

RESEARCH ARTICLE

Assessment of Preoperative and Postoperative Hearing Following Type 1 Tympanoplasty: A Retrospective Study

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Abstract

Background: Chronic otitis media is worldly prevalent disease with otorrhoea, hearing loss, otalgia causing psychological trauma and financial burden to the society. In an attempt to overcome this menace, various techniques of Tympanoplasty have evolved out and from time to time improvisation was done based mainly in terms of hearing improvement and disease free ear.

Objective: To assess the preoperative and postoperative assessment of hearing following type 1 tympanoplasty.

Methods: A retrospective study involving all patients who underwent type I tympanoplasty in ENT department, Abdul Malek Ukil Medical College Hospital, Noakhali, Bangladesh for perforation of the tympanic membrane during the period June 2022 to December 2023. Only 50 patients are included in the present study. All the patients who presented with com were submitted to an assessment protocol, history taking, specific physical examination (otoscopy and rhinoscopy), audiogram, examination under microscope to confirm otoscopic findings.

Results: Total 50 cases included our study. Majority of cases (54%) were between 21-30 years. Females 27 (54%) are more as compared to male 23 (46%), patients in the present study. Out of the 50 patients, 22 (44%) patients had disease in the right ear, 28 (56%) had disease in left ear. 38 (76%) patients had unilateral & 12 patients (24%) had bilateral disease. Out of the seven patients with bilateral disease, the ear with more hearing loss was operated on first. Large perforation is seen in 26% of patients and posterior central perforation in 24%. Preoperative hearing threshold of half of the patients (50%) lies in range 35-39 Db, whereas in 22 patients (44%) hearing threshold lies in 30-34 Db range and only 3 (6%) patients have hearing threshold in 40-44 Db range. The commonest presenting complaint is ear discharge. Hearing loss seen in only 30 (60%) patients. Tinnitus is found in 2 (4%), pain in the ear in 18 (36%) and vertigo in 0% of patients.

Conclusions: Intermittent otorrhoea was the most common and hearing loss was seen only in 60% of the patients as presenting complaint in chronic otitis media in our study. There was no significant predilection for gender. Hearing improvement was assessed by improvement in ab gap in this study and was significant after type 1 tympanoplasty.

Keywords: Preoperative, Postoperative, Type 1 Tympanoplasty.

1. Introduction

Chronic otitis media is worldly prevalent disease with otorrhoea, hearing loss, otalgia causing psychological

trauma and financial burden to the society. In an attempt to overcome this menace, various techniques of Tympanoplasty have evolved out and from time to

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time improvisation was done based mainly in terms of hearing improvement and disease free ear. Chronic otitis media is a longstanding infection of the middle ear cleft characterized by persistent or recurrent aural discharge, deafness and perforation of tympanic membrane. The term tympanoplasty was first used in 1953 by Wullstein to describe surgical techniques for reconstruction of the middle ear hearing mechanism that had been impaired or destroyed by chronic ear disease. Tympanoplasty is the culmination of over 100 years of development of surgical procedures on the middle ear to improve hearing. The first of these procedures was stapes mobilisation, followed by plastic repair of a perforated tympanic membrane and correction of congenital meatal atresia. Mucosal Type Of Chronic Otitis Media Can Be Managed In Two Ways, Conservative And Surgical Management. The aim of middle ear surgery for hearing is reduction in the patient's hearing disability, not just closure of the air-bone gap [1]. Small perforations usually heal spontaneously but when the edges of the perforation are covered by stratified squamous epithelium, a perforation becomes permanent and does not heal spontaneously [2]. Tympanoplasty is an operation to eradicate disease in the middle ear and to reconstruct the hearing mechanism, with or without tympanic membrane grafting[3].” Procedures such as grafting the tympanic membrane, alone, or in combination with ossiculoplasty (tympanoplasty with ossicular chain reconstruction), comprise the varying subtypes of tympanoplasty [4]. The five types of Tympanoplasty they described refer to the most lateral intact structure on which the conductive mechanism will be constructed. Type I Tympanoplasty indicates all three ossicles to be present and mobile. Thus, OCR is not needed. Type II grafts the tympanic membrane to an intact incus and stapes. A type III exists when an intact mobile stapes superstructure is present and the tympanic membrane or graft remains directly on the stapes superstructure. Type IV describes an absent or eroded superstructure with the graft or tympanic membrane overlying a mobile stapes footplate. Type V Tympanoplasty refers to a fenestration created in the horizontal semicircular canal. Type-1 Tympanoplasty is performed when there is tympanic membrane perforation without any ossicular damage. Some people have trouble hearing correctly for the first few days after the surgery. It gets better with time as the eardrum starts to heal. Usually, the packing material dissolves itself in a few weeks. Tympanoplasty type 1 can be nearly as straightforward as myringoplasty and for instance simply involve removal of a retracted

membrane. In the tympanic cavity or removal of adhesions around the ossicles but it can also be an extensive and time-consuming procedure when combined with mastoidectomy procedures. Risks include pain, bleeding, infection, failure of the graft, recurrence, further surgery, worsening hearing loss or deafness, dizziness, and facial nerve injury resulting in facial palsy or to the chorda tympani nerve resulting in taste disturbances. The incidence of mucosal type of chronic otitis media is high in developing countries because of poor socioeconomic standards, poor nutrition and lack of health education. It is an important cause of hearing impairment [5]. More and more attention has been focused on the effectiveness of treatment modalities in relation to the costs. Evaluation of treatment results in reconstructive middle ear surgery with special regard to quality of life aspects is, therefore, of increasing importance.

2. Materials and Methods

A retrospective study involving all patients who underwent type I tympanoplasty in ENT department, Abdul Malek Ukil Medical College Hospital, Noakhali, Bangladesh for perforation of the tympanic membrane during the period June 2022 to December 2023. Only 50 patients are included in the present study. All the patients who presented with com were submitted to an assessment protocol, history taking, specific physical examination (otoscopy and rhinoscopy), audiogram, examination under microscope to confirm otoscopic findings. During history taking, the patients were questioned about the disease onset, period of time spent without otorrhoea, number of otologic infections per year and if they had undergone previous otologic surgeries.

2.1 Inclusion Criteria

1. Dry Central Perforation
2. Pure Conductive Hearing Loss
3. Patients With Inactive Mucosal Type Of Chronic Otitis Media
4. Patients In Whom Type-1 Tympanoplasty Performed

2.2 Exclusion Criteria

1. Marginal Or Attic Perforation
2. Mixed Or Sensorineural Type Hearing Loss
3. Patients With Active Ear Discharge
4. Patients With Attico-Antral Or Squamosal Type Of Chronic Otitis Media
5. Patients With Complications Of Chronic Otitis Media

6. Patients Previously Operated For Ear Surgery

Routine investigations apart from examination under microscope were done in every case, which has provided useful information i.e., perforation size, location, tympanosclerosis, presence or absence of inflammatory mucosa in the middle ear. Radiologically

patient was assessed pneumatization status of mastoid bone by x-ray schuller's view. All patients underwent diagnostic nasal endoscopy (dne) in order to check nasal conditions, to rule out pathologies that prevent proper functioning of the eustachian tube.



Figure 1. Normal tympanic membrane



Figure 2. Moderate central perforation



Figure 3. Posterior central perforation

The audiometry was done following standard protocol. pure tone audiogram is done in every selected patient. Average of hearing loss (air conduction threshold) was calculated by selecting 500, 1000 and 2000 Hz frequencies. In this study the audiometer used was manual. The test was performed in acoustically treated room. Standard headphones were used for air conduction. Patient was given proper explanation of



Figure 4. Large Perforation



Figure 5. Anterior Central Perforation

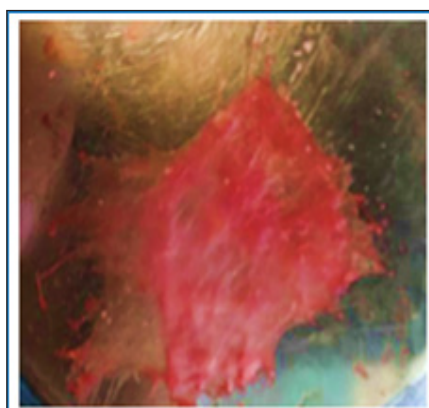


Figure 6. Temporalis Fascia Graft

the procedure before audiometry and adequate time was taken for testing. The operations are performed under local or general anesthesia using a microscope via post-aural incision using underlay technique. Temporalis fascia graft is used as a graft material. All the patients are followed after surgery as usual after 1 week, 6 weeks, 3 months.

3. Results

Total 50 cases included our study. The detailed information regarding age, sex, clinical findings, pre-operative and post-operative hearing thresholds pre-operative air bone gap findings, complications following surgery, status of graft and post-operative air bone gap findings were noted. As shown in table-1

majority of cases (54%) were between 21-30 years. Females 27 (54%) are more as compared to male 23 (46%), patients in the present study. Out of the 50 patients, 22 (44%) patients had disease in the right ear, 28 (56%) had disease in left ear. 38 (76%) patients had unilateral & 12 patients (24%) had bilateral disease. Out of the seven patients with bilateral disease, the ear with more hearing loss was operated on first.

Table 1. Age distribution (N=50)

Age Group (age in years)	No. of cases (N=50)	Percentage (%)
0-10	0	0
11-20	10	20
21-30	27	54
31-40	10	20
41-50	3	6
Sex		
Male	23	46
Female	27	54
Side		
Right	22	44
Left	28	56
Laterality		
Unilateral	38	76
Bilateral	12	24

Table 2. Symptom distribution (N=50)

Symptoms	No. Of Patients	Percentage
Hearing Loss	30	60
Earache	18	36
Vertigo	0	0
Tinnitus	2	4
Location Of Perforations		
Large	13	26
Moderate Central	17	34
Posterior Central	12	24
Anterior Central	8	16
Hearing Threshold (In Dbs.) Between		
30-34	22	44
35-39	25	50
40-44	3	6
Complication Rate		
Persistent Discharge	2	4
Graft Failure	5	10
Decreased Hearing	3	6
Wound Gaping	2	4

The commonest presenting complaint is ear discharge. Hearing loss seen in only 30 (60%) patients. Tinnitus is found in 2 (4%), pain in the ear in 18 (36%) and vertigo in 0% of patients. On microscopic examination of the operating ears, the presence of moderate central perforation was the commonest finding (34%). Large perforation is seen in 26% of patients and posterior central perforation in 24%. Preoperative hearing threshold of half of the patients (50%) lies in range

35-39 Db, whereas in 22 patients (44%) hearing threshold lies in 30-34 Db range and only 3 (6%) patients have hearing threshold in 40-44 Db range. Only 4 out of 50 patients had complication following surgery. 5 patients (10%) had graft defect, 3 patients (6%) had residual hearing loss. 2 (4%) patients had wound gaping and 2 (4%) had persistent discharge (Table-2).

Table 3. Graft uptake rate (N=50)

Tympanic Membrane		Number Of Patients (N=50)	Percentage (%)
Graft Uptake		45	90
Graft Failure (Total=3)	Complete Graft Failure	0	0
	Medialization Of Graft	3	6
	Residual Perforation	2	4

Table 3 shows 45 (90%) out of 50 patients have successful graft uptake. 5 (10%) patients had graft failure out of which 3 patients (6%) had medialization of graft and 2 patient (4%) had residual perforation.

Table 4. Overall hearing improvement of the patients post operatively

Hearing Improvement In Db	No. Of Patients	Percentage
0-25 (Normal Range)	47	86
26-40 (Mild Deafness Range)	7	14

As per table 4, post operatively 47 (86%) out of 50 patients hearing improvement occurs in normal range. Only 7 patients (14%) were in mild deafness range. mean of preoperative air bone gap is 23.66 Db, whereas postoperatively it is air bone gap is 13.66 Db. improvement in air bone gap is 9.8 Db (Table-5).

Table 5. Air Bone Gap In Pure Tone Audiometry

AB Gap	Mean (in Db)
Preop AB Gap	23.66
Postop AB Gap	13.66
Change In AB Gap	9.8

4. Discussion

Type 1 tympanoplasty is a surgical technique for closing tympanic membrane perforation and reconstructing the tympanic membrane. This technique is limited to repair of the tympanic membrane. In this technique, the ossicular chain is intact and mobile, without other surgical manipulations in the middle ear. Tympanoplasty is an operation to eradicate disease in the middle ear and to reconstruct the hearing mechanism, with or without tympanic membrane grafting. Different materials have been used to construct the tympanic membrane, the most accepted of which is temporalis fascia autograft and almost always the most favourable graft for its immunologically compatability [6]. Implicit in the definition is that the ossicular chain is intact and mobile and that there is no middle ear disease such as

infected mucosa or in growth of skin. The present study describes various parameters in assessing the hearing improvement after successful type 1 tympanoplasty. Postoperative audiological evaluations were done after 3 months and 6 months following the surgery. The present study showed that out of 50 cases, 21-30 years age group people were high (54%) with the mean age being 24.8 years. Indicating the fact that csom is mainly the middle ear infection which tends to occur more in early decades of life and resolves to leave permanent perforations with conductive hearing loss in many cases. This finding is consistent with the other studies called M. Mohamad Et-Al [7] in which commonly affected age group is 21-30 years and mean age being 28.5 years. In other studies like Biswas Et-Al [8] the lowest age is 12 years and the highest is 46 years, whereas mean age is 29 years, Joshi Et-Al [9] the lowest is 12 years and the highest

age is 42 years and mean age is 25.5 years. In our study male: female ratio is 1:1.14, which is consistent with Gaurav Batni et al [10] Et-Al In which male: female ratio is 1:1.4. In which 46% of male and 54% of females are affected. Islam Et-Al [11] MR Dawood Et- Al [12] H. Lokhna Et-Al [13] shows similarly female preponderance whereas in other studies like Shetty Et-Al [14], M. Mohamad At-El [7] shows male preponderance. In our study intermittent otorrhoea is present in 100% (50) patients which is similar finding in studies like M. Mohamad Et-Al [7] And Shetty Et-Al [14], Lokhna Et-Al [13]. Tinnitus is present in 7% of cases whereas in Shetty Et-Al [14] it is present in 18% of cases and in Lokhna Et-Al [13] 5.4% of cases. In our study ear ache is present in 37% of cases whereas in Shetty Et-Al [14] earache is present in 29% of cases. Thus most common presenting symptom is intermittent otorrhoea. Large perforation is seen in 13 (26%) of cases, moderate central in 17 (34%), posterior central in 12 (24%), anterior central 8 (16%) cases. In Biswas Et-Al [8] 28% anterior central, 30 % in posterior central and 42% subtotal perforation is seen. Whereas in Joshi Et-Al [9] 36% anterior central, 34% posterior central and 28% subtotal perforation are seen. Posterior perforations have a greater hearing loss than anterior perforation. He found that 43 Db hearing loss is seen in posterior central perforation [15]. Most common complication is graft failure and decreased hearing 10% and 6% respectively in our study. Graft take up rate is 45 (90%). In graft failure medialisation of graft is seen in 3 (6%) of cases whereas residual perforation seen in 2 (4%) of cases. Biswas Et-Al [8] shows graft take up rate 82 % whereas total graft failure rate 18%. In our study preoperative hearing ac threshold was in 35-39 Db range in 50% of patients, mean preoperative ac threshold is 32.5 Db. Whereas in Biswas Et-Al [8] mean preoperative threshold is 34, in Joshi Et- Al [9] It Is 38.69. Mean postoperative ac threshold in our study is 23.5 Db, whereas in Biswas Et-Al [8] it is 24 Db, Joshi Et-Al [9] it is 30.35 Db. In our study mean preoperative AB Gap and Postoperative AB Gap Is 23.66 and 13.66 respectively and mean of change in AB Gap Is 9.8Db. In Biswas Et-Al [8] mean of change in AB Gap is 11 and in Joshi Et-Al [9] it is 10. Only 7 patients (14%) were in mild deafness range. Mean of preoperative air bone gap is 23.66 Db, whereas postoperatively it is air bone gap is 13.66 Db. Improvement in air bone gap is 9.8 Db. Majority of patients have been benefited by tympanoplasty. Out of 50 patients 43 patients come into normal range of hearing and only 7 patients were still lying in range of mild deafness as shown in table 10 due to complications following surgery.

5. Conclusion

Intermittent otorrhoea was the most common and hearing loss was seen only in 60% of the patients as presenting complaint in chronic otitis media in our study. There was no significant predilection for gender. Hearing improvement was assessed by improvement in ab gap in this study and was significant after type 1 tympanoplasty. Tympanoplasty is a beneficial procedure in hearing improvement.

Conflict of Interest: None.

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