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CLINICAL STUDY OF IMPACT OF SIZE ,SITE & SHAPE OF TYMPANIC MEMBRANE PERFORATION ON SURGICAL CLOSURE WITH AUDIOLOGICAL IMPROVEMENT FOR CHRONIC OTITIS MEDIA - OUR EXPERIENCE.

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ABSTRACT

INTRODUCTION: Ear discharge is one of the most common ear complaint encountered by an Otorhinolaryngologist. Chronic Suppurative Otitis Media is of two types – safe and unsafe. Myringoplasty is a surgical procedure used to close the perforation of pars tensa of the tympanic membrane and to improve the hearing loss.

METHODS: The present study of 50 cases between 15 – 60 years of age and both sexes with chronic suppurative otitis media - tubotympanic type disease and having dry central perforation was conducted as a cross sectional prospective study in the Department of ENT,Government General Hospital ,Kurnool.

RESULTS: In this series the minimum age was 15 years and maximum age was 58 years .Number of male were 27(54%) and female 23 (46%). It was found that the hearing loss was proportional to the size of the perforation. No statistically significant difference was noted in hearing loss based on site or shape of tympanic membrane perforation in our study. All 50 patients underwent Myringoplasty & followed up regularly . Graft was successfully taken up in 42 patients giving a success rate of 87.5% in our study & the rest 6 patients (12.5%) were considered as failures.

CONCLUSION: In our study hearing loss was proportional to the size of the perforation and no statistically significant difference was noted in hearing loss based on site or shape of tympanic membrane perforation .

KEYWORDS : Chronic Suppurative Otitis Media (CSOM), tympanic membrane, audiological gain

INTRODUCTION: Ear discharge is one of the most common ear complaint encountered by an Otorhinolaryngologist. Most of the cases of long term ear discharge, after clinical examination are attributed to Chronic Suppurative Otitis Media. Chronic Suppurative Otitis Media is of two types – safe and unsafe, out of which safe variety comprises of infection of mucosa of the middle ear cleft with discharge and central perforation Chronic Suppurative Otitis Media (CSOM) was defined by World Health Organisation Foundation Workshop in 1966 as 'a stage of ear disease in which there is chronic infection of the middle ear cleft i.e. Eustachian tube, middle ear and mastoid, and In which a non intact tympanic membrane (eg. Per foration or tympanostomy tube) and discharge (otorrhoea) are present".

Some patients develop either recurrent bouts of otorrohoea (active CSOM) or a dry but permanent tympanic membrane perforation (inactive CSOM). CSOM produces mild to moderate conductive hearing loss in more than 50% of cases.Myringoplasty is a surgical procedure used to close the perforation of pars tensa of the tympanic membrane and to improve the hearing loss.There are two established techniquesof myringoplasty,overlay technique and underlay technique. In overlay technique we place the graft lateral to fibrous layer of the tympanic membrane & in underlay technique which is the most common and time tested we place the graft medial to the tympanic membrane remnant.

AIMS & OBJECTIVES :

1) To investigate the impact of tympanic membrane perforation size, site and shape on hearing loss and its successful surgical closure.
2) To determine audiological gain following successful closure of such tympanic membrane perforation.

MATERIALS & METHODS: The present study of 50 cases between 15 – 60 years of age and both sexes with chronic suppurative otitis media - tubotympanic type disease and having dry central perforation was conducted as a cross sectional prospective study in the Department of ENT,Government General Hospital ,Kurnool.All the patients were examined carefully after admission.

Inclusion criteria: Chronic otitis media with dry central perforation of at least one month duration

Age between 15 to 60 years and both sexes
Hearing loss < 45 dB
No evidence of active infection

Exclusion criteria: Patients with Cholesteotoma & retraction pockets
Age less than 15 years and more than 60 years

Patients with moderately severe to severe hearing loss on pre-operative pure tone audiometry suggestive of ossicular disruption & sensorineural hearing loss Revision cases of tympanoplasty

Patients having history of diabetes, hypertension and other systemic diseases. All required information about the patients which includes name, age, sex, address .occupation, presenting complaints, present and past history, physical examination , pure tone audiometry and other laboratory investigations were recorded.Examination under microscopy was done to assess the size,site & shape of perforation. After taking written informed consent ,all patients undergone myringoplasty through postaural approach by underlay technique taking temporalis fascia as a graft material.All the patients were followed up at 2wks,4wks,6wks 8wks & 6 months after surgery.
Intraoperative otomicroscopy was performed in all patients and maximum vertical and horizontal diameter of the perforation were measured using an ophthalmic Vernier calipers.

The area of the perforation was then calculated using the equation
$A = \pi R_1 R_2$

Where A = perforation area
$\Pi = 3.8159$ constant
R_1 = Radius of perforation along the vertical axis
R_2 = Radius of perforation along the horizontal axis

The total effective vibratory area of tympanic membrane was taken as 55 Square mm. On the basis of tympanic membrane perforation size patients were categorized into four groups.

Group I : Perforation area ≤ 14 mm2 (<25% of total effective vibratory area)

Group II : Perforation area 15 - 27 mm2 (25-50% effective area

perforated)

Group III: Perforation area 28-41 mm2 (50-75% effective area perforated)

Group IV: Perforation area ≥ 42 mm2 (75-100% effective area performed)

Tympanic membrane was divided into conventional four quadrants and on the basis of location of perforation three categories were made:

ANTERIOR: This group included perforations involving anteroinferior (AI), anterosuperior (AS) or involving anterosuperior and anteroinferior (AS+AI)

POSTERIOR : This included posteroinferior (PI), posterosuperior (PS), and perforations involving both posteroinferior and posterosuperior quadrants (PI+PS).

MIXED: This group included perforations involving both anterior and posterior quadrants.

Also shape of the peforation was noted whether circular, oval or irregular. The operated ear was examined for graft uptake at the end of 10th post operative week and in those patients in whom the graft was taken up successfully, hearing was assessed by pure tone audiometry and audiometric gain was noted.

The relation between different size, site and shape of tympanic membrane perforations and their effects on hearing loss and surgical outcome was studied. The audiological gain achieved in patients in whom the graft was successfully taken was also statistically analysed.

OBSERVATIONS & RESULTS: Out of all patients attending ENT clinic, we studied 50 patients who fulfilled the inclusion criteria and diagnosed as having chronic suppurative otitis media tubotympanic type(inactive stage) .In this series the minimum age was 15 years and maximum age was 58 years .Number of male were 27(54%) and female 23 (46%).Unilateral CSOM was seen in 32 (64%) & rest 18(36%) were bilateral. On the basis of perforation size, 14 (28%) out of total 50 patients were categorized under group I, 18 (36%) came under group II, whereas group III and group IV had 12 (24%) and 6 (12%) patients respectively.It was found that the hearing loss was proportional to the size of the perforation, (ie the hearing loss increased progressively as the size of the perforation increased). Group I had mean hearing loss of 30.79, the mean hearing loss in group II, III & IV was 34.89, 38.32 and 44.00 respectively.Based on perforation site hearing loss in Anterior group (13 patients 26%) was 32, Posterior group (8 patients 16%) was 33 and Mixed group (29 patients 58%) was 38.28.Similarly the shape of perforation was categorized into Circular (23), Oval (25) & Irregular / Bean shaped (2) and hearing loss was found to be 36.35, 35.56 & 32.50 respectively.No statistically significant difference was noted in hearing loss based on site or shape of tympanic membrane perforation in our study.All 50 patients underwent Myringoplasty & followed up regularly . 2 patients did not come for follow up and the rest 48 came regularly for postoperative follow up. Graft was successfully taken up in 42 patients giving a success rate of 87.5% in our study & the rest 6 patients (12.5%) were considered as failures. On analysing the collected data it is found that tympanic membrane perforation size does not have any impact on surgical outcome. The 6 failures which occurred in the study were distributed across the various perforation size categories as follows Group I (2),Group II (1),Group III (2) & Group IV (1) and was found to be statistically unsignificant (p value = 0.736). Also 6 failures distributed across the various site categories as follows (2 anterior, 1 posterior & 3 mixed). Statistical analysis of site of perforation and myringoplasty outcome showed that there was no significance (P value = 0.846).On analysis of 6 failures (2 circular & 4 oval) of the perforation shape categories, no relation was found between shape of the tympanic membrance perforation and myringoplasty outcome (p value = 0.661). The operated ear was examined for graft uptake at 10th post operative week and in those patients in whom the graft was taken up (42 patients) hearing was reassessed by pure tone audiometry and audiometric gain was calculated. (Audiometric gain = Pre op audiometry result – Post of audiometry result). The Audiometric gain in dB based on tympanic membrane perforation size in Group I , Group II, Group III & Group IV were 13.80, 17.00, 21.14 & 27.80 respectively . Results showed that the hearing gain achieved following successful myringoplasty was also porportional to the size of the tympanic membrane perforation.The difference between the mean audiological gain of different perforation size groups was found to be statistically significant (p value = 0.0001).

TABLE 1. Group showing TM Perforation Size and Mean Hearing Loss

TM Perforation Size	No. of Patients	Percentage	Mean hearing loss in dB
Group I (≤ 14 mm2)	14	28%	30.79 ± 5.323
Group II (15-27 mm2)	18	36%	34.89 ± 5.624
Group III (28 - 14 mm2)	12	24%	38.32 ± 5.728
Group I (≥ 42 mm2)	06	12%	44.00 ± 3.326
TOTAL	50		35.80 ± 6.713

TABLE 2. Group showing TM Perforation Site, Shape and Mean Hearing Loss

TM Perforation Site	No.ofPatients & Percentage	Mean hearing loss in dB	TM Perforation Shape	No.ofPatients & Percentage	Mean hearing loss in dB
ANTERIOR	13 (26 %)	32.00 ± 6.164	CIRCULAR	23 (46%)	36.35 ± 6.733
POSTERIOR	8 (16%)	33.00 ± 5.425	OVAL	25 (50%)	35.56 ± 6.671
MIXED	29 (58%)	38.28 ± 6.318	IRREGULAR	2 (4%)	32.50 ± 10.607

TABLE 3. MEAN THREE FREQUENCY, AIR CONDUCTION AUDIOMETRY RESULTS FOR PATIENTS WITH SUCCESSFUL MYRINGOPLASTY

Tm Perforation size	No of cases	Audiometric result (dB)		Audometric gain in dB
		Pre – op	Post – op (10wk)	
Group I	10	30.79	16.99	13.80
Group II	17	34.89	17.89	17.00
Group III	10	38.32	17.12	21.14
Group IV	5	44.80	17.00	27.80
Total	42	35.80	17.28	18.52

DISCUSSION :Statistical analysis of all our cases has been made with reference to several parameters and conclusions were drawn from them and compared with other series.Most of the patients in our study were in 2 nd and 3 rd decade which is comparable to Ettehad et al and also other studies. The present study conducted among 50 patients showed that males 27 (54%) were affected more commonly as compared to females 23 (46%), with a ratio of 1.11: 1 which was also reported in other studies like Nawabusi et al, Loy et al, Jha et al, Ettehad et al,Poorey et al, Gul et al, and Khana et al. It was found that the hearing loss was proportional to the size of the perforation (Table 1) (ie hearing loss progressively increased as the size of the perforation increased) which was also reported in other studies like Austin et al,Ahmed & Ramani ,Berger et al, Voss et al, Ibekwe et al & Pannu et al.Some studies showed posterior perforations caused more hearing loss than anterior perforations like Ahmed et al , Durko et al & Ibekwe et al while other studies as seen in Vopss et al,Mehta et al, Ymatsuda et al, Lerut et al, Kumar et al & Pannu et al showed no significance of hearing loss based on site of perforation which is also similar to our study. In the present study also the TM perforations were categorized based on shape as circular, oval and irregular. However no statistical significant difference was noted in the mean hearing loss across the different shape of perforations (p value = 0.724). Out of the 48 patients who followed up post operatively it was found that graft was taken up fully in 42 patients. The success rate following myringoplasty in this study was found to be 87.5 %. This success rate was comparable to the rate found in various other studies. In the present study it was found that tympanic membrane perforation size does not have any impact on surgical outcome. The 6 failures which occurred in the study were distributed across the various perforation size categories as follows.(Group I = 2) , (Group II = 1) , (Group III = 2), (Group IV = 1).This was found to be statistically unsignificant (p value = 0.736).Similarly the 6 failures were distributed across the various site categories as follows (2 anterior, 1 posterior and 3 mixed) . Statistical analysis of site of perforation and myringoplasty outcome showed that there was no significance (P value 0.846).Similarly analysis of 6 failures (2 circular and 4 oval) of the perforation shape categories found to have no relation with myringoplasty outcome (p value

=0.661).Hence none of the studied factors like tympanic membrane perforation size, site or shape were found to affect the outcome of myringoplasty. This is similar to the result obtained in other studies. Analysis of data showed that the hearing gain achieved following successful myringoplasty was proportional to the size of the tympanic membrane perforation.The mean three frequency air counduction hearing loss improved from 35.8 dB preoperatively to 17.28 dB post operatively ,ie the mean air conduction audiometric gain following myringoplasty as per this study was18.52dB.(Refer Table -3)).The mean audiometric gain across the four perforation size groups were 13.80 dB ,17.00 dB , 21.14 dB , 27.80 dB respectively. The difference between the mean audiological gain of different perforation size groups was found to be statistically significant, (p value is 0.0001). This is similar to the results obtained by Wasson et al.. Thus it was noted that the hearing gain was maximum in larger size perforations (Group IV) as these perforations had maximum pre operative hearing loss.

CONCLUSION: The hearing loss was proportional to the size of the tympanic membrane perforation and the hearing loss increased as the size of the perforation increased.Posterior perforations were associated with more hearing loss as compared to anterior perforations but the difference was not statistically significant.(p value = 1.000).Shape of the perforation was also found to have no significance with relation to hearing loss (p value=0.724).

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