IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 1 Ser.5 (January. 2021), PP 12-16
www.iosrjournals.org

To determine efficacy of cortical mastoidectomy with tympanoplasty as compared to tympanoplasty alone

Vivek Kumar Pathak(1) ,Ankit Nehra (2), Sonali tyagi (3), Rohit Chaudhary(4),DR. Rohit Saxena (5), Dr.Anoop Raj(6)

(1) Assistant Professor , Department of Otolaryngology , School of Medical Sciences &research ,sharda university,Greater Noida, Uttar Pradesh
(2) JR-3 , Department of Otolaryngology , School of Medical Sciences &research ,sharda university,Greater Noida, Uttar Pradesh
(3) ,(4) JR-2, Department of Otolaryngology , School of Medical Sciences &research ,sharda university,Greater Noida, Uttar Pradesh
(4) JR-3, Department of Otolaryngology , School of Medical Sciences &research ,sharda university,Greater Noida, Uttar Pradesh
(5) ,(6) Professor , Department of Otolaryngology , School of Medical Sciences &research ,sharda university,Greater Noida, Uttar Pradesh
Corresponding author: Dr.Vivek K. Pathak
Assistant Professor , Department of otolaryngology School Of Medical Sciences & Research , Sharda university Greater Noida ,Uttar-pradesh ,India-201306

Abstract
Introduction : Chronic otitis media is a very common condition in the developing countries in both adult and paediatric age groups. Tympanoplasty is the most commonly performed surgery for non- cholesteatomatous chronic otitis media. The contribution of mastoid aeration and therefore the role for mastoidectomy in mucosal chronic otitis media has been debated for decades amongst clinicians. This study was undertaken to determine efficacy of tympanoplasty with mastoidectomy as compared to tympanoplasty alone in mucosal chronic otitis media.
Materials and methods : 60 patients were included in this prospective analytical study according to inclusion and exclusion criterion and randomly distributed into two groups. In Group A (tympanoplasty alone) 16 were male and 14 females . In Group B (Tympanoplasty with mastoidectomy) there were 13 males and 17 female. The data obtained was analysed using SPSS, version 21.0, P-value less than 0.05 was taken as stastically significant .
Results : In this study, the mean pre- and post-operative pure-tone average was found to be 33.71±2.95 dB and 25.19±3.36 dB in Group A, with a mean hearing gain of 8.53 dB. The mean pre- and post- operative pure-tone average was 35.37±4.96 dB and 26.2±3.34 dB in Group B, with a mean hearing gain of 9.17 dB
Conclusion :In our study we found that Cortical Mastoidectomy gave no statistically significant benefit over tympanoplasty in mucosal type of COM , Although hearing gain and air-bone gap reduction was more in cortical mastoidectomy with tympanoplasty it was not statistically significant .
Key Words: *COM-Chronic otitis media, tympanoplasty, mastoidectomy, mucosal, non-cholesteatomatous*

Date of Submission: 28-12-2020 Date of Acceptance: 09-01-2021

I. Introduction

Chronic otitis media (COM) is defined as chronic inflammation of the middle ear cleft. It may be classified into mucosal and squamosal types. Worldwide, there are between 65-330 million patients suffering from COM . In India, the prevalence is 7.8% which is very high and makes it a major clinical concern.[1]

In mucosal disease, the infection is limited to the mucosa and the antero-inferior part of the middle ear cleft. It may present with chronic, intermittent or persistent discharge through a perforation in the tympanic membrane. Continuing infection of the nasopharynx with secondary infection of the middle ear cleft , changes in the mucosa of the middle ear secondary to eustachian tube dysfunction and mucosal infection of the middle ear by resistant organisms, may all contribute to the development of persistent active mucosal chronic otitis media.

The mastoid air cell system plays a significant role in the middle ear physiology. They aid in middle ear aeration, drainage and pressure regulation. It has been theorized that lack of adequate middle ear aeration in patients with non-cholesteatomatous COM is major cause for failure of tympanoplasty and recurrence of the

disease in some patients. The mastoid air cell system is also thought to be a reservoir of the infection in cases when the drainage of the middle ear had been compromised for a considerable period of time.

Management of mucosal COM may be medical or surgical. Surgical intervention is considered the definitive management for inactive mucosal COM. The role of surgical intervention has always been to completely eradicate the disease and provide the patient with a dry ear. Tympanoplasty is the established and preferred mode of management of inactive mucosal disease. However, since mastoid air cells may act as a reservoir of the disease and mastoid air cell aeration may be a significant variable for success of the procedure, it has long been postulated that concurrent cortical mastoidectomy may improve the outcome in non-cholesteatomatous COM. Here we have conducted a study to compare the outcome of tympanoplasty and tympanoplasy with mastoidectomy in cases of inactive mucosal chronic otitis media.

II. Materials And Methods :

This prospective, analytical study was conducted over a period of 18 months from 1st January 2018 to 30th June 2019. A total of sixty patients who fulfilled the eligibility criteria were included in the study and randomly allocated into the two groups of thirty each. Patients in Group (A) underwent tympanoplasty alone whereas patients in Group (B) underwent tympanoplasty with cortical mastoidectomy.

Inclusion criteria comprised of patients of mucosal inactive COM between the ages of 16 to 60 years with a central perforation, dry for at least 4-6 weeks prior to surgery and conductive deafness. Those excluded comprised of patients of squamosal COM, associated otitis externa, with history of previous ear surgery and those with systemic co-morbidities like diabetes mellitus and uncontrolled hypertension.

Ethical clearance was obtained from the institutional ethical committee prior to the commencement of the trial and appropriate written, informed consent was taken from each patient who participated in the study.

All eligible patients were subjected to a thorough history taking followed by an extensive clinical examination. Examination under microscope, pure tone audiometry and routine blood investigations were conducted for each patient. Tympanoplasty was performed under general anesthesia for all patients after appropriate pre-anaesthetic clearance. Post-aural approach and temporalis fascia graft were used and the underlay technique was employed for placement of the graft. In cases of cortical mastoidectomy, the antrum was opened and aditus patency confirmed in every case.

Post- operative follow up was done at the ENT out-patient department at the end of 1 week, 1 month, 3 months and 6 months. Hearing evaluation was done by pure tone audiometry at 6 months. Hearing gain and reduction of air bone gap were measured to assess the improvement in hearing.

Graft status and presence of residual disease was assessed at the 3rd and 6th months.

The data obtained was collated and analyzed using statistical package for the social science (SPSS, version 21.0). Statistical analysis was done using paired and unpaired *t*-test for quantitative variables and Chi-square test for qualitative ones. Quantitative data were expressed as mean±SD whereas qualitative data was expressed in terms of frequency and percentage.The confidence interval was set to 95% and the margin of error accepted was 5%. $P < 0.05$ was considered statistically significant.

III. Results

60 patients were included in the study and randomly distributed into two groups. In Group A (tympanoplasty alone) 16 were male and 14 females with a mean age group of 26.2 ±7.1. In Group B (Tympanoplasty with mastoidectomy) there were 13 males and 17 females with a mean age group of 29.6±10.4 [Table 1].

Table 1 : Number of cases in different age groups between group A and B

AGE	Group A	%	Group B	%
16-20	07	23.33	07	23.33
21-25	08	26.66	06	20
26-30	07	23.33	05	16.66
31-35	04	13.33	05	16.66
>35	04	13.33	07	23.33
Total	30	100	30	100
Mean±SD	26.26±7.11		29.63±10.47	

In this study, the mean pre- and post-operative pure-tone average was found to be 33.71±2.95 dB and 25.19±3.36 dB in Group A, with a mean hearing gain of 8.53 dB. The mean pre- and post- operative pure-tone average was 35.37±4.96 dB and 26.2±3.34 dB in Group B, with a mean hearing gain of 9.17 dB [Table 2].

Table 2: Mean pure tone average Pre and post –operative between group A and B

	GROUP A	GROUP B
Hearing loss(Pre op)	33.71	35.37
Hearing loss(post op)	25.18	26.2
Hearing gain	8.53	9.01

The mean pre- and post-operative air-bone gap was 37.27 ± 9.51 dB and 24.21 ± 11.64 dB in Group A, with improvement in air-bone gap of 8.54 dB. The mean pre- and post-operative air-bone gap was 32.27 ± 11.53 dB and 23.75 ± 9.91 dB in Group B, with improvement in air-bone gap of 9.01dB [Table 3].

Table 3 : Mean Pre and post operative Air Bone gap between group A and B

	GROUP A (dB)	GROUP B (dB)
AIR BONE GAP (PRE OP)	19.37	20.87
AIR BONE GAP (POST OP)	10.83	11.86
AIR BONE GAP REDUCTION	8.54	9.01

The difference in hearing gain and air bone gap reduction between these two groups was found to be statistically insignificant.

With respect to graft uptake, in Group A patients ,the graft uptake success rate was 86.66 % at 3 months and remained 86.66 % at 6 months. In Group B patients ,the graft uptake success rate was 86.66 % at 3months, and 90 % at 6 months [Table 4].

Table 4 : Status of graft uptake at 3 and 6 months follow up

Postoperative follow up	Group A		Total	Group B		Total
	Absent	Present		Absent	Present	
Discharge (3 Months)	25	05	30	27	03	30
Discharge (6 Months)	29	01	30	29	01	30

P-value was more than 0.05 so statistically the difference in the outcome was insignificant.

In reference to eradication of the disease, in Group A, 83.33 % patients had no ear discharge during follow up at 3 months. After 6 months follow up, 97% patients has no discharge. While in Group B 86.66% patients has no discharge at end of 3 months. At 6 months follow up 97% patients had no discharge. A success rate of 97% was achieved in disease eradication in both group after 6 months [Table 5]

Table 5: Post-operative discharge at 3 and 6 months between group A and B

Postoperative follow up	Group A		Total	Group B		Total
	Absent	Present		Absent	Present	
Discharge (3 Months)	25	05	30	27	03	30

Discharge (6 Months)	29	01	30	29	01	30

P-value was more than 0.05 so statistically there was no difference in the outcome between group A and group B .

IV. Discussion

The role of mastoid air cells in the pathophysiology of chronic otitis media has remained in contention for years. Mastoid system is thought to primarily act as a pneumatic buffer for pressure variations in the middle ear.[2][3][4] Cortical mastoidectomy was first popularized by William House in 1958.The functional benefit of a well aerated mastoid in non-cholestatomatous chronic otitis media, however, was first proposed by Holmquist and Bergström [2] It was later substantiated by Flisberg *et al.*[3] Sadé [4] and Richards *et al.*[5]

In accordance with the Boyle's Law, the mastoid air cells can minimize the effect of pressure changes in the middle ear cleft by increase in the volume of the middle ear mastoid pneumatic system . Poorly pneumatized mastoids do not have this buffering capacity and are therefore more prone to tympanic membrane retraction and chronic inflammatory conditions.[6]

In view of this rationale the advantages and disadvantages of cortical mastoidectomy with tympanoplasty for non-cholesteatomatous COM have remained a point of controversy. Addition of mastoidectomy to the surgical procedure makes it very elaborate, time-consuming and sometimes financially unviable for the patients. Therefore while performing mastoidectomy, the benefits as well as the risks to the patient should be considered and the need for mastoidectomy in every case of mucosal COM needs to be carefully evaluated.[7]

Various studies have reviewed the pros and cons of performing mastoidectomy with tympanoplasty for mucosal COM over the years.

Kaur et al, in 2017,[8] evaluated 60 patients of COM who were divided into 2 groups . Group A were subjected to tympanoplasty alone whereas Group B underwent Tympanoplasty with cortical mastoidectomy. Graft uptake and hearing improvements for these were compared post-operatively . It was found that graft uptake success rate and hearing gain in both the groups were statistically insignificant, They concluded that combining cortical mastoidectomy with tympanoplasty did not give any additional benefits in terms of hearing gain or disease clearance.

In 2017, Aggarwal et al [9] conducted a retrospective study on 40 patients comparing the benefits of tympanoplasty with mastoidectomy with tympanoplasty alone. The mean hearing improvement was found to be 9.41dB in the tympanoplasty group and 12.05 dB in tympanoplasty combined with cortical mastoidectomy. The graft uptake was 80% in tympanoplasty group and 95% in tympanoplasty combined with cortical mastoidectomy. Recurrence of discharge was seen in 4 cases of tympanoplasty. The study concluded that tympanoplasty combined with cortical mastoidectomy had better outcome in terms of hearing improvement, graft uptake and clinical improvement but the difference in 2 groups is statistically insignificant.

In 2018, Mohanty et al.[10]conducted a similar study on 40 patients. Graft uptake was found to be 80% in the tympanoplasty group and 72% in the group where cortical mastoidectomy was done along with tympanoplasty. In successful graft take up, the results of hearing improvement and graft mobility were found to be similar with or without mastoidectomy.

Similar studies by Baylan et al[11], Mishiro *et al.*[12], Toros *et al.*[13], Bhat *et al.*[14] and Ramakrishnan *et al.*[15] found no statistically significant differences in hearing improvement or success in disease eradication by doing mastoidectomy with tympanoplasty.

McGrew *et al.*[16] in 2004 did a comprehensive survey and reviewed 320 patients undergoing tympanoplasty alone and 144 patients undergoing tympanoplasty with mastoidectomy for tympanic membrane perforations in non-cholesteatomatous CSOM. No statistically significant differences were noted between perforation repair success and postoperative air-bone gap. They provided a in- depth analysis of long-term benefits of tympanoplasty with mastoidectomy and found that patients with tympanoplasty alone were more likely to require subsequent otologic procedures compared with patients who underwent concomitant mastoidectomy and recommended concurrent mastoidectomy.

Doifode et al [17], in 2016, observed that a higher success rate was observed in patients who had undergone Tympanoplasty with mastoidectomy with regards to graft uptake, achievement of dry ear and hearing improvement. In conclusion they found that simple mastoidectomy was an effective means of re- pneumatizing the sclerotic mastoid and eradicating mastoid sources of infection.

In our study we found that Cortical Mastoidectomy gave no statistically significant benefit over tympanoplasty in mucosal type of COM with regards to graft success rate, disease eradication and hearing gain. Although hearing gain and air-bone gap reduction was more in cortical mastoidectomy with tympanoplasty it was not statistically significant.

V. Conclusion

In conclusion our results have shown that clinically and statistically cortical mastoidectomy with tympanoplasty had no additional advantage over tympanoplasty in the surgical outcome of mucosal chronic otitis media. Results of our study are comparable to similar studies available in literature.

References

[1]. Gleeson M.Scott-Brown's Otorhinolaryngology, Head and Neck Surgery.7 th ed.London:Hodder Arnold; 2008.3396
[2]. Holmquist J, Bergström B. The mastoid air cell system in ear surgery. ArchOtolaryngol 1978;104:127-9.
[3]. Flisberg K, Ingelstedt S, Ortegren U. The relationship of middle ear disease to mastoid hypocellularity. A working hypothesis. Acta Otolaryngol Suppl 1963;182:69-72.
[4]. Sadé J. The correlation of middle ear aeration with mastoid pneumatization. The mastoid as a pressure buffer. Eur Arch Otorhinolaryngol 1992;249:301-4
[5]. Richards SH, O'Neill G, Wilson F. Middle-ear pressure variations during general anaesthesia. J Laryngol Otol 1982;96:883-92
[6]. Ruhl CM, Pensak ML. Role of aerating mastoidectomy in noncholesteatomatous chronic otitis media. Laryngoscope 1999;109:1924-7.
[7]. Vybhavi M K, Mudhol R S. Assessment of hearing in patients undergoing tympanoplasty with and without cortical mastoidectomy for chronic otitis media: A hospital-based, randomized controlled trial. Indian J Health Sci Biomed Res 2016;9:303-7
[8]. Kaur M, Singh B, Verma B.S., Kaur G, Kataria G, Singh S. Comparative Evaluation between Tympanoplasty Alone & Tympanoplasty Combined With Cortical Mastoidectomy in Non- Cholesteatomatous Chronic Suppurative Otitis Media in Patients with Sclerotic Bone. IOSR Journal of Dental and Medical Sciences . 2014 Jun;13.6: 40-5.
[9]. Agrawal A, Bhargava P. Comparative Evaluation of Tympanoplasty with or Without Mastoidectomy in Treatment of Chronic Suppurative Otitis Media Tubotympanic Type. Indian J Otolaryngol Head Neck Surg. 2017;69(2):172-175. doi:10.1007/s12070-016-1038-5
[10]. Mohanty S , Devipriya V , Sreenivas C , Vinay Raj T. Comparison of Surgical Outcomes in Chronic Otitis Media (Mucosal) following Type 1 Tympanoplasty with and without Cortical Mastoidectomy.International Journal of Contemporary Medical Research 2016;3.8:2175-8.
[11]. Balyan FR, Celikkanat S, Aslan A, Taibah A, Russo A, Sanna M. Mastoidectomy in noncholesteatomatous chronic suppurative otitis media: Is it necessary? Otolaryngol Head Neck Surg 1997;117:592-5.
[12]. Mishiro Y, Sakagami M, Takahashi Y, Kitahara T, Kajikawa H, Kubo T. Tympanoplasty with and without mastoidectomy for non-cholesteatomatous chronic otitis media. Eur Arch Otorhinolaryngol 2001;258:13-5.
[13]. Toros SZ, Habesoglu TE, Habesoglu M, Bolukbasi S, Naiboglu B, Karaca CT, *et al.* Do patients with sclerotic mastoids require aeration to improve success of tympanoplasty? ActaOtolaryngol 2010;130:909-12.
[14]. Bhat KV, Naseeruddin K, Nagalotimath US, Kumar PR, Hegde JS. Cortical mastoidectomy in quiescent, tubotympanic, chronic otitis media: Is it routinely necessary? J Laryngol Otol 2009;123:383-90.
[15]. Ramakrishnan A, Panda NK, Mohindra S, Munjal S. Cortical mastoidectomy in surgery of tubotympanic disease. Are we overdoing it? Surgeon2011;9:22-6.
[16]. McGrew BM, Jackson CG, Glasscock ME 3rd. Impact of mastoidectomy on simple tympanic membrane perforation repair. Laryngoscope 2004;114:506-11.
[17]. Parag V. Doifode, Sandeep Dabhekar, S. H. GawarleIndian.Tympanoplasty with or without cortical mastoidectomy in CSOM :A Comparitive study. Journal of Basic and Applied Medical Research; September 2016;5.4: 852-62.

Dr.Vivek K. Pathak, et. al. "To determine efficacy of cortical mastoidectomy with tympanoplasty as compared to tympanoplasty alone." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(01), 2021, pp. 12-16.