Modified Radical Mastoidectomy: A Relook at the Surgical Pitfalls

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Abstract The primary aim of surgery for cholesteatoma is to eliminate the disease, to produce a safe and dry ear which is self cleansing, modify the anatomy of the tympanomastoid compartment so as to prevent recurrent disease and wherever possible to reconstruct the hearing mechanism. The advances in medical technology and the medical expertise gained over a period of time have greatly influenced the results in cholesteatoma surgery. The aim of the present study was to assess the intraoperative findings during revision mastoid surgery for atticotympanic disease and to ascertain the preventable factor that could reduce recurrence. A retrospective analysis of all clinical data and operative notes of patients who had undergone revision surgery for recurrent cholesteatoma, in our unit in a tertiary care centre in south India over a period of 3 years from July 2007 to July 2010 was done. 33 patients had undergone revision mastoid surgery for cholesteatoma. Most patients presented with symptoms and sign of disease about 2 years after the first surgery. The commonest complaint was recurrent foul smelling ear discharge. The most frequent site of recurrent cholesteatoma was the tip cells (72%) and the most important cause for failure of surgery with recurrence of disease was inadequate meatoplasty (70%). In our study, recurrent disease was likely due to cholesteatoma in the tip cells left uncleared and inadequate meatoplasty. Both these issues reflect faulty techniques in performing good meatoplasty or

the tip cell are not adequately reduced into the external auditory canal. Bone work is generally taught well in all temporal bone workshops but no emphasis is laid on soft tissue work hence the failure and recurrence. Thus we emphasize the need to teach the budding otologists the importance of and proper technique of meatoplasty.

Keywords Cholesteatoma ·
Modified radical mastoidectomy · Meatoplasty

Introduction

Cholesteatoma is a progressive disease that erodes bone and if left untreated leads to complication [1, 3]. The treatment for cholesteatoma is primarily surgical, that is aimed at elimination of the disease by completely removing the cholesteatoma sac and exenterating the mastoid into the external auditory canal, thus producing a safe and dry ear which is self cleansing [1, 2]. Surgical reconstruction of the hearing mechanism is done as a single stage procedure or at a relook procedure later on. We usually follow the single stage procedures (i.e. modified radical mastoidectomy). This is so because of lack of awareness and improper follow up among our population. The reason for failure of mastoid surgery is debated. High facial ridge is implicated as the most common cause for failure [2, 3]. In this study, we reviewed the surgical findings in a series of revision tympanomastoid surgery to determine the common cause of failure.

Aim

The aim of this study was to access the intraoperative findings during revision mastoid surgery for atticotympanic disease and to ascertain the preventable factors so as to reduce recurrence.

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Patients and Methods

This retrospective study was carried out at the Department of ENT and Head and Neck Surgery of a tertiary care Teaching Hospital in South India, from July 2007 to June 2010. The case records and operative notes of all patients undergoing revision tympanomastoid surgery for cholesteatoma were included in the study. The revision surgery was performed in a single unit by the senior author or under his supervision. The descriptive data noted were age, sex, when was the previous surgery done, presenting symptoms and any co-morbid conditions. Type of pathology (granulation, cholesteatoma), location of cholesteatoma, probable reasons for failure and complication of disease or of the previous surgery were identified and noted from the operative notes. All previous surgeries were done by different surgeons. We had 34 cases of recurrent disease which required surgery. Of these one case had undergone a canal wall up technique and was excluded from the study.

Results

The frequency distribution for age, gender is given in Fig. 1. Most patients presented with persistent foul smelling ear discharge. Though most of them had moderate hearing loss, only one patient had sought intervention for hearing loss and was found to have recurrence of disease Fig. 2. The XY scatter graph for the time interval since previous surgery and the present surgery is shown in Fig. 3, which shows a mean duration of $4.2 (\pm 2.11 \text{ SD})$ years and mode of 2 years.

The most frequent site of cholesteatoma found during revision surgery was the mastoid tip cell (72%), followed by antrum, cells at the sinodural angle and the sinus tympani Fig. 4. The most common identifiable cause for recurrence or problem cavity was found to be retained tip cells (72.20%) and inadequate meatoplasty (66%). Other problems identified were dehiscence sigmoid sinus plate (12.12%), dehiscence tegmen plate (6.06%), dehiscence facial nerve (3.03%), and lateral semicircular canal fistulae (3.03%). In addition,

Fig. 1 Frequency distribution, age and gender

Fig. 2 Presenting symptoms

Fig. 3 Period in years from previous surgery

Fig. 4 Retained cholesteatoma during revision surgery

Fig. 5 Problems identified during revision surgery

Eustachian tube block (27%) and irregular cavity with granulation in 42% of the patients as seen in Fig. 5 and Table 1.

Discussion

Bondy in 1910 described the indications and technique of modified radical mastoidectomy. Since then modified radical

mastoidectomy (MRM) is the term used to describe an operative technique done for managing cholesteatoma in which the all diseased tympanomastoid air cells are removed, exenterated and exteriorized to the external auditory canal with reconstruction of middle ear transformer mechanism.

It is important to understand albeit theoretically the difference between recurrent and residual cholesteatoma. Residual cholesteatoma refers to keratinizing epithelium

Table 1 Problems identified during revision surgery

Problem	%	Numbers
Cholesteatoma retained cells	100	(33/33)
Retained infected air cells	61	(20/33)
Mucosal lining in mastoid cavity	6.06	(2/33)
Granulation tissue	42	(14/33)
Eustachian tube obstruction	27.00	(9/33)
Labyrinthine fistulae	3.03	(1/33)
Facial nerve dehiscence	3.03	(1/33)
High facial ridge	45	(15/33)
Retained mastoid tip cholesteatoma	72.20	(24/33)
Inadequate meatoplasty	66	(22/33)
Dehiscent dural plate	6.06	(2/33)
Dehiscent sigmoid plate	12.12	(4/33)

that remains after a surgical procedure [4, 5]. Recurrent cholesteatoma is defined as the presence of a secondary acquired cholesteatoma that appears following the complete removal of a previous cholesteatoma [5].

The technique of modified radical mastoidectomy is to prevent recurrent or residual cholesteatoma along with preservation or reconstruction of ossicular mechanism to restore hearing [2].

Modified radical mastoidectomy has a low rate of recurrence of disease compared to intact canal wall technique [6]. In our study, the mean period between the first surgery and revision surgery was 4.3 ± 2.11 years and the mode was 2 years. Hence, we recommend a minimum follow up of 6 years post surgery following modified radical mastoidectomy.

Nadol et al. [2] found that the common site for recurrence in canal wall down mastoidectomy was the sinus and tegmental air cells. Veldman and Braunius [7] described the facial nerve and sigmoid sinus to be the most common site of disease recurrence. In this study the mastoid tip cells followed by sinodural angle, sinus tympani and the tegmen antri region to be the most common site of disease recurrence.

Megerian et al. [3] and Bhatia et al. [8] had described that inadequately lowered facial ridge (67%), stenotic EAC (64%), inadequate meatoplasty (59%) to be the most frequent cause for failure. In this study the retained tip cells (72.20%) (Fig. 6), cholesteatoma at the sinodural angle (63%) (Fig. 7), inadequate reduction of posterior canal wall in flush with the external auditory canal (Fig. 8) leading to recurrence of tip cell cholesteatoma and inadequate meatoplasty (66%) were the main areas of concern for recurrent or residual disease. This probably could be due to the fact that in the present generation of otolaryngologists are exposed to so much of temporal bone workshops where most of the bone work is taught. Hence the fear of the

Fig. 6 Cholesteatoma at the tip cells **Fig. 7** Cholesteatoma in sinodural angle **Fig. 8** Inadequately reduced lateral attic wall and posterior canal wall

facial nerve is far less than previous reports. What is not taught is the requirement for adequate soft tissue work such as meatoplasty. We emphasize the importance of a good and adequate meatoplasty to prevent recurrence.

In addition it is highly imperative on the part of the surgeon to educate the patient for regular follow up and during follow a close inspection of the cavity is required to detect early recurrence which can sometimes be managed in the OPD.

Conclusion

In our study, recurrent disease was more common due to cholesteatoma in the tip cells left uncleared and/or inadequate meatoplasty. Bone work is generally taught well in all temporal bone workshops but no emphasis is laid on soft tissue work. We emphasize the importance of an adequate meatoplasty in achieving good results when managing cholesteatoma.

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