Myringosclerosis: An Indication of A Blocked Aditus

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Abstract Tympanoplasty has been the mainstay of treatment in chronic otitis media. In a non cholesteatomatous chronic otitis media, there has been much debate whether a cortical mastoidectomy is required or not. Creating an aerating mastoidectomy in cases of blocked aditus ad antrum helps in reducing the recurrence. However, the status of aditus is not always known unless a mastoidectomy is performed. In this study we try to find out if there is any clinical clue regarding a blocked aditus ad antrum by looking at the tympanic membrane. Forty-three cases of cortical mastoidectomies were retrospectively studied in this series. Patency of aditus ad antrum was analyzed with respect to presence of myringosclerosis and the status of middle ear mucosa. In this study myringosclerosis was found to be significantly associated with a blocked aditus while no such association was found with the status of middle ear mucosa. The presence of myringosclerosis may indicate a blocked aditus ad antrum and performing a cortical mastoidectomy in such cases may help in creating an aerated mastoid, thereby possibly reducing the recurrence rate.

Keywords Myringosclerosis · Aditus ad antrum · Cortical mastoidectomy

Introduction

Tympanic membrane reconstruction has been the mainstay of treatment for chronic otitis media with perforation of the drum. Over the last century there has been substantial amount of research published in the literature evaluating the factors influencing the successful graft uptake. Many such factors like age, sex, presence of systemic diseases, size of perforation, duration of dry period, presence of myringosclerosis, operation type, status of opposite ear, addition of mastoidectomy, Eustachian tube dysfunction, middle ear risk index, etc. have been extensively studied [1–3]. A number of causes have been recognized for failed tympanic membrane reconstructions including infection, poor wound healing, Eustachian tube dysfunction, retained disease and poor surgical technique.

Holmquist and Bergstrom first suggested that addition of mastoidectomy improves the chance of successful tympanoplasty in chronic otitis media [4]. Many otologists believe that lack of an aerating mastoidectomy contributes significantly to the failure of tympanoplasty [5]. The presence of a pneumatized mastoid greatly increases the volume of the middle ear/mastoid system which primarily acts as a buffer to pressure changes in the middle ear. This is in accordance to the Boyle's law [4, 6, 7].

Preoperatively, the aeration of mastoid air cell system can be evaluated by a computed tomography (CT), which may show soft tissue density at the attic, aditus, and the antrum. But then, this mode of investigation cannot be used on all patients undergoing tympanoplasty. This is especially true of developing and underdeveloped countries where this is not financially feasible. Also, the poor follow up means that revision surgery may not be possible indicating the need for a successful operation at the first instance.

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Materials and Methods

All tympanoplasty procedures with cortical mastoidectomy surgeries done by the primary author in the past 3 years were analyzed retrospectively from the hospital records. Data was obtained regarding presence or absence of myringosclerosis in each of these cases. Operative notes of all these cases were reviewed as to the presence or absence of a patent mastoid antrum. Patent mastoid antrum was defined as those ears that showed easy flow of irrigated saline between middle ear and mastoid on reaching the antrum, without the surgeon being required to clear any disease to make it patent. The status of middle ear mucosa was also noted as to whether it was congested or polypoidal, in which case it was termed unhealthy; or normal and healthy.

A total of 43 cortical mastoidectomy cases were included in this study. There were no revision cases involved in this study. The outcome of surgery whether graft uptake or hearing improvement was not evaluated, as this was not included in the objectives of this study.

The data was analyzed by Fisher's exact test and the statistical significance of p was set at 0.05. Odds ratio was calculated and described with a confidence interval of 95%.

Observation and Results

This study involved 43 cases of cortical mastoidectomies performed during 2007 to 2010. The mean age of the patients included in the study was 28 years with the youngest being 13 years and oldest being 55 years. 15 of our patients were males and the remaining 28 were females. Of the cases selected for the study, 11 of our patients had disease in their right ears, 14 in their left ears and the remaining 18 had bilateral disease. X-ray of the mastoids showed all cases with sclerosed mastoids. Myringosclerosis was present in 24 of our patients and absent in 19 patients. In the myringosclerosis positive group the mean age was 31 years while it was 25 in those it was absent. The duration of the disease in both the groups were similar and ranged from 1 to 15 years.

All these patients had undergone cortical mastoidectomy with corresponding reconstructive procedures ranging from myringoplasty to malleus stapes assembly depending on the situation. The patency of the aditus ad antrum as evidenced by the free flow of irrigated saline between the middle ear and antrum was reviewed in all these cases. It was observed that the aditus ad antrum was not patent in 18(75%) of the myringosclerosis present group and 5(26%) of the myringosclerosis absent group. Patency of the aditus was noted in 6(25%) and 14(74%) of the myringosclerosis present and absent group, respectively (Table 1). The odds ratio for the aditus being non patent in a patient having

Table 1 Status of aditus ad antrum with respect to myringosclerosis

	Aditus not patent		Aditus patent	
Myringosclerosis present	18	6	24	
Myringosclerosis absent	5	14	19	

myringosclerosis was found to be 8.4 (95% CI 2.12 to 33.29) and this was found to be statistically significant ($P = 0.0022$).

In most of the cases where the aditus was blocked, we noted the presence of tympanosclerotic plaques in the aditus area and were confirmed by histopathological examination. These plaques were eventually removed to attain patency of the aditus and tympanoplasty was completed.

The status of the middle ear mucosa at the time of surgery was reviewed. 21 of the study cases had unhealthy mucosa and 22 had healthy mucosa at the time of surgery. Of these, aditus was not patent in 14(66.67%) and 9(40.91%) patients of unhealthy and healthy middle ear mucosa groups, respectively. Aditus was patent in 7(33.33%) and 13(59.09%) of the unhealthy and healthy middle ear mucosa groups, respectively (Table 2). The odds ratio of aditus not being patent if the middle ear had unhealthy mucosa was found to be 2.89 (95% CI 0.83 to 10.01) and it was not statistically significant ($P = 0.129$).

In these group of patients where the aditus was not patent, we found edematous or polypoidal mucosa in the aditus which was cleared to achieve patency. Antibiotic and steroid soaked gelfoam was placed in these areas to prevent inflammation and a formal tympanoplasty was completed.

Discussion

There has been a considerable debate whether cortical mastoidectomy is required in the management of non cholesteatomatous chronic otitis media. Some authors believe that mastoidectomy is not necessary for treatment of all non cholesteatomatous ears [8]. However, some believe that addition of mastoidectomy greatly increases the success of tympanoplasty [4]. Some authors prefer to add cortical mastoidectomy in cases with congested, polypoidal, moist or discharging ear [9]. Ruhl and Pensak opine that mastoidectomy should be considered in all failed cases of tympanoplasty reconstruction and also if the pre

Table 2 Status of aditus ad antrum with respect to middle ear mucosa

	Aditus not patent		Aditus patent	
Unhealthy middle ear mucosa	14	7	21	
Healthy middle ear mucosa	9	13	22	

operative imaging shows poorly pneumatized mastoid or those with evidence of soft tissue in the mastoid, aditus or epitympanum. But this may not be possible universally for reasons mentioned earlier.

The mastoid air cell system acts as a buffer to equalize the pressure changes in the middle ear. When this has been affected by a sclerotic mastoid or the presence of an inflamed tissue in the aditus blocking the aeration of the mastoid air cell system, achieving an aerating mastoidectomy will re establish this physiologic buffer system. But to identify such cases with blocked aditus preoperatively is not easy. Presence of congested and polypoidal mucosa in the middle ear may not be associated with blocked aditus ad antrum. Presence of myringosclerosis can be a clue to this as evidenced in this study.

Tympanosclerosis is a nonspecific result of chronic inflammatory processes of the middle ear, is characterized by hyaline deposits in the tympanic membrane, the tympanic cavity, and occasionally the mastoid [1, 10]. It is a nonfunctional and inert repair phenomenon that is however not unchangeable. There is no overall evidence of resolution of sclerotic changes over time [11]. The etiology of this is not clearly known although many hypotheses have been proposed like, sequelae of acute or chronic otitis media, stagnation of secretions in the mucosal folds, immunologic mechanism, disordered fibrogenesis during healing following long standing inflammation, and so on [11]. Histopathological studies of these white plaques reveal dense fibrous and collagenous connective tissue, poor in cells with hyaline degeneration and occasional calcification in the tympanic mucosa. Longstanding and repeated undrained suppurative or non suppurative effusions would promote progressively more dense and avascular fibrous adhesions in the tympanum [12].

The term ‘myringosclerosis’ is used when tympanosclerosis involves only the tympanic membrane [10]. This is usually the first stage of the disease and later progress to involve the ossicular chain [13]. On the tympanic membrane it can involve any site of the drum although some studies report higher predilection for posterosuperior quadrant [11]. In the middle ear the attic is the most common site although the pars flaccida is never involved. This is because the tympanosclerosis most commonly occurs in the region of least mucous glands and ciliary population; the attic and the aditus being the site that fits this description the most [14]. Involvement of the attic and the aditus by the tympanosclerotic plaques may contribute to the blocking of the aditus seen in many patients in our study. Since most of the recurrent cases after myringoplasty have a non patent aditus ad antrum as evidenced in the previous studies, adding a cortical mastoidectomy and clearance of the tympanosclerotic plaques from the aditus may help to prevent such recurrences.

Conclusion

Mastoid air cell system acts as a buffer to equalize the middle ear pressure changes. Reestablishing the patency of this system may help in reducing the failure rates in tympanoplasty procedures as evidenced by earlier studies. In the present study, presence of myringosclerosis was noted to have a higher risk of blocked aditus. Since this result is based on observations of a single institution, we would like to see more such research from different institutions in different geographical locations so that a consensus may be arrived at defining indications for cortical mastoidectomy in non cholesteatomatous chronic otitis media.

Conflict of interest The authors declare that they have no conflict of interest.

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