

Do totally occlusive nasal packs after nasal surgery increase the risk of immediate respiratory distress during recovery from anesthesia?

Total tıkaçıcı burun tamponu nazal cerrahi sonrası anesteziden derlenme sırasında erken solunum sıkıntısı riskini artırır mı?

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ABSTRACT

Objectives: This study aims to compare the risk of immediate respiratory distress (IRD) during the recovery of anesthesia between the nasal surgery with totally occlusive nasal packing and non-respiratory tract-related surgeries.

Patients and Methods: A total of 300 patients (180 males, 120 females; mean age 30.1±8.2 years; range 18 to 52 years) were included in the study. The patients were assigned to one of two age- and sex-matched groups according to surgery type: 1) patients undergoing nasal surgery with totally occlusive nasal packs for nasal septum deviation or 2) patients undergoing non-respiratory tract surgeries for various diseases. Immediate respiratory distress was defined as any unanticipated hypoxemia, hypoventilation or upper-airway obstruction (stridor or laryngospasm) requiring an active and specific intervention.

Results: The patients who underwent nasal surgery with totally occlusive nasal packs had a 6.25 times higher risk of IRD than the patients who underwent non-respiratory tract surgery during recovery from general anesthesia. Smokers had a 4.8 times higher risk of having IRD than non-smokers during the post-extubation phase. There were no significant differences in the incidence of IRD between males and females.

Conclusion: Based on our study results, totally occlusive nasal packs and smoking were associated with poor extubation status at the end of the surgical procedure.

Keywords: Nasal packing; nasal surgical procedure; respiratory distress; tracheal extubation.

ÖZ

Amaç: Bu çalışmada anesteziden derlenme sırasında total tıkaçıcı burun tamponu ile birlikte nazal cerrahi ve solunum yolu ile ilişkili olmayan cerrahiler arasında erken solunum sıkıntısı (ESS) riski karşılaştırıldı.

Hastalar ve Yöntemler: Toplam 300 hasta (180 erkek, 120 kadın; ort. yaş: 30.1±8.2 yıl; dağılım 18-52 yıl) çalışmaya alındı. Hastalar cerrahi tipine göre yaş ve cinsiyet eşleştirilmiş iki gruptan birine ayrıldı: 1) total tıkaçıcı burun tamponu ile birlikte nazal septum deviasyonu için nazal cerrahi yapılan hastalar veya 2) çeşitli hastalıklar nedeniyle solunum yolu dışı cerrahi yapılan hastalar. Erken solunum sıkıntısı beklenmedik hipoksemi, hypoventilasyon veya aktif ve spesifik girişim gerektiren üst solunum yolu tikanıklığı (stridor veya larengospazm) olarak tanımlandı.

Bulgular: Genel anesteziden derlenme sırasında total tıkaçıcı burun tamponu ile nazal cerrahi yapılan hastalarda ESS riski, solunum yolu dışı cerrahi yapılan hastalara kıyasla, 6.25 kat daha yüksekti. Sigara içenlerde ESS riski, ekstübasyon sonrası fazda, sigara içmeyenlere kıyasla 4.8 kat daha yüksekti. Erkekler ve kadınlar arasında ESS insidansı açısından anlamlı bir fark yoktu.

Sonuç: Çalışma sonuçlarımıza göre, total tıkaçıcı burun tamponu ve sigara kullanımı, cerrahi işlem sonunda kötü ekstübasyon durumu ile ilişkilendirildi.

Anahtar Sözcükler: Burun tamponu; nazal cerrahi işlem; solunum stresi; reakeal ekstübasyon.



Despite advances in anesthetic medications and administrations tracheal extubation still remains the most risky phase of anesthesia. It is known that respiratory tract-related complications are three times more common in the post-tracheal extubation phase than in the tracheal intubation and induction of anesthesia phases.^[1,2] Frequently-seen respiratory complications that arise perioperatively and cause a decrease in oxygen saturation include coughing, laryngospasm, and bronchospasm.^[3,4]

In operating theaters of otolaryngology clinics, it is well known that respiratory complications are seen frequently during the extubation phase of anesthesia especially in surgeries such as adenotonsillectomy and direct laryngoscopy. Septoplasty, rhinoplasty, and concha surgeries are the most common operations performed in otorhinolaryngology practice.^[5,6] The surgical methods for these surgeries can differ, but many surgeons traditionally use total nasal packing to prevent complications such as postoperative bleeding, adhesions, hematoma formation, and recurrence of septal deviation.^[6,7] Nasal surgery is also known to be associated with poor extubation comfort and increased risk of respiratory distress; however, this information is generally anecdotal. In the literature, there are studies comparing the complication rates of various nasal packing materials or suturing techniques.^[8-10] However, despite the fact that nasal surgery and total nasal packing are performed regularly, there is very little data regarding whether nasal surgery with total nasal packing increases the risk of immediate respiratory distress (IRD) during recovery from general anesthesia when compared with non-respiratory tract surgeries. Therefore, the aim of this study was to compare IRD rates between patients who underwent nasal surgery with total nasal packing and patients who underwent non-respiratory tract surgeries during the post-extubation phase of anesthesia based on objective criteria.

PATIENTS AND METHODS

This study was conducted at the Otorhinolaryngology and Anesthesiology clinics of Amasya University Sabuncuoğlu Şerefeddin Training and Research Hospital between June 2013 and January 2015. A total of 300 patients (180 males, 120 females; mean age 30.1 ± 8.2 years;

range 18 to 52 years) were included in the study. The study was approved by the ethical committee of Ankara Numune Training and Research Hospital, and informed consent was obtained from all participating subjects. The study was conducted in accordance with the principles of the Declaration of Helsinki.

A case controlled clinical study was conducted to compare rates of IRD following tracheal extubation between patients who underwent nasal surgery with total nasal packing and patients who underwent non-respiratory tract surgeries in various surgery clinics. The patients were assigned to one of two age- and sex-matched groups, according to surgery type: 1) patients underwent nasal surgery with totally occlusive nasal packs for nasal septum deviation and 2) patients underwent non-respiratory tract surgeries for various diseases. The patients in group 1 (n=150) underwent septoplasty or rhinoplasty operations with or without turbinate surgery, and those in group 2 (n=150) underwent procedures such as inguinal hernia surgery, orthopedic interventions and manipulations, otoplasty, varicocele surgery, and scar revision. Patients who had undergone respiratory tract-related procedures such as otorhinolaryngological, neurosurgical, thoracic, cardiovascular, and gastrointestinal system operations were not included in the study. Operation time was also an inclusion criterion. Patients whose surgery lasted between 30 and 90 minutes were included in the study. Patients who had a history of neurological, cardiological, or respiratory diseases were not included in the study.

The study exclusion/inclusion criteria were designed to reduce variables between the groups that could influence the results. Patients who were accepted as status 1 and 2 according to the American Society of Anesthesiology (ASA) physical status classification system and who underwent similar anesthesia protocols were included in the study. In summary, total intravenous induction using propofol (2 mg/kg), fentanyl (1 microgram/kg), and atracurium (0.5 mg/kg) was administered, and after relaxation of the muscles, tracheal intubation was performed and mechanical ventilation was started. Standard perioperative care, including the monitoring of electrocardiography, heart

rate, noninvasive blood pressure, and oxygen saturation, was carried out. During mechanical ventilation, inhalational anesthesia was continued with sevoflurane (0.6-1.6 MAC) and N₂O-O₂ (50%). The patients who had additional dosage of atracurium were not included in the study.

Criteria for appropriateness of tracheal extubation in the operating room was at the discretion of each individual anesthesiologist. However, extubation criteria was basically defined as: adequate oxygenation of the patient (oxygen saturation >92%), adequate ventilation (tidal volume >5 mL/kg, spontaneous respiratory rate >7 bpm, ET CO₂ <50 mmHg), hemodynamically stable patient, full reversal of muscle relaxation (sustained 5 second head lift or hand grasp). In order to determine immediate respiratory distress related to anesthesia in the operating theatre, the criteria was defined as any unanticipated hypoxemia (hemoglobin oxygen saturation <90%), hypoventilation (respiratory rate <8 breaths/min or arterial carbon dioxide tension >50 mmHg) or upper-airway obstruction (stridor or laryngospasm) requiring an active and specific intervention (ventilation, tracheal intubation, opioid or muscle relaxant antagonism, insertion of oral/nasal airway or airway manipulation).^[11] Detailed notes were taken by the surgeons and anesthesiologists.

Statistical analysis

All of the variables among the groups and the incidences of determined respiratory distress were analyzed statistically with the IBM SPSS

version 21.0 for Windows software package (IBM Corporation, Armonk, NY, USA). Normality of data in each group was tested with the Kolmogorov-Smirnov test. Data were shown as mean ± standard deviation for continuous variables, and number of cases was used for categorical variables. Differences between the groups were analyzed by t-test or chi-square, as appropriate. A *p* value less than 0.05 was considered statistically significant.

RESULTS

Descriptive statistics about the study groups are shown in Table 1. No significant differences were found between the groups in terms of age, gender, or cigarette smoking.

When the IRD events were compared according to the pre-established objective criteria, it was found that there were 25 (16.7%) events in group 1 and four (2.7%) events in group 2. Accordingly, the difference between the groups was significant (*p*<0.001). The relative risk (RR) was calculated as 6.25 (95% CI=2.2-17.5). Hence, we could say that the patients who had nasal surgery with totally occlusive nasal packs were 6.25 times more likely to have respiratory distress during the post-extubation phase of anesthesia than the patients who underwent non-respiratory tract surgery. The odds ratio (OR) was calculated as 7.3 (95% CI=2.5-21.5), which could mean that the odds of experiencing respiratory distress were 7.3 times higher in group 1 than in group 2.

When the effect of cigarette smoking was evaluated, the study results showed that IRD

Table 1. Descriptive statistics and post-extubation immediate respiratory distress rates of the study groups

Variables	Nasal surgery group with totally occlusive nasal packs			Non-respiratory tract surgery group			<i>p</i>
	n	%	Mean±SD	n	%	Mean±SD	
Age			30.5±9.1			29.6±7.2	0.35
Gender							0.56
Males	93			87			
Females	57			63			
Cigarette smoking	46	30.6		49	32.7		0.8
Males	38	41		39	44.8		0.8
Females	8	14.8		10	15.8		0.65
Respiratory distress	25	16.7		4	2.7		<0.001
Smoking/respiratory distress	14/25			3/4			

SD: Standard deviation.

events were seen more often in smokers than in non-smokers ($p < 0.001$). The RR was calculated as 4.8 (95% CI=2.3-10.1), and the OR was calculated as 5.8 (95% CI=2.5-13.3).

After evaluating all the participants, we found that 16 males and 13 females had IRD during the recovery phase of anesthesia; there was no significant difference according to gender ($p=0.1$).

According to clinical observations, IRD events were most commonly characterized by the patient holding his or her breath, a subsequent decrease in oxygen saturation, straining and coughing during the period just after the tracheal extubation. All of the patients who were accepted as IRD were treated with forced-mask application with 100% oxygen. The inhaler salbutamol and/or methylprednisolone were administered. None of the patients was intubated again due to respiratory distress. There was no unexpected morbidity or mortality.

DISCUSSION

Despite the fact that nasal surgery with totally occlusive nasal packs is commonly performed and the nose has an important role in respiration physiology, we did not find any cohort studies in the literature regarding the risk of respiratory distress during recovery from general anesthesia when compared to non-respiratory tract surgeries. The current investigation showed that (i) patients who underwent nasal surgery with totally occlusive nasal packs had a 6.25 times higher risk of IRD than the patients who underwent non-respiratory tract surgery during recovery from general anesthesia; (ii) smokers had a 4.8 times higher risk of having IRD than non-smokers during the post-extubation phase; and (iii) there were no differences between males and females in terms of IRD.

The patient is forced to breathe through the mouth by using totally occlusive nasal packing, which is not a physiological situation. Breathing through the mouth causes acceleration of breathing, increases the energy spent for respiration, and decreases the depth of respiration.^[12] In addition, using totally occlusive nasal packs may change blood gas values by causing alveolar hypoventilation and airflow obstruction, and by reducing alveolar gas diffusion. Jensen et al.^[9] observed

patients preoperatively for 24 hours with a pulse oximeter, and for two nights following the insertion of nasal packs, and demonstrated statistically significant increases in the number and duration of nocturnal apneas. It has been reported in the available literature that complications such as hypoxia, heart attack, cerebrovascular events, and sudden death can develop due to acute total nasal obstruction.^[12]

In one recent study, the use of both ventilated and totally occlusive nasal packs was studied in patients who had undergone nasal surgery. The results showed that patients receiving totally occluding nasal packs had significant decreases in HCO_3 and pO_2 concentrations in their arterial blood; there were no effects on pH or oxygenation. The investigators attributed this situation to the increased ventilation rate. Patients in both groups demonstrated changes in heart rate variability, measured with a Holter monitor. The investigators of this study postulated that nasal packing may cause exaggerated parasympathetic activation and vagally stimulated cardiac changes.^[10]

The possible reasons for the increased risk of IRD in nasal surgery with totally occlusive nasal packs depends on exaggerated laryngeal reflexes due to upper respiratory tract stimulation. The touch and pressure receptors located in the nose might trigger these reflexes, which could be stimulated by totally occlusive packs.^[13,14] Also, the blood and secretions which accumulate in the pharynx during nasal surgery could also be responsible for respiratory distress due to stimulation of the internal branch of the superior laryngeal nerve. Nasal, buccal, and laryngeal irritations are known to be among the etiologies of laryngospasm.^[2,13,15] Moreover, the neurological reflexes that are present in coughing involve the vagal nuclei because of acute total nasal obstruction, and they have a marked influence within the respiratory and digestive systems.^[7,14,15]

The most common IRD events observed in this study were coughing accompanied by decreased oxygen saturation and breath-holding. In all of our cases this was a self-limiting factor that recovered with forced mask application and administration of 100% oxygen, methylprednisolone infusion, and/or salbutamol inhalation.

In conclusion, in the post-tracheal extubation phase of anesthesia, patients who underwent nasal surgery with totally occlusive nasal packs had an increased risk of immediate respiratory distress when compared to patients who underwent non-respiratory tract-related surgeries. In addition, smoking was a serious risk factor for respiratory distress during recovery from anesthesia, regardless of surgery type.

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