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Comparison between Outcome of Myringoplasty with and without Ensuring the Patency of Aditus ad Antrum

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Abstract

Background: Myringoplasty is a technique for the closure of the simple perforation of the tympanic membrane. For the better outcome, myringoplasty combined with cortical mastoidectomy has been tried in many studies. **Objectives:** To compare the outcome of repair of tympanic membrane perforations with myringoplasty alone versus myringoplasty with opening of blocked aditus if any by doing antrostomy. **Methodology:** This was a prospective study. Patients included in the study were randomly allocated into 2 groups, the group I and the group II. The group I included 17 patients undergoing myringoplasty with antrostomy and the group II included 17 patients undergoing only myringoplasty. The blocked aditus was made patent if it was found blocked during antrostomy procedure. Graft uptake rate and improvement in conductive hearing loss were measured as success rate. **Results:** Mean age of the patients in the group I was 23.12 ± 7.55 years. The mean age of patients in the group II was 25.53 ± 8.79 years. In the group I unilateral disease was present in 6 (35%) cases. In the group II unilateral disease was present in 12 (70.5%) cases. In the group I subtotal perforation was present in 9 (52.9%) cases and moderate to large perforation was present in 8 (47%) cases. In the group II subtotal perforation and moderate to large perforation were present in 9 (52.9%) and 8 (47%) cases respectively. Aditus was found to be blocked in eleven (64.7%) patients in the group I. Successful graft uptake was seen in twelve cases (70.58%) in the group I and eleven cases (64.7%) in the group II with all of them showing improvement in hearing. The success rate of the group I was 70.58% while success rate of the group II was 64.7%. The mean of pre-operative and post-operative air-bone gap was 31.94 ± 11.7 dB and 24.8 ± 10.55 dB respectively in the group I with the mean hearing gain

of 7.06 ± 3.9 dB. Similarly, the mean of pre-operative and post-operative air-bone gap was 28.24 ± 10.5 dB and 17.9 ± 0.08 dB respectively in the second group with the mean hearing gain of 10.29 ± 4.83 dB. **Conclusion:** There was no difference between success rate of myringoplasty with antrostomy group and myringoplasty alone group in the treatment of mucosal tympanic membrane perforation; however in majority of cases where aditus patency was checked (group I) it was found to be blocked (64.7%).

Keywords

Myringoplasty, Antrostomy, Cortical Mastoidectomy

1. Introduction

Chronic otitis media (COM) has high prevalence rate worldwide. It is still more common in developing countries. It is an inflammatory process of the mucoperiosteal lining of the middle ear space and mastoid. COM is basically divided into squamous or mucosal types. The main problem associated with mucosal type is recurrent otorrhoea and hearing loss. So myringoplasty is recommended to get rid of these problems in the future.

Although it is one of the common disease conditions otologist encounters in day-to-day practice, the surgical treatment of COM is not fully satisfying to patients and the doctors as the procedure cannot be done with full assurance of success. Success rate of myringoplasty could be affected by multiple factors. Studies have been done to compare the success rate of myringoplasty done differently in terms of types of graft, types of surgical technique, types of approaches etc. Similarly myringoplasty with cortical mastoidectomy has also been identified as an effective method of treatment of chronic ear infection resistant to antibiotic therapy, but the effect of mastoidectomy on patients without evidence of active infectious disease remains highly debated and unproven [1]. There are multiple opinions regarding this matter. The first is that mastoidectomy is useful for both infected and dry ears [2]. The second is that mastoidectomy is useful for infected ears, but not for dry ear [3]. The third is that mastoidectomy is neither useful for infected ears nor for dry ears [4] [5].

The primary argument in favor of mastoidectomy has been an improvement in the middle ear and mastoid environment through clearance of diseased, secretory mucosa and the ventilator mechanisms of an open mastoid system [6]. The mastoid air cell system acts as a buffer to the changes in pressure within the middle ear, and by increasing the volume available to the middle ear space through a surgically opened mastoid, it would be protective for the TM in response to middle ear pressure changes. So, failure to create pneumatized air cell system in a case of mucosal COM may increase the chance of surgical failure [7]

Myringoplasty with cortical mastoidectomy is not only time consuming but also associated with more complications as compared to only myringoplasty. As

compared to cortical mastoidectomy antrostomy requires only a limited bony work. Hence antrostomy has advantages over cortical mastoidectomy. It is less time consuming and associated with fewer complications as compared to cortical mastoidectomy. Similar study has not been published before. So this study was done to find out whether there is any significant difference in outcome of surgery between myringoplasty alone and myringoplasty with antrostomy

2. Methodology

This is a prospective study. The study was done after taking the ethical clearance from the institutional review committee of B.P. Koirala Institute of Health Sciences, Dharan, Nepal where the study was conducted. The duration of study was 1 year. The study was conducted from January 2016 to December 2017. We included all the patients with mucosal tympanic membrane perforation planned for myringoplasty. The perforation size was classified as small perforation when it constituted less than 25% of the whole TM; moderate size perforation if constituted 25% - 50% of the whole TM; large perforation when constituted 50% - 75% of the whole TM; and subtotal perforation if constituted more than 75% of the whole TM [8]. There were more than one operating surgeons. It ranged from senior doctor (consultant doctor) to junior doctor (postgraduate student doctor).

The inclusion criteria were:

1) Patients with mucosal chronic otitis media;

2) Patients giving consent for the operative procedure;

3) No history of discharge at least for the last 1 month and;

4) No discharge on otoscopic examination prior to surgery.

Exclusion criteria were:

1) Evidence of squamous disease;

2) Recent history of ear discharge within a month;

3) Children of age less than 7 years;

4) Age of the patient more than 50 years;

5) Previous history of surgery in the same ear;

6) Ossicular discontinuity or ossicular fixation detected during the procedure.

Patients included in the study were randomly allocated into 2 groups by lottery method. The group I included 17 patients undergoing myringoplasty with antrostomy and the group II included 17 patients undergoing only myringoplasty. Antrostomy was done among the patients in the group I through post aural approach. Antrostomy was done in order to assess the patency of aditus ad antrum. For this we have done only limited work in the cortical bone. We made a hole in the Mc Ewen's triangle which allows the largest burr to pass through. We continued drilling till antrum is reached. We confirmed the patency of the aditus by putting normal saline from the antrum and checking its free flow into the middle ear. If the saline was found to be freely flowing then this would become the limit of our drilling work in the mastoid. If the aditus ad antrum was found to be blocked then it was made open by removing the edematous mucosa

or granulation tissue blocking the aditus. All patients were provided with thorough explanations about both surgical techniques. Informed and written consent were obtained before including in the study. Preoperative and postoperative care were similar for all the patients in both the groups. Documentation of the size of the perforation, preoperative otorrhea, status of the opposite ear, status of middle ear mucosa, status of ossicles were done. They were followed in the outpatient clinic at 1st, 4th and 6th weeks after the surgery. Pre-operative and post-operative (6th week after the surgery) pure tone audiometry (PTA) were done. Outcomes were measured in terms of successful graft uptake rate and improvement in conductive hearing loss. Success was defined as the absence of any of the following findings: perforation of the TM, atrophy, or atelectasis of the eardrum or otorrhea.

Statistics: For statistical analysis data were entered in SPSS. Independent sample *t*-test was used to compare quantitative variables in the two groups while Chi-square or Fisher's exact test was used for qualitative ones. Mean, standard deviation, frequency and percentage were used to summarize the data. A *p*-value of less <0.05 was considered statistically significant.

3. Result

The total number of patients in our study was 34.17 of them were in myringoplasty with antrostomy group (group I) and the other 17 were in the myringoplasty only group (group II). Different characteristics of the two groups are shown in Table 1. The mean age of the patients in the group I was 23.12 ± 7.55 years and the range was 13 - 36 years. The mean age of patients in group II was 25.53 ± 8.79 and the range was 8 - 46 years. In the group I, myringoplasty was done by post-aural approach in all the cases. In the group II, it is done by post aural approach in 15 (88%) cases and by permeatal approach in 2 (11.7%) cases. Regarding the use of grafting materials, temporalis fascia was used in all the cases of the group I. In group II, temporalis fascia was used in 15 (88%) cases and tragal perichondrium was used in 2 (11.7%) cases. Antrostomy with limited cortical work was done in all cases of the group I. Aditus was found to be blocked in eleven (64.7%) cases and patent in six (29.4%) cases (Figure 1).

In group I graft uptake was seen in twelve cases (70.58%) and failed in five (29.4%) cases. Surgery was done by senior and the junior doctors. Successful graft uptake rate in case of patients operated by senior doctors in group I was 12/13 (92.3%). In the group II successful graft uptake was seen in eleven cases (64.7%) and failed in six (29.4%) cases. In this group also surgery was done by senior and junior doctors. Successful graft uptake rate in case of patients operated by senior doctor was 7/10 (70%) in group II. The mean of pre-operative and post-operative air-bone gap was 31.94 ± 11.7 dB and 24.8 ± 10.5 dB respectively in group I with the mean of hearing gain of 7.06 ± 3.9 dB (Table 2). Similarly, the mean of pre-operative and post-operative air-bone gap was 28.24 ± 10.5 dB and 17.9 ± 7.08 dB respectively in group II with the mean of hearing gain of

Table 1. Comparision of different characteristics between the two groups.

Characteristics	Group I	Group II	*p*-value
Age	23.12 ± 7.55	25.53 ± 8.79	0.492 (NS)
Sex			
Male	8 (47.05%)	7 (41.17%)	0.546 (NS)
Female	9 (52.94%)	10 (58.82%)	
Ear involved by COM			
Unilateral	6 (35.29%)	12 (70.58%)	0.039 (S)
Bilateral	11 (64.70%)	5 (29.41%)	
Size of perforation			
Moderate to large	6 (35.29%)	9 (52.94%)	0.491 (NS)
Subtotal	11 (64.70%)	8 (47.04%)	
Ear operated			
Right	14 (82%)	8 (47%)	0.031 (S)
Left	3 (17.6 %)	9 (53%)	
Anaesthesia			
General	2 (11.76%)	1 (5.88%)	0.500 (NS)
Local	15 (88.23%)	16 (94.11%)	
Approach of surgery			
Post auricular	17 (100%)	15 (88.23%)	0.145 (NS)
Permeatal	0	2 (11.76%)	
Types of graft			
Temporalis fascia	17 (100%)	15 (88.23%)	0.145 (NS)
Tragal perichondrium	0	2 (11.76%)	
Surgery done by			
Senior	13 (76.47%)	10 (58.82%)	0.465 (NS)
Junior	4 (23.52%)	7 (41.17%)	
Surgical success rate			
Successful	12 (70.58%)	11 (64.70%)	0.714 (NS)
Unsuccessful	5 (29.41%)	6 (35.29%)	

(Note: NS—not significant; S—significant).

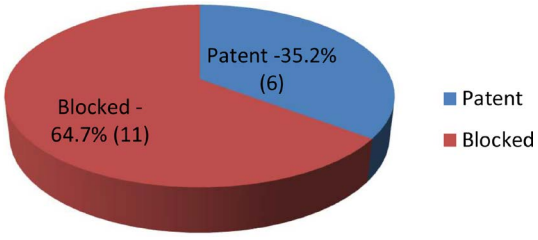

Figure 1. Aditus patency in Gp I.

Table 2. Pre-operative and post-operative hearing level.

Characteristics	Group I	Group II	*p*-value (t-test)
Pre-operative ABG	31.94 ± 11.7	28.24 ± 10.5	0.622
Post-operative ABG	24.8 ± 10.55	17.9 ± 7.08	0.117
p-value for comparison within the group	<0.01	<0.01	
Hearing Gain	7.06 ± 3.9	10.29 ± 4.83	0.387

10.29 ± 4.83 dB. Hearing improvement occurred in all the patients where there was successful graft uptake.

4. Discussion

Myringoplasty is a technique for the closure of the simple perforation of the tympanic membrane. For the better outcome of the surgical result, many different techniques have been tried e.g. different approaches of surgery, different grafts, combining with additional procedure like cortical mastoidectomy etc. However, the success rate achieved ranges between 70% - 98% [8]-[14]. In our study we have done limited cortical mastoidectomy expecting better outcome than myringoplasty alone.

In the group I successful graft uptake was seen in twelve out of seventeen cases (70.58%). The success rate achieved here was lower than in other studies [15] [16] [17]. This could be due to surgeon factor. Here surgery was done by senior as well as junior doctors. It has been shown that the degree of operative experience of the surgeon is found to be significantly correlated with the graft take rate [18]. The overall success rate was less than the success rate of the surgery done by senior surgeon which is however, comparable to the success rate of the other published literature [15] [16] [17]. Similarly overall success rate in case of group II was also lower as compared to other similar studies. This can be justified also on the fact that junior surgeon has also operated some of the cases (7/17). Becker J *et al.* [14] reported that the success rate around 70% which is comparable to our study.

Kamath MP *et al.* [1] found out that myringoplasty with cortical mastoidectomy was an effective method of treatment of chronic ear infection resistant to antibiotic therapy. The effect of mastoidectomy on patients without evidence of active infectious disease is still debated. Mutoh T *et al.* [3] revealed that mastoidectomy is useful for infected ears, but not for dry ear. Mohammed Abdel Tawab H *et al.* [4] concluded that mastoidectomy is not useful for either infected or dry ears.

A retrospective study by McGrew *et al.* [2] examined the effect of canal wall-up mastoidectomy on 484 dry, unoperated, noncholesteatomatous tympanic membrane perforations versus tympanoplasty alone. Their results showed identical perforation closure success rates of 91% in each group. Hearing differences also were statistically insignificant.

Mishiro *et al.* [19] did a study in which 251 cases of noncholesteatomatous

chronic otitis media were reviewed to determine whether tympanoplasty with mastoidectomy is more helpful to treat these cases than just tympanoplasty alone. In his study 147 patients were treated by tympanoplasty with mastoidectomy and 104 were operated on without mastoidectomy. There was no statistically significant difference between the two groups.

Albu *et al.* [5] conducted a study with 320 patients treated by either myringoplasty with cortical mastoidectomy or myringoplasty only. They concluded that there were no significant difference in outcome of surgery between cortical mastoidectomy and myringoplasty performed on patients with persistent or intermittent discharging CSOM and no evidence of cholesteatoma or mucosal blockage within the antrum.

In a randomized controlled study by Bhat *et al.* [20] the comparison between the outcomes for mastoidotympanoplasty and tympanoplasty alone was done in a tubotympanic, chronic, suppurative otitis media. There were no statistically significant differences in hearing improvement, tympanic perforation closure, graft uptake or disease eradication, comparing the two groups at 3 and 6 months post-operatively. So the study showed that Mastoidotympanoplasty was superior to tympanoplasty alone over a short-term follow-up period.

In a study done by Jackler and Schindler [21] 48 patients with chronic otitis media with tympanic perforations who underwent myringoplasty with mastoidectomy, it was found that simple mastoidectomy was found to be an effective means of re-pneumatizing the sclerotic mastoid and restoring the hearing.

In our study we did not find significant difference between success rate of group I and group II. The graft uptake rate and improvement in hearing both were not statistically significant. In our study also we could not reach the conclusion that cortical work should be done with myringoplasty as there was no significant difference in the success rate between the two groups.

Aditus was found to be blocked in eleven (64.7%) cases and it was found to be patent in six (29.4%) cases. A study by Bhagat M [22] it was reported that 10 out of 50 patients had blocked aditus either by granulation tissue or edematous mucosa. Our observation of blocked aditus among the patients of chronic otitis media (COM) was quite high. If 64.5% of the aditus are blocked then it seems reasonable to open it by doing cortical mastoidectomy. But to open aditus we can also do a small hole antrostomy by minimizing the working area of the mastoid cortex. By doing this we can assess the patency of the aditus and if it is found to be open then no need for further cortical work and if aditus is found to be blocked then with minimal hole we can assess the aditus. By doing so we can save the time, minimize the chances of injury to dural plate and sinus plate. And it can be done under local anesthesia as it can be done quickly as compared to cortical mastoidectomy. We found no extra complications in adding antrostomy procedure to myringoplasty except it took extra intraoperative time average of 30 minutes.

Our drawbacks were small sample size, short duration of follow up and mul-

tiple operating surgeons. Patients are operated by both less experienced and more experienced surgeons. A surgeon should have operated equal number of cases in group I and group II. So further study with larger sample size and preferably single operator is recommended.

5. Conclusion

There is no significant difference between the success rate (in the form of successful graft uptake and hearing improvement) of myringoplasty with antrostomy group versus myringoplasty only group in the treatment of mucosal tympanic membrane perforation. Majority of aditus ad antrum (64.5%) were found to be blocked in cases of mucosal chronic otitis media.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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