Acute Respiratory Complications After Uvulopalatopharyngoplasty

Uvulopalatofaringoplasti Sonrası Akut Respiratuar Komplikasyonlar

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ABSTRACT Objective: Uvulopalatopharyngoplasty (UPPP) is a common surgery performed in snoring patients with obstructed upper airway. The aim of this study was to investigate the predictors of immediate postoperative respiratory complications and to assess management in snoring patients undergoing UPPP. **Material and Methods:** A retrospective cross-sectional study was performed in a tertiary referral centre. Eighty-nine patients with snoring undergoing UPPP surgery were reviewed. Patients were categorized into respiratory complication (Group I, 12 patients) and noncomplication groups (Group II, 77 patients) and the groups were compared for age, sex, surgical procedure, body-mass index (BMI) and hospitalization time. **Results:** Significant differences were found between the two groups for general anesthesia, high BMI and additional surgical procedures (UPPP with tonsillectomy, septoplasty and turbinate procedure) ($p< 0.05$) with regard to acute respiratory complications. The management included continued oxygenation (7 patients), emergent tracheotomy (3 patients) and reintubation and mechanical ventilation (2 patients). **Conclusion:** Acute airway obstruction after UPPP is positively correlated with additional surgical procedures, high BMI and general anesthesia and usually occurs within 3 hours of surgery. Conservative management by an experienced anesthesiologist is usually adequate and one should be ready for emergent tracheotomy.

Key Words: Snoring; surgery; uvula; respiratory therapy

ÖZET Amaç: Uvulopalatofaringoplasti (UPPP) hafif ve orta şiddette horlaması olan hastalarda uygulanan tedavi yöntemlerinden biridir. Horlama cerrahisi nedeni ile UPPP yapılan hastalarda erken postoperatif dönemde ortaya çıkan akut respiratuar komplikasyonları ortaya koymak ve tedavisini değerlendirmek amacı ile bu çalışma planlandı. **Gereç ve Yöntemler:** Bu retrospektif kesitsel çalışma üçüncü basamak sağlık merkezinde yapıldı. UPPP operasyonu yapılan 89 hasta değerlendirildi. Hastalar, respiratuar komplikasyonlar görüldüğü birinci grup (Grup I, 12 hasta) ve bu komplikasyonların görülmediği ikinci grup (Grup II, 77 hasta) olmak üzere iki farklı gruba ayrıldı. Hastalar yaşlarına, cinsiyetlerine, uygulanan cerrahi yöntemlere, vücut-kitle indeksine (VKİ) ve yatış sürelerine göre karşılaştırıldı. **Bulgular:** Birinci grup ve ikinci grup arasında, akut respiratuar komplikasyonlar ile ilgili olarak genel anestezi, VKİ ve ek cerrahi prosedürler (UPPP ile tonsillektomi, septoplasti, konka cerrahisi) açılarından anlamlı fark bulundu ($p< 0.05$). Respritauar komplikasyonların görüldüğü birinci grup hastaların tedavisinde oksijen tedavisi (7 hasta), acil trakeotomi (3 hasta) ve reentübasyon ve mekanik ventilasyon (2 hasta) uygulandı. **Sonuçlar:** UPPP cerrahisi sonrası akut hava yolu komplikasyonları, ek uygulanan cerrahi prosedürler, yüksek VKİ oranı ve genel anestezi yöntemi ile ilişkili bulundu ve postoperatif ilk 3 saat içinde çıktı. Bu hastalara tecrübeli bir anestezi uzmanı tarafından konservatif tedavi yeterli olup, acil trakeotomi içinde hazır bulunmak gerekir.

Anahtar Kelimeler: Horlama; cerrahi; uvula; respiratuar, tedavi

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Obstructive sleep apnea syndrome (OSAS) is a complex disorder with potentially serious physiologic consequences. UPPP is a common surgery performed in patients with mild to moderate snoring as a

partially curative procedure. The anatomic and physiologic abnormalities associated with snoring increase the risks of complication in the intraoperative and perioperative periods.[1-4] Postoperative edema may increase the perioperative complications.[3] The most common complications during the immediate postoperative period are respiratory complications, including airway obstruction leading to respiratory arrest and reintubation or emergent tracheotomy.[1-3] Studies assessing perioperative risk factors and perioperative management for such patients are rare.[5,6]

We performed this retrospective study to investigate the predictors of immediate postoperative respiratory complications and to assess the management of snoring patients who had undergone UPPP.

MATERIAL AND METHODS

A retrospective review was performed on 89 patients with snoring who underwent UPPP in a university teaching hospital between March 1999 and May 2006 after approval by the Human Studies Research Board.

Polysomnography (PSG) was performed in our patients undergoing surgery. Before 2004, when PSG was not available in our hospital, OSAS and patients requiring UPPP were diagnosed with extra diagnostic methods such as awake fiberoptic endoscopy with or without Muller's maneuver, nasoendoscopy, airway manometry, pulse oxymetry and cephalometry. PSG data was available only in 8 patients. Apnea was defined as cessation of breathing for at least 10 seconds. Hypopnea was a decreased effort to breathe at least 50% less than the baseline and with at least a 4% decrease in SaO_2. The Apnea hypopnea index (AHI) was calculated as the sum of total events (apneas and hypopnea) per hour. UPPP indications were decided according to the physical examination and clinical staging for oropharyngeal narrow, palate-tongue position, tonsil sizes and hypertrophy degree on the lateral side of the oropharynx.[1]

The surgical procedure included UPPP without tonsillectomy, followed by suture apposition of the denuded anterior and posterior faucial pillars and excision of 1 to 2 cm of the soft palate, including the uvula; tonsillectomy was performed when required. Septoplasty and inferior turbinate surgery were performed when required and the surgical techniques included submucosal resection for septoplasty and turbinectomy without turbinate bone, electrocautery, and radiofrequency for inferior turbinate. Nasal packing with ventilation tube was performed after nasal surgery.

Associated procedures for UPPP with or without tonsillectomy included turbinate procedure and septoplasty under local or general anesthesia. Nasal packing was used in 11 patients undergoing septoplasty. Charts were reviewed for patient age, sex, surgical procedure, BMI and hospitalization time.

Surgical procedures were applied under general anesthesia in 72 patients and local anesthesia in 17 patients. Local anesthesia was selected in UPPP patients who were not overweight, had no systemic problems and underwent no additional surgical procedures. In patients without cardiac disease and hypertension 1% lidocaine with epinephrine at a ratio of 1:100,000 were administered through the submucosal plane. A thorough airway examination was performed by anesthesiologist before intubation. Sedatives, opioids and large doses of longer acting drugs, especially neuromuscular blocking agents were avoided during general anesthesia and non-steroidal analgesics were used when necessary.

Patients were categorized into respiratory complication (Group I, 12 patients) and noncomplication groups (Group II, 77 patients) and the two groups were compared for each potential risk factor. Respiratory complications were defined as need for conservative management (oxygen supplementation, nasal or oral airway, tracheal reintubation) or surgical management (emergent tracheotomy). These groups were also compared for potential risk factors.

Postoperative courses for the patients were evaluated by reviewing perioperative anesthesia, surgical and nursing notes, postoperative anesthe-

siologist's notes, vital signs and any complications that occurred within the first three hours. A respiratory complication was defined as the need for airway intervention or a return visit to the operating room for airway obstruction. The respiratory treatment included oxygen supplementation, nasal or oral airway, tracheal reintubation and emergent tracheotomy.

BMI (kg/m^2) was measured for patients in the respiratory complication and noncomplication groups before surgery. The BMI was calculated as follows: Weight/Height^2, where weight was measured in kilograms and height was measured in meters. A BMI less than 25 was considered normal, 27 to 30 mild obesity, 30 to 40 moderate obesity, and greater than 40 morbid obesity. UPPP was not the primary therapeutic attempt in patients with a high BMI. A weight loss program was given to patients who were moderate to morbid overweight before surgery.

Statistical Analysis

The variables for risk factors were not normally distributed. Therefore variables for risk factors in the multivariate analysis were not adequate in this study. Variables were analyzed using the Wilcoxon's rank sum test, whereas Student's t test was used for normally distributed variables. Chi-square analysis was performed to analyze data with respect to the presence or absence of a specific risk factor. A p value < 0.05 was considered statistically significant.

TABLE 1: Additional upper airway procedures performed concomitantly with uvulopalatopharyngoplasty.

Concomitant procedure	Number of subjects	Percentage of subjects (%)
UPPP with tonsillectomy	54	60.67
Septoplasty	19	21.34
Turbinate procedure	11	12.35

UPPP: Uvulopalatopharyngoplasty.

RESULTS

There were 89 patients with a procedure code for UPPP; 12 were females and 77 were males. The mean age was 33.9 ± 8.78 (range 27-63 years). Table 1 summarizes concomitant procedures performed with UPPP. Demographic data for all patients were shown in Table 2. No significant differences were found between the two groups with regard to age or gender (p>0.05).

Surgical procedures in addition to UPPP were tonsillectomy in 60.67%, septoplasty in 21.34%, and turbinate procedure in 12.75%, (Table 1). Preoperative AHI values ranged from 9.24 to 26.25, with a mean AHI of 16.20 in eight patients with PSG records. Postoperative AHI values ranged between 6.97 and 13.80 with a mean AHI of 10.71. UPPP with tonsillectomy and septoplasty were performed in 3 of 8 patients with PSG records, 3 patients underwent UPPP, and 2 patients underwent UPPP and turbinate procedure. Acute respiratory complications did not develop in those patients and a statistical analysis could not be made.

TABLE 2: Demographic data of patients.

Patients		Group I*	Group II**
Age	Mean, SD	51.16 ± 8.4	43.71 ± 8.45
Gender	Male	83.33%	87.01%
	Female	16.66%	12.98%
Postoperative time after surgery	Mean, SD (Month)	38.08 ± 23.31	33.27 ± 20.13
Additional surgical procedure	UPPP with Tonsillectomy	83.33%	57.14%
	Septoplasty	58.33%	14.28%
	Turbinate	25%	10.38%
Anesthesia type	General	100%	77.92%
	Local	-	22.07%

*Group I: Acute respiratory complication group, **Group II: Noncomplication group, SD: Standard deviation; UPPP: Uvulopalatopharyngoplasty.

There were 12 patients (13.48%) in the acute respiratory complication group (Group I) and all patients in "Group I" had an acute respiratory complication whereas complication developed in 77 cases in the noncomplication group (Group II). UPPP and additional surgical procedures were performed under general anesthesia in all patients in Group I. In Group II, 16 patients underwent surgery under local anesthesia and 61 under general anesthesia. Acute respiratory complications were common in patients with general anesthesia and additional surgical procedures ($p< 0.05$). (Table 2). Acute respiratory complication developed in 11 patients undergoing septoplasty with nasal packing and acute respiratory complication did not develop in 8 patients undergoing septoplasty without nasal packing.

The mean BMI was 36.5 ± 3.5 kg/m^2 (range 30.87-42.1 kg/m^2) in Group I and 31.8 ± 3.3 kg/m^2 (range 27.75-37.4 kg/m^2) in Group II. Nine patients were moderately obese and 3 were morbidly obese in Group I and 68 patients were moderately obese and 9 were morbidly obese in Group II. Acute respiratory complications were more common in patients with high BMI in Group I than in Group II ($p<0.05$).

Patients in Group I had respiratory complications. Difficult airway management and intubation were the most challenging problems in this group. The management of Group I patients were summarized in Table 3. In 3 patients (3.4%), postextubation respiratory distress developed after early extubation in the operating room. The larynx could not be visualized and emergent tracheotomy was performed in these cases. During recovery from general anesthesia, desaturation below 90% and 80% developed in 3 and 4 cases, respectively. These respiratory complications were attributed to airway obstruction due to laryngospasm in the immediate postextubation period. These patients were treated with supplemental oxygen. In one patient, postextubation bronchospasm developed and one patient had respiratory distress of unknown origin in the recovery room. These two patients were reintubated and admitted to the intensive care unit for further management.

DISCUSSION

This retrospective study was designed to investigate the acute respiratory complications of UPPP in snoring patients and to assess management. Acute respiratory complications were related to the additional surgical procedures and use of general anesthesia and they usually occur within 3 hours of surgery especially in patients with high BMI.

Several reports were published on perioperative complications and OSAS severity. Kim et al found that AHI, lowest oxygen saturation and level of apnea were the most reliable predictors of immediate postoperative oxygen desaturation and respiratory complications in patients undergoing UPPP surgery.[4] Kezirian et al reported the incidence of serious nonfatal complications and 30-day mortality after UPPP as 1.5% and 0.2%, respectively, in a large cohort of UPPP patients at veteran hospitals.[3] Esclamado et al retrospectively reviewed 135 patients with OSAS after UPPP and associated procedures.[7] They compared 18 patients with complications (14 airway complications, 3 hemorrhages and 1 arrhythmia) with 117 patients without

TABLE 3: Management of acute respiratory complication group (Group I).

Management	n	Rate (%)	BMI (mean & SD)	Additional Surgical Procedure		
				UPPP with tonsillectomy (n)	Septoplasty (n)	Turbinate (n)
Supplemental oxygenation	7	7.86	34.64 ± 2.61	5	3	3
Emergent tracheotomy	3	3.37	41.22 ± 0.92	3	3	1
Reintubation	1	1.12	35.3 ± 0	1		
Mechanical ventilation	1	1.12	36.5 ± 0		1	1

n: Number of patients; BMI: Body mass index, kg/m^2; SD: Standard deviation; UPPP: Uvulopalatopharyngoplasty.

complications. Preoperative apnea index (AI) and lowest saturation (LSAT) were significantly different between the two groups. A preoperative AI greater than 70 or LSAT less than 80 were considered risk factors for the development of complications. However, difficult intubation was identified as the major complication in this study which in fact is related to the severity of snoring. In contrast, we evaluated postoperative acute respiratory complications that occurred within three hours after UPPP and difficult intubation was not defined.

In 1998 Mickelson and Hakim reviewed 347 patients with 14 complications and found no significant differences between those with and without complications with regard to age, BMI, respiratory disturbance index or AI.[6] However, an association was detected between multiple simultaneous procedures and the development of complications. Rollheim et al. reported that patients with BMI > 30 had significantly lower obstructions and obese patients failed to respond or had relapses after UPPP.[8] In our study, acute respiratory complications were common in patients with general anesthesia, additional surgical procedures and high BMI score and no significant differences were found in acute respiratory complications with regard to age or gender.

Surgical procedures such as septoplasty, UPPP with tonsillectomy, turbinate surgery, geniohyoid advancement, midline glossectomy, and tracheotomy are frequently performed simultaneously with UPPP. Some surgeons have cautioned against performing nasal surgery along with UPPP because of the concern that the nasal packing could worsen airway obstruction that occurs because of edema at the UPPP site.[8] Many authors do not use packing at all provided that there is no heavy bleeding during or after the operation.[8-10] Additional procedures involving nasal surgery do not necessarily increase the risk if no packing is done. Of those who use packing, some remove it on the day of the operation, others up to 5 days postoperatively. In our study, acute respiratory complications were common in patients undergoing septoplasty with packing. We suggest avoiding packing after septoplasty especially in patients undergoing surgery for snoring.

In this study, we found an association between the development of complications and multiple nasal procedures and tonsillectomy performed along with UPPP (Table 2). Performing both procedures concurrently avoids additional procedure, anesthetic and cost. It may be prudent to perform UPPP and nasal surgery or UPPP with tonsillectomy as separate, staged procedures, especially in high-risk patients.

Accentuation of upper airway obstruction in patients with OSAS by general anesthesia was documented by many authors.[10] Local anesthesia was recommended as the best technique whenever possible.[10-12] Hulcrantz et al. studied 55 patients with OSAS in whom UPPP was performed by regular surgical technique using local anesthesia and no respiratory complications were observed.[11] Haraldsson and Bredbacka studied 53 consecutive patients undergoing laser-uvulopalatoplasty under local anesthesia and suggested that it was a safe, effective and comfortable method with no respiratory complications.[12] Acute respiratory complications developed in patients undergoing UPPP under general anesthesia in our study.

The incidence of respiratory complications for UPPP ranges between 2% to 11% postoperatively according to Spiegel et al.[13] Respiratory complications appear to occur in the very early postoperative period in most cases. All episodes of airway obstruction occurred either intraoperatively or in the immediate postoperative period, typically on extubation.[13] Similarly, pulmonary edema tends to develop immediately on extubation when it does happen. This phenomenon was reported most often in cases of acute airway obstruction such as laryngospasm or foreign body aspiration.[14] In our study, the incidence of acute respiratory complications was 13.48%. In three patients, postextubation respiratory distress developed after premature extubation. Respiratory complications were caused by airway obstruction due to presumed laryngospasm immediately postextubation in 7 patients. Postex-

tubation bronchospasm developed in one patient and one patient had respiratory distress of unclear origin in the recovery room.

Whenever general anesthesia is needed, the technique/drugs used should be specifically selected to allow early return of consciousness and minimal postanesthetic sedation if possible. For patients suspected of having OSAS, a thorough airway examination should be performed by an anesthesiologist. This examination should include Mallampati classification, atlanto-occipital joint extension, anterior mandibular space, tonsil size, and craniofacial abnormalities.[15] A thorough examination of the upper airway is not only crucial for the anaesthesiologist but also for the otolaryngologist before surgery.

Sedatives and opioids were avoided since respiratory arrest, upper airway obstruction, coma and even death were reported after administration of these drugs in patients undergoing UPPP in a study conducted by Waters et al.[16] The ideal management method for postoperative airway obstruction in patients undergoing UPPP for treatment of snoring is still controversial. Most of the postextubation respiratory distresses developed after premature extubation in the operating room.[3,4] Oxygen, oropharyngeal and nasopharyngeal airways, bag mask valve device, suction, intubating equipment, and opioid antagonists should be available for immediate use in the operating room.[17] Continuous positive airway pressure (CPAP) must be available for immediate use postoperatively in all patients with known or suspected OSAS.[17] Tracheal extubation should be carried out only when the patient is conscious, communicative, and breathing spontaneously with an adequate tidal volume and oxygenation.[18] Patients should be monitored with continuous pulse oximetry and provided supplemental oxygen as needed to maintain adequate oxygenation by an experienced anesthesiologist after surgery.[13,16]

The data for patients receiving and not receiving PSG is not adequate to determine whether PSG changes the rate of acute respiratory complications. If the anesthesia and surgical team know in advance that the patient has significant apnea, the level of precaution for acute respiratory complication is increased.

This study has limitations; first it is not a prospective study and second we did not perform full PSG before and after UPPP in all patients. PSG laboratories have become widespread since 2004 in our province. It would be beneficial to provide the available polysomonographic data but the significance of this study is to determine the acute respiratory complications of the UPPP procedure. However, this study will encourage us to conduct a prospective study. To our knowledge, this is the first study to evaluate the acute respiratory complications after UPPP and their management. There are also different surgical options (Laser-Assisted Uvulopalatoplasty, Radiofrequency Tissue Volume Reduction and soft palatal implants) for the treatment of primary snoring.[19,20] These surgical procedures could be done under local anesthesia and have less respiratory complications.

In conclusion, acute airway obstruction after UPPP is positively correlated with additional surgical procedures and the use of general anesthesia and it usually occurs within 3 hours of surgery in high BMI cases. Despite the fact that one should be ready for emergent tracheotomy in such cases, conservative management by an experienced anesthesiologist is usually adequate.

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