



Effect of Nasopharyngeal Irrigation on Early Eustachian Tube Functions in Patients Undergoing Adenoidectomy: A Clinical Prospective Study

Adenoidektomi Sırasındaki Nazofaringeal İrigasyon Yönteminin Erken Dönemde Östaki Tüp Fonksiyonlarına Etkisi: Prospektif Çalışma

Şahin Öğreden, Hasan Deniz Tansuker, Abdurrahman Buğra Cengiz, Alper Tabaru, Cemal Özyılmaz, Mehmet Faruk Oktay

University of Health Sciences, İstanbul Bağcılar Training and Research Hospital, Clinic of Otolaryngology, İstanbul, Turkey

Abstract

Objective: The hypertrophic adenoid tissue can cause to eustachian tube dysfunction by mechanical or inflammatory effect both of which block the nasopharyngeal ostium of the eustachian tube. Adenoidectomy, with or without tonsillectomy, is the most common surgical procedure in children. In this study, we aimed to investigate whether nasopharyngeal irrigation for hemorrhage control in adenoidectomy patients has an effect on eustachian tube functions.

Method: Patients who underwent adenoidectomy for adenoid hypertrophy evaluated on both the preoperatively and on the postoperative first day by otomicroscopic examination and with tympanometry for eustachian tube functions. Patients were divided into two groups according to nasopharyngeal irrigation type after surgery. Group 1 was the transnasal pressure irrigation group; group 2 was transoral passive irrigation group. Tympanometry was used to measure pressure, volumetric, and compliance values to compare pre- and postoperative values.

Results: 40 patients were included in the study. There was no significant difference between the age and sex distributions of the patients. Volume and compliance values between the groups were similar before and after the surgery. The mean pressure values of the tympanometry parameters were highly significantly different for the right ear and moderately different for the left ear in group 1; were significantly different for the right ear and highly significantly different for the left ear in group 2. Postoperative

Öz

Amaç: Adenoid dokunun hipertrofisi, mekanik veya enflamatuvar süreçlerden dolayı östaki tüpünün nazofaringeal ağzını obstrükte ederek östaki disfonksiyonuna yol açmaktadır. Adenoidektomi, tonsillektomi ile birlikte çocuklarda yapılan en sık cerrahi prosedürdür. Bu çalışmada adenoidektomi yapılan hastalarda kanama kontrolü için yapılan nazofarenks irrigasyonunun östaki tüp fonksiyonlarına etkisinin olup olmadığını araştırmayı amaçladık.

Yöntem: Adenoid hipertrofisi nedeniyle opere edilen hastaların ameliyat öncesi ve ameliyat sonrası birinci gün otomikroskopik muayene ve timpanometri ile östaki tüp fonksiyonları değerlendirildi. Hastalar ameliyat sonrası nazofarenks irrigasyonuna göre iki gruba ayrıldı. Grup 1 hastalara transnazal basınçlı irrigasyon, grup 2 hastalara transoral pasif irrigasyon yapıldı. Timpanometri ile basınç, volüm, kompliyans değerleri ölçülerek ameliyat öncesi ve sonrası değerler karşılaştırıldı.

Bulgular: Çalışmaya 40 hasta dahil edildi. Hastaların yaş ve cinsiyet dağılımları arasında anlamlı bir fark bulunmadı. Gruplar arasında volüm ve kompliyans değerleri ameliyat öncesi ve sonrasında benzer bulundu. Timpanometri parametrelerinden basınç ortalama değerleri ameliyat öncesi-sonrası için grup 1'de sağ kulak için çok ileri düzeyde anlamlı olarak farklı ve sol kulak için sınırdan anlamlı farklı iken, grup 2'de sağ kulak için ileri düzeyde anlamlı olarak farklı ve sol kulak için çok ileri düzeyde anlamlı olarak farklı idi. Ameliyat sonrası timpanometri tipleri grup 1'de



Address for Correspondence: Abdurrahman Buğra Cengiz, University of Health Sciences, İstanbul Bağcılar Training and Research Hospital, Clinic of Otolaryngology, İstanbul, Turkey

E-mail: drcengiz@gmail.com **ORCID ID:** orcid.org/0000-0003-3942-6765 **Received:** 23.01.2019 **Accepted:** 3.02.2019

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Abstract

typanometry types were seen as bilateral type C in 7 patients, as right side type C in 4 patients, as bilateral type B in 2 patients, as left side type C in 4 patients in group 1. However, in group 2, right side type B, left side type B and bilateral type C tympanogram were observed in 1 patient, 2 patients and 12 patients, respectively.

Conclusion: In this study, we observed that the nasopharyngeal irrigation to control bleeding after adenoidectomy had adverse effect on the eustachian tube functions but larger series of studies are needed to confirm this.

Keywords: Nasopharyngeal irrigation, adenoidectomy, tympanometry

Öz

7 hastada bilateral tip C, 4 hastada sağ tip C, 2 hastada bilateral tip B, 4 hastada sol tip C görüldü. Grup 2'de ameliyat sonrası 1 hastada sağ tip B, 2 hastada sol tip B, 12 hastada bilateral tip C timpanogram izlendi.

Sonuç: Bu çalışmada adenoidektomi sonrası kanama kontrolü için yapılan nazofarenks irrigasyonunun östaki tüp fonksiyonlarına etkisinin olumsuz yönde olduğunu gördük ancak bunun doğrulanması için daha geniş serili çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Adenoidektomi, nazofarenks irrigasyonu, timpanometri

Introduction

Eustachian tube dysfunction results in all acute and chronic otologic pathologies to begin. Blustone ve Doyle defined the functions of the eustachian tube as ventilation, drainage and protection of the middle ear. Any disruption of these functions initiates middle ear pathologies (1). Clinical audiometry and tympanometry can be used for screening and diagnosis. However, tympanometry is the gold standard for assessing middle ear pressure, volume and tympanic membrane compliance. Treatment may vary depending on the duration and severity of the disease. Adenoid tissue was first described by Meyer in 1868 as a lymphoid tissue that is part of the Waldayer ring. Adenoid hypertrophy obstructs the upper respiratory tracts and causes complaints such as chronic nasal obstruction, mouth open sleep, snoring and recurrent sinusitis (2).

Traditional adenoidectomy using curette was first described in 1885 (3). Traditional adenoidectomy is usually performed using curette. Adenoidectomy usually is not associated with significant bleeding. In this technique hemostasis is achieved by pressure using postnasal packing and/or irrigation with saline solutions (4). Mathiasen et al. (5) demonstrated the safety and efficacy of a novel hemostatic sealant in children undergoing adenoidectomy. The nasopharynx is generally irrigated with saline after adenoidectomy for removal of blood and clots (4). This can be performed by two ways; by transnasal pressure irrigation, and by transoral passive irrigation. However it has been speculated that the eustachian tube function could be affected by the irrigation process.

In this study, we aimed to investigate the effect of nasopharyngeal irrigation methods for hemostasis on eustachian tube function in patients undergoing

adenoidectomy and to eliminate this defect in the literature since there has been no studies on this subject so far.

Material and Methods

The study is performed in İstanbul Bağcılar Training and Research Hospital and the study protocol was carried out in accordance with the principles of the European Ethical Committee, and an approval from ethical committee in the same centre was obtained before initiation of the study (No: 2019.01.1.01.121.r1.001). Preoperative otomicroscopic examination and tympanometry were performed to evaluate the eustachian tube functions indirectly. Patients with tympanic membrane adhesions, retraction or perforations; with congenital deformities such as cleft palate lips, with history of previous ear surgery, and tympanometry findings different from type A were excluded from the study. Under general anesthesia and supine position, adenoidectomy was performed by traditional curettage method in all patients. All of the operations were performed by the same experienced surgeon. Postoperative bleeding control was achieved with pressure and electro-cautery. The patients were divided into two groups randomly. In the first group, nasopharynx irrigation was performed transnasally by closing one of the nostrils with approximately 500 cc physiological saline at the end of the operation. The patients in the second group were filled with saline orally and then nasopharynx irrigation was performed by aspiration. Patients in both groups were assessed by otomicroscopic examination and tympanometry on postoperative day 1. Tympanometry was performed again on the 7th day of those who were not Type A.

Statistical Analysis

The minimum number of subjects required in each group was found to be 13 in order to make a significant difference

of 97.00 between the two groups. Type I Error=0.05, power of test (POWER) 0.80 Statistical analyzes were performed with the program MedCalc (MedCalc Software, Broekstraat, Mariakerke, Belgium). Normal distribution of continuous variables was investigated by Kolmogorov-Smirnov test. Gaussian distributions were shown as mean ± SD. The Student's t-test was used to compare the average values between the groups. The paired samples t-test was used in the comparison of the groups' average before and after surgery. Statistical significance was evaluated at the level of p<0.05 (two-tailed).

Results

40 patients were included in the study. Fifteen patients (37.5%) were female and 25 patients (62.5%) were male. Age of the patients ranged from 1 to 15 years and the mean age was 6.87 years. Mean age of the patients was 6.8 in transnasal irrigation group (group 1) with 13 males and 7 females; and that was 6.9 in transoral irrigation group (group 2) with 12 males and 8 females (Table 1).

Table 1: Demographic features of the patients

	Transnasal pressure irrigation, group 1 (n=20)	Transoral passive irrigation, group 2 (n=20)	P
Age (year)	6.8±2.9	6.9±3.0	=0.915
Male/Female (N/N)	13/7	12/8	=0.744

There was no significant difference between the age and sex distributions of the patients. Volume and compliance values between the groups were similar before and after the surgery.

The mean pressure values of the tympanometry parameters were highly significantly different for the right ear and moderately different for the left ear in group 1; were significantly different from the pressure parameters comparing group 2 (Table 2) The pressure levels in group. Postoperative tympanometry types were seen as bilateral type C in 7 patients, as right side type C in 4 patients, as bilateral type B in 2 patients, as left side type C in 4 patients in Group 1. However, in group 2, right side type B, left side type B and bilateral type C tympanogram were observed in 1 patient, 2 patients and 12 patients, respectively.

Discussion

The eustachian tube extends between the middle ear and the nasopharyngeal cavity and provides ventilation, drainage and protection of the middle ear. The most important function of the eustachian tube is the balance between the middle ear and atmospheric pressure (6). Adenoid tissue is localized in the lymphoepithelial tissue of the nasopharynx. The enlarged adenoid tissue results in nasopharyngeal obstruction. Adenoid hypertrophy is diagnosed by endoscopic nasopharyngoscopy and cephalometric radiography (7). Adenoidectomy is a

Table 2: Volume and compliance values between the groups before and after the surgery

		Preoperative	Postoperative	Sig after op.	
Transnasal pressure irrigation, group 1	Right ear	Volume	0.56±0.11	0.61±0.19	=0.142
		Comp	0.46±0.22	0.47±0.23	=0.895
		Pressure	-67.1±90.0	-170.8±97.6	<0.0001
	Left ear	Gradient	0.39±0.25	0.32±0.16	=0.284
		Volume	0.57±0.10	0.54±0.15	=0.270
		Comp	0.52±0.20	0.47±0.21	=0.140
		Pressure	-74.7±72.6	-133.2±84.8	=0.012
Transoral passive irrigation, group 2	Right ear	Gradient	0.34±0.17	0.29±0.13	=0.146
		Volume	0.62±0.10	0.62±0.12	=0.963
		Comp	0.43±0.23	0.39±0.22	=0.256
	Left ear	Pressure	-80.0±67.8	-132.8±88.0	=0.067
		Gradient	0.26±0.21	0.25±0.20	=0.766
		Volume	0.59±0.17	0.58±0.15	=0.727
		Comp	0.43±0.23	0.40±0.23	=0.627
Significance between the groups	Right ear	Pressure	p=0.689	p=0.001	
	Left ear	Pressure	0.782	p=0.03	

frequently performed surgical procedure. In 1885, Wilhem Mayer first described adenoidectomy technique by curettage method that is still current today (3).

Ünlü et al. (8) reported 64 patients to have bilateral traumatic tube dysfunction, and 10 patients to have unilateral eustachian tube dysfunction preoperatively in a study of adenoidectomy and tonsillectomy performed 64 patients. In the tympanometric examination they performed on the seventh day postoperatively, they found that 2 patients had bilateral traumatic tube dysfunction. In our study, we found that all of the tympanometric examinations we performed on the seventh postoperative day were normal. Thompson and Crowther reported at least one ear to have type C tympanogram in 34 of 63 patients with septoplasty (9). In our study we observed that 27 of 40 patients with adenoidectomy had type C tympanograms. Montaña-Velázquez et al. (10) reported significant tympanometric abnormalities and decreased middle ear pressure in 20 patients aged between 4 to 9 years who underwent adenotonsillectomy. They thought that this abnormality was due to the deterioration of the coordination of the eustachian tube and nasopharyngeal muscles. In our study we observed that the middle ear pressure was falling and that resulted in type C tympanogram. Şerefican et al. (11) reported that edema induced eustachian tube dysfunction developed in 30 patients performed anterior nasal packing comparing to and improvement of eustachian tube function after took packing off postoperatively. Yılmaz et al. (12) reported that middle ear pressures continued to decrease in the nasal packing group rather than silicone nasal septal splint group after one week. In a study of 25 patients with adenotonsillectomy, type c tympanogram was reported in 74% on the first postoperative day (13). Hone et al. (14) reported that 39% of the patients had eustachian tube disfunction by tympanometric examination on first day after adenotonsillectomy. In our study, similar to these two studies, we found mean pressure values of the tympanometry parameters (type C tympanogram) were highly significantly different for the right ear and moderately different for the left ear in the transnasal pressure irrigation group; those were significantly different for the right ear and highly significantly different for the left ear in the transoral passive irrigation group.

Conclusion

In this study, we observed that the nasopharyngeal irrigation to control bleeding after adenoidectomy had adverse effect on the eustachian tube functions but wider series of studies are needed to confirm this effect.

Ethics

Ethics Committee Approval: The study is performed in İstanbul Bağcılar Training and Research Hospital and the study protocol was carried out in accordance with the principles of the European Ethical Committee, and an approval from ethical committee in the same centre was obtained before initiation of the study (no: 2019.01.1.01.121.r1.001).

Informed Consent: It was obtained from all the patients parents.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Ş.Ö., A.T., C.Ö., Concept: Ş.Ö., H.D.T., A.B.C., M.F.O., Design: Ş.Ö., H.D.T., A.B.C., Data Collection or Processing: A.T., C.Ö., A.B.C., Analysis or Interpretation: Ş.Ö., H.D.T., A.B.C., M.F.O., Literature Search: Ş.Ö., H.D.T., A.B.C., Writing: Ş.Ö., A.B.C.

Conflict of Interest: No conflict of interest was declared by the authors.

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