

## Original Research Article

# COMPARATIVE STUDY OF TYPE 1 TYMPANOPLASTY IN DRY AND WET EARS IN SAFE TYPE OF CSOM

Srirama Naveen Kumar<sup>1</sup>, Swapna Lenka<sup>2</sup>, Varre Jhansi Rani<sup>3</sup>, Keerthi Varma Gedela<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of ENT, Andhra Medical College, Visakhapatnam, Andhra Pradesh.

<sup>2</sup>Assistant Professor, Department of ENT, Andhra Medical College, Visakhapatnam, Andhra Pradesh.

<sup>3</sup>Senior Resident, Department of ENT, Andhra Medical College, Visakhapatnam, Andhra Pradesh.

<sup>4</sup>Assistant Professor, Department of ENT, Andhra Medical College, Visakhapatnam, Andhra Pradesh.

Received : 08/03/2024  
Received in revised form : 10/05/2024  
Accepted : 29/05/2024

**Corresponding Author:****Dr. Swapna Lenka**

Assistant Professor,  
Department of ENT,  
Andhra Medical College,  
Visakhapatnam, Andhra Pradesh.  
Email: swapnakalyanirs@gmail.com.

DOI: 10.5530/ijmedph.2024.2.99

Source of Support: Nil,  
Conflict of Interest: None declared

Int J Med Pub Health  
2024; 14 (2); 506-514

**ABSTRACT**

**Background:** Chronic otitis media is the chronic inflammation of mucoperiosteal lining of middle ear cleft characterized by ear discharge, a permanent perforation of tympanic membrane and impairment in hearing. It is less common now than in pre antibiotic days and is usually less severe. But due to poor hygiene, low socioeconomic conditions and poor nutrition, it does still take up considerable amount of clinic time and operating time dealing with chronic otitis media or sequelae of previous otitis media. In Tubotympanic type, there may be a persisting perforation in tympanic membrane usually starts in childhood as a result of recurring infection spreading via Eustachian tube to tympanic cavity. Surgical intervention is the treatment of choice for closure of perforation and Tympanoplasty is the most commonly done surgery.

**Aim and Objectives:** To compare graft uptake in Dry and Wet ears. To compare hearing improvement in dry and wet ears postoperatively.

**Materials and Methods:** It is a hospital based prospective observational study done from March 2021 to August 2022 with 60 Subjects -30 dry ears and 30 wet ears in department of ENT, Government ENT hospital, Andhra medical college, Visakhapatnam.

**Results:** Mean age was 30.06 +\_ 12.28 years in dry ears and in wet ears was 29.93 +\_ 12.40 years in wet ears respectively. Males were 33 and females were 27 in this study. Right ears were affected in 31 cases and left ears were affected in 19 cases . There were 10 cases which had bilateral CSOM. There were 63 % of small, 59 % of medium, 36 % of large sized central perforations. Bilateral involvement was seen in 39 % of cases in this study. The graft uptake was 97 % in dry ears and 90 % in wet ears. Hearing improvement was 93.3 % in dry ears and was 87 % in wet ears respectively. There was no significance statistically between the two groups in terms of graft uptake and hearing improvement.

**Conclusion:** The graft uptake was 97 % in dry ears and 90 % in wet ears. Hearing improvement was 93.3 % in dry ears and was 87 % in wet ears respectively. There was no significance statistically between the two groups in terms of graft uptake and hearing improvement. Therefore presence of discharge at the time of surgery doesn't have any effect on outcome of the Type 1 Tympanoplasty.

**Keywords:** Tympanoplasty, Chronic suppurative otitis media (CSOM), chronic middle ear (ME).

**INTRODUCTION**

Chronic suppurative otitis media (CSOM) describes chronic middle ear (ME) disease and is defined as

'chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharge or otorrhoea through a tympanic membrane

perforation.<sup>[1]</sup> Tympanoplasty with or without mastoid surgery is indicated for chronic ear disease processes such as tympanic membrane perforations resulting from previous middle ear infections, atelectatic tympanic membranes, retraction pockets, cholesteatomas, tympanosclerosis, and chronic otitis media with effusion or mastoid cholesterol granuloma. Fortunately, with progress in medical diagnosis and antibiotic therapy, it is not usual for otitis media to manifest its lethal potential.<sup>[2]</sup> CSOM is a major prevailing health problem in developing countries like India due to low socioeconomic status and malnutrition.<sup>[3]</sup> Persistent perforation occur either due to improper treatment of recurrent middle ear infections or infected traumatic perforation.<sup>[4]</sup> Surgery is the treatment of choice for closure of perforation. It is believed that actively discharging ear is contradiction for surgery because it can lead to graft rejection. To avoid this, generally antibiotic course is given and ear is allowed to become dry before surgery. This interval can vary and can lead to apparent increase in number of hospital visits for patient. In our country, people coming from far and remote areas may not maintain regular follow up.<sup>[5]</sup> Also limited research has been conducted that compares the surgical outcomes of dry and wet ears. Therefore this study is being done to evaluate the outcomes and success of Tympanoplasty in dry and wet ears of safe type of chronic suppurative otitis media with respect to graft uptake and hearing improvement.

## **MATERIAL AND METHODS**

Hospital based prospective observational study

**Duration of the study:** March 2021 to August 2022.

**Sample Size:** 60 Subjects -30 dry ears and 30 wet ears

**Source of the study:** Study conducted in department of ENT, Government ENT hospital, Andhra medical college, Visakhapatnam.

### **Inclusion Criteria**

- i. Patients with age group between 18 - 50 years of both sexes.
- ii. Patients who gave a valid consent
- iii. Patients with Tubotympanic disease having dry ears for minimum of 6 weeks and wet ears with minimal mucoid discharge.
- iv. CSOM with small, moderate, large total/Subtotal central perforation.
- v. Patients with pure conductive hearing loss and good cochlear reserve.
- vi. Patients with normal ET function.

### **Exclusion Criteria**

- i. Attico - antral type of CSOM
- ii. CSOM with sensorineural hearing loss
- iii. CSOM with aural polyp and granulations
- iv. CSOM with otitis externa
- v. CSOM with extracranial and intracranial complications

vi. Vi. Those who are not willing to participate in the study

vii. Vii. Malignancies

### **Method of Collection of Data**

- A thorough evaluation of 60 patients was done who were satisfying the above criteria and after taking informed and written consent
- The data was collected in a case proforma as per annexure
- The patients selected for the study underwent clinical, audio logical, radiological and laboratory investigations
- Detailed history was taken regarding chief complaints, past illness, previous surgeries
- Examination including general physical, systematic examination was assessed
- Examination of ear, nose and throat and clinical assessment of hearing by tuning fork tests was done
- Nasal endoscopy was done to look for any pathologies causing ET dysfunction
- PTA and other investigations like complete blood picture, RBS, RFTS, chest x ray and ECG were done
- Patients underwent anaesthetic checkup and consent was taken after explaining regarding the procedure with risks and complications.
- Local anaesthesia was generally preferred except in apprehensive patients who needed general anaesthesia
- All the patients underwent tympanoplasty type 1 with temporalis fascia grafting by underlay technique through post aural william wilde's incision

### **Surgical Steps**

#### **Premedication**

For patients posted under local anaesthesia, 30mg pentazocine and 25mg phenergen was given intramuscularly 30-40 mins prior to procedure

#### **Position of The Patient**

Patient was placed in supine position with the head turned to opposite side

#### **Infiltration**

Postauricular area is infiltrated with 2% xylocaine with 1 in 1 lakh adrenaline.

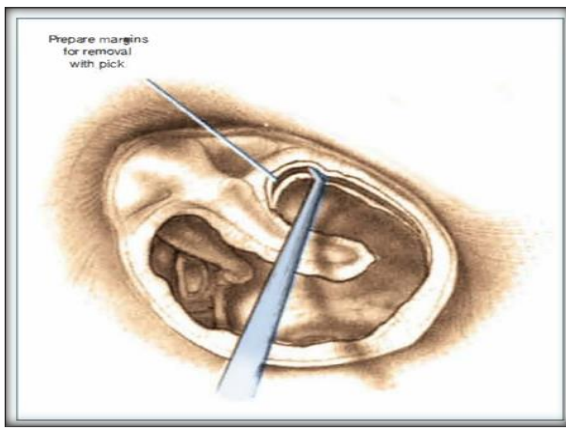
The EAC walls were infiltrated using 2ml syringe of 26G needle.

#### **Elevation of Periosteum**

Periosteal incision is given and flap is elevated and reflected anteriorly. Spine of henle is identified. Stab incision is given and EAC was exposed.

#### **Freshening of The Margins**

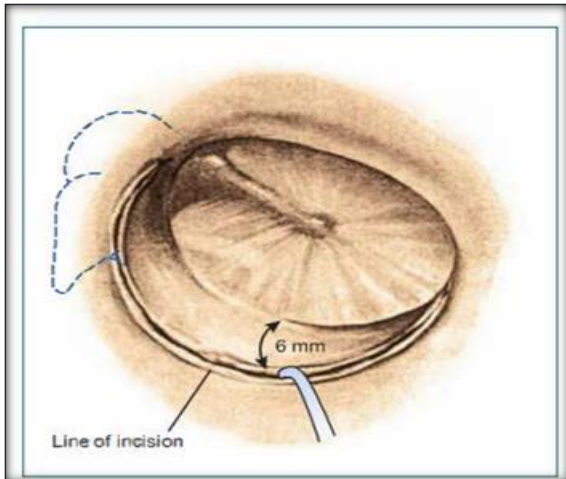
TM margins are freshened and gentle scraping of undersurface done.



**Figure 1: Denuding Perforation Edges**

### Incision and Flap Elevation

Tympanomeatal flaps are given after giving incisions at 11'o clock to 7'o clock in left ear and 1'o clock to 5'o clock in right ear.



**Figure 2: Typical Design for A Tympanomeatal Flap**

### Inspection of middle ear

Middle ear is inspected for status of ossicles, their mobility, oval and round windows.

### Placement of graft

Graft is placed via underlay technique. Gelfoam placed in middle ear and tympanomeatal flap repositioned. Gelfoam is placed over the graft filling the entire bony EAC



**Figure 3: The Graft Is Placed into The Middle Ear So That It Lies Under the Annulus Anteriorly**

### Closure

Wound closed in layers. Aural pack kept and mastoid bandage applied

### Postoperative management

Patients were kept on intravenous antibiotics for two days followed by oral antibiotics, analgesics and antihistamines. mastoid bandage and suture removal was done on 7<sup>th</sup> postoperative day.

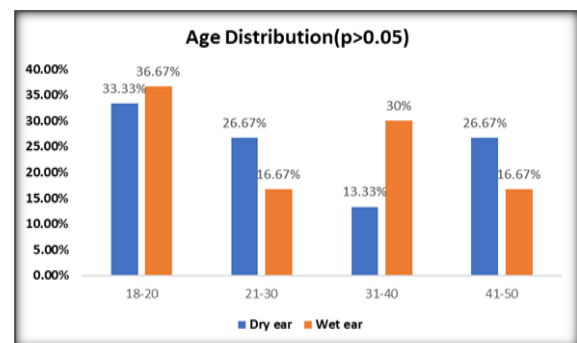
### Instructions given to the patient

- avoid nose blowing
- Sneeze with mouth open
- Avoid lifting heavy objects and straining
- Precautions of dry ear

Graft uptake and Hearing assessment by PTA at intervals of 1,3 and 6 months postoperatively.

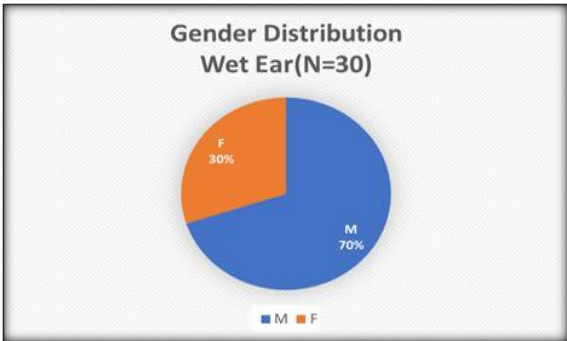
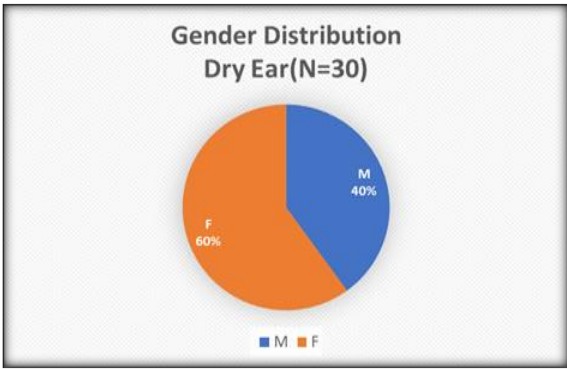
## RESULTS

60 cases were included in the present study. Of which majority were in the age group of 18-20 years (35 %). In dry ears ,33.33% and in wet ears 36.67% were in the age group of 18-20 years. The mean age in dry ears is 30.066 12.28 years and in wet ears is 29.93 +\_12.40 years. There was no significance statistically with respect to age in both groups. (p=0.14)



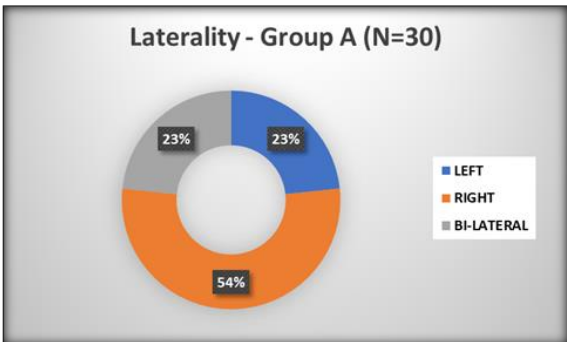
**Figure 4: Bar Diagram of Age Distribution**

Out of 60, 33 (55%) were males and 27 (45%) were females. In that 12 were males and 18 were females with dry ears, 21 were males and 9 were females with wet ears. There was no significance statistically in terms of gender between the two groups. (p = 0.14).



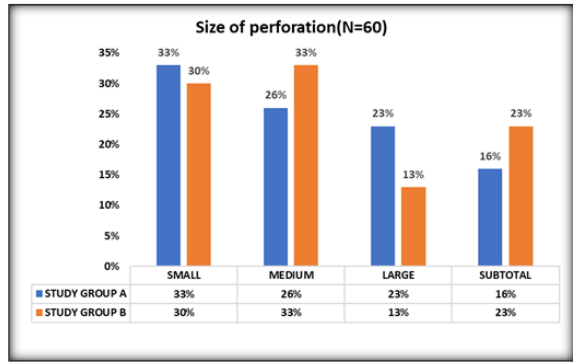
**Figure 5: Pie Chart of Gender Distribution in Dry and Wet Ear**

Right ears (51.7%) were affected more than left (31.7%) and bilateral involvement was around 16.7% which was not significant statistically with p value of 0.1.



**Figure 5: Pie Chart of Laterality**

According to the Size of the perforation, 19 (31.70 %) cases have small sized perforation of which 10 are in dry and 9 were in wet ears respectively. Medium sized perforation were second most commonly found in 18 (30%) including 8 in dry and 10 in wet ears. Large perforations were seen in about 11 cases (18.40 %) which include 7 in dry and 4 in wet ears. Subtotal perforations were found in 12 (20%); 5 in dry and 7 in wet ears. There was no significance statistically in regards to size of perforation in dry and wet ears with p value of 0.7.

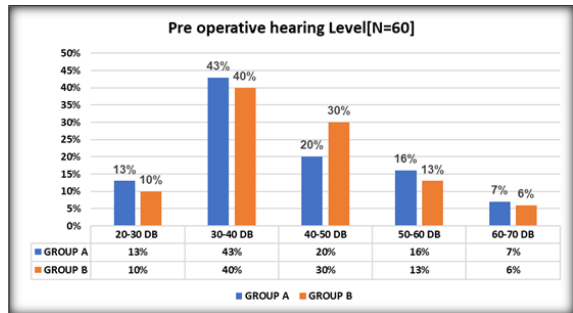


**Figure 6: Bar Diagram Size of Perforation**

Pre-operative hearing assessed by PTA showed 26 (43.4 %) in the threshold of 30-40 dB in which 13 were dry ears and 12 were wet ears. There were 14 (23.4 %) showed threshold in between 40-50 dB which included 6 in dry and 9 in wet ears.

A total of 9 (15 %) in which 5 were dry and 4 were wet ears showed threshold in the range of 50-60 dB. Around 7 (11.67 %) had hearing threshold in between 20-30 dB which included 4 of dry and 3 of wet ears.

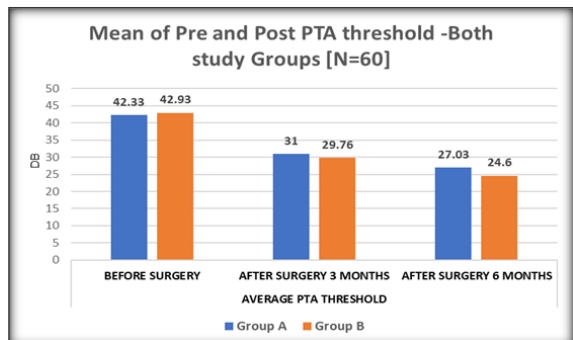
There was no significance statistically in between the two groups (p=0.9).



**Figure 7: Bar Diagram Pre-Operative Hearing Level**

Average PTA threshold post operatively at end of one month was 34.2+ 9.18 dB, at end of 3 months was 31 + 9.20 dB and by the end of 6 months it was 27.03 + 8.22 dB.

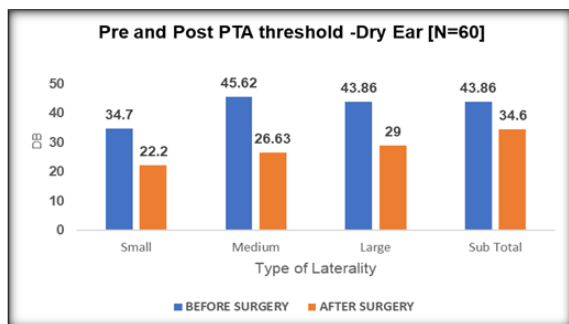
In dry ears, overall mean PTA was 42.4 dB pre operatively and 31 dB, 27.03 dB after 3 and 6 months postoperatively. Similarly it was 42.93 dB before and 29.76 dB, 24.6 dB at 3 and 6 months after surgery in wet ears. There was no statistical significance between two groups (p=0.37).



**Figure 8: Mean of Pre and Post Pta Threshold - Both Study Groups**

**In Dry Ears**

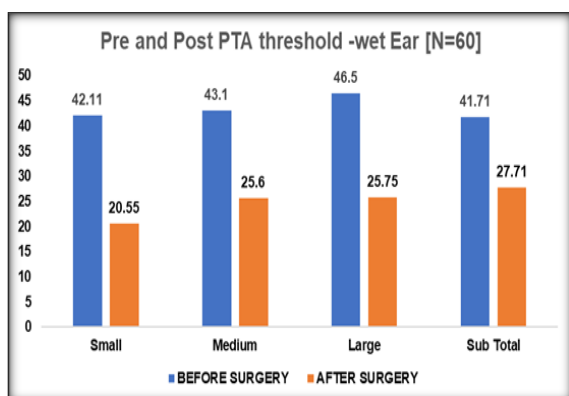
About 10 of small sized perforations showed average PTA threshold of 34.7 dB before and 22.2 dB after surgery at end of 6 months. Medium sized perforations had mean threshold of 45.62 dB and 26.63 dB pre and 6 th month postoperatively. Average threshold of 43.86 dB was seen pre operatively in both large and subtotal perforations while 29 dB in large, 34.6 dB in subtotal perforations at the end of 6 months of surgery.



**Figure 9: Pre and Post PTA Threshold - Dry Ear**

**In Wet Ears**

Average PTA threshold for small CP was 42.11 dB pre operatively which improved to 20.55 dB after 6 months post operatively. In case of medium CP it was 43.1 dB before surgery and 25.6 dB six months after surgery. Large perforations showed 46.5 dB and 25.75 dB pre and 6 months post operatively. Threshold of 41.71 dB pre operatively and 27.71 dB post operatively (6 months) was seen in case of subtotal perforations.



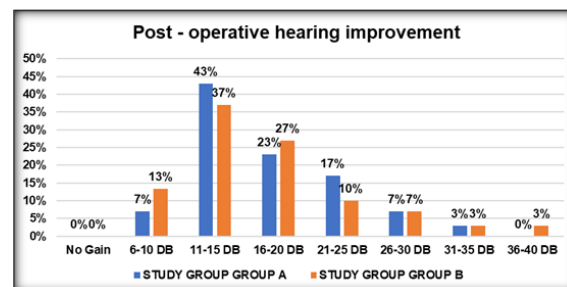
**Figure 10: Bar Diagram of Pre and Post PTA**

**Threshold - Wet Ear**

**Post-Operative Hearing Improvement**

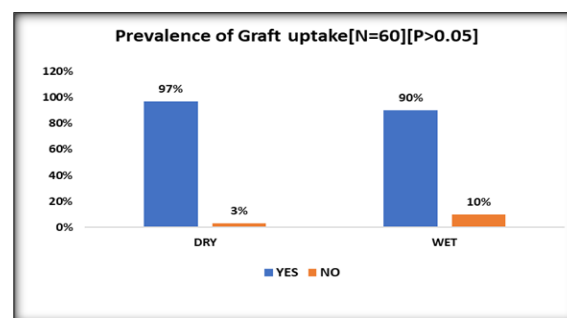
Hearing gain in threshold of 11-15 dB was seen in around 40 % including 13 of dry and 11 of wet ears Around 25 % showed improvement of 16-20 dB of

which 7 were dry and 8 were wet ears. 13.33 % of cases showed hearing gain of 21-25 dB in which 5 was in dry and 3 in wet ears. Hearing gain of 6-10 dB was seen in 2 of dry ears and 4 of wet ears which 10 %. Hearing improvement of 26-30 dB was seen in 6.67 % which include 2 each of dry and wet ears. Hearing gain of 31-35 dB seen in 3.33 % (1 each of dry and wet ears) and 36 - 40 dB was seen in 1.7 % (1 of wet ears).



**Figure 11: Bar Diagram of Post - Operative Hearing Improvement**

Overall graft uptake was seen in 56 cases (93.4 %) which include 29 (97 %) of dry ears and 27 (90 %) of wet ears. 4 cases (6.67 %) had poor graft uptake in 60 cases with residual perforation seen in 1 (3 %) of the dry and 3 (10 %) in wet ears. There was no significance statistically between the two groups ( $p = 0.5$ ).



**Figure 12: Bar Diagram of Prevalence of Graft Uptake**

**Statistical Analysis**

The data was calculated as the mean +/- SD or the median, depending on their distribution. Frequencies were expressed in percentages. The differences in quantitative variables in between the groups were assessed by means of the unpaired t test and paired t test. The chi square test was used to determine differences in categoric variables between groups. A p value of <0.05 using a two-tailed test was considered as significant for all statistical tests. Data were analysed with a statistical software package. (SPSS, version 16.0 for windows).

**Table 1: Age distribution in dry and wet ears**

AGE	STUDY GROUP		TOTAL	%
	Dry ear	Wet ear		

18-20	10	11	21	35
21-30	8	5	13	21.66667
31-40	4	9	13	21.66667
41-50	8	5	13	21.66667
				0
<b>TOTAL</b>	<b>30</b>	<b>30</b>	<b>60</b>	

**P=0.14**

**Table 2: Gender Distribution**

GENDER	STUDY GROUP		TOTAL	%
	A	B		
MALE	12	21	33	55
FEMALE	18	9	27	45
<b>TOTAL</b>	<b>30</b>	<b>30</b>	<b>60</b>	<b>100</b>

**P=0.14**

**Table 3: Laterality**

SIDE AFFECTED	GROUP-A	(%)
LEFT	7	23.33333333
RIGHT	16	53.33333333
BI-LATERAL	7	23.33333333
<b>TOTAL</b>	<b>30</b>	<b>100</b>

**P=0.1**

**Table 4: Size of Perforation**

SIZE	STUDY GROUP		TOTAL	(%)
	A	B		
SMALL	10	9	19	31.66667
MEDIUM	8	10	18	30
LARGE	7	4	11	18.33333
SUBTOTAL	5	7	12	20
<b>TOTAL</b>	<b>30</b>	<b>30</b>	<b>60</b>	<b>100</b>

**P=0.7**

**Table 5: Pre-Operative Hearing Level**

HEARING	STUDY GROUP		TOTAL	(%)
	A	B		
20-30 DB	4	3	7	11.67
30-40 DB	13	12	26	43.33
40-50 DB	6	9	14	23.33
50-60 DB	5	4	9	15
60-70 DB	2	2	4	6.67
<b>TOTAL</b>	<b>30</b>	<b>30</b>	<b>60</b>	<b>100</b>

**P=0.9**

**Table 6: Average PTA Threshold**

STUDY GROUP	NOS	AVERAGE PTA THRESHOLD		
		BEFORE SURGERY	AFTER SURGERY 3 MONTHS	AFTER SURGERY 6 MONTHS
Group A	30	42.33	31	27.03
Group B	30	42.93	29.76	24.6

**P=0.37**

**Table 7: Pre and Post PTA Threshold - DRY EAR**

TYPE OF PERFORATION	NOS	AVERAGE PTA THRESHOLD	
		BEFORE SURGERY	AFTER SURGERY
Small	10	34.7	22.2
Medium	8	45.62	26.63
Large	7	43.86	29
Sub Total	5	43.86	34.6

**P=0.82**

**Table 8: Pre and Post Threshold - WET EAR**

TYPE OF PERFORATION	NOS	AVERAGE PTA THRESHOLD	
		BEFORE SURGERY	AFTER SURGERY
Small	9	42.11	20.55

Medium	10	43.1	25.6
Large	4	46.5	25.75
Sub Total	7	41.71	27.71

**P=0.83**

**Table 9: Post-Operative Hearing Improvement**

HEARING GAIN	STUDY GROUP		TOTAL	(%)
	GROUP A	GROUP B		
No Gain	0	0	0	
6-10 DB	2	4	6	10
11-15 DB	13	11	24	40
16-20 DB	7	8	15	25
21-25 DB	5	3	8	13.333
26-30 DB	2	2	4	6.67
31-35 DB	1	1	2	3.33
36-40 DB	0	1	1	1.7
Total	30	30	60	

**Table 10: Prevalence of Graft Uptake**

GRAFT	DRY	WET	TOTAL	(%)
YES	29	27	56	93.33
NO	1	3	4	6.67
TOTAL	30	30	60	

**P=0.5**

**Table 11: Mean and SD of Age**

	AGE	
	DRY EAR	WET EAR
MEAN	30.067	29.93
SD	12.28	12.4

**Table 12: Mean and SD of Pre Op and Post Op PTA- Dry Ear**

TYPE	PRE OP PTA(Db)		POST OP PTA(Db)					
	MEAN	SD	1 month		3 month		6 month	
			MEAN	SD	MEAN	SD	MEAN	SD
Small central(n=10)	34.7	3.97352	27.9	3.3483	24.8	3.19026	22.2	3.2249
Medium central(n=8)	45.625	9.30342	36.5	6.27922	31.875	5.64263	26.625	3.58319
Large central(n=7)	43.8571	15.4858	35.7143	12.619	33.2857	12.9449	29	12.6359
subtotal(n= 5)	43.8571	9.49737	41	10.3441	38.8	10.0598	34.6	8.26438

**Table 13: Mean and SD of Pre Op and Post Op PTA- Wet Ear**

TYPE	PRE OP PTA(Db)		POST OP PTA(Db)					
	MEAN	SD	1 month		3 month		6 month	
			MEAN	SD	MEAN	SD	MEAN	SD
Small central(n=9)	42.11111	9.020039	30.44444	4.693376	25.22222	4.055175	20.55556	2.697736
Medium central(n=10)	43.1	8.786985	36.8	8.854377	31.2	7.671013	25.6	6.93141
Large central(n=4)	46.5	20.53452	40.5	18.92969	32.25	17.21191	25.75	12.86792
subtotal(n= 7)	41.71429	16.29636	37.42857	14.26951	32.14286	13.61896	27.71429	13.97276

## DISCUSSION

CSOM is the chronic inflammation of the middle ear cleft. It is characterized by persistent otorrhoea via permanent perforation. Surgery is indicated if there is recurrent discharge and hearing impairment after initial medical management. The outcome of the surgery is dependent on many factors such as age, size and location of perforation, status of the ear, extent of the disease, graft materials used, techniques, expertise, post-operative care. AGE

In the present study, 60 cases were studied. CSOM is prevalent in all age groups ranging from paediatric to elderly. Age is an important factor affecting the outcome of tympanoplasty. In children, the functioning of the eustachian tube contributes to

the outcome of the surgery. The patients included in this study were in the age group of 18 - 50 years. Majority of the patients included were 34 in 18 - 20 years of age in which 10 were dry and 11 were wet ears. Magsi et al (2012) reported that the maximum number of patients were 11 to 20 years of age.<sup>[6]</sup> A similar study done by Shradda sharma et al. on Surgical outcome of Type 1 Tympanoplasty showed most of the patients under 30 years of age.<sup>[7]</sup> Another study done by Singh et al also showed majority of the patients were 21 - 30 years of age,<sup>[8]</sup> . It was found that age is a confounding factor in the outcome of surgery (in study done by Webb and Chang, 2008; Gupta, 2009) therefore extremes of the age groups were not included in the present study.<sup>[9,10]</sup> here is no significance statistically

between the two groups in the present study with respect to age.

#### Laterality

Right ear (50 %) was more commonly involved than left. Surgery was performed in right ears in majority of the cases in this study. This carried no significance.

#### Size of Perforations

Majority (7 %) of the cases showed small sized perforations in this study. This is in contrary to study by Nagle et al where 57 % had medium sized perforation.<sup>[11]</sup>

#### Graft Uptake

In our study the graft uptake is 93.4 % overall with 97 % in dry and 90 % in wet ears. There is no statistical significance in between the two groups.

Raj and Vidit study on Myringoplasty in Wet ears showed same outcomes in wet and dry ears.<sup>[12]</sup>

Ceylan et al study showed the success rate and hearing improvement in dry ears was more though the presence of the discharge didn't affect the graft uptake and it is the surgeon 's experience which is the important factor for the outcome of the surgery

They found that better healing in wet ears is because of increased vascularity.<sup>[13]</sup>

S.K. Nagle et al found success rate of 88 % in dry and 74 % in wet ears with no significance statistically (p = 0.07 ).<sup>[11]</sup>

Uyar et al stated that ear has to be dry for atleast 3 months before surgery for better outcomes in terms of graft uptake. In their study only paediatric age group was included and only 28 underwent tympanoplasty type 1 while remaining (31.6 %) had ossicular reconstruction.<sup>[14]</sup> But in our study we performed only type 1 tympanoplasty and excluded paediatric population. Onal et al stated that ear has to be dry for at least a month for success of tympanoplasty. Their study included all types of tympanoplasty and various other factors like smoking ,socio-economic status of the patient along with size , site of perforation , experience of surgeon etc.<sup>[15]</sup>

Therefore in this study, the success of Type 1 Tympanoplasty in terms of graft uptake and hearing improvement was consistent with most of the studies.

**Table 14: Graft Success in Various Studies**

Sr No	Study	No. of cases	Graft success in wet ears%	Graft success in dry ears%
1	Glasscock et al.	1556	92.7	93.1
2	Ceylan et al.	865	88.6	88.0
3	Nagle et al.	100	74.0	88.0
4	Raj and Vidit	50	84.0	88
5	MdZakariaSarker et al.	60	53.85	89.36
6	Vartiainen et al.[61,62]	404	70	87.5
7	Gersdosff et al.	73	50	79.2
9	Naderpour et al.[60]	60	93.3	96.7
10	Deosthale et al.[63]	86	80	86.95
11	R Shankar et al.	70	80	88.6
12	Shreyash et al[65].	60	86.7	90
13	Yojana Sharma et al.[64]	103	94	100
14	Present study	60	90	96.7

## CONCLUSION

The graft uptake was 97 % in dry ears and 90 % in wet ears.

Hearing improvement was 93.3 % in dry ears and was 87 % in wet ears respectively.

There was no significance statistically between the two groups in terms of graft uptake and hearing improvement.

Therefore presence of discharge at the time of surgery doesn't have any effect on outcome of the Type I Tympanoplasty.

## REFERENCES

1. William P.L.Hellier Chronic Otitis Media. In: John C Watkinson, Raymond W Clarke (Ed) Scott - Brown's Otorhinolaryngology Head & Neck Surgery vol 2 Eighth Edition CRC Press Taylor & Francis Group p 155
2. William H. Slattery Iii, Md Pathology and Clinical Course of Inflammatory Diseases of the Middle Ear. In: Gulya AJ (ed) Glasscock and Shambaugh's surgery of the ear, 5th edition. Ontario, BC Decker ,p 422

3. Deosthale, N. V., Khadakkar, S. P., Kumar, P. D., Harkare, V. V., Dhoke, P., Dhote, K., ... Varma, R. (2017). Effectiveness of Type I Tympanoplasty in Wet and Dry Ear in Safe Chronic Suppurative Otitis Media. Indian Journal of Otolaryngology and Head & Neck Surg. 2018 Sep;70(3):325-330.
4. Pramod Shankarrao Dhanajkar, Prashant Narayanrao Keche, Vijayalakshmi Kishan Ambulgekar, Surendra Hirasingsh Gawarle, Abhijit Ram Gundale. Comparative Study of Outcome of Type I Tympanoplasty in Dry and Wet Ear in Tertiary Care Hospital. Indian J Otolaryngol Head Neck Surg. 2022 Aug; 74:217-223.
5. Sharma, Y., Mishra, G., & Patel, J. V. (2017). Comparative Study of Outcome of Type I Tympanoplasty in Chronic Otitis Media Active Mucosal Disease (Wet Ear) Versus Chronic Otitis Media Inactive Mucosal Disease (Dry Ear). Indian Journal of Otolaryngology and Head & Neck.
6. Magsi PB, Jamro B, Sangi HA. Clinical presentation and outcome of mastoidectomy in chronic suppurative otitis media (CSOM) at a tertiary care hospital Sukkur, Pakistan. RMJ. 2012;37(1):50-z
7. Shraddha Sharma 1, Digvijay Singh Rawat 1, Yogesh Aseri 1, Giriraj Prasad Trivedi 1, Praveen Chandra Verma 1, B K Singh 1A Prospective Randomized Study to Compare Surgical Outcome Using Wet and Dry Temporalis Fascia Graft in Type I Tympanoplasty
8. Singh BJ, Sengupta A, Das SK, Ghosh D, Basak B (2009) A comparative study of different graft materials used in



- myringoplasty. *Indian J Otolaryngol Head Neck surg.* 61(2):131–134
9. Benjamin D Webb 1, C Y Joseph Chang. Efficacy of tympanoplasty without mastoidectomy for chronic suppurative otitis media DOI: 10.1001/archotol.134.11.1155
  10. Nishi Gupta and Rajesh Kumar Mishra Tympanoplasty in children doi: 10.1007/BF02993741
  11. Nagle SK, Jagade MV, Gandhi SR, Pawar PV (2009) Comparative study of outcome of type 1 tympanoplasty in dry and wet ear. *Indian J Otolaryngol Head Neck Surg* 61(2):138–140
  12. Nagle SK, Jagade MV, Gandhi SR, Pawar PV (2009) Comparative study of outcome of type 1 tympanoplasty in dry and wet ear. *Indian J Otolaryngol Head Neck Surg* 61(2):138–140
  13. Raj A, Vidit T (1999) Review of patients undergoing wet myringoplasty. *Indian J Otol* 5(3):134–136
  14. Uyar Y, Keles B, Koc, S, Oztu`rk K, Arbag H. Tympanoplasty in pediatric patients. *Int J Pediatr Otorhinolaryngol.* 2006; 70:1805–1809.
  15. Onal K, Uguz MZ, Kazikdas KC, Gursoy ST, Gokce H. A multivariate analysis of otological, surgical and patient-related factors in determining success in myringoplasty. *ClinOtol.* 2005; 30(2): 115-20. doi: 10.1111/j.1365-2273.2004.00947.x.