

Title : Audiometric Assessment Of Hearing Status In Patients After Myringoplasty

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ABSTRACT:

Introduction :Chronic suppurative otitis media (CSOM) is a middle ear disease with permanent abnormality of pars tensa or pars flacida resulting in discharge and hearing loss. Hearing loss is mostly conductive in nature. Pure tone audiometry is a subjective measurement of hearing threshold level. It is done preoperatively to know the degree and type of hearing loss and postoperatively to measure the audiological gain.

Objective: to assess hearing status of patients after myringoplasty using pure tone audiometer.

Methods: The study was done on 100 patients suffering from CSOM active mucosal type. Patient parameters including age, size and site of the perforation were evaluated. Hearing levels were assessed as the mean air conduction (AC), and air-bone gap (ABG) at 500, 1000, and 2000 Hz, and their relation with aforementioned parameters were analyzed. Myringoplasty was performed and then patients were followed up for three months and on each visit hearing status was assessed by Pure Tone Audiometry.

Results: At the end of the study it was found that most of the patients were in younger age group 15-25 years (60%). The commonest site was central perforation (88%) with large size perforation being (51%). The pre and post operative audiological difference found to be significant with average audiological gain more than 10dB and overall hearing improvement was 86% at 1 month and 93% at the end of 2 and 3 months.

Conclusions: There was a significant audiological improvement following myringoplasty with postauricular route using temporalis fascia graft via underlay technique in patients of mucosal type of chronic suppurative otitis media. However no significant difference was found in the audiological gain when compared to different age, site and size of perforation.

Keywords : Myringoplasty, Pure Tone Audiometry, CSOM, Air bone gap

INTRODUCTION:

Chronic suppurative otitis media has been an important middle ear disease since prehistoric times. Perforations of the tympanic membrane cause a conductive hearing loss that can range from negligible to 50 dB. The primary mechanism of conductive loss is a reduction in ossicular coupling caused by a loss in the sound pressure difference across the tympanic membrane.(1)

The degree of hearing loss is determined by the size and site of perforation. As the size increases, sound reaches both windows at the same time. The resultant cancellation of vibratory movement of the cochlear fluid column produces the maximum hearing loss. The site of the perforation also affects the degree of hearing loss. Perforation of the posterior part of the tympanic membrane will cause greater hearing loss than the perforation of the anterior part, (2) as round window gets exposed and the tympanic membrane no longer shields the round window from sound (baffle effect).

Myringoplasty is a surgical repair of a tympanic membrane perforation without ossicular reconstruction.(3) The technique was established for the first time by Berthold in 1879. Myringoplasty can be done by underlay, overlay or interlay technique by using various grafts like temporalis fascia, cartilage, perichondrium, fat, vein etc. However, temporalis fascia has long been considered as the ideal graft material for tympanic membrane perforation due to its healing and acoustic properties.(4)

Pure tone audiometry (PTA) is the key hearing test used to identify hearing threshold levels of an individual, enabling determination of the degree, type and configuration of hearing loss.(5) The degree of hearing improvement depends on several factors such as site and size of perforation, ossicular status, surgical technique, type of graft and eustachian tube function.(6)(7)

MATERIALS AND METHODS:

This prospective study was carried out on 100 patients of COM mucosal type in department of otorhinolaryngology Jawaharlal Nehru Medical College and Hospital, Aligarh between August 2017 to August 2019. The preoperative hearing loss was calculated in each group by taking average of air conduction at 500hz, 1000 hz and 2000hz. The ear was first made quiescent and

then myringoplasty was performed via postauricular approach using temporalis fascia graft via underlay technique.

Patients were followed up for three months and hearing gain was assessed by subtracting the preoperative ABgap from the post operative ABgap of each individual.

INCLUSION CRITERIA :

Patients of 15 to 55 years of age with mucosal type of chronic otitis media with central perforation for at least 3 months with adequate cochlear reserve and patent eustachian tube with no evidence of cholesteatoma were included in the study.

EXCLUSION CRITERIA:

Patients with total or attic perforation or with sensorineural deafness and sinonasal pathology were excluded from the study. Patients with systemic diseases like tuberculosis, diabetes and hypertension were also not part of this study

Table 1: Age wise distribution with mean hearing loss, dB = decibel

Age group	No. of cases	Percentage	Mean hearing loss in (dB)
15-25	60	60%	35.3
26-35	27	27%	32.4
36-45	9	9%	36
46-55	4	4%	34.5

RESULTS

In total of 100 patients, the age group of patients in study ranged from 15 to 55 years. Out of them 60 patients were of younger age groups (15-25) with mean hearing loss of 35.3 dB. (Table 1)

The tympanic membrane perforations were then classified into four groups based on their size: small (<25% of TM), medium (25-50% of TM), large (50-75% of TM) and subtotal (>75% of

TM). And we observed that maximum perforation were large type(51%) with mean hearing loss of 37.8dB.(Figure-1)

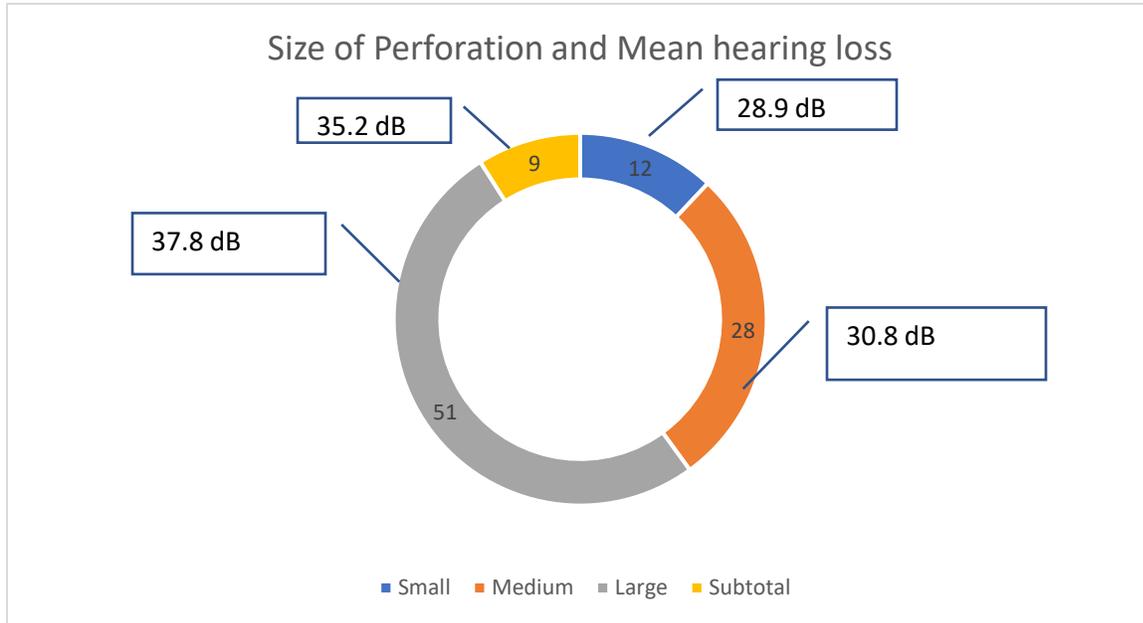
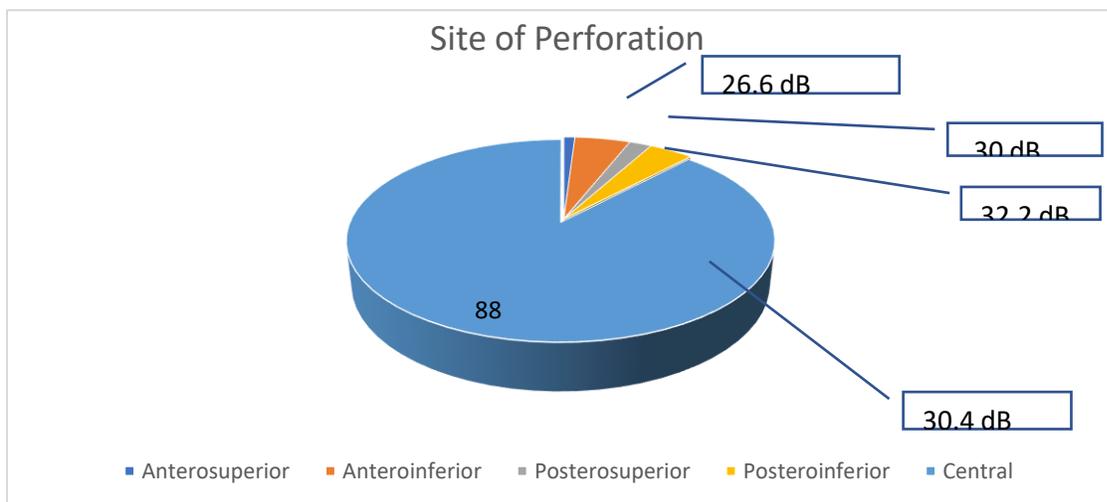


Fig 2: Distribution of perforation on basis of size (Mean hearing loss in dB = Decibel)

The TM perforations were also divided on the basis of their location on pars tensa. And it was found that a large number of perforations (88%) were in central position with mean hearing loss of 30.4dB.(Figure- 3)

Fig 3: Distribution of perforation on the basis of site (Mean hearing loss in dB = Decibel)



It was concluded that majority of patients suffered from only mild hearing loss between 26dB to 40dB followed by moderate degree. (Table 4)

Table 4: Distribution on basis of degree of hearing loss (dB = Decibel)

Degree of hearing loss	No. of patients	Range of hearing loss in dB
None	22	<=25
Mild	55	26-40
Moderate	22	41-55
Moderately Severe	1	56-70
Severe	0	71-90
Profound	0	>90

The average preoperative air bone gap was 34.6dB and it consequently decreased to 16.96 dB by the end of three months post operatively. Hence, the audiological gain or air bone gap closure calculated out to be 17.64dB after three months. Overall hearing gain was more than 13dB after myringoplasty in each three months and P value at each post op 1, 2 and 3 months was <0.05, showing the results to be statistically significant. (Table 5)

Table 5 :Pre and Post op Audiological profile of patient

Mean HL dB speech frequency	Pre op mean in dB	Post op 1 month mean in dB	t test and P value	Post op 2 month mean in dB	t test and P value	Post op 3 month mean in dB	t test and P value
A-Bgap	34.6	20.13	t=8.67 P<0.000 1	17.02	t=10.79 P<0.000 1	16.96	t=10.32 P<0.0001
A-Bgap closure		14.47		17.58		17.64	

Note:- HL= hearing loss, db=Decibel, gap=Air bone gap,

Hearing gain was calculated by subtracting post operative air bone gap from preoperative air bone gap and it was found that air bone gap closure was more in patients of age group 46-55 years followed by younger age group 15-25 years. The result was statistically insignificant. (Table 6)

Table 6: Association of Hearing results versus age group

Age group(years)	AB gap closure at 1 month in dB +/- SD	AB gap closure at 2 month in dB +/- SD	AB gap closure at 3 month in dB +/- SD
15-25	15.27+/-11.8	19.4+/-12	18.8+/-12.4
26-35	15.1+/-9.2	16.0+/-10.1	17.3+/-8.7
36-45	10.8+/-10.7	15.25+/-10.0	14.3+/-7.0
46-55	17.75+/-13.3	20+/-13	20+/-17
ANOVA	F=0.5207	F=0.6984	F=0.3485
P value	0.6691	0.5557	0.7903

Note:- AB gap=Air bone gap, dB= decibel, SD= Standard deviation, ANOVA= Analysis of variance

On comparing the hearing gain between different sites and sizes of perforation it was concluded that perforations of posteroinferior region and perforation of large size showed more hearing improvement after myringoplasty with air bone gap closure of more than 15dB. (Table 7 and 8)

Table 7 : Association of Hearing results with site of perforation

Site	AB gap closure at 1 month in dB +/- SD	AB gap closure at 2 month in dB +/- SD	AB gap closure at 3 month in dB +/- SD
AS	0	0	0
AI	8.3+/-3.3	12.5+/-14.7	13+/-13.0
PS	5.5+/-5.5	11.5+/-1.5	9+/-0
PI	15.5+/-10.9	19+/-12.1	20.75+/-12.4
Central	15.8+/-11.2	18.7+/-11.2	19.0+/-10.9
Pvalue	0.3090	0.3555	0.2912

Note:- AB gap= Air bone gap, db= Decibel, SD= Standard deviation, AS= Anterosuperior, AI= Anteroinferior, PS= Posterosuperior, PI= Posteroinferior, ANOVA= Analysis of variance

Table 8 : Association of Hearing results with size of perforation

Size	AB gap closure at 1 month in dB +/-SD	AB gap closure at 2 month in dB +/-SD	AB gap closure at 3 month in dB +/-SD
Small	10.1+/-8.9	14.2+/-12.7	15.2+/-13.0
Medium	12.5+/-9.1	15.5+/-7.5	16.0+/-7.7
Large	18.6+/-12.1	21.4+/-12.4	20.9+/-12.5
Subtotal	10.7+/-8.2	12.5+/-8.4	13.8+/-7.9
P value	0.0191	0.363	0.1464

Note :- AB gap= Air bone gap, db= Decibel, SD= Standard deviation, ANOVA= Analysis of variance

DISCUSSION:

Chronic otitis media (COM) is a chronic infection of middle ear which is more prevalent in low socio-economic population, due to overcrowding, poor hygiene and ignorance. The ear discharge is most common symptom in chronic suppurative otitis media followed by hearing loss of conductive type.

This study has been undertaken to evaluate the postoperative results in terms of audiological gain in patients suffering from chronic suppurative otitis media (mucosal type). Patients were divided into different groups on the basis of age, site of perforation and size of perforation. Preoperative audiometry was done for each admitted patient. Patients were followed up for a period of about 3 months postoperatively.

In our study which included 100 patients, most of the cases were of younger age group (60%). This is in accordance with *Nahata et al 2014* who observed maximum patients in age group of 15-24 years (38%).⁽⁸⁾ This might be due to an increase in the general level of awareness among this age group of people.

In our study most of the patients were suffering from mild hearing loss (55%). The study was in line with findings of *MD. Ejaz Ahmed Shariff 2019* who in his study of 32 patients found maximum patients with mild hearing loss (45.3%).(9) Similarly *Handi et al* found mild to moderate hearing loss in 83% of ears.(10)

On considering the size of perforation we found 51% of patients have large size perforation followed by medium size 28%.(8) Also observed maximum number of patients of patients with large size perforation(43). It was observed that hearing loss increased with increase in the size of perforation from small(28.9dB) to large.(37.8dB). The result was comparable with *Aneesha M et al.* who found 28.4dB hearing loss in small size perforation which increased to 40.4 dB hearing loss in large size perforation.(11)

In this study maximum number of patients were having central perforation (88%). The result was similar to study done by *Aneesha M et al.* where maximum patients (43) had central perforation.(11) *Sood AS et al* found 80 cases of central perforation).(12) In our study posteroinferior quadrant perforations have higher mean hearing loss. The study is in accordance with *Nahata et al 2014* who observed that posterior perforations have greatest hearing loss that is 39.99dB.(8)

Most of the authors consider that the improvement in hearing by air conduction to 30dB or closure of air bone gap to within 20 dB or less as successful result.

In our study of 100 patients mean preoperative air bone gap was 34.6dB. The postoperative mean air bone gap was (20.13dB, 17.02dB and 16.96dB at 1 month, 2 month and 3 month respectively). Hence, air bone gap closure was (14.47dB, 17.58dB, 17.64dB at 1 month, 2 month and 3 month respectively). The result found to be statistically significant with $p < 0.05$. Overall hearing improvement was 86% at 1 month, 93% at the end of 2 month and 3 month.

The study was similar to *Tegnoor MS et al (2017)* who observed pre and post operative air conduction threshold as 33.34db and 20.20 respectively with mean audiological gain around 13db.(13) Achievement of an audiometric gain in hearing thresholds following successful myringoplasty has also been documented by *M.T.Kalcioglu et al 2013.* (14)

Considering the age of the patient maximum gain was found in age group of 46-55 years at the end of three month that is around 20 dB. While lesser gain is seen in 15-25 age group around 18dB. However, the result was not significant. A study by *MR Dawood (2017)* shows that age and gender do not seem to have any bearing on the postoperative hearing improvement, which are in agreement with the results of several other studies (*Shrestha and Sinha, 2006 ; Karela et al., 2008*). (15)(16)(17)

Talking about the size of perforation, we observed in our study that hearing gain increased with the increasing size of perforation. The gain was 15.2 dB in small, 16dB in medium and 20dB in large size perforation. It is consistent with Wesson's study, which concluded that mean air conduction audiometric gain was directly correlated with preoperative perforation size (*Wasson et al., 2009*, and the study by *Kumar (2015)*). (18)(19)

On the basis of site of perforation, more air bone gap closure was found in posteroinferior quadrant perforation (20.75dB) followed by central perforation (19dB).

CONCLUSION:

It was concluded that there was a significant audiological improvement following myringoplasty with postauricular route using temporalis fascia graft via underlay technique in patients of mucosal type of chronic suppurative otitis media. However, no significant difference was found in the audiological gain when compared to different age, sex, site and size of perforation. The pre and post operative audiological difference following successful myringoplasty was significant with $p < 0.0001$. Average audiological gain was more than 10dB. Overall hearing improvement was 86% at 1 month, 93% at the end of 2 month and 3 month.

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