

Original Article

Hearing Evaluation after Myringoplasty in Underlay Technique

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Abstract

Objective: to determine the success rate of underlay technique of myringoplasty regarding rate of graft take, complications and hearing improvement.

Methods: This Cross sectional study was done in the department of ENT & Head-Neck Surgery, Dhaka Medical College Hospital & Shaheed Suhrawardy Medical college Hospital, Dhaka from July 2012 to December 2012. Sixty(60) patients who underwent myringoplasties were included in the study. All myringoplasty were performed by a postaural approach using autologous temporalis fascia and underlay technique.

Results: The total success rate (graft uptake) was 88.3% and of the successful cases an overall hearing improvement was achieved in 73.58% of cases. The mean audiological improvement in air conduction threshold was 13.24 dB & mean closure of the air bone gap was 11.64 dB. The mean values of hearing gain of small perforations and subtotal perforations have shown significant difference. The mean values of hearing gain between posterior perforation and subtotal perforation have shown significant difference.

Conclusion: Underlay myringoplasty is an effective technique of repairing the tympanic membrane perforation due to high rate of graft take and marked hearing improvement.

Key Words: myringoplasty, underlay technique.

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Introduction

Tympanic membrane perforation primarily results from middle ear infections of acute or chronic onset, trauma or iatrogenic. In Bangladesh, chronic otitis media is very common. Patients with COM usually presents with recurrent ear discharge, deafness and Tympanic membrane perforation. The degree of hearing impairment depends on the size of the perforation and the state of the ossicular chain. A hole in the tympanic membrane reduces the effective area of the membrane in contact with the sound wave, the pressure differential across the Tympanic membrane, reduce the mechanical coupling between the remaining intact portion of the membrane & malleus¹.

There is a significant quantitative correlation between the size and site of perforation & hearing loss. Small perforations (10% of the tympanic membrane) produce losses of 10-15 dB below 3 KHZ. Large perforations produce severe losses over the whole range particularly at higher frequencies through these perforations, the sound waves act directly on the round and oval windows. Moderate perforations (10-40% of the tympanic membrane) have far more severe effects when placed on the posterior & superior margin of the membrane than when placed on the anterior & inferior margin. However non marginal perforations with intact ossicular chain hearing loss is approximately 10-30 dB². The literature suggests that upto 80% of these perforations undergo spontaneous closure³.

Myringoplasty is the term used to describe the surgical repair of a perforated tympanic membrane. The success rate remained low until Wullstein & Zoellner introduced the operating microscope into otologic surgery in the 1950s⁵.

Myringoplasty has gone through many changes in techniques and grafting materials. The size of various perforation is labeled in relation to their quadrants as small, medium and large. Further perforations in the tympanic membrane are described according to their anatomical location. Central perforations are in the pars tensa. The location of central perforation is denoted by their relationship to the handle of malleus & can be termed as anterior, posterior, inferior or subtotal.

Perforated tympanic membrane can be repaired by a variety of graft materials like autologous temporalis fascia, perichondrium, cartilage and adipose tissue and can be approached by endoaural, postaural or transcanal route. Graft can be placed by underlay, overlay and inlay (sandwich) technique.⁶

Success rates for closure of tympanic membrane 60-90 percent in adult and 35-94 percent in children⁷. The closure rate is reported to be higher in smaller perforations (74%) than large perforations (56%)⁸. Palva and Ramsay looked at the outcome of 281 Myringoplasties in their department, the closure rate was 97% and mean hearing improvement was 8.0 dB⁹. There has been shown to be direct correlation between hearing gains following Myringoplasty and preoperative perforation size⁸.

However factors which are commonly related to the successful outcome are size and site of perforation, duration of discharging ear and associated pathology in the middle ear. The prerequisite of Myringoplasty are (a) central dry perforation, (b) functioning eustachian tube (c) no respiratory tract infection. Now a days Myringoplasty is a common operation in the ENT department having microsurgical facilities.

Methods

This cross sectional study was carried out Dhaka Medical College Hospital, Dhaka & Shaheed Suhrawardy Medical College Hospital, Dhaka for 6 months (July 2012 to December 2012).

Inclusion criteria: Patients of inactive mucosal variety of Chronic otitis media with central perforation, dry ear for at least 2 months, Age of the patients between 15-45 years.

Exclusion Criteria: Patients having atticofacial disease, ossicular chain abnormalities, COM with sensorineural deafness, inner ear abnormality, history of previous ear surgery, patient requiring any other procedure upon middle ear than Myringoplasty, mentally ill person.

Data were collected by detailed history, clinical examination, pure tone audiometry.

All myringoplasty were performed by a postaural approach using autologous temporalis fascia and underlay technique. During follow-up examination every patient who underwent Myringoplasty in underlay technique were examined weekly interval for first month, then 5th & 9th weeks of postoperative period & after that as needed. Audiometric tests were performed before operation & on 5th & 9th weeks of postoperative period. All information were endorsed in the data sheet. Audiometric findings and result were expressed in table form.

Results

Overall graft taken in 53 out of 60 cases (88.3%) & graft failure in 7 cases (11.7%). Hearing gain occurred in 39 (73.58%) patients & no improvement seen in 14(22.42%). There is not a statistically significant difference between the younger and older age group regarding hearing improvement. Mean preoperative & postoperative air conduction threshold(9th week) in successful cases was 43 dB & 29.76 dB respectively with a mean audiological improvement was 13.24 dB. Improvement of air bone gap was 11.64 dB. Hearing gain of small perforation and subtotal perforation and posterior perforation and subtotal perforation have showed significant difference.

Table-I
Graft take rate (n=60)

Tympanic membrane	Number of patients	Percentage
Graft take	53	88.3
Graf failure	7	11.7

Table-II
Hearing improvement in successful cases(n=53)

	Number	Percentage
Hearing gain	39	73.58%
No improvement	14	22.42%

Table-III

Hearing improvement after myringoplasty in the patient of different age group (n=53)

Age group	Number	percentage	mean
≤26 years	31	58.49	11.37
>26 years	22	41.35	13.25
Total	53	100.00	12.15

Table-IV

Hearing threshold and air bone gap (ABG) of the patient before and after myringoplasty (n=53)

Hearing Thresholds	Male Mean	Female Mean	Total Mean
Air conduction threshold	42.80	43.26	43.00
Air bone gap	29.36	30.15	29.70
Postoperative(5th wk)			
Air conduction threshold	33.94	32.29	33.36
Air bone gap	20.02	21.48	21.79
Postoperative(9th wk)			
Air conduction threshold	29.87	29.62	29.76
Air bone gap	18.50	17.50	18.06

Table-V
Average improvement of hearing(mean ABG) in different size of perforation (n=53)

Size	Total	%	mean
Small	10	18.9	15.32
medium	18	34.0	13.68
Large	10	18.9	12.43
Subtotal	15	28.3	11.50
Total	53	100.0	13.06

Table-VI

Average improvement of hearing (mean ABG) in different size of perforation (n=53)

Site	No	%	Mean
Anterior	14	26.4	13.01
Posterior	12	22.6	15.14
Inferior	6	11.3	13.85
Subtotal	21	39.6	11.46
Total	53	100.0	13.06

Discussion

In this study 60 patients of inactive mucosal variety of chronic otitis media who were fulfilling certain inclusion & exclusion criteria were studied prospectively in the department of ENT& Head-Neck surgery, Dhaka Medical college Hospital & Shaheed Suhrawardy medical college hospital, Dhaka. The study period was from July 2012 to December 2012. Preoperative and postoperative examinations of the patients were conducted clinically as well as audiological.

In this series the graft take rate was 88.3%(53 out of 60). This rate of graft intake is more or less similar to the Kotecha¹¹ (82%), Ugo Fisch¹² (86%) & Eero Vartiainen ((91.2%).

The study shows that the overall hearing gain occurred in 39 (73.58%) patients. Hearing improvement of 10 dB or more was considered significant. In that sense, no improvement seen in 14 patients. The mean preoperative & postoperative air conduction threshold(9th week) in successful cases was 43 dB & 29.76 dB respectively with a mean audiological improvement in air conduction threshold was 13.24 dB & mean closure of the air bone gap was 11.64 dB.

Makaya¹⁴ et al reported a hearing improvement of more than 10 dB in 62% patients and less than 10 dB in 24% patients which compares favourably with this study. Umaphy¹⁵ et al reported a hearing

improvement of more than 10 dB in 72% of patients, which correlates closely with this study. Biswas¹³ et al reported a mean pre and post-operative air conduction threshold of 34 dB and 24 dB and found a mean audiological improvement of 10 dB in 60.78% of patients. Sethi¹⁶ et al reported an overall improvement of hearing in 76% of patients in which 39.4% had a closure of air-bone gap within 20-30dB, 34.2% within 10-20 dB and 26.3% within 0-10 dB. In a study carried out in Spain by Labatut¹⁷ et al ,hearing improvement established as an air-bone gap difference of less than 20 dB was seen in 56% of cases.

Age of the patients in this study ranges from 15-45 years. Mean age of this patients were 25.92 years. Mean hearing improvement after successful myringoplasty was found 11.37 dB in the age group of <26 years (58.49%) & 13.25 dB in the age group of >26 years(41.35%). So there is not a statistically significant difference between the younger and older age group regarding hearing improvement.

The significance of size & site of perforation was recorded in this study. The perforation size was categorized as small, medium, large & subtotal on the basis of the surface area involved. In this study majority of the perforations were medium sized(34%) followed by subtotal (28.3%),large (18.9%) & small (18.9%).The mean audiological improvement(ABG) in case of small, medium, large & subtotal perforations were 15.32 dB,13.68 dB,12.43 dB & 11.50 dB respectively. The mean values of hearing gain of small perforation and subtotal perforation have shown significant difference. So the hearing improvement following myringoplasty in underlay technique for patients of small perforations (15.32dB mean gain in ABG) were significantly greater than those observed in subtotal perforations(11.50 dB gain in ABG) & large perforations.

Lee⁸ P et al showed that size does influence success; the success rate for small perforations was 74.1% compared with 56.0% for large perforations. Size also influences the change in four-frequency air conduction thresholds (small perforations +7.2 dB, large perforations +10.2 dB;) in successful myringoplasties. This study is often similar to our study.

Depending on the position of the perforations these were grouped as anterior, posterior, inferior & subtotal perforations. In our series, majority of the perforations were subtotal(39.6%), followed by anterior (26.4%), posterior (22.6%) & inferior (11.3%). The mean audiological improvement(ABG) in case of anterior, posterior, inferior & subtotal perforations were 13.01 dB, 15.14 dB, 13.85 dB & 11.46 dB respectively. The mean values of hearing gain of posterior perforation and subtotal perforation have shown significant difference ($P < 0.05$). So the hearing improvement following myringoplasty in underlay technique for patients of posterior perforations (15.14dB mean gain in ABG) were significantly greater than those observed in subtotal perforations(11.46 dB gain in ABG) Considering significant outcome of the study, it has been tried to overcome the limitations as far as possible. Beyond the scope, following limitations were encountered in the study.

1. This study is conducted among a small number of cases within a short time frame in few centers. The result of this study may not reflect the total scenario.
2. Reperforation of tympanic membrane may occur upto two years after myringoplasty. So long term follow up of the patients are recommended.

Conclusion

Underlay myringoplasty is an effective technique of repairing the tympanic

membrane perforation due to high rate of graft take and marked hearing improvement. Factors influencing hearing improvement were size & site of perforation.

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