

Original Research Article

Results of tympanoplasty in reference to the condition of middle ear mucosa and edge of perforation in safe chronic otitis media

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ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is an important and a highly prevalent disease of the middle ear and poses serious health problem worldwide especially in developing countries where large percentage of the population lack specialized medical care, suffer from malnutrition and live in poor hygienic environmental conditions. Aim of the study was to study the outcome of tympanoplasty in the light of character of edge of perforation and middle ear mucosa condition.

Methods: This prospective study was conducted in 39 patients who underwent tympanoplasty in the department of ENT and head and neck surgery, Assam medical college and hospital, Dibrugarh between 1st June 2019 to 31st May 2020. Rim of perforated tympanic membrane and middle ear mucosa were sent for HPE. Three post-operatives follow up were done and surgical success was measured in terms of graft uptake and improvement in hearing.

Results: Out of 39 cases, successful graft uptake was seen in 33 (84.62%) cases. Extension of migration of squamous epithelium in the undersurface of tympanic membrane was found in all 6 cases (3 had complete epidermosis while 3 had partial). All the six graft failure cases had diseased middle ear mucosa, mostly infected hypertrophied mucosa and tympanosclerosis with infiltration of chronic inflammatory cells and 1 patient had keratosis flakes with vascular stroma.

Conclusions: Hypertrophic changes with inflammation of middle ear mucosa and epidermosis on the medial surface of tympanic membrane was found to have negative influence on the tympanoplasty outcome.

Keywords: COSM, Tympanoplasty, Epidermosis, Pure tone audiometry

INTRODUCTION

Chronic otitis media is the chronic inflammation of mucoperiosteal lining of the middle ear cleft characterized by ear discharge, a permanent perforation of the tympanic membrane and impairment in hearing.¹ CSOM results from long term Eustachian tube dysfunction with poorly aerated middle ear space, multiple bouts of acute otitis media and persistent middle ear infection.²

CSOM is commoner in developing countries, with its prevalence being reported as high as 11%, whereas it is a vanishing disease in more developed part of the world

where incidence is less than 2%. In the developing countries still, poverty, ignorance, dearth of specialists and limited access to medical care amongst others conspire to worsen the course and complications (sometimes life-threatening) of CSOM.³

A number of histopathological changes can develop in the middle ear and mastoid in CSOM. Some changes are the result of infection and inflammation, while others represent the host response to the disease process. Taken together these changes lead to the signs and symptoms of CSOM and also play an important role in determining success or failure of surgery for CSOM.⁴

Most infected perforations can be managed conservatively with topical antibiotics and regular aural toilet. When conservative medical management has failed to control COM an individual often becomes a candidate for a surgical procedure. If a surgical procedure is required, the choice of surgical procedure depends on the nature and extent of disease. In COM without cholesteatoma, the procedure should be designed to provide aeration of the middle ear, attic, antrum, and mastoid air cell spaces, as well as closure of the tympanic membrane.⁵

The results of tympanoplasty are measured in terms of success or failure of graft-take and hearing improvement.⁶

This present study has been undertaken with the aim of eradication of disease, to evaluate the results of tympanoplasty in reference to the pathological status of middle ear mucosa and edge of perforation.

METHODS

This prospective study was conducted in 39 patients who underwent tympanoplasty in the department of ENT and head and neck surgery, AMCH, Dibrugarh between 1st June 2019 to 31st May 2020 after obtaining a study approval from the institutional ethics committee.

All the cases of CSOM with central perforation attending the out-patient department and inpatient department of ENT and head and neck surgery, Assam medical college fulfilling the inclusion and exclusion criteria were included in the study.

Inclusion criteria

Patient with central perforation, patient with conductive hearing loss, patient giving consent for surgery and for the study, patient willing to come for regular follow up

Exclusion criteria

Unsafe CSOM, patient with other types of perforation except central type and patient with history of ear surgery.

All the patients included in the study were subjected to detail history, complete general, systemic and ENT examination after taking proper informed and written consent. ENT examination included otoscopy, tuning fork test, EUM (Examination under microscope) and audiometric investigation in the form of PTA (Pure tone audiometry). All the patients with discharging ear were initially treated conservatively by aural toileting, antibiotics, antihistaminics and decongestants in order to achieve dry ear for minimum duration of 4 weeks. After those cases were prepared for surgery and tympanoplasty was performed in all cases.

Autogenous temporalis fascia was used as graft material in all the cases. 1.5-2 mm of the tissue at the margin of the TM perforation was excised with the help of an angled pick. The whole rim was then removed with a micro crocodile forceps. After resection, outer surface of the rim of TM was marked with gentian violet meticulously for orientation and sent to pathology department for HPE to find out the extent of epidermosis undersurface of rim of tympanic membrane. Using Hartmann cupped micro ear forceps; a small bit of tissue from the mucosa of middle ear was taken and sent for histopathological examination.

Post-operative follow up was done on 10th day, 3rd week and 12th week during which assessment of graft uptake, presence or absence of any ear discharge were noted. During 3rd follow-up, audiological assessment was done in the form of PTA. The findings were recorded and analyzed to evaluate post-operative hearing improvement by calculating pre-operative and post-operative air-bone gap (ABG) and post-operative hearing gain in decibel.

Surgical success was measured in terms of successful graft uptake, ability to achieve dry ear and improvement in hearing.

Continuous data were presented in terms of Mean \pm SD and the difference between pre and post operative measurement were listed by using paired t-test. A p of less than 0.05 was considered as statistically significant. Calculations were done using Microsoft excel 2010.

RESULTS

Out of 39 patients in our study, 14 (35.90%) were male and 25 (64.10%) were female with male and female ratio 1:1.78. The age ranged from 13 to 60 years with mean age 33.90 \pm 12.49 years. We found that, 26 (66.67%) cases were from rural background and 13 (33.33%) from urban area.

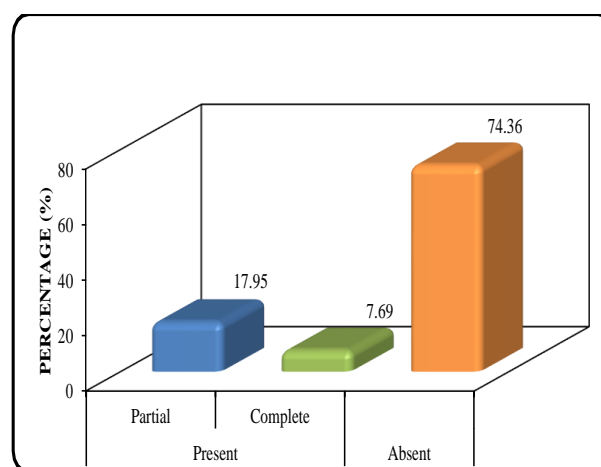


Figure 1: Epidermosis under surface of tympanic membrane.

Figure 1 shows the extension of migration of stratified squamous epithelium in the inner surface of tympanic membrane. We found that in 29 cases out of 39 (74.36%) no squamous epithelium on the under surface of tympanic membrane i.e., mucoepithelial junction is present at the margin of the perforation. In 7 (17.95%) cases, it was located medial to the perforation but not complete. In 3 cases (7.6%), squamous epithelium was found at any point on inner aspect of tympanic membrane.

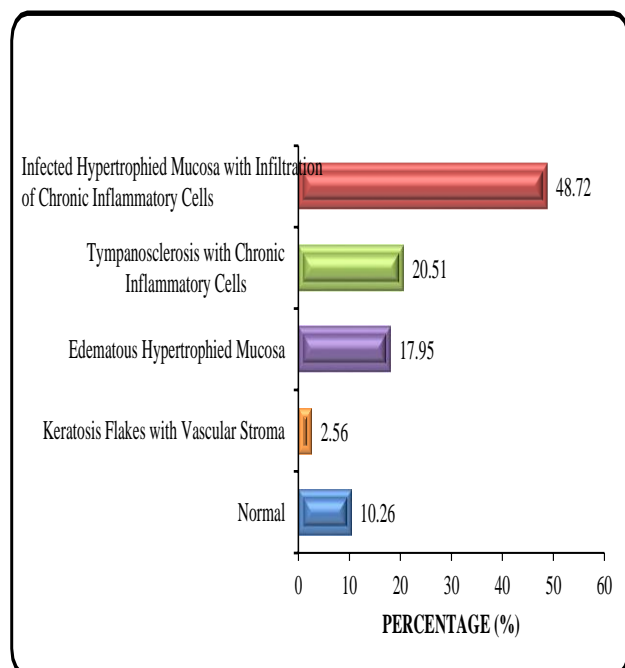


Figure 2: Status of middle ear mucosa (Histopathological study).

Fig.2 shows the histopathological study of middle ear mucosa. Out of 39 cases, normal mucosa was seen in 4 cases (10.26%). The commonest type of HPE was found to be infected hypertrophied mucosa with infiltration of chronic inflammatory cells in 19 cases (48.72%) followed by tympanosclerosis with chronic inflammatory cells in 8 cases (20.51%) and edematous hypertrophied mucosa in 7 cases (17.95%) respectively. Keratosis flakes with vascular stroma was seen in 1 patient (2.56%).

Table 1: Comparison of mean preoperative and postoperative PTA.

Variables	Pre op PTA		Post op PTA		P value
	Mean	SD	Mean	SD	
Air conduction (dB)	41.31	4.59	31.10	5.48	<0.001
Bone conduction (dB)	9.00	2.25	9.00	2.25	1
Air bone gap (dB)	32.31	4.21	22.10	4.87	<0.001

Table 1 shows that mean pre-operative AC was 41.31 ± 4.59 dB and mean post-operative AC was 31.10 ± 5.48 dB with $p < 0.001$ (calculated by Student's t test) which was statistically significant. Similarly, the mean pre-operative ABG was found to be 32.31 ± 4.21 dB and post-operatively 22.10 ± 4.87 dB with $p < 0.001$ which was also statistically significant.

Table 2: Gain in hearing.

Gain in hearing (dB)	Number	Percentage (%)
1-5	1	2.56
6-10	20	51.28
>10	18	46.15
Total	39	100.00
Mean±SD	10.21±1.84 dB	

Table 2 shows distribution of patients according to post-operative gain in hearing at 3rd follow up (12th week). 20 patients (51.28%) had hearing gain in the range of 6-10 dB while 18 patients (46.15%) had more than 10 dB hearing gain. Mean gain in hearing was found to be 10.21 ± 1.84 dB.

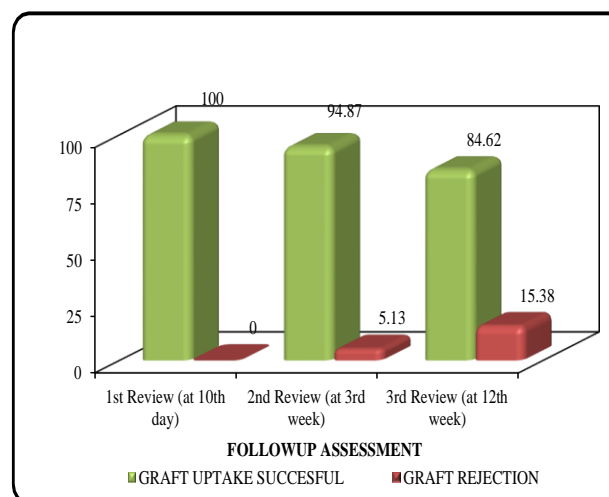


Figure 3: Follow up assessment of graft status.

Figure 3 shows graft status of the patients at three post-operatives follow up. It was found that all 39 cases had successful graft uptake in the 1st follow-up on 10th post-operative day. Two cases (5.13%) had graft failure at 3rd week and subsequently 6 cases (15.38%) had graft rejection at 3rd follow-up on 12th week. Successful graft uptake post-operatively at 3rd follow-up (12th week) was seen in 84.62% of cases.

DISCUSSION

CSOM is a common middle ear cleft disease in ENT practice. The tympanoplasty technique using fascia as an underlay graft is the most commonly used technique because of the availability of the material and the satisfactory results.

In the present study, successful graft uptake was seen in 84.62% of cases.

Here, we found that 29 cases out of 39 (74.36%), there was no squamous epithelium on the undersurface of tympanic membrane i.e., mucoepithelial junction is present at the margin of the perforation. In 7 cases (17.95%) the squamous epithelium was found to be migrated to some extent on the medial surface of the TM but didn't engulf the entire medial surface (partial epidermosis). In 3 cases (7.6%), squamous epithelium was found at any point on the inner aspect of tympanic membrane. We also observed that all these three cases where squamous epithelium was present on both sides of TM had post-operative graft failure. Another three graft rejected cases had partial epidermosis of tympanic membrane.

Hence, a central tympanic membrane perforation should not merely be considered as a simple defect. Outer stratified squamous epithelium can migrate from the perforation edges to the inner surface of the tympanic membrane. Therefore, it is essential to remove any squamous cell epithelium that might have extended under the edge of the perforation onto the medial surface of the tympanic membrane before placement of a connective tissue graft to close the perforation. Otherwise, there may be an increased risk of cholesteatoma formation and no migration of epithelial cells over the graft to close the perforation.

Fouad et al carried out a histopathological study on sixty cases of subtotal perforations in non-cholesteatomatous ears and found that creeping of stratified squamous epithelium around the edge occurred in 23 per cent of cases for a distance of up to 4 mm.⁷

Oktay et al in their study "tympanic membrane changes in central tympanic membrane perforations" found that in 10 out of 29 perforations (34.48%) mucocutaneous junction ends at the outer surface of the tympanic membrane perforation. In 8 cases (27.58%) mucocutaneous junction reached the inner surface of the tympanic membrane perforation and 11 cases (37.93%) had squamous epithelium on both sides of tympanic membrane.⁸

Presence of inflammatory disease in the middle ear is a crucial risk factor in the success of tympanoplasty procedures.

The present study showed normal middle ear mucosa in 4 cases (10.26%). The most common type of HPE was found to be infected hypertrophied mucosa with infiltration of chronic inflammatory cells in 48.72% of cases followed by tympanosclerosis with chronic inflammatory cells in 20.51% and edematous hypertrophied mucosa in 17.95% cases respectively. Interestingly, 1 patient (2.56%) showed keratosis flakes with vascular stroma in HPE. So, this patient was

diagnosed as tubotympanic type clinically but histopathological report was suggestive of attico-antral type. All the six graft failure cases had abnormal middle ear mucosa.

Sharma et al in a clinicohistopathological study on 100 COM patients found that in the tubotympanic type, hyperplastic mucosa (33.3%) was the commonest finding followed by edematous mucosa and tympanosclerosis (19.4%). They also found an increase in lymphocytes in all the cases while an increase in plasma cells was seen in 94% cases. An increase in histiocytes was seen in 48% cases, giant cells were observed in 16% cases.⁹

CONCLUSION

Chronic otitis media is one of the major public health problems in general population in this part of the world. Management of the disease has been a challenge to the otologist since ancient times. Tympanoplasty is an effective procedure that can lead to improvement in hearing function of patients and prevention of recurrent ear discharge. However, there are various factors which can influence the surgical outcomes in chronic otitis media. Squamous epithelium into the undersurface of tympanic membrane was found to have negative influence on surgical outcome. A diseased middle ear mucosa can function as a barrier to normal gas exchange by inflammatory changes subsequently altering the pressure regulation and affecting tympanoplasty outcome. However, subtotal and marginal perforation could not be studied as biopsy could not be taken.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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