

# Relation of mastoid size in graft uptake in patients with type 1 tympanoplasty alone and type 1 tympanoplasty with cortical mastoidectomy

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## Abstract

**Background:** Chronic suppurative otitis media (CSOM) is an inflammation of the middle ear cleft includes middle ear cavity proper with mastoid. One of the major cause for the failure of graft uptake is infection. Simple mastoidectomy is an effective means of repneumatizing and removing disease from the mastoid. The effect of mastoidectomy on patients without evidence of active infection remains highly debated and unproven. **Objectives:** This study undertaken to evaluate the outcome of graft uptake in different sizes of the mastoid bone in type I tympanoplasty with cortical mastoidectomy and type I tympanoplasty alone and to compare the results between these two. **Methods:** The comparative study comprises of 60 patients with CSOM safe type in quiescent stage. All cases operated during a period of 2yrs. Thirty of these cases were selected for type I tympanoplasty alone (Group A) and 30 cases were selected for type I tympanoplasty with cortical mastoidectomy (Group B). Prospective cohort study is done. Patients were reviewed after 3 weeks, for inspection of operated ear. The second and third post operative reviews were done at 3rd and 6th month respectively for clinicoaudiological assessment of the operated ear with respect to graft status, ear discharge and hearing improvement. The post-operative audiograms were recorded on 2nd and 3rd visits. **Results:** The take up rates of graft is high in large mastoids. Better results were obtained by performing a type I tympanoplasty with cortical mastoidectomy than with a type –I tympanoplasty alone. Further more cases with a small mastoid preoperatively were benefited by a cortical mastoidectomy. a larger mastoid gives a much better take up rate, as compared to a smaller mastoid, irrespective of whether Type I tympanoplasty was done with or without cortical mastoidectomy. **Conclusion:** A cortical mastoidectomy is an effective means of repneumatizing the mastoid air cell system as well as eradicating the mastoid source of infection. Our study proves that a larger mastoid gives a much better take up rate, as compared to a smaller mastoid, irrespective of whether Type I tympanoplasty was done with or without cortical mastoidectomy.

**Key Words:** Type I tympanoplasty; Cortical mastoidectomy, pneumatisation, mastoid size.

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## INTRODUCTION

Chronic suppurative otitis media (CSOM) is an inflammation of the middle ear cleft includes middle ear cavity proper with mastoid<sup>1</sup>. One of the major cause for the failure of graft uptake is infection. Simple mastoidectomy is an effective means of repneumatizing

and removing disease from the mastoid<sup>2,3</sup>. The effect of mastoidectomy on patients without evidence of active infection remains highly debated and unproven. The non-mastoid causes of graft failure include general disability, technical error, and most importantly – eustachian tube dysfunction<sup>4</sup>. Mastoid factors include the extent of mastoid pneumatization and the presence of inflammatory disease in mastoid, while there is little controversy over the importance of non-mastoid factors; otologists have debated the role of mastoid in tympanic membrane reconstruction. Some argue that tympanic membrane perforations should be repaired by type I tympanoplasty alone, regardless of the status of the mastoid, others advocate mastoidectomy coupled with tympanic membrane repair when mastoid condition warrants<sup>5,6</sup>. Ventilation of middle ear is an essential predictor of functional results following middle ear reconstruction. It

is a complex and dynamic process depending upon functional status of the eustachian tube, the degree of pneumatization of mastoid air cells and the condition of middle ear mucosa. The role of mastoid pneumatization in the middle ear aeration is not exactly known. But it forms an air reservoir and acts as a surge of tank to minimize pressure fluctuation<sup>7,8</sup>. The exact mechanism of the pneumatization of the mastoid air cell system is poorly understood. The pneumatization has been linked to hereditary and genetic factors. It has also been related to the size of the skull and the height of the individual. The functional status of the eustachian tube has been correlated to the pneumatization of the mastoid air cells by some authors, whereas, others do not confirm a significant correlation between the two. However, the ears with CSOM have consistently shown a reduction in the size of mastoid air cell system. The purpose of this study is to evaluate the outcome of graft uptake in different sizes of the mastoid bone in type I tympanoplasty with cortical mastoidectomy and type I tympanoplasty alone and to compare the results between these two.

**MATERIALS AND METHODS**

This study comprises of 60 patients with CSOM safe type in quiescent stage. All the cases were operated during a period of 2 years between May 2012-May 2015 in the department of ENT, JJMMC Davangere: 30 of these cases were selected for type I tympanoplasty alone (Group A) and 30 cases were selected for type I tympanoplasty with cortical mastoidectomy (Group B). [Table 1] The work up for these cases consisted of a detailed history and a complete general physical, systemic and ear, nose and throat examination. In all the patient a routine blood and urine examination, X-ray of paranasal sinuses and mastoids, examination under microscope and puretone audiometry were done. The size of the mastoids was roughly measured by using a graph paper, on which the X-ray film of the mastoid taken in the lateral oblique view was superimposed. Accordingly the mastoids were classified as:

- Small mastoids = <5cm<sup>2</sup>
- Medium mastoids = 5-10cm<sup>2</sup>
- Large mastoids = >10cm<sup>2</sup>

Those patients with a predisposing foci of infection in the nose and para nasal sinuses were subjected to septal correction and endoscopic sinus surgeries and tonsillectomy to eliminate the foci of infection and only then taken up for type I tympanoplasty. Patients with a history of long standing allergy or any systemic diseases, which might influence the operative results, were excluded from the study. Preoperatively all the patients had a discharge free period of 4-6 weeks. Most of the

group B patients were selected on the basis of presence of a quiescent ear with sclerotic mastoids. Cortical mastoidectomy was done followed by a type I tympanoplasty in the same sitting. Patients were reviewed after 3 weeks, for inspection of the operated ear. The second and third post operative reviews were done at 3 months and 6 months respectively for a clinico-audiological assessment of the operated ear with respect to graft status, ear discharge and hearing improvement. The postoperative audiograms were recorded on the 2<sup>nd</sup> and 3<sup>rd</sup> visits.

**RESULTS**

**Table 1: Showing study groups**

Type I tympanoplasty (Group A)	Type I tympanoplasty with cortical mastoidectomy (Group B)
30 cases	30 cases
Total no. of cases 60	

**Table 2: Relation of the Mastoid Size of Graft Uptake 2 a): Type I tympanoplasty (Group A)**

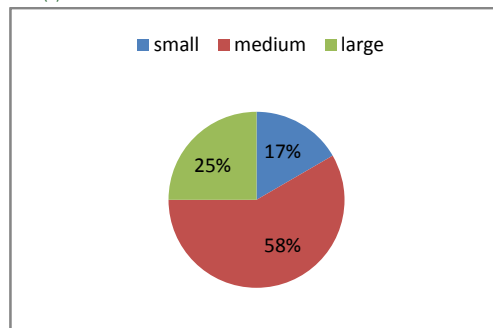
Size of mastoids	No. of cases	Take up rate	Failure rate
Small	6	4 (66.6%)	2 (34.4%)
Medium	18	14 (77.7%)	4 (22.3%)
Large	6	6 (100%)	0

Adjusted  $\chi^2_{(2)} = 3.317$  p = 0.190 (Not significant)

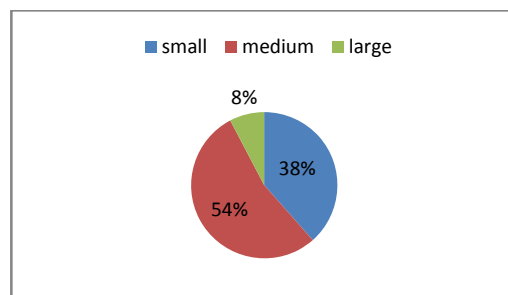
**2 b): Cortical mastoidectomy + type I tympanoplasty (Group -B)**

Size of mastoids	No. of cases	Take up rate	Failure rate
Small	13	10 (76.9%)	3
Medium	15	14 (93.3%)	1
Large	2	2 (100%)	0

Adjusted  $\chi^2_{(2)} = 2.167$  p = 0.338 (Not significant)



**Figure 1: Relation of graft take up rate with mastoid size in type 1 tympanoplasty alone**



**Figure 2: Relation of graft take up rate with mastoid size in type 1 tympanoplasty with cortical mastoidectomy**

The study groups are shown in Table 1. The relation of the mastoid size of graft uptake in type 1 tympanoplasty alone Table 2a, Figure 1 and type 1 tympanoplasty with mastoidectomy is shown in Table 2b, Figure 2. It shows that a larger mastoid gives a much better take up rate, as compared to a smaller mastoid, irrespective of whether Type I tympanoplasty was done with or without cortical mastoidectomy. However, with a cortical mastoidectomy, the take up rates were found to be better even for smaller mastoids.

## DISCUSSION

Type I tympanoplasty is an operation in which the reconstructive procedure is limited to repair of tympanic membrane perforation. Implicit in the definition is that the ossicular chain is intact and mobile and that there is no middle ear disease such as infected mucosa or in growth of the skin. Exploration of the middle ear and ossicular chain is a routine part of most type I tympanoplasty operations.

### Size of mastoids and Take up rates

Jackler and Schindler<sup>9</sup> in their study divided cases according to the size of mastoids on radiography and found that large mastoids ( $>10\text{cm}^2$ ) had a 100% take up rates, compared to small mastoids ( $<5\text{cm}^2$ ) which had a success rate of only 84.6%. Our study showed similar results with a 100% take up in cases with large mastoids and 73.6% take up rates with small mastoids. The association of reduced mastoid pneumatization to chronic middle ear infection and tympanic membrane reconstruction has been reported by Holmquist<sup>9</sup>. The success of type I tympanoplasty has been directly correlated with the mastoid air cell volume. A small mastoid air cell size is a poor prognostic indicator in tympanoplastic surgery. This is based on the "air reservoir" theory, which states that the mastoid air cell system provides a pneumatic reservoir upon which the middle ear can draw upon during period of transient eustachian dysfunction. There was no definite study in the literature depicting the relationship between the duration of ear discharge and the success rates of type I tympanoplasty. In our study most of the cases in both groups had a history of prolonged ear discharge, which however did not seem to influence the success rates. The other important factor presumed to influence the results of type I tympanoplasty is the period of dryness of the ear to be operated. There seems to be a difference of opinion regarding the period of dryness required prior to surgery.

Booth in his series observed that long periods of dryness do not appear to make a significant difference but emphasized that the ear should be dry at the time of surgery, for better results. Packer *et al.*<sup>10</sup> and Adkins in their study concluded that no minimum qualifying period with a dry ear was deemed necessary for a successful type I tympanoplasty. No actively discharging ear cases were included in our study. All the cases had a discharge free period of 4 to 6 weeks prior to surgery. However some of ears were wet in spite of aggressive medical management, which were included in Group – B.

## CONCLUSION

Infection represents the single most important cause of graft failure and can result from a hidden mastoid disease. A simple mastoidectomy is an effective means of reneumatizing the mastoid air cell system as well as eradicating the mastoid source of infection. Our study proves that type I tympanoplasty along with a cortical mastoidectomy gives better results than type I tympanoplasty alone. We found a correlation between the size of the mastoids and the take up rates, with large mastoids having a 100% success rate.

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