

A Study on Use of Partial Ossicular Replacement Prosthesis and Total Ossicular Replacement Prosthesis in Ossiculoplasty at SMC Vijayawada**T.V.S.S.N. Leela Prasad¹, G.B. Sreenivas², Aditya Kanchumurthy³, P. Ratna Babu⁴, K Ravi⁵, Peter Mummdivarapu⁶**¹Associate Professor, Department of ENT, SMC, Vijayawada²Assistant Professor, Department of ENT, SMC, Vijayawada³Assistant Professor, Department of ENT, SMC, Vijayawada⁴Assistant Professor, Department of ENT, SMC, Vijayawada⁵ Professor & HOD, Department of ENT, SMC, Vijayawada⁶Senior Resident, Department of ENT, SMC, Vijayawada

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Conflict of interest: Nil

Abstract:**Objectives:** A Prospective study to analyse the hearing followed by partial and total replacement prosthesis in chronic suppurative otitis media with open and closed mastoidectomy.**Study Design:** 1 year study from august 2022 to July 2023 in a Tertiary care Hospital – Siddhartha Medical College, Vijayawada.**Methods:** A Total of 40 patients with Chronic Suppurative Otitis Media with good cochlear reserve and good Eustachian tube function. Both male and female. Investigations include complete ENT examination, Otoscopy, Pure tone Audiometry and CT Temporal bones. Following surgery pure tone audiometry is done in 3rd and 6th month. All cases with Sensorineural hearing loss are excluded.**Results:** Male to female ratio was observed to be 1:1.4, AB closure in this study is 80% of which 75% (30/40) cases underwent intact canal wall procedure while 25% (10) cases underwent canal wall down procedure. In patients with intact canal wall success Rate is 95.6% with PORP and 100% with TORP this has yielded A-B closure of 30 dB.**Keywords:** PORP, TORP Ossicular reconstruction, Mastoidectomy.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**

Hearing is one of the vital sensations to man, in India especially in Andhra Pradesh, the incidence of CSOM is high about 30% of the patients who attend ENT OP suffer from CSOM.

Single major cause of conductive deafness is CSOM[1]. For successful ossicular reconstruction an air-filled middle ear and functional eustachian tube are very important pre-requisites.

Ossicular reconstruction with partial and total Ossicular replacement prosthesis is now popular² and the result of these techniques is described.**Aims & Objectives**

1. This is a prospective study conducted in SMC Vijayawada to describe the partial and total ossicular replacement prosthesis used for ossicular reconstruction while treating the patients with chronic suppurative otitis media with Mastoid Tympanoplasty.

2. To improve functional aspect of hearing following open and closed Mastoidectomy, attempt is made to reconstruct the ossicular chain.
3. To analyse the above methods, the success rate is judged by standard parameters like gain in AB gap with in 20dB, gain in air conduction and improvement of hearing more than 15 dB post operatively.
4. To evaluate the results and complications of TORP and PORP.

Materials and Methods

This is a prospective study of results of PORP and TORP in Ossiculoplasty for patients of CSOM conducted between AUGUST 2022 to JULY 2023 for a period of one year at SMC Vijayawada. Study group consist of 40 patients, the patients are aged between 10-55- years among them 16 were males and 24 were females.

Inclusion Criteria: The criteria for selection the study group included patients of both safe and unsafe type of CSOM with good cochlear reserve and good eustachian tube function are selected, both intact canal and canal wall down procedures are included.

Clinical examination includes complete ENT examination with special emphasis on oto-endoscopy. Patients are subjected to x-ray mastoids/ CT-temporal bones, pure tone audiometry, all patients with haematological investigation are done.

Operations are done under local /general anaesthesia. Post aural incision was given; disease was cleared from middle ear and mastoid as necessary. Ossicular chain status assessed. Ossicular reconstruction was planned. In our study we used PORP and TORP to reconstruct the ossicular chain.

All the patients underwent audiometry before surgery and postoperative 3rd and 6th month. Puretone averages 500 hz 1000 hz and 2000 hz were compared with preoperative and post-operative results

Austin developed a system which is based on remaining portion of the ossicular system to be constructed. It offers a more technical and functional method of describing the state of middle ear, the type of disease and the best choice of graft material³.

Exclusion Criteria:

- Patients with Sensorineural hearing loss.
- Patients age less than 10 years and more than 55 years are excluded.

Austin/Kartush Classification⁴:

- O) Ossicular chain intact (M+I+S+).
- A) Malleus present, stapes present (M+S+).
- B) Malleus present, stapes absent (M+S-).
- C) Malleus absent, stapes present (M-S+).
- D) Malleus absent, stapes absent (M-S-).
- E) Ossicular head fixation.
- F) Stapes fixation.

Results

Table 1: Age Distribution (n=40)

Sl. No.	Age Group (years)	No. of Cases	Percentage
I	10 – 15	7	17 %
II	16 – 20	8	20%
III	21 – 30	12	30%
IV	31 – 40	10	25%
V	>40	3	8%

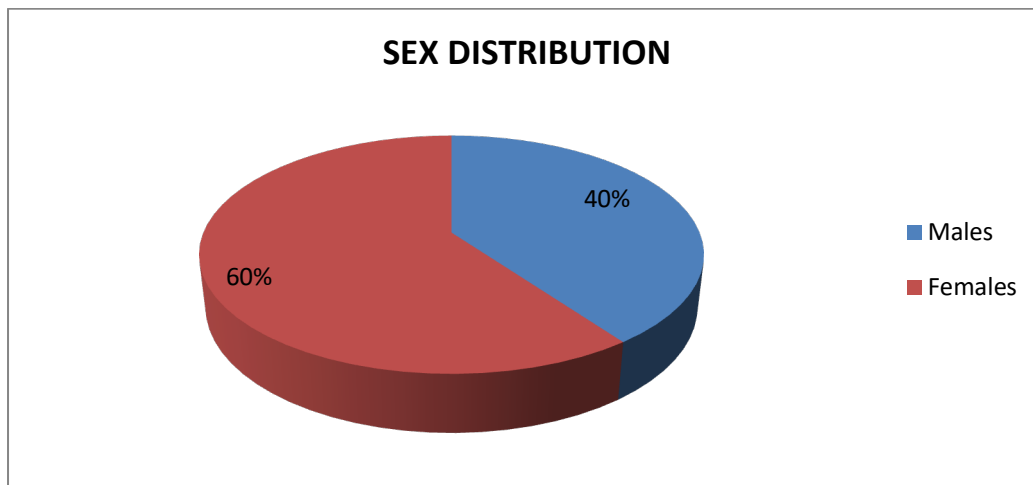


Figure 1: sex distribution

Table 2: Distribution by involved ear (n = 40)

SL. No.	Ear Involved	No. Of Cases	Percentage
1	Right	17	42%
2	Left	18	45%
3	Both	5	13%

Table 3: Symptoms Distribution:

Sl. No.	Symptoms	No. of Patients	Percentage
1	Otorrhoea	40	100%
2	Hearing loss	37	92.5%

3	Earache	8	20%
4	Vertigo	4	10%
5	Tinnitus	4	10%



Figure 2: Distribution by ear findings (n = 40)

Table 4: Pre-operative Air- Bone Gap (n =40)

SL. No.	Air bone gap (dB)	No. of Patients	Percentage
1	10 – 20	4	10%
2	21 – 30	26	65%
3	>30	10	25 %

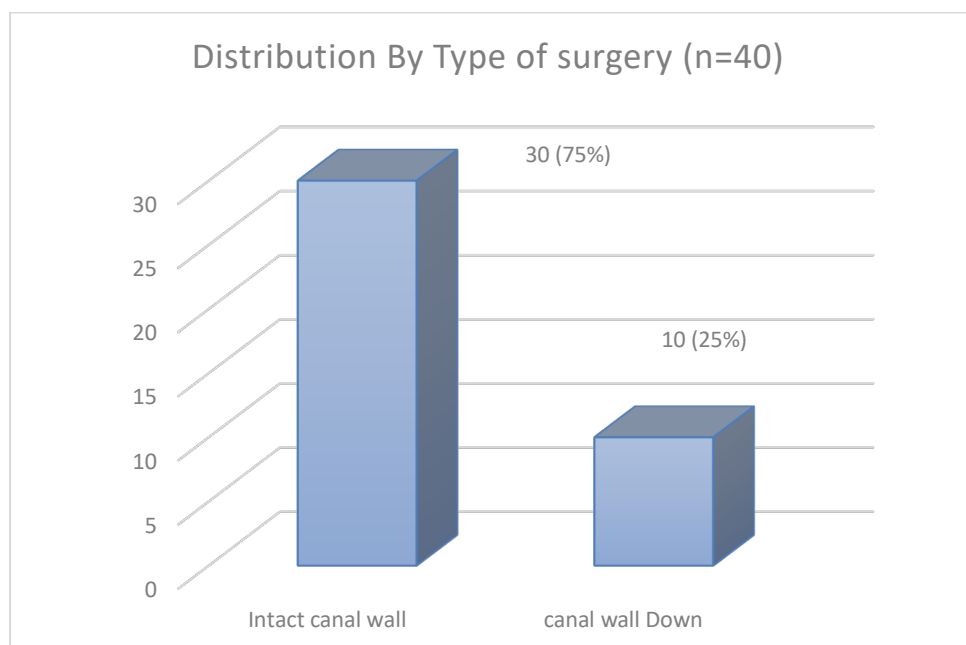


Figure 3: Technique

Table 5: Air Bone Closure by Technique of Surger

Air Bone Gap closure (dB)	Intact Canal Wall Technique	Canal Wall Down Technique
0-10	7	3
11-20	15	6
21-30	6	1
31-40	2	0

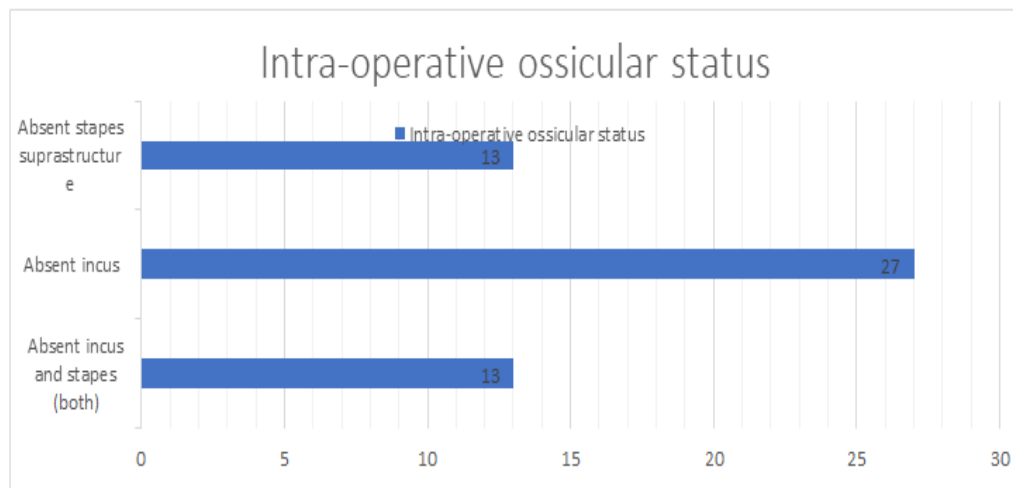


Figure 4: Intraoperative status

Table 6: Distribution of Prosthesis by Technique: (n=40)

SL. No.	Technique	Prosthesis	No. of patients	Percentage	
1	Intact canal wall technique	PORP	23	57.5%	30
		TORP	7	17.5 %	
2	Canal wall Down technique	PORP	4	10 %	10
		TORP	6	15 %	
		TORP	13	PORP	27

Table 7: Air Bone Gap Closure by Technique of Surgery and type of Prosthesis

Air Bone Gap Closure(dB)	ICW		CWD	
	PORP	TORP	PORP	TORP
0-10	6	0	1	3
11-20	11	4	3	2
21-30	5	3	0	1
31-40	1	0	0	0

Observation and Results

A total of 40 CSOM patients with and without cholesteatoma surgical treatment was given with in a period of 12 months at GGH Vijayawada The detailed Information of age, sex, clinical findings, preoperative air bone gap finding, intraoperative Ossicular pathology, type of reconstruction, post-operative air bone gap findings are given in the above graphs 40 patients clinically diagnosed as having CSOM both safe and unsafe types are included Out of which 16 were males and 24 were females.

Left ear was more commonly involved (18) than Right ear (17) and in 5 cases both ears were affected, most of the patients were more than 20 years of age 25/40 with female predominance male: female=16:24 commonest complaints were otorrhea (100%) and hearing loss 92% With average duration of hearing impairment 2.6 years and for otorrhea is 5.5 years.

Attic perforation was commonest otoscopic finding in (70%) 28/40 followed by central perforation

(17.5%)7/40 And marginal perforation 12.5% (5/40) all these cases were subjected to Tympanomastoidectomy with ossicular chain reconstruction with Teflon partial ossicular replacement prosthesis PORP or TORP. Success rate is 92.5% (37/40) in my study.

The failures are due to infection graft failure and prosthesis extrusion the results correlate with similar studies described. The follow up in my study was done up to 18 months. In my study AB closure within 20 dB was 82.5% (78% of PORP and 92% of TORP. At 12 months follow up. Success was shown to be 92.5% (PORP-92.5% and TORP-92.3%). 3 out of 40 prostheses extruded.

Discussion

The technique of Ossiculoplasty has been referred since the introduction of operating microscopy. So many graft materials are being used to restore the dry and functioning of the ear The Ideal prosthesis for the ossicular reconstruction should be bio compatible, stable, and safe, easily insertable. The Prosthesis should weigh 10-40 mg provide proper

tension between the Tympanic membrane and stapes to form less than 30-degree angle with tympanic membrane and accommodate the malleus. Selection of the prosthesis must be based on several factors like compatibility and ease of configuring the prosthesis during surgery.

Conductive hearing loss from ossicular chain abnormalities may result from either discontinuity or fixation of the ossicular chain. Discontinuity appears because of an eroded Incudo-stapedial joint, absent incus and stapes superstructure. The cause of Ossicular damage is cholesteatoma or retraction in more than 80% of case and blunt trauma, congenital or neoplastic causes in the remaining⁵.

The problem associated with ossicular chain reconstruction in CSOM are quite different from those in patients with a dry, infection free middle ear, tympanic membrane perforation, Eustachian Tube dysfunction or Cochlear deficits, these problems should also be considered to Achieve optimal hearing.

Treatment of patients with cholesteatoma poses a unique set of problems. The goals of cholesteatoma removal are developing a safe ear, producing a clean dry ear and improving or maintaining hearing. A safe dry ear may require removal of the posterior external auditory canal, which reduces middle ear volume which may affect hearing the goal of ossicular chain reconstruction, is better hearing most typically for conversational speech used to improve or to maintain the conductive portion of hearing loss. The aim is to close the air bone gap and to improve the patients overall hearing. Hearing improvement is best when the hearing level of the diseased ear is raised to a level close to that of the better hearing ear. Small improvements in hearing are more likely to be appreciated by patients with bilateral hearing loss

Conclusion

Standardised prognostic classification must be adopted to compare the results across multiple studies

A cartilage cap must be used when PORP or TORP is used Extension /displacement rates of prosthesis are between 0.5-10% and are lower when cartilage cap is used Across the past 10 years of published report based on clinical data Titanium PORP yields approximately equivalent hearing results to incus

interposition TORP reconstruction most probably yield a poorer hearing result than PORP when all cases are considered.

Considering the technical skill needed to successfully perform incus interposition, a general Otolaryngologist should opt for titanium reconstruction prosthesis for Open Cavity Reconstruction The success rate in ossiculoplasty is expressed as closure of airborne gap equal or within 20dB, or improvement in air conduction more than 40dB and gain in post-operative hearing 15dB. All this depends upon eradication of disease, selection of proper available graft material; it's sculpting and providing stability.

The use of ossicular prosthesis for middle ear reconstruction continues to expand with advances in microsurgical techniques for repair of diseased ossicles the cause of post-operative dysfunction may not be readily apparent at otologic examination, and CT is useful in the diagnostic work up in affected patients. The type of procedure performed, and the prosthesis used can often be determined with CT, which can also help to identify many causes of prosthetic dysfunction.

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