

Original Article

Post operative hearing status in canal wall down mastoidectomy with type III tympanoplasty

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Abstract:

Background: Canal wall down procedure may be with or without reconstruction such as tympanic membrane, ossicular chain or posterior canal wall reconstruction. To preserve and improvement of hearing, prevent discharge and recurrence, now a days canal wall down mastoidectomy with reconstruction such as type III tympanoplasty under magnification is a modern advancement in otology

Objectives: To find out hearing status before mastoidectomy and hearing status after canal wall down mastoidectomy with and without reconstruction.

Methods: Prospectove study done on 3 tertiary hospitals in Dhaka. Number of patients were 40 who underwent for modified radical mstoidectomy, 20 were with reconstruction and 20 without reconstruction (Type 3 Tympanoplasty)

Results: hearing was deteriorated in most of the cases (60%) of MRM without tympanoplasty. Air Bone (AB) Gap Increased 3.65dB after CWD without reconstruction. Closer of AB gap (9.77 dB) occurred after CWD with reconstruction.

Introduction:

Atticoantral variety of CSOM most commonly involves the epitympanum & usually associated with cholesteatoma. Cholesteatoma is histologically benign but

may be aggressive locally and associated with significant morbidity or mortality if untreated.¹

The choice of treatment of cholesteatoma is surgery for which the goal is total clearance of disease, to obtain a safe, dry ear, restoration or maintaining the functional capacity if possible.²

There are different surgical modalities of treatment according to the extent of cholesteatoma and amount of destruction such as suction clearance, intact canal wall procedures (cortical mastoidectomy, combined approach tympanoplasty) and canal wall down procedures (atticotomy, atticotoantrotomy, Modified radical mastoidectomy and Radical mastoidectomy)³.

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In the early days of chronic ear surgery radical mastoidectomy was the operation of choice but poor hearing and high incidence of chronic or intermittent discharge were the limitations of this procedure. To overcome this disadvantage modified radical mastoidectomy was proposed and most commonly performed.^{4,2}

In intact canal wall procedure there is good preservation of hearing but more chance of incomplete clearance or recurrence of disease. Canal wall down procedure causes disease clearance properly but the disadvantage of poor preservation of hearing which can be overcome by reconstructive surgery.^{1,4}

The techniques and concepts of modern reconstructive middle ear surgery came into the field when Moritz (1952), Zollner (1953, 1955), Wullstein (1953, 1956) in Germany introduced tympanoplasty operation.²

Canal wall down procedure may be with or without reconstruction such as tympanic membrane, ossicular chain or posterior canal wall reconstruction. To preserve and improvement of hearing, prevent discharge and recurrence, now a days canal wall down mastoidectomy with reconstruction such as type III tympanoplasty under magnification is a modern advancement in otology.^{2,3}

In most of the patients of chronic suppurative otitis media, Pure Tone Audiometry shows the hearing loss ranges from mild to severe depending on extent of the disease. In canal wall down mastoidectomy without reconstruction there is destruction of ossicles and/or Tympanic membrane for complete clearance of disease. The postoperative audiometric evaluation shows further hearing loss. On the other hand canal wall down mastoidectomy with reconstruction i.e. tympanoplasty, ossiculoplasty improves hearing in variable amount. In the study of MU Ahmed (2005) and Ajalloueyan (2006) shows that significant number of patients receiving such procedure have improved their hearing status.^{3,4}

Careful follow up, by clinical, radiological and audiometric means are essential to make a comment about hearing status of the patient. The worldwide practice of performing such surgery and it's good outcome has encouraged to do this research work.

Modified radical mastoidectomy with tympanoplasty

The types of Tympanoplasty²

Type-1: reconstruction of the tympanic membrane (ossicular chain intact and mobile).

Type-2: malleus handle absent, reconstruction of the tympanic membrane over the malleus remnant and long process of incus.

Type-3: malleus and incus absent, reconstruction of the tympanic membrane over an intact and mobile stapes (myringostapediopexy) with stapes acting as columella.

Type-4: mobile stapes footplate exteriorized with reconstruction of the tympanic membrane as a round window baffle.

Type-5: stapes fixed, fenestration.

Aims and Objectives:

1. To find out hearing status before mastoidectomy.
2. To find out hearing status after canal wall down mastoidectomy with and without reconstruction.

Methods:

This study was conducted using following methods and materials:

Type of Study : Prospective Study

Place of Study : ENT department of Mymensingh Medical College Hospital (MMCH), Sir Salimullah Medical College and Mitford Hospital (SSMC & MH), Dhaka and Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka.

Duration of Study

One year, January 2008 to January 2009.

Study Population

Patients of CSOM (atticoantral variety) admitted for canal wall down mastoidectomy.

Sample size (n)

Group I: 20 Patients of canal wall down mastoidectomy without reconstruction.

Group II: 20 Patients of canal wall down mastoidectomy with reconstruction (type-III tympanoplasty).

Total number of patients was 40.

Data Collection: Relevant data were collected in a preformed data collection sheet for each of the patient.

Analysis of data and results: All data checked and verified thoroughly to reduce the inconsistency. The numerical data obtained from this study compiled and analyzed. The results are presented here as tables and figures.

Results:**Table I**

Distribution of the types of surgery (n = 40).

Types of surgery	No of patients	Percentage
canal wall down mastoidectomy without reconstruction	20	50
canal wall down mastoidectomy with reconstruction	20	50

Table II

Post operative follow up of patients (n = 40).

Complications	1 st Week	2 nd Week	4 th Week	6 th Week	8 th Week
Discharge	—		16 (40%)	11 (27.5%)	8 (20%)
Vertigo	2 (5%)	nil	nil	nil	nil
Facial Weakness	2 (5 %)	2 (5 %)	2 (5 %)	2 (5 %)	2 (5 %)
Dead ear	nil	nil	nil	nil	nil
Vomiting	3 (7.5%)	nil	nil	nil	nil

Table XII shows that ear discharge after 4 weeks of operation was 40% and at the end of 8 weeks which was 20%. Two case having preoperative facial weakness in which function did not return after 8 weeks. None of the patients developed dead ear.

Table: III

Condition of the mastoid cavity (8 weeks post operatively) (n=40).

Cavitywetness	Type of Surgery		Total
	CWD mastoidectomy with tympanoplasty type III n(%)	CWD mastoidectomy without tympanoplasty type III n(%)	
Dry	18 (90%)	14 (70%)	32 (80%)
Wet	2 (10%)	6 (30%)	8 (20%)
Total	20 (50%)	20 (50%)	100%

Dry cavity in CWD with tympanoplasty group (90%) was higher than CWD without tympanoplasty group (70%).

Table IV

Post operative hearing status (after 8 weeks) in canal wall down mastoidectomy without type III tympanoplasty (n = 20).

Improved	nil	nil
Unchanged	8	40%
Deteriorated	12	60%
(10-19dB)	(7)	(35%)
(20-29 dB)	(3)	(15%)
(> 29 dB)	(2)	(10%)
Total	20	(100%)

Table XIV shows that hearing was not improved after mastoidectomy without tympanoplasty. Hearing deterioration occurred in most of the cases (60%).

N.B. Here <10 dB variation of hearing in PTA is considered as unchanged.

Table V

Post operative hearing status (after 8 weeks) in canal wall down mastoidectomy with type III tympanoplasty (n = 20).ins 0)ptal comlication ectomy. astoidectomy.

Hearing Status	No. of patents	Percentage
Improved	9	45%
(10-19dB)	(5)	(25%)
(20-29 dB)	(2)	(10%)
(> 29 dB)	(2)	(10%)
Unchanged	7	35%
Deteriorated	4	20%
Total	20	100%

Table XV shows that hearing status improved in 45% cases.

Table VI

Hearing Improvement (after 8 weeks) in canal wall down mastoidectomy without reconstruction (n = 20).

Preoperative Air Bone	Post Operative Air Bone	Hearing Improvement /
(AB) Gap	(AB) Gap	Closer of AB Gap
Mean (dB)	Mean (dB)	Mean (dB)
37.85 dB	41.50 dB	-3.65

Air Bone (AB) Gap Increased 3.65dB after CWD without reconstruction

Preoperative AC was 30-70 dB (Mean 59.20 dB) and BC was 10-30 dB (Mean 21.35 dB). The preoperative AB gap was 20-55 dB (Mean 37.85 dB). Post operative AC was 50-75 dB (Mean 63.75 dB) and BC was 15-35 dB (Mean 22.25 dB). Post operative AB gap was 35-55 dB (Mean 41.50 dB).

Table VII

Hearing Improvement (after 8 weeks) in canal wall down mastoidectomy with reconstruction (n = 20).

Preoperative Air Bone (AB)	Post Operative Air	Hearing Improvement /
Gap	Bone (AB) Gap	Closer of AB Gap
Mean (dB)	Mean (dB)	Mean (dB)
37.55 dB	27.78 dB	9.77 dB

Closer of AB gap (9.77 dB) occurred after CWD with reconstruction.

Discussion:

Chronic suppurative otitis media with or without complications affects a large number of patient in developing countries and is quite common in our country especially the younger and low socioeconomic groups. In attic antral variety of chronic suppurative otitis media (CSOM), cholesteatoma is usually present in middle ear & mastoid air cell system, which is mainly responsible for different complications.⁵

Goals of surgical management of cholesteatoma include the eradication of disease, restoration of hearing and restoration of normal anatomical configuration. Prior to 1950s, the only surgery that was popularly recommended and used for middle ear cholesteatoma was radical or modified radical mastoidectomy. Now a days canal wall down mastoidectomy with tympanoplasties are widely performed. Convincing evidence exists that recurrence is reduced in CWD mastoidectomy with tympanoplasty and the hearing outcome is not sacrificed⁶.

In this study, patients of attic antral variety of CSOM were divided into two groups: Group-I, Patients who underwent CWD mastoidectomy without reconstruction and group-II, patients who underwent CWD mastoidectomy with reconstruction. Each groups comprises 20 patients.

In the present study the age range were from 8 years to 50 years. The average age was being 21 years. The highest number of patients (45%) were in 11-20 years age group. The younger age groups suffer more as because of cellular mastoid, horizontal position of Eustachian tube and enlarged adenoids and re-current upper respiratory tract infections, which is supported by other studies.^{2,7}

Bathing habit of the study population revealed that major group (75%) had the habit of

bathing in pond and river which was a factor of reactivation of ear infection and complication, this finding had also supported by others.^{6,8}

In this series male (70%) were more affected than female (30%) with a male and female ratio of 2.3:1 which also showed in different studies.^{27,31,32} Female was less in number because they are less cared in society, they hardly attended the hospital and there are few bed allocation for the female as compared to male.⁶ Among the study group right ear involvement was 50%, 40% in left ear and 10% in both ear.

In this study group the commonest complaints were otorrhoea (100%) and hearing impairment (100%). which was also supported by other studies²⁷

cholesteatoma was present in all patients (100%) and granulation tissue in 40% cases, that is also similar to other studies⁹.

In the present study, 67.5% had attic perforation and 32.5% had posteriosuperior marginal perforation. This findings are more or less similar to other series where attic perforation were more than the posteriosuperior marginal perforation.^{5,10}

Vertigo was present in 2 (5%) cases, vomiting in 3 (7.5%) cases after canal wall down mastoidectomy which disappeared within 1st week of operation. This may be due to surgical or thermal stimulation of labyrinth. Among the 2 (5%) cases of facial paralysis, 1 case had preoperative facial paralysis. Facial nerve function did not return after 8 weeks of operation. This was also similar to other study.⁸

Post operative follow up of patients showed that aural discharge was 40% at 4th week, 27.5% at 6th week and 22.5% at 8th week. The study showed that after 8 weeks achievement of dry ear with canal wall down

mastoidectomy with tympanoplasty type-III was 90% where canal wall down mastoidectomy without reconstruction was 70% which was also similar to other studies.¹¹

In the present series of canal wall down mastoidectomy without tympanoplasty, hearing threshold was unchanged in 40% cases, hearing loss by 10-19 dB in 35% cases, 20-29 dB in 15% cases & more than 29 dB in 10% cases. This study shows hearing threshold remained unchanged or deterioration of hearing after surgery and there was no hearing improvement.²⁹ In the other group of canal wall down mastoidectomy with type III tympanoplasty, hearing threshold remained unchanged in 35% cases, and hearing was improved by (10-19 dB) in 25% cases, 20-29 dB in 10% cases & more than 29 dB in 10% cases. Thus hearing threshold was improved or at least remain unchanged in 80% cases & hearing deterioration occurred in 20% cases. This result is more or less similar to others.¹²

In Group-I patients, preoperative AC was 30-70 dB (mean 59.20dB) and BC was 10-30 dB (mean 21.35 dB). The preoperative air bone (AB) gap was 20-55 dB (mean 37.85 dB) while postoperative AB gap was 35-55dB (mean 41.5dB). AB gap increased postoperatively and there was no hearing improvement in group 1. This was also noted in another article.¹³

In group II preoperative AC was 35-75dB (mean 58.3 dB) BC was 10-35dB (mean 20.75dB). So, the preoperative air bone gap was 37.55dB, while post operative AB gap was 10-45dB (mean 27.78dB). So the mean hearing gain was 9.77dB (with a range between 5-30dB). This result was more or less similar to other study^{14,15,16}

In both groups, during MRM, partially diseased ossicle and incus were removed resulting in discontinuity of ossicular chain

and deterioration of hearing. In some cases, the gap between the disrupted ossicular chain was bridged by cholesteatoma and thus hearing was maintained. But after removal of disease, continuity of ossicular chain was lost and resulting in deterioration of hearing.¹⁶ In addition, in case of CWD mastoidectomy with tympanoplasty, sometimes medialization of graft occurs, for which middle ear cavity is not maintained and possibly eustachian tube function is not established properly. As a result deterioration of hearing occurs¹⁷.

Conclusion:

Early detection and management of chronic suppurative otitis media with cholesteatoma should be our goal to prevent complication and post operative care and follow up are imperative to prevent recurrence and promotion of life. The functional results of this study support the importance of type III tympanoplasty in conjunction with CWD mastoidectomy. In fact reconstruction following mastoidectomy not only improves the hearing but also causing dry ear and prevention of complication and thus improves the quality of life.

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