

Hearing results after myringoplasty

Shrestha S¹, Sinha BK²

¹Lecturer, Kathmandu Medical College Teaching Hospital, ²Professor, Dept. of ENT, TU Teaching Hospital

Abstract

Background: Myringoplasty is one of the various surgical techniques for the management of chronic suppurative otitis media of tubotympanic type (CSOM-TT). The presence of a perforation of tympanic membrane with intermittent discharge and hearing loss of conductive nature are the indications of myringoplasty. It is a beneficial procedure done for closing tympanic membrane perforation and improving hearing.

Objective: The aim of this study was to assess hearing improvement after myringoplasty within ten weeks following surgery.

Material and methods: The study population consisted of 50 patients who were suffering from CSOM-TT. Preoperative and postoperative examinations of the patients were conducted clinically as well as audiotically. Pre and postoperative air-bone (A-B) gap were calculated by taking the averages of bone conduction and air conduction at the frequencies of 500, 1000 and 2000 Hz. Myringoplasty was performed with underlay technique under local anaesthesia by either permeal or endaural approach. Temporal muscle fascia was used as grafting material for reconstruction of the tympanic membrane.

Results: Preoperatively, air-bone gap of 30 db or more was observed in 39 (76%) patients whereas post operatively A-B gap of 30 db or more was observed in only one patient. Using hearing gain exceeding 15 dB as the criterion, thirty-nine (78%) patients had their hearing gain exceeding 15 dB. Using postoperative A-B gap within 20 dB as the criterion, 42 (84%) patients had their A-B gap within 20 dB.

Conclusion: Myringoplasty is a beneficial procedure for hearing improvement. Using the proportion of patients with a postoperative A-B gap of 30 dB as the criterion, in this study, 98% of patients achieved their A-B gap closer within 30 dB. Using hearing gain exceeding 15 dB as the criterion, 78% patient had their hearing gain exceeding 15 dB.

Key words: CSOM, myringoplasty

Chronic suppurative otitis media is one of the most common ear diseases in developing countries¹. CSOM is defined as a persistent disease, insidious in onset, often capable of causing severe destruction of middle ear structure and irreversible sequelae, which is clinically manifested with deafness and discharge more than three months. The disease affects the area of the tympanic membrane². Myringoplasty is one of the various surgical techniques for the management of CSOM-TT disease. It is defined as simple surgical repair of a tympanic membrane perforation without ossicular reconstruction. The presence of a perforation of tympanic membrane with intermittent discharge and hearing loss of conductive nature are the indications of myringoplasty. It is a beneficial procedure done for closing tympanic membrane and improving hearing. The degree of hearing improvement depends on several factors such as site and size of perforation, ossicular status, surgical technique, type of graft and function of Eustachian tube^{3,4}. However; hearing recovery in the immediate postoperative may

decrease because of presence of gel foam in the middle ear and external auditory canal⁵.

There has not been published regarding hearing improvement trend within 10 weeks following myringoplasty with emphasis on time of maximal hearing improvement. No studies have been done so far to find out the trend in hearing improvement within the short period of ten week following surgery in Nepal.

Correspondence

Dr. Sangita Shrestha
Dept. of ENT & HNS
Kathmandu Medical College
Sinamangal, Kathmandu, Nepal
Email: sangitadr@yahoo.com

Therefore, this study conducted to assess hearing improvement after myringoplasty within ten weeks following surgery. Majority of the myringoplasty done in our setup use the underlay technique, temporalis fascia graft and gel foam. This study gives an idea about the trend in hearing improvement following myringoplasty within the period of 10 week following surgery.

Materials and methods

The study population consisted of 50 patients who were suffering from CSOM-TT type. The study period was one and half years from February 1999 to July 2000. Preoperative and postoperative examinations of the patients were conducted clinically as well as audiological. The preoperative examinations included ear, nose and throat examination, otoscopic examinations of both ears. The external auditory meatus and the tympanic membrane were examined and site of the perforation was noted. The tuning fork test was performed with a frequency of 512 Hz was used. .

Audiometric examinations were performed using a clinical audiometer calibrated according to ISO standard. A pure tone air and bone conduction audiogram within one week prior to surgery were recorded at the frequencies of 250, 500, 1000, 2000, 4000 and 8000 Hz. Air and bone conduction threshold were determined with appropriate masking technique whenever indicated. Hearing level was defined as the mean air conduction threshold at 500, 1000 and 2000 Hz and average of these frequencies was calculated to access the hearing level. Pre-operative A-B gap were calculated by taking the averages of bone conduction and air conduction at the frequencies of 500, 1000 and 2000 Hz. The detail general physical and systemic examinations of all patients were recorded.

All the patients of the study group were examined under microscope within one week prior to surgery. Examination under microscope was done of the ear to be operated. This was carried out with a speculum under the operating microscope to reliably assess the tympanic membrane, site of the perforation, to rule out any other pathology and to assess the ossicular status as far as possible. Those who were found to be have cholesteatoma; granulation polyps, discharge and ossicular discontinuity were excluded from this study.

Myringoplasty was performed with underlay technique under local anaesthesia either permeal or endaural approach. Temporal muscle fascia was used as grafting material for reconstruction of the

tympanic membrane. Bismuth Iodoform Paraffin Paste (BIPP) pack was removed on the 10th postoperative day. Then the patients were instructed to instil three drops of antibiotic (ciprofloxacin) ear drop three times a day to the operated ear for 15 days. The patients were then called for follow up at the interval of four, six, eight and ten weeks following surgery. During follow up both clinical and audiological examinations was done. Postoperative audiograms were obtained at the consecutive interval of 4th, 6th, 8th and 10th week following surgery. Postoperative hearing level were calculated as the mean air conduction threshold at 500, 1000 and 2000 Hz .Postoperative A-B gap was calculated comparing as an average of preoperative bone conduction threshold and postoperative air conduction threshold at frequencies of 500Hz, 1000Hz and 2000 Hz.

Results

Age and Sex Distribution

Majority of the male patients (n=25) belonged to the age group 15 to 25 whereas 12 out of 18 female fall in age group 15 to 25 (Table 1).

Site of Perforation

The 50 patients were divided into different groups, according to the site of perforation, namely, anterior central, posterior central, central malleolar, and big central (Table 2).

Preoperative audiometric evaluation

An impairment of preoperative bone conduction threshold of 20 db or more was observed in none of 50 patients. Preoperatively, an impairment of air conduction with 40 db or more was observed in 62% (31) of the patients and A-B gap of 30 db or more was observed in 76% (39) of patients (Table 3). The normal threshold of audiometer is 120 db in our set up.

The impaired air conduction threshold and the A-B gap also varied with the type of perforation, being greatest in the big central, and least in those with anterior central perforation.

Postoperative hearing improvement

The number of patients gaining an improvement after operation resulting closure of the A-B gape (table 4). It shows progressive improvement in air-bone gap.

Hearing Results

The study included 50 ears operated upon during February1999 to July 2000. The hearing statistics were based on the average of the three frequencies 500, 1000 & 2000 Hz and compare the 4th, 6th, 8th & 10th week postoperative air conduction to pre operative bone conduction (Tables 5, 6, 7, 8).

Patients were review at 6th week following surgery; it was found that number of cases in A and B column were increased to 8 (16%) and 22(44%) respectively. Therefore, more patients achieved A-B gap between zeros to 20dB at 6th week compared to 4th week follow up. The last follow up at 10th week following surgery had shown that “A” category had same

number of patients as in 8th week having achieved maximal closure of A-B gap. “B” category had slight increase in number of patients compared to 8th week with improved A-B gap within 11-20dB. Only one patient had more than 31dB A-B gap that had big central perforation

Table 1: Age and Sex Distributions

<i>Age in Years</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
15 – 20	13	5	18
21 – 25	12	7	19
26 – 30	5	2	7
31 – 35	0	3	3
36 – 40	2	1	3
<i>Total</i>	32	18	50

Table 2: Site of perforation, Age and Sex of 50 patients who underwent Myringoplasties

<i>Type of Perforation</i>	<i>No. of Patients</i>	<i>Age (Years)</i>
Anterior Central	7	17 – 40 Average: 27
Posterior Central	4	24 – 40 Average: 29
Central Malleolar	17	15 – 37 Average: 22
Big Central	22	15 – 35 Average: 22
Total	50	15 - 40

Table 3: Severity of Hearing loss according to the site of perforations. Preoperative Air conduction thresholds and Air-Bone gaps in the different groups.

<i>Position of perforation</i>	<i>Air-Bone Gap</i>	
	<i>No. of pts. with 30 db or more</i>	<i>Mean (db)</i>
Anterior Central	4/7(57%)	35
Posterior Central	3/4(75%)	34
Central malleolar	14/17(82%)	43
Big central	18/22(82%)	43
Total	39/50(76%)	

Table 4: Number of Patients with Post-Operative Improvement

<i>Position of Perforation</i>	<i>(No. of pts .with 20 db or more Improvement in Air-Bone Gap)</i>			
	<i>4th Week</i>	<i>6th Week</i>	<i>8th Week</i>	<i>10th Week</i>
Anterior Central	0/7	1/7(14%)	0/7(0%)	1/7(14%)
Posterior Central	0/4	2/4(50%)	1/4(25%)	2/4(50%)
Central Malleolar	7/17(41%)	7/17(41%)	10/17(59%)	13/17(76%)
Big Central	8/22(36%)	12/22(55%)	14/22(64%)	15/22(68%)
<i>Total</i>	15/50(30%)	22/50(44%)	25/50(50%)	31/50(62%)

Table 5: Air-bone gap at 4th week following surgery

Total	A (0 to10db) No. (%)	B (11 to20db) No. (%)	C (21 to 30 db) No. (%)	D (>=31db) No. (%)	E (0 to 20 db) No. (%)
50	3 (6%)	15 (30%)	19 (38%)	13 (26%)	18 (36%)
Result	Excellent	Good	Fair	Failure	Satisfactory

Table 6: A-B gap at 6th week following surgery

Total	A (0 to10db) No. (%)	B (11 to20db) No. (%)	C (21 to 30 db) No. (%)	D (>=31db) No. (%)	E (0 to 20 db) No. (%)
50	8 (16%)	22 (44%)	16 (32%)	4 (8%)	30 (60%)
Result	Excellent	Good	Fair	Failure	Satisfactory

Table 7: A-B gap at 8th week following surgery)

Total	A (0 to10db) No. (%)	B (11 to20db) No. (%)	C (21 to 30 db) No. (%)	D (>=31db) No. (%)	E (0 to 20 db) No. (%)
50	11 (22%)	30 (60%)	7 (14%)	2 (4%)	41 (82%)
Result	Excellent	Good	Fair	Failure	Satisfactory

Table 8: A-B gap at 10th week following surgery

Total	A 0 to10db No. (%)	B 11 to20db No. (%)	C 21 to 30 db No. (%)	D >=31db No. (%)	E 0 to 20 db No. (%)
50	11 (22%)	31 (62%)	7 (14%)	1 (2%)	42 (84%)
Result	Excellent	Good	Fair	Failure	Satisfactory

Discussion

Out of 50 patients, seven had anterior central perforation, four had posterior central perforation, 17 had central malleolar perforation and 22 had big central perforation. The result has shown that age and sex did not seem to have any bearing on the site of perforation preoperative hearing level or postoperative hearing improvement. Yung (1983) obtained similar findings⁶. There was no relationship between duration of ear discharge and size of the perforation.

The impaired air conduction threshold and air-bone gap also varied with the site of perforation, being greatest in the big central perforation and least in anterior central perforation. Several ears had marked hearing loss associated with different site of perforation. This was particularly noticeable when the round window had been exposed. Big central and

central malleolar perforation had greatest hearing loss^{7,8}. In present study the preoperative air conduction threshold poorer than 40 dB for big central perforation was found in 17 (77%) out of 22 patients. The preoperative A-B gap poorer than 30 dB for big central perforation was found in 18 of 22 (82%) patients. Similarly, the preoperative air conduction threshold poorer than 40 dB for central

malleolar perforation was found in 12 (71%) and preoperative A-B gap poorer than 30 dB was observed in 14 (82%).

In the present study, an increased incidence of preoperative hearing loss was found in big central perforation and central malleolar perforation compared with anterior central and posterior central perforation. Similar figures were found by young

(1983) that big central, central malleolar and posterior central perforation had greater hearing loss compared to other sites of perforation⁶. He found that out of 18 patients 6 had big central perforation with pre-operative air conduction loss was average of 43dB whereas in central malleolar type of perforation an average of 48dB pre-operative air conduction loss. Similarly, A-B gap was also widening in these patients. The greater hearing loss in big central perforation and central malleolar perforation were due to exposure of the round window.

Temporal muscle fascia graft was placed by underlay technique in 49 cases and in one case modified underlay technique was used where graft was placed lateral to the handle of malleus. This patient was found to have central malleolar perforation with the tip of the malleus handle touching the promontory. Postoperative hearing improvement was 18dB in this patient at 10th week. The study done by Stage (1992) showed good hearing improvement with underlay technique graft lateral to the malleus handle and concluded as good alternative method to conventional underlay myringoplasty in ears with perforation involving the area anterior to the malleus handle⁹.

There are different criteria for assessing hearing after chronic ear surgery such as social hearing method, hearing gain method and mean A-B gap for each frequency but non are universally accepted method¹⁰. The standard method of comparing the post-operative air conduction to pre operative bone conduction appears most frequently in literature¹⁰. Thus, this method had been used for calculating hearing result in this study.

Japan Clinical Otology Committee has used following three criteria for calculation of the hearing (Tai, 1998).¹¹ Using the proportion of patients with a postoperative hearing within 40 dB as the criterion, in this study, 100% of patients achieved their hearing level within 40 dB. Using hearing gain exceeding 15 dB as the criterion, 78% patients (39 no.) had their hearing gain exceeding 15 dB. Using postoperative air-bone gap within 20 dB as the criterion, 84% patients (42 no.) had their air-bone gap within 20 dB. There were 27 patients (54%) had maximal closure of A-B gap at 10th week followed by 15 patients (30%) at 8th week and 8 patients (16%) in 6th week. Graft could be seen in the all cases except six at 4th week. These 6 patients who had Gel foam still in the external auditory canal at the 4th week. In the audiological evaluation, these 6 patients were found to having greater hearing loss at 4th week compared

to other groups. Only one patient did not have any improvement in hearing level after surgery in all the subsequent follow-ups. On otoscopic examination, there was medialization of the graft with retraction at the posterior superior quadrant, which probably resulted due to Eustachian tube dysfunction.

Conclusion

Site of perforation affects the degree of hearing loss. Regarding site of perforation, big central and central malleolar perforation had greater hearing loss than other perforation sites. Myringoplasty is a beneficial procedure for hearing improvement. Using the proportion of patients with a postoperative hearing within 40 dB as the criterion, in this study, 100% of patients achieved their hearing level within 40 dB. Using hearing gain exceeding 15 dB as the criterion, 78% patients (39) had their hearing gain exceeding 15 dB. Using postoperative air-bone gap within 20 dB as the criterion, 84% patients (42) had their air-bone gap within 20 dB.

References

1. Aoyogi M, Yokota M, Nakamura T. Effects of aging on hearing results in tympanoplasty. *Acta Otolaryngol (Suppl)* 1994; 511: 81-86.
2. P.M. Shenoy. Management of chronic suppurative otitis media. Scott Brown 5th edition volume 3; chapter 10; *Otology*: 215.
3. Black J H, Wormald P J. Myringoplasty-effects on hearing and contributing factors. *S Afr Med J* 1995; 85: 41-3.
4. Blakley B W, Kim S, Vancamp M. Preoperative hearing predicts postoperative hearing. *Otolaryngol. Head Neck Surg* 1998; 119: 559-563.
5. Blanshard J D, Robson A K, Smith I, Maw A R. A long-term view of Myringoplasty in children. *J Laryngol Otol* 1990; 104: 758-62.
6. Yung M W. Myringoplasty: Hearing gain in relation to perforation site. *J Laryngol Otol* 1983; 97: 11-17.
7. Feilen S E, Federspil P. Long-term outcome of tympanoplasty in chronic middle ear infection in childhood. *HNO* 1996; 44: 143-47.
8. Gersdorff M, Garin P, Decat M, Juantegui M. Myringoplasty: long-term results in adults and children. *Am J Otol* 1995; 16: 532-35
9. Stage J, Pederson K B. Underlay tympanoplasty with the graft lateral to the malleus handle. *Clin Otolaryngol* 1992; 17: 6-9.
10. Harder H, Jerlvall L, Kylene P, Ekvall L. Calculation of hearing results after tympanoplasty. *Clin Otolaryngol* 1982; 7:221-229.
11. Tai CF, Ho KY, Juan KH. Age and the prognosis of tympanoplasty type I. *Kao Hsiung I Hsueh Ko Hsueh Tsa Chih* 1998; 14: 542-547.