

STUDY TO ASSESS THE EUSTACHIAN TUBE FUNCTION BEFORE AND AFTER TYMPANOPLASTY: A COMPARATIVE STUDY.

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Abstract

Aim: aim to assess the eustachian tube function before and after tympanoplasty.

Materials and methods: The present prospective comparative study was conducted in the Department of ENT, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar India. Among 60 patients confirmed with the diagnosis of chronic otitis media. Preoperative PTA and eustachian tube function tests were taken. Patients were then subjected to ear surgery.

Results: Majority of patients were young adults the mean age group was 28.16±6.61 years. Of these patients, 55.0% were males and 45.0% were females. Mean preoperative PTA was 40.32±3.41 and post operatively the PTA was 31.41±4.65 improved significantly (p<0.05).

Conclusion: The prognosis of middle ear surgery has a direct correlation with the Eustachian tube functions, i.e. good Eustachian tube functions is essential for obtaining a good prognostic value and vice versa.

Keywords: eustachian tube functions, pure tone audiometry, tympanoplasty, chronic otitis media

Introduction

Chronic suppurative otitis media (CSOM) is of two types tubotympanic (mucosal) and atticointral (squamous). Tubotympanic type (mucosal) is mainly due to infection from the oropharynx and the nasopharynx and sources like Gastroesophageal reflux diseases travels via the eustachian tube into the middle ear.¹

Three main functions of eustachian tube are ventilation and regulation of middle ear pressure, middle ear clearance of secretions, and protection against nasopharyngeal sound pressure and reflux of nasopharyngeal secretions.²

Eustachian tube dysfunction (ETD) refers to the ventilation dysfunction caused by an abnormal opening of the Eustachian tube.³ It is considered to be a pathogenic factor of otitis media and is probably associated with the outcomes of middle ear surgery.⁴

Tympanoplasty is a procedure to eradicate disease in the middle ear and to reconstruct the hearing mechanism with or without tympanic membrane repair. The aims of tympanoplasty are to give a dry ear and to restore hearing as much as possible. Many factors have been attributed for the success, out of which ETD is considered one of the most important. ETD can be evaluated by various tests and assessment of the same can predict the outcome of tympanoplasty.

However, effective and universal evaluation methods for ETD are still lacking because of the hidden position and complex structure of the Eustachian tube. A preoperative test of tubal function is important for achieving a satisfactory result of tympanoplasty.⁵ Hence, assessment of eustachian tube function is of paramount importance not only before embarking on any surgery for suppurative otitis media, but also for establishing its etiological basis and deciding outcome of surgery. Hence the present study was conducted with the aim to assess the eustachian tube function before and after tympanoplasty.

Materials and methods

Study Design

The present prospective comparative study was conducted in the Department of ENT, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. Among 60 patients confirmed with the diagnosis of chronic otitis media.

The study protocol was reviewed by the Ethical Committee of the Hospital and granted ethical clearance. After explaining the purpose and details of the study, a written informed consent was obtained.

Inclusion Criteria

- Patients above 18 years of age of either sex
- Patients confirmed of chronic otitis media
- Patients having more than 40 dB hearing loss on pure tone audiometry

- Patients who has signed the informed consent

Exclusion criteria

- Patients who has not signed the informed consent
- Patients with poor cochlear reserve
- Patients having any kind of acute and chronic systemic illness

Sample selection

The sample size was calculated using a prior type of power analysis by G* Power Software Version 3.0.1.0 (Franz Faul, Universitat Kiel, Germany). The minimum sample size was calculated, following these input conditions: power of 0.80 and $P \leq 0.05$ and sample size arrived were 60 participants.

Methodology

Patients having chronic otitis media (mucosal disease) with central type of perforation and in whom Tympanoplasty with/without Cortical Mastoidectomy was planned were subjected to the study. A thorough clinical ENT examination was done and evidence of any other ENT conditions were ruled out.

A pure tone audiometry was done with INTERACOUSTICS AC 40 AUDIOMETER, followed by Eustachian tube evaluation with the INTERACOUSTICS TITAN SERIES IMPEDANCE AUDIOMETER in all the patients. Tympanoplasty was performed on all patients, whether they underwent Cortical mastoidectomy or not. Following the surgery, the patients were called after 3 months for their first visit, and a second set of PTA and Eustachian tube function tests was done. Patients in whom the graft failed to take up and had retraction or perforation was assessed accordingly, i.e. Toynbee's test procedure. The changes in Air-bone gap (ABG) were compared preoperatively and postoperatively.

Statistical analysis

The data was entered in the form of a data matrix in Microsoft Excel® and analysed statistically using IBM® SPSS® version 20.0.0. Descriptive statistics were calculated as frequencies for categorical variables and means and standard deviation for continuous variables. The difference of continuous variables, among two groups was explored using independent samples t-test. P-value of <0.05 was considered statistically significant for the purpose of the study.

Results

Table 1: demographic profile of the study population

Variables	
Age (years)	28.16±6.61
Gender	
Male	33 (55.0%)
Female	27 (45.0%)
Total	60 (100.0%)

Table 2: laterality of involvement of ear

Laterality	N (%)
Right	27 (45.0%)
Left	33 (55.0%)

Table 3: functional outcome PTA and ABG before and after surgery

Operative	PTA	ABG
Pre operative	40.32±3.41	26.24±2.17
Post operative	31.41±4.65	16.33±2.90
p-value	0.001 (Sig.)	0.001 (Sig.)

Test applied: Paired t-test

Table 4: outcome in terms of graft uptake

Outcome	N (%)
Successful	52 (86.7%)
Failure	8 (13.3%)

Discussion

Precise evaluation of eustachian tube function in the clinical audiological practice aims at safely defining tube status in order to guarantee the success of any type of procedure used to improve the middle ear function. Unfortunately, however the assessment of Eustachian tube function has not been popularized as much as it warrants. The natural outcome of this has been poor success in spite of competent surgery in well-equipped microsurgical setup.

Though many otologists carry out tests for anatomical patency of eustachian tube, yet this test do not serve the purpose for which they are undertaken. These techniques merely tell us whether the eustachian tube is anatomically patent or not. The purpose of undertaking the Eustachian tube function tests is to assess its physiological profile not the anatomical patency of tube that is required for maintaining the normal function of middle ear. The modern impedance audiometer offers us facility of ascertaining physiological function of the eustachian tube even in the presence of tympanic membrane perforation.

The majority of patients were young adults the mean age group was 28.16±6.61 years. Of these patients, 55.0% were males and 45.0% were females. Similarly Antony A et al.⁶ in his study observed majority of patients were young adults between the age group of 20-29 yrs of age. The mean age group was 27.18 + 11.65 yrs. Of these patients, 22(44%) were males and 28(56%) were females. The main presenting complaint for these patients was Ear discharge.

In the present study mean preoperative PTA was 40.32±3.41 and post operatively the PTA was 31.41±4.65 improved significantly ($p<0.05$) this was found in agreement with the published literature carried out by Antony A et al.⁶ the mean Preoperative PTA was 31.34 dB + 10.02 dB. The post-operative PTA at the 3rd month

showed that there was significant improvement compared to the Preoperative PTA Assessment of Eustachian tube function should be considered mandatory before undertaking any surgery for treatment of patients having chronic otitis media.⁷

Successful graft uptake was observed in 86.7% of the subjects. This was found in agreement with the study conducted by Priya et al.⁸ in their study stated that there was strong association between eustachian tube function and graft taken up rate was observed. Sen et al.⁹ in 1998 assessed ETF by using impedance audiometry Those with normal Eustachian tube function a graft uptake of 80%, 80% graft uptake in partially impaired Eustachian tube function, and 66% graft uptake in totally impaired Eustachian tube function.

Conclusion

The present investigation concluded that the impedance audiometer offers the best means of assessing the Eustachian tube function, as measures function in both intact as well as in perforated tympanic membranes. The prognosis of middle ear surgery has a direct correlation with the Eustachian tube functions, i.e. good Eustachian tube functions is essential for obtaining a good prognostic value and vice versa.

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