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ORIGINAL ARTICLE

Effect of Surgery for Nasal Obstruction on Improvement of Eustachian Tube Functions

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ABSTRACT

Background: The equilibrium of air pressure between the atmosphere and the middle ear is maintained via the eustachian tube. Diseases of the nasal cavity and paranasal sinuses can impact the function of the eustachian tube. Before undergoing surgery for suppurative otitis media, it is crucial to assess eustachian tube function because it is a significant factor in the pathophysiology of both suppurative and non-suppurative otitis media. This study aimed to evaluate the nasal obstruction and the effect of nasal obstruction surgery on ETF and middle ear ventilation**. Methods**: One hundred patients with abnormal eustachian tube function and nasal blockage were included in this investigation. Tympanometry and eustachian tube function tests, such as the Valsalva and Toynbee maneuvers, were conducted the day before the nasal surgery and again one and two months after the procedure. **Results:** One month after surgery, 54(27%) ears had poor ETF and 146(73%) had good ETF. Prior to surgery, 164(82%) and 36(18%) ears had poor ETF. Two months after surgery, 150(75%) had good ETF and 50(25%) had poor ETF. **Conclusion:** Even though many writers think that for patients with CSOM, nose surgery should be done before tympanoplasty because it can help the Eustachian tube operate properly and may improve the outcome of middle ear surgery. Therefore, it is not possible to consistently offer septoplasty prior to tympanoplasty for all patients with CSOM and septal abnormalities. Therefore, it is recommended that ET tube function be evaluated in order to determine whether nasal surgery is required prior to tympanoplasty.

Keywords: Eustachian Tube ;Nasal Obstruction ;Tympanometry, Septoplasty

INTRODUCTION

Air enters the middle ear through the eustachian tube, which opens between it and the nasopharyngeal cavity. The equilibrium of air pressure between the atmosphere and the middle ear is maintained by the eustachian tube [1].ET function may be impacted by disorders of the nasal cavity and paranasal sinuses [2]. In rats, nasal blockage altered the middle ear mucosa's epithelium and secretions, and a decrease in air entering through the Eustachian tube may exacerbate the middle ear cavity's aeration [3].Inadequate ventilation via the Eustachian tube (ET) was linked to otitis media. A major factor in the pathophysiology of both suppurative and non-suppurative otitis media is eustachian tube dysfunction. Therefore, before undergoing surgery for suppurative otitis media, it is crucial to assess eustachian tube function [4].Ear fullness, tinnitus, blocked ears, or an inability to balance middle ear pressures are some of the signs of ET dysfunction [5]. The ETF can be evaluated using tympanometry and Eustachian tube function (ETF) tests, which include the Valsalva and Toynbee

movements. Due to the Eustachian tube's functional weakness, patients with tubal dysfunction frequently experience ear fullness. Nonetheless, the majority of patients exhibit normal tympanometry in spite of the feeling of full ears [6].Evaluating nasal obstruction and the impact of nasal obstruction surgery on middle ear ventilation and ETF was the goal of this study.

METHODS

This prospective study was carried out in the Department of Otorhinolaryngology Zagazig medical college from 2022 to 2024 for duration of 2 years on 100 patients of age group 16 to 65 years. Patients with abnormal ETF and those complaining of nasal blockage were included in this investigation. Congenital ear or palate malformations, ossicular chain malfunction as clinically or by PTA and tympanometry suspected, nasal surgical history, patients with fair follow-up, patients with recent middle ear or nasal infections, and patients with malignant lesions were also excluded. Tympanometry and ETF tests in the form of Valsalva and Toynbee maneuvers were conducted the day before surgery and again one and two months afterward.

A thorough medical history was obtained, and a full E.N.T. examination was performed. All patients had diagnostic nasal endoscopies utilizing rigid endoscopes of O degree to check for peri-tubal mucosal edema, post-nasal discharge, and the Eustachian tube orifice.

Ethical approval : Approval was taken from the institutional review board (IRB#1508/8-July-2025) of Zagazig University's Faculty of Medicine. Every patient gave their consent to take part in the trial. The work was carried out in accordance with the 1964 Declaration of Helsinki, the World Medical Association's Code of Ethics, and its later unifications for research involving human participants.

Statistical analysis SPSS ver.12.0, a commercial software program (SPSS Inc., Chicago, IL, USA), was used to analyze the data. P-values below 0.05 were regarded as significant.

RESULTS

The 100 patients in this study ranged in age from 16 to 65 years, with 67 (67%) males and 33 (33%) females. Every patient (100%) reported having nasal blockage, ear pain (32%), ear fullness (91%), diminished hearing (37%), and tinnitus (6%).58 percent of cases had bilateral nasal blockage, 31 percent had left-sided nasal obstruction, and 11 percent had right-sided nasal obstruction.62 cases (62%) had a deviated nasal septum, 29 cases (29%) had inferior turbinate hypertrophy, 14 cases (14%) had middle turbinate hypertrophy, and 25 cases (25%) had nasal polyps, according to endoscopic nasal examination. occlusion of the eustachian tube 74 (74%). 34 (34%) of the study's cases involved septoplasty, 18 (18%) involved FESS and nasal polyp excision, 16 (16%) involved septoplasty and SMD, 14 (14%), 6 (6%), 7 (7%), and 3 (3%), respectively, involved conchoplasty and bilateral inferior turbinectomy, septoplasty and inferior turbinectomy, and septoplasty and nasal polyp excision.Preoperatively, 115 (57.5%) of the ears in this study had normal type-A tympanograms, while 85 (39.5%) had abnormal tympanograms, 79 (39.5%) had type C tympanograms, and 6 (3%) had type B tympanograms. One month after surgery, 176 (88%) of the ears had normal type A tympanograms, while 24 were abnormal, with 3 (1.5%) type B and 21 (9.5%) type C curves. Two months after surgery, 178 (89.5%) had normal type A tympanograms, while 22 abnormal tympanograms, with 3 (1.5%) type B and 19 (9.5%) type C curves. According to the chi-square test, the percentage of type A cases before and after surgery increased statistically significantly (p value <0.05). When compared to preoperative state, the statically significant

normalization of the tympanogram indicates that nasal surgery for blockage was successful after surgery. There was no statically significance change seen in the proportion of type A, postoperatively between at 1 month and at 3 months (Table 1). One month after surgery, 54 (27%) ears had poor ETF and 146 (73%) had good ETF. Prior to surgery, 164 (82%) and 36 (18%) ears had poor ETF. Two months after surgery, 150 patients (75%) had good ETF and 50 patients (25%) had poor ETF. Although a patient may have a bad ETF in spite of having a type A tympanogram, this does not usually indicate a good ETF. According to the chi-square test, the percentage of good ETFs before and after surgery increased statistically significantly (p value <0.05). This demonstrates that postoperative nasal surgery for blockage improves ETF statically. (Table 2)As indicated in table (3), there was no discernible relationship between the kind of tympanogram and the side of nasal blockage in this investigation.Middle ear pressure ranged from -150 to -400 daPa before surgery, with a mean of -126. One month after surgery, middle ear pressure ranged from -75 to 400, with a mean of -15. Two months later, MEP ranged from -80 to 400, with a mean of 16, and there was a statistically significant improvement in MEP between preoperative and postoperative times ($p<0.05$). Therefore, middle ear ventilation has improved statistically significantly after nasal blockage surgery. Between one and two months after surgery, there was no discernible difference in MEP. (Table 4)

Table1: Preoperative and postoperative tympanograms**.**

Type	Preoperative	Postoperative (1month)	Postoperative 2 months
Type A	155(57.5%)	176(88%)	178(89%)
Type B	6(3%)	3(1.5%)	3(1.5%)
Type C	79(39.5%)	21(10.5%)	19(9.5)
Total	200(100%)	200(100%)	200(100%)

Table2: Preoperative and postoperative Eustachian tube function.

ETF	Poor	Good
Preoperative	**164(82%)**	**36(18%)**
Postoperative 1 month	**54(27%)**	**146(73%)**
Postoperative 2 month	**50(25%)**	**150(75%)**

Table 3: Relation between side of nasal obstruction and preoperative and postoperative tympanogram.

No of Nasal obstruction patients		Type of tympanogram			
		Right ear		Left ear	
		A	C	A	C
Bilateral	58	45	13	47	11
Left	31	26	5	22	9
Right	11	10	1	9	2

Table 4: Middle ear pressure preoperatively and postoperative at 1 month and at 2months after removal of pack.

Category	Preoperative(daPa)	Postoperative 1month(daPa)	Postoperative2 months(daPa)
range	-150to-400	-75to-400	-80to-4oo
mean	-126	-15	-16

DISCUSSION

The middle ear's air pressure and atmospheric pressure are balanced by the eustachian tube [7]. Excessive seromucous gland secretions in the pharyngeal portion of the Eustachian tube may result in obstruction of the tube [8].The most common causes of recurrent otitis media or otitis media with effusion were allergies and ET dysfunction brought on by adenoid hypertrophy [9].

It is still unclear how nasal and oropharyngeal issues contribute to the pathophysiology of CSOM, but moderate septal deviations have been shown to impair ET function, and patients with these deviations had higher levels of negative middle ear pressure than those with a straight nasal septum [10]. When a nasal route was blocked in rats, the epithelium and middle ear mucosal secretions changed [11,12]. These statistics and the current study's findings are comparable. The current study's findings showed that impaired Eustachian tube functioning are linked to SD. Therefore, prior to middle ear surgery, it is preferable to repair septal abnormalities that accompany tubotympanic type CSOM.Because it may disrupt Eustachian tube function, septal deviation may make CSOM procedures less successful. Inadequate ventilation through the Eustachian tube (ET) is thought to be associated with middle ear inflammatory diseases. Pathological processes affecting the nasal cavity and paranasal sinuses may impact ET function, potentially leading to chronic otitis media[2].Even though many writers think that for patients with CSOM, nose surgery should be done before tympanoplasty because it can help the Eustachian tube operate properly and may improve the outcome of middle ear surgery, Therefore, it is not possible to consistently propose septoplasty prior to tympanoplasty for all patients with CSOM and septal abnormalities [3].Therefore, it is recommended that ET tube function be evaluated in order to determine whether nasal surgery is required prior to tympanoplasty.

Conclusions

Even though many writers think that for patients with CSOM, nose surgery should be done before tympanoplasty because it can help the Eustachian tube operate properly and may improve the outcome of middle ear surgery. Therefore, it is not possible to consistently offer septoplasty prior to tympanoplasty for all patients with CSOM and septal abnormalities. Therefore, it is recommended that ET tube function be evaluated in order to determine whether nasal surgery is required prior to tympanoplasty

Conflict of Interest: The authors declare no conflict of interest.

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