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Original Article

Comparative Study of Hearing Status after Modified Radical Mastoidectomy with and Without Reconstruction

Syed Sanaul Islam[1], Belayat Hossain Siddiquee[2], A.B.M. Luthful Kabir[3], Muhammad Rafiqul Islam[4], Md. Abdur Razzak[5]

Abstract:

Objective: *To compare the hearing status after modified radical mastoidectomy with and without reconstruction*.

Materials and Methods: *This was a cross sectional observational study which was carried out in the departments of Otolaryngology and Head-Neck surgery of Bangabondhu Sheikh Mujib Medical University Dhaka Medical College during the period of April'2012 to September '2012. A Total 30 patients of CSOM (Atico-antral variety) underwent modified radical mastoidectomy (MRM) with or without reconstruction were included in this study. Patients were divided into two groups according to operative procedure. Patient underwent MRM without reconstruction belonged to group I (n=15) and with reconstruction was considered as group II(n=15). Patients were examined thoroughly and preoperative hearing level was assessed by pure tone audiometry one week before operation. Both groups of patients were operated by general anesthesia under microscope with post auricular approach. In group II, temporalis fascia and cartilage were taken as graft materials after doing modified radical mastoidectomy. 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 11-20 years and most of patients were male. Closure of air-bone gap was higher in patients underwent MRM with reconstruction.*

Conclusion: *Reconstruction following MRM causes better hearing gain and also improves the quality of life.*

Key words: *Hearing Status, Modified Radical Mastoidectomy, Reconstruction*

1. Medical officer. National institute of ENT, Tejgaon, Dhaka.
2. Professor, Professor & Chief, Head & Neck Surgery Division Department of Otolaryngology and Head-Neck surgery, BSMMU
3. Research officer. National institute of ENT, Tejgaon, Dhaka.
4. Registrar. National institute of ENT, Tejgaon, Dhaka.
5. Resident surgeon, Shaheed Suhrawardy Medical College Hospital, Dhaka.

Address of correspondence : Dr. Syed Sanaul Islam, FCPS (ENT), Medical Officer. National institute of ENT, Tejgaon, Dhaka, Bangladesh. Mobile: 01712616303, E-mail: 78sanaul@gmail.com

Introduction:

Chronic supporative otitis media (CSOM) is a common middle ear disease.[1] Higher incidence of CSOM with cholesteatoma has been attributed in developing countries due to poor living condition, overcrowding, poor personal hygiene, lack of breast feeding, passive smoking, poor general health, poor resistance to infection, lack of health awareness, paucity of accessible health care, illiteracy & ignorance.

The atticoantral variety of chronic suppurative otitis media usually associated with cholesteatoma. 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 functional capacity if possible.[2,3] There are different surgical modalities of treatment according to the extent of cholesteatoma and amount of destruction such as intact canal wall procedures (cortical mastoidectomy, combined approach tympanoplasty) and canal wall down procedures (atticotomy, atticoantrostomy, modified radical mastoidectomy and radical mastoidectomy).[4]

At the close of 20th century the surgical procedure used to treat chronic middle ear disease was treated by either simple or radical mastoidectomy, with no attempt to preserve the pre-operative hearing level. The concepts of modern reconstructive middle ear surgery came into the field when Moritz, Zollner, Wullstein in Germany introduced tympanoplasty operation.[4] Modified radical mastoidectomy may be done with or without reconstruction such as tympanic membrane, ossicular chain or posterior canal wall reconstruction, to preserve & improvement of hearing, prevent discharge and recurrence. Now a day's modified radical mastoidectomy (canal wall down) with reconstruction under magnification is a modern advancement in otology.[4,5]

In modified radical mastoidectomy hearing results depends on the status of the ossicular chain and on the re-establishment of the transmission of sound through a tympano-ossicular system.[6] In most of the patients of chronic supporative otitis media, PTA shows the hearing loss ranges from mild to severe depending on extent of disease.[7] In modified radical mastoidectomy (canal wall down) there is destruction of ossicles and or tympanic membrane for complete Clearance of disease. If per operative reconstruction was not done in that case post operative audiometric evaluation may remain unchanged or further hearing loss (±10dB).[8] On the other hand MRM with reconstruction improved post operative hearing status in more proportion of patient than without reconstruction.[8] MRM with tympanoplasty mean hearing improvement 8dB.[9] In MRM with ossiculoplasty, ABG 0-10dB is achieved in only 50% of patients while 80% have ABG of 0-20 dB.[8]

In my study, I measured the preoperative hearing status in both the group undergoing MRM with reconstruction and without reconstruction. Then further audiological assessment following surgery will be done. Hearing status will be measured in every patient of each group and the result of the two groups will be compared.

Aims and Objectives:

General Objectives:

To compare the hearing status after modified radical mastoidectomy with and without reconstruction.

Specific Objectives:

1. To determine the preoperative hearing status of CSOM due to cholesteatoma.
2. To find out the appropriate surgical procedure to restore anatomical and functional status for cholesteatoma.

Methods :

Study Design: Cross-sectional Observational study

Place of Study: Department of Otolaryngology & Head-Neck Surgery, BSMMU & Dhaka Medical College Hospital.

Duration of Study: 6 months (From April' 2012 to September' 2012)

Study Population: Patients of CSOM (Atticoantral variety) admitted for modified radical mastoidectomy (MRM) in BSMMU and DMCH.

Sample Size (n): Group I : 15 patients of MRM without reconstruction.

Group II : 15 patients of MRM with reconstruction.

Total number of patients was 30.

Inclusion Criteria:

1. All Cases of CSOM with cholesteatoma underwent surgery.

Exclusion Criteria:

1. Patients with any intracranial complication due to cholesteatoma.
2. Patients with bilateral CSOM with cholesteatoma.

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.

Method of Study: A total number of 30 patients (Group I -15 and Group II-15), who underwent MRM without and with reconstruction were collected. After taking history the patients were examined thoroughly by otoscope and under microscope. Tuning fork test, test for facial nerve integrity and fistula test were performed in every case. Hearing level was assessed by PTA with masking. X-ray mastoid and in some cases CT scan of petro-mastoid area were done. Both groups of patients were operated by general anesthesia under microscope with post auricular approach. In group II, temporalis fascia and cartilage were taken as graft materials after doing modified radical mastoidectomy. PTA was done after 8 weeks postoperatively and compared.

Data Analysis: After collection all the data were checked and edited. Then all data were satistically analysed by SPSS method.

Observation and Results:

Table I :

Age distribution of patients (n=30)

Age Groups (Years)	No of Patients	Percentage (%)
11-20	14	46.67
21-30	09	30
31-40	04	13.33
41-50	03	10
Total	30	100

Most of patients were in 11-20 years age group (46.6%).

Table II :

Sex distribution of patients (n=30)

Sex	No of Patients	Percentage (%)
Male	18	60
Female	12	40
Total	30	100

The ratio of male and female patient is 1.5:1

Table III :

Type of perforation of Tympanic membrane in operated ears (n=30)

Type of perforation	No. of patients	Percentage (%)
Attic	24	80
Postero Superior marginal	06	20
Total	30	100

Most of the patients were with attic perforation 80%

Table IV :
Condition of the mastoid cavity (8 weeks post operatively) (n=30)

Cavity wetness	Type of Surgery		Total
	Group I (n=15)	Group II (n=15)	
Dry	09 (60%)	12 (80%)	21 (70%)
Wet	06 (40%)	03 (20%)	09 (30%)
Total	15 (50%)	15 (50%)	30 (100%)

Dry cavity in MRM with Reconstruction group (80%) was higher than MRM without Reconstruction group (60%).

Table V :
Post operative hearing status (after 8 weeks) in MRM with Reconstruction (n=15)

Hearing Status	No. of Patients	Percentage (%)
Improved	12	80%
(10-19 dB)	08	53.33%
(20-29 dB)	02	13.33%
(>29 dB)	02	13.33%
Unchanged	02	13.33%
Deteriorate	01	6.67%
Total	15	100%

Hearing status improved in 80% cases in MRM with reconstruction.

Table VI :
Post operative hearing status (after 8 weeks) in MRM without Reconstruction (n=15)

Hearing Status	No. of Patients	Percentage (%)
Improved	Nil	Nil
Unchanged	03	20%
Deteriorated	12	80%
(10-19 dB)	08	53.33%
(20-29 dB)	03	20.00%
(>29 dB)	01	06.67%
Total	15	100%

Hearing deterioration occurred in most of the cases (80%) after MRM without reconstruction. (Here < 10 dB variation of hearing is considered as unchanged.)

Table VII :
Hearing improvement (after 8 weeks) in both groups (n=30)

Groups	Preoperative Air Bone (AB) Gap Mean (dB)	Postoperative Air Bone (AB) Gap Mean (dB)	Hearing Improvement/ Closer of AB Gap Mean (dB)
Group I	35.65	38.15	-3.50
Group II	37.55	24.17	13.38

Airbone (AB) gap was more closed in group II

Discussion:

This cross sectional study was carried out with an aim to compare the hearing status after modified radical mastoidectomy with and without reconstruction. The study findings were discussed and compared with previously published relevant studies.

In the present study the age range were from 11 years to 50 years. The average age was being 21 years. The highest number of patients (46.67%) was 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-currents URTI which is supported by other studies.[10]

In this series male (60%) were more affected than female (40%) with a male and female ratio of 1.5:1 which also showed in different studies.[11,12] 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.

In the present study, 80% had attic perforation and 20% had posterosuperior marginal perforation. This findings are more or less similar to other series where attic perforation were more than the posteriosuperior marginal perforation.[13,14]

The study showed that after 8 weeks achievement of dry ear with MRM with reconstruction was 80% where MRM without reconstruction was 60% which was also similar to other studies.[15] In the present series of MRM without reconstruction, hearing threshold was unchanged in 20% cases, hearing loss by 10-19 dB in 53.33% cases, 20-29 dB in 20% cases & more than 29 dB in 6.67% cases. This study shows hearing threshold remain unchanged or deterioration of hearing after surgery and there was no hearing improvement. In the other group of MRM with reconstruction hearing threshold remained unchanged in 13.33% cases, and hearing was improved by (10-19 dB) in 53.33% cases, 20-29 dB in 13.33% cases & more than 29 dB in 13.33% cases. Thus hearing threshold was improved in 80% cases and hearing deterioration occurred in 6.67% cases. This result is more or less similar to others.[14]

In group-I, the preoperative mean AB gap was 35.65 dB while post operative mean AB gap was 38.15 dB). AB gap increased post operatively and there was no hearing improvement in group –I which was also noted in another article.[15] In group –II preoperative mean AB gap was 37.55 dB, while post operative mean AB gap was 24.17 dB). So the mean hearing gain was 13.38 dB. This result was more or less similar to other study.[16]

In both groups, during MRM partially diseased ossicle and incus were removed resulting in discontinuity of ossicular chain was bridged by cholesteatoma and thus hearing was maintained. But after removal of diseases, continuity of ossicular chain was lost and resulting in deterioration of hearing. In addition, in case of MRM with

tympanoplasty, sometimes medialization of graft occurs for which middle ear cavity was not maintain and possibly Eustachian tube function was not established properly. As a result, deterioration of hearing occurred.

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 reconstruction in conjunction with MRM. In fact reconstruction following MRM not only improved the hearing gain but also causing dryness of ear and prevention of complication and thus improves the quality of life.

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