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Original Research Article

Comparison of endoscopic underlay and microscopic underlay tympanoplasty: a prospective research at a tertiary care centre in Gujarat

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ABSTRACT

Background: Tympanoplasty is an ever evolving surgery with myriad of approaches and tools. Use of endoscope is relatively new and there are few studies evaluating the use of endoscope via microscope because of a big learning curve in using one hand endoscopic technique despite it being minimally invasive.
Methods: This is a prospective study conducted from June 2016 to May 2017 with a sample size of 44 patients. The study included patients of Chronic Otitis Media (COM) of mucosal inactive type without any co-morbidities in which only Type-1 tympanoplasty was done. The patients were divided into endoscopic or microscopic group using simple random sampling and after taking written and informed consent. The patient's details regarding audiometric, oto-endoscopic and nasal endoscopic evaluation were recorded. Intra operative findings, duration of surgery and post-operative pain scoring were recorded. The patients were followed up for 3 months and subjected to post-operative audiometry and patient satisfaction questionnaire. The groups were evaluated for graft take up and closure of air bone gap, post-operative complications and patient satisfaction. The results were analysed using descriptive statistics (mean and percentage) and CHISQ test.
Results: Graft was taken up in 21 patients (95%) in microscopic as opposed to 20 in endoscopic group (90%). Mean VAS scoring for pain was 2.5 in microscopic group on first post-operative day and 1.5 for the endoscopic group. The mean improvement in air bone gap post-surgery was 23.68 dB (SD=4.94) for microscopic group and 16.13 dB (SD=6.49) for endoscopic group.
Conclusions: Endoscopic tympanoplasty as a technique has a long learning curve. The results indicate that endoscopic technique is as efficacious as and less invasive than microscope surgery for doing tympanoplasty.

Keywords: Chronic otitis media, Endoscopic tympanoplasty, Microscopic tympanoplasty, Overlay technique, Underlay technique

INTRODUCTION

Tympanoplasty as a surgery is an ever evolving science with myriad of techniques and materials. The concept of tympanoplasty evolved with Wullstein and Zollner's paper.[1,2] The use of overlay technique however was not giving persistent results leading Shea and Tabb to evolve underlay technique wherein the graft was placed under the tympanic membrane remnant.[3-5] Each technique was debated in literature with differing yet comparable rate of complications.

Traditionally this surgery was performed with the microscope. However, microscope functions on straight line of sight principle and visualization of middle ear completely and removal of pathology, especially that of

retrotympanum, attic and hypotympanum, requires frequent adjustments and also curettage of posterior canal wall, scutum and canalplasty.

However with the arrival of endoscopes in otology as a tool for vision the field is in a flux.[6-8] However endoscope as a tool with angular moving vision allows the surgeon with instantaneous view of the recesses along with added vision of ventilation pathways and better view of attic without removal of canal bone; also anterior canal wall tucking is not required with the elevation of a circumferential flap.

In India, otologists have been slow to adopt the endoscopic technique because of one hand limitation. Till date of sending this article we could identify only four articles on endoscopic tympanoplasty, of which one author used a novel two handed technique and another author used endoscope as an adjunct to the microscope.[9-12]

METHODS

This is a prospective study with sample size of 44 patients. The study period was from June 2016 to May 2017. IEC approval was obtained before starting the study. The study included patients having COM of mucosal type (inactive). Age of the patients ranged from 15-55 years. Patients included in study had no systemic co morbidities and all underwent Type 1 tympanoplasty using either microscopic (Group A) or endoscopic (Group B) technique based on simple random sampling. The patient's details regarding audiometric, oto-endoscopic and nasal endoscopic evaluation were recorded. Intra operative findings, duration of surgery and post-operative pain scoring were recorded.

Group A involved type 1 tympanoplasty done by post aural microscopic approach. Group B involved type 1 tympanoplasty done using Zero degree 4mm diameter 15.8 mm length endoscope by permeatal route. In both groups temporalis fascia was used as a graft material placed in an underlay fashion. The patients were called for follow up and their otoscopic findings were recorded. Post-operative audiometry was done and all patients were administered a patient satisfaction questionnaire. The groups were then evaluated for graft take up rate, closure of air bone gap, post-operative complications and patient satisfaction. Results were analysed using descriptive statistics (percentage and mean and standard deviation) and Chi square test.

RESULTS

In endoscopic group, the average age of patients was 29 years with 12 (55%) females 10 males (55%). In this group, 10 patients (45%) had large central perforation whereas 6 (27%) each had subtotal and moderate perforation. In the microscopic group, average age was 33 years with 12 males and 10 females (Table 1). In this group, 12 patients (54%) had large central perforation whereas 7 patients (32%) came with subtotal perforation and 3 patients (14%) had moderate perforation (Table 2).

Table 1: Demographic profile of patients.

Demographic profile	Group A (microscopic) (n=22)	Group B (endoscopic) (n=22)
Average age	33 years	29 years
Age range	16-50 years	15-55 years
Males	12 (55%)	10 (45%)
Females	10 (45%)	12 (55%)

Table 2: Distribution of patients according to the size of perforation.

Size of perforation	Group A (microscopic) (n=22)	Group B (endoscopic) (n=22)
Large	12 (54%)	10 (45%)
Subtotal	7 (32%)	6 (27%)
Medium	3 (14%)	6 (27%)

In endoscopic group, post operatively, four patients had repeated episodes of Otitis Media with Effusion (OME) of which two patients had re-perforation (success rate 91%) at 3 months of follow up. There was no evidence of graft lateralization or ossicular fixation in that group. Mean VAS scoring for pain was 1.5 on first post-operative day. With regard to satisfaction (with respect to scar and pain), mean Likert's score was 3.5 on a scale of 1 to 5 (1 being not satisfied and 5 being highly satisfied).

Table 3: Comparison of results of the two techniques.

Parameter	Microscopic group (n=22)	Endoscopic group (n=22)	P value
Canalplasty	10 (45%)	1 (5%)	0.0017
Curettage of posterior canal wall	6 (27%)	0	0.0084
Graft take up	21 (95%)	20 (91%)	0.5498
Reperforation	1 (5%)	2 (9%)	-
Mean VAS score for pain on first post-operative day	1.5	2.5	-
Mean score of Likert's scale for satisfaction	2.75	3.5	-

In the microscopic group, three patients had post-operative episodes of OME of which one patient had a repeat perforation. Canalplasty was needed in 10 patients in this group as opposed to one patient in endoscopic group. Mean VAS scoring for pain was 2.5 in

microscopic group on first post-operative day and overall satisfaction Likert's score of 2.75. Statistical analysis of difference using Chi square test for graft take up in two groups is 0.358 with P value of 0.5498 which was not significant. However, there was significant difference between the two groups in relation to cananlplasty and posterior wall curretage (Table 3).

Table 4: Comparison of pre and postoperative air bone gap closure.

Audiometric Data	Group A		Group B	
	Mean	Standard deviation	Mean	Standard deviation
Pre-operative bone conduction thresholds	12.4	3.53	14	2.94
Pre-operative air conduction thresholds	46.3	4.94	39.7	8.2
Pre-operative air bone gap	33.9	1.41	25.7	8.1
Improvement in air bone gap post operatively	23.68	4.94	16.13	6.49

Table 4 shows the comparison of pre and postoperative air bone gap closure between the two groups.

DISCUSSION

The primary goal of any grafting technique in tympanoplasty is to consistently produce a thin, conically shaped, vibrating membrane resembling the original drumhead as closely as possible.

Endoscope has been established by Tarabichi, Usami et al as an adjunct to microscope because of its role in visualising the pathways of ventilation of middle ear and now has become accepted worldwide.[13,14] Its primary limitation is that it is a single handed technique which makes the work tedious. However, by recent innovations done by Khan et al, two handed technique has evolved.[12] Bone work has also been done in endoscopic surgery thereby increasing its use even in cholesteatoma removal.[15]

Tympanic membrane perforation can occur in any age group, but is more commonly seen between 15-30 years.[16] In other study, the age range was between 16-40 years.[17] The most comprehensive study by Rizer et al involved subjects between 3-85 years of age.[18] In the present study, patients were between 15-55 years of age. The most common age group of patients in our study was the third decade (Table 1).

A review of literature covering microscope versus endoscopic techniques conducted by Tseng et al identified four studies (involving 266 patients in total) that met their inclusion criteria. They found that the pooled tympanic membrane closure rates and hearing results of endoscopic and microscopic tympanoplasty were comparable (85.1% vs. 86.4%, respectively; RR: 0.98; 95% CI: 0.85 to 1.11; I^2=0) (mean difference of improvements of air-bone gaps: -2.73; 95% CI: -6.73 to 1.28; I^2=80%).[19] They found that pooled canalplasty rate of endoscopic tympanoplasty was significantly lower than that of microscopic tympanoplasty. Patients undergoing endoscopic tympanoplasty had a more desirable cosmetic result than with microscopic tympanoplasty.[16] This compares well with the results of the present study with mean Likert's score of 3.5 for satisfaction in Group B (Table 3).

The underlay technique has shown to be have lesser complications such as atelectasis and reperforation. The complication rate shown for underlay has been claimed to be lower by Doyle et al, Glasscock et al ranging from 6-10 percent.[20,21] In our own study endoscopic group showed no evidence of atelectasis or graft medialization but two patients had reperforation. In the microscopic group one patient had reperforation.

CONCLUSION

Endoscopic technique of tympanoplasty can yield similar result as microscopic technique with better cosmetics and less pain.

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