

Successful Myringoplasty - Do The Site & Size Of TM Perforation Matter?

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Abstract

Objective: To determine the impact of size and site of tympanic membrane perforation on the success of myringoplasty.

Methodology: A cross-sectional, descriptive study was carried out from July 2019 to December 2021 in the ENT Department of Fauji Foundation Hospital Rawalpindi to achieve this objective. After approval of the Hospital Ethical Committee, a sample size of 100 patients was calculated by using the WHO sample size calculator. Patients were selected through Non-probability convenient sampling. Informed consent was obtained from all the patients. All the patients were operated upon through a postauricular approach using the underlay technique and temporalis fascia was used as a graft in all the cases. The success of myringoplasty was assessed one month after surgery. Myringoplasty was considered successful upon complete closure of the defect as assessed under a surgical microscope. Data analysis was done using SPSS version 24. Qualitative variables like gender, site of perforation, size of perforation, and success rate were measured on frequency and percentage. Effect modifiers like age, gender, size of perforation, and site of perforation were controlled by the stratification. A chi-square test was employed and a p-value less than or equal to 0.05 was considered significant.

Results: There were 52% males and 48% females. The mean age was 35.5 years and they ranged between 15 to 45 years. There were 46% of patients in group 15-25 years, while there were 54% of patients in group 26-45 years Overall myringoplasty was successful in 71% of patients. Myringoplasty was successful in 73% of males, while it was successful in 69% of females. It was successful in 93.5% of patients in the age group 15-25 years, while it was successful in 52% of patients in the age group 26-45 years. Regarding the size of perforation, it was successful in 100% pinhead size perforations, 86.7% small-sized, 89.5% medium-sized, 42% large, and 6.7% subtotal-sized perforations. Regarding the site of the perforations, myringoplasty was successful in 96% anterior, 100% posterior, 40% inferior, 40% central, and 8% subtotal/large perforations.

Conclusion: The success rate of myringoplasty has a definite association with size and site of perforation. The smaller the perforation, the higher would be the success rate. Similarly, anterior and posterior perforations heal better as compared to inferior and central perforations.

Keywords: Myringoplasty, Tympanic membrane perforation, Tympanic membrane, Site & Size of TM perforation.

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1. Introduction

Chronic Suppurative Otitis Media (CSOM) is defined as persistent or recurrent inflammation of the middle ear cavity in the presence of persistent perforation of the tympanic membrane and recurrent or persistent ear discharge for more than three months duration. It is accompanied by hearing loss of variable degrees. CSOM is quite common in children who are more prone to upper respiratory tract infections, but it may persist till adulthood. Dysfunction of the Eustachian tube (ET) or ascending infection from the ET is the most important underlying factor present in 70% of patients.

Management of CSOM, tubo-tympanic type is based first on achieving a dry ear with the help of regular aural toilet combined with topical ear drops. Systemic antibiotics are not important as their insufficient

therapeutic tissue concentration is less effective than topical antibiotic drops. This objective is followed by myringoplasty to close the tympanic membrane defect to restore hearing as well as to prevent recurrent middle ear infections.

Conventionally myringoplasty is performed around 04 weeks after the infection has subsided. Some of the perforations heal spontaneously after the resolution of infection, but in those cases that do not heal on their own, myringoplasty is indicated. Myringoplasty is a common surgical procedure that refers to the closure of the tympanic membrane defect to improve hearing and prevent recurrent middle ear infections. Myringoplasty was introduced by Berthold in 1878 but modified by Heermann in 1958. How far a myringoplasty is successful in achieving the desired results, depends upon many factors, such as the size and site of the perforation, whether the ear is dry or

wet, the age of the patient, the function of Eustachian tube, and course the nature of the graft etc.

In CSOM with pin-head perforations, myringoplasty with fat tissue from the ear lobe can also be done successfully as an office procedure. A significant success rate has been seen even in large perforations. Other materials such as tragal perichondrium, tragal cartilage, and venous graft have been used for myringoplasty, but the most favoured is the temporalis fascia autograft due to its easy availability and its low metabolic requirements. Besides the transmeatal approach for smaller perforations, both the post-aural and endaural approaches are adopted by the surgeons. The graft is laid either by overlay technique or as an underlay graft. The underlay technique results in better survival rates. Moreover, it gives better access to the middle ear. Regarding the surgical approaches, the post-auricular approach has ease in accessing the tympanic cavity⁵. With the advancement in technology and improved surgical techniques, the graft success rate is expected around 90-97%. Outcomes have also improved since the introduction of endoscopic myringoplasty.

Since the site and size of TM perforations are two important determinants for a successful myringoplasty, we carried out this study to analyze the effects of these factors.

2. Materials & Methods

A cross-sectional, descriptive study was carried out in the ENT Department of Fauji Foundation Hospital, Rawalpindi from July 2019 to December 2021 to determine the impact of size and site of tympanic membrane perforation on the success of myringoplasty.

A total of 100 patients with CSOM, tubotympanic type with dry ear drum perforation were selected for this study. The sample size (n= 100) was calculated by using the WHO sample size calculator by non-probability convenient sampling technique. Selection criteria for this study included an inactive dry central perforation in a known case of CSOM, belonging to both genders, within the age range of 15-50 years, and having no previous surgery in that ear. The patients with cholesteatoma, ossicular erosion, mixed or sensorineural hearing loss, deformity of the external ear canal and Diabetes Mellitus were excluded.

Permission for the study was taken from Hospital Ethical Committee and informed consent was taken from

all the patients before enrolment for the study. A detailed history was obtained from all the selected patients. Complete Head and Neck and ENT examinations were carried out. Otoscopic examination of the ear drums was done in the OPD pre-operatively with the help of a surgical microscope. The size of the perforation was analysed and perforations were classified as pin-hole size, small, medium, large and subtotal. Similarly, sites of perforation were also analysed preoperatively by otoscopy and were classified as anterior, posterior, inferior and central perforations based on the location of perforation. Pure Tone Audiometry was done, pre and post-operatively, in all the selected patients to assess and record their hearing thresholds for both air and bone conduction.

All the patients were operated on through a post-auricular approach using the underlay technique and temporalis fascia was used as a graft in all the cases. The success of myringoplasty was assessed one month after surgery. Myringoplasty was considered successful upon complete tympanic membrane closure as assessed on otoscopy.

Data were entered and analysed using SPSS version 24. Quantitative variables like age and size of perforation were measured as mean and standard deviation. Qualitative variables like gender, site of perforation, size of perforation and success rate were measured on frequency and percentage. Effect modifiers like age, gender, size of perforation and site of perforation were controlled by the stratification. A chi-square test was employed and a p-value less than or equal to 0.05 was considered significant.

3. Results

Out of 100 patients, 52 (52%) were males, while 48 (48%) were females. The mean age of patients was 35.4 ± 7.5 SD years, while the patients' ages ranged between 15- 45 years. There were 46 (46%) patients in group 15-25 years, whereas there were 54 (54%) patients in group 26-45 years.

Regarding the size of perforation, pinpoint perforations were present in 32 (32%), small in 15 (15%), medium in 19 (19%), large in 19 (19%) and subtotal in 15 (15%) patients respectively. As regards the site of perforation, these were found to be anterior in 26 (26%), posterior in 24 (24%), inferior in 25 (25%) and central in 25 (25%) patients respectively. (Table 1).

Myringoplasty was successful in regards to the closure of defects, in 71 (71%) patients as shown in Figure 1.

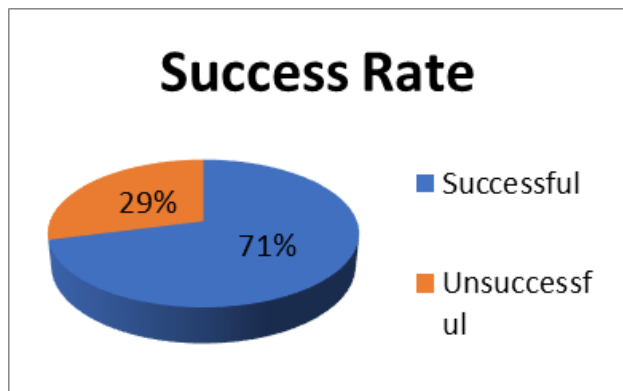


Figure-1 Success Rate of Myringoplasty

With regards to the size of the perforations, the procedure was successful in 32 (100%) pinpoint, 13 (86.7%) small, 17 (89.5%) medium, 8 (42.1%) large, 1 (6.7%) subtotal size of perforations respectively as shown in Table 1.

Table-1 TM Perforation’s characteristics (Site & Size) & Post Op Success Rate

TM Perforations characteristics	Frequency (n=100)	Success Rate
	Percentage (100%)	
Size of perforation		
Pinpoint	32 (32%)	32 (100%)
Small	15 (15%)	13 (86.7%)
Medium	19 (19%)	17 (89.5%)
Large	19 (19%)	08 (42.1%)
Subtotal	15 (15%)	01 (6.7%)
Site of perforation		
Anterior	26 (26%)	26 (100%)
Posterior	24 (24%)	24 (100%)
Inferior	25 (25%)	20 (80%)
Central	25 (25%)	01 (04%)

Regarding the site of perforation, myringoplasty was successful in 26 (100%) anterior, 24 (100%) posterior, 20 (80%) inferior and 1 (4%) central perforation respectively as shown in Table 1.

With regards to gender, out of 52 male patients, myringoplasty was successful in 38 (73%), while it was unsuccessful in 14 (27%) patients. Among the 48 females, myringoplasty was successful in 33 (69%) patients, while it was unsuccessful in 15 (31%) patients (p=0.665) as shown in Table 2

Table-2 Stratification of Success of Myringoplasty Concerning Gender

Gender	Myringoplasty		Total	p- Value
	Successful	Unsuccessful		
Male	38 (73%)	14 (27%)	52 (100%)	0.665
Female	33 (69%)	15 (31%)	48 (100%)	
Total	71 (71%)	29 (29%)	100 (100%)	

With regards to age groups, among the 46 patients in the age group 10-25 years, myringoplasty was successful in 43 (93.5%) patients, while it was unsuccessful in 3 (6.5%) patients. Among the 54 patients in the age group 26-45 years, myringoplasty was successful in 28 (52%) patients, while it was unsuccessful in 26 (48%) patients (p=0.000) as shown in Table 3.

Table-3 Stratification of success of Myringoplasty concerning Age group

Age	Myringoplasty		Total	p- Value
	Successful	Unsuccessful		
15-25 Years	43 (93.5%)	03 (6.5%)	46 (46%)	0.000
26-45 Years	28 (52%)	26 (48%)	54 (54%)	
Total	71 (71%)	29 (29%)	100 (100%)	

5. Discussion

The foremost objective of a myringoplasty is to improve hearing and prevent recurrent infections by the

closure of the tympanic membrane defect. The success of myringoplasty is determined by many factors besides the size and site of the perforation, but these two factors are not very widely documented and more emphasis has been given to hearing improvement. Our study showed successful closure in 71% of the patients, although Acharya et al (2022) showed a success rate of 83-84%, while Karunaratne & Violaris (2021) showed a success rate of 93-94%. Our success rate in terms of graft uptake is quite acceptable as many of the published studies show a success rate of 35-95%. So our success rate falls within the acceptable range. Previous data have suggested the size of the TM perforation to be an influential prognostic factor in successful graft uptake. Our study also shows a 96% success rate in small perforations while it was only 26% in the case of large perforations. This conclusion is also supported by a study that showed success in 74% of small perforations as compared to 56% in large perforations. Similarly another study by Jurado et al (2008) also showed 90% success rate for small perforations as compared to 54.5% in large perforations. Two similar studies also showed a much higher success rate in small perforations as compared to large perforations. Singh et al (2022) also concluded that the size of the TM perforation is a significant factor leading to the success rate of a myringoplasty. But in contrast, Mondal et al (2019) showed a better success rate in large perforations as compared to smaller perforations. But the measure for success in his study was hearing gain, rather than closure of the defect. And this is understandable as smaller perforations cause a little loss of hearing. Kim et al (2021) showed that the site or size of a tympanic membrane perforation has no role in determining a successful myringoplasty. Although there is a difference of opinion regarding the size of the perforation as a significant factor in graft uptake, most of the studies favour our conclusion in this regard. Wu et al (2015) showed long term basis, the size of a TM perforation mattered in cases of large perforations. But Westerberg et al (2011) did not show any association of graft uptake with variables like cause or size of perforation. Our study does not show any difference in the success rate of graft uptake in both anterior, posterior and inferior perforations, but success rates are quite low among central perforations. But a study, by Carr et al (2015) showed that the graft uptake rate in cases of anterior and subtotal perforations was quite

low. Pothala et al (2018) also considered the site of perforation as a significant factor in determining the fate of graft uptake. In another study, Das et al (2015) also reported a 100% success rate in posterior perforations and the lowest in cases of central perforations and these results are quite similar to our results in this aspect. Gersdorff et al (2010) also reported that the anterior perforations were the most difficult to close. A similar observation was also made by Darouassi et al (2019) when they found anterior perforations to be a bit more difficult to heal by myringoplasty. Regarding the prognostic factors for a successful myringoplasty, Karakus et al (2020) concluded that the site of the perforation is more important than the size, and in contrast, showed the best results in central perforations. Tseng et al (2016) also reported that repairing anterior perforations is a more challenging factor than the other sites. In another study, Singh et al (2005) showed that the success rate is far better in posterior and inferior TM perforations as compared to anterior TM perforations. Lima et al (2011) also did not find the site of perforation as a significant prognostic factor. A study by Saleh et al (2019) also concludes that the size of the perforation was a significant influence on graft uptake while the site of the perforation had no such influence. All these studies show that there is a definite impact of the size and site of the tympanic membrane on graft uptake. The small sample and conduction of the study at a single centre limit the generalization of the results of this study. However, it is recommended that a study may be carried out on a much higher number of cases and that too in more than one centre to determine the significance of size and site of TM perforations as significant factors in determining successful myringoplasties.

5. Conclusion

The success rate of myringoplasty has a definite association with size and site of perforation. The smaller the perforation, the higher would be the success rate. Similarly, anterior and posterior perforations heal better as compared to inferior and mid-position perforations.

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Contributions:

A.M, M.K.H - Conception of study

A.M, M.K.H, I.A, N.K, A.U.A, S.N -

Experimentation/Study conduction

A.M, M.K.H, I.A, N.K -

Analysis/Interpretation/Discussion

A.M, I.A, N.K, A.U.A, S.N - Manuscript Writing

M.K.H - Critical Review

M.K.H - Facilitation and Material analysis

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