IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 9 Ver. V (Sep. 2015), PP 33-35
www.iosrjournals.org

Pre-Operative and Post - Operative Audiometric Evaluation Inchronic Otitis Media

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Abstract:
Background*: Chronic Otitis Media (COM) is a chronic inflammatory disease of the middle ear cleft and mastoid that often results in partial or total loss of the tympanic membrane (TM)andossicles, leading to conductive hearing loss that can range in severity up to 60 dB.*
Method*: In this prospective study, we evaluated pre- operative and post – operative hearingimprovement in 120 patients with CSOM under goingtympanoplasty with or withoutmastoidectomy , studied between December 2011 to may 2013 in tertiary centre. The audiological benefit was analyzed after 3 months and 6 months postoperatively*
Result: *The mean A-B closure for central, marginal and attic perforation were 13.93dB, 5.41dB and 4.36dB respectively.In our study , 67 cases (55.83%) showed hearing improvement of 0 – 10 dB, 39 patients (32.50%) showed 11 – 20 dB and 14 cases (11.67%) reported audiological gain between 21 – 30 dB.*
Conclusion*: We found that as the size of perforation increases the hearing gain was found toimprove more, post operatively , location of perforation significantly affects the hearing outcome and temporalis fascia is conclusively ideal graft material due to better acceptance and hearing benefit.*
Keywords: *Chronic otitis media, Tympanoplasty, Mastoidectomy*

I. Introduction

Chronic Otitis Media (COM) is a chronic inflammatory disease of the middle ear cleftand mastoid that often results in partial or total loss of the tympanic membrane (TM)andossicles, leading to conductive hearing loss that can range in severity up to 60 dB.A conservative estimate of the number of people in the world suffering from COM isover 20 million **(1).**As per WHO, the prevalence of COM in Indian population is approximately 2% whichis comparatively higher than that found in developed countries like that of USA and UKwhere the prevalence is <1%.**(2)** Several therapeutic practices and regimen haveevolved and tried out to treat COM, but the surgical management (Tympanoplasty) hasremained the ultimate choice.Tympanoplasty is procedure of eradication of disease in middle ear cleftand reconstruction of the hearing mechanism by repairing the tympanicmembrane with or without ossiculoplasty. This operation can be combinedwith either an intact canal wall or a canal wall down mastoidectomytoeradicate disease from the mastoid. In this present study, focus has been made on audiometric evaluation taking into criteria of Air Bone Gap method and Air Conduction Threshold.The patients were audiologically assessed preoperatively and postoperativelyfor the hearing status. It emerges from our analysis that sizable number ofpatients shows improvement postoperatively. This study attempts todocument and analyze different methods of Tympanoplasty in CSOM andtheir effectiveness postoperatively.

II. Aims And Objectives :

1.Selection of patients of COM with conductive deafness to undergo ear surgeries(tympanoplasty, mastoidectomy).
2.To perform the appropriate type of ear surgery for the worse ear; after examinationand pre-operative Pure Tone Audiometry (PTA).
3.To determine the hearing improvement in treated patients by pre-operative andpostoperative audiometric evaluation (A-B gap) after 3 months and 6 months ofsurgery.
4.To study results of different graft materials used for tympanoplasty.

III. Materials And Methods:

120 Patients of COM presenting with deafness and/or ear discharge inotorhinolaryngology OPD were studied between December 2011 to may 2013. Patientswere chosen by simple random selection.Inclusion criteria were as follows: Patients of hearing impairment aged between 5-50years requiring operative management for COM , Patients compliant enough to give sixmonth follow up.

The selected patients were subjected to a detailed history and complete ear, nose,and throat examination. The ears were examined by otoscopy initially and subsequentlyby a microscope to establish a pre-operative diagnosis of safe or unsafe disease.

All patients underwent a pre-operative pure-tone audiometry (PTA) to find out thehearing status and to obtain documentary evidence for the same, and X-ray mastoid(bilateralSchullre's view) to assess the pathology and surgical anatomy of the mastoid.Patients were followed up regularly with PTA 3 and 6 months postoperatively.

IV. Observation And Results:

In the present study, 120 cases of COM were included. All patients ear rendered drypreoperatively. All patients are operated with post auricular approach and different typesof graft materials were used. Various factors influencing the hearing outcome werestudied. The audiological benefit was analyzed after 3 months and 6 monthspostoperatively and the results were analyzed based on the observations of the secondfollow up audiogram (after 6 months).COM is of mucosal and epithelial type. 66.6 % cases were of mucosal type whereas33.3 % were of epithelial type of COM.We classify the Tympanic membrane perforation as small, medium and largedepending on its size. In our study maximum number of the cases had medium centralperforation. With this data we assessed relation between size of perforation and postoperative hearing gain.Depending upon the location of tympanic membrane perforation, it is classified ascentral, marginal and attic perforation. Most of the patient presented with centralperforation. The mean A-B closure for central, marginal and attic perforation were13.93dB, 5.41dB and 4.36dB respectively.In our study temporalis fascia has been used in maximum number of cases. Othergrafts used were temporalis fascia with conchal cartilage, temporalis fascia with tragalcartilage, fat, and temporalis fascia with autograft incus. We analyze the result for grafttake-up rate and hearing gain for particular graft material.Maximum number of cases operated for type 1 tympanoplasty and corticalmastoidectomy. Out of 120 cases, 20 patients were operated for recurrence of the disease or reperforation referred to our tertiary centre. In our study , 67 cases (55.83%) showed hearing improvement of 0 – 10 dB, 39 patients (32.50%) showed 11 – 20 dB and 14 cases (11.67%) reported audiological gain between 21 – 30 dB. (**table 1)**

V. Discussion :

The present study describes various parameters in assessing the hearing improvement after surgeries for COM. Post operativeaudiological evaluation was done after 3 months and 6 months following surgery. The objectives of any surgical procedures on the middle ear are two-fold, the eradication of the disease and achievement of hearing gain.

Our study included , 80 (66.6%) cases of mucosal type of COM and 40 (33.3%) casesof epithelial type of COM.

We found that the size of perforation influences the hearing gain in a way that audiological benefit is higher for large perforation (**table 2**). Following studies like JD Wasson R et al, Lee p et al **(3)**, James L. Sheehy and Anderson, Black JH and Wormald PJ **(4),** Mehta RP et al **(5)**, Nepal A et al **(6)**showed statistically significant relationship between the size of the perforation and degree of hearing impairment.The mean air-bone gap for central, marginal and attic perforation were 13.93dB,5.41dB and 4.36dB respectively (**table 3**). Studies like Ibekwe TS et al (**7**), Yung MW**(8)** also shown that the site of perforation affects the degree of hearing loss and the degree of subsequent improvement. They also shown that posterior perforations had a greater hearing loss than anterior perforations.

An ideal graft would be one which is easily available, inexpensive, inert, non-toxic,easy to sterilize, store and mould, is not extruded or absorbed, maintains its strengthand does not induce any foreign body reaction. Out of 120 tympanoplasty and mastoidectomy performed, graft failure was observed in 11 cases (**table 4).** Total success rate in terms of graft take up rate was 90.83% and it is comparable with following studies(**table no 5**).

Kazikdas KC et al compared graft take up rate for temporalis fascia with cartilagetympanoplasty. They also concluded that air-bone gap and pure-tone average scorescomparing the gain between both techniques showed no significant changes in thethreshold ($P > 0.05$). We compared our study results with Kazikdas KC et alstudy**(9)(table no 6).**

VI. Audiological Assessment And Type Of Surgery

In our study mean A-B closure in various types of tympanoplasties are as follows (**table no 7)**The mean A-B closure in our study was **11.31dB.** Mean A-B Closure is compared andtabulated as follows with other studies on hearing evaluation in surgery for COM**(table no 8).**

The long term success of tympanoplasty is largely dependent on factors outside thecontrol of the surgeon and includes:

- patient follow up rate
- Eustachian tube function
- middle ear stability
- condition of the mucosa

The short term results are hence a more accurate reflection of the actual reconstructivetechnique. In general, if the mastoid cavity remains stable over long time, the hearingresults too remain stable over that period of time.

VII. Conclusion.

- We found that as the size of perforation increases the hearing gain was found toimprove more, post operatively .
- We concluded that location of perforation significantly affects the hearing outcomeafter surgery.
- Type of Graft has a bearing on the audiological benefit, being more in temporalisfascia when compared to other graft material and is conclusively ideal graft material dueto better acceptance and hearing benefit.
- The total success rate in terms of graft uptake rate was 90.83%. Mean A-B closure was 11.31 dB.
- When mastoidectomy was included as a part of the procedure the hearingimprovement was comparatively lesser.
- The long term results of the procedure need to be evaluated.

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Tables

Table no 1 :- STRATIFICATION OF AUDIOLOGICAL GAIN WITH RESPECT TO TYPE OFSURGERY

Type of surgery performed	**No. of patients showing post-op improvement in AC threshold to various extents**				
	<5dB Exellent	5-10Db Very Good	11-20dB Good	21-30dB Average	31-40dB Poor
Type 1 tympanopalsty	5	9	33	11	0
Type 2 tympanoplasty	2	5	5	2	0
Type 3 Tympanoplasty	1	5	1	1	0
Type 1 + CM	6	14	0	0	0
Type 2 + MRM	6	5	0	0	0
Type 3 + MRM	9	0	0	0	0

Table no 2 :- SIZE OF PERFORATION AND AUDIOLOGICAL BENEFIT

Size of perforation	**Number of cases**	**Mean A-B closure**
Small	19	10 dB
Medium	60	10.95 dB
Large	25	14.2 dB

Table no 3 :- LOCATION OF PERFORATION AND AUDIOLOGICAL BENEFIT

Type of perforation	**No. of cases**	**Mean A-B closure**
Central	75	13.93 dB
Marginal	29	5.41 dB
Attic	11	4.36 dB

Table no 4 :-EFFECT OF DIFFERENT GRAFTS ON AUDIOLOGICAL IMPROVEMENT AND SUCCESS RATE

Type of graft	**No of cases**	**No of failure**	**Mean A-B Closure**
TF	80	6	13.41dB
TF+TC	14	1	7.85 dB
TF+CC	9	1	7.77 dB
VEIN GRAFT	2	1	6.00 dB
AUTOINCUS	13	2	3.61 dB
FAT	2	-	2.5 dB

Table no 5 :- comparison of studies for success rate of graft take up

Author	Success rate of Graft take up
Present study	90.83%
Vartiainen E	88%
Al-ghamdi SA	73.2%
Black JH	78%
Carr MM	75%

Table no6 :- comparison of present study with kazikdas KC study for graft used and take up

Graft Material used	**Present Study**		**Kazikdas KC et al**	
	Graft used	Graft take up	Graft used	Graft take up
Cartilage Graft	**23**	**21**	**23**	**22**
Temporalis Fascia	**75**	**69**	**28**	**21**

Table no 7 :- Mean A-B gap closure in various types of tympanoplasties in our study

Type of surgery performed	**Mean A-B Closure**	**No of Revision cases**
Type 1 Tympanoplasty	14.36dB	7
Type 2 Tympanoplasty	12.07dB	1
Type 3 Tympanoplasty	10.37dB	2
Type 1 + CM	6.30 dB	6
Type 2 + MRM	4.36 dB	3
Type 3 + MRM	0.8 dB	1

Table no 8 :- comparison of various studies for Mean A-B closure

Author	**Mean A - B closure**
Present study	11.31dB
Palva T (**10**)	12.23 dB
Sheehy JL (**11**)	< 10 dB in 88% cases
Gersdorff	13.3 dB
Kartush JM	5.3 dB