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The effect of anterior nasal packing with airway tubes on pulmonary function following septoplasty*

Aim: To investigate the effects of nasal packing with airway tubes on pulmonary function following septoplasty.

Materials and methods: Fifty patients who were operated for nasal septal deviation between 2006 and 2008 were included in our study. Nasal packs with airway tubes were used for all patients following septoplasty. Pulmonary function tests and PO₂ measurements with pulse oximetry were performed preoperatively and in the second postoperative day just before removal of the nasal pack. Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 Second (FEV₁), FEV₁/FVC (FEV₁%), Forced Expiratory Flow (FEF₂₅₋₇₅%), and PO₂ values were compared.

Results: The mean age of study population was 35.3 ± 12.6 years (range : 18 - 64). There was no significant difference found regarding - FVC: 4.2 ± 0.9 vs. 4.1 ± 0.9, FEV₁: 3.5 ± 0.8 vs. 3.5 ± 0.9, FEV₁%: 85.3 ± 9.3 vs. 83.6 ± 10.7, FEF₂₅₋₇₅%: 4.1 ± 1.5 vs. 4.0 ± 1.6, PO₂: 98.3 ± 0.8 vs. 98.2 ± 0.5 between preoperative and in the second postoperative day just before removal of the nasal pack (P > 0.05).

Conclusion: The results indicate that nasal packing with airway tubes is not a cause for post-operative respiratory dysfunction and hypoxia.

Key words: Nasal packing, pulmonary function, septoplasty, oxygen saturation

Septoplastiyi takiben kullanılan anterior hava yolu tüplü burun tamponlarının akciğer fonksiyonu üzerine etkisi

Amaç: Septoplasti sonrası hava yolu tüplü nazal tamponların pulmoner fonksiyonlar üzerine etkilerini araştırmak.

Yöntem ve gereç: Nazal septal deviasyon nedeniyle 2006-2008 yılları arasında ameliyat edilen 50 hasta çalışmamıza dahil edildi. Septoplasti sonrası tüm hastalara hava yolu tüplü nazal tamponlar kullanıldı. Ameliyat öncesi ve ameliyattan 2 gün sonra tamponlar alınmadan hemen önce Pulmoner fonksiyon testleri ve pulse oksimetri ile PO₂ ölçümleri yapıldı. Zorlu vital kapasite (FVC), 1. saniyede zorlu ekspiratuar volüm (FEV₁), FEV₁/FVC (FEV₁%), zorlu ekspiratuar akım (FEF₂₅₋₇₅%) ve PO₂ değerleri karşılaştırıldı.

Bulgular: Çalışmaya dahil edilen hastaların ortalama yaşı 35,3 ± 12,6 (aralık: 18-64) dır. Ameliyat öncesi ve ameliyattan 2 gün sonra tamponlar alınmadan hemen önce gruplar arasında FVC: 4,2 ± 0,9 vs. 4,1 ± 0,9, FEV₁: 3,5 ± 0,8 vs. 3,5 ± 0,9, FEV₁%: 85,3 ± 9,3 vs. 83,6 ± 10,7, FEF₂₅₋₇₅%: 4,1 ± 1,5 vs. 4,0 ± 1,6, PO₂: 98,3 ± 0,8 vs. 98,2 ± 0,5 değerleri açısından istatistiksel olarak anlamlı bir fark saptanmadı.

Sonuç: Hava yolu tüplü nazal tamponlar kullanılarak elde edilen sonuçlar ameliyat sonrası respiratuar disfonksiyon ve hipoksi oluşmadığını göstermektedir.

Anahtar sözcükler: Nazal tampon, pulmoner fonksiyon, septoplasti, oksijen saturasyonu

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Introduction

Nose is the main entrance and the most physiologic route in respiration. Respiratory mechanics and arterial blood gas compositions may change with obligatory oral breathing after nasal obstruction. It indicated that the use of nasal packing following nasal surgery may result with hypoxia (1-3). A "nasopulmonary reflex" may be the reason for hypoxia (4,5). Arterial O₂ tension changes have been reported not only following nasal packing but also with simple nasal obstructions (1,6,7). The results of the studies designed for measuring the pulmonary function during nasal obstruction are not in agreement with each other. Early experiments demonstrated that partial nasal obstruction had a definite deleterious effect on pulmonary function (4). Furthermore, their observation suggested that the degree of symptomatic improvement following corrective nasal surgery could be predicted by preoperative pulmonary function testing (5). Later experiments from the same laboratory showed that total nasal occlusion by posterior packing had no effect on pulmonary functions in normal subjects (8). Discrepancies in previous studies could be attributed to a lack of control of variables. Nasal packing in septoplasty is considered mandatory by most surgeons to prevent the formation of a septal hematoma and to support the unstable septal fragments post-operatively (9-12). Recently, the use of nasal packs with airway tubes has been recommended to reduce the discomfort and to prevent the nocturnal hypoxia post-operatively (10,13). Nasal irrigation through the airway tube is necessary in order to avoid crust and blockage.

The present study was designed to investigate the significance of the nasal packing with an airway tube, allowing a limited airflow, on pulmonary function following septoplasty. To the best of our knowledge, there is no study measuring the pulmonary function of patients with anterior nasal pack with an airway tube.

Materials and methods

Fifty patients who were operated for nasal septal deviation between 2006 and 2008 were included to our study. There were 15 females and 35 males with an age range of 18 to 64. Their mean age was 35. Before

each operation, a detailed history was taken, a physical and ENT examination was performed, and the informed consent form was obtained from each patient. None of the patients had a history of bronchopulmonary, cardiac, neuromuscular, or allergic diseases. Surgery was performed under general anesthesia and followed by a bilateral nasal packing using a Merocel packing with airway tube. Using the digital palpation, the free position of the posterior opening of the airway tube was confirmed. To avoid crusting and blockage, patients were asked to irrigate each airway tube with 5 ml isotonic saline solution in every 3 to 4 h. Pulmonary function tests were performed using VMAX® Encore. Oxygen saturation was measured using an Ohmeda 3700 pulse oximeter with a finger probe. Pulmonary function tests and PO₂ measurements with pulse oximetry were performed preoperatively and in the second postoperative day just before the removal of the nasal pack. FVC, FEV₁, FEV₁%, FEF₂₅₋₇₅%, and PO₂ values were compared.

Results are presented as mean ± SD (standard deviation). Statistical analysis was performed using SPSS software (Version 13.0; SSPS Inc, Chicago, IL) and paired sample t-test. Significance level was taken as P < 0.05. The study was approved by the local ethics committee and conducted according to the Declaration of Helsinki II.

Results

The mean age of the study population was 35.3 ± 12.6 years (range: 18-64). There were 15 (30%) females and 35 (70%) males. There were no significant differences found regarding; FVC: 4.2 ± 0.9 vs. 4.1 ± 0.9, FEV₁: 3.5 ± 0.8 vs. 3.5 ± 0.9, FEV₁%; 85.3 ± 9.3 vs. 83.6 ± 10.7, FEF₂₅₋₇₅%: 4.1 ± 1.5 vs. 4.0 ± 1.6, PO₂: 98.3 ± 0.8 vs. 98.2 ± 0.5 between preoperative and in the second postoperative day just before the removal of the nasal pack (P > 0.05) (Table).

Discussion

It is difficult to determine the significance of the nasal function in respiration objectively. Theoretically, arterial oxygen desaturation may be induced by airway obstruction, alveolar hypoventilation, decrease of pulmonary gas diffusion, or changes in the ratio of ventilation and perfusion (10,14,15).

Table. Statistical analysis of pulmonary function test and PO₂ measurements pre- and postoperative period.

N = 50	Preoperative	Postoperative	P value
FVC	4.2 ± 0.9	4.1 ± 0.9	0.78
FEV ₁	3.5 ± 0.8	3.5 ± 0.9	0.09
FEV ₁ %	85.3 ± 9.3	83.6 ± 10.7	0.05
FEF ₂₅₋₇₅ %	4.1 ± 1.5	4.0 ± 1.6	0.32
PO ₂	98.3 ± 0.8	98.2 ± 0.5	0.63

Experiments on dogs by Cavo et al. (14) demonstrated that posterior nasal packing induced arterial hypoxia and hypercapnia in intact animals, returning to normal when the pack was removed. This effect was abolished by laryngectomy, which suggested that nasal airway obstruction with secondary hypoventilation rather than increased bronchomotor tone is the underlying physiological mechanism for hypoxia in awake dogs with nasal packing (14). In our study the limited air passage provided by the nasal packing with airway tubes prevented the total nasal airway obstruction, which may result in secondary hypoventilation and an increase in bronchomotor tone.

Ogura et al. (4) and Togawa and Ogura (16) conducted several studies that demonstrated a correlation between the degree of fixed anatomic nasal obstruction and pulmonary function. They also indicated a nasopulmonary reflex with the effector mechanism involving the bronchial muscle. Our findings about the lack of any effect of nasal packing with an airway tube on pulmonary function support these studies.

Taasan et al. (17) failed to report significant changes in nocturnal oxygen saturation in a group of healthy subject with total nasal packing. However, they performed this study on only 7 patients.

Ogretmenoglu et al. (18) showed that nasal packing caused a significant decrease in O₂ saturation, a borderline decrease in PO₂, insignificant changes in

PCO₂, a significant increase in the minimum and mean heart rates, and insignificant changes in the maximum heart rates. The combined effect of hypoxemia and hypercapnia on the chemoreceptor system resulted in an undue stress on the cardiovascular system (6). In Ogretmenoglu's study, the decrease in O₂ saturation and PO₂ might be the reason for the significant increase in the minimum and mean heart rates. In our study the lack of statistically significant difference among PO₂ levels, between preoperative and the second postoperative day, may be interpreted as there is no unfavorable effect on cardiac functions like pulmonary functions.

Yigit et al. (19) conducted a study on 40 patients, 20 with nasal packing with airway tubes and 20 with nasal packing without airway tubes, and demonstrated the PO₂ decrease and PCO₂ increase in patients with nasal packing without airway tubes postoperatively. They explain these results by the hypoxia following a nasal obstruction. Their results in nasal packing without airway tubes are similar with our findings.

Kurkcuoglu et al. (20) demonstrated a significant increase in partial arterial oxygen saturation percentages, as well as peak and forced expiratory flow speed in a group of patients with deviated nasal septum 1 month after the surgical correction.

In this study we found no significant differences regarding FVC, FEV₁, FEV₁%, FEF₂₅₋₇₅%, and PO₂ between preoperative and in the second postoperative day just before removal of the nasal pack (P > 0.05). The results indicate that nasal packing with airway tubes is not a cause for post-operative respiratory dysfunction and hypoxia. Nasal packing with an airway tube, allows partial nasal breathing, provides a more physiologic environment compared to nasal packing without airway tube and prevents respiratory dysfunction and hypoxia. However, there is definitely a need for further investigation by continuous monitoring the patients for PO₂ preoperatively and during the postoperative period with a nasal packing.

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