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Original Article

Outcomes of Myringoplasty in Wet and Dry Ears

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OBJECTIVE: To determine if the wet ear at time of surgery adversely affects the success rate of myringoplasty operations.

MATERIALS and METHODS: A total of 46 wet ears (with mucoid discharge) and 52 dry ears (at least 1 month before surgery) with mucosal chronic suppurative otitis media were operated on by myringoplasty. Graft take and hearing gain rates 6 months after surgery were calculated for both groups and compared.

RESULTS: The graft take rate was 87% for the wet ear group and 90.4% for the dry ear group. The hearing gain rate was 91.3% for the wet ear group and 92.3% for the dry ear group. Differences were found to be statistically nonsignificant for both graft intake (p=0.665) and hearing gain (p=1.00).

CONCLUSION: The success of myringoplasty is not adversely affected by the presence of mucoid ear discharge at time of surgery, and outcomes are comparable to those of the operation done for dry ear.

KEY WORDS: Myringoplasty, otitis media, tympanic membrane

INTRODUCTION

Myringoplasty is a common otological procedure indicated in mucosal chronic otitis media [1]. It aims to close the tympanic membrane perforation to prevent recurrent otorrhea, and create a sound-conducting mechanism in a well-aerated mucosa-lined middle ear cleft, and maintain these achievements over time [2-5].

Myringoplasty was first introduced by Berthold [6] in 1878, who used a thick skin graft, while Wullstein [7] and Zollner [8] further developed the procedure and used a split skin graft. By the 1980s, most otologists were convinced that a graft of mesodermal origin, such as perichondrium, fascia, vein, or fat tissue, was advantageous in myringoplasty [9].

Several factors may affect the outcome of myringoplasty, such as the site and size of the perforation, technique (underlay versus overlay), approach (endaural versus postaural), experience of the surgeon, condition of the other ear, type of used graft, age of the patient, and condition of the operated ear (dry versus wet) [5, 10-14].

Controversy exists about the condition of the middle ear as a prognostic factor in myringoplasty. The aim of this study is to compare the outcome of myringoplasty in wet and dry ears.

MATERIALS and METHODS

This prospective study was conducted in the Otorhinolaryngology Head and Neck surgery Department, Zagazig University, between January 2013 and August 2014. Informed written consent was signed by enrolled subjects, and institutional review board (IRB) approval was obtained (ZU-IRB #1663). The study included 84 patients with mucosal chronic otitis media who underwent myringoplasty after the exclusion of 12 patients who were lost to follow-up. Their ages ranged from 12 to 47 years (mean, 21.7). There were 44 females and 40 males. Bilateral myringoplasty was done for 14 patients (9 females and 5 males); so, the total number of operated ears was 98 (53 females and 45 males), divided into group (A), including 46 wet ears that showed mucoid discharge at the time of surgery, and group (B), including 52 ears that were dry for at least 1 month before surgery. Diabetic patients, patients with previous tympanoplasty in the same ear, patients needing ossiculoplasty, patients with sensorineural hearing loss in the same ear, and patients less than 12 years old were excluded. The proportions of the sizes and sites of perforations were comparable in both groups. The perforation size was estimated using Griffin [15] grade: grade I: perforation involving less than 1 quadrant (25%) of the pars tensa, grade II: involving from 1 quadrant (25%) up to 2 quadrants (50%) of the pars tensa, grade III: involving more than 2 quadrants (50%) up to 3 quadrants (75%) of the pars tensa, and grade IV: involving more than 3 quadrants (75%) of the pars tensa. The demographic

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characteristics of both groups are shown in Table 1. All patients were subjected to preoperative pure tone audiometry (PTA), and air conduction threshold for each patient was calculated as the mean of the 0.5, 1, 2, and 4 kHz thresholds [5]. Through the postaural approach, using the underlay technique, a harvested conchal perichondrium graft was used in all patients. Conchal cartilage was used to support the graft anteriorly in patients with grade III or grade IV perforations and with anterior perforations. Patients were followed up by otoscopic examination 3 weeks, 6 weeks, 3 months, and 6 months postoperatively. At the last follow-up, postoperative PTA was done for all patients, and air conduction threshold was calculated as was done preoperatively. Postoperative hearing gain was calculated as the preoperative air conduction threshold minus the postoperative one. Successful myringoplasty in terms of healing was defined as intact tympanic membrane 6 months after surgery. Hearing gain of at least 10 dB was considered success in terms of hearing [5].

Statistical analysis performed using SPSS 14.0 statistical software for Windows (SPSS Inc, Chicago, IL, USA). The significance level was set at $P < 0.05$. T-test was used for quantitative data, and chi-square test was used for qualitative data.

Table 1. Demographic characteristics of both groups.

	Group A (40 patients, 46 wet ears)	Group B (44 patients, 52 dry ears)	P value
Age (years)			
Average	14 – 45	12- 48	0.2626*, NS
Mean ± SD	20.5 ± 13.6	23.7 ± 12.4	(t = 1.1281)
Sex			
Male	20 (43.5%)	25 (48%)	0.647*, NS
Female	26 (56.5%)	27(52%)	(Chi-square: 0.21)
Size and site of perforation:			
Grade I, anterior	1 (2.17 %)	1 (1.9 %)	0.999*, NS
Grade I, central	4 (8.68 %)	5 (5.45 %)	(Chi-square = 1.167)
Grade I, posterior	4 (8.68 %)	6 (6.54 %)	
Grade II, anterior	1 (2.17 %)	2 (3.8 %)	
Grade II, central	7 (13.2 %)	8 (8.72 %)	
Grade II, posterior	7 (13.2 %)	6 (6.54 %)	
Grade III, anterior	2 (4.34 %)	2 (3.8 %)	
Grade III, central	4 (8.68 %)	6 (6.54 %)	
Grade III, posterior	6 (13. %)	7 (7.63 %)	
Grade IV	10 (21.7 %)	9 (9.81 %)	

SD: standard deviation; NS: non-significant

Table 2. Demographic characteristics of both groups

	Group A (46 wet ears) No (%)	Group B (52 dry ears) No (%)	P value
Graft intake	40 (87%)	47 (90.4%)	0.665, NS (Chi-square 0.187)
Hearing gain (≥ 10 dB)	42 (91.3%)	48 (92.3%)	1.00*, NS
Residual perforation	6 (13%)	5 (9.6%)	0.588, NS
Grade II, central	-	1 (1.9%)	(Chi-square 1.925)
Grade III, anterior	2 (4.34%)	2 (3.8%)	
Grade III, central	1 (2.17%)	1 (1.9%)	
Grade IV	3 (6.5%)	1 (1.9%)	
Complications			0.34*, NS
Perichondritis	1 (2.17%)	-	(Chi-square 2.176)
Postauricular hematoma	1 (2.17%)	-	

* Fisher's exact test; NS: non-significant

RESULTS

Graft uptake was noticed in 40 (87%) ears of the wet ear group and in 47 (90.4%) ears of the dry ear group, and the difference was not found to be statistically significant (p value, 0.665) (Table 2). Failures in the wet ear group were noticed in 6 ears, and 4 of them were due to anterior medialization of the graft, resulting in residual anterior perforation. Three of these ears had grade IV perforation, while the remaining one had grade III perforation before the operation. Persistent reperforation was the cause of failure seen in the other 2 ears of this group and was associated with upper respiratory infection. Failed myringoplasty was noticed in 5 ears of the dry ear group and was found in ears with preoperative grade II (one failure), grade III (one failure), and grade IV (3 failures) perforations. All of them were associated with anterior medialization of the graft. One patient had perichondritis of the auricle, and another one had postauricular hematoma, which was drained. Both ears belonged to the wet ear group.

Preoperative air conduction (AC) threshold ranged between 10.3 and 35.3 dB (mean 25.6) for the wet ear group and between 11.2 and 38.5 dB (mean 27.5) for the dry ear group. Postoperative AC threshold ranged between 0.0 and 33.9 dB (mean 13.6) for the wet ear group and between 0.0 and 35.5 dB (mean 15.2) for the dry ear group. Hearing gain ranged between 5.6 and 28.8 dB (mean 10.3) for the wet ear group and between 3.5 and 30.2 dB (mean 11.2) for the dry ear group (Table 3). Success in terms of hearing (hearing gain of at least 10 dB) was achieved in 42 (91.3%) wet ears and in 48 (92.3%) of dry ears (Tables 2, 3). Differences in hearing results between both groups were not found to be statistically significant. No patients had sensorineural hearing loss or worsening of their air conduction threshold.

DISCUSSION

It is a common belief that myringoplasty should be done in a totally dry ear to obtain a successful surgery. The uncertainty about the effect of wetness of the middle ear on the outcome of myringoplasty, in addition to the high number of patients who present with wet ear on the day of the surgery and postpone it because of this, encouraged us to investigate the results of myringoplasty in such patients and to compare it with the results of myringoplasty in dry ear.

It is difficult to control for all variables that play a part in determining the outcome of myringoplasty [16]. In the present study, the variables of age, sex, and site and size of the perforation showed no significant differences between both groups. Also, we used the same approach, graft material, and technique for both groups; so, we believe that both groups are broadly comparable. Patients with wet ear may

Table 3. Hearing results in both groups.

	Group A		Group B		P
	range	Mean (SD)	Range	Mean (SD)	value
AC threshold:					
- Preoperative	10.3-35.3	25.6 (4.72)	11.2 – 38.5	27.5 (5.33)	0.0697 (t=1.83)
- Postoperative Hearing gain	0.0 – 33.9	13.6 (7.56)	0.0 – 35.5	15.2 (7.31)	0.297 (t=1.0486)
	5.6 - 28.8	10.3 (6.43)	3.5 – 30.2	11.2 (7.8)	0.635 (t=0.4756)

SD: standard deviation; AC: air conduction

present with ear discharge (mucoid or mucopurulent) or only edematous middle ear mucosa, and to make the group of wet ears homogeneous, we included only patients with mucoid ear discharge.

The present study showed a graft intake rate for myringoplasty of 90.4% in dry ears and 87% in wet ears and a hearing gain rate of 91.3% in wet ears and 92.3% in dry ears, and these differences were not statistically significant for both graft intake and hearing gain. Our outcomes for both groups fall within the range of successful myringoplasty rates described in the literature as regards graft intake (71%-96 %) [5, 11, 16-19] and postoperative hearing improvement (72%-97%) [5, 17, 20-21]. One big series conducted by Mills et al. [16] has reported a success rate of 82% and 83% for myringoplasty in active and inactive ears, respectively. A meta-analysis done by Vrabec et al. [22] considering the effect of otorrhea on closure rate indicates that tympanoplasty on a discharging ear is as successful as in a dry ear. The 2 previously mentioned studies defined wet ear as an ear that is actively discharging and did not describe the nature of the discharge. In a comparative study, Nagle et al. [23] included only patients with mucoid discharge in the wet ear group and achieved a primary complete graft uptake rate of 88% and 74% in dry and wet ears, respectively. They did not find this difference to be statistically significant, but the p value was approaching the significance value (p = 0.07). Also, no statistical significance was found regarding hearing improvement in the two groups. Contrary to our results, many studies have reported that a discharging middle ear at time of surgery influences the outcome of myringoplasty either positively or negatively. Gersdorff et al. [24] and Pignataro et al. [10] found a better outcome when operating on a dry ear, and both recommended medical treatment of discharging ears to control the inflammatory changes before myringoplasty. Interestingly, Pignataro et al. [10] have concluded that among various studied factors that may affect the outcome of myringoplasty, a dry ear is the single most meaningful factor in the success of a graft. The duration of dryness of the ear before myringoplasty was one of several factors studied by Onal et al. [11] to determine their influence on the outcome of the operation. They have reported that myringoplasty is more likely to be successful if the ear has been dry for a longer period. They found that whenever the ear is dry for less than 1 month before surgery, the success rate is 60%, and if the ear is dry for more than 1 month, the success rate increases to 82%, and the difference was statistically insignificant but close to the level of significance (p=0.067). On the other hand, few studies revealed a positive effect of ear discharge on graft uptake. Caylan et al. [25] have reported better healing of the tympanic membrane after myringoplasty in a discharging ear and achieved a 100% success rate, while it was 75% in dry ears. They attributed such better results in discharging ears to the probable increase in the vascularity of the middle ear, which could have favored faster and better healing and graft uptake. Vijayendra et al.[26] conducted a histopathological study and found that the tympanic membrane of wet ears showed preservation of all layers of the epithelium, a higher number of inflammatory cells, and abundant blood vessels, while in totally dry ears, the tympanic membrane showed a single layer of epithelium, as well as scant or absent inflammatory cells and blood vessels. Due to these findings, they inferred that graft failure is more in totally dry perforations, and they recommended conversion of all tympanic membrane perforations in dry ears into subtotal perforations to remove the atrophic and avascular portion of the ear drum.

Good vascularization or angiogenesis of the grafted material is one of the most important physiological factors for successful grafting in myringoplasty. Noh and Lee [27] evaluated the vascularization time of the grafted temporalis fascia and tragal perichondrium in active and inactive mucosal chronic otitis media and found that there is no significant relationship between vascularization time of the graft and the status of middle ear mucosa (dry versus wet).

In conclusion, mucoid ear discharge is not a reason to postpone myringoplasty, as it has no adverse effect on the outcome of the operation as regards graft uptake and hearing gain.

Ethics Committee Approval: Institutional review board (IRB) approval was obtained (ZU-IRB #1663).

Informed Consent: Informed written consent was signed by enrolled subjects.

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