients. The a-b gap was closed to 10 to 15 dB in 82.25% of the patients. The total put together the overall success rate with good conversational hearing was 84.65%. T test calculator for single sample was used to find the statistical significance between the preoperative and postoperative mean values of air, bone conduction, air bone gap, PTA the variables were found to be significant as the p value was <0.05. (Table 7)

Table 6: Showing the final outcome of Type III Tympanoplasty in terms of auditory gain (n-62)

Audiological assessment Preoperative	Number	Audiological assessment Postoperative	Number	P value
Mean Air conduction values		Mean Air conduction values		0.001
15 to 25 dB (23.85±2.10)	03	15 to 25 dB (15.85±2.05)	41 (66.12%)	
25 to 35 dB (34.15±3.35)	12	25 to 35 dB (25.05±2.15)	21	
35 to 45 dB (41.60±4.37)	20	35 to 45 dB (35.10±2.45)	0	
45 to 55 dB (50.46±5.85)	13	45 to 55 dB (42.13±3.11)	0	
55 to 60 dB (52.85±2.10)	14	55 to 60 dB (17.85±2.10)	0	
Mean Bone conduction values		Mean Bone conduction values		0.001
05 to 10 dB (19.50±7.75)	04	15 to 20 dB (19.50±7.75)	42 (67.74%)	
10 to 15 dB (14.85±9.15)	27	20 to 25 dB (14.85±9.15)	20	
15 to 20 dB (28.59±8.25)	16	25 to 30 dB (28.59±8.25)	0	
20 to 25 dB (34.38±6.05)	08	30 to 35 dB (34.38±6.05)	0	
25 to 30 dB (38.29±4.62)	01	35 to 40 dB (38.29±4.62)	0	
a-b Gap		a-b Gap		0.001
10 to 15 dB (13.13± 2.17)	34	10 to 20 dB (16.74± 5.15)	51 (82.25%)	
15 to 20 dB (17.26± 2.40)	21	20 to 30 dB (29.12± 3.85)	11	
25 to 30 dB (23.31± 3.10)	07	30 to 40 dB (37.64± 4.45)	0	
PTA		PTA		0.001
15 TO 25 dB (22.14± 4.23)	31	15 TO 25 dB (23.24± 8.15)	54 (87.06%)	
25 TO 35 dB (30.20± 2.15)	29	25 TO 35 dB (34.50± 3.45)	04	
35 TO 45 dB (33.18± 3.10)	02	35 TO 45 dB (43.28± 6.16)	04	
Revision cases	-	-	10 (15.35%)	0.001

Discussion:

Cholesteatoma with or without retraction pocket in the TM is reported in the literature and various surgical managements are discussed for its treatment. Sometimes CH presents as an incidental finding remaining silent over many years but with a potential to develop complications and symptoms like tinnitus, loss of hearing, vertigo and intracranial complications such as meningitis, brain abscess and hydrocephalus. [16]

Surgical treatment is advocated by many authors in grade III and IV retraction pockets to avoid progression of HL. [17] Many authors reported absence of recurrence in 67 to 74% of the operated ears. [18] The purpose of doing a Mastoidectomy in these cases where there is impaired ventilation of

the middle ear cleft is to increase the capacity of the cleft to prevent future atelectasis. [19] But he Mastoidectomy surgery has the risk of producing facial nerve palsy and failure in epithelialisation may cause recurrence of retraction pocket and failed hearing improvement. [20]

Immordino A, Salvago P, Sireci F et al [21] reported from their study reduced air bone gap to 20 dB in 71% patients out of 51 patients. Preoperative air bone gap was 28.4 ± 5.8 db HL for all patients, which changed to postoperative ABG of 16.9 ± 6.7 dB irrespective of the type of surgery performed with an average improvement of 11.5 dB HL (p < 0.001).

In the present study the overall auditory gain in PTA from 15 to 25 dB was observed in 54

(87.06%) of the patients. The a-b gap was closed to 10 to 15 dB in 51 (82.25%) of the patients. Put together the overall success rate with good conversational hearing was in 53 (85.48%). T test calculator for single sample was used to find the statistical significance, the age and gender variables were found to be significant as the p value was <0.05.

The failure rate was 09 (14.51%) and among these 06 (66.66%) patients had second revision done to get PTA 10 to 15 dB. (Table 7) Quaranta, N., Fernandez-Vega Feijoo, S et al [22] quoted from their study in revision Tympanoplasty procedures a failure rate of The failure rate was 17.5%, but only in 5% of cases was a functional revision needed. In this study the mean values of air bone gaping dB were 13.13 ± 2.17 in 34 (54.83%) patients, 17.26 ± 2.40 in 21 (33.87%) patients and 23.31 ± 3.10 in 07 (11.29%) patients. (Table 5) There was no difference in the auditory gain in terms of Air bone gap or PTA in the patients studied. Yu H, He Y, Ni Y, Wang Y, Lu N, Li H. et al [23] from their study observed that there was no significant difference in ABG-closure rates from the preoperative to the late point of auditory measurement.

They concluded that there was no significant difference between the three different types of reconstruction materials used (autologous, TORP and Homograft ossicles). In some studies, authors found lower air bone gap closures following type III Tympanoplasty procedures in CH patients which were explained by them that it was due to early postoperative time of measurement. [24, 25]

Different authors define the success of Tympanoplasty procedures in different terms but most conclude that healing of defective TM (graft uptake), good middle ear ventilation and closure of air- bone gap are the ideal measurement parameters. [26, 27]

From their study Wood CB, O'Connell BP et al [28] reported a short-term ABG of 26 ± 11 dB HL; among them only 26% achieved an ABG of <20 dB, and 58% achieved an ABG of <30 dB. But at long time follow-up (36 months) the mean ABG value was 25 ± 10 dB HL; 33% achieved an ABG <20 dB, while 66% achieved an ABG <30 dB. Shetty S. [29] Reported from his study of Type III Tympanoplasty a final outcome of 20.41 dB in 46 out of 50 (92%) patients. In his study the mean pre op hearing loss was 42.50 dB, and the mean post op hearing was 20.41 dB.

Conclusions:

Type III Tympanoplasty procedure is an ideal method of eradicating CH and restoring the hearing to optimal levels. The status of ossicles following erosion by the disease determines the method of reconstruction and auditory gain. The type of ossicular prosthesis used has no significant role in achieving the auditory gain. The present study has

presented a small data but it reflected the literature reviews of the benefit of Type III Tympanoplasty in CH management with low recurrence rates and long term auditory gains for the patients. A larger surgical series would confirm further the benefits of such procedure. Columella type of ossicular grafting in Type 3 Tympanoplasty yielded good hearing benefit in patients with severe ossicular necrosis.

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