

Original Article

Factors affecting surgical outcome of myringoplasty

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Abstract:

Introduction: This prospective study was carried out to evaluate the factors that affect the graft take rate as well as hearing improvement after myringoplasty.

Method: In this study 60 patients were divided into several groups based on 4 factors like size of perforation (small, medium and large), site of perforation (anterior central, posterior central and central malleolar), Condition of the middle ear (dry & wet) and surgical approach (post auricular and transcanal).

Surgical outcome of myringoplasty was measured on the basis of graft take rate and post operative hearing improvement.

Results: Size of the perforation affects the graft take rate and post operative hearing gain. Post operative closure of air-bone gap was 10.45 dB, 19.21 dB and 18.86 dB in small, medium and large perforation respectively.

Hearing gain was greater after closure of large perforation than the smaller one. Graft take rate was 100%, 82% and 72.73% in small, medium and large perforation respectively. Graft take rate was greater in small perforation than other.

Site of perforation also affects surgical outcome after myringoplasty. Graft take rate in anterior central, posterior central and central malleolar perforation was 66.67%, 82.25% and 83.79% respectively. Graft take rate was higher in central malleolar perforation than anterior central perforation. Post operative air-bone gap closure after myringoplasty was 15.31 dB, 12.38 dB and 20.89 dB in anterior central, posterior central and central malleolar perforation respectively. Post operative improvement of hearing was greater in central malleolar perforation. Condition of middle ear at the time of operation also affects the surgical outcome. Graft take rate was 89.36% in dry perforation and 53.85% in wet perforation. Graft take rate was greater in dry perforation. Closure of air-bone gap was 18.23 dB and 7.8 dB in dry and wet perforation respectively. Hearing improvement was greater in dry perforation.

No significant difference was found in post-aural and transcanal approach.

Conclusion: From this study we concluded that site and size of tympanic membrane perforation and condition of middle ear effects surgical outcome after myringoplasty.

Key words: Myringoplasty, hearing improvement, graft take rate.

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Introduction:

Myringoplasty is the term used to describe the surgical repair of the perforated tympanic membrane. Perforation of the tympanic membrane primarily results from middle ear infection, trauma or iatrogenic causes. The literature suggests that up to 80% of this perforation undergoes spontaneous closure. Three principal indications for myringoplasty are- 1) Recurrent otorrhea, 2) desire to swim without wearing water proof in the ear and 3) to improve the conductive hearing loss resulting from a non-healing perforation of the tympanic membrane.¹

The primary goal in myringoplasty is the restoration of the integrity of the tympanic membrane. This result could be obtained by means of surgical techniques based on the positioning of the connective tissue at the site of the ear drum perforation, with the purpose of stimulating skin and mucosal regeneration, leading to permanent closure of the defect.²

Success rate in the range of 90% are frequently quoted. Despite the high success rate and the routine nature of the procedure, the effect of many influencing factors remains unresolved. These include the age of the patients; site of the perforation, size of the perforation, length of the ear has been dry prior to surgery, the presence of infection at the time of surgery and status of the opposite ear.³

The size of the perforation was graded as small (less than 50%), medium (50-75%) and large (> 75%).⁴

The size of the perforation often has been mentioned as a determining aspect. Some reports indicate that large perforations are more prone to the reperforation.⁵ The size of perforation was found to be related to a worse prognosis in large defects.²

Several authors have reported a higher incidence of graft failure in anterior perforations. This has been attributed to a

combination of factors, including anterior perforation being technically more challenging to repair owing to more difficult access, resulting in an increased risk of graft misplacement, the anterior portion of tympanic membrane also have relatively poor perfusion.¹

There are three recognized surgical approaches accessing the tympanic membrane for myringoplasty; endaural, post auricular, permealatal/ transcanal. In general, the site of perforation and surgeon's experience determine the favoured approach. The endaural approach is preferred for posteriorly based or central perforations, whereas the post-aural approach allows more superior access to anteriorly based perforation.

The permealatal approach is an option for small central perforation in which the ear canal is wide enough to allow good visualization of the tympanic membrane through an ear speculum.¹

This study analyzed a number of factors postulated to affect surgical outcome in order to assess their utility in selecting successful surgical candidates. Myringoplasty is a common surgical procedure and analysis of their factors will certainly help in future selection and care of the patients.

Methods:

This prospective study was carried out in the department of ENT - Head & Neck surgery of Bangabandhu Sheikh Mujib medical University (BSMMU), Dhaka, from July 2007 to June 2009. Sixty (60) cases were selected for this study that underwent myringoplasty using underlay temporal fascia graft. The assessment of the patients was established on the basis of history, clinical examination and audiometric test, per operative assessment and post operative follow up was done. Perforation were classified as anterior

only if the entire perforation was anterior to the handle of the malleus, if an anterior perforation extended posterior to the malleus handle, it was grouped into central perforation. The perforation entirely situated posterior to the handle of the malleus was considered posterior. Entire perforation of the pars tensa with fibrous annulus as the only remnant was considered total perforation. The size of the perforation was graded as small (less than 50%), medium (50-75%) and large (> 75%). Patients were grouped according to the condition of the middle ear as dry or wet. Here wet ear means only serous/mucous middle ear discharge. All cases of purulent discharge were excluded. Patients were also grouped according to surgical approach as post auricular and transcanal. Hearing impairment was assessed by pure tone audiometry with or without masking.

Most of the myringoplasty was done by post-auricular approach. Rests of the patients were operated by transcanal approach depending on the condition of the external auditory canal and the position of the perforation. In all of the patients temporalis fascia was used as graft material. Underlay technique was used in every case. In patients with bilateral ear disease operation was performed in one ear at a time. Operations were performed by various surgeons.

Inclusion criteria: Tubo tympanic variety of CSOM, Age 15 to 45 years.

Exclusion criteria:

- (a) Tympanosclerosis and ossicular chain disorder, Presence of cholesteatoma.
- (b) Age less than 15 years and more than 45 years.
- (c) History of previous operation in the same ear.

Patients were followed up postoperatively up to 3 months and after that as needed. During follow-up condition of the wound, condition of the external auditory canal and tympanic membrane was noted. Surgical outcome of myringoplasty was measured on the basis of the condition of the graft taken or failure and postoperative hearing gain. Hearing improvement was assessed by closure of air-bone gap.

Results:

Table-I

Distribution of patients by age (n=60)

Age group (years)	Male	Female	Total	Percentage
15-25	10	7	17	28.33
26-35	21	9	30	50
36-45	4	5	9	15
46-55	1	3	4	6.67
Total	36	24	60	100

Table-I showed majority of the patients (50%) were among the age group 26-35 years. Mean age of the patients was 30 years.

Table-II

Distribution of patients according to site of tympanic membrane perforation (n=60)

Site of perforation	No. of patients	Percentage (%)
Anterior central	6	10
Posterior central	17	28.33
Central malleolar	37	61.67
Total	60	100

Table 11: Showed most of the patients (61.67%) had central malleolar perforation.

Table-III

Distribution of patients on the basis of perforation size (n=60)

Size of perforation	No. of patients	Percentage (%)
Small	13	21.67
Medium	25	41.67
Large	22	36.67
Total	60	100

Above table showed that most of the patients (41.67%) had medium size perforations.

Table-IV

Distribution of patients on the basis of surgical approach (n=60)

Surgical approach	No. of patients	Percentage (%)
Post-aural	50	83.33
Transcanal	10	16.67
Total	60	100

Most of the patients (83.3%) underwent myringoplasty by post-aural approach.

Table-V

Distribution of patients according to condition of middle ear (n=60)

Condition of middle ear	No. of patients	Percentage (%)
Dry	47	78.33
Wet	13	21.67
Total	60	100

Condition of middle ear of the patients (78.33%) was dry and remaining (21.67%) was wet.

Table VI

Distribution of improvement of hearing thresholds after myringoplasty in relation to the size of the perforation (n=60)

Size of perforation	Bone conduction thresholds Mean (dB)	Air conduction thresholds Mean (dB)	Air bone gap Mean (dB)
Small	1.08	11.17	10.45
Medium	2.01	21.60	19.24
Large	0.92	18.67	18.67

t= 3.11 (p<0.001)

The closure of air-bone gap in small, medium and large perforation was 10.45 dB, 19.24 dB and 18.67 dB respectively. The difference of air bone gap closure between small and larger perforation was statistically significant by unpaired t-test (p<0.001). The improvement of hearing between other groups was also statistically significant.

Table-VII

Distribution of improvement of hearing thresholds after myringoplasty in relation to the site of the perforation (n=60)

Site of perforation	Improvement of Bone conduction thresholds Mean (dB)	Improvement of Air conduction thresholds Mean (dB)	Improvement of Air bone gap Mean (dB)
Anterior central	1.87	16.87	15.31
Posterior central	1.22	13.49	12.41
Central malleolar	1.10	20.03	20.89

t= 3.82 (p<0.001)

Table VII showed that closer of air bone gap was maximum (20.89 dB) in central malleolar perforation and minimum (12.48 dB) in posterior central perforation. Which was statistically significant from unpaired t-test (p<0.001).

Table-VIII

Distribution of improvement of hearing thresholds after myringoplasty in relation to condition of the middle ear (n=60)

Condition of the middle ear	Improvement of Bone conduction thresholds	Improvement of Air conduction thresholds	Improvement of Air bone gap
	Mean (dB)	Mean (dB)	Mean (dB)
Dry	1.87	17.75	18.23
Wet	0.57	6.62	7.80

t= 2.34 (p<0.02)

Above table showed closure of air bone gap was more in dry ear. The difference between two groups was statistically significant from unpaired t-test (p< 0.02).

Table-IX

Distribution of improvement in hearing thresholds after myringoplasty in relation to surgical approach (n=60)

Condition of the middle ear	Improvement of Bone conduction thresholds	Improvement of Air conduction thresholds	Improvement of Air bone gap
	Mean (dB)	Mean (dB)	Mean (dB)
Post-aural	1.32	17.95	17.3
Transcanal	2.77	24.62	15.46

This table showed that distribution of improvement of hearing thresholds in relation to the surgical approach. Difference between two groups was not statistically significant from unpaired t-test (p> 0.05).

Discussion:

Four preoperative factors were studied to see the surgical outcome. These were the site of perforation and size of perforation of the tympanic membrane, condition of the middle ear and surgical approach. In a study it was showed that age, size and site of the perforation, condition of the ear and grafting materials were considered influencing factors affecting the success after myringoplasty.⁵

Surgical outcome was measured on the basis of graft take rate and post operative hearing improvement. Another series showed that

main outcome measures were a) success- i.e. intact tympanic membrane, b) closure of the perforation, c) post operative hearing gain.⁶

In this study average graft taking rate was 81.67%, which is similar with other study with success rate (60-99%) for closure of the tympanic membrane in adult.¹

Various studies showed that there are different criteria for assessment of hearing improvement after myringoplasty. Portman⁷ favoured a hearing gain method, whereas Elbrond⁸ used the mean air-bone gap for each frequency.

Majority of perforation was medium sized followed by large and small. Mean preoperative air-bone gap of small perforation was 21.91 dB and that of medium perforation was 34.8 dB which was statistically significant from

unpaired t- test ($p < 0.05$). Improvement of air-bone gap closure after myringoplasty in small, medium and large size perforation was 10.45 dB, 19.24 dB and 18.67 dB respectively. The study is similar to other study.⁹

The graft take rate was small, medium and large perforations were 100%, 80% and 72.73% respectively. Other series³ showed that the failure rate was higher with large perforations.

Majority of the patients had malleolar perforation (61.67%) followed by posterior central (28.33%) and anterior central (10%). Graft take rate was more in central malleolar perforation (83.79%) than posterior central (82.35%) and anterior central perforation (66.67%). Though in a series it was found that anterior perforation predisposed to an unfavourable take rate of the graft.⁵

Improvement of hearing threshold after myringoplasty was more in central malleolar perforation (20.89 dB) than anterior central (15.31 dB) and posterior central (12.48 dB). A study² obtained worse result with posterior perforation which is relevant to our study.

Maximum perforations (78.33%) were dry. Graft take rate was more in dry perforation (89.36%) than wet perforation (53.85%). Improvement of hearing threshold was more in dry perforation (18.23 dB) than wet (7.8 dB).

Similar observation was also noted in the present series.

No operation was performed through endaural approach. Most of the operation was done by post-aural approach and remaining by transcanal approach. Graft take rate was 82% in post-aural approach and 80% in transcanal approach. Improvement of hearing threshold after myringoplasty in relation to surgical approach was 17.3 dB in post-aural approach and 15.46 dB in transcanal approach.

According to another study⁴, post-aural is superior to transcanal approach. Significant difference on approaches was also not seen in the present study.

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