Modified Radical Mastoidectomy with Type III Tympanoplasty: Revisited

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Abstract Chronic suppurative otitis media with cholesteatoma is a fairly common condition presenting in any ENT clinic and its surgery remains one of the most challenging surgeries in otology. The primary goal of cholesteatoma surgery is to clear the disease and produce a safe and stable ear but there is still debate on whether these goals are best achieved by canal wall down or canal wall up procedures. A retrospective study was done to assess benefits of modified radical mastoidectomy (MRM) with type III tympanoplasty in terms of eradication of disease and hearing improvement. It consisted of 140 patients of chronic otitis media (attico-antral) who underwent MRM with type III tympanoplasty in 156 ears in a tertiary care centre. Temporalis fascia graft was used for tympanoplasty. Results were analyzed in terms of condition of cavity, condition of graft and gain in hearing. The study showed significant improvement in gain in air conduction (21.24 dB) and closure of AB gap (15.62 dB). In the Indian population with low socio-economic status and poor follow up, single stage canal wall down procedure (MRM) provides maximum benefit to patients in terms of eradication of disease and hearing improvement.

Keywords Cholesteatoma · Modified radical mastoidectomy · Tympanoplasty · Temporalis fascia

Introduction

Chronic suppurative otitis media is recurrent and progressive disease, characterized by tympanic membrane perforation and suppurative discharge lasting more than three months [1]. It is associated with significant hearing loss. Attico-antral disease, in particular, erodes the bone, destroys the ossicles and has the potential to cause life threatening complications. Surgical treatment of middle ear cholesteatoma remains one of the most challenging surgeries in otology.

The primary goal of cholesteatoma surgery is to clear the disease and produce a safe and stable ear. Maintenance or improvement of hearing is important but should not be at the cost of the primary goal. There is a longstanding and largely unresolved debate as to whether these goals are best achieved by canal wall down or canal wall up procedures.

Modified radical mastoidectomy (MRM) allows excellent visualization of disease with proportionally good chance of complete removal. The mastoid and middle ear can be readily inspected in the follow up period in the outpatient setting itself and second look surgery is usually not required. Hence this procedure along with Tympanoplasty is widely performed for cholesteatoma with the advantage of less recurrences and good hearing.

The aim of the study was to report the surgical outcome of patients with CSOM (attico-antral) with malleus/incus erosion who had undergone canal wall down mastoidectomy with type III tympanoplasty.

Materials and Methods

This retrospective study was carried out in a tertiary care center involving one hundred and forty patients of chronic suppurative otitis media attico-antral type, who underwent

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single stage MRM with type III tympanoplasty on 156 ears from January 2009 to January 2014. The indication for MRM were patients with extensive cholesteatoma, poor hearing status, sclerosed mastoid, presence of extra cranial complications, poor compliance for follow up. Patients who presented with tubotympanic disease, sensorineural hearing loss or intracranial complications were excluded. All case of canal wall up and canal wall down mastoidectomies with other types of tympanoplasty were also excluded.

A detailed history and thorough ENT examination was done in all patients. Microscopic examination of the affected ears was done to confirm the findings. The lateral oblique view radiographs of both mastoids were taken. HRCT Temporal bone was done in those cases, where clinical diagnosis was not clear. Tuning fork tests and pure tone audiometry were done pre operatively. Informed written consent was obtained. All patients were operated under general anaesthesia. Post aural William wilde's incision was given. Temporalis fascia graft was used for tympanoplasty. Graft was applied directly on the suprastructure of stapes. Patients were followed for a period of one to 5 year, the condition of cavity and graft was assessed at 3 months, 6 months and 1 year along with tuning fork tests and pure tone audiometry at every visit and mean of 500, 1000 and 2000 Hz was taken as pure tone threshold. The data obtained was subjected to statistical analysis with help of statistical software package SPSS 20.0.

Observation and Results

In our study the minimum age of the patient was 6 years and maximum age was 56 years. Maximum number of patients i.e., 56 (35 %) were in the age group 11–20 years followed by 48 (34.3 %) patients in the age group 21–30 years.

Out of 140 patients 86 were males and 54 were females. The male to female ratio was 1.6:1. 65 % of the patients belonged to rural area whereas 35 % belonged to urban area. 63 (40.38 %) patients had disease in right ear while 56 (35.80 %) had disease in left ear. Bilateral disease was found in 21 (23.71 %) patients.

100 % (140) patients presented with ear discharge, 94.8 % (132) patients presented with hearing loss. 3 patients (2.5 %) presented with facial palsy (Table 1).

Cholesteatoma was found in all 156 ears (100 %). Posterosuperior perforation was present in 104 ears (66.66 %) while 52 patients (33.33 %) had attic perforation (Table 2). 26 ears were found to have discharge at 3 months follow up. 18 ears became dry after medical treatment. At the end of 1 year, well healed cavity with

Table 1 Clinical features of the study population (n = 140)

Presenting complaints	No. of patients	Percentage
Otorrhoea	140	100
Hearing loss	132	94.8
Vertigo	18	12.82
Headache	16	11.4
Tinnitus	15	10.25
Otalgia	11	7.6
Facial palsy	03	2.56

Table 2 Clinical findings (n = 156 ears)

Clinical findings	No. of ears	Percentage
Cholesteatoma	156	100
Posterosuperior perforation	104	66.66
Attic perforation	52	33.33
Granulations	34	21.79
Polyp	28	17.94
Retraction pocket	14	8.97

intact graft was seen in 148 (94.87 %) ears (Fig. 1). 8 (5.12 %) cases were advised revision surgery. The mean pre-operative air conduction was 52.44 dB which improved to 31.2 dB post-operatively and the mean pre-operative A-B gap was 33.65 dB which reduced to 18.03 dB post operatively (Table 3).

The gain in air conduction was 21.24 dB and A-B gap closure was achieved by 15.62 dB. Paired t test were applied. P value was highly statistically significant (Table 4; (Fig. 2).

Discussion

The present study was based on 140 patients who underwent MRM with type III tympanoplasty during a period of 5 years from January 2009 to January 2014.

In our study the patients were between 6 and 56 years of age, with mean age was 31 year. Maximum number of patients i.e., 56 (35 %) were in the age group 11–20 years followed by 48 (34.3 %) patients in the age group 21–30 years. These findings were in fair agreement with those reported earlier by Salman et al. [2] in the year 2005 with most common age group 16–30 years. The overall sex distribution showed a male preponderance. 61.42 % were males while 38.57 % were females. The male to female ratio was 1.6:1. Nelson et al. [3] found the incidence of cholesteatoma as being about 1.4 times higher in men compared to women. Majority of cases (65 %) belonged to rural areas, 35 % belonged to urban areas.

The diagnosis of cholesteatoma is usually made on otologic examination. The cases in which diagnosis was not obvious, computerized tomography demonstrated soft tissue mass with characteristic ossicular displacement and bone erosion. Commonest complaint was otorrhoea (100 %), these patients presented with foul smelling scanty discharge. Blood stained discharge is often noted with granulation tissue and polyps. Hearing loss was present in 132 (94.28 %) patients. 8 (5.71 %) patients had hearing sensitivity within normal limits; these were Cholesteatoma hearers. Otagia was present in 11 (7.85 %) patients. 16 (11.4 %) patients presented with headache. Giddiness was present in 18 (12.85 %) patients. Only 15 (10.71 %) patients had tinnitus. Grade III facial paresis was present in 3 (2.14 %) patient. None of the patients presented with intracranial complications. In a retrospective study done by Parisier et al., the most common presenting symptom were otorrhoea (73 %), hearing loss (85 %), otalgia (32 %), tinnitus (8 %) and vertigo (8 %). Only (0.8 %) presented with an intracranial complication [4].

Table 3 Pre-op and post-op audiological status of patients (n = 156 ears)

	Mean	S.D.
Pre-op AC	52.44 dB	5.33
Post-op AC	31.2 dB	4.44
Pre-op AB gap	33.65 dB	5.6
Post-op AB gap	18.03 dB	4.64

Fig. 1 Post operative appearance of tympanic membrane

Table 4 Improvement in hearing after surgery (n = 156 ears)

Gain in AC	21.24 dB	p value ≤ 0.0001	t test = 38.242
A-B gap closure	15.62 dB	p value ≤ 0.0001	t test = 26.826

Cholesteatoma was present in all 156 (100 %) patients, attic perforation was seen in 52 (33.33 %) patients, 28 (17.94 %) patients had aural polyps, granulation tissue was present in 34 (21.79 %) patients. This was in accordance to the results of Proctor [5] which suggested the association of granulation tissue in 93–95 % of the cases of cholesteatoma. Retraction pocket was seen only 4 (10 %) patients. Ossicular defect was seen in all the cases (100 %) leading to raised air conduction threshold and air bone gap. Incus was the most commonly eroded ossicles (73 %). Malleus was second most commonly eroded ossicles (33 %). Austin reported the most common ossicular defect to be the erosion of incus with intact malleus and stapes in 29.50 % [6]. 8 (5.71 %) patients had hearing sensitivity within normal limits, these were the Cholesteatoma hearers. 21 (16 %) patients had mild hearing loss. Maximum number of patients i.e., 63 (47 %) had moderate hearing loss. Moderately severe hearing loss was seen in 35 (26.1 %) patients. Severe hearing loss was seen in 13 (9.9 %) patients. Thus 63 % of the cases had mild to moderate hearing loss. Profound hearing loss was not seen in any patient. According to WHO estimates CSOM causes a mild to moderate conductive hearing loss of 30–60 dB in more than 50 % of the cases [7].

Out of 156 ears operated, conductive hearing loss was present in 126 ears (80.7 %), mixed hearing loss was in 30 ears (19.3 %). Bansal in his study on unsafe CSOM patients (n = 54); 26 patients (48.14 %) had conductive hearing loss, 16 patients (29.62 %) had mixed hearing loss and 12 patients (22.22 %) had sensorineural hearing loss [8].

In our study, overall success rate was 94.87 % (148 ears). 8 (5.12 %) cases were advised revision surgery due to recurrent/residual disease. In a similar study done by Binti Abdullah et al. on 63 patients had success rate of 78 % with 3 % recurrence rate [9].

Ojala used autograft incus in type III tympanoplasty, he could achieve a mean post operative A-B gap of 25.8 dB [10]. Reilly at the same time had achieved a mean A-B gap of 18.6 dB with the same material [11]. Harvey reported that by using pre-sculpted homograft septal cartilage in type III tympanoplasty he could achieve a mean post operative A-B gap of 23.8 dB [12]. Our study had achieved a mean post operative A-B gap of 18.03 dB which is comparable to the above cited studies.

Fig. 2 Showing pre-operative and post-operative pure tone audiometry

Conclusion

Our study showed equally good post-operative hearing results compared to studies in which MRM with type III tympanoplasty was done using other prosthesis. Temporalis fascia as graft material is very much affordable by the patients instead of other expensive materials like titanium, TORP, PORP, hydroxyl apatite, etc. These encouraging results tell us that easily available temporalis fascia can be used for middle ear reconstruction following canal wall down mastoidectomy with good improvements in hearing along with eradication of disease in a single stage procedure. In the Indian population with low socio-economic status and poor follow up single stage canal wall down procedure (MRM) provide maximum benefit to patients in terms of eradication of disease and hearing improvement.

Compliance with Ethical Standards

Conflict of interest The authors states that there is no conflict of interest, no funding or financial relationships.

Informed consent Informed consent was obtained from all individual participants included in the study.

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