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Original Research Paper

Evaluation of Outcomes of Tympanoplasties With and Without Cortical Mastoidectomy

Medical Science

KEYWORDS : Cortical mastoidectomy, Tympanoplasty with mastoidectomy, Tympanoplasty

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ABSTRACT

Context: *Even today well-trained and experienced otologists remain divided as to the importance of combining mastoidectomy with tympanoplasty in the treatment of chronic non-cholesteatomatous otitis media. We performed a comparison of patients with post infectious simple tympanic membrane perforations treated with tympanoplasty and tympanoplasty combined with intact canal wall mastoidectomy, in terms of outcome.*

Aims: *The aim of the study was to evaluate the outcomes of tympanoplasties with and without cortical mastoidectomy in terms of graft uptake rate and hearing improvement.* ***Settings and Design:*** *A combination of retrospective and prospective cohort study.* ***Materials and Methods:*** *A total of 50 patients undergoing tympanoplasty with or without cortical mastoidectomy were included in the study and were followed up for a period of six months for the graft uptake and hearing improvement. Statistical analysis used: Fisher's exact test and chi square test.* ***Results:*** *In our study, there was no significant difference in the graft uptake rate or the hearing improvement in both these groups.* ***Conclusions:*** *As per this study, it can be concluded that the addition of cortical mastoidectomy to type I tympanoplasty did not improve the graft uptake rate or the hearing improvement in cases of chronic suppurative otitis media tubotympanic disease.*

Introduction

The management of chronic otitis media has witnessed a profound change during the past century, from the early attempts at surgical exposure of the middle ear in 1889, to the present day techniques of tympanoplasty with canal wall up or down surgeries. Well-trained, experienced otologists currently remain divided as to the importance of mastoidectomy in the treatment of chronic non-cholesteatomatous suppurative otitis media. The use of mastoidectomy as a means to establish drainage of a complicated infection of the ear sparks little controversy. However, the use of mastoidectomy to treat chronic drainage or suppuration from uncomplicated otitis media remains an issue of debate. Some authors have thought that mastoidectomy is justified in cases of chronic suppurative otitis media, which have been refractory to maximal antibiotic therapy and is essential for the complete clearance of the disease process. However, others have argued that mastoidectomy is not just unnecessary when treating chronic noncholesteatomatous suppurative otitis media but also increases patient risks with little or no significant advantage in clinical outcome. When attempting to examine the effect of mastoidectomy on patients treated surgically for otitis media, it becomes evident that an objective analysis is often difficult because subjective assessments are frequently required to consider many factors that affect surgical outcomes. We performed a comparison of patients with postinfectious simple tympanic membrane perforations treated with tympanoplasty or without tympanoplasty combined with intact canal wall mastoidectomy. The study was specifically limited to patients with a persistent non-traumatic tympanic membrane perforation, a history of otitis media, no presence of cholesteatoma, and no active evidence of infection.

Aim of the study

The aim of the study was to evaluate the outcomes of tympanoplasties with and without cortical mastoidectomy in cases of chronic otitis media (mucosal disease) in terms of graft uptake rate and hearing improvement on the basis of tunning fork test.

Materials and Methods

This study was conducted in the department of ENT at a Sola Civil hospital for a period of one year from March 2015 to March 2016. The patients were selected randomly from those undergoing ear surgeries in the department, with complaints of ear discharge or hearing loss. A total of 50 patients undergoing tympanoplasty with or without cortical mastoidectomy were included in the study. All these patients were followed up for a period of next 6 month post operatively.

Study design

A combination of retrospective and prospective cohort study was conducted. A total of 50 patients who underwent tympanoplasty with or without mastoidectomy were selected randomly and their clinical details were reviewed in a retrospective manner. Later these patients were followed up prospectively to assess the surgical outcome and clinical course in terms of graft uptake rate and improvement in hearing on the basis of tunning fork test.

Selection criteria

A group of 50 patients undergoing type I tympanoplasty (Wullstein and Zollner) with or without cortical mastoidectomy, for chronic otitis media mucosal disease, were selected randomly for the study. Only type I tympanoplasties were included to avoid any disparities in the ossicular pathologies and their reconstruction, which would alter the results of the study and make it more complicated. Of the total 50 patients who had undergone tympanoplasty, 21 patients had type I tympanoplasty alone, while the other 29 had type I tympanoplasty with cortical mastoidectomy. The patients in the study group were thus divided into two – the 1st group, Group A comprising patients who had type I tympanoplasty without cortical mastoidectomy; and the 2nd group, Group B that included patients undergoing type I tympanoplasty with cortical mastoidectomy. Both these groups were assessed intraoperatively for the size of the perforation, status of the middle ear, any ossicular chain abnormality and presence of tympanosclerotic patch. When cortical mastoidectomy was done, the findings in the mastoid antrum and air cells and the patency of the aditus were noted. All these cases were reviewed retrospectively to assess the presenting symptoms, duration of complaints, hearing loss, last episode of ear discharge, otoscopic findings, degree of hearing loss and mastoid pneumatization. The degree of hearing loss was noted based on the tuning fork tests and pure tone audiometry results. All cases with active evidence of infection as indicated by the duration of discharge free period being less than three weeks or the otoscopy showing active discharge in the middle ear were excluded from the study. All patients with general medical

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illnesses like diabetes, hypertension, tuberculosis etc., were excluded from the study. Those patients with symptomatic deviated nasal septum, chronic sinusitis, allergic rhinitis, chronic tonsillitis and other middle ear pathologies like ossicular fixity or damage were not considered for the study.

Surgical technique

All the patients were put on broad-spectrum antibiotics prior to the surgery; informed consent was taken and had overnight fasting. The patients were operated under general anesthesia, by the same surgeon to avoid any confounding factors in the technique of surgery or the skill of the surgeon. A postaural William Wilde incision was used in all the cases. Temporalis fascia was used as the graft material in all the patients. The mastoid antrum was opened by drill work and a complete cortical mastoidectomy was done in the second group of patients. The patency of the aditus was checked and the findings in the mastoid antrum noted. Any block in the aditus was cleared and an underlay type I tympanoplasty was done in all the cases. Postoperatively the broad-spectrum antibiotic was continued, together with analgesics and systemic decongestants. Suture removal was done on the seventh postoperative day. The patients were further followed up at 3 weeks, 3 months and 6 months to assess the status of the ear, graft uptake and hearing improvement in terms of tunning fork test at 3 months. The postoperative findings in both these groups were compared and the results were analyzed.

Observations

Group A included patients who underwent type I tympanoplasty without cortical mastoidectomy, comprising 21 patients. Group B included those patients who had type I tympanoplasty with cortical mastoidectomy, with a total of 29 patients in this group. The different intraoperative findings, the clinical data of the patients and other confounding variables in both these groups were analyzed and compared. On retrospective analysis, it was found that all the patients had history of ear discharge, while the other complaints included hearing loss, tinnitus and ear ache.

Analyses of results

The patients were followed up at 3 weeks, 3 months, 6 months and at 1 year. A successful graft uptake was defined as the closure of the tympanic membrane perforation either fully or partially (including cases with small residual perforations). The status of the tympanic membrane at the end of six month was taken as the result. In Group A, of the 21 cases, the graft was successfully taken up in 19 cases (90.47%), of which 1 case had a small residual perforation and the graft failed to take up in 2 cases. In Group B, the graft was successfully taken in 26 cases of the total 29 patients (89.65%) and failed in 3 cases [Table 1]. One patient in Group A and two patients in Group B, in whom the graft had failed, had postoperative infection in the middle ear. One case had a small residual perforation in the anterior quadrant. A Fisher's exact test was employed to analyse the results for statistical significance. The P value obtained was 1, which showed that the difference in the results were not statistically significant and was merely due to chance. Alternatively, a chi square test also showed the results to be insignificant (P = 0.82) with the P value being >0.05. The hearing improvement after the surgery was assessed in terms of tunning fork test at 3 months. The hearing improvement was considered successful if the Rinne's test is positive. In Group A, 14 patients have Rinne's test positive after operation. In Group B, 17 patients have Rinne's test positive after operation.[Table 2]. Though the difference in the hearing improvement between the 2 groups may appear significant in the first look, a statistical analysis of the results using the Fisher's exact test and a chi square test (P value 0.79) showed the difference to be insignificant. Thus, the relatively better hearing results obtained in Group B might be due to different selection bias. With regard to the surgical complications, no intraoperative or postoperative complications occurred in both the study groups, except for the small residual perforation in one case in each group. Regarding the symptom relief, all the patients in whom the graft had taken up had a subjective symptom relief both in terms of cessation of ear discharge and hearing improvement, except for 2 patients in Group A and 3 patients in Group B.

Table 1: Graft uptake rate

Patient group	Graft take up	Frequency	Percentage
Group A	Success	19	90.47%
	Failure	2	9.53%
Group B	Success	26	89.65%
	Failure	3	10.35%

Table 2: Hearing improvement

Group A	Frequency	Rinne's test		Weber's test (Lateralization)	
		+ve	-ve	Towards operated ear	Towards opposite ear
Bilateral CSOM	9	6	3	3	6
Unilateral CSOM	12	8	4	4	8

Group B	Frequency	Rinne's test		Weber's test (Lateralization)	
		+ve	-ve	Towards operated ear	Towards opposite ear
Bilateral CSOM	10	6	4	4	6
Unilateral CSOM	19	11	8	8	11

Discussion

Many authors have recommended mastoidectomy in conjunction with tympanic membrane grafting to increase graft success in revision tympanoplasty. The primary argument in favor of mastoidectomy has been an improvement in the middle ear and mastoid environment through clearance of diseased mucosa and through the ventilatory mechanisms of an open mastoid system. Opponents of mastoidectomy argue that the mastoid air cell system is thought to function, at least in part, as a buffer to the changes in pressure within the middle ear. The functional advantage of a large aerated mastoid was first suggested by Holmquist and Bergstrom[2] and, later, was substantiated by Sade et al.,[3,4] and Richards et al. The presence of a pneumatized mastoid greatly increases the volume of the middle ear and mastoid system, which, in accordance with Boyle's law, can moderate pressure changes in the middle ear cleft. Thus in a well-pneumatized mastoid, significant changes in middle ear pressure will likely have little effect on the middle ear and tympanic membrane owing to the buffering action of the mastoid air cell system. Hence, the pneumatized mastoid should not be disturbed by mastoidectomy. Although this physiological concept is certainly well supported in the literature, very few papers actually compare the success of tympanoplasty with and

without the addition of mastoidectomy. McGrew et al.,[7] attempted to compare the surgical outcome of tympanic membrane perforation repair with and without canal wall up mastoidectomy. Tympanic membrane repair was equally effective in both groups and the hearing results were comparable. They proposed that cortical mastoidectomy was not necessary for successful repair of simple tympanic membrane perforations. In our study by using temporalis fascia as the graft material, we obtained a graft uptake rate of 90.47% in patients who had tympanoplasty alone and 89.65% in patients who had tympanoplasty with cortical mastoidectomy. As per this study, it can be concluded that mastoidectomy is not necessary for successful closure of tympanic membrane perforations in chronic suppurative otitis media tubotympanic disease, excluding the cases with reservoir of infection. These patients had shown absence of disease progression along with reduction in the number of patients requiring subsequent procedures was noted in this group. In a study conducted by Yoon et al.,[5] in 119 cases, no significant difference was noted in the graft uptake rate when mastoidectomy was combined with tympanoplasty. Mishiro Y et al.,[6] obtained a graft success rate of 90.5% in tympanoplasty with cortical mastoidectomy and 93.3% in patients who had tympanoplasty alone. There was no statistically significant difference between the two and it was concluded that mastoidectomy is not helpful when combined with tympanoplasty for non-cholesteatomatous chronic otitis media, even if the ear is discharging. Balyan et al.,[8] have reported equivalent results of graft uptake and hearing result with or without mastoidectomy in their series of 323 tympanoplasties. They argued that mastoidectomy is usually not necessary for treatment of patients with non-cholesteatomatous chronic otitis media. In the study by Mishiro Y et al.,[6] the rates of the postoperative air-bone gap within 20 dB were 81.6% in the first group and 90.4% in the latter, without a statistically significant difference. Even in our study the difference in hearing improvement between the two groups were not statistically significant. In our study, the graft was not taken-up in 5 cases and 2 patients had a small residual perforation. About 20% cases in each group did not have a satisfactory hearing improvement. The cause of graft failure must have been postoperative infection. Though several authors support the theory that mastoidectomy improves the chance of successful tympanoplasty for patients with non-cholesteatomatous chronic otitis media, none prove that the addition of mastoidectomy yields better surgical results than tympanoplasty alone. When considering the addition of a mastoidectomy to a tympanoplasty, the performing surgeon should consider not only the potential added benefit but also potential risks and costs to the patient. As a result, it is incumbent on each surgeon to define this risk for his or her own procedures, review the relative risk, and account for it in determining whether a mastoidectomy is appropriate in each case. The demerits of this study are that the number of patients in both the groups is comparatively less than that required for an effective epidemiological study. Moreover, the duration of follow-up is short and no long-term analysis of disease progression, re-perforation or the need for subsequent procedures has been made.

Conclusions

Tympanoplasties with and without cortical mastoidectomy in cases of chronic suppurative otitis media (tubotympanic disease) showed no significant difference in outcome. The addition of cortical mastoidectomy to type I tympanoplasty did not improve the graft take-up rate or the hearing improvement in cases of chronic suppurative otitis media tubotympanic disease. Thus, cortical mastoidectomy is not necessary in cases of uncomplicated tympanoplasties.

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