

Is Cortical Mastoidectomy Justified In Tubotympanic Chronic Otitis Media?

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Abstract

Objectives: To compare the graft uptake rates and hearing outcomes in cases of tubotympanic chronic otitis media undergoing Tympanoplasty with and without Cortical mastoidectomy. **Materials & Methods:** It was a prospective study carried out over the period 1 year from 2012-13 with a sample size was 50 patients. Patients were randomised into Group A (tympanoplasty group) or group B (Tympanoplasty with cortical mastoidectomy group). Independent two sample T test was used to compare post operative graft uptake rates and hearing outcomes in the two groups. **Results:** Post operative graft uptake rates at the end of 6 months and mean hearing gain were found comparable in both groups ($p > 0.05$). **Conclusion:** Tympanoplasty alone is sufficient in patients with tubotympanic type of chronic otitis media, as the results of graft uptake and hearing improvement show no significant difference between the tympanoplasty and cortical mastoidectomy group.

Key Words

cortical mastoidectomy, tympanoplasty, tubotympanic disease

Introduction

Chronic suppurative otitis media (CSOM) is a chronic inflammatory disease of the middle ear and mastoid which presents with recurrent ear discharge or otorrhoea through a tympanic membrane perforation. [1] The mainstay for treatment of CSOM is surgical with the main goals being eradication of the disease and preservation or improvement of hearing. Tympanoplasty is a procedure to eradicate disease from middle ear cleft and to reconstruct the hearing mechanism with or without tympanic membrane grafting. [2] The two opposing demands of tympanoplasty are namely, removal of all the disease process and at the same time trying to maintain as much of normal tissue as possible to facilitate reconstruction of the hearing mechanism. Cortical mastoidectomy is a surgery done to exenterate all the

infected mastoid air cells and improve the aeration of the middle ear cleft without lowering the posterior canal wall. [3] Many factors contribute to the success or failure of surgery to correct tympanic membrane perforations, the single most important of which is infection which can result from a hidden mastoid disease or external contamination iatrogenic in origin. In this study we analyzed the graft uptake, the post operative air bone gap and the hearing gain in both the groups. Intraoperative middle ear findings such as polypoidal mucosa, granulations, glue, tympanosclerotic patch were documented. Apart from this, the mastoid exploratory findings for group B, such as granulations in antrum, aditus block were also documented. We designed this study to

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compare the efficacy of tympanoplasty with and without cortical mastoidectomy for the treatment of tubotympanic type of chronic otitis media.

Material and Methods

The present study was carried out in Department of Otorhinolaryngology & Head and Neck Surgery of our college over the period of 1 year, 2012-13. During this period a total of 50 patients with tubotympanic type of chronic otitis media were selected from the outpatient department and admitted to undergo surgery after proper evaluation and work up to satisfy the inclusion criteria of the study. Patients were randomised by alternating into two groups, group A undergoing tympanoplasty and group B, undergoing Tympanoplasty with cortical mastoidectomy. The study was conducted after ethical clearance and review by the research review committee.

Inclusion Criteria: Patients with tubotympanic chronic otitis media with a dry perforation were selected. Age group 18 - 60, Patients with complaints of chronic ear discharge with or without hearing loss with a safe perforation which were dry for 3 weeks, No history of any complications of chronic otitis media.

Exclusion Criteria: Patients with atticofacial type of chronic otitis media. Patients with history of previous ear surgery, Patients with sensorineural hearing loss, Any congenital abnormality in middle or inner ear, History of concurrent nasal symptoms e.g excessive nasal discharge, postnasal drip.

All the patients were evaluated in detail by means of - Proper history taking and clinical examination, Relevant investigations including haemogram, bleeding and clotting time, urine for routine microscopy and x ray mastoids. Audiometric evaluation to document type and degree of hearing loss was done. Pure tone audiometry was done and preoperative mean air-bone gap was calculated taking average of four frequencies i.e 0.5 KHz, 1.0 KHz, 2.0 KHz and 3KHz. All the patients underwent examination under microscope to rule out any features of unsafe disease. Preoperative preparation included intravenous antibiotic for one day prior to surgery for all patients and premedication with i.m. phenargen and i.m fortwin half hour prior to surgery. Either local or general anesthesia was used depending on age, general condition and cooperation of patient. All patients underwent surgery by post auricular route. In all the patients, temporalis fascia was used as a graft and grafting was done by underlay technique. Intra operative status of ossicles, middle ear, presence or absence of polypoidal tissue, granulations, glue was documented. In cortical mastoidectomy, apart from all of the above, status of the mastoid antrum and the aditus was documented.

Meticulous postoperative care was taken and oral antibiotics, systemic decongestants and analgesics were given in the postoperative period. Patients were discharged on 2nd postoperative day and suture removal was done on 7th day.

Patients were followed up every weekly in the 1st month and then at the end of 3rd month for the post operative pure tone audiometry and at the end of the 6th month for checking the graft uptake.

Statistical Analysis

Statistical analysis was done using SPSS software (version 17.0). Data was expressed as mean \pm standard deviation (S.D). Post-operative graft uptake analysis and post operative air-bone gap comparison of both groups was done using Independent two sample T- test taking $p < 0.05$ as significant (95% confidence interval). Mean Hearing gain for both the groups was calculated and compared using independent T- test.

Outcome Measures:

Results were analyzed on the following parameters-

Post operative graft take up seen at the end of 3rd follow up visit at the end of 6th month post surgery.

Audiometric evaluation at 3 months post surgery and comparison of the post operative air bone gap for both the groups. Hearing improvement post surgery was taken as Air bone gap of 20 dB at 3 months post surgery.

Hearing gain was calculated for both the groups.

Results

In this study, a total of 50 patients were taken and randomly divided into two groups, 25 patients in Group A who underwent Tympanoplasty and 25 in Group B who underwent Cortical Mastoidectomy with tympanoplasty.

Demographic data: Age Distribution: In this study, patients within the age of 18- 60 were proposed to be enrolled. Among the total of 50 patients, 60 % were in the age group of 18- 30 yrs and 40 % in the age group of 31-45 yrs, however there were no patients in the age group of 46- 60 yrs. The youngest patient in both the groups was 18 yrs old, while the oldest patient in group A was 45 yrs old and in group B was 45 yrs old. In group A, the mean age was 28.32 ± 8.34 (S.D), and in group B was 30.68 ± 7.24 . The mean age for the entire study group being 29.50 ± 7.82 .

Sex Distribution : In this study, out of the total 50 patients, 46 % were males and 54% females. Out of the 25 patients in Group A, 20% were males and 30% females. In Group B, there were 26% males and 24% females.

Preoperative Findings

1. **X Ray Mastoids:** X ray mastoids showed sclerosed mastoid air cells in 68% of the total patients,

Table 1. Graft Uptake Rates In Both Groups

	GROUP A		GROUP B		P VALUE
GRAFT UPTAKE	N	%	N	%	
SUCCESSFUL	22	88	23	92	0.646
FAILURE	3	12	2	8	NS

Table 2. Air-Bone Gap Pre and Post Operatively

	GROUP A	GROUP B	P VALUE
PRE OPERATIVE A-B GAP	33.8 ± 5.25	32.6 ± 5.02	
POST OPERATIVE A-B GAP	19.4 ± 5.06	19.6 ± 6.75	0.906 NS
HEARING GAIN	14.4 ± 5.46	13.0 ± 5.59	0.375 NS

Table 3. Comparison of Graft Uptake Rates of Present Study with Previous Studies

Surgery	Present study	Albu S. et al (2012)	Toros SZ et al (2010)	Ramakrishnan et al (2011)	Mc Grew et al (2004)
Tympanoplasty	88 %	76 %	76.1%	96.775%	90.6%
Tympanoplasty with cortical mastoidectomy	92 %	82.8%	78.3%	93.55%	91.6%

Table 4. Comparison Between Mean Post-operative Air Bone Gap Between Present Study & Previous Studies

Surgery	Present study	Ramakrishnan et al (2011)	Toros et al (2010)	Mc Grew et al (2004)
Tympanoplasty	19.4 ± 5.06	12.71 ± 11.54	10.52 ± 8.95	16.4 ± 12.4
Tympanoplasty with cortical mastoidectomy	19.6 ± 6.75	12.55 ± 12.98	16.77 ± 11.22	14.4 ± 11.1

out of which 40% were in Group B and 28% in Group A. In rest of the 32% it showed normal pneumatised pattern, out of which 22% were in Group A and 10% in Group B.

2. Size of Perforation: In this study, perforation size is comparable in both groups, with medium sized perforation forming the majority, found in 58% of the total cases.

Intraoperative Findings

1. Ossicular status: The ossicular status in both groups were found to be comparable. Erosion of ossicles are found in association with other pathological findings such as granulation and polypoidal middle ear mucosa. There are similar findings in the antrum of the patients in Group B, who underwent cortical mastoidectomy with tympanoplasty.

2. Middle ear findings: In Group A, 5 patients had the presence of tympanosclerotic patch, while there were no such patients in Group B. Polypoidal mucosa

was found in 2 patients in Group A, while it was found in 10 patients in group B. Granulations were also found more in Group B patients, seen in 5 cases where as it was present in only 1 cases in Group B. Glue was seen in only 1 case in the Group B and was not found in any of the cases of Group A.

3. Type of Tympanoplasty done: Out of the total 25 patients in each group, 23 underwent Type I tympanoplasty in both groups, while 1 patient underwent Type II tympanoplasty in both groups. Type III tympanoplasty was done in 1 patient in Group A, which was a Type IIIa tympanoplasty, i.e graft was placed on stapes head, while in Group B it was a Type IIIc tympanoplasty, i.e. graft was placed of stapes footplate.

4. Mastoidectomy findings in group B: In group B, during surgery granulations were found in the antrum in 11 patients while 14 patients had blocked aditus. 14 patients had a normal antrum with no disease, while 11

patients had patent aditus.

1. Graft Intake : In group A, 22 out of 25 patients had successful graft uptake at the end of 6 months postoperatively whereas in group B, 23 patients had successful uptake. Independent two sample T- test was done using SPSS software to compare the graft uptake results of both the groups. Graft uptake rate between group A and group B are 88% and 92%. The p value was 0.646, as $p > 0.05$ there is no statistically significant difference between the groups. [Table 1]

2. Postoperative Air Bone Gap: Post operative air bone gap of 20 dB and less was seen in 76% of group A patients and 80% of group B patients. Mean post op AB gap for group A patients was 19.4 ± 5.06 dB and for group B was 19.6 ± 6.75 dB. Independent two sample T-test was applied, p value was 0.906, since $p > 0.05$ so statistically not significant.

3. Hearing:: Hearing gain was calculated subtracting the pre operative AB gap from the post operative AB gap for both the groups. The mean hearing gain was evaluated as 14.4 ± 5.46 for group A and 13.0 ± 5.59 for group B. Independent T- test was applied, p value was 0.375 ($p > 0.05$), so no statistical significance found in the mean hearing gain between the two groups. [Table 2]

Discussion

Many factors contribute to the success or failure of surgery to correct tympanic membrane perforation and improve the hearing. Proponents of concomitant mastoidectomy cite the role of mastoid aeration in improving the surgical results as well as no additional costs and risk associated with the surgery for promoting it. Functional success after tympanoplasty is only partly determined by a surgeon's technical skill. Other factors also play a significant role including biological and pathological factors^[4] and factors that influence the mechanics and acoustics of middle ear reconstruction.^[5] In this study, among the total 50 cases 58% had medium sized perforation, 22% had large perforation and 12% small perforation. Middle ear findings suggestive of polypoidal mucosa was present in 2 cases in group A and 10 cases in group B, whereas granulations were found in 1 case in group A and 5 cases in group B. These findings of group B closely correlated with the findings of granulations in antrum and aditus block. Out of the 10 patients in group B having polypoidal middle ear mucosa, 7 had granulations in antrum (70%) and 6 had aditus block (60%) showing the concomitant presence of mastoid involvement in these cases. In the present study, the graft uptake in tympanoplasty alone was 88% and in tympanoplasty with cortical mastoidectomy was 92%.

The difference between the two groups was not statistically significant as P value was > 0.05 . On comparing the graft uptake rates of present study with previous studies [Table 3], graft uptake results have been marginally better in tympanoplasty with cortical mastoidectomy in present study as well as previous studies, though the difference has not been found to be statistically significant in any of the studies. In the study by Albu *et al*,^[3] factors were found to be significant in predicting success rate of surgery, a healthy opposite ear, a long dry period before the surgery and non-smoker status.^[6] In the study by Mc Grew *et al*, the authors found that patients with tympanoplasty alone were more likely to require subsequent otologic procedures compared with patients who underwent initial concomitant mastoidectomy (15.5% vs. 12.2%), although this did not reach statistical significance ($P > 0.05$). The most common subsequent procedures included tympanoplasty, pressure equalization tubes, tympanoplasty with mastoidectomy, and tympanoplasty with canal wall down mastoidectomy.^[7] In an analysis of 46 patients undergoing tympanoplasty alone and 46 patients undergoing tympanomastoidectomy, Toros *et al*. found perforation closure success rates of 76.1% and 78.3% respectively, and postoperative airbone gaps of 10.52 ± 8.95 in the tympanoplasty group and 16.77 ± 11.12 in the tympanomastoidectomy group. No statistically significant differences were noted. The authors concluded that mastoidectomy may not be necessary in this patient population.^[8] Another factor leading to failure of tympanoplasty is total or partial non-aeration of the middle ear and development of negative static middle ear pressure. Assessment of a poor eustachian tube function preoperatively is a bad predictor of the successful closure of the tympanic membrane.^[9] In the present study, the mean residual air bone gap for patients who underwent tympanoplasty was 19.4 ± 5.06 dB, whereas in the cortical mastoidectomy group it was 19.6 ± 6.75 dB. There is no statistical significance between the two groups. Similar results were reported in other studies [Table 4], in Ramakrishnan *et al's* study where no statistical significance was found between the two groups and authors concluded that cortical mastoidectomy is not needed in the surgery of tubotympanic chronic otitis media as it did not significantly alter the surgical results.^[10] Another study by Kaur *et al*, in which comparative evaluation was done between tympanoplasty alone and tympanoplasty with cortical mastoidectomy in non-cholesteatomous CSOM, the results of hearing improvement, graft uptake and clinical improvement were statistically insignificant in both groups.^[11] In another study, "Comparative evaluation of

tympanoplasty with or without mastoidectomy in treatment of chronic suppurative otitis media tubotympanic type" by Agrawal A. *et al* in 2017, 40 patients were randomly allotted to tympanoplasty group and tympanoplasty with cortical mastoidectomy group. Graft uptake was 80% in tympanoplasty group and 95% in tympanoplasty with mastoidectomy group, however in terms of graft uptake and hearing gain the results were not statistically significant.^[12]

Conclusion

Based on the results of the present study, it can be concluded that tympanoplasty alone is sufficient in patients with tubotympanic type of chronic otitis media, as the results of graft uptake and hearing improvement show no significant difference between the tympanoplasty group and tympanoplasty with cortical mastoidectomy group. I would thereby like to conclude that cortical mastoidectomy can be considered as a useful adjunct to tympanoplasty in selected cases of chronic suppurative otitis media of the tubotympanic type. The decision for the surgery should be made by the surgeon after careful evaluation of the middle ear status through otoscopy, preoperative examination under microscope and x ray mastoids. As such, tympanoplasty alone is sufficient for majority of cases having healthy middle ear mucosa. Much remains to be accomplished, in terms of larger study population and a longer follow up period as well as surgical technique followed in order to define the ideal surgical procedure for the patients of chronic suppurative otitis media.

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Conflicts of Interest

There are no conflicts of interest.

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