



RESEARCH ARTICLE

SURGICAL OUTCOME OF CENTRAL PERFORATION IN TYMPANOPLASTY WITH AND WITHOUT CORTICAL MASTOIDECTOMY

*Gaurav Bambha, Anjali Solanki, Manita Bambha and Chandi Garg

Kalpana Chawla Govt Medical College & Hospital, Karnal

ARTICLE INFO

Article History:

Received 29th June, 2016
Received in revised form
27th July, 2016
Accepted 09th August, 2016
Published online 30th September, 2016

Keywords:

Tympanoplasty,
Cortical Mastoidectomy.

ABSTRACT

Introduction: Otitis media is defined as “an inflammation of the middle ear without reference to etiology or pathogenesis. Otitis media also implies concomitant inflammation, to a greater or lesser extent mastoid air cell system, owing to its anatomic linkage to the middle ear cleft i.e. the tympanic cavity

Aim & Objective: To analyze and compare the surgical outcome of tympanoplasty with and without cortical mastoidectomy in central perforation C.S.O.M. (TTD) type. To assess the role of cortical mastoidectomy in the management of C.S.O.M. (TTD) type.

Study Design : A prospective comparative study comprising of 50 patients who were randomly divided into two equal groups according to the inclusion and exclusion criteria as given below with 25 patients undergoing type 1 Tympanoplasty and 25 patients undergoing type 1 Tympanoplasty with cortical mastoidectomy, done over 2 years from July 2006 to July 2008 at Sri Ramachandra University, Chennai.

Conclusion:

- Cortical mastoidectomy is recommended in patients of CSOM (TTD) with subtotal perforation (involving all the quadrants).
- The graft take up rate is similar in both the groups in patients with central perforation (involving one or two quadrants).
- In successful graft take up, results of hearing improvement and graft mobility are similar with and without mastoidectomy.
- Possibility of finding mastoid antral pathology is more in patients with CSOM (TTD) with subtotal perforation as observed in this study.

Copyright © 2016, Gaurav Bambha et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Gaurav Bambha, Anjali Solanki, Manita Bambha and Chandi Garg, 2016. “Surgical outcome of central perforation in Tympanoplasty with and without cortical mastoidectomy”, *International Journal of Current Research*, 8, (04), 39039-39043.

INTRODUCTION

Otitis media is defined as “an inflammation of the middle ear without reference to etiology or pathogenesis” Otitis media also implies concomitant inflammation, to a greater or lesser extent of mastoid air cell system, owing to its anatomic linkage to the middle ear cleft i.e. the tympanic cavity. It is important to realize that the inflammatory changes described above occur not only in the tympanic cavity but in the entire middle ear cleft including the mastoid antrum and the various cell tracts of the temporal bone thus simple closure of the perforation in active mucosal chronic otitis media without surgical removal of infected mucosa and granulation tissue from mastoid is fraught with failure to control the disease.

The two goals of Tympanoplasty are to eliminate disease and improve hearing. The results of Tympanoplasty are measured in terms of success or failure of the graft uptake and hearing improvement. The cortical mastoidectomy (Schwartz, 1873) is Transcortical opening of the mastoid cells and the antrum. The term simple mastoidectomy is usually used for drainage of the mastoid abscess. The bony meatal wall is intact and remains thick medially. The anterior attic in simple mastoidectomy is not exposed and only the superior aspects of the malleus head and incus body, as well as the prominence of the lateral semicircular canal are visualized. The limits of a simple mastoidectomy are marked by posterior canal wall anteriorly, sigmoid sinus plate posteriorly, tegmen antrii superiorly, tip cells inferiorly, and the dome of the lateral semicircular medially.

*Corresponding author: Gaurav Bambha,
Kalpana Chawla Govt Medical College & Hospital, Karnal

MATERIALS AND METHODS

A prospective comparative study comprising of 50 patients who were randomly divided into two equal groups according to the inclusion and exclusion criteria as given below with 25 patients undergoing type 1 Tympanoplasty and 25 patients undergoing type 1 Tympanoplasty with cortical mastoidectomy, done over 2 years from at Sri Ramachandra University, Chennai.

Inclusion Criteria

- All dry and quiescent ears.
- All discharging ears which after appropriate conservative management became dry or quiescent.

Exclusion Criteria

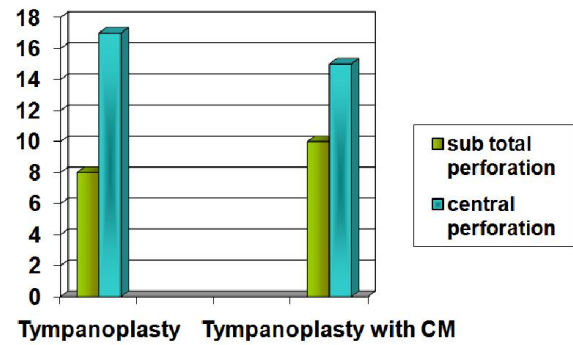
- Immunocompromised diseased states : DM, TB
- C.S.O.M. (A.A.D) type.
- Sensorineural hearing loss.
- Discharging ears refractory to treatment.
- History of ENT surgeries.
- Traumatic perforations.
- Congenital ear anomalies.

After a proper selection and evaluation, the patients underwent the standardized procedure of type 1 tympanoplasty with and without cortical mastoidectomy. Per operatively the middle ear and mastoid cavity were inspected for the disease process such as; polypoidal mucosa, granulation tissue, fibrous tissue, glue and the per operative findings were recorded. The disease was cleared from the middle ear and the mastoid antrum and a type 1 tympanoplasty with and without cortical mastoidectomy was done for the subjects according to their group. Post operatively all the patients were discharged on the 2nd post operative day. Patients were started on systemic antibiotics, analgesics and antihistaminics for duration of one week. Post operatively all the patients were followed up for a total duration of 6 months with regular intervals at 1st, 3rd and 6th month. Postoperatively patients were assessed for the status of the graft, mobility of the graft and the hearing improvement. A detailed otomicroscopic examination was done at each visit to check for the graft status. Mobility of the graft was assessed by doing a seigalization. Pure Tone audiogram was done for all the patients at the end of 6 months to assess the level of hearing improvement.

RESULTS

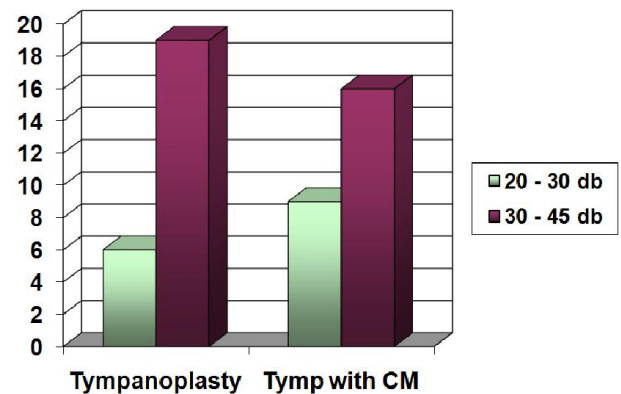
Type of perforation

The type of perforation was classified as central and subtotal perforation. In the tympanoplasty group, 17 out of 25 had central perforation and 8 out of 25 had subtotal perforation. In the cortical mastoidectomy group, 15 out of 25 patients had central perforation and 10 out of 25 patients had subtotal perforation. The p - value calculated was 0.77, which was statistically insignificant.



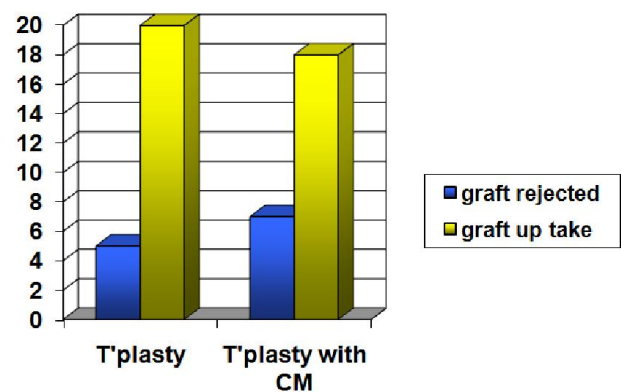
Pre op Hearing

Table showing the pre and post operative hearing levels. In the tympanoplasty group, there were 6 and 19 patients in 20 - 30 and 30 - 45 db hearing loss categories, respectively. In cortical mastoidectomy group, there were 9 and 16 patients in 20- 30 and 30 - 45 dbHL categories, respectively.



Follow up

Graft uptake



Group	Graft taken u	Graft rejected	Mobility +
Tympanoplasty	20 (80%)	5 (20%)	12 (48%)
Tympanoplasty with C.M.	18 (72%)	7 (28%)	7 (28%)

P value for the graft uptake was calculated in each group, using the Pearson's chi square test with Yate's continuity correction, was found to be 0.74 which was not significant. The percentage of mobility of graft post operatively in group 1 was 28 % and in group 2 was 48 %.

Post – Op hearing

The pre operative hearing levels in the tympanoplasty group were 6 and 19 in 15- 30 and 30 – 45 dBHL and the post operative hearing levels were found to be 10 in both 15- 30 and 30 – 45 dBHL respectively. In cortical mastoidectomy group, there were 9 and 16 patients in 15- 30 and 30 – 45 dBHL categories pre operatively, which post operatively became 12 and 6, respectively. Students independent 't' test was used to calculate the mean, standard deviation and the test of significance of mean values of the pure tone average hearing levels between the 2 groups which is shown in table 1.

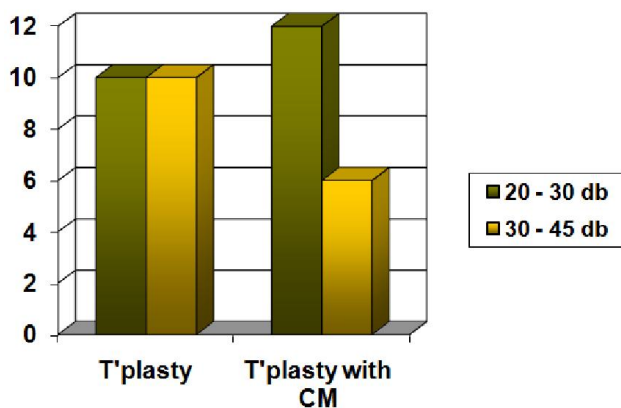


Table 1. Students independent 'T' test to calculate the 'p' value

Group	Tympanoplasty	Tympanoplasty with CM	p - value
	Mean +/- std dev	Mean +/- Std dev	
Pre – op	34.3 +/- 5.8	33.3 +/- 7.0	0.60
Post – op	30.4 +/- 5.8	29.6 +/- 8.7	0.71
Change	3.9 +/- 3.4	3.8 +/- 4.7	0.88

The pre op mean and standard deviation of pure tone average in tympanoplasty group is higher than the mean pre op value in the cortical mastoidectomy group. However, there is no significant difference in mean P value which is 0.60 and is insignificant. The mean post - op pure tone average value and std deviation in the 2 groups were 3.9+/- 3.4 and 3.8 +/- 4.7 and the p value calculated was 0.71 which was statistically insignificant.

Table 2. Students paired 'T' test to calculate the 'p' value

Group	Pre op	Post op	Change	p - value
	Mean +/- std	Mean +/- std	Mean +/- std	
Tympanoplasty	34.3 +/- 5.8	30.4 +/- 5.8	3.9 +/- 3.4	< 0.0001
Tympanoplasty With C.M.	33.3 +/- 7.0	29.6 +/- 8.7	3.8 +/- 4.7	< 0.001

Table 2 showing the comparison of pre operative mean and std deviation of pure tone average values within each group. Students paired 'T' test was used to calculate the P value and was found to be < than 0.0001 which was statistically significant.

DISCUSSION

Chronic suppurative otitis media owing to the poor socio economic status and poor environmental conditions account for morbidity in about 5% of the total population. If this

ailment is not corrected the hard ships faced by the patients will be tremendous. Hence the purpose of the ear surgery is to restore the normal anatomical and physiological status of the ear, so that the patient leads a comfortable life style. ENT surgeons by performing corrective surgery for chronic suppurative otitis media can change the lifestyles of their patient's profoundly. The medical line of management will only lessen the severity of symptoms. Perforation of the tympanic membrane is nature's way of maintaining middle ear ventilation under the pressure of inflammatory process in the tympanomastoid cleft. The middle ear mucosa is carefully evaluated through the tympanic membrane perforation. Tympanoplasty is a surgery performed to eradicate disease from the middle ear cleft and to reconstruct the hearing mechanism with tympanic membrane grafting and with or without mastoid surgery. In some cases extensive pathology may be seen in the mastoid cavity in the form of hypertrophied mucosa, polypoidal tissue, antral cysts etc occluding the aditus, which should be cleared to attain the aditus ad antrum patency.

In 2-3% of cases of tubotympanic pathology associated cholesteatoma is seen in the mastoid, and at times extensive tympanosclerosis is seen. The Age and the Sex of the patients in both the groups were comparable and bear no statistical significance. The symptoms pre operatively were hearing loss, tinnitus and ear block which were comparable in both the groups. Fiscer 2 tailed test was applied to the compare the symptoms in both the groups and were found to be comparable i.e. were statistically insignificant. The type of perforation in both the groups was classified into central and subtotal perforation. 8 (32%) of patients had a subtotal perforation in the tympanoplasty group and 10 (40%) of patients in cortical mastoidectomy group. The otomicroscopic findings in both the groups were presence of polypoidal tissue, myringosclerosis and normal middle ear mucosa. The presence of polypoidal tissue in the middle ear was compared between both the groups and the p value calculated was 0.05 and was found to be statistically significant. Presence of myringosclerosis was statistically insignificant when compared between both the groups. The preoperative hearing levels were divided into 20 – 30 db and 30 – 45 db hearing loss on the basis of pre operative pure tone audiogram. In tympanoplasty group 6 patients had pure tone average within 20 – 30 db and 19 patients in 30 – 45 db level. In the mastoidectomy group there were 16 patients with pure tone average between 20 – 30 db and 9 patients with in 30 – 45 db. Peroperatively the findings in tympanoplasty group were the presence of polypoidal tissue, glue, adhesions and myringosclerosis and in the mastoidectomy group in addition to the above findings there was the presence of antral disease in the form of polypoidal tissue, hypertrophied mucosa, antral cysts blocking the aditus ad antrum. In tympanoplasty group 10 patients per operatively had polypoidal mucosa in the middle ear per operatively, 7 patients had adhesion in the region of oval window, round window and in the ossicular chain thus reducing the over all mobility of the ossicular chain. 5 patients each had glue and tympanosclerosis in the tympanoplasty group. Per operatively in one of the patient undergoing tympanoplasty the ossicular chain was found to be disrupted due to the erosion of the lenticular process of incus and 2 patients had cholestetoma debris in the middle ear and

were excluded from the study. In the cortical mastoidectomy group 16 patients had polypoidal tissue per operatively in the middle ear 50 % of these also had a blocked antrum. 12 patients had antral disease blocking the patency of aditus ad antrum. 5 patients showed adhesions and 3 patients glue. The percentage of graft uptake in tympanoplasty group at first follow up was 68 % and in mastoidectomy group was 72 % which at 2nd follow up at 3rd month was 80 % i.e 20 patients had the successful graft uptake in tympanoplasty group and 72% i.e. 18 patients had a successful graft uptake in mastoidectomy group which was same at 6th month. Of the 5 patients who had the graft failure in tympanoplasty group 4 had polypoidal tissue per operatively and all the 4 had subtotal perforation and 1 patient had normal middle ear mucosa with a central perforation. Of the 7 patients who had graft failure in the mastoidectomy group 4 had a subtotal perforation and 3 had a central perforation and 6 of them had antral disease and polypoidal tissue in the middle ear. Parson's chi square test with yate's continuity correction was used to calculate the p value which was 0.74 and statistically insignificant. The graft failure in the tympanoplasty group can be attributed mainly to the presence of polypoidal tissue and subtotal perforation in which the presence of antral disease was more likely. The graft mobility in tympanoplasty group was 48 % and in mastoidectomy group was 28 % which was checked by siegelization.

Post op hearing assessment was done at 6th month with a pure tone audiogram. An improvement of 10 db or more was considered to be significant improvement in hearing levels. our results showed a more than 10 db improvement in 6 patients in the tympanoplasty group and 8 patients in the cortical mastoidectomy group. The mean post - op pure tone average value and std deviation in the 2 groups were 3.9+/- 3.4 and 3.8 +/- 4.7 and the p value calculated was 0.71 which was statistically insignificant. In a study conducted by mutoh t et al comparing the results efficacy of mastoidectomy in methicillin sensitive staph aureus and methicillin susceptible staph aureus infected otitis media Mastoidectomy had significantly better results concerning postoperative complications in discharging ears with MRSA-infected chronic otitis media (32). In a separate study by Rickers J, Petersen CG comparing the long term follow up evaluation of mastoidectomy in children with non cholesteatomous chronic suppurative otitis media they concluded that mastoidectomy in these patients should be kept as a last resort when intensive conservative treatment and myringoplasty fails (33). In another similar study Balyan et al. compared the graft success rate and the final functional hearing outcome and found tympanoplasty without mastoidectomy as preferable treatment modality in non cholesteatomous ears ($p > 0.05$) (34). Vijayendra et al. advocated the opening of antrum to prevent the surgical failure in 2-3 % of patients (35). In their retrospective analysis of 251 cases of non cholesteatomous chronic otitis media by Mishiro et al. who underwent tympanoplasty with and without mastoidectomy Graft success rates were 90.5% in group A and 93.3% in group B. The rates of the postoperative air-bone gap within 20dB were 81.6% in group A and 90.4% in group B, without a statistically significant difference (36). Glasscock has reported a 96% success rate with underlay technique (37). 86% take rate was found by Rizer (38). Smyth and Patterson in

their report of 153 Tympanoplasty patients showed it to be 78% with a longer follow up (39). In our study take rate (closure of perforation) was 80 % (20 patients), 5 patients had a failure in closure of perforation. The success of Tympanoplasty depended on the status of middle ear mucosa, eustachian tube function, size and site of perforation and presence of tympanosclerosis.

Conclusions

- Cortical mastoidectomy is recommended in patients of CSOM (TTD) with subtotal perforation (involving all the quadrants).
- The graft take up rate is similar in both the groups in patients with central perforation (involving one or two quadrants).
- In successful graft take up, results of hearing improvement and graft mobility are similar with and without mastoidectomy.
- Possibility of finding mastoid antral pathology is more in patients with CSOM (TTD) with subtotal perforation as observed in this study.

REFERENCES

- Aibara, R. Welsh, J., Puria, S. and Goode, R. 2001. Human middle ear sound transfer function and cochlear input impedance. *Hear Res.*, 152 : 100-9
- Anson, B.J., Donaldson, J.A. 1981. Surgical anatomy of the temporal bone, 3rd (edn). Philadelphia: WB Saunders, 1981
- Chouard, C.H. 1977. Wriesberg intermediary nerve. in: Fisch U(ed). Facial nerve surgery. Birmingham, AL: Aesculapius Pub Co., 24-39.
- Decraemer, W.F., Khanna, S.M., Funnell, W.R.J. 1989. Interferometric measurements of the amplitude and phase of tympanic membrane vibrations in the cat. *Hear Res.*, 38: 1-18
- Gleeson, M., Felix Neivergelt, J. 1991. Quantitative and qualitative analysis of the middle ear mucosa. IN : Sade J (ed). The eustacian tube, basic aspects. Amsterdam Kughler and Ghedini , 125 – 31
- Goode, R.L. Killion, M., Nakamura, K., Nishihara, S. 1994. New knowledge about the function of the human middle ear: development of an improve analog model. *Am L Otol* 15: 145 – 54.
- Guinan, J.J., Peake, W.T. 1967. Middle ear characteristics of anaesthetized cats. *J Acoust Soc Am*, 41: 1237 – 61
- Kirikae, I. 1960. The struction and fuction the middle ear function . Tokyo : University of Tokyo Press.
- Kurokawa, G., Goode, R.L. 1995. Sound pressure gain produced by the human middle ear. *Otolaryngol Head Neck Surg*, 113: 349-55
- Michaels, L., Soucek, S. 1989. Development of the stratified squamous epithelium of the human tympanic membrane and external canal: The origin of auditory epithelial migration. *American Journal of Anatomy*, 184: 334-44.
- Proctor, B. 1964. The development of the middle ear spaces and their surgical significance. *Journal of Otolaryngology*, 78 : 631- 49

- Puria, S., Peake, W.T. 1997. Rosowski JJ. Sound pressure measurements in the cochlear vestibule of human cadaver ears . *J. acoust. Soc. Am.*, 101; 2754 -70
- Sade, J. 1966. Middle ear mucosa Archieves of otolaryngology, 84: 137 – 43
- Tonndorf, J., Khanna, S.M. 1972. Tympanic membrane vibrations in human cadaver ears studied by time averaged holography. *J Accoust Soc Am.*, 52: 1221 -33
- Wever, E.G., Lawrence, M. 1954. Physiological acoustics. Princeton (NJ) : Princeton University Press.
