Section A-Research paper

THE STUDY OF EUSTACHIAN TUBE FUNCTION IN SAFE OTITIS MEDIA

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Abstract

Objective: This present article is a study with a view to assess cases of safe otitis media and the eustachian tube patency in all the cases with the analysis of utility of different methods of assessing eustachian tube patency.

Methods and Materials: A cross sectional study conducted at a tertiary care teaching hospital. 86 patients with safe otitis media previously treated with medical management were chosen. Valsalva Test, Siegalization test, Ear drops test, Tympanometry and Nasopharyngoscopy were carried out. Observations made were based on the sensitivity of the various eustachian tube function tests.

Results: Siegalization test had 88% accuracy whereas Valsalva and ear drop test had 83% accuracy. Tympanometry only had 76% accuracy and Nasopharyngoscopy detected 75% accurate results.

Conclusion: Our study concluded that Valsalva test although 83% accurate, is a subjective test. Siegalization with 88% accuracy provided correct results only in cases with small to medium central perforation. Ear drop test, the result depends on the size and location of the perforation. Nasopharyngoscopy is a accurate, non-invasive test to visualize nasopharyngeal pathology. Tympanometry is easy to carry out and when followed by Toynbee test in patients without a patent eustachian tube on tympanometry, provided with 91% accurate results.

Keywords: Valsalva test, Tympanometry, Eustachian tube, Otitis media

Introduction

The eustachian tube forms a vital bridge between the nasopharynx and middle ear that maintains equilibrium between the middle ear and atmosphere. It is formed of two parts; the

bony part which is in a state of forced opening and a cartilaginous part which opens only during yawning, chewing or forceful inflation. Although the bony part ventilates and drains secretions of middle ear by mucociliary transport system, and has gravitational direction of drainage into nasopharynx, the cartilaginous part forms the heart of this dynamic system by providing ventilation to the middle ear via the nasopharynx.

The eustachian tube protects the middle ear from various ascending secretions, pressure variations and microorganisms which further contribute to the etiology of acute otitis media, otitis media with effusion and chronic otitis media. Any focus of infection in the upper respiratory tract travels along the eustachian tube giving rise to mucosal edema and congestion of eustachian tube mucosa which further leads to anatomical and physiological obstruction of the eustachian tube ultimately hampering the middle ear ventilation and air getting absorbed which leads to negative pressure in the middle ear which is the basic pathology for otitis media.

Abnormal function of the eustachian tube is one of the major reasons for graft failure post tympanoplasty. Although there are a lot of factors that influence graft uptake rate, a good preoperative tubal function is a pre requisite for a high success rate tympanoplasty.

Clinically and with aid of diagnostic procedures it has now become easy, cost effective, reliable and convenient to conclude this basic pathology behind the cause of otitis media, that is Eustachian tube dysfunction.

Materials and methods

The study was a cross-sectional type of study. It was carried out from June 2021 to December 2022 on patients visiting the ENT department at a tertiary care teaching hospital. Eighty-six patients with mucosal chronic suppurative otitis media were selected. The study included all age groups including few cases of children with enlarged adenoids, cleft palate and nasopharyngeal mass. All cases with discharge treated with medical line of management were also included. Patients with a history of traumatic perforation were excluded. Post operative patients with residual perforation or failure of graft uptake were also excluded from this study.

A sample size of eighty-six patients was planned. All the patients were subjected to various procedures of eustachian tube function tests.

Valsalva Manouver: Mouth closed tightly, nose is pinched and air is blown out forcibly.

Pneumatic Otoscopy: The speculum is connected to a side tube which is further attached to a rubber bulb. The rubber bulb is pressed and released to alter pressure in the ear canal. The tympanic membrane and its mobility is then examined.

Ear drops Test: In cases of perforated tympanic membrane, on topical use of ear drops if a bitter sensation is felt in the throat or not.

Tympanometry: All patients were subjected to tympanometry. In patients whom middle ear pressure was not built up, Toynbee's test was performed.

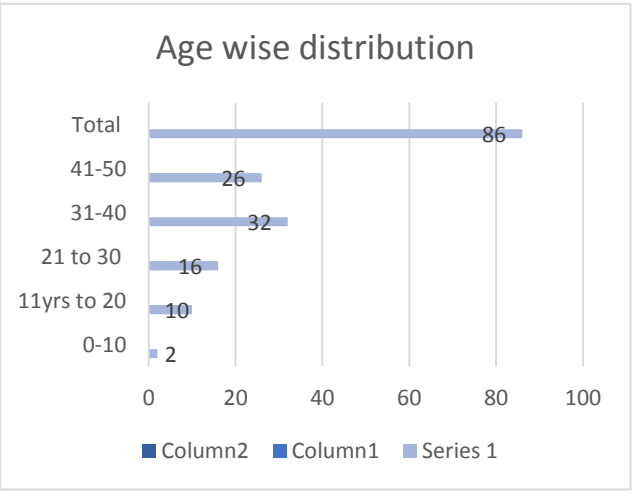
Toynbee's test: The subject is asked to swallow with their nose pinched. If the eustachian tube opens during the test, the middle ear pressure changes is determined by the timing of the tubal opening and nasopharyngeal pressure gradient by means of a graphical representation.

Nasopharyngoscopy: The patient is kept nil by mouth for 3 hours. The nose is packed with 4% lignocaine solution-soaked cotton patties for preparation. Cotton patties are removed and the scope is passed through a roomy nasal cavity into the nasopharynx. The patient is asked to swallow and Valsalva Manouver is done. Opening of the eustachian tube and other pathologies in the surrounding areas are noted.

Observations and Results:

The results are distributed according to the age and sex of the patient.

In this study, 41% of the patients were female and 59% were male. The majority of patients lie between the age of 31-40years followed by 41-50 years of age.



Distribution made on the size of perforation

72% of the cases had a small to moderate size of perforation while the rest 28% had a large central perforation.

Table 1 shows the distribution of cases made on the size of perforation.

Size of perforation	Number of patients
Small to moderate	62
Large	24
Total	86

Table 2 shows results of the various eustachian tube tests performed on 86 patients.

Test	Observation	Result/Number of patients	
		Yes/Normal	**No/Not seen/Inflammation**
Valsalva Manouvre	Air leak appreciated	72	14
Siegalisation	Mobility of Tympanic Membrane Observed	76	10
Ear Drop Test	Felt in Throat	80	6
Tympanometry	Pressure built up	20	66
Nasopharyngoscopy	Eustachian tube opening	65	21

Discussion

Valsalva Manouvre to evaluate for tubal patency showed good results in terms of air leak appreciation. Hence indicating that this test is highly sensitive and specific which correlates with the study conducted by Yusuf et al in 2011.[2] Ding et al in his study also concluded that Valsalva test is the most easy and convenient, non-expensive method for evaluation of tubal function.[1] As per Dhingra, failure of the test does not prove blockage of the tube as the test is subjective and only 65% cases can successfully perform this test.

Siegalisation is one of the simplest and oldest ways to access middle ear end of the eustachian tube system. In our study, 88% patients with small to medium central perforation showed mobility of the tympanic membrane indicating good tubal patency. The remaining who had large central perforation, mobility could not be assessed. As per studies conducted by Marshall et al[4] in 1984, it is a method of diagnostic evaluation to assess tubal patency which very well matches with our study.

Ear drop test is one of the most simplest, cost effective and valuable diagnostic tool to assess tubal patency and evaluates mucociliary function. When ear drop test was conducted among 86 patients, 93% could feel the bitter sensation in the throat. The remaining either had a blocked tube or could not make out the response. These findings very much coincide with the studies done by Prasad et al[5] in 2009 and Nishant Kumar et al in 2012.[6]

Renata et al[8] in their study in 2010 mentioned that tympanometry is used to study ventilatory function of the eustachian tube based on the principle of acoustic immittance. Hence this pressure equalization swallow test is accurate to assess the tube dysfunction when it recovers after middle ear and/or upper respiratory tract infections. The test was followed by Toynbee's test to provide confirmatory results in patients that showed a blocked eustachian tube on tympanometry. The result of Toynbee test in case of blocked tube shows a flat-curve graph while patent tube shows step-ladder pattern graph. As per study conducted by Pelikan et al[7] in 2009, eustachian tube dysfunction is one of the main causes for frequent relapses of middle ear infection.

Nasopharyngoscopy is a diagnostic tool that localises the hidden areas responsible for tube obstruction. In our study we found that, 75% cases had normal tube opening which suggested

good tube function despite presence of inflammation around the tube opening. Rest 25%, tube opening was not visualised indicating poor tube function due to a central cause such as adenoids, nasopharyngeal mass, cleft palate or chronic sinusitis.

Conclusion

Valsalva test provides accurate result in 83% patients. However, we still felt that this test was biased to some extent and depends on patient's response.

Siegalisation test provides correct status of Eustachian tube in 88% patients having small to medium perforation on tympanic membrane. This test does not hold good for cases of large central perforation because appreciation of mobility of tympanic membrane is difficult.

Ear drops test yields good results and provides correct status of Eustachian tube function in 93% patients. Despite of good results, the duration of result varies depending on the size and site of perforation on tympanic membrane.

Nasopharyngoscopy is an accurate, non-invasive test. In our study 75% cases had normal tube opening while in the rest tubal opening was not visualized due to nasopharyngeal pathology.

Tympanometry is a practical and easy test. In 76% patients, pressure could not be built indicating patency of Eustachian tube. Further in the remaining 24% patients were subjected to Toynbee test amongst them Eustachian tube was patent in 64% patients showing a "step ladder graph and "flat type" of graph was noted in the remaining 36% patients with blocked tube. Hence, we can conclude that 91% patients had a patent Eustachian tube.

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