ORIGINAL ARTICLE

ROLE OF CORTICAL MASTOIDECTOMY IN INACTIVE, MUCOSAL TYPE OF CHRONIC OTITIS MEDIA

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ABSTRACT: Chronic Otitis Media still remains a major health problem in our country. The management of Chronic Otitis Media with or without cholesteatoma, is probably the most common reason why the simple mastoid operation is performed today and Cortical mastoidectomy,[1] with tympanic membrane perforation repair and/or ossicular chain repair is considered the treatment of choice for tubotympanic type of Chronic Otitis Media. In the advent of management aspects very limited study has been document in India. In this context present study to aim to compare the outcomes for cortical mastoidectomy with tympanoplasty and for tympanoplasty alone in cases of inactive, mucosal, chronic, suppurative otitis media. 100 cases were randomly allocated into two groups. In Group I - 50 cases were considered for Tymanoplasty along with cortical mastoidectomy. In Group II - 50 cases considered for the Tympanoplasty alone. Perforation closure, graft uptake and hearings out comes were documented. Collected data were analyzed by using MINI tab - 10.50 version, Binary logistic regression and chi-square test of independence were used to draw the significant inference. As per the study results, hearing improvement ($p>0.05$), tympanic perforation closure ($p>0.05$), graft uptake or disease eradication ($p>0.05$) is not statistically significant with pre and post-operative period. Comparing the two groups at three and six months post-operatively. Cortical mastoidectomy with tympanoplasty was found to have no advantage over tympanoplasty alone in terms of graft uptake rates and hearing improvement. Hence, it may not be necessary to undertake routine mastoid exploration in all cases of inactive, mucosal type of chronic otitis Media.

KEYWORDS: Chronic Otitis Media; Tympanoplasty, Mastoidectomy; Tympanic Membrane perforation.

INTRODUCTION: Chronic Otitis Media still remains a major health problem in our country. The management of Chronic Otitis Media, with or without cholesteatoma, is probably the most common reason why the simple mastoid operation is performed today and Cortical mastoidectomy,[1] with tympanic membrane perforation repair and/or ossicular chain repair is considered the treatment of choice for tubotypmpanic type of Chronic Otitis Media. As a precautionary measure, many surgeons perform for both tympanoplasty and mastoidectomy routinely irrespective of the stage of the disease, fearing recurrence and graft failure.[2] This is questionable as mastoid plays an important role in middle ear aeration and pressure regulation as it serves as middle ear gas reserve.[3] It has also been demonstrated that, in ears after surgery, recovery of both the gas exchange function and aeration in the mastoid is expected only when the mastoid mucosa can be preserved even partially, thus showing the importance of preserving

the mastoid where mastoidectomy is not necessary. Thus given the role played by the mastoid in the physiology of middle ear function, this study addresses the question of the need of cortical mastoidectomy in every case of inactive mucosal type of COM. Present study to aim to compare the outcomes for cortical mastoidectomy with tympanoplasty and for tympanoplasty alone in case of inactive, mucosal, chronic, suppurative otitis media.

MATERIALS AND METHODS: Randomized control study was undertaken in two tertiary referral, teaching hospitals in Bangalore city. It comprised an efficacy study of two surgical procedures. The study period was from November 2011 to May 2013. The cases were selected by random sampling. The sample of 100 cases included two groups of 50 cases each – Group – I (patients who underwent cortical mastoidectomy with type I tympanoplasty) and Group-II (patients who underwent type I tympanoplasty only).

INCLUSION CRITERIA: Mucosal COM with patients aged 12 years and above, a minimum of 6 months elapsed since last episode of ear discharge 3) small and medium sized central perforation 4) Mild degree of hearing loss (26-40 dB). The intactness of the ossicular chain was confirmed by examination under microscopy, pure tone audiometry (PTA) and presence of a round window reflex was done at during surgery.

EXCLUSION CRITERIA: 1) Granulation tissue, cholesteatoma, or polyp in the ear prior to surgery, 2) Ossicular pathology as evidenced by preoperative PTA and intra operative evaluation 3) Multiple tympanic membrane perforations 4) large central, total or marginal perforation of pars tensa 5) clinically significant predisposing focus of infection in the nose or throat. 6) Complications of otitis media 7) patients aged below 12 years 8) mixed hearing loss, moderate to severe degree of conductive hearing loss (>40dB).

All recruited patients were examined and investigated in the ENT out-patient departments of two tertiary care hospitals to confirm the eligibility criteria. Written Consent was obtained from the patient or care taker (i.e. Cortical mastoidectomy with type I tympanoplasty, and type I tympanoplasty alone).

SURGICAL PROCEDURE AND INTERVENTION: Most of the surgical procedures were performed under local anesthesia (Cortical mastoidectomy with type I tympanoplasty, n=40; type I tympanoplasty alone, n=41). However, general anaesthesia was used in few patients under 18 years of age (Cortical mastoidectomy with type I tympanoplasty, n=10; type I tympanoplasty alone, n=9). Tympanomeatal flap elevation via a postauricular approach was performed in all cases. All patients underwent Type-I tympanoplasty using temporalis fascia graft, placed by underlay technique. The graft was supported by a few pieces of dry Gelfoam.

POST-OPERATIVE MANAGEMENT: Postoperatively, all the patients were imposed oral antibiotics, analgesics and antihistaminics for seven days. The sutures were removed on seventh day and antibiotic ear canal pack was removed after 3 weeks duration.

PATIENTS FOLLOW UP: All cases were followed up on OPD basis once weekly in the first month, once a month later on and at third and sixth month. Otoscopy was done to assess the graft status and presence of any discharge at every follow-up. Pure tone audiogram was done during the third and sixth month follow-up. The presence of any complication was noted and treated simultaneously. For hearing results, Kartush 0 to 10 dB scale was used (**Excellent**: 10 to 20 dB, **Good:** 20 to 30 db, **Fair**: >30 dB, **Poor**)

RESULTS:

DEMOGRAPHIC CHARACTERISTICS: Group I – Comprises male was 23 and female was 27 patients respectively. The mean age was 29.7+0.63 (C195% 26.23-32.56 yrs). In Group II male comprises 24 and 26 females respectively. The mean age was 30.14+0.98 (CI 95% 27.35-34.62 yrs). Bilateral perforation was seen in 24 cases (In Group, 11 cases were seen and 14 cases seen in Group 2). The chosen side of operation among the bilateral ear cases was the worse ear. The operated ear was more common on left side (57%), including 30 in Group 1 and 27 in Group II. Whereas on right side, it was 43%, in Group I being 20 and Group II being 23. Out of 100 cases, 57 cases had medium sized perforation, 29 being in Group 1 and 28 in Group 2. Small perforation was seen in 43 cases; including 21 in Group 1 and 22 in Group 2. The mean preoperative PTA was observed to be 31.49+4.58. The mean ABG was found to be 22.07+5.04. Maximum number of cases (47%) had ABG < 20 dB group. 27 cases in Group 1 and 20 cases in Group 2 had <20 dB ABG. 25% cases had ABG of >25dB. Preoperative air-bone gap distribution is show in Figure 1.

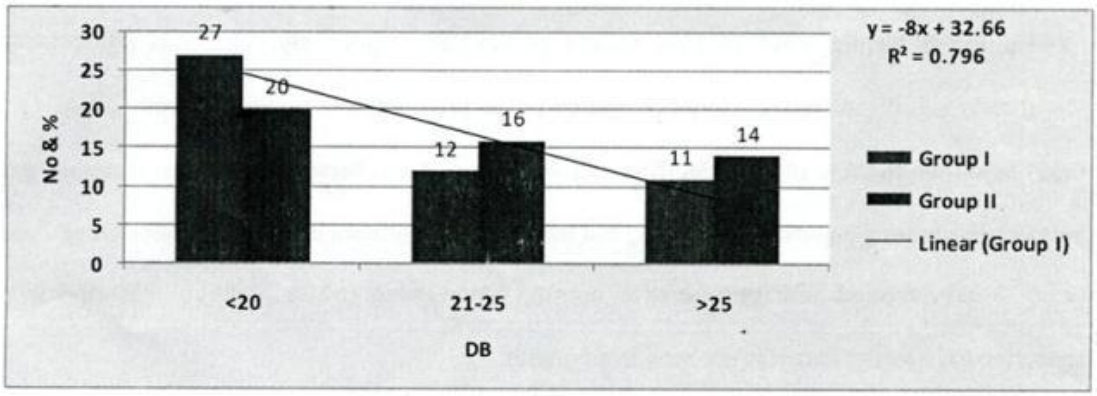

Fig. 1: Pre-operative air bone gap distribution

Status of middle ear mucosa	Group 1	Group II
Normal	16-(32.0%)	18-(36%)
Edematous	24-(48.0%)	21-(42.0%)
Hypertrophied	10-(20.0%)	11-(22.0%)

Table 1 : Status of middle ear mucosa distribution

Follow up results: The time taken for post-operative healing was the same in both groups. The first outcome measured was perforation closure. The results presented in table 2. Present study, postoperative follow up by otoscopic examination after 6 months showed intact graft in 46 cases in Group 1 and 44 cases in Group 2. 4 cases in Group 1 and 6 cases in Group 2 showed residual perforation. Graft uptake rate was slightly better in Group 1 compared to group 2, but was not statistically significant. However, it was not statistically significant difference was found ($p>0.05$) between the results of the two groups for any comparison.

The second outcome was found to be improved in hearing status. The mean PTA at 3 months and 6 months were 24.08+4.70 and 22.06+6.31 respectively (table 3). The mean ABG at 3 months and 6 months were 16.23+4.56 and 14.54+5.88 respectively. This was found to be statistically significant improvement compared to the pre-operative findings in both groups ($p<0.05$) as shown in table (4). No significant association was found between the type of procedure and postoperative hearing improvement showing that there was no significant difference between group 1 and group 2 as compared with postoperative hearing improvement (table 5 and 6). Post-operative sensorineural hearing loss was not seen in any cases.

In the Group 1, 08 cases (16%) had excellent hearing improvement, 37 cases (74%) had good, 4 cases (8%) had fair and 1 case (2%) had poor hearing improvement. In the Group 2, 34 cases (68%) had good hearing improvement, whereas 10 cases (20%) had excellent, 5 cases (10%) had fair hearing improvement and 1(2%) case had poor hearing improvement (Figure 2). There were 6 cases in Group 2 and 4 cases in Group 1 with residual perforation, in total 10 cases. Out of the 10 cases, 7 cases had medium sized perforation and 3 had central perforation. Status of the contralateral ear was assessed in each case. In Group 1, 3 cases had normal ear, whereas rest 1 case had active mucosal COM in the other ear. In Group 2, 5 cases inactive mucosal type of COM in the contralateral ear and none and none had active mucosal COM. Out of 10, 6 cases underwent revision Tympanoplasty after 6 months follow-up.

Group	Intact graft		Residual Perforation	
	N	%	N	%
Group 1	46	92	4	8
Group 2	44	88	6	12

Table 2: Comparison of Graft uptake rate in two groups

Time Interval	Group 1	Group 2
Preoperative	31.68	31.3
3 Months	23.88	24.28
6 Months	21.86	22.26

Table 3: Comparison of mean PTA between two groups

Statistics	Preoperative hearing in operated ear		Post-operative hearing in the operated ear			
	PTA	ABG	PTA – 3 Months	PTA – 6 Months	ABG – 3 Months	ABG – 6 Months
Mean+SD	31.49+4.58[a]	22.07+5.04[a]	24.08+4.70[a]	22.06+6.31[a]	16.23+4.56[a]	14.54+5.88[a]
Spearman Correlation Co efficient	0.36	0.52	0.62	0.77	0.82	0.78
Chi square-value	3.46	3.02	4.81*	5.63*	6.21*	5.99*
P-Value	0.36	0.14	0.02*	0.03*	0.01*	0.001*

Table 4: Comparison between preoperative and post operative hearing

[a, b,:] Superscript signifies between and within the groups - DMART test

Variables	Co efficient	S.E.	Wald	df	Sig.	Exp(B)	95.0% of C.I. for EXP(B)	
							Lower	Upper
PTA 3 Months	.012	.109	011ns	1	.916	1.012	.817	1.252
PTA 6 Months	.027	.099	.074ns	1	.785	.973	.802	1.181
ABG 3 Months	.024	.117	.043ns	1	.837	1.024	.815	1.288
ABG 6 Months	.022	.108	.043ns	1	.836	1.023	.827	1.264
Cortical Mastoidectomy	-.399	1.081	.137ns	1	.712	.671		

Table 5: Association of cortical mastoidectomy with type I and hearing improvement postoperatively

Variables	Co efficient	S.E.	Wald	df	Sig.	Exp(B)	95.0% of C.I. for EXP(B)	
							Lower	Upper
PTA 3 Months	.013	.209	001ns	1	.916	1.012	.817	1.252
PTA 6 Months	.028	.012	.042ns	1	.785	.973	.802	1.181
ABG 3 Months	.022	.113	.032ns	1	.837	1.024	.815	1.288
ABG 6 Months	.026	.208	.045ns	1	.836	1.023	.827	1.264
Myringoplasty	-.391	1.18	.136ns	1	.712	.671		

Table 6: Association between tympanoplasty and post operative hearing

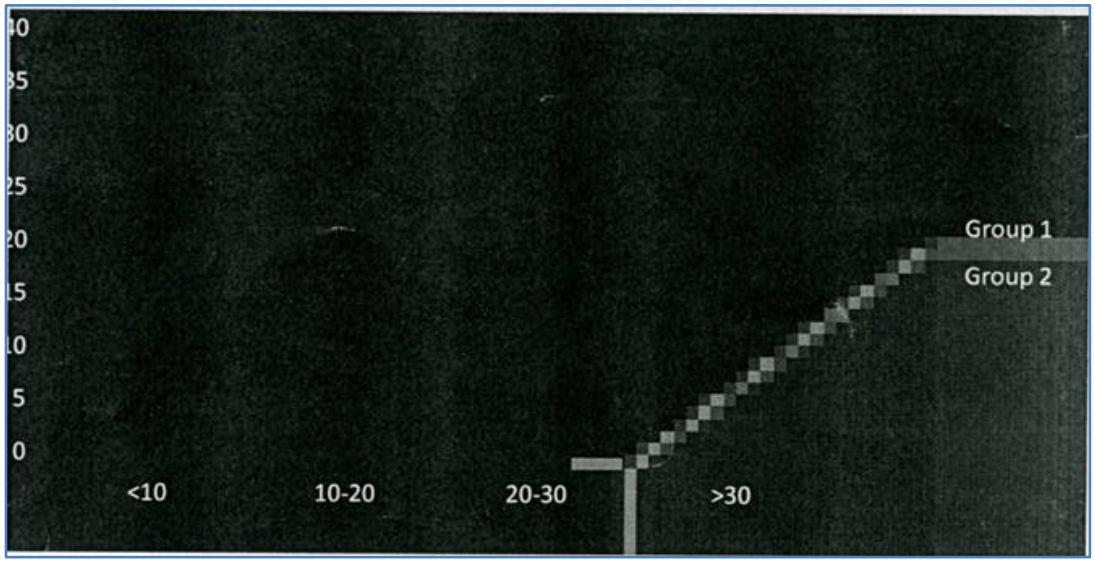

Fig. 2: Post-operative grading ABG

DISCUSSION: Cortical mastoidectomy is performed with tympanoplasty in cases of active mucosal type of disease in order to clear the mastoid reservoir of infection. But its role in quiescent and inactive disease is questionable. Therefore the question of whether cortical mastoidectomy needs to be routinely done in all cases needs to be addressed. The addition of cortical mastoidectomy to tympanoplasty increases the chances of damaging the incus and associated sensorineural hearing loss, dura, sigmoid, sinus and facial nerve.

In this study cases were followed up for 6 months. Of the 10 failure cases, there were 6 cases in Group 2 and 4 cases in Group 1 with residual perforation. The patients were treated with medical line of management and out of 10, 6 cases underwent revision Tympanoplasty after 6 months follow-up. Most of the failure cases had medium sized perforations. In a study conducted by Vartanien re perforations were significantly more often in larger perforations sized >50% of drum area compared to smaller perforations (<50%). This could probably be due to poorer vascular supply to a larger graft as a larger area of graft remains unsupported in space.[16] It is also technically more difficult to graft a larger area than a smaller one. R Aggarwal in his study observed higher success rates with smaller perforations (less than 50% of pars tensa).[17]

Of 10 patients with residual perforations, 5 patients had inactive mucosal disease in contralateral ear and 1 patient had active mucosal disease in contralateral ear. Yoon TH et al in their study, concluded that, there were no significant relationships between surgical success rate and the status of the contralateral ear.[18] But Merendra D et al reported that Multivariate analysis demonstrated that disease of the contralateral ear and a large tympanometric volume were statistically significant.[19]

Most failure cases were associated with nidus of infection in the upper respiratory tract. Smith and Vaughan et.al suggested that nasal bacterial load should be reduced in order to control the incidence of suppurative otitis media.[20]

Present study patients with wider air bone gap had poorer surgical outcome as compared to patients with narrow air bone gap. Blakley etal. Studied the relationship between pre and post-operative hearing in 124 patients undergoing tympanoplasty and concluded that poor hearing before surgery, regardless of anatomy.[21] The following review of literature quoted for comparison of present study.

Study	Year	Sample	Study design	Follow up	Success rates
Holmquist & Bergstrom[4]	1978	31	Retrospective	6 Months	MTP 83% TP 50% (graft take up)
Jacklet and Schindler[5]	1984	48	Retrospective	8 Yrs	MTP 84.6-100% (take up)
Lau & Tos[6]	1986	229	Retrospective	11 Yrs	MTP Reperforations 12% Reoperations 16%
Vartianen & Kansanen[7]	1992	221	Retrospective	Mean 6.3 yrs	Infection control 92%
Ruhl & Pensak[8]	1999	135	Retrospective	8 Yrs	MTP 90.4%
Krishnan et.al[9]	2002	120	Prospective, comparative	3 Yrs	Quiescent: MTP 80% TP 50% DRY: MTP 100% TP 78%
Nayak DR et.al[10]	2003	20+20	Prospective, controlled	20.4 Months	MTP 100% TP 60%

Table 7: studies supporting cortical mastoidectomy with tympanoplasty

Study	Year	Sample	Study design	Follow up	Success rates
Pratt[11]	1976	50	Retrospective	2 years	84% overall
Balyan[12]	1997	81	Retrospective	34 Months	MTP 85.7% TP 90.5%
Mishiro etal.[13]	2001	251	Retrospective comparative	31.7 Months	MTP 90.5%
McGrew etal.[14]	2004	484	Retrospective comparative	33 Months	MTP 91.6% TP 93.3%
Mutoh etal[15]	2007	18+31	Retrospective comparative	16.8 Months	MRSA: MTP90% TP 62.5% MSSA: MTP81.8% TP 80%
K V Bhat etal[2]	2008	68	Prospective	6 Months	MTP 82.85% TP 75%

CONCLUSION: We conclude that cortical mastoidectomy with tympanoplasty does not give any additional benefits over tympanoplasty in terms of graft uptake of COM with small or medium sized perforation and mild degree of hearing loss. Analysis of failure cases revealed that larger size of perforations, disease in contralateral ear and infectious foci in the nose, sinuses and throat were factors which may negatively influence the outcome of surgery. Post-operative hearing is dependent on pre-operative air bone gap. A wider air bone gap is associated with comparatively poorer outcome.

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