

COMPARATIVE STUDY OF TYMPANOPLASTY WITH OR WITHOUT CORTICAL MASTOIDECTOMYIslam MT¹, Rafiquzzaman M²**Abstract**

Introduction: Tympanoplasty with or without cortical mastoidectomy is the subject of debate amongst different otolaryngologists. One theory suggests that tympanoplasty type-I which combined with cortical mastoidectomy in wet or discharging ear is beneficial. Other theory suggests that cortical mastoidectomy adjunct with tympanoplasty type-I, has no significant effects on surgical outcome in any condition of dry or wet ear in tubotympanic variety of CSOM.

Aim: The purpose of this study is to compare the surgical outcome of type-I tympanoplasty with or without cortical mastoidectomy.

Methods: It is a retrospective, observational, multicentre study conducted in between July 2003 to July 2013 amongst 258 patients of uncomplicated tubotympanic variety of chronic suppurative otitis media with age ranging from 18 years to 55 years. 140 patients (54%) were having history of ear discharge (Group-I) and remaining 118 patients (46%), having no complaints of ear discharge (Group-II) within 3 months prior to surgery. 50% of each group were operated with tympanoplasty type-I only and 50% of each group was operated with tympanoplasty type-I with cortical mastoidectomy. Outcome of surgical procedures in different groups were analyzed in terms of graft uptake and hearing improvement.

Results: Out of 140 patients with discharging ear, only tympanoplasty procedure (n=70) resulted in successful graft taking in 62 patients (88.6%) and the hearing level within 20dB were achieved in 57 persons (81.4%). Tympanoplasty with cortical mastoidectomy (n=70) resulted in successful graft taking in 61 patients (87%) and the postoperative

hearing level within 20dB were found in 56 persons (80 %). Out of 118 patients with dry ear, only tympanoplasty procedure (n=59) resulted in successful graft taking in 54 patients (91.5%) and postoperative hearing level within 20dB were achieved in 48 persons (81.36%). Tympanoplasty with cortical mastoidectomy (n=59) resulted in successful graft taking in 53 patients (89.8 %) and the postoperative hearing level within 20dB were achieved in 47 persons (79.7%). Comparison of results in both procedures in dry and wet ear showed no significant statistical difference.

Conclusion: Cortical mastoidectomy is not proved to be mandatory or effectively helpful with type-I tympanoplasty for uncomplicated chronic suppurative otitis media, irrespective of its dry or discharging status.

Key-words: Chronic suppurative otitis media (CSOM), Tubotympanic type, Pure tone audiometry, Tympanometry, Graft take, Air-bone gap.

Introduction

Chronic suppurative otitis media (CSOM) is characterized by intermittent or persistent, discharge through a perforated tympanic membrane¹. In tubotympanic variety perforation of the tympanic membrane is in the pars tensa. In these cases patients classically present with mild to moderate conductive hearing loss with or without otorrhoea². CSOM is the most common cause of hearing loss in the developing world³. Tympanoplasty is a surgical technique for the reconstruction of the middle ear hearing mechanism.

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Wulstein has described tympanoplasty and its various types in 1953. Tympanoplasty is the final step in the surgical conquest of conductive hearing loss and is the culmination of over 100 years of development of surgical procedures on the middle ear to improve hearing⁴. According to Wulstein, in type-I tympanoplasty, graft is placed over or under the intact malleus handle. It is usually performed to repair the small, medium or subtotal or sometimes total perforation of the ear drum⁴.

Hearing loss associated with TM perforation can range from 0-40 dB². The results of tympanoplasty for chronic TM perforations are excellent in experienced hands. Successful closure of perforation and improvement in hearing are typically seen in greater than 90% of patients². Cortical mastoidectomy is a surgical procedure to exenterate diseased air cells from mastoid air cell system. Commonest indications of simple mastoidectomy are as a preliminary step in various otologic operations and in acute coalescent mastoiditis⁵. Today most mastoidectomies either are performed for complicated chronic ear disease or are part of more complex otologic procedures⁶. But still it is done by some otologists to treat uncomplicated CSOM, with a claim to clear the source of infection from mastoid and to create the middle ear cleft, although on empirical belief^{7,8}. So, tympanoplasty with or without mastoidectomy is still a dilemma in repair of tympanic membrane. We emphasize the current body of literature with an effort to elucidate the best practice.

Materials and Methods

It is a retrospective, observational study performed in two referral hospitals, Combined Military Hospital, Dhaka and Combined Military hospital, Chittagong. Surgeries were performed by both authors of this article. Study was conducted in between July 2003 to July 2013. Two hundred and fifty eight patients were selected from ENT outpatient's department of these two hospitals. They were diagnosed as case of uncomplicated chronic suppurative otitis media of tubotympanic variety. Age range of these patients were from 18 years to 55 years. Cases with cholesteatoma, ossicular chain erosion, disruption or loss of ossicle, found clinically or microscopically during

operation were excluded from the study. One hundred and forty patients (54%) having history of ear discharge in last 3 months prior to surgery were included in Group-I. All patients with discharging ears were managed conservatively and were taken up for surgery once they became dry. Fifty percent of this group were operated randomly with tympanoplasty type-I (subgroup-I A) and 50% of this group were operated with tympanoplasty type-I with cortical mastoidectomy (subgroup-I B). Remaining 118 Patients (46%), having no complaints of ear discharge in last 3 months prior to surgery were placed in Group-II. Amongst them, 50% patients were operated with tympanoplasty type-I only (subgroup-II A) and remaining 50% had undergone tympanoplasty type-I with cortical mastoidectomy (subgroup-II B). All patients underwent surgery by post aural approach. Autologous temporalis fascia graft was used for repair of tympanic membrane perforation.

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Results

Analyzing the results of patients with discharging ear (group-I, n=140), in its subgroup-I A (only tympanoplasty, n=70) grafts were successfully taken in 62 patients (88.6%). In its subgroup-I B (tympanoplasty with cortical mastoidectomy) grafts were effectively taken in 61 patients

(87%). Since P-value is very high. So we can not reject the null hypothesis. There is no significant statistical difference between two procedures (Table-I).

Table-I: Percentage of perforation closure or graft success rate in discharging ear group (Group-I, n=140).

Sub-group	Operation	Graft success	Percentage	Z Value	P Value
I A (n=70)	Tympanoplasty only	62	88.6%	0.1136	0.91
I B (n=70)	Tympanoplasty with Cortical mastoidectomy	61	87.0%		

Amongst the patients with dry ear (group-II, n=118), grafts were successfully taken in 54 patients (91.5%) in subgroup-II A (n=59, only tympanoplasty) and in 53 patients (89.8%) in subgroup-II B (n=59, tympanoplasty with cortical mastoidectomy). Since P-value is very high, we can not reject the null hypothesis. There is no significant statistical difference between the results of two procedures (Table-II).

Table-II: Percentage of perforation closure or graft success rate in dry ear group (Group-II, n=118).

Sub-group	Operation	Graft success	Percentage	Z Value	P Value
II A (n=59)	Tympanoplasty only	54	91.5%	0.1250	0.90
II B (n=59)	Tympanoplasty with Cortical mastoidectomy	53	89.8%		

In discharging ear group (Group-I), the postoperative hearing level within 20dB in air conduction were achieved in 57 persons (81.4%) in group-I A (only tympanoplasty) and in 56 persons (80%) in group-I B (tympanoplasty with cortical mastoidectomy). Since P-value is very high, we can not reject the null hypothesis. There is no significant statistical difference between two procedures (Table-III).

Table-III: Percentage of hearing improvement, Air-bone gap closure within 20 dB (Group-I, n=140).

Sub-group	Operation	Persons with postoperative hearing level 20dB in AC	Percentage	Z Value	P Value
I A (n=70)	Tympanoplasty only	57	81.4%	0.1112	0.91
I B (n=70)	Tympanoplasty with Cortical mastoidectomy	56	80.0%		

Functional improvement of post operative hearing level in air conduction upto 20 dB were measured in 48 persons (81.36%) in group-II A (only tympanoplasty) and in 47 persons (79.7%) in group-II B (tympanoplasty with cortical mastoidectomy), Since P-value is very high, we can not reject the null hypothesis. There is no significant statistical difference between two procedures (Table-IV).

Table-IV: Percentage of hearing improvement, hearing level within 20 dB in air conduction (Group-II, Dry Ear group, n=118).

Sub-group	Operation	Persons with Hearing level upto 20dB in AC	Percentage	Z Value	P Value
II A (n=59)	Tympanoplasty only	48	81.36%	0.1210	0.90
II B (n=59)	Tympanoplasty with Cortical mastoidectomy	47	79.7%		

Discussion

Although tympanoplasty with or without mastoidectomy is a common procedure, failure of perforation closure is not a rare occurrence. Optimization of the tympanoplasty procedure would lead to improved patient outcome and increased patient satisfaction. Controversy currently exists amongst otologists regarding the appropriate treatment of tympanic membrane perforations resulting from chronic suppurative otitis media without cholesteatoma. Proponents for mastoidectomy with tympanoplasty for this patient population contend that surgical opening of the mastoid pneumatic system buffers pressure changes in the middle ear according to Boyle's Law and allows for the debridement of infected tissue and devitalized bone that may not be otherwise effectively treated. Anecdotal and empirical data supporting this theory are prevalent within the literature. However, several recent studies investigating tympanoplasty with or without mastoidectomies refute the claim that mastoidectomy improves otologic outcomes following perforation repair.

Graft uptake with neotympanum formation rate and the percentage of improvement of hearing upto workable level is almost similar in both wet and dry ears irrespective of the surgical procedure of tympanoplasty with or without cortical mastoidectomy. In this study, after performing the statistical analysis, it can be concluded that since P-value is very high in all tables, we can not reject the null hypothesis and it is proved that there is no significant statistical difference between the results of these two procedures.

This is consistent with the study of Chavan SS et al, which reported that four month postoperatively there was no significant difference in graft uptake with tympanoplasty with cortical mastoidectomy (97.33%) as compared to tympanoplasty without mastoidectomy (93.33%). They also denoted that aerating the sclerosed mastoid adjunct with tympanoplasty did not have any significant variation in the improvement of hearing status postoperatively as compared with the surgical procedure of tympanoplasty alone⁹. Hall et al also evidenced in their study that tympanoplasty alone may be sufficient for repair of simple and uncomplicated tympanic membrane perforation¹⁰. Krishnan et al denotes that if a meticulous tympanoplasty is performed with particular care to remove all the disease from the middle ear and provided the eustachian tube function is good, the results of graft uptake and hearing improvement are almost the same as in tympanoplasty with mastoidectomy¹¹, which is also commensurable with our study. In this study, it is worth noted that outcome of hearing gain in terms of post operative mean air –bone gap is 18.94+/-10.2 dB in tympanoplasty with mastoidectomy and 17.9 +/-7.01 dB in tympanoplasty alone, which are almost similar and there by consistent with present study.

The results are comparable with the study conducted by Vertianen et al in which is published in the article "Hearing results of surgery for chronic otitis media without cholesteatoma"¹². Graft uptake is comparable to the series studies by Gersdorff et al (1995) which were reported in the American Journal of Otology¹³. Study of Rickers et al and Balyan et al also suggested that mastoidectomy did not seem to play a significant beneficial role as regards the postoperative hearing gain and graft uptake^{14,15}.

Study of Mishiro et al showed that there was no statistically significant difference in graft success rate in a large patient group (first group) treated with tympanoplasty with mastoidectomy (90.5%) and the second group treated with only tympanoplasty (93.3%). In the same study they showed that the rate of postoperative air-bone gap within 20dB was 81.6% in first group and 90.4% in the second group, without a statistically significant variation. In the same study they have found that graft success rate of dry ears was 90.7% in first group and 94.4% in second group. So there was no statistically significant difference between discharging ears and dry ears¹⁶. These findings are concurrent with the present study.

Conclusion

Anecdotal and empirical evidence has resulted in the common practice of performing mastoidectomy with tympanoplasty for the treatment of chronic suppurative otitis media, tubotympanic variety. Proponents for concomitant mastoidectomy in this patient population cite mastoid aeration and limited increased risks or costs for the patient. As evidenced in this study and in other literatures, mastoidectomy is not helpful in tympanoplasty for uncomplicated chronic suppurative otitis media, even if the ear is discharging and tympanoplasty alone is sufficient for repair of simple and uncomplicated tympanic membrane perforations along with remarkable augmentation of hearing acuity in a significant percentage of this group of patient population.

References

1. Slattery WH. Pathology and Clinical Course of Inflammatory Disease of the Middle Ear. Glasscock-Shambaugh Surgery of the Ear, 5th edition, Ontario, Elsevier, 2003; 21: 428.
2. Gross ND, McMenomey SO. Aural Complication of Otitis Media. Glasscock-Shambaugh Surgery of the Ear, 5th edition, Ontario, Elsevier, 2003; 22: 432.
3. Verhoeff M, van der Veen EL, Rovers MM. Chronic suppurative otitis media: a review. Int J Pediatr Otorhinolaryngol 2006; 70:1.

4. Sismanis A. Tympanoplasty. Glasscock Shambaugh Surgery of the Ear, 5th edition, Ontario, Elsevier, 2003; 24: 463.
5. Sanna M, Sunose H, Mancini F. Simple Mastoidectomy. Middle Ear and Mastoid Microsurgery, 2nd edition, New York, Thieme, 2012; 12: 245.
6. Adunka OF, Buchman CA. Mastoidectomy. Otolology, Neurotology and Lateral Skull Base Surgery, 1st edition, New York, Thieme, 2011; 5:295-96.
7. Dubey SP, Larawin V. Complication of chronic suppurative otitis media and their management. Laryngoscope 2007; 117:264.
8. Akinpelu OV, Amusa YB, Komolafe EO. Challenges in management of chronic suppurative otitis media in a developing country. J Laryngol Otol 2008; 122:16.
9. Chavan SS, Deshmukh SD, Pawar VG. Tympanoplasty with or without cortical mastoidectomy. Gujrat Medical Journal 2011; 8(1): 8-10.
10. Chavan SS, Deshmukh SD, Pawar VG. Tympanoplasty with or without cortical mastoidectomy. Gujrat Medical Journal 2011; 8(1): 8-10.
11. Krishnan A, Reddy EK, Chanrdakiran C. Tympanoplasty with or without mastoidectomy- a comparative study. Indian Journal of Otolaryngology and Head and Neck surgery 2002;54(3): 195-8.
12. Vartainen E, Vartainen J. Hearing results of surgery for chronic otitis media without cholesteatoma . Ear, Nose , Throat Journal 1995; 74(3) : 165-6.
13. Gredroff M, Garin P. Myringoplasty long term results in adult and children, American Journal of Otolology 1995; 16(4): 532-5.
14. Rickers j, Peterson CG, Pedersen CB, Ovesen T. long-term follow-up evaluation of mastoidectomy in children with non-cholesteatomatous chronic suppurative otitis media. Int J Pediatr Otorhinolaryngol 2006; 70:711.
15. Balyan FR, Celikkanat S, Aslam A. Tympanoplasty with or without mastoidectomy for noncholesteatomatous chronic otitis media: is it necessary? Otolaryngol Head Neck Surg 1997; 117:592.
16. Mishiro Y, Sakagami M, Takahashi Y. Tympanoplasty with or without mastoidectomy for non cholesteatomatous chronic otitis media. Eur Arch Otorhinolaryngol 2001; 258(1): 13-5.