

TMSS Medical College Journal (TMCJ)

Volume 12, No. 01, January 2019

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An Official Publication of TMSS Medical College



TMSS Medical College Journal (TMCJ)

January 2019

An Official Publication
of
TMSS Medical College, Bogura, Bangladesh

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Printed by

TMSS Printing Press
Bogura, Bangladesh
e-mail: tmssprintingpress@gmail.com

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Original Article**Role of myringoplasty in hearing improvement**Saiduzaman M^{1*}, Islam MN², Ali MH³

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This study was carried out to assess the graft take rate as well as hearing improvement after myringoplasty with temporal fascia graft by underlay technique. In this study graft take rate was 85% (51 out of 60) and graft failure was 15% (9 out of 60). The age range of the patients was 10 to 50 years. Highest number of patients was in the age group of 21 to 30 years and graft take was also maximum in this age group. Graft take rate of small size perforation (100%) and medium size perforation (93.23%) had more than subtotal perforation (77.77%). Success rate of posterior perforation was maximum (93.75%) followed by anterior perforation (88.23%). In case of approach of operation postaural approach had maximum success rate (88.09%) followed by endaural (75%) and transcanal approach (80%). In this study the mean pre and postoperative air conduction threshold in the successful cases were 34 dB and 24 dB respectively, with a mean audiological improvement of 10 dB. Improvement of mean air bone gap was 11 dB. Of the successful cases hearing was improved in 31 patients (60.78%) and 20 patients (39.21%) showed no significant hearing improvement. From this study it can be concluded that myringoplasty is a successful treatment modality for tympanic membrane perforation

Key words : Myringoplasty; Role of Myringoplasty improvement**Introduction**

In Bangladesh like all developing countries the incidence of chronic suppurative otitis media (CSOM) is very high because of poor socioeconomic standard, over crowding, poor nutrition and lack of health education. Among the two types of chronic suppurative otitis media. Tubotympanic variety is the commonest and is called safe variety as the risk of developing complications are less and the name tubotympanic indicate disease of Eustachian tube and tympanic cavity¹. Tubotympanic disease is always characterized by central perforation involving the pars tensa of varying size and shape but with a narrow margin of intact annulus and usually with part or all of the membrane of the malleus remaining. The perforation of the tympanic membrane is associated with aural discharge and hearing loss. Aural discharge is always mucoid or mucopurulent and varies with upper respiratory tract infection. Discharge is usually intermittent recurring whenever there is a fresh head cold or water enters in to the ear². Hearing loss in tubotympanic disease is usually conductive in nature but a few case of sensorineural hearing loss is found . Hearing loss with intact ossicular chain is

approximately 10-30 dB. But more when ossicular chain is disrupted. Myringoplasty is the operation specially designed to repair or reconstruct the tympanic membrane. The earliest reported successful myringoplasty was done by Berthold in 1978, using full thickness skin graft³. Since then, myringoplasty has gone through many changes in technique and materials. Shea in 1960, first introduced underlay technique for myringoplasty but using vein graft. And autologous temporal fascia used as graft material firstly by Heerman in 1960⁴. The surgical outcome of myringoplasty is influenced by many factors. The reported success rate of myringoplasty is therefore variable, partly because of differences in the inclusion and exclusion criteria⁵. In a study overall success rate of myringoplasty was 86%. Posterior and inferior perforations had a 98% success rate for repair compared to only 67% of anterior perforation. The success rate of subtotal perforation closure was (92.5%)⁶. But the graft failure was more in younger patients. A study found better success with advancing age⁷. This is due to lower incidence of upper airway infection and better Eustachian tube function in later

age and the relative immaturity of system in younger children, Lorenzo Pignataro found better success rate in underlay technique than overly technique⁸. The success rate was 82.3% in the former and 79.1% in the later. At present, myringoplasty is a common operation in the Otolaryngology Department, having microsurgical facilities. The present study aims to evaluate the surgical and audiological outcome of myringoplasty using underlay technique with temporal fascia graft in selected patients with tympanic membrane perforation and to assess the factors potentially influencing those outcomes.

Material & Methods

This prospective study was carried out in the of Doctor's Clinic, Unit-2, Thanthania, Bogura from July 2016 to June 2017. Sixty (60) cases were selected for this study who 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 followup was done.

Inclusion criteria

- CSOM- Tubo tympanic type with dry central perforation for at least 3 months but with no other external ear, middle ear or inner ear diseases.
- Patients with good cochlear reserve.
- Patients with healthy middle ear mucosa.

Exclusion criteria

- Evidence of cholesteatoma.
- Previous tympanic surgery.
- Traumatic perforation.
- Severe Tympanosclerosis.
- Only hearing ear.
- Chronic otitis externa.
- Systemic diseases : Diabetes Mellitus, Tuberculosis.

The patients were post operatively followed up at weekly interval for 1st month and Then at the period of three month interval for 1st year. At the follow up examination, result of surgery was regarded as successful if ear was dry and the tympanic membrane intact and mobile. Audio metric test (PTA and Impedence) were performed after three months and hearing gain or loss was compaired with pre-operative test.

Results

Table-I show that overall graft taken in 51 cases (85%) and graft failure in 9 cases (15%), amongst which complete failure of graft was in 4 patients (1.66%), medialization in one patient (1.66%), residual perforation in 3 patient (5%) and re-perforation in one patient (1.66%). In this study maximum patients were noted in the third decade 55%. Graft take rate was also maximum in this age group. The age of the youngest patient was 12 year and age of the oldest patient was 46 years. The mean age was 29 (Table-II).

Table-I: Graft take rate (n=60)

Tympanic membrane	no of patients	(percent)
Graft take (intact & Mobile)	51	(85%)
Graft failure Complete graft failure	4 (6.66%)	9(15%)
Medialization		1(1.66%)
Residual perforation		3(5%)
Re-perforation		1(1.66%)

Table-II: Age distribution with relative frequency of graft take rate in different age groups.

Age group (Year)	No of patients (%)	Graft take no of pts (%)	Graft failure no of pts.(%)
11-20	11(18.33%)	9(81.81%)	2(18.18%)
21-30	33(55%)	29(87.87%)	4(12.12%)
31-40	13(21.66%)	11(84.6%)	2(15.38%)
41-50	3(35%)	3(66.66%)	1(33.33%)

Table-III: Relative frequency of graft take rate in relation to the size of perforation

Size	Myringoplasty	Graft take	Graft failure
Small	2(100%)	2(100%)	0(0%)
Medium	31(100%)	28(91.3%)	3(9.7%)
Subtotal	27(100%)	21(77.77%)	6(22.22%)

The above table shows that medium size perforations were the commonest one and graft take rate was (91.3%) which was more than subtotal perforations (77.77%). Graft take was 100% in small size perforations.

Table – IV: Relative frequency of graft take rate in relation to the site of perforations (n=60.)

Site	No of patients (%)	Graft take, no of pts. (%)	Graft failure, no of pts. (%)
Anterior	17	15(88.23 %)	2(11.76 %)
Posterior	16	15(93.75 %)	1(6.25 %)
Subtotal	27	21(77.77 %)	6(22.22 %)

Majority of subtotal perforations were operated but the graft take rate (77.77%) was less than posterior (93.75%) and anterior perforations (88.23%).

Table-V: Surgical approach (n-60)

Approach	No. of patients (%)	Graft taken (%)
Postaural	42 (70%)	37 (88.09 %)
Endaural	8 (13.33%)	6 (75%)
Trans canal	10 (16.66%)	8 (80%)

Above table shows that most common approach was postaural (70%) followed by transcanal approach (16.66%).

Table -VI: Audiological results in successful cases (51 cases)**(A) Preoperative air conduction threshold :**

Preoperative air conduction threshold	No. of patients (%)	Mean
0-20 dB	8 (15.68%)	34
20-30 dB	18 (35.29%)	
>30 dB	25 (49.01%)	

(b) postoperative air conduction threshold :

Preoperative air conduction threshold	No. of patients (%)	Mean
0-20 dB	18 (35.29%)	24
20-30 dB	27 (52.94%)	
>30 dB	6 (11.76%)	

(c) Air bone gap in pure tone audiometry of the patients those underwent myringoplasty:

Air bone gap	Mean (dB)
Preoperative air bone gap	23
Postoperative air bone gap	12

Table VI (A,B,C) shows that mean preoperative and postoperative air conduction threshold in successful cases was 34 dB and 24 dB respectively with a mean audio logical improvement of 10dB. Improvement of air bone gap was 11dB.

Table -VII: Hearing improvement (n-51)

	Number of Patients	Percentage
Hearing gain	31	60.78%
No improvement	20	39.21%

Above table shows that hearing gain occurred in 31 (60.78%) patients and no improvement seen in 20 (39.21%) patients. Gain or loss of hearing of 0-10 dB was not considered significant. In that sense, no improvement seen in 20 patients.

Discussion

In this study 60 patients those underwent myringoplasty using underlay technique with temporal fascia graft were studied prospectively after taking relevant history, clinical examination, investigation and follow-up. In this series the graft take rate was 85% (51 out of 60) and the graft failure was 15 % (9 out of 60). This rate of graft intake is more or less similar to the Kotecha (82%) and Ugo Fish (86%), whereas Eero Vartiainen showed that rate of graft intake 91.2% which is significantly higher than this study. In this study, lowest and highest age of patients at presentation was 12 and 46 year respectively with a mean age of 29 years. Patient's age ha generally considered as influencing surgical outcome. Maximum graft take rate (84.84%) was in the age of 21-30 years, followed by 84.61%, 72.72% and 66.66% in the age group of 31-40 years, 11- 20 years and 41-50 years age group respectively. Vrabec et al⁶ found better success with advancing age. This is due to low incidence of upper airway infections and better Eustachian tube function in this age and the relative immaturity of the immune system in younger children. Medium size perforations were commonest one in this study and the graft take rate was also maximum in this group (91.3%) Graft take rate of subtotal perforation was

significantly less (77.77%). In case of small size perforation graft take rate was 100%. One series showed that the closure rate was reported to be higher in small perforations (74%) than large perforations (56%)⁹. In this study graft take rate in case of posterior and anterior perforation was 93.75% and 88.23% respectively which was significantly more than that of subtotal perforation (77.77%). The site of perforation statistically affect in our series as has been previously reported by others¹⁰. And higher rate of surgical failure in patients with anterior perforations in comparison to posterior perforations in this study, may have been due to the more limited vascularization of the anterior part of the ear drum, limited access to this perforation as well as difficulty in graft placement also. Surgical approach depended on dimension of external auditory canal, site of perforation as well as surgeon's preferences. In this study graft take rate was significantly greater with postauricular approach (88.96%) than that of endaural (75%) and transcanal (80%) approach. Whenever others series found no difference of graft in take in relation to approach used⁹. The mean pre and post-operative air conduction threshold in the successful cases were 34 dB. and 24 dB respectively with a mean audiological improvement of 10 dB. Improvement of mean air-bone gap was 11 dB. The best improvement was observed at the frequency of 250-1000 Hz. One might suppose that after a straightforward myringoplasty the air-bone gap should be within a 10dB. This hearing result was achievement in only 60.78% (31 out of 51) of successful operation. Lee et al and Palva and Ransay stated that mean hearing improvement was 8 dB in their series, this improvement is often similar to our study¹¹. Sheehy and Anderson stated that in most case of chronic suppurative otitis media, even though the ossicular chain may appear normal, there is some factor of scar tissue that prevents total restoration of hearing. However in our series included 20 ears (39.21%) of the successful cases in which hearing was not improved significantly after surgery despite having the eardrum heal perfectly and the middle ear remain aerated. This is similar to the Ugo Fish who showed that hearing improvement occurred in 66% patient.

Conclusion

Myringoplasty is an operation to reconstruct the tympanic membrane. Over the years many methods have been used for closing perforation. The most widely used accepted method is underlay graft of temporal fascia. From the study it can be concluded that myringoplasty is a successful treatment modality of tympanic membrane perforation. Success rate was more with advancing age than younger children. This is due to low incidence of upper airway infections in this age. Graft take rate also depends on size of perforations. Medium size perforation were commonest one in this study. Graft take rate of small and medium size perforation had more than subtotal perforation. In case of approach of operation post aural approach had maximum success rate than endaural and transcanal approach. In this study mean audiological hearing impairment was 10dB. So myringoplasty can be used safely for repair of tympanic membrane perforation and hearing improvement.

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