

Effect of Eustachian Tube Function on Tympanoplasty Outcome**Ankit Kumar Tiwari¹, Surendra Singh Moupachi², Meenakshi Ambulker³, Surbhi Choubey Mishra^{4*}**¹Senior Resident, Department of ENT, Shyam Shah Medical College & Sanjay Gandhi Memorial Hospital, Rewa, (MP).²Professor & Head, Department of ENT, Shyam Shah Medical College & Sanjay Gandhi Memorial Hospital, Rewa, (MP).³Junior resident, Department of ENT, Shyam Shah Medical College & Sanjay Gandhi Memorial Hospital, Rewa, (MP).⁴Post Graduate Resident, Department of ENT, Shyam Shah Medical College & Sanjay Gandhi Memorial Hospital, Rewa, (MP).

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Abstract**Background:** Eustachian tube play a vital role in the pathogenesis of middle ear cleft disease Normal eustachian tube function (ETF) is responsible for successful tympanoplasty outcome. Pre operative eustachian tube function test should be done.**Aim & objective:** To evaluate the role of Eustachian tube function in successful graft uptake in tympanoplasty.**Method:** A prospective study was done on 50 patients, with mucosal type of chronic otitis media (COM). Eustachian tube function (ETF) was assessed with various methods like impedance audiometry (Toynbee's method), methylene blue dye etc. and correlation of graft uptake with preoperative eustachian tube function was done.**Result:** Out of 50 patients 78% had normal eustachian tube function and 22% had partially impaired eustachian tube function. Tympanoplasty was successful in 94% patients with normal eustachian tube function and 54% patients with partially impaired eustachian tube function.**Conclusion:** There is a strong association between eustachian tube function and graft uptake. Thus, proving that eustachian tube plays a major role in the graft uptake. So preoperative eustachian tube function should be done.**Keywords:** Eustachian tube function, Mucosal COM, Tympanoplasty.

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Introduction

Eustachian tube maintains air pressure between middle ear and ambient atmosphere (ventilatory function), protection of the middle ear from pathogens/foreign material present in the nasopharynx and drainage of mucus from middle ear cavity to nasopharynx, (mucociliary function).[1][2]

Impairment of eustachian tube function plays a vital role in the pathogenesis of middle ear cleft disease.[3] Success of reconstructive ear surgery as well as long term prognosis depends on proper functioning of Eustachian tube. Ventilatory function of eustachian tube can be assessed by tympanometry, sonotubometry, photoelectric method, radiological studies and air pressure equalization technique. Besides it, there are several manoeuvres by which anatomical patency of eustachian tube can be assessed like Valsalva, Politzer, and Toynbee manoeuvres.[4]

Tympanoplasty is a procedure of choice to eradicate the disease from the middle ear and to reconstruct the hearing mechanism with or without tympanic membrane repair.[5]The success rate of tympanoplasty depends on several factors such as patient's age, eustachian tube function, perforation size, smoking, bilateral disease and septal deviation. Out of these factors, eustachian tube function is considered as most important prognostic factor.[6]

Toynbee's test is the test of tubal function in perforated tympanic membrane while William's test is the test of tubal function in patients with intact tympanic membrane.[7] Hence for satisfactory result of tympanoplasty, a pre-operative testing of eustachian tube function should be considered as an important factor.

In this study, assessment of eustachian tube function was done in patients with chronic otitis media with reference to its treatment outcome. The sample

group included patients with normal eustachian tube function as well as partially impaired eustachian tube function. Objective of study is, to see the effect of eustachian tube function with reference to graft uptake on tympanoplasty.

Material and Method

A prospective study was done on 50 patients who came to ENT OPD at tertiary care centre with tympanic membrane perforation and reduced hearing (mucosal type of COM) from September 2022 to February 2023. All patients underwent detailed history and complete otorhinolaryngological examination. Examination was done to rule out other source of infection at ear nose and throat. Each patient was subjected to the following procedures like blood investigations, pus culture and sensitivity if ear discharge was present at time of examination, pure tone audiometry, impedance audiometry, otoendoscopy, diagnostic nasal endoscopy and plain X-ray both mastoids-Law's view.

Inclusion criteria

Patients in the age group of 12-45 years with mucosal type of chronic otitis media having central perforation with no clinical evidence of active infection in ear, nose and throat as well as good cochlear reserve were included in the study.

Exclusion criteria

1. Patients with squamosal type of chronic otitis media with complication.
2. Chronic otitis media patients with age less than 12 year and above 45 years.
3. Mucosal type of chronic otitis media with other source of infection in ear nose & throat (URTI).
4. Chronic otitis media patients with sensory neural hearing loss.
5. Patient with congenital anomalies.
6. Patients who had already undergone tympanoplasty (revision case).

Assessment of eustachian tube function

The diagnosis of eustachian tube dysfunction is essential for better understanding of the pathogenesis of chronic otitis media. A series of different clinical methods like, Toynbee's test, tympanometry, radiological method (x-ray mastoid), methylene blue dye test etc is used for assessment of eustachian tube function.

Surgery

Patients with normal or partially impaired eustachian tube function, were subjected to type 1 tympanoplasty by postaural route with underlay technique of graft placement. Temporalis fascia was used as a graft material in all cases. In patients with partially impaired eustachian tube function, prolonged medication like steam inhalation, antihistaminic and antibiotics were given to improve eustachian tube function.

Post operative care

Parenteral broad spectrum cephalosporine with analgesic was given for a period of one week then all sutures were removed followed by oral antibiotics for next one week. Post operative uptake of graft was assessed by microscopy and otoendoscopy after 1 week. Follow up otoendoscopy was done on 1st, 3rd and 6th week respectively. Hearing assessment was done at 3rd and 6th month.

Result

In study population 36% (18) were males whereas 64 % (32) were females. Eustachian tube function was analysed clinically and graft uptake was assessed by otoendoscopy with reference to eustachian tube function status. The result is tabulated and analysed. In this study we tried to find association between graft uptake and eustachian tube function which was statistically significant ($P < 0.05$).

Table 1: Age wise distribution of patient

Distribution by age		
Age group (year)	No. of patient	Percentage (%)
12- 25	21	42
25- 35	14	28
35-45	15	30
Total	50	100

Out of 50 patients, most of the patients belong to the age group of 12 to 25 year (42%).

Table 2: Distribution of study population based on Eustachian tube function

Eustachian tube function	Number	Percentage (%)
Normal	39	78
Partially impaired	11	22
Complete impaired	0	0

Out of 50 patients, 39 patients had normal eustachian tube function and 11 had partially impaired eustachian tube function.

Table 3: Uptake of graft at 3 months

Tubal function	No of patients	Graft uptake	Graft failure
Normal	39(78%)	32(82%)	7(17.9%)
Partially impaired	11(22%)	3(27%)	8(72.7%)
Total	50	89.7%	38.4%

At 3 months, graft uptake was 82% in patients with normal eustachian tube function & 27% in patients with partially impaired eustachian tube function.

Table 4: Uptake of graft at 6 months

	No of patients	Graft uptake	Graft failure
Normal	39 (78%)	36(92.3%)	3 (7.6%)
Partially impaired	11 (22%)	6(54.5%)	5(45.4%)
Total	50	84%	16%

At 6 months graft uptake was 92.3% in patients with normal eustachian tube function and 54.5 % in patients with partially impaired eustachian tube function.

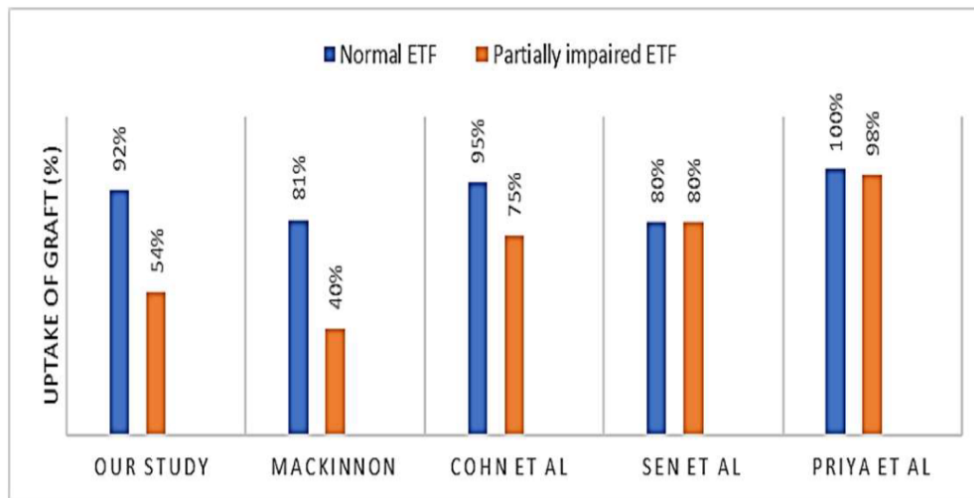


Figure 1: Eustachian tube function & graft uptake in various study

Discussion

The eustachian tube function is the most important determining factor of surgical outcome in patients with mucosal type of chronic otitis media.[8] A properly functioning Eustachian tube and good tubotympanic mucociliary drainage is necessary for middle ear functioning and favourable outcome of tympanoplasty. [9] Eustachian tube dysfunction is responsible for tympanoplasty failure as it maintains both middle ear pressure dynamics and through recurrent otitis media. [8]

In this study on 50 patients with chronic otitis media (mucosal type), underwent the preoperative eustachian tube function test and significantly correlated with outcome after surgery.

Patients with normal eustachian tube function showed a graft uptake when compared with those with impaired eustachian tube function.

In present study most common affected age group was 12-25 year (42% of total patients) while mean age was 29.32 year. A study done by Shiromany et al had patients in age range from 12 to 64 years and mean age was 26.7 ± 10.18 years. [5]Quantitative methods for measuring preoperative tubal function

in patients with perforated ear drum was done by Palva and Siedentop et al in 1963. They were found 16% patients have normal ETF while in our study 78% patients have normal ETF. Eustachian tube function has been the centre of focus because of its primary role in the pathogenesis of otitis media and in the aeration of middle ear cavity. [10]Post operatively it was found that out of 39 cases with normal Eustachian tube function, 36 patients (92.3%) took up graft successfully while graft failure was seen in 3 cases (7.6%). On the other hand, in 11 patients with impaired eustachian tube function, 6 patients (54.5%) took up graft successfully while 5 patients (45.4%) rejected the graft. In 1970 Mackinnon observed 81% success rate in patients with normal eustachian tube function and 40% in patients with impaired eustachian tube function.[11]

In 1979 Cohn et al, assessed eustachiantube function preoperatively and they found 95% successful graft uptake seen in patients with normal eustachian tube and 75% graft uptake in patients with partially impaired eustachian tube function.[12]

In 1998 Sen et al assessed eustachian tube function with relation to outcome of tympanoplasty. Those

with normal eustachian tube function as well as partially impaired eustachian tube function, both had graft uptake of 80%.[13] In 2012 Priya et al found 100% graft uptake in patients with normal eustachian tube function and 98% in patients with partially impaired eustachian tube function.[14] (Figure 1).

Conclusion

In present study correlation between graft uptake and eustachian tube function was significant. P value is <0.05. Hence, there is a strong association between eustachian tube function and graft uptake. Thus, proving that normally functioning Eustachian tube plays important role in tympanoplasty surgery in terms of successful graft uptake. But this does not mean that patients with impaired tubal function cannot have successful tympanoplasty. Hence to increase the success rate of tympanoplasty surgery preoperative eustachian tube function is imperative.

Limitations: Small sample size, no control group.

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