

Cortical Mastoidectomy Improves the Results of Type I Tympanoplasty: A Myth or Not

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KEYWORDS

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ABSTRACT:

Introduction: Patients with mucosal variety of COM may have associated disease in the mastoids, which makes it a good practice to explore the mastoids during tympanoplasty. The mastoid pneumatic system is thought to act primarily as a buffer to pressure changes in the middle ear. The presence of pneumatised mastoid greatly increases the volume of the middle ear/ mastoid system, which in accordance with Boyle's law, can minimize the effect of pressure changes in the middle ear cleft. A poorly pneumatised air cell system lacks this buffering capacity and thus is prone to inflammatory changes in the middle ear cavity.

Objective: To compare the outcomes of patients undergoing Type I Tympanoplasty with and without cortical mastoidectomy.

Materials and Methods: An institution based prospective observational study was conducted in the Department of Otorhinolaryngology in a Tertiary Medical College of Kolkata. The study was conducted from March 2019 to August 2020 which included 120 patients of Mucosal variety of COM attending OPD of Otorhinolaryngology in the Tertiary Institute, after taking proper consent abiding by the inclusion and exclusion criteria. Patients presented with a history of chronic discharge from the ear (>3 months), without any symptoms and signs of complications.

Result: The comparison of Air Bone gap among the post-operative patients, shows a non-significant value of 0.263 (Independent t test) (>0.05). This shows that there is no significant difference between the outcomes when operated with Type I Tympanoplasty or Type I Tympanoplasty when combined with Cortical Mastoidectomy.

Conclusion: In our study, it has been found out that although the graft uptake rate and the hearing outcomes are better in cases where Tympanoplasty is combined with a Cortical Mastoidectomy, it is not statistically significant. So we can conclude that whether or not combined with a Cortical Mastoidectomy, Type I Tympanoplasty can be used as the treatment of choice in uncomplicated mucosal variety of Chronic Otitis media with mild to moderate degrees of conductive hearing loss.

Introduction

Patients presenting with chronic otitis Media (COM) can have an inflammatory process in the whole of tympanomastoid compartment, including the tympanic

cavity, eustachian tube, mastoid antrum and all the pneumatised spaces of temporal bone. The disease process is largely affected by the severity of infection, host response and time course over which the disease



manifests. Tympanoplasty is used as a standard procedure for disease clearance from the middle ear. Adding mastoid exploration with tympanoplasty gives it an advantage of complete disease clearance from the mastoid area as well as increases the air reservoir. The mastoid pneumatic system is also thought to act as a buffer to pressure changes in the middle ear. The presence of pneumatised mastoid can increase the volume of middle ear and mastoid system, which according to the Boyle's law, can minimize the effect of pressure changes in the middle ear cleft. A poorly pneumatised air cell system lacks this buffer system and thus is prone to increased inflammatory changes in the middle ear cavity. Cortical mastoidectomy is used in case of a chronic otitis media with or without cholesteatoma. It is performed in mucosal COM to clear the attic-antral block, if present and achieve aeration of the mastoid. Aeration of the mastoid has been believed to be one of the very important factors in achieving better results in terms of graft uptake and hearing improvement. The use of mastoidectomy as a means to re-establish drainage of mastoid antrum in mucosal variety of COM is still controversial. This study has been designed to assess the effectiveness of cortical mastoidectomy in cases of mucosal variety of COM. We aimed to evaluate if aerating the mastoid by simple cortical mastoidectomy in cases of mucosal COM improves the success rate of tympanoplasty measured as per the parameters like improvement in the hearing threshold and increased graft uptake. Thus including cortical mastoidectomy in every case of tympanoplasty might be taken as the new treatment of choice and bring a change in the era of tympanoplasty.

Materials And Methods

An institution based prospective observational study was conducted in the Department of Otorhinolaryngology of a Tertiary Medical College, Kolkata. The study was conducted from March 2019 to August 2020. The study included 120 patients of mucosal variety of COM attending OPD of Otorhinolaryngology after taking proper consent abiding by the inclusion and exclusion criteria. 60 of them had undergone type I tympanoplasty and rest 60 underwent type I tympanoplasty with cortical mastoidectomy.

Inclusion criteria:

- Male and female adults subjects

- Mucosal type of COM
- Mild to moderate conductive hearing loss
- No evidence of infection in the nasopharynx and throat.

Exclusion criteria:

- Adults with any acute illness or chronic debilitating disease
- Paediatric age group (<12 years)
- Elderly age group (>60 years)
- Sensory, neural or mixed hearing loss
- Discharging ear
- Previous mastoid surgeries

Statistical analysis was done by version 20 of SPSS. Independent or unpaired t tests was done for the two samples, one where Type I tympanoplasty and other group where Cortical Mastoidectomy was combined with Type I tympanoplasty, to find which showed better improvement in terms of air bone gap. Chi-square test was done to find the association of graft uptake with the type of operative procedure done.

Results

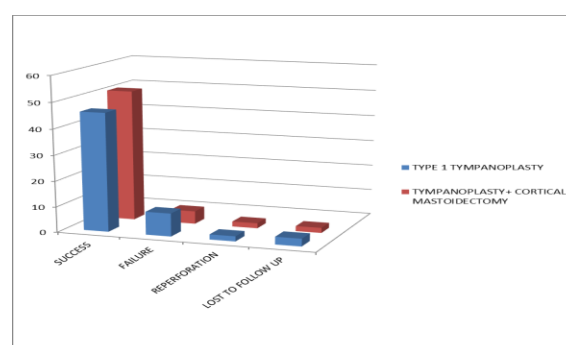


Fig 1: Out of the 60 patients who were operated with Type I Tympanoplasty, 46 (76.7%) has successful graft uptakes, 9 (19%) cases failed to take up the graft, 2 of the previously taken grafts, as seen at 3 months follow up, show re-perforation, whereas 2 patients were lost to follow up.

Out of the 60 patients who were operated with Type I Tympanoplasty and Cortical Mastoidectomy, 51 (85%) had successful graft uptakes, whereas 5 (8.3%) had failed, 2 had a re-perforation and 2 were lost to follow up.



	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.601 ^a	3	.659
Likelihood Ratio	1.618	3	.655

Table I: 4 cells (50.0%) have expected count less than 5. The minimum expected count is 2.00.

Show that the p value is **0.655**, concluding that there is no correlation between the type of surgery and the graft uptake.

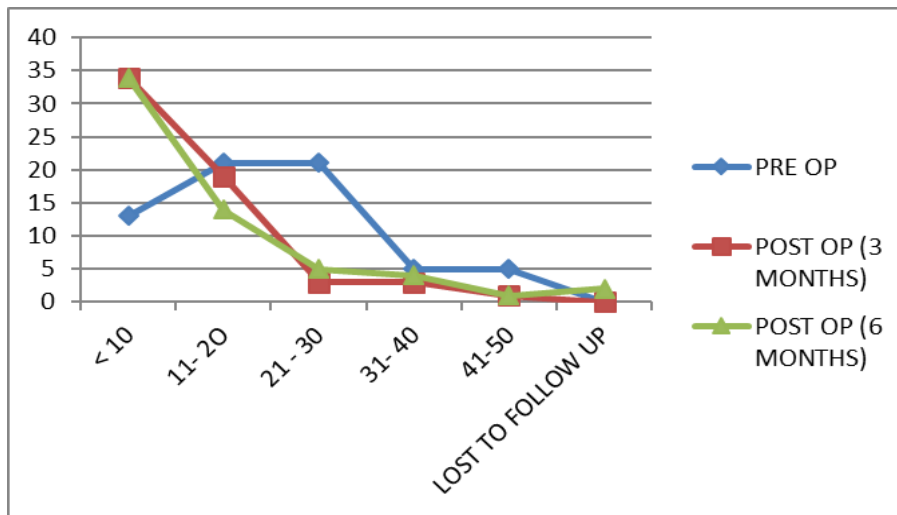


Fig 2: Shows the A-B gap comparison in the patients undergoing type1 tympanoplasty, which shows 56.7 % of patients having a <10 db hearing loss in the post-operative period as compared to 21.7% in the pre-operative period.

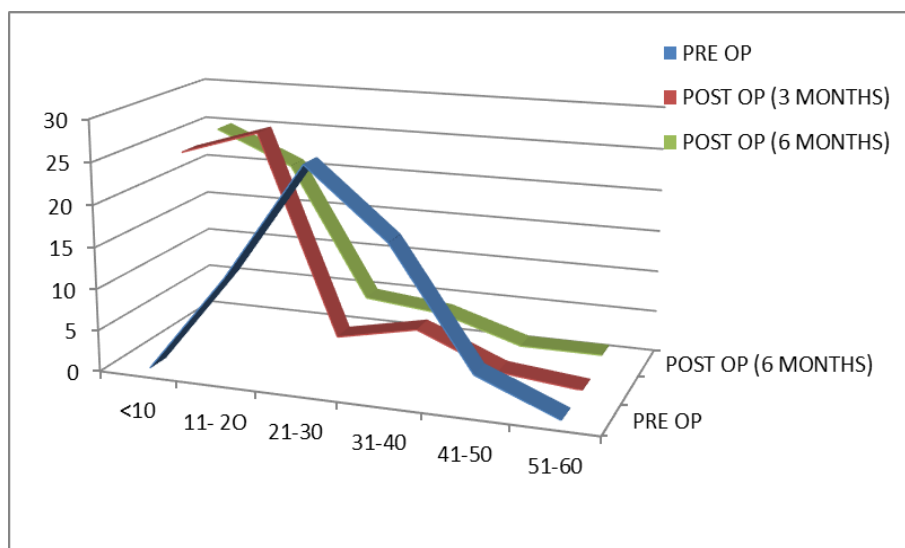


Fig 3: Shows improvement in the A-B Gap in patients operated with Type I tympanoplasty and Cortical Mastoidectomy, where none of the patients had <10 db in the preoperative period, and following the procedure, 25% have Air Bone gap <10 db.

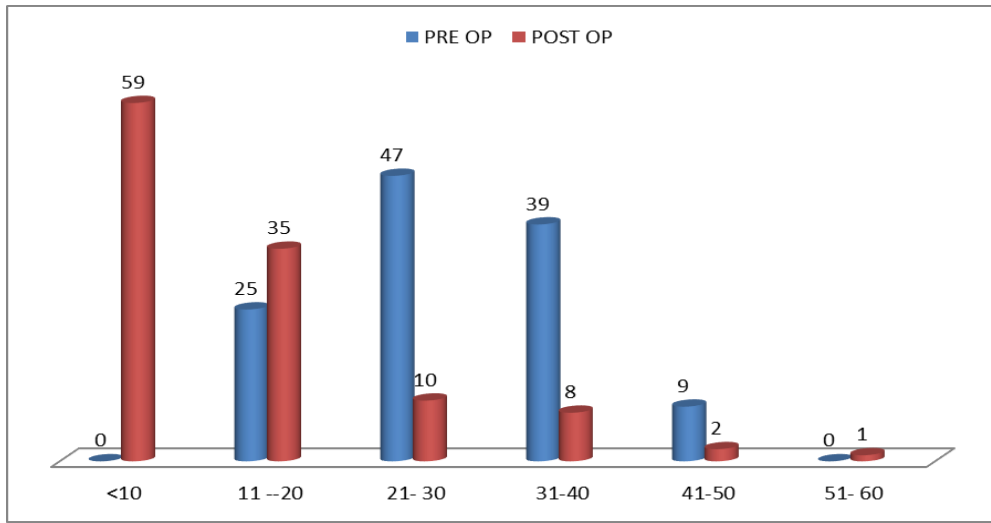


Fig 4: Shows the pre operative and post operative comparison of Air Bone Gap.

	Levene's Test for Equality of Variances	t-test for Equality of Means					
		F	Sig.	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
ABGAP	Equal variances assumed	.612	.436	118	.263	2.067	1.839
POST OP AT 6 MONTHS	Equal variances not assumed			115.713	.263	2.067	1.839

TABLE II: Shows the comparison of Air Bone gap among the post operative patients, which shows a non significant value of **0.263 (Independent t test)** (>0.05). This shows that there is no significant difference between the outcomes when operated with Type I Tympanoplasty or Type I Tympanoplasty when combined with Cortical Mastoidectomy.

Discussion

In our study a total of 120 subjects, with a mucosal variety of chronic otitis media were included taking into account the inclusion and the exclusion criteria. Type I Tympanoplasty was done for 60 subjects and cortical mastoidectomy along with a Type I Tympanoplasty was done among the other 60 subjects. The patients were followed up for a period of 6 months with a pure tone

audiometry done at 3 and 6 months respectively. Out of the 120 subjects 5 were lost during follow up, and the rest 115 were followed till the end of the research work.

Out of the 60 patients who were operated with Type I Tympanoplasty, 46 (76.7%) has successful graft uptakes, 9 (19%) cases failed to take up the graft, 2 of the previously taken grafts, as seen at 3 months follow up, show reoperation, where as 2 patients were lost to



follow up. Out of the 60 patients who were operated with Type I Tympanoplasty and Cortical Mastoidectomy, 51 (85%) had successful graft uptakes, whereas 5 (8.3%) had failed, 2 had a reoperation and 2 were lost to follow up. From the above values, we have come to a conclusion that cortical mastoidectomy when combined with Type I Tympanoplasty gives better results in terms of graft uptake, as compared to simple Type I Tympanoplasty. A Chi-square test comparing graft uptake with the operative procedure shows that there is no association between the two ($p=0.655$)

In a retrospective study by **Mishiro *et al***¹ 251 ears with non-cholesteatomatous chronic otitis media were operated in an 11 year period. They recorded 90.5% overall graft success rates in patients of tympanoplasty with cortical mastoidectomy and 93.3% overall graft success rates were obtained in patients who underwent tympanoplasty alone.

Balyan *et al*² in a retrospective study of 323 patients also showed that tympanoplasty without mastoidectomy is the preferable treatment in chronic suppurative otitis media. A study by **Akriti Sharma *et al***³ which evaluates the outcome of type I tympanoplasty with and without mastoidectomy in 40 patients with CSOM safe type in dry ear shows that Type I tympanoplasty with cortical mastoidectomy has better graft uptake (100%) as compared to without mastoidectomy (95%). A Comparative retrospective study done by **Anjana agarwal and Punit Bhargawa**⁴, which was taken up among 40 patients shows that graft uptake was 80% in tympanoplasty group and 95% in tympanoplasty combined with cortical mastoidectomy.

A comparison of the post operative Air Bone Gap, in the pre operative period and a follow up at 3 months and 6 months in the post operative period, shows that in patients undergoing Type I Tympanoplasty, there were 80% with < 20 db A-B Gap, as compared to 56.7% in the pre operative period. In a similar way, among the patients in which a cortical mastoidectomy was done with a Type I Tympanoplasty, 76.6% had <20 db A-B Gap as compared to the 12% preoperative value. The above data shows a better improvement in the patients undergoing cortical mastoidectomy along with Type I Tympanoplasty, but not statistically significant as depicted by p value of 0.263.

Holmquist and Bergstrom⁵ were the first to suggest that mastoidectomy improves the chance of successful tympanoplasty for patient with mucosal variety of chronic otitis media.

In a study by **Nayak *et al***⁶, they found out that size of the mastoids directly influence the take up rate of the graft as well as the hearing gain following myringoplasty in dry tubotympanic disease ears. A study by **Akriti Sharma *et al***³ which evaluates the outcome of type I tympanoplasty with and without mastoidectomy among 40 patients with CSOM safe type in dry ear shows that post-operative A-B gap closure is better in tympano-mastoidectomy (20.48 dB) than tympanoplasty (15.75 dB) with p value <0.05. Post-operative hearing gain and graft uptake were both better with tympano-mastoidectomy and tympanoplasty. Study by **Anjana agarwal and Punit Bhargawa**⁴ which was a retrospective study taken up among 40 patients of either sex in the age group 20–50 years were reviewed post operatively on 2, 4, 8 and 16 weeks to inspect post operative graft uptake and PTA was done at fourth month to evaluate hearing improvement. Hearing improvement was compared in both the groups, in tympanoplasty group was 9.41 and in tympanoplasty combined with cortical mastoidectomy was 12.05. In a comparative study by **Anushree Raviprakash Bajaj**⁷ *et al*, in the post operative period of 3 months, improvement in hearing threshold of greater than 15 db was observed in 73.33% in group 1 and 83.33% in group 2, and the difference was statistically significant. A prospective study by **Sunil Garg and Vikas Kakkar**⁸, which included 40 patients having tubotympanic type type of CSOM, Tympanoplasty and Cortical Mastoidectomy was done in all patients and they were followed up for graft acceptance and hearing impairment for 5 years to see the long term results. 90% of the cases had graft accepted. In dry ears, graft uptake rate was 89% and in ears with mucoid discharge it was 92%. Average air-bone-gap reduced to 13.90 db as compared to average air-bone-gap preoperatively of 38.62 db. After 5 years, 83.5% patients had >10dB improvement in hearing, so they recommend opening of the mastoid if on inspection of middle ear one finds mucoid type of discharge. **Eliades and Limb**⁹ conducted a study on 26 patients to review surgical outcomes for patients with perforations resulting from CSOM without cholesteatoma and concluded that there was no additional benefit to performing mastoidectomy



with tympanoplasty for uncomplicated tympanic membrane perforations. **Vikramjit Singha and Amlan Debbarma**¹⁰ in a prospective study where results of Type 1 tympanoplasty were compared with cortical mastoidectomy, the post-operative air conduction was within 25 dB in 73.8% of cases and within 40dB in 7.1 % of cases. They showed that it is a good practice to open up mastoid and look for any disease process in type-I tympanoplasty. Opening up of mastoid eradicates disease process and lowers graft rejection. Cortical mastoidectomy also increases the air reserve of the middle ear cleft and improves the middle ear physiology in the long run. Cortical mastoidectomy with type-I tympanoplasty gives high success rate and gives rise to few complications

Conclusion:

Mucosal variety of Chronic Otitis Media has various surgical treatment options among which Tympanoplasty and Mastoid exploration have been studied and researched abundantly. The indications of doing a Cortical Mastoidectomy in a mucosal variety of COM with mild to moderate conductive hearing loss is still a debate. In our study, it has been found out that although the graft uptake rate and the hearing outcomes are better in cases where Tympanoplasty is combined with a Cortical Mastoidectomy, it is not statistically significant. So we can conclude that whether or not combined with a Cortical Mastoidectomy, Type I Tympanoplasty can be used as the treatment of choice in uncomplicated Mucosal variety of Chronic Otitis media with mild to moderate degrees of conductive hearing loss. It is yet a myth that type I tympanoplasty gives superior results when combined with cortical mastoidectomy, which has been busted in our study.

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