

## ***Original Article***

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# **Study of Hearing Status After Canal Wall Down Mastoidectomy with Type-III Tympanoplasty**

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### **Abstract:**

**Objective:** To observe hearing status in case of canal wall down mastoidectomy with type III tympanoplasty.

**Methods:** This was a cross sectional study which was carried out in the departments of Otolaryngology and Head-Neck surgery of Bangabondhu Sheikh Mujib Medical University during the period of July' 2011 to March' 2012. A Total 38 patients having cholesteatoma underwent canal down mastoidectomy with type III tympanoplasty, were included in this study. Patients were divided into two groups according to their age. Age belonged to 18 years and more than 18 years were considered as child and adult respectively. Patients were examined thoroughly and preoperative hearing level was assessed by pure tone audiometry one week before operation. Post operative patients were followed up at regular intervals. Pure tone audiogram (PTA) was done after 8 weeks and hearing assessment was compared by closure of air bone gap.

**Results:** In this study majority of patients were within 13-17 years in child group and 18-35 years in adult group. Most of patients were male. Closure of air-bone gap was significantly higher in adults. Improvement of hearing status was more in adults.

**Conclusion:** CWD mastoidectomy with tympanoplasty not only lowers recurrence rate but also improves hearing status although less likely in child and younger age group than adults.

**Key words:** Hearing status, Canal wall down mastoidectomy, Type-III tympanoplasty

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### Introduction:

Canal wall down mastoidectomy with tympanoplasty (CWDT) for chronic suppurative otitis media with atticofacial variety is a common otological surgery. The aims of surgery are removal of the disease and preservation of good hearing function. Our aim is to report the hearing outcome of patients with CSOM with atticofacial variety, who had mastoidectomy with the classical Wullstein type III tympanoplasty.

Chronic Suppurative Otitis Media (CSOM) is a stage of ear disease in which there is chronic infection in the middle ear cleft.<sup>1</sup> It is a disease of insidious onset and present with persistent aural discharge and hearing impairment as a result of repeated infection from nose nasopharynx & oropharynx or from persistent Eustachian tube dysfunction or from improper treatment of ASOM.<sup>2</sup>

Chronic Suppurative Otitis Media is a worldwide health problem but higher in developing countries. Poor living conditions, poor hygiene, malnutrition, lack of access of medical care—all are major risks for CSOM. Young age, genetic factors, bottle feeding, use of a dummy, day care attendance, passive smoking are also contributing factors.<sup>3,4</sup>

The prevalence of CSOM in Bangladesh is 4.5% according to WHO situation review report.<sup>5</sup> The prevalence rate of CSOM in two different studies in our country in slum area and in rural area among children are found to be 7.39% and 12.44% respectively— are alarming for us.<sup>6</sup>

CSOM is classified based on the location of perforation and presence of pathologies like cholesteatoma and retraction pockets. When there is central perforation in the pars tensa it is called tubotympanic variety of CSOM, on the other hand when there is marginal perforation or presence of either a cholesteatoma or a retraction pocket, then it

is called atticofacial variety. Among these variety atticofacial or unsafe variety is more concerning to otologists. Because the most fascinating topics and one of the greatest and most complex problems in otology, Cholesteatoma is related with these variety. In clinical practice up to 50% of ears with active chronic otitis media is associated with cholesteatoma among 5% CSOM prevalence rate in our country.<sup>7</sup>

The choice of treatment of cholesteatoma is surgery for which the ideal goal is the total clearance of disease to obtain a safe, dry ear, and restoration or maintaining the functional capacity within a one stage surgical procedure if possible.<sup>8</sup> Children are considered to be less successful than in adults because of repeated RTI, poorer tubal function and higher incidence of otitis media.<sup>9</sup>

There are different surgical modalities for management of CSOM with cholesteatoma: intact canal wall procedures or closed mastoidectomy (combined approach tympanoplasty), canal wall down mastoidectomy (atticofacial, radical-mastoidectomy, Modified radical mastoidectomy).<sup>10</sup> Former is associated with higher recurrence rate (5% to 71%) but preservation of hearing is maintained. In canal wall down procedure there is less recurrence rate but with loss of hearing. With the concept of modern reconstructive surgery Tympanoplasty which is done by Zollner & Wullstein (1953, 1956) of Germany, made revolution in tympanomastoid surgery (canal wall down mastoidectomy with tympanoplasty) where almost disease clearance is achieved along with reconstruction of middle ear sound system done for hearing improvement. In type III, only stapes suprastructure present and placement of allograft is done on top of the stapes capitulum.

Now a day's canal wall down mastoidectomy with type III tympanoplasty under magnification is advocated by most otologists. The study is expected to show the hearing improvement after canal wall down mastoidectomy with tympanoplasty type-III.

### **Aims and Objectives:**

#### 1. General Objective:

To observe hearing status in case of canal wall down mastoidectomy with type III tympanoplasty.

#### 2. Specific Objective:

- To find out hearing status before mastoidectomy.
- To observe hearing status after mastoidectomy
- To compare hearing status in canal wall mastoidectomy with type III tympanoplasty in adult pre and postoperatively.
- To compare hearing status in canal wall mastoidectomy with type III tympanoplasty in children pre and postoperatively.

### **Methods and Materials:**

**Study design:** Cross-sectional study

**Study period:** July' 2011 to March' 2012.

**Study place:** Department of Otolaryngology and Head-Neck Surgery, BSMMU- Dhaka

**Study population:** All cases of CSOM with cholesteatoma or atticocanal variety admitted in BSMMU treated by canal wall down mastoidectomy with type III Tympanoplasty.

### **Selection criteria:**

#### *A. Inclusion criteria:*

- All patient of CSOM with cholesteatoma

- Patient more than 5 years & below 50 years.
- Those who will give informed consent to undergo the study.

### **B. Exclusion criteria:**

- CSOM without cholesteatoma.
- CSOM with External & Inner Ear abnormality, SNHL or any systemic disease.
- H/O previous mastoidectomy.

**Sample size:** 38.

**Sampling technique:** Purposive sampling technique was adopted. All the available subjects during the data collection period who fulfilled the study selection criteria were included in the study.

**Data collection technique:** Complete history taking and clinical examination were done and recorded in data collection sheet. Preoperative hearing level was assessed by pure tone audiometry and impedance audiometry one week before operation. Both group of patient were operated on under general anaesthesia with post auricular approach. Temporalis fascia was taken as graft material and placed over the stapes head after doing modified radical mastoidectomy. Operation was done by various surgeons. Post operative patients were followed up at weekly interval for the first month and then 02 weekly intervals up to 08 weeks and after that pure tone audiogram (PTA) was done and compared hearing assesment by closure of air bone gap.

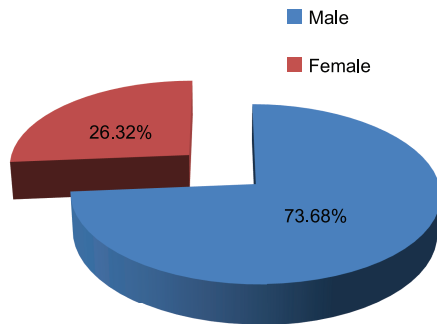
**Data analysis:** After collection all the data were checked and edited. Then data were entered into computer with the help of software SPSS 16 version.

## Observation and Results

**Table I**  
*Distribution of age group(n=38).*

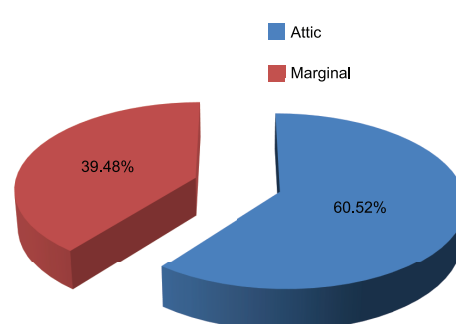
Age (years)	Frequency (n)	Percent (%)	Average age(Years)
5-12 years	8	21.05%	24.22±12.15 ( Min.8 & Max.51)
13-17 years	10	26.31%	
18-35 years	13	34.21%	
Above 35 years	7	18.42%	
Total	38	100.0%	

Among the study subjects more than one third was in 18 to 35 years age group (34.21%). Less than one third was in 13 to 17 years age group (26.31%)



**Fig.-1:** *Distribution of sex among the study subjects(n=38)*

Among the study subjects more than two thirds was male (73.68%) and less than one third was female (26.32%).



**Fig.-2:** *Condition of Tympanic Membrane*

More than half of the patients had attic perforation (60.52%). More than one third had marginal perforation (39.48%).

**Table II**  
*Status of Graft (n=38)*

Graft	Group	Frequency (n)	Percent	Total (%)
Graft accepted	Child	13	34.21%	78.94%
	Adult	17	44.73%	
Graft Failure	Child	5	13.15%	21.4%
	Adult	3	7.89%	
Total	38	100.0%	100.0%	

The graft accepted in 78.94% cases. Graft accepted rate is more in adults.

**Table III**  
*Pre operative and post operative hearing threshold in child (n=18)*

Bone conduction threshold Mean(dB)		Air conduction threshold Mean(dB)		Air Bone gapMean (dB)	
Pre operative	Post operative	Pre operative	Post operative	Pre operative	Post operative
16.7	13.6	48.16	45.2	30.7	29.26

Average pre operative Air Bone gap was 30.7dB and post operative Air-Bone gap was 29.26dB.

**Table IV**  
*Pre operative and post operative hearing threshold in adult (n=20)*

Bone conduction threshold Mean(dB)		Air conduction threshold Mean(dB)		Air Bone gapMean (dB)	
Pre operative	Post operative	Pre operative	Post operative	Pre operative	Post operative
24.7	20.9	56.6	42.2	31.7	21.8

Average pre operative Air Bone gap was 31.7dB and post operative Air-Bone gap was 21.8 dB.

**Table V**  
*Comparison of hearing improvement among child and adult*

AB gap	Group	Mean $\pm$ SD	P value(student t test)
Preoperative AB gap	Child (18)	29.42 $\pm$ 9.79	.05s
	Adult (20)	33.01 $\pm$ 15.79	
Post Operative AB gap	Child (18)	27.68 $\pm$ 8.20	.04 s
	Adult (20)	23.52 $\pm$ 12.56	

Average pre operative AB gap was significantly more in adult (33.01  $\pm$ 15.79) than child (29.42  $\pm$ 9.79). Average post operative AB gap was significantly more in child (27.68  $\pm$ 8.20) than adult (23.52  $\pm$ 12.56).

**Table VI**  
*Distribution of Patients according to Post Operative Development in Hearing Status*

Study Groups	Post Operative Hearing Status		
	Improved	Unchanged	Deteriorated
Adult(n=20)	16(80%)	1(5%)	3(15%)
Child(n=18)	9(50%)	1(5.6%)	8(44.44%)

Improvement of post operative hearing status was more in adults(80%) than in child(50%).

**Discussion:**

In this cross sectional study all patients were underwent CWD mastoidectomy with type III tympanoplasty for CSOM with cholesteatoma and observed the pre and post operative hearing results in terms of average ABG and the size of ABG closure in adults and child separately.

In this study average age of the patients was 24.22 years being range from 8 to 50 years and which was almost similar to another study (mean age 21.3 years).<sup>11</sup> Most of patients belonged to the age group 11 to 20 years which is similar to other study.<sup>12</sup> Male 28 (76.68%) are more than female in our study because they are less cared and hardly attended in the hospital in our socio cultural aspect. In the study, 60.52% had attic perforation and 39.48% had marginal perforation. Graft was accepted more in adult (44.73%) than child (34.21%) and overall success rate 78.94%.

In our study, pre operative hearing threshold in child and younger age group (n=18) showed average bone conduction threshold and air conduction threshold was 16.7dB and 48.16 dB respectively. Their average preoperative Air Bone gap was 30.7 dB. On the contrary average post operative bone conduction and air conduction threshold was 13.6dB and 45.2 dB respectively and their average post operative Air Bone gap was 29.26dB. Net hearing gain was 1.44 dB. Among them hearing status had improved in 9(50%) cases, 8(44.44%) had deteriorated and 1(5.6%) unchanged. It is compared to another study<sup>13</sup> which was conducted

on 114 children. Author observed hearing improvement was achieved in 38% of CWD procedures (P/0.957). Hearing deterioration was observed in 47% of CWD procedures (P/0.328) among children. Authors explained that Cholesteatoma in children has a more aggressive growth pattern and often involves

the entire mastoid and mesotympanum which necessitates early surgical treatment. Thus after CWD procedures done in the children in both our and reference studies, net hearing gain and overall improvement was so trivial.

Pre operative hearing threshold in adult (n=20) showed average bone conduction threshold and air conduction threshold was 24.7dB and 56.4 dB respectively. Their average preoperative Air Bone gap was 31.7 dB. On the contrary average post operative bone conduction and air conduction threshold was 20.9dB and 42.20 dB respectively and their average post operative Air Bone gap was 21.8 dB. Net hearing gain was 9.9 dB.

A similar study reported only short term hearing results where average pre operative ABG which was 37.dB was reduced to 29.8 dB postoperatively with a net gain of 8.0 dB.<sup>14</sup>

In our study 16(80%) of adult had improvement in hearing status whereas 3(15%) deteriorated and 1(5%) unchanged which is not similar to another study where hearing improvement was in 30%, remained unchanged in 55%, and worsened in 15%.<sup>15</sup>

In this study adults had more improvement in gaining hearing status as well as dry mastoid cavity and better acceptance of graft taking whereas children had overall mild improvement in hearing gain and had more discharging mastoid cavity with more graft failure although the surgical procedures were same in both groups.

Main reasons behind such findings are due to having more extensive disease process due to well pneumatization of mastoid bone, horizontally placed Eustachian tube are prone to get middle ear infection, medialization of grafts and being poor follow up responder.

**Conclusion:**

Management of chronic suppurative otitis media with cholesteatoma should be aimed

to prevent complication and recurrence rate and also improvement of hearing status. The functional results of this study support the importance of type III tympanoplasty in conjunction with canal wall down mastoidectomy (CWD). In fact CWD mastoidectomy with tympanoplasty not only lowers recurrence rate but also improves hearing status although less likely in child and younger age group than adults because of pneumatization of mastoid, eustachian tube dysfunction and poor follow up response.

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