

Transcanal Endoscopic Tympanoplasty – Structural, Functional and Quality Of Life Outcomes

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ABSTRACT

Endoscopic tympanoplasty is being used nowadays as a comparatively minimal invasive surgical alternative to the conventional microscopic tympanoplasty in the treatment of chronic otitis media (COM). Adult population attending OPD and diagnosed with COM-Mucosal disease and who are worked up for endoscopic Type-I tympanoplasty were included in this study (n=32). The anatomical function in terms of graft uptake, functional result in terms of A-B gap closure and quality of life in terms of post-operative pain, comfort scores, CES and SF-12V2 scores have been assessed. The graft uptake rate was 96.9% and the mean A-B gap closure was 14.56dB. The QOL outcomes in terms of CES and SF-12V2 scores showed improvement between pre and post op scores on comparison. We suggest that endoscopic tympanoplasty is a viable alternative to microscopic tympanoplasty with comparable efficacy and better quality of life outcomes.

INTRODUCTION

Chronic otitis media (COM) remains a disease with a high prevalence despite advances in diagnostic technologies and treatment modalities [1,2]. Management options available are medical management, hearing aid or surgery [2]. Medical management involves use of appropriate antibiotics for resolution of active infection which is then followed by surgical interventions to reconstruct the ear drum and also restore hearing. Tympanoplasty with or without mastoidectomy and ossiculoplasty is the surgical option for COM-Mucosal type. Tympanoplasty involves closure of the tympanic membrane perforation by a soft tissue graft, usually temporalis fascia, with or without reconstruction of the ossicular chain [2]. Tympanoplasty can either be performed by conventional microscope assisted technique or with endoscopes. Endoscopic tympanoplasty is gaining importance due to its minimally invasive techniques, better quality of life and with similar surgical outcomes. At present, QOL (quality of life) is under limelight and all the disease and the treatment options are assessed on the basis of how it affects the quality of life of patients. The surgery that offers better patient related outcomes is preferred in addition to better surgical outcomes. Our study was done to evaluate the structural, functional and quality of life outcomes of endoscopic type I tympanoplasty among adult Indian population.

MATERIAL & METHODS:

This prospective, observational study of 32 patients was conducted at tertiary care hospital in India for a period of 6 months. Institutional Ethical Committee approval was obtained. Adult patients (18-70 years) who were diagnosed with COM- mucosal disease and planned for endoscopic surgery were included. All the patients underwent standard history taking, ENT examination, otoendoscopy and puretone audiometry before planning for the surgery. The otoscopic findings like the presence and side of perforation, site of the perforation (Anterior, Posterior, Superior or Inferior quadrant) and size of the perforation (small, moderate, large and sub-total) were noted.

Pre-operative hearing assessment was done with Pure-Tone Audiometry. The ASHA method was used. The pure-tone average (500,1000, 2000, 3000 Hertz) of Air and Bone conduction and the Air-Bone gap (A-B gap) was assessed and noted.

Chronic Ear Survey (CES) is a disease specific QOL questionnaire for COM and has 13 questions totally divided into three sub-categories such as activity restriction (AR), symptom subscale (ST) and medical resource utilization (MR) subscale and the total CES score is obtained by adding all the 3 subscale scores. All the questions are about the duration of 6 months which has been modified to 3 months in this present study. Each option of a particular question has been given a score. The individual subscale score and total score ranges from 0-100, where 0 indicates poor QOL and 100 indicates the best score [23,24].

Short Form Questionnaire -12 version 2 (SF-12 V2) is a general QOL questionnaire and has two sub-scores namely physical component score (PCS) and mental component score (MCS) and a total score. The SF-12V2 contains 7 major questions with subdivisions in 4 questions. Physical and Mental Health Composite Scores (PCS & MCS) are computed using the scores of twelve questions and range from 0 to 100, where a zero score indicates the lowest level of health measured by the scales and 100 indicates the highest level of health. Both Physical and Mental Health Composite Scales combine the 12 items in such a way that they compare to a national norm with a mean score of 50.0 and a standard deviation of 10.0 [26]. The transformed scores are calculated for both the sub-score and total score.

Patients were questioned according to the SF-12 V2 and Chronic Ear Survey questionnaires and were recorded pre-operatively. Patients underwent type I tympanoplasty using underlay technique by single – handed endoscopic technique by the senior author. Temporalis fascia graft was used in all the cases. The graft was harvested from the 2cm incision over the temporal region. Post-operative pain was assessed in the immediate post-op period (0hours), 6hours after surgery and on first post-operative day (24 hours after surgery) using Numerical Rating Scale-11(NRS-11). All patients were treated with the same analgesics. Patient comfort scale assessment was done on the day of discharge using Numerical Rating Scale-11 (NRS-11). Patients were followed up at third week, 3 months and 6 months after surgery.

During the follow-up visit at third month and sixth month, graft uptake was assessed by the oto-endoscopic examination. Absence of perforation was considered as successful graft uptake. Pure-Tone Audiometry was done at the third month follow-up and the pure-tone average of air and bone conduction and the A-B gap was noted.

The patient's responses to SF-12 V2 questionnaire were recorded post-operatively at first month (over telephonic conversation) and Chronic Ear Survey questionnaire at third month of follow-up.

STATISTICS

Microsoft word and Excel were used to generate graphs and tables. Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. Descriptive analysis was used for gender, age, side of perforation, size of perforation and site of perforation. Inferential analysis was used for graft uptake and A-B gap closure. In descriptive statistics, the continuous variable has been expressed as mean and standard deviation and categorical variables expressed in frequency and percentage. In inferential statistics, Fisher's Exact test was used to compare the categorical data. Chi square test and ANOVA test was used for correlation statistics. Subscale and total score were calculated for CES and SF-12V2 questionnaire. The raw scores of SF-12V2 are then converted into transformed score using SF-12V2 calculator. Paired T test was used to compare the pre-op and post-op CES and SF-12V2 scores. All statistical analysis was tested at 95% confidence interval and the P value of < 0.05 is considered as significant.



Figure 1: Pre-op image of perforation



Figure 2: Post-op image of intact neotympanum

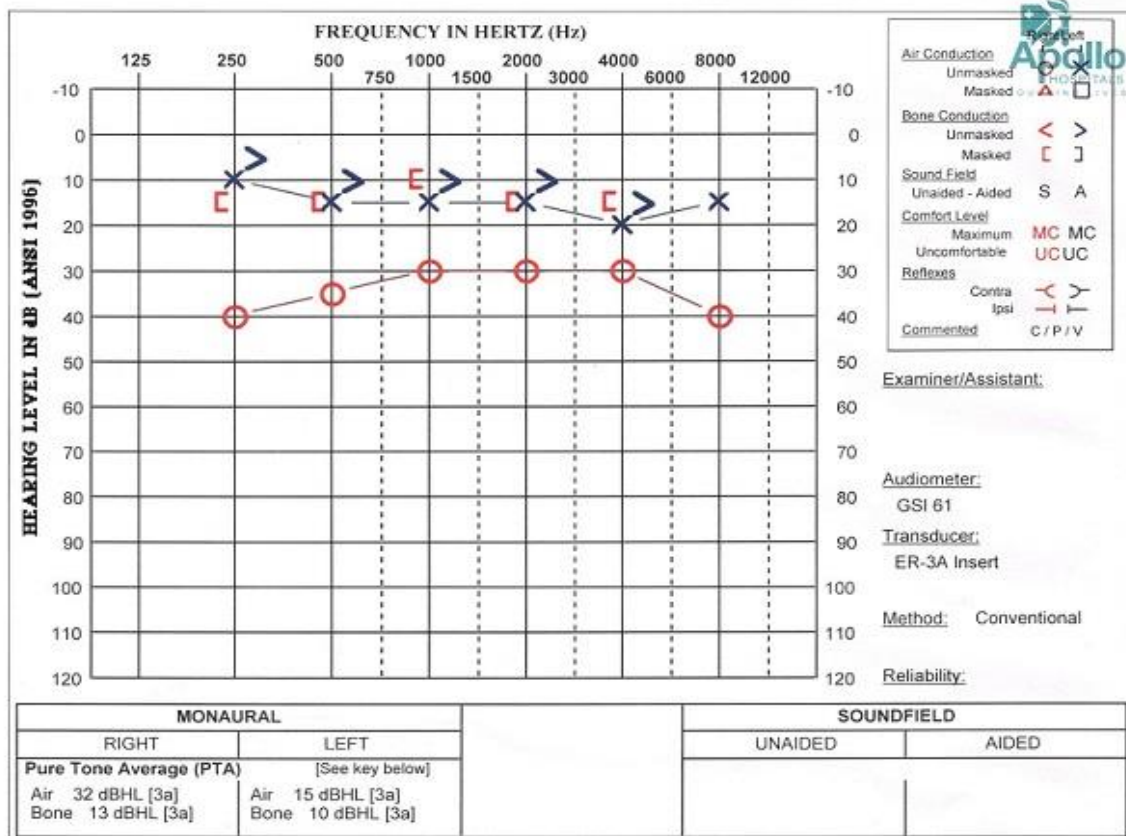


Figure 3: PRE-OP PTA

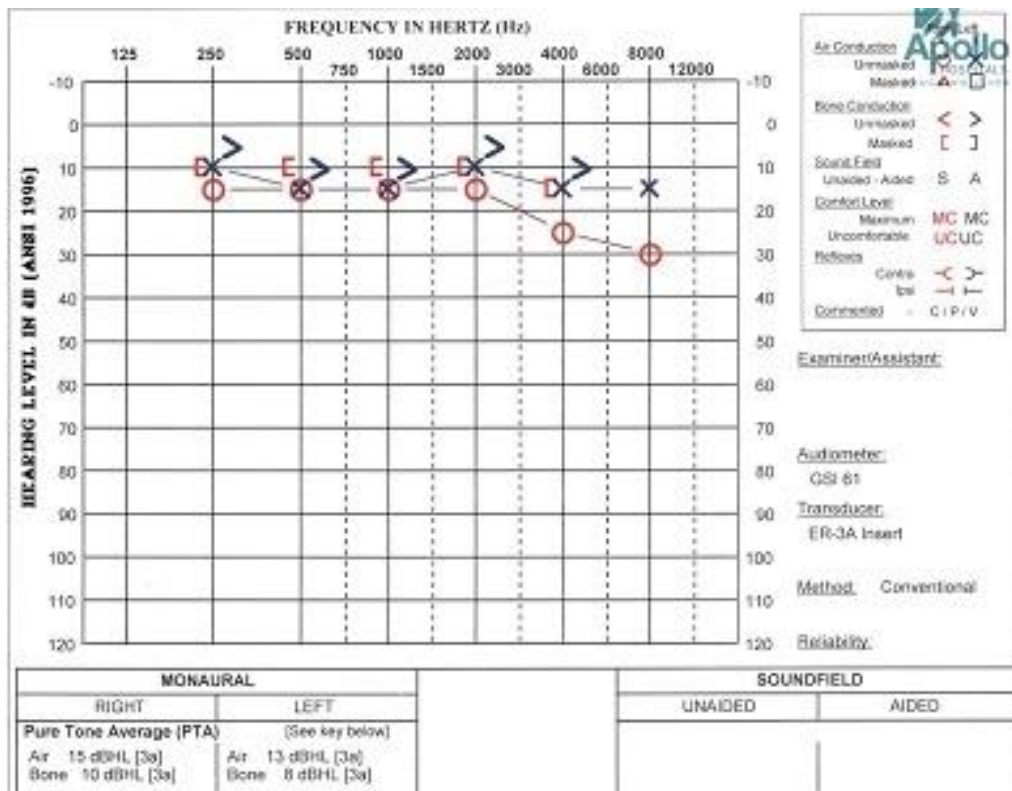


Figure 4: POST OP PTA

Table 1: Difference between Pre-Op and Post-Op CES Scores

ENDOSCOPIC TYMPANOPLASTY (N=32)	Mean	Std. Deviation	p value
PRE AR SCORE	40.6	11.3	0.00
POST AR SCORE	93.2	11.3	
PRE ST SCORE	68.4	10.3	0.00
POST ST SCORE	97.7	5.0	
PRE MR SCORE	61.5	18.2	0.00
POST MR SCORE	87.3	9.2	
PRE TOTAL CES SCORE	56.5	12.2	0.00
POST TOTAL CES SCORE	92.7	7.9	

Table 2: Difference between Pre-Op and Post-Op SF-12V2 Scores

ENDOSCOPIC TYMPANOPLASTY	Mean	Std. Deviation	p value
pre op PCS	79.8	5.4	0.32
post op PCS	81.8	10.2	
pre op MCS	81.9	2.0	0.00
post op MCS	76.2	1.9	
pre op SF 12	80.9	1.4	0.01
post op SF 12	78.8	3.9	

RESULTS

Total of 32 patients who underwent endoscopic tympanoplasty were included in our study out of which 18 were females (56.3%) and 14 were males (43.7%). The age of the patients included in our study ranged from 18-69 years. Mean age of the patient included in our study was 41.19 years. Right sided perforation was common 62.5% (n=20). Out of 32 patients, 22 (68.8%) had moderate sized perforation, 7 (21.8%) had small perforation and 3 (9.4%) had large perforation. Anterior quadrant perforation was more common with 14 (43.8%) patients, 10 (31.2%) had posterior quadrant and 8 (25%) had inferior quadrant perforation.

Out of 32 patients, 31 had successful graft uptake (96.9%). The mean A-B gap closure was 14.56dB. (Figures 1-2) depicts the graft uptake and Figures 3 and 4 depicts the A-B gap closure]. The graft uptake rate and mean A-B gap closure were correlated with site and size of perforation. Among one failure case, the perforation was in the anterior quadrant. P value on correlating the site of perforation and success rate was 0.630 (not significant). The mean A-B gap closure was 15.06db in anterior perforation, 12.29db in inferior perforation and 14.63db in posterior quadrant perforations. There was no correlation between site of perforation and mean A-B gap closure ($p = 0.333$). Out of one failure in our study the perforation was moderate sized. There was no correlation between size of perforation

and success rate ($p=0.829$). The mean A-B gap closure was 17.67db for large perforations, 14.02db for moderate perforations and 13.82db for small perforations. There was no correlation between size of perforation and mean A-B gap closure ($p=0.350$).

There was statistically significant improvement on comparing the pre-operative and post-operative subscale and total CES scores (Table 1). In SF-12 V2, the PCS score difference between pre-op and post-op scores was not statistically significant. ($p = 0.321$), but the p value on comparing the pre-op and post-op difference between MCS and total SF-12V2 were statistically significant (Table-2).

The mean post-operative pain scores at 0, 6 and 24 hours were 2.63, 1.97 and 1.06. The mean comfort score was 9.125.

DISCUSSION

Endoscopic ear surgeries have gained limelight in the past few years owing to its minimally invasive techniques, better visualization and similar surgical outcomes when compared to microscopic techniques [1-3]. Many authors have advocated that endoscopic techniques provides advantage of minimal tissue dissection and the need for canalplasty in endoscopic tympanoplasty is far less than microscopic technique [4]. We have studied the surgical, functional and QOL outcomes in adult patients who underwent type I tympanoplasty.

The graft uptake rate in microscopic tympanoplasty ranges from 90-100% and that of endoscopic tympanoplasty ranges from 83-96% on reviewing the literature [4-7]. Our study also demonstrated similar success rates 96.9%. The success rates among both the groups were statistically comparable in the literature [4-7]. The mean A-B gap closure ranges from 7-16db according to the literature [7,8]. The mean A-B gap closure in our study was 14.56db.

Many studies have advocated numerous factors that play a role in determining the success rate of tympanoplasty [8-11]. The factors attributed are age and sex of the patient, status of contralateral ear, history of previous ear surgeries, adenoid and nasal pathologies, smoking, MERI scores, Eustachian tube functioning, perforation size and site, type of grafts used and techniques of graft placement [9-11]. But the recent studies have proved that success rates or recurrence rates after tympanoplasty are not affected by any of these factors except MERI scores and Eustachian tube functioning [9-11]. In our study there were no correlation of site and size of perforation to that of graft uptake or mean A-B gap closure ($p>0.05$). Authors in the literature have emphasized the fact that the endoscopic myringoplasty fulfils the criteria of minimally invasive surgery with the least trauma to the tissues and almost eliminates the intra-operative and post-operative complications [12-19].

Otitis media is one of the commonest diseases of the middle ear which causes serious problems leading to morbidity and increase in DALY (Disability Adjusted Life Years) [20]. COM can severely impact quality of life (QOL) of patients. The concept of QOL emerged in the 1970s as an important new outcome for healthcare. The notion of health-related quality of life (HRQOL) has evolved since the 1980s as a subjective and multi-dimensional concept that includes domains related to physical, mental, emotional and social functioning. It goes beyond direct measures of population health, life expectancy, causes of death and focuses on the impact of health status on quality of life [20-25].

At present, the disease and the treatment options are assessed on the basis of how it affects the quality of life of patients. The general HR-QOL questions assess the physical, mental and social functioning of an individual. The disease specific QOL measures the same physical, mental and social functioning, medical utilization, activity restriction and symptom scoring of an individual with respect to his disease process. The general QOL surveys available are SF-36, SF-12V2, WHO-QOL Assessment questionnaire, FACT-G, EQ-5D-5L [23-25]. The disease specific HR-QOL surveys used for otitis media are CES, COMOT-15, Child QOL, EIS, QOL 3 item, TAIQOL, HHIA [23-25].

The Chronic Ear Survey (CES) is a disease specific QOL survey comprising 13 questions [23,24]. The improvement in sub-scale scores and total CES scores were statistically significant on comparison between pre and post op scores. Hence it can be concluded that the endoscopic tympanoplasty technique could effectively eliminate the symptoms of COM and endoscopic technique improves the disease specific quality of life index.

The Short form questionnaire-36 is a general QOL health survey questionnaire with 36 items. It has been modified and only the essential components like physical and mental health composition scores can be calculated by means of 12 questions that are formulated and given in a much simpler and less time consuming format as Short form questionnaire-12 Version 2 (SF-12V2) [26]. In the studies conducted by Baumann et al [21], Demir [22] and Nadol et al [23], it is shown that the general QOL (SF-36) is not affected by the COM or by the treatment for COM. But in our study we wanted to know whether there is any change in the quality of life after the surgery during first 4 weeks when the patient has been advised a lot of restrictions in his/her daily routine that might affect the physical, mental, emotional and social functioning of the patient. The studies evaluating the treatment option rendering better QOL in COM patients are lacking.

The difference in the MCS and Total SF-12V2 scores show significant improvement in scores between pre and post op scores leading to a conclusion that endoscopic tympanoplasty improves the general QOL of the patient even during the first month of the surgery.

CONCLUSION

Endoscopic tympanoplasty provides comparable surgical outcomes as to microscopic technique and in addition it provides advantages like minimal tissue dissection, less need of canalplasty and also can be performed as a daycare surgery. The surgical treatment which provides better quality of life apart from disease clearance and good hearing function should be opted. We used general health survey like SF-12-V2 and disease specific QOL survey like CES to compare the outcomes before and after the surgery. Endoscopic tympanoplasty has improved QOL outcomes in terms of post-operative pain, comfort score, general QOL score like SF-12V2 and disease specific QOL score like CES survey scores. Endoscopic tympanoplasty can be a minimally invasive alternative to microscopic tympanoplasty with improved quality of life outcomes.

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Authors' contributions:

Satish Nair: Substantial contributions to the conception or design of the work, revising it critically for important intellectual content, analysis and interpretation of data for the work and drafting the work and final approval of the version to be published.

J G Aishwarya: Substantial contributions to the acquisition of data for the work, revising it critically for important intellectual content and final approval of the version to be published.

Dr Ankita: Substantial contributions to the statistical calculations and review of literature.

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