

# A Study on Ossicular Reconstructive Procedures and its Audiological Outcome

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## ABSTRACT

**Introduction:** Chronic suppurative otitis media (CSOM) constitutes a major public health problem in children and adults in the developing world. Current work aimed to study the ossicular reconstructive procedures and its audiological outcome.

**Material and Methods:** Patients aged more than 16 years, diagnosed with CSOM and posted for middle ear surgery were included. Patients who were less than 16, had malignancy of middle ear, otitis externa or previous history of ear surgery were excluded.

**Results:** Cortical mastoidectomy was done in majority of cases along with TM. It recorded a mean improvement of 11.30 db in 6th month post op audiological improvement. Loss of 8.30db was observed in case where cortical mastoidectomy with type 1 tympanoplasty was done along with conchal cartilage kept medial to temporalis fascia graft.

**Conclusion:** An improvement of 18.35 db is seen in cases where malleus was reshaped and articulated with stapes.

**Keywords:** Tympanoplasty, Chronic Suppurative Otitis Media, Pure Tone Audiometry

## INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a common middle ear pathology that composes of tympanic membrane perforation together with a chronically inflamed middle ear mucosa. CSOM can happen with or without cholesteatoma which is an in-growth of eardrum skin into the middle ear cavity.<sup>1</sup> CSOM is the leading problem of conductive hearing impairment in adults which is secondary to injury to the eardrum and middle ear ossicles effected by chronic inflammation present in the tympanic cavity. Ossicular erosion, a common complication of CSOM, may lead to total failure of middle ear mechanics and result in substantial hearing loss.<sup>2</sup>

Chronic suppurative otitis media is a worldly prevailing disease with otorrhoea, hearing loss, otalgia inducing psychological trauma and financial burden to the community. In an effort to subdue this menace, various techniques of Tympanoplasty have developed out and from time to time improvising was done based mainly regarding hearing improvement and disease free ear.<sup>3-5</sup>

CSOM is the main indication for Tympanoplasty. It is a condition of the middle ear with a wide range of pathology affecting mastoid, facial nerve, and ET. For this reason, Tympanoplasty, unlike Stapedotomy, doesn't have a standardized procedure. The technique and procedure varies according to the individual case findings and pathology.<sup>6</sup> Current work aimed to study the ossicular reconstructive

procedures and its audiological outcome

## MATERIAL AND METHODS

This was a prospective study, conducted in department of otorhinolaryngology in a tertiary care hospital. Patients aged more than 16 years, diagnosed with CSOM and posted for middle ear surgery were included. According to the proforma, detailed history was taken then through ENT and systemic examination was done. The ears were examined by otoscopy initially and otoendoscopy to establish a preparative diagnosis of safe or unsafe disease. All patients underwent a pure tone audiometry, to find out the hearing status and obtain documentary evidence for the same, and X-ray mastoid (bilateral Schueller's view) to assess the pathology and surgical anatomy of the mastoid. Exclusion criteria: History of previous mastoidectomy, previous Stapedotomy or stapedectomy, Malignancy of middle ear, CSOM in congenitally defective ears.

## STATISTICAL ANALYSIS

Microsoft office 2007 was used for the analysis. Descriptive statistics like mean and percentages were used for the analysis.

## RESULTS

In 164 patients, 40.9% were males, and 59.1% were females. 33 patients had both ears included which were operated sequentially. Out of 164 cases that were planned for mastoidectomy, 90.85% cases were CSOM mucosal type, and 6.09% were CSOM squamous type. A maximum number of tympanic membrane perforations that presented to us were subtotal perforations. Small quadrant perforations were the next most common presentation. In 24.4% cases, the long process of incus was eroded, proving to be the most general ossicular erosion in CSOM cases. Only 7.9% cases had stapes erosion in our study. Most cases were managed by Cortical mastoidectomy with type 1 tympanoplasty. In few cases, when the remaining ossicles were unhealthy for

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ossicular reconstruction, we attempted harvesting a bone graft from posterior canal wall, and drilling and grafting were done in such bone grafts, and ossiculoplasty was done. Such cases are also included in my study. 15 cases were managed by transposition of incus between malleus and suprastructure of stapes. Conchal cartilage was grafted in few cases in ossiculoplasty and all these cases, the cartilage graft was placed the medial to temporalis fascia graft to prevent retraction of the graft.

In the 3rd month follow up, 86% was the success rate in graft uptake in my institution, as these patients had intact TM. 1.8% patients were identified with residual perforation. Reinfection was seen in 0.6%. 7.9% patients did not turn for 3rd month follow up. 3.7% patients were identified with external auditory canal granulations. In 6th month follow up, 76.8% patients had intact TM. 11% patients were absent in 6th month follow up. This increase in percentage of patients who didn't turn up for 6th month follow up may be the reason for slight fall in success rate in 6th month compared to 4th month, because people with intact TM may not turn up for further follow up. Reinfection group has increased from 0.6% to 5.5%. this increase in reinfection of the ear may be due to Eustachian tube dysfunction, poor postop care by the patients, use of ear buds in postop ears by patients himself to clear the post op secretions. This increase in reinfection may also contribute to the slight fall in success rate when we compare the success rate between 3rd and 6th month. 4.9% patients had residual perforation and 1.5 patients had external auditory 6th month postop otoscopic view after cortical mastoidectomy with Type 1 tympanoplasty.

**DISCUSSION**

Mathur et al.<sup>7</sup> in 1991 observed erosion of incus in 22% of cases and Quarranta et al.<sup>8</sup> in 1995, stated same in 27% cases. Udaipurwala et al. have presumably considered the lenticular process to be a part of the long process of incus, since they have not considered it independently.<sup>9</sup> Austin reported the

Side	Frequency	Percentage
Right	83	50.6%
Left	81	49.4%

**Table-1:** Ear of surgery

CSOM	Frequency	Percentage
TT	149	90.85%
AA	10	6.09%
Others (Grade 4 RET, Aural Polyp)	5	3.04%

**Table-2:** Classification of CSOM

Pre-op otoscopic	Frequency	Percentage
PSR	9	5.5%
Posterior	21	12.8%
ST	71	43.2%
CP	33	20.1%
Attic	1	.6%
Anterior	24	14.6%
Grade 4 RET	4	2.4%
Aural Polyp	1	.6%

**Table-3:** Pre-op otoscopic finding

Type of surgery	Pre-op PTA (dB)	3 <sup>rd</sup> month PTA (dB)	Improvement (dB)	6 <sup>th</sup> month PTA (dB)	Improvement (dB)
CM, TYPE 1 Tym	37.67	28.16	9.50	26.21	11.30
CM, TYPE 1 Tym, Conchal C Under the handle	30.65	36	-5.35	38.95	-8.30
CM, TYPE 2 Tym	42.60	28.60	14	24.30	18.3
CM, TYPE 3 Tym	34.98	27.56	7.42	27.98	7.00
CM, TYPE 3 Tym, Conchal cover SS	30.45	25.00	5.45	25.30	5.15
CM, bone graft from post canal wall, over foot plate arti with M	26.40	26	0.40	26.30	0.10
CM, bone graft from post canal wall, over footplate arti with neo TM	40.05	32.30	7.75	31.15	8.90
CM, I reshaped and kept bet M and SS	40.64	32.45	8.19	29.61	9.70
CM, I reshaped between SS and neo TM	44.00	38.30	5.70	32.00	12.00
CM, M reshaped between footplate and neo TM, ConchalC over M	33.73	31.53	2.20	29.66	4.06
CM, M reshaped between SS and neo TM	44.65	28.45	16.30	26.30	18.35
MRM, bone graft from post canal wall, over footplate	33.60	30.50	3.10	29.00	4.60
MRM, M reshaped between footplate and neo TM	31.30	30.30	1.00	26.00	5.30
MRM, TYPE 1 Tym, Conchal C Under the handle	40.00	34.00	6.00	31.20	8.80
MRM, TYPE 3 Tym	36.20	24.33	11.86	20.53	15.66
MRM, TYPE 4 Tym	38.40	29.25	9.15	25.30	13.10
MRM, M reshaped and kept over footplate	40.00	36.00	4.00	32.00	8.00

**Table-4:** Assessment of audiological improvement

Success rate	3 <sup>rd</sup> month		6 <sup>th</sup> month	
	Frequency	Percent	Frequency	Percent
Residual perforation	3	1.8%	8	4.9%
Granulation	6	3.7%	3	1.8%
Reinfection	1	.6%	9	5.5%
Intact	141	86.0%	126	76.8%
Absent	13	7.9%	18	11.0%

Table-5: Follow up finding

most common ossicular injury to be the erosion of incus, with intact malleus and stapes, in 29.50% cases.<sup>10</sup> Kartush observed erosion of long process of incus with an intact malleus handle and stapes suprastructure (type A) as the usual ossicular defect.<sup>11</sup> Shreshtha et al. and Mathur et al. also stated similar findings in unsafe CSOM.<sup>7,12</sup>

The stitch less surgery was used in all our patients who had tympanoplasty without mastoidectomy. Using this route, the posterior and anterior tympanomeatal flaps (anterior and posterior tympanotomy) raised have been shown to be adequate for disease clearance, proper graft placement, and better surgical outcome as well as ensuring stitch less surgery.<sup>13,14</sup> Other patients with cholesteatoma were managed by tympanoplasty merged with restrained radical mastoidectomy via the post-auricular approach.

Although the type of graft substance used for closure of TM perforations has been shown to have an impact on result of surgery, there are no consistent success rates for achieving an intact tympanic membrane after surgery using another surgical techniques.<sup>15,16</sup>

Sergi et al. reported that tympanoplasty occurred in a 57–97% rise in patients' hearing function and that myringoplasty can enhance hearing independent of the site and size of perforation, and thus reasoned that hearing enhancement can be used as an indication for myringoplasty.<sup>17</sup> Mishra et al. reported hearing increase of 10–30 dB in 95% of their cases.<sup>18</sup> Faramarzi et al. reported that approximately 24% patients that had ABG within 25 dB before intervention; increasing to 71% post-operatively.<sup>19</sup> Demirpehlivan et al. in their study on the association of different TM reconstruction techniques in type I tympanoplasty reported increase in average PTA post-operatively, regardless of the materials used for the reconstruction.<sup>15</sup>

## CONCLUSION

Cortical mastoidectomy was done in majority of cases along with TM. An improvement of 18.35 dB was seen in cases where malleus was reshaped and articulated with stapes. This proves that autografts still holds well in ossiculoplasty. In the 3rd month follow up, the success rate of tympanoplasty is 86%. In 6 months follow up, worked up success rate is 76.8%. It recorded a mean improvement of 11.30 dB in 6th-month post op audiological improvement.

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