

# EVALUATION OF IMPROVEMENT OF HEARING IN TYPE I TYMPANOPLASTY & ITS INFLUENCING FACTORS.

Asok K. Saha,\* D.M.Munsi,\*\* S.N.Ghosh\*\*\*

**Abstract:** study included 40 patients treated for CSOM with central perforation. Only type I tympanoplasty was done in 30 patients with dry central perforation and simple mastoidectomy with type I tympanoplasty was performed in 10 patients with moist or discharging perforation. Type I tympanoplasty utilizing an underlay technique with TFG shows high probability of success (85%). Presence of bilateral perforations lowers the success rate (66.66%). Status of non-operated ear is a significant factor for success rate. An overall hearing gain of about 10db was achieved. Poor pre-operative hearing status of elderly adversely influences post-operative improvement of hearing. Type I tympanoplasty with simple mastoidectomy results excellent surgical success rate (100%) but gives less improvement of hearing (closure of A-B gap = 3.3db). In type I tympanoplasty alone surgical success rate drops to 80-75% but it offers more improvement of hearing (closure of A-B gap = 6.708 db)

**Key words:** CSOM, type I tympanoplasty, Hearing gain, influencing factors

## INTRODUCTION

Chronic suppurative otitis media (CSOM) is a long standing infection of a part or whole of middle ear cleft. CSOM is characterised by ear discharge, a permanent Perforation and imparment in hearing. Statistics shows 5 crore chronic ear patients in our country. It is single most important cause of hearing impairment in rural population. One can actually realise the importance of hearing only when one loses to hear. Corrective surgery of CSOM provides dry ear with iprovement of hearing in majority of patients- Type I tympanoplasty is performed in case of dry central perforation. Type I tympanoplasty with simple mastoidectomy is indicated if middle ear mucosa is congested, polypoidal, moist or discharging. In 2 to 3 % of tubotympanic disease associated cholesteatoma is seen in mastoid. It is therefore wise to explore mastoid routinely to remove the pathology, if any.

In this study, our aim was to evaluate hearing improvement in CSOM following type I tympanoplasty and to correlate the improvement with influencing factors like age of the patients, status of non operated ear and surgical procedures.

## MATERIALS AND METHODS

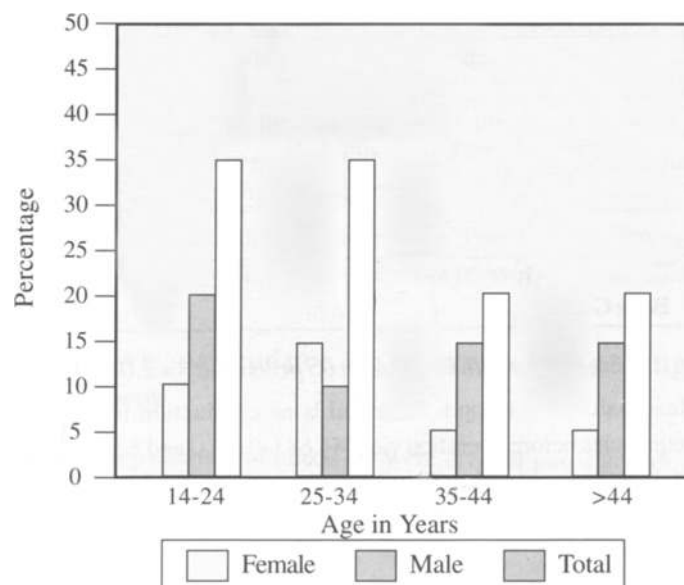
This prospective study was conducted at the Department of Otolaryngology, North Bengal Medical College, Darjeeling, which included 40 patients treated for CSOM with central perforation between May 2003 to October 2004. All the cases had undergone a thorough clinical, audiological and radiological examination. Patient having a history of previous ear operation or revision operation was excluded. Preoperatively patients with active CSOM received medical treatment in the form of oral antibiotics, antihistamines with systemic decongestants and topical antibiotics with steroid drugs to make the ear dry and inactive. 10 out of 40 patients had moist or discharging ear even after medical treatment. Only type I tympanoplasty was done in 30 patients with dry perforation by permeal or endaural or post auricular approach under local anaesthesia (2% xylocaine with 1 to 2 lacs adrenaline). Rosen's permeal approach was preferred in patients with wide external auditory canal (EAC). Lempert's endaural incision was used in patients with narrow EAC and posterior

perforation. Wilde's post auricular incision was made where remnants of tympanic membrane was difficult to see permeal under microscope. Simple mastoidectomy with type I tympanoplasty was performed in 10 patients with moist or discharging subtotal or near total perforation by postauricular incision under general anesthesia.

In all cases Temporalis fascia Graft (TFG) was harvested through a separate incision and under surface grafting technique had been adapted. Gelfoam was applied in the mesotympanum in order to prevent fall back the graft in the middle ear. In all cases thotough washing of EAC was done with normal saline before operation. Assessment of hearing was done before and 6-12 weeks after surgery by Tuning Fork Test and Pure Tone Audiometry.

## OBSERVATION AND RESULT

All the patients of study group (40, Male-24, Female-16) had ear discharge. Bilateral ear disease was in 12 cases (30%). Right ear disease was in 8 cases (20%). Left ear disease was in 20 cases (50%). Right ear was operated in 12 cases (30%). Left ear was



\*RMO cum clinical tutor, \*\*Professor, \*\*\*Professor & Head Department of Otorhinolaryngology, North Bengal Medical College, West Bengal.

operated in 28 cases (70%). Age of the youngest patient was 14 years and that of the oldest patient was 56 years.

Comparison of the result within the study group before and 6-12 weeks after operation was done by paired 't' test. Unpaired 't' test was applied to independent observation made on individuals of different groups.

**SURGICAL SUCCESS RATE**

Out of 40 patients (Male-24, Female-16), TFG of 6 patients was not taken (4-Male, 2- Female). TFG of 34 patients was taken successfully. Here surgical success means an intact tympanic membrane found at least 6 -months post operatively. Overall Graft success rate success rate was 85%, Male success rate (83.3%) & Female success rate (87.5%).

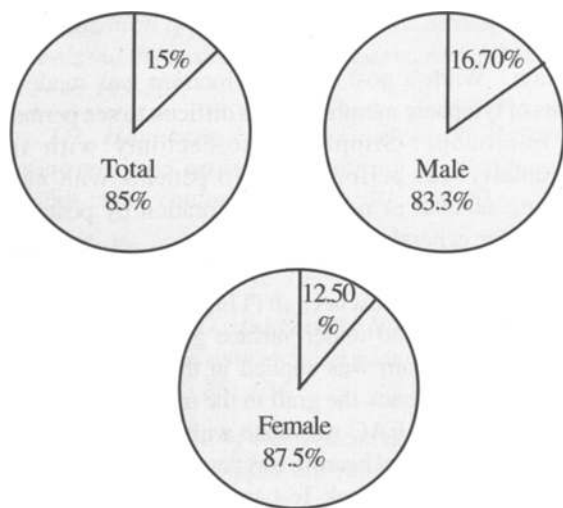


FIG 2 : SHOWING SURGICAL SUCCESS RATE

**Post Operative Hearing improvement:**

The mean hearing loss in speech frequencies Pre-operatively and Post-operatively is shown in Fig: 3 & 4.

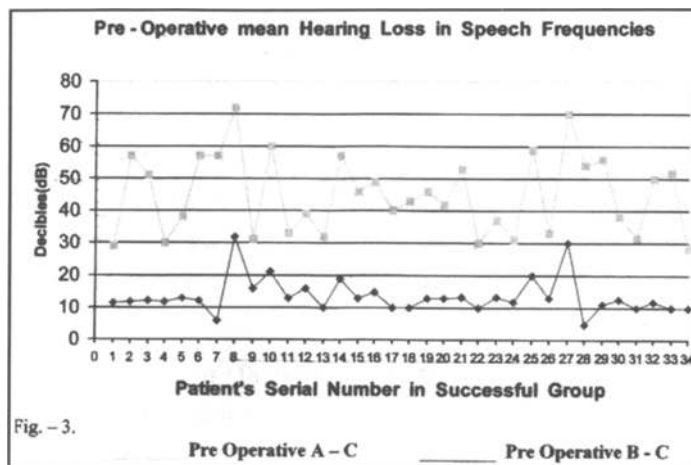


Fig. - 3.

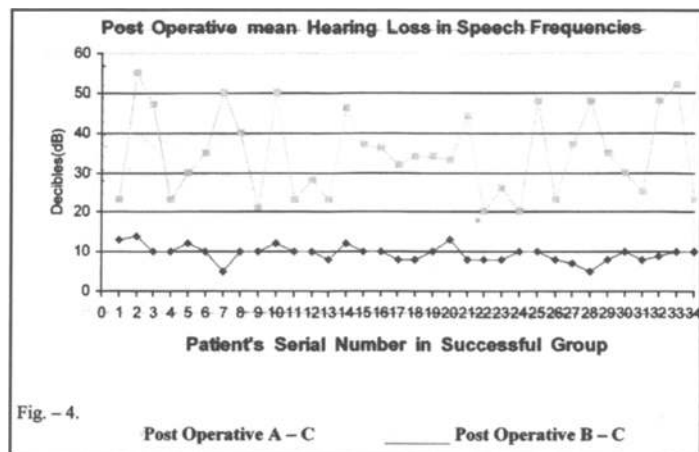


Fig. - 4.

**Table-I**

Mean HL Db for 500,1000,2000 cps	Pre-Operative	Post-Operative	Paired t-	P Value
<b>Air Conduction</b>	44.+/- 12.40	34.56 +/- 10.85		
<b>Bone Conduction</b>	14.06 +/- 5.76	9.470 +/- 1.91		
<b>Air-Bone Conduction Gap</b>	30.6176 +/- 10.4968	25.0882 +/- 10.9693		
<b>Gain of Air Conduction</b>	10.1176 +/-7.1849		8.211	P< 0.00
<b>Gain of Bone Conduction</b>	4.5882 +/- 5.4834		4.879	P< 0.00
<b>Closure of Air Bone Gap</b>	5.5294 +/- SD			

Significant value of 't' of 0.05 probability = 2.04

Mean value of air conduction and bone conduction in speech frequencies before operation were 44.68 (+) or (-) and 5.76 db (+) or(-) respectively. Their value after operation were 34.56 (+) or (-) 10.85 dB and 9.47 (+) or (-)1.91 dB respectively.

The Closure of Air Bone Gap - is significant

Mean air bone gap at speech frequencies before and after operation were 30.6178 (+) or (-) 10.4968 dB and 25.0882 (+) or (-) 10.9693 respectively. Mean closure of air bone gap following operations was 5.5294(+ ) or (-) SD dB. Mean gain of air conduction and bone conduction were 10.1176 (+) or (-) 7.1849 dB and 4.5882 (+) or (-) 5.4834 dB respectively. .

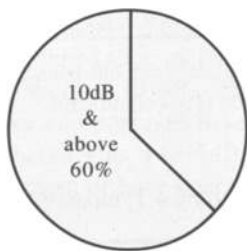
**Hearing and Age Group:**

Patients of the successful group were divided in four groups according to age .

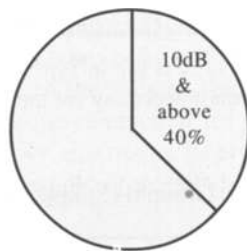
Group A ( age 14-24 yrs) has been noted best mean hearing gain. Group D ( age 45 yr and above) has achieved worst mean hearing gain.

**Table-II showing hearing gain vs Age group**

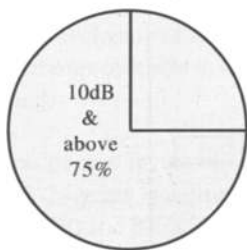
Group	Age in year	Male	Female	No. of Patients	Mean gain of air conduction in speech frequencies(dB)	Mean gain of Bone conduction in speech frequencies in( dB)
A	14-24	4	6	10	12.2	7
B	25-34	4	6	10	8	3.6
C	35-44	6	2	8	10	8.25
D	45 & above	6	0	6	7	2.66



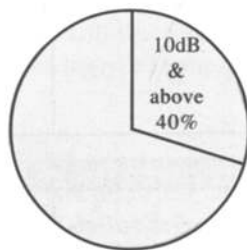
Group A (14-24 Yrs.)



Group B (25-34 Yrs.)



Group C (35-44 Yrs.)



Group D (45 Yrs. and above)

Best result of hearing gain of A-C ( in speech frequencies) has been found in group C (35-44 yrs). Where as worst result of hearing gain of A-C (in speech frequencies) was achieved by group D (45 yrs and above)

**Graft take vs Status on non operated ear**

**Table III showing Graft take vs Status of non operated ear**

	No. of patients	Graft take	% of success rate
B/L Perforations	12	8	66.66%
One Ear Perforation	28	26	92.85%

Presence of bilateral perforation has adversely influences the success rate for graft take. Status of non-operated ear was probably a significant factor for success rate of graft take.

**Graft take and surgical procedure**

**Table IV showing Graft take vs Surgical procedure used.**

Operative procedure	No. of patients underwent operation	No of patients with graft take	% of graft take
Type I tympanoplasty permeal approach (Underlay technique)	20	16	80%
Type I tympanoplasty endaural approach (Underlay technique)	8	6	75%
Type I tympanoplasty postauricular approach (Underlay technique)	2	2	100%
Simple mastoidectomy & Type I tympanoplasty post auricular approach 9Underlay technique)	10	10	100%

Excellent graft take (100%) was found in patients underwent simple Mastoidectomy with Type I tympanoplasty via postauricular approach.

Surgical success rate dropped to 80% or 75% in patients who underwent only Type I tympanoplasty via permeal or endaural approach.

**Operative procedure used versus Hearing improvement**

Successful patients (graft take-34) were divided into 2 groups . Group I consisted of 24 patients having CSOM with dry central perforation. They underwent Type I tympanoplasty- Group II

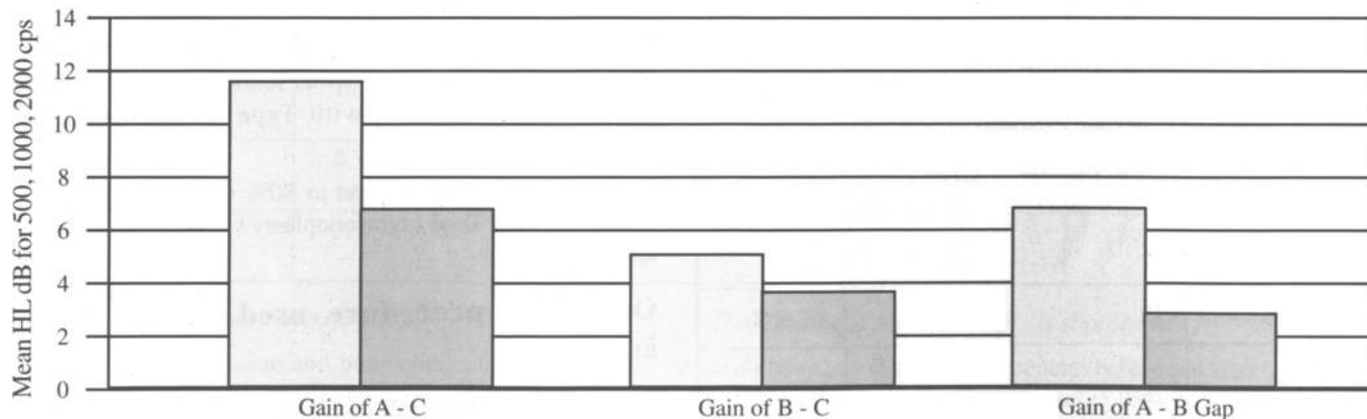
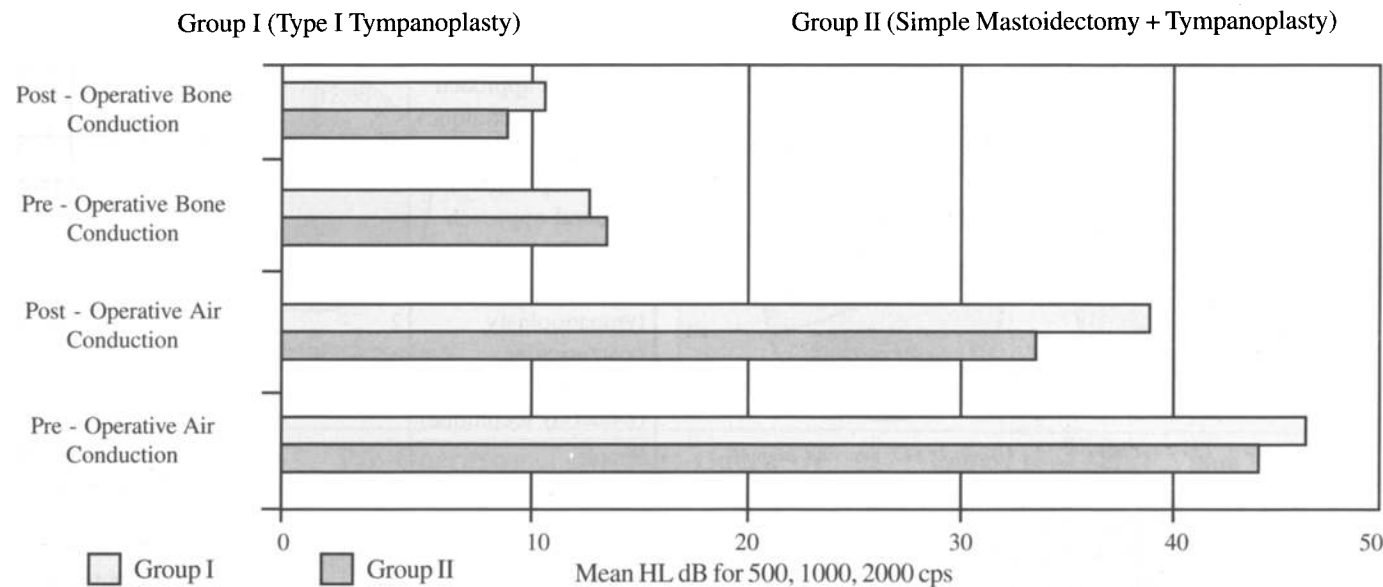
involved 10 patients having CSOM with moist or discharging ear. They underwent simple mastoidectomy with Type I tympanoplasty.

**Table V: Showing Audiological profile of group I vs Group II**

Mean HL dB for 500,1000,2000 cps	Group 1		Group II		t-value	P Value
	Pre-op	Post op	Pre-op	Post-op		
Air Conduction	43.958	32.458	46.4	39.6	1.78	>0.001
Gain of A-C	11.5		6.8			
Bone Conduction	14.125	9.125	13.9	10.3	0.67	>0.001
Gain of B-C	5		3.6			
Air-Bone Gap	29.833	23.333	32.5	29.3		
Closure of Air Bone Gap	6.5		3.2			

t 32 at P of 0.05 = 2.04 which is higher than 't' in this experiment. The closure of A-B gap in Type I tympanoplasty only has been found greater than the closure of A-B gap in Type I tympanoplasty following simple mastoidectomy but the difference is not significant.

**Audiological Profile**



**DISCUSSION**

The study consisted of 60 % male and 40% female. It shows increase prevalence of CSOM in male. 40 patients (14-56 years)

were treated for CSOM with central perforation by type I tympanoplasty. 30 patients with dry central perforation were treated by only type I tympanoplasty. 10 patients with moist or

discharging subtotal or near total perforation were treated by simple mastoidectomy with type I tympanoplasty. The overall graft success rate was 85%. male success rate was 83.33% and female success rate was 87.5%.

Fadl. F.A1 (2003) and Tai CF2 (1998) studied outcome of type I tympanoplasty and found overall success rate of 84.5% and 74% respectively. In bilateral perforations (12 cases) graft success rate was 66.66% (8 cases) whereas in one ear perforation (28 cases) the graft success rate was 92.85% (26 cases). Therefore the presence of bilateral diseases has adversely influenced the success rate. Adkins WY ay 3 (1984) reported similar findings in type I tympanoplasty utilising an underlay technique with temporalis fascia.

Preoperative mean Air conduction (for speech frequencies) in our study was 44.68 dB and post operatively it was 34.56dB. A mean gain of Air threshold of 10.118 dB was achieved. Hamans EP et al<sup>4</sup> (1996) studied allograft tympanoplasty type I and found a median hearing gain of 10 dB, comparable to the present study Pre-operative and post operative mean bone conduction for speech frequencies was 14.06dB and 9.47 dB respectively. An improvement of bone conduction threshold of 4.59dB has been noted.

The improvement is significant where pre-operative bone conduction threshold was worse than 10dB. The result is comparable to the result of Ostfeld E et al<sup>5</sup> (1979). After operation (6-12 weeks) closure of A-B gap of 5.5294 dB was achieved. The significant improvement in hearing following type I tympanoplasty was noted.

Influence of age factor on prognosis for type I tympanoplasty shows 14-24 years age group achieved best mean hearing gain of A-C (12.2 dB) and B-C (7dB). 45 years and above age group showed worst mean hearing gain of A-C (7dB) and B-C (2.66 dB). Using gain of air conduction 10 dB as criterion, best result (75%) was noted for 35-44 years age group and worst result (33.33%) was achieved for 45 years and above age group. Analysis of our results showed younger the age group, a better chance of social

hearing than the elderly. Tai CF et al<sup>2</sup> (1998) observed the similar result.

Type I tympanoplasty with simple cortical mastoidectomy is done routinely if middle ear mucosa is congested, polypoidal, moist or discharging. In most of the cases extensive polyps is seen in mastoid cavity that is cleared to make potency of aditus. 2 % to 3 % cases of tubotympanic pathology is associated with cholesteatoma, if any. In our study, type I tympanoplasty with simple cortical mastoidectomy showed excellent surgical success rate (100%) but less closure of Air-bone gap (3.2 dB) indicating lesser degree of improvement of hearing. In type I tympanoplasty alone the surgical success rate dropped to 80-75% but there was more closure of air-bone gap (6.70 dB) indicating greater degree of improvement of hearing.

## REFERENCES

1. Fadl. F.A. outcome of type I tympanoplasty. *Soudi Medical Journal* 1 24 (1) 58-61, 2003, Jan
2. TaiCF, HoKY, JuanKH. Age and prognosis of tympanoplasty type I *Kaohsiung Journal of Medical Science* 14 (9): 542-7), 1998 Sept.
3. AdKinsWY, WhiteB. Type I tympanoplasty: influencing factors. *Laryngoscope* 94 (7): 916-8, 1984 Jul.
4. Hamans EP, Govaerts PJ Somers T. Offeciars FE Allograft tympanoplasty type I in the childhood population- *Annals of otology, Rhinology and laryngology*, 105 (ii) : 871-6, 1996 Nov.
5. Ostfeild E, Bar on C Bergam M. Bone Conduction changes following successful tympanoplasty type I. *Laryngoscope*. 89 (11): 1820-4, 1979 Nov

## Address for correspondence

Dr. Asok Kumar Saha  
Amardeep Apartment  
Flat No. A 102  
23, Baguiati Road,  
Kolkata-700028