



A STUDY OF POST-OPERATIVE HEARING OUTCOME IN CHOLESTEATOMA SURGERIES.

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ABSTRACT

Introduction:- The ability to hear is an important sensory function for communication and better quality of life. One of the leading cause of hearing loss is acquired disorders like chronic otitis media with cholesteatoma. This study is to know the audiological outcomes with respect to cholesteatoma surgeries at our institute. This will be an objective guide for pre-operative counseling of the patients and also will act as insight into our institute outcomes.

Aim:- To evaluate the Pure Tone audiometry (PTA) outcomes in cholesteatoma surgeries and to observe improvement in pre and post-operative air-bone gap (ABG).

Materials & Methods:- A retrospective study of 50 patients who underwent ear surgeries for cholesteatoma at the Department of Otorhinolaryngology, VIMS, Ballari during the period Dec 2015 to May 2017.

Result:- Audiological evaluation of patients revealed 86% of the study population to have conductive hearing loss and 14% patients had mixed hearing loss. The preoperative pure tone average for air conduction of the study population was 35.18dB and the mean postoperative ABG was 19.5dB with an improvement in mean ABG of 13.39dB with p value of <0.000 suggestive of highly significant association.

The mean improvement in ABG in Intact Canal Wall (ICW) mastoidectomy was 11.78dB whereas It was 14.08dB in Canal Wall Down (CWD) mastoidectomy showing a no statistical significant

Conclusion:- In cholesteatoma there is definitely an improvement of conductive hearing loss with surgery, though the primary aim is eradication of disease.

KEYWORDS : CHOLESTEATOMA, PTA, CWD, ICW MASTOIDECTOMY

INTRODUCTION

The ability to hear is an important sensory function for communication and better quality of life. The sense of hearing is important, not only to understand the expression of people around, but also for proper development of speech and language.

Disorders affecting hearing can be congenital or acquired. Yet, these preventable and correctable conditions which demand attention. The leading cause of hearing loss in acquired disorders being chronic otitis media is both preventable and correctable to certain extent.^{1,2}

Cholesteatoma is an erosive process causing destruction of the middle ear structures, leading to hearing impairment in a large majority of patients affected. The expansion of cholesteatoma may result in bone erosion of the ossicles, otic capsule, fallopian canal, tegmen tympani, and tegmen mastoideum.³ The involvement of these structures that are in close proximity to the middle ear can cause irreversible sequel and life-threatening complications.

Cholesteatoma whether congenital or acquired, can only be eradicated from the temporal bone by surgical resection. The goals of surgical management include the eradication of disease, restoration of hearing, and to the extent possible, maintenance or restoration of normal anatomic configuration.

Cholesteatoma has long been a formidable adversary to the otologic surgeon. There is no single surgical treatment of choice for aural cholesteatoma. The extent of cholesteatoma, the amount of preoperative destruction, mastoid pneumatization guides the surgeon in choosing the type of operation for a particular ear – which may range from simple extraction of cholesteatoma to radical mastoidectomy.

The controversy that has received the most attention in the literature concerns the optimal surgical treatment of cholesteatomas. Is the intact canal wall (ICW) mastoidectomy or canal wall down (CWD) mastoidectomy the preferred surgical approach for cholesteatomas, and why? Literature supports the use of both ICW and CWD techniques stating various reasons for the same.

MATERIALS AND METHODS

A retrospective study of 50 patients who underwent ear surgeries for

cholesteatoma at the Department of Otorhinolaryngology, VIMS, Ballari during the period Dec 2015 to May 2017.

INCLUSION CRITERIA

- 1) All patients diagnosed and operated for chronic otitis media with cholesteatoma
- 2) Patients with recurrent or residual cholesteatoma (previously operated cases)
- 3) All age groups of patients and both the sexes.

EXCLUSION CRITERIA

No specific exclusions. Cholesteatoma needs management under all circumstances.

This is a retrospective study of post-operative hearing outcome in cholesteatoma surgeries in VIMS Ballari. Since it is a time bound study which was undertaken over a period of 18 months, all the patients of COM with cholesteatoma during the study period were included. A written informed consent was taken from all patients included in the study.

Documents regarding pre-operative Pure-Tone Audiogram were collected. Confirmation of the cholesteatoma matrix post operatively was documented by HPE report.

Surgery (Intact Canal Wall or Canal Wall Down mastoidectomy) was done either under general or local anaesthesia in adult cases as per anaesthetist opinion and under general anaesthesia in children and apprehensive adults. Temporalis fascia was used as the grafting material. Primary ossicoplasty / tympanoplasty was done as per individual case needs. Follow-up data of PTA at 1, 3 and 6 months are noted.

STUDY ANALYSIS

Statistical analysis was done with IBM SPSS Version 22 for Windows. Qualitative data was represented in the form of frequency. Association between qualitative variables was assessed by Chi Square test. Quantitative data was represented in the form of Mean & Sd. Inter group comparison was done with Unpaired t test. A P value of <0.05 was considered as statistically significant.

RESULTS

This study included 50 patients between the age of 9 to 55 years, with 34 males and 16 females. In this study, 22 patients(44%) were aged between 10-19years. Though cholesteatoma can present at any age, its occurrence reduces after the age of 30 years according to our study. The most common age of presentation was between 10-20 years. Males were more commonly affected with a male: female ratio of 2.1:1. 46 patients(92%) were presented with history of hard of hearing. (Table 1)

All patients in the study population underwent mastoidectomy with tympanoplasty at a single stage via the post-aural approach. Forty-nine (98%) patients underwent primary surgery for cholesteatoma. 35 (70%) underwent canal wall down mastoidectomy and 15 (30%) patients underwent intact canal wall mastoidectomy. Canal wall down mastoidectomy was done in patients with complications and in cases where adequate disease clearance could not be accomplished with the posterior canal wall intact.

One (2%) patient had revision surgery. In this patient who underwent intact canal wall procedure in the past, had extensive cholesteatoma who underwent revision canal wall down mastoidectomy. The patient had irregular cavity with inadequate meatoplasty causing symptoms.

All patients in the study underwent ossicular reconstruction in the form of myringoplasty or myringostapedotomy. 42 (84%) of the patients in the study population underwent myringostapedotomy. Myringoplasty was done in 8(16%) patients. This was owing to the destruction of ossicles by the disease process and performed to accomplish adequate disease removal.

Preoperative pure tone audiometry was performed in all patients and pure tone average for air conduction and bone conduction was calculated for 0.5, 1, 2 kHz and the air-bone gap were determined.

Audiological evaluation of patients revealed 86% of the study population to have conductive hearing loss and 14% patients had mixed hearing loss. The preoperative pure tone average for air conduction of the study population was 35.18dB and the mean postoperative ABG was 19.5dB with an improvement in mean ABG of 13.39dB with p value of <0.000 suggestive of highly significant association.(Table 2)

The mean improvement in ABG in ICW mastoidectomy was 11.78dB whereas it was 14.08dB in CWD mastoidectomy showing a not statistically significant(Table 3).

Table 1: Distribution of study subjects based on hard of hearing

Hard of hearing	Frequency (N=50)	Percentage (%)
Present	46	92
Absent	4	8

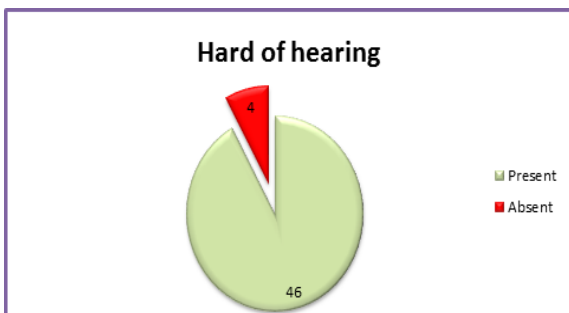


Table 2: Comparison of preoperative and postoperative ABG

Assessment	ABG		Paired t test
	Mean	Std. Deviation	
Preoperative air bone gap (ABG) in dB	35.18	6.59	12.588,
Postoperative ABG in Db	19.50	8.19	P<0.000,
Net improvement in ABG (pre-Post)	13.39	7.43	Highly Significant

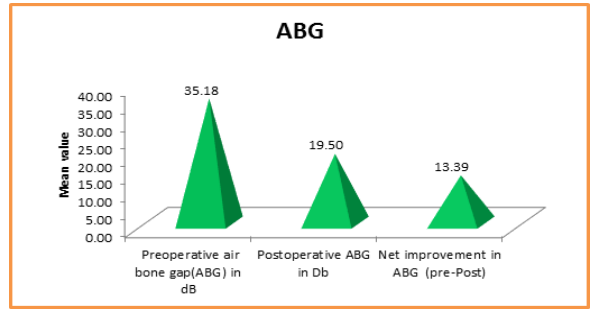
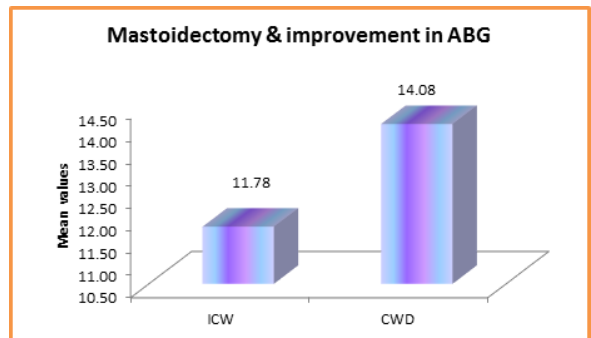


Table 3: Comparison of preoperative and postoperative ABG with respect to type of mastoidectomy

Net improvement in ABG & Mastoidectomy				
Mastoidectomy	N	Mean	Std. Deviation	Unpaired t test
ICW	15	11.78	8.76	-1.003, p<0.321, Not Significant
CWD	35	14.08	6.80	



DISCUSSION

In a CWD mastoidectomy, the bony tympanic annulus and much of the ear canal is removed, and the tympanic membrane graft is placed onto the facial ridge and medial attic wall. This results in a significant reduction in the size of the residual middle ear space. However, as long as this air space is $\geq 0.5\text{cc}$, the resultant loss of sound transmission should be less than 10dB. Since the average volume of the tympanic cavity is 0.5 – 1cc, a CWD procedure should create no significant acoustic detriment, so long as the middle ear is aerated. Indeed clinical studies comparing the acoustic results of CWD vs. ICW mastoidectomy have shown no significant difference.^{5,6}

In our study, the preoperative air-bone gap was 35.18(±6.59) dB and the postoperative air-bone gap was 19.50(±8.19) dB with an air bone closure of 13.39(±7.43)dB noted.

The net improvement in ABG in ICW mastoidectomy was 11.78(±8.76) dB and that in CWD mastoidectomy was 14.08(±6.8) dB with a significant p value of 0.321 as determined by the unpaired 't' test. In a study done by Dodson et al⁷ on pediatric cholesteatoma, statistical analysis of the means for postoperative air-bone gap, closure of the air-bone gap, change in bone conduction, and postoperative SRT revealed no significant differences between groups at a 95% confidence interval.

A CWD procedure also results in the creation of a large air space lateral to the ear drum, i.e., the air space within the mastoid bowl including the EAC. This mastoid bowl and ear canal space generates resonances which can influence middle-ear sound transmission favorably or unfavorably.⁸ The structure-function relationships between the size and shape of the mastoid cavity, and cavity resonances have not been well defined. An improved understanding of this issue may help otosurgeons to configure mastoid cavities in ways that are acoustically beneficial.

Hearing outcomes were also better in patients who underwent MS vs. MP. The mean improvement in ABG in MS was 12.98 dB and in MP was 15.54 dB. Autologous ossicles gave the best results for reconstruction in terms of air-bone closure.

Carrillo RJ, in their study found the ABG of 20 dB or less at 500 Hz and 30 dB or less at 1 kHz decreased probability of Ossicular discontinuity from 33 to 5.6% and 15.5%, respectively.⁷

Air-bone gap levels of greater than 30 dB at 2 kHz and greater than 40 dB at 4 kHz increased the probability of Ossicular discontinuity from 33 to 89%. In the presence of cholesteatoma, the chance of Ossicular discontinuity was 88% irrespective of ABG.⁹

Limitations

Retrospective and non-randomized control study.

The number of patients in the study (50) was a limitation to draw conclusions.

The follow-up of 6 months is too small a period owing to the chronic nature of the disease and its recurrence.

The study had only 38% of patients who had complete 6 months follow up, with 94% patients attending the 1 month follow up and 62% patient had 3 month follow up. 6% patients were lost to follow up.

Recommendations

Further studies on large number of patients with a long follow up is recommended.

CONCLUSION

In cholesteatoma there is definitely an improvement of conductive hearing loss with surgery, though the primary aim is eradication of disease.

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