



**EVALUATION OF EUSTACHIAN TUBE FUNCTION IN CHRONIC SUPPURATIVE OTITIS MEDIA WITH REFERENCE TO SURGICAL TREATMENT OUTCOME.**

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**ABSTRACT**

This is a prospective study over 2 years of period, conducted on 100 patients to assess the function of Eustachian tube in Chronic Suppurative Otitis Media(tubo tympanic type) with reference to surgical outcome. This study is done to assess the outcome of myringoplasty related to Eustachian tube function in CSOM and , to compare the surgical outcome of CSOM in both normal Eustachian tube function and Eustachian tube dysfunction. ETF was assessed by impedance audiometry , forced inflation test . Patients will be divided into two outcome groups on the basis of ear findings:- 1. Graft Healed with good middle ear function will be considered as successful outcome.2. Failure of Graft or perforation secondary to otitis media will be considered as failure. The results were tabulated using Chi-square test and Fisher Exact Test. Statistical significance was taken as P < 0.05. The data was analysed using SPSS version 17 and Microsoft Excel 2007.

**KEYWORDS :**

**INTRODUCTION :**

Chronic suppurative otitis media is defined as chronic inflammation of middle ear cleft confined to eustachian tube , anterior and inferior part of the mesotympanum and hypotympanum as a result of unresolved asom or acute necrotising otitis media characterized by intermittent , mucopurulent , non foul smelling , moderate to profuse , non blood stained discharge associated with central perforation with two types (LILLE TYPE I – PERMANENT PERFORATION SYNDROME , LILLE TYPE II – PERSISTENT TUBOTYMPANIC MUCOSAL INFECTION).

In the present study the Eustachian tube function (ETF)will be evaluated in Chronic otitis media and the Eustachian tube function in non intact Tympanic membrane will be measured by Impedance Audiometry and dye instillation test is done to demonstrates the efficiency of mucociliary transport mechanism of Eustachian tube.

The methods to assess the ventilatory function of Eustachian tube are by following tests:

**CLINICAL EVALUATION:**

- 1.Otoscopy
- 2.Nasopharyngoscopy and Nasal Endoscopy

**AUDIOMETRY:**

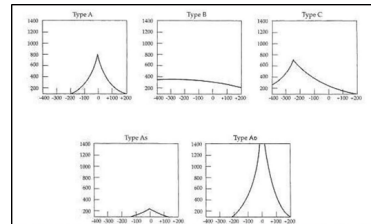
**1. TYMPANOMETRY**

Tympanometry is an excellent method to assess the tympanic membrane and middle ear system and thereby the functioning of Eustachian tube. This test detects middle ear effusion and negative middle ear pressure accurately in an objective manner. But there may be high negative pressure in some children who are asymptomatic. Hence a resting pressure that is highly negative suggests Eustachian tube obstruction but presence of normal tympanogram does not necessarily exclude Eustachian tube dysfunction. In cases of Patulous Eustachian tube dysfunction, normal tympanogram can be obtained.

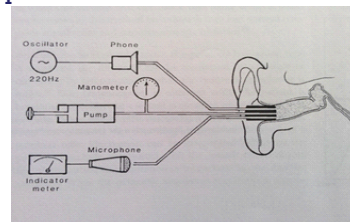
**2. Manometry (Non intact TM)**

The pump-manometer system is used to assess the

Eustachian tube function clinically if the Tympanic membrane is not intact. The Eustachian tube opening pressure should exceed +400 to +600mm H2O.



**FIGURE 1**



**FIGURE 2**

**3. Toynbee test**

Toynbee's test is one of the best to assess Eustachian tube patency. Swallowing with closed nostrils, development negative pressure is positive test. This is evident by pneumaticotoscopy or by doing tympanogram before and after the test, if the Tympanic membrane is intact. If the Tympanic membrane is not intact the test result can be obtained by observing in manometer of impedance bridge.

**4 Modified inflation-deflation test**

**NINE STEP INFLATION-DEFLATION TYMPANOMETRIC TEST:**

Bluestone developed a nine step test to study the Eustachian tube function if Tympanic membrane is intact.

**FORCED INFLATION TEST**

In CSOM patients with non-intact Tympanic membrane the forced inflation test is done to assess Eustachian tube function. The manometer probe is fitted to test ear and the

pressure of middle ear is raised to 500dPa and then the Eustachian tube opens and the pressure drops. This passive opening of Eustachian tube is called opening pressure. After the pressure is equilibrated the Eustachian tube closes and this is called as closing pressure. If there is no passive opening of Eustachian tube, then the patient asked to swallow 3-5 times. This will open the Eustachian tube and then the pressure drop occurs. This is active opening of the Eustachian tube. This is considered as a positive test.

If the Eustachian tube doesn't open even after swallowing, then it is negative. Positive test suggests normal functioning of Eustachian tube and Negative test suggests grossly impaired Eustachian tube function

**SURGICAL PROCEDURE**

After Eustachian tube function assessment, patients were taken up for myringoplasty depending upon the middle ear status. Antibiotics were given for 1 week along with analgesics, antihistamines and multivitamins. Post-operatively on the 7th day sutures were removed.

**OUTCOMES**

On the basis of ear findings in post-operative period patients were divided into two outcomes

1. Healed graft with good middle ear function considered as successful outcome
2. Graft failure or perforation secondary to Otitis media during follow up is considered as failure.

**CASE STUDY 1**

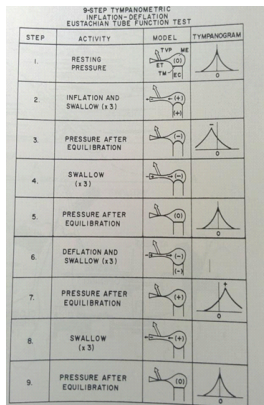


FIGURE 3

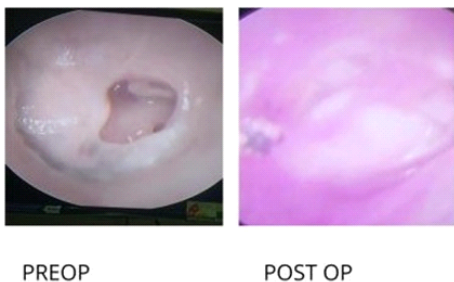


FIGURE 4  
CASE STUDY 2

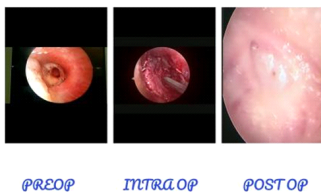


FIGURE 5

**Observation and Results**

In this study analysis of 100 patients with CSOM (tubotympanic-safe type) inactive stage is to determine the importance of ETF in surgical outcome. Each case was evaluated in detail comprising the history, clinical examination and investigations. Surgical and medical treatment was done and all cases were followed up.

The clinical data was collected by means of a proforma and the observations made were analysed with the master chart.

**STUDY GROUPS :**

Data collected from 100 selected subjects were internally compared, tabulated, analysed and interpreted by using descriptive and inferential statistics based on the formulated objectives of the study

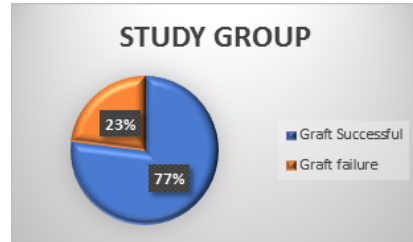


CHART 1: STUDY GROUPS

Study Groups	Graft Successful	Graft failure	Total
Number	77	23	100
Percentage	78.00	22.00	100.00

TABLE 1 : STUDY GROUPS

The above table and chart represents the graft successful and graft failure rate .

**Age**

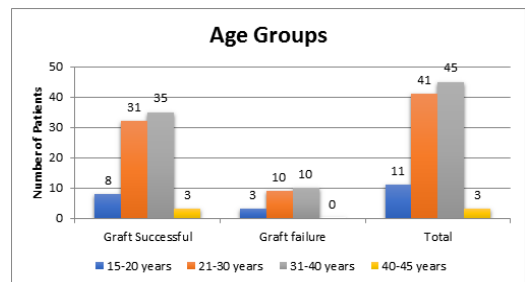


CHART 2 : AGE

Age Groups	Graft Successful	%	Graft failure	%	Total	%
15-20 years	8	10.39	3	13.04	11	11
21-30 years	31	40.26	10	43.48	41	41
31-40 years	35	45.45	10	43.48	45	45
40-45 years	3	3.9	0	0	3	3
Total	77	100	23	100	100	100

TABLE 2 : AGE

Age Distribution	Graft Successful	Graft failure	Total
Mean	19.25	5.75	25
SD	13.93	4.38	18.27
P value Unpaired t Test			0.343

The above table and bar chart represents the association between the Age and Post operative graft status.

Gender

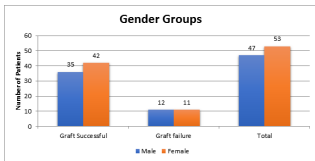


CHART 3 : GENDER

Gender Groups	Graft Successful	%	Graft failure	%	Total	%
Male	35	44.87	12	52.17	47	47.00
Female	42	53.85	11	47.83	53	53.00
Total	78	100.00	23	100.00	100	100.00
<b>P value Chi Squared Test</b>					0.756	

The above table and bar chart represents the association between the Gender and Post operative graft status.

XRAY MASTOID

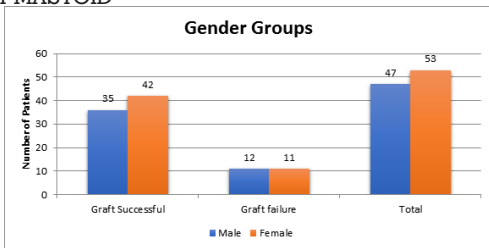


CHART 4 : X-RAY MASTOID

X-RAY MASTOID	
WELL PNEUMATISED	77 (77%)
POORLY PNEUMATISED	23 (23%)
TOTAL	100 (100%)

The above table and pie chart represents the frequency of pneumatisation of mastoid air cell system in our study group.

TYMPANOMETRY-EUSTACHIAN TUBE FUNCTION TEST

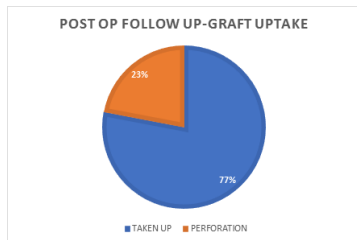


CHART 5 : TYMPANOMETRY-ETF TEST

TYMPANOMETRY-ETF TEST	
NORMAL	79 (79%)
IMPAIRED	21 (21%)
TOTAL	100 (100%)

TABLE 5 :TYMPANOMETRY-ETF TEST

The above table and pie chart represents the frequency of Eustachian tube function using Tympanometry test in the study group.

POST OP FOLLOW UP-GRAFT STATUS

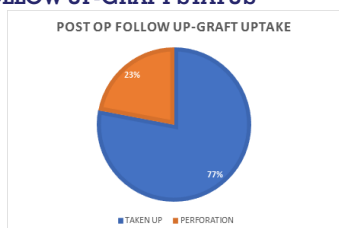


CHART 6 : POST OP FOLLOW UP-GRAFT STATUS

POST OP FOLLOW UP-GRAFT UPTAKE	
TAKEN UP	77 (77%)
PERFORATION	23 (23%)
TOTAL	100 (100%)

TABLE 6 : POST OP FOLLOW UP-GRAFT STATUS

The above table and pie chart represents the frequency of Post operative graft status in our study group.

TYMPANOMETRY-ETF Test vs POST OP FOLLOW UP-GRAFT UPTAKE

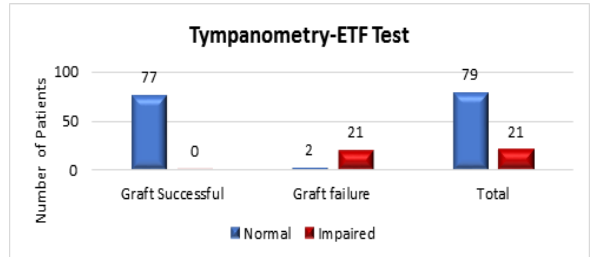


CHART 7 :TYMPANOMETRY-ETF TEST VS POST OP FOLLOW UP-GRAFT UPTAKE

Tympanometry-ETF Test	Graft Successful	Graft failure	Total
Normal	77 (97.47%)	2 (2.53%)	79 (100%)
Impaired	0 (0%)	21 (100%)	21 (100%)
Total	77 (77%)	23 (23%)	100 (100%)
<b>P value</b>			<0.001
<b>Chi Squared Test</b>			

7: TYMPANOMETRY-ETF TEST VS POST OP FOLLOW UP-GRAFT UPTAKE

The above table and bar chart represents the association between the Eustachian tube function and Post operative graft status.

RESULTS

While analysing tympanometry-ETF test status, it was observed that majority of the graft successful study subjects had normal results (n=77, 97.47%) and majority of the graft failure study subjects had impaired results (n=21, 100.00%) (p= <0.001, chi squared test). When statistically comparing tympanometry-ETF test status between the outcome groups, the difference in the percentage of normal test result in graft successful group (97.47%) and graft failure group (2.53%) and the difference in the percentage of impaired test result in graft successful group (0.00%) and graft failure group (100.00%) was found to be statistically insignificant (p <0.05).

DISCUSSION

TYMPANOMETRY VS GRAFT UPTAKE:

In the present study Eustachian tube function is assessed by Tympanometry. The tympanometric studies revealed that out of 100 patients, 79 patients had normal Eustachian tube function in which 2 patients(2.53%) had graft failure and 77 patients(97.47%) graft uptake was successful whereas 21 patients(100%) had perforation with severe impairment of Eustachian tube function. Proper functioning of the Eustachian tube is necessary for maintaining the middle ear pressure at the ambient atmospheric pressure. This, in turn is essential for the middle ear to carry out the impedance matching function. Assessment of ET function by the impedance audiometer is clinically more rational and clinically relevant as this process of evaluation of tubal function assesses the physiological function of ET which is more important to the clinician than the mere assessment of the anatomical patency of the tube as is possible by most of the other methods. Adequate tubal function is a pre-requisite for the success of reconstructive middle ear surgery.

This trend of significantly higher incidence of normal tympanometry-ETF test status at diagnosis in graft successful group and higher incidence of impaired tympanometry-ETF test status at diagnosis in graft failure group was observed by Yoganadh et al<sup>10</sup>. He assessed ETF by using impedance audiometry and dye instillation and observed a success rate of 95.5% in patients with normal ETF.

In a study done by Priya and et al<sup>5</sup> in 2012 and observed a success rate of 100% in patients with normal ETF.

Cohn et al<sup>8</sup> in 1979 pre operatively assessed ETF by using impedance audiometry and observed a success rate of 95% with normal ETF.

Sen et al<sup>14</sup> in 1998 assessed ETF using impedance audiometry and observed a success rate of 80% in normal ETF.

In a study done by vishal et al<sup>6</sup> and observed a success rate of 87% in patients with normal ETF.

Holmquist<sup>4</sup> studied eustachian tube function in adults before and after tympanoplasty and reported that the operation has high rate of success in good eustachian tube function.

So, pre-operative assessment of ETF should be done for good outcome of surgery

Follow up was done after 1 month and 3 months post operatively. Patients were evaluated post operatively using otoscopy and otoendoscopy. On the basis of ear findings, patients were divided into two outcome groups, which are

- 1) Successful outcome defined as healed graft
- 2) Graft failure or perforation was considered as failure.

### Conclusion

A properly functioning eustachian tube is an integral part of a normally functioning middle ear and it plays a vital role in the success of Myringoplasty.

On outcome comparison (graft successful versus graft failure) following myringoplasty in both normal functioning Eustachian tube and Dysfunction Eustachian tube ,the following significant conclusions were observed.

Eustachian tube functional status is significantly assessed by tympanometry-ETF test and it seems to have a direct influence on the degree of post-operative graft uptake.

In this study it was observed that 79 patients had normal Eustachian tube function in which 77 patients had successful outcome with healed graft and 2 patients had graft failure with perforation . 21 patients had perforation with impaired Eustachian tube function. Patients showed increase in success rate of graft uptake with normal ETF when compared with those with impaired ETF.

In view of ET dysfunction , treating the cause of Eustachian tube dysfunction is essential for successful post op graft uptake. A pre operative test of tubal function is therefore of great importance as one can achieve satisfactory result of Myringoplasty.

### BIBLIOGRAPHY

1. Evaluation of Factors Affecting the Surgical Outcome in Tympanoplasty Masoud Naderpour, Yalda Jabbari Moghadam, Ensieh Ghanbarpour, Nikzad Shahidi Iran J Otorhinolaryngol. 2016 Mar; 28(85): 99–104.
2. Emir H, Ceylan K, Kizilkaya Z, Gocmen H, Uzunkulaoglu H, Samim E. Success is a matter of experience: type 1 tympanoplasty. European archives of otorhinolaryngology. 2007;264(6):595–9.
3. Mohan C, Sharma S, Srivastava A. Has mastoid pneumatization any bearing on tympanoplasty?. Indian J Otol 2015;21:266-9.
4. Holmquist J, Bergström B. The mastoid air cell system in ear surgery. Arch

- Otolaryngol 1978;104:127-9.
5. Priya K, Karthikeyan P, Coumare VN, Sambandan AP (2012) Evaluation of Eustachian tube function in chronic suppurative otitis media (tubotympanic type) with reference to its treatment outcome. Indian J Otol 18:179–183
6. Dave, V. & Ruparel, M. Indian J Otolaryngol Head Neck Surg (2019) 71: 10. <https://doi.org/10.1007/s12070-018-1525-y>
7. Srivastava Abhinav, Mohan Chander, Sengar Arjun (2014) How relevant is eustachian tube function in surgical outcome of tympanoplasty? J Evol Med Dent Sci 3(08):1855–1858.
8. Cohn AM eustachian tube function and tympanoplasty. Ann. Otol 1979;8:339-47
9. Palva T (1987), Surgical treatment of Chronic middle ear disease, Myringoplasty and tympanoplasty. Acta Otolaryngologica, 104(3-4);
10. Yoganandh, M (2016) Evaluation of Eustachian Tube Function in Chronic Suppurative Otitis Media (Tubotympanic Type) with Reference to Surgical Outcome. Masters thesis, Madras Medical College, Chennai.
11. Prasad, Kishore & Hegde, Mahesh & Prasad, Sampath & Meyappan, Hari. (2009). Assessment of eustachian tube function in tympanoplasty. Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery. 140. 889-93. 10.1016/j.otohns.2009.02.015.
12. Sato H, Nakamura H, Honjo I, Hayashi M (1990) Eustachian tube function in tympanoplasty. Acta Otolaryngol Suppl 471:9–12
13. Biswas A (1999) Eustachian tube function test: a new dimension in the management of CSOM. Indian J Otolaryngol Head Neck Surg 51(2):14–22
14. Sen S, Guha S, Biswas A, Ghosh LM (1998) A comparative study of methods of evaluation of Eustachian tube functions in chronic otitis media. Indian J Otol 4:147–149
15. Acuin J. Chronic suppurative otitis media: burden of illness and management. 1st ed. Switzerland: World Health Organization, Geneva; 2004. pp. 9–10