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Original Research Article

Modified radical mastoidectomy in chronic otitis media: year outcome post-surgery

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ABSTRACT

Background: Cholesteatoma is defined as erosive process, eroding ossicular chain, scutum, otic-capsule, fallopian canal and tegmun. Surgical management of cholesteatoma includes mastoidectomy. The aim of the study was to focuss on MRM: indications and outcomes of procedure.
Methods: This study aims at knowing the indications and outcome of MRM after 1 year in terms of success rate, efficacy and patient's satisfaction. It involves study over 42 patients who underwent surgery and were followed over a period of one year post surgery.
Results: After 1 year of MRM 64.27% showed hearing improvement, 95.2% had dry and settled cavity, and there was no post-operative facial palsy, and SNHL.
Conclusions: MRM is a procedure of choice for COM with extensive disease of mastoid. A meticulous and skilled MRM gives a well fashioned mastoid cavity with minimum or no recurrence/post-operative complications with a satisfactory hearing outcome.

Keywords: MRM, COM, AB gap

INTRODUCTION

Chronic otitis media (COM) is an inflammatory process of middle ear space resulting in permanent changes in tympanic membrane.

Cholesteatoma (congenital or acquired) is defined as erosive process characterized by trapped squamous epithelium that produces and accumulates desquamated keratin debris, eroding ossicular chain, scutum, otic-capsule, fallopian canal and tegmun.[1]

Surgical management of cholesteatoma includes mastoidectom, defined as exploration of mastoid cavity for eradication of disease. Three priorities in surgery for COM are eradication of disease, prevention of recurrence and preservation or restoration of hearing.

Mastoidectomy is broadly classified as intact canal wall and canal wall down procedure on basis of whether posterior canal wall is removed or preserved.

Evaluation of the surgical success of modified radical mastoidectomy (MRM) and assessment of various host and surgical factors has been a subject of interest for many years and still continues to be a challenge. In our present study, our focus is on MRM: indications and outcomes of procedures in terms of persistent otorrhea, hearing outcome, post- operative complications, and recurrence of cholesteatoma.

Aims and objectives

The aim and objective of this study was to study the indications of MRM and outcome of the procedure after 1

year in terms of success rate, efficacy and patient's satisfaction.

METHODS

It is a non- randomized prospective clinical study conducted over a duration of 1 year at ENT Department, GMC, Latur, Maharashtra.

The present study began only after attaining the ethical approval by institutional ethical committee.

The study sample consisted of 42 patients suffering from chronic otitis media from November 2013 to November 2014. The operated patients were followed up for one year i.e. from 2014 to 2015. The study included the patients between age group of 5 years and 70 years with chronic otitis media having one or more of the following symptoms: chronically discharging ear refractory to medical treatment, decreased hearing, mass in EAC, post auricular swelling, facial palsy and the ones who were compliant for long term follow up. The study excluded the patients who required only ossiculoplasty and myringoplasty, were mentally or terminally ill patients, were uncooperative patients, belonged to extreme ages (i. e.; <5 years and >70 years) and the ones with malignancy or congenital hearing disorder.

Patients with following symptoms reported to OPD discharging ear, decreased hearing, mass in ear, swelling behind pinna, otalgia and miscellaneous symptoms like fever, tinnitus, vertigo, facial asymmetry, altered sensorium etc. indicating impending/established complication of COM. Detailed history pertaining to ear symptoms was recorded and thorough general and ENT examination was done. Dry aural toilet was done to remove debris from the ear canal and examined under microscope. Ear as much as possible was made dry prior to surgery and microscopic findings were noted down.

Routine blood and analysis, X-ray mastoid were done preoperatively. Patients underwent HRCT temporal bone and the findings were noted. Selected patients were subjected to MRM surgery under appropriate anaesthesia and observed postoperatively. Patients were followed up regularly with PTA at 3, 6 and 12 months post-operatively. Data was analysed for hearing improvement by comparing pre-operative and post-operative (AC) air conduction thresholds and closure of A-B gap at speech frequency.

The hearing threshold and A-B gap were calculated as the mean value of the thresholds for 500, 1,000 and 2,000 Hz. Outcomes were also measured in terms of discharging ear, waterproof ear, and recurrence of cholesteatoma, complications (infections, SNHL, facial palsy, tinnitus, and change in taste) and cavity problems. All the collected data were recorded in excel sheet and the statistical analysis was done using 't' paired test and the significance was calculated.

RESULTS

The study included 42 patients of which 21 were male and remaining 21 were female. They all belong to varied age groups. Maximum number of patients belonged to age group of 11-20 and 21-30 years with minimum falling in range of 51-60 years (Table 1 and 2).

Table 1: Showing age wise distribution of patients.

Age group (years)	No. of patients
5-10	5
11-20	15
21-30	12
31-40	4
41-50	3
51-60	2
61-70	1

Table 2: Showing distribution of male and female included in the study.

Sex	No. of patients
Male	21
Female	21

Patients came to ENT OPD with varied presenting complaints, the commonest of all being discharging ear (100%) and decreased hearing (100%). The least being the ones with complications like facial palsy (7%) altered sensorium (7%) and giddiness (4.7%). Out of 42 patients, tinnitus (abnormal perception of sound) was an associated complaint in 31 (73.80%) patients. The patients were evaluated by oto-microscopic examination and following findings were obtained which are tabulated below along with their frequencies of occurrence. The most common finding was attic destruction with flakes (30.95%) (Table 3).

Table 3: Oto-microscopic findings.

Oto-microscopic findings	N	%
Attic destruction with flakes	13	30.95
Polypoidal mass in external ear canal	06	14.30
Retraction pocket in postero-superior part of pars flaccida	05	11.90
Attic perforation	06	14.30
Granulations in attic region	06	14.30
Flakes in mastoid cavity with high facial ridge	04	9.52
Granulation tissue in mastoid cavity (not responding to local treatment)	02	4.76

Oto-microscopic examination showed flakes in attic region in 4 cases and granulation tissue in attic region in 4 cases. Patients with mass in EAC, post-auricular abscess and facial palsy were subjected to preoperative HRCT

temporal bone. As per HRCT Temporal bone, pre-operative decision for modified radical mastoidectomy surgery was taken. All of the 42 patients underwent modified radical mastoidectomy (canal wall down) procedure. The various intraoperative findings seen during MRM are depicted below in tabulation (Table 4).

Table 4: Intra-operative disease findings in MRM procedure.

Intra-operative findings	N	%
Cholesteatoma in mastoid cavity	22	52.38
Cholesteatoma in epitympanum, mesotympanum	22	52.38
Cholesteatoma in sinus tympani area and stapes footplate	18	42.85
Cholesteatoma extending up to petrous apex	03	7.14
Granulation tissue in mastoid cavitywith extension into epitympanum, mesotympanum and hypo tympanum	20	47.61
Granulation tissue in sinus tympani and stapes footplate area	14	33.3
Erosive destruction of posterior canal wall	11	26.19
Dehiscence of facial canal		
Horizontal segment	03	7.14
Vertical segment	01	2.38
Dehiscent sigmoid sinus plate	08	19.04
Dehiscent tegmen plate	05	11.90
Dehiscent lateral Semicircular canal	03	7.14
Erosion of mastoid cortex with postauricular and temporal region abscess	08	19.04
Polypoidal mass in EAC	06	14.30
Sclerosis of mastoid air cell system	20	47.61

Out of 42 cases of chronic otitis media, 8 cases were previously operated cases out of which 6 were operated for CWD mastoidectomy and 2 were CWU mastoidectomy. These cases were found to be due to recurrence of disease and revision mastoidectomy was planned in form of MRM procedure. In our study, chorda tympani nerve was identified in all cases and it was eroded by disease in 15 cases. During surgery we came across following: seen intact (26.19); cut while removing canal wall (38.09%); eroded by disease (35.71%).

Every MRM was accompanied with tympanoplasty by using temporalis fascia/tragus/conchal cartilage graft. Ossiculoplasty was performed in 12 cases wherein refashioned incus was used in 7 cases and rest 5 cases had conchal cartilage.

Post-operative outcome: none of the patients had graft failure during the entire 1 year follow up. Here, 74% of patients after MRM surgery had dry ear at 3rd month, 88% at 6th month and 95.2% at the 12th month follow up. In present study it was found that the recurrence rate for MRM surgery was 9.5%, 4.76% and 4.76% at 3rd, 6th and 12th month of post-operative follow-up respectively. In our study, none of the patients were aware of change in taste symptoms until asked. First assessment for change in taste, dryness of mouth or numbness was carried out within 48-72 hours post-operatively for awareness of symptom. Post-operatively, all patients were again assessed at 3rd, 6th and 12th month for taste disturbance. It was seen that only 35.71% post-operative cases had change of taste at 12th month follow up. In our study, it was seen that at the end of 12th month post-operatively, 95.2% had settled cavity while 4.76% cases suffered from granulations refractory to local treatment with crystal violet and debridement. At the 3rd month of postoperative follow up 7.6% had tolerance to water exposure at 12th month of postoperative follow up 96% MRM patients had dry waterproof ear. The entire post-operative outcome is shown in Figure 1.

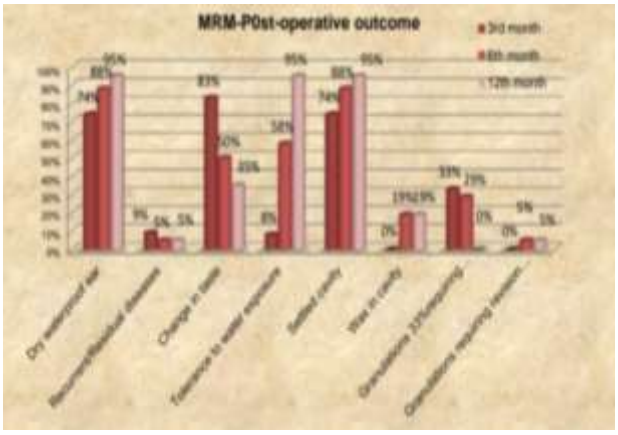

Figure 1: MRM post-operative outcome.

Table 5: Post-operative outcome: hearing assessment.

Post-operative changes in group of 10 dB	AB gap			AC threshold		
	Percentage (N)			Percentage (N)		
	3rd month	6th month	12th month	3rd month	6th month	12th month
≤(+)10	47.61 (20)	33.33 (14)	28.57 (12)	47.61 (20)	33.33 (14)	33.33 (14)
(+)11-20	9.52 (4)	16.66 (7)	14.28 (6)	16.66 (7)	19.04 (8)	14.28 (6)
(+)21-30	0	7.14 (3)	14.28 (6)	0	11.9 (5)	16.66 (7)
>(+)31	0	0	0	0	0	0

Continued.

Post-operative changes in group of 10 dB	AB gap			AC threshold		
	Percentage (N)			Percentage (N)		
	3rd month	6th month	12th month	3rd month	6th month	12th month
0	4.76 (2)	4.76 (2)	4.76 (2)	0	0	0
≤(-)10	30.95 (13)	21.42 (9)	19.04 (8)	33.33 (14)	19.04 (8)	16.66 (7)
(-)11-20	7.14 (3)	16.66 (7)	14.28 (6)	2.38 (1)	16.66 (7)	16.66 (7)
(-)21-30	0	0	4.76 (2)	0	0	0
≥(-)31	0	0	0	0	0	2.38 (1)

Hearing assessment of all patients was done pre-operatively and post-operatively at 3rd, 6th and 12th month with PTA. Pre-operative and post-operative closure of air-bone gap (ABG) and air conduction threshold were compared in all patients of MRM. Majority of patients fell within the group of 51-60 dB both pre-operatively and post-operatively. For AB gap, it was found that maximum patients showed improvement in 0 to (+) 10 dB after MRM (28.57%) while maximum worsening was seen in 0 to -10 dB (19.04%). The proportion of ABG closure within 20 dB was 42.85%. For AC threshold, it was found that maximum patients showed improvement in 0 to (+) 10 dB (33.33%) while maximum worsening was seen in 0 to -10 dB (16.66%).We found that Improvement in AB gap was seen in 57.14% while 4.76% cases had no change post-operatively. It was interpreted that 64.27% showed improvement. Pre-operative mean AB gap is 51.9 dB and postoperative mean AB gap is 47.07 dB. The mean gain in AB gap post-operatively for MRM procedure was 4.83 (Table 5).

It was also seen that 63.63% of patients with intact stapes showed improvement in hearing which greater than patients with absent stapes suprastructure (50%). In our study, 61.90% cases showed post-mastoidectomy improvement in tinnitus by 12th month whereas 19.04%) cases had worsening and remaining had no change in tinnitus. In our study, we didn't have any case of postoperative sensori-neural hearingloss, wound infection and facial palsy.

DISCUSSION

In the present study, discharge from ear and decreased hearing was the main/presenting complaint in 100% cases whereas 30.9% patients presented with complications of COM like abscess, facial palsy, and giddiness. Near about 14.3% cases came to ENT OPD with complaints of mass in EAC. 31 cases had tinnitus which was intermittent, ringing type and increased with discharge in ear. As per the study of Asma binti Abdullah et al conducted on 63 patients of COM the major complaint was otorrhea (92%), decreased hearing (70%), earache (41%), remaining 35% had miscellaneous symptoms like ear bleed, tinnitus and vertigo.[1] Prasad et al performed study on 40 patients and observed that most common symptoms were otorrhea 85% and then hearing loss in 47.5%.[2] In our study oto-microscopic examination revealed , attic destruction with flakes (30.95%) as most common finding ,polypoidal mass in external auditory canal (14.3%). Postero-superior retraction pocket in pars flaccida was seen in 11.90% cases and attic perforation in another 14.30%. 9.52% cases had flakes in mastoid cavity with high facial ridge and 4.76% had granulation tissues in mastoid cavity not responding to local treatment. The study conducted by Siddiqui et al showed 37.5 % cases having posterior perforation with cholesteatoma and 12.5 % cases with attic perforation harboring cholesteatoma.[3] Mohammad Ajalloueyan et al observed on oto-microscopy that amongst 72, 100% had perforated tympanic membrane/attic retraction pocket. 88% cases had marginal perforation and 12% had central perforation. Attic cholesteatoma was seen in 32% patients.[4]

In present study, all cases of COM were investigated by HRCT temporal bone. Pre-operative decision for MRM as a procedure of choice was made depending upon the findings of HRCT temporal bone. Elderly and infirmed patient where second look surgery was unadvisable and occasionally with disease in an only hearing ear had been preoperatively selected as candidates for MRM procedures. Intra- operatively decision of MRM carried out by removing the bony posterior wall of external auditory canal was taken in following conditions; un-resectable disease on stapes footplate and facial nerve, extensive disease involving petrous apex cells with exposed dura, low lying tegmun limiting access to attic, un-resectable sinus tympani disease, un-reconstructable posterior canal wall defect, in patients with facial nerve involvement for facial nerve decompression and presence of labyrinthine fistula.

Table 6: Post-operative outcomes of our study compared with other available literature.

Outcome (12th month follow up)	Our study	Study 1	Study 2	Study 3
Dr y waterproof ear	95.2%	Payal et al[6] (95%)	Dubey et al[7] (37.6%)	Ajalloueyan et al[4] (96%)
Recurrence or residual disease	4.76% due to inadequate meatoplasty	Abdullah et al[1] 3% residual disease in inaccesible regions.	Karmarkar et al[8] (0.23%)	Bebear et al[9] (23.8%)

Continued.

Outcome (12th month follow up)	Our study	Study 1	Study 2	Study 3
Altered taste	35.71%	Michael et al[1] (24%)	Shrivastav et al[11] (none)	Just T et al[12] (30%)
Improvement in pre-op tinnitus	(61.90%)	Zeman et al[13] (46.5%)	Leonetti et al[14] (46.5%)	
Facial nerve palsy	0%	Thapa et al[15] (2.61%)	Garap et al[16] (4%)	Wormald et al[17] (1.7%)
Snhl (studies, show varied effect of of drill time and burr usage on SNHL posy mastoidectomy)	0%	Leonetti et al[14] (0%)	Sorri et al[18] (0%)	None

Table 7: Post-operative outcomes of our study compared with other available literature.

Study	Pre-operative AB Gap	Post-operative AB gap	Mean AB gap
Present study	51.9 dB	47.07 dB	4.83 dB
Shrestha et al[20]	37.8 dB	29.8 dB	8 dB
Kabdwal et al[21]	35.63 dB	29.54 dB	6.09 dB
Kumar et al[22]	38.10 dB	29.30 dB	8.8 dB

Out of 42 cases, 8 patients were cases of recurrence of disease and were operated with revision MRM. Similar interpretations are well documented in study conducted by Siddiqui et al according to which, 75% cases who underwent CWD procedure had extensive nature of cholesteatoma with involvement of ossicles and erosion of surrounding bony walls with impending/established complications.[3]

Likewise, Ajalloueyan et al during his study on 108 patients concluded that 72 cases who had either large/hidden cholesteatoma or cholesteatoma involving supratubal, sinus tympani, peri-facial nerve, stapes footplate and labyrinthine were treated with CWD mastoidectomy so with the literature above and our study following indications of MRM was established: un-resectable disease on stapes footplate and facial nerve and sinus tympani, extensive disease involving petrous apex cells with exposed dura, low lying tegmun, un-reconstructable posterior canal wall defect, presence of labyrinthine fistula, recurrent disease or facial nerve involvement and patients in whom second look surgery is unadvisable.[5] Post-operative outcomes of our study compared with other available literature (Table 6).

Post-operative hearing outcome: As per present study, at the 12th month of follow up, 57.14% cases of MRM had improvement and 38.08% had worsening in AB gap closure. No change was seen in 4.76% cases. When AC Threshold was analyzed, it was found that 64.27% cases had improved threshold while 35.7% cases reported worsening post-MRM. Preoperative mean AB gap is 51.9 dB and postoperative mean AB gap is 47.07 dB. The mean gain in AB gap post-operatively for MRM procedure was 4.83 dB. This data suggested that MRM procedure results in improvement in hearing. Comparison of the same in other studies has been shown in Table 7.

Follow up visits after mastoidectomy

In the present study, apart from designed follow up, we noticed frequent visit of patients to OPD in case of MRM for cleaning of discharge, dewaxing and local debridement with 19.23% for dewaxing, 30.76% for local debridement of granulation tissue and 2 for recurrence of disease. Mean number of visits was 2 per month with more frequent visits in initial 6 months. The above data was supported by Khalil et al study, where,median of 11 and mean of 13.3 visits to outpatients was made over the study period of 158 months (a mean of 1 visit per year).[23]

Limitation

The study was conducted on a very small smaple, as was carride out only in as-ingle institute so the result can't be applied to all and everyone. More over the follow up period is only one year. The real output measurement for it the study, to be more accurate, requires a longer follow up period of about greater than 5 years.

CONCLUSION

Present study results in light of other studies: MRM is a procedure of choice for COM with extensive disease in mastoid cavity, antrum, attic, sinus tympani, mesotympanum and hypotympanum. Limited and localized disease can be managed by CWU mastoidectomy. MRM creates a mastoid cavity which is smooth-walled self-draining with adequate meatoplasty and lowered facial ridge. High facial ridge, inadequate meatoplasty, bony overhangs in mastoid cavity and residual disease in deeper areas (sinus tympani, stapes footplate, air cell tracts) lead to failure of primary surgery. This may be overcome by oto-endoscopy guidance with rigid and flexible angled telescopes intra-operatively. MRM with type III tympanoplasty produces modest

closure of air bone gap.Presence of stapes suprastructure has better post-operative hearing outcome. Major disadvantage of MRM is postoperative mastoid cavity which requires regular aural toilet. But MRM is beneficial for patients with poor compliance and good MRM cavity does not need second look surgery.

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