Conscious sedation : clues for diagnosing obstructive sleep apnea syndrome

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Abstract

Background and aims: **The use of anesthetic agents for endoscopic sedation has recently increased. However, sedation introduces additional risks in patients with obstructive sleep apnea syndrome (OSAS). The presence of sleep apnea is not often enough questioned in clinical practice. The purpose of this study was to determine whether patients with sedation-induced snoring and decreased arterial oxygen saturation during gastroscopy are more likely to have OSAS.**

Methods: **This study considered 600 consecutive patients undergoing elective outpatient upper gastrointestinal endoscopy under conscious sedation for evaluation of dyspepsia. Ten patients with observed snoring and decreased arterial saturation during the gastroscopy procedure were enrolled in the study. The control group was comprised of 13 patients matched by sex, age, and body mass index (BMI) who did not snore and had a more stable oxygen saturation under conscious sedation during an elective outpatient gastroscopy for the evaluation of dyspepsia and were selected using a computer-generated randomized sequence. Patients were monitored and an overnight polysomnography was performed in the study group. Statistically significant differences between groups were assessed using the nonparametric Wilcoxon and independent-samples t-tests.**

Results: **There was no significant difference in age or BMI between the two groups (p>0,05)**

Mean minimum oxygen saturation was significantly different between the two groups (p=0.011). In the study group, 7 patients were found to have moderate OSAS necessitating a continuous positive airway pressure device.

Conclusion: **Patients with hypoxia and snoring, under conscious sedation are more likely to have OSAS. "Out-of-operating-room" sedoanalgesia is therefore critical.** (Acta gastroenterol. belg., **2016**, 79, **289-293**).

Key words : obstructive sleep apnea syndrome, gastroscopy, conscious sedation

Introduction

Upper gastrointestinal endoscopy (UGE) is a relatively safe procedure with a complication rate of less than 0.1%. However, a marked increase in the use of anesthetic agents for endoscopic sedation in recent years has introduced additional risks associated with this procedure. Use of anesthetic agents varies in different countries, particularly with regards to the administration of propofol. Information regarding abnormalities of major organ systems, drug and egg allergies, current medications, prior adverse reactions to sedatives and anesthetics, last oral intake, and tobacco and alcohol use are of importance for anesthesiologists and anesthesia technicians [1]. However, sleep disorders or the presence of snoring are not often investigated in clinical practice.

Obstructive sleep apnea syndrome (OSAS) is characterized by intermittent and recurrent obstruction of the upper airways during sleep. It has an estimated incidence of 4% and may be higher in obese individuals. Patients present with a history of witnessed sleep apnea, loud snoring, and excessive daytime somnolence [2]. OSAS is considered to be a risk factor for hypertension, coronary artery disease, heart failure, type 2 diabetes mellitus, and stroke; additionally, perianesthetic risks are increased in patients with OSAS. Typical doses of respiratory depressants may cause hypoventilation, apnea, or cardiopulmonary arrest [3]. Immediate diagnosis is therefore essential, however, a recent study showed that 90% of patients with OSAS remain undiagnosed [4-8].

The aim of the present study was to determine whether patients with sedation-induced snoring and decreased arterial oxygen saturation during UGE are more likely to have OSAS.

Patients and methods

This was a prospective, case-controlled, single center study in which 600 consecutive patients who underwent elective outpatient UGE under conscious sedation (CS) for evaluation of dyspepsia between March, 2015 and June, 2015 at Baskent University Konya Hospital, Konya were considered. It is routine practice at our hospital to sedate patients using propofol (0.5 mg/kg bolus infusion at a rate of 1.0 mg/min) combined with low-dose midazolam (1 mg), which is administered by a nurse anesthetist. Anesthesia was induced in the same manner in all patients in this observational study. Supplemental oxygen was routinely administered via a nasal cannula (2 L/min). Heart rate, blood pressure, and oxygen saturation with pulse oximetry were monitored in all patients. Diagnostic upper gastrointestinal endoscopy was performed with moderate sedation using the Modified Observer's Assessment of Alertness/Sedation scale (score 3–5). Procedure times were less than 10 min in all patients. Both snoring and a decrease in oxygen saturation (<90 %) were observed in 10 patients, the minimum number required for power analysis. The lowest oxygen saturation values were recorded and

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the UGE procedure was successfully completed in all cases. All patients were questioned for information regarding demographics, drugs used, systemic diseases, and history of surgical procedure(s).

Patients were excluded in cases of known acute or chronic renal failure, chronic liver disease, decompensated heart failure, chronic obstructive pulmonary disease, OSAS, history of stroke, psychiatric disorder, and use of stimulant drugs.

The final study population was comprised of 10 subjects (8 male, 2 female) who exhibited uninterrupted snoring for ^{3}10 seconds with a significant decrease in oxygen saturation. The control group was comprised of 13 patients (9 male, 4 female) matched by sex, age, and body mass index (BMI); who did not exhibit snoring and did exhibit more stabilized oxygen saturation during elective outpatient UGE under conscious sedation (CS) for the evaluation of dyspepsia; selected using a computer-generated randomized sequence. The STOP questionnaire is a sensitive tool for the screening of patients with severe OSAS and was administered to all patients in both the study and control groups.

The patients in the study group were referred to a pulmonary specialist and evaluated using a multidisciplinary approach. After physical examination, an overnight polysomnography was performed using a 44-channel polysomnograph (Eseries; Compumedics, Melbourne, Australia) in all patients at the Baskent University Konya Hospital Sleep Disorders Center.

Apnea was defined as a ≥90% decrease in airflow amplitude for a minimum period of 10 seconds relative to baseline levels. Hypopnea was defined as a ≥50% decrease in airflow amplitude with a ≥3% oxygen desaturation or arousal from sleep, relative to baseline values and for a minimum period of 10 seconds. Arousal was scored in accordance with accepted definitions. The apnea-hypopnea index (AHI) was calculated using the number of apneic + hypoapneic episodes per hour of sleep. Patients with an AHI of ≥5 events/h were diagnosed with OSAS. The AHI was used to classify the severity of sleep apnea according to the following criteria: mild, 5-15 events/h; moderate, 15-30 events/h; and severe, >30 events/h.

The quality of this study was assessed using a Consort statement.

Ethics and Consent

This study was approved by the local ethics committee of Baskent University, Konya. Written informed consent was obtained from all patients in accordance with the Helsinki Declaration.

Statistical Analyses

Data were analyzed using the Statistical Package for the Social Sciences (Version 17.0, SPSS Inc., Chicago, IL, USA). Statistically significant differences between groups were assessed using the nonparametric Wilcoxon test and independent-sample t-test. A P-value <0.05 was considered statistically significant.

Results

All patients in both the study and control groups were determined to have an American Society of Anesthesiologists (ASA) physical status class of 1 to 2. There was no statistically significant difference in age or BMI between the two groups ($p > 0.05$). The mean age of the patients in both groups was 54.9 and 51.1 years respectively and age distribution in both groups was homogeneous. Diagnostic UGE was performed in all patients. No patients required endotracheal intubation and no severe post-procedural complications were observed. Age, sex, BMI, additional diseases, smoking habits, oxygen saturation, AHI, and STOP questionnaire scores for the study group are presented in Table 1. With the exception of AHI, data for the same variables in the control group is presented in Table 2.

Table 1. — **Demographic and the clinical characteristics of the patients in the study group**

Age (y)	Sex	BMI (kg/m^2)	Concomittant diseases	Smoking habit	Initial oxygen saturation	Lowest oxygen saturation	STOP questionnaire	AHI
67	M	35.9	Diabetes, hypertension	+	98	87	4	3.3
52	M	28.3	COPD	+	96	85	3	15.2
59	F	36.7	Hypertension	_	95	68	4	5.2
49	M	25.5	_	+	100	93	3	27.1
36	M	40.0	_	_	98	20	3	30.0
73	M	29.5	Diabetes	_	96	83	3	19.0
50	F	34.9	Hypertension	_	100	65	4	20.4
66	M	30.0	Hypertension	_	92	78	2	11.0
50	M	30.0	_	_	97	84	2	24.2
47	M	30.0	Hypertension	_	98	88	4	5.8

M, Male, ; F, Female ; COPD, Chronic Obstructive Pulmonary Disease ; AHI, Apnea–Hypopnea Index ; BMI: Body Mass Index

Table 2. — **Demographic and clinical data of the control group**

Age (y)	Sex	BMI (kg/m²)	Concomittant diseases	Smoking	Initial oxygen saturation	Lowest oxygen saturation	STOP questionnaire
79	M	29.0	CAD	_	94	93	1
29	F	31.0	_	_	100	100	1
53	F	30.0	Diabetes	_	100	98	1
32	M	25.3	_	+	99	97	1
51	M	30.0	Dyslipidemia	+	98	96	1
50	M	32.0	Hypertension	_	98	98	1
73	M	32.5	Diabetes	_	96	93	1
25	M	27.8	_	_	99	97	0
62	F	33.0	Hypertension	_	98	97	2
63	F	29.9	_	_	99	97	1
62	M	31.0	Hypertension	_	99	96	2
28	M	25.0	_	+	100	99	0
57	M	35.0	CAD	+	98	96	1

M: Male, F: Female, BMI: Body Mass Index, CAD: Coronary Artery Disease

A statistically significant difference in the mean minimum oxygen saturation level was observed between the study and control groups (75.10% vs. 96.70%; p=0.011). The head tilt-chin lift maneuver and administration of supplemental oxygen with higher concentrations were performed for patients with low oxygen saturation. The procedure was interrupted and mask ventilation was required in only one patient in the OSAS group. Within the study group, the polysomnographic study found that 7 patients were classified as moderate OSAS necessitating a continuous positive airway pressure device, 1 patient was classified as mild OSAS and 2 patients were classified with simple snoring. Two patients in the control group had STOP questionnaire scores of 2 points, however, these patients did not agree to undergo polysomnography.

Discussion

The results of this single-center, prospective, observational study showed that snoring and a significant decrease in oxygen saturation during UGE under conscious sedation may assist the diagnosis of OSAS. Eight of the 10 patients in the study group were diagnosed with OSAS using polysomnography while 2 patients were classified with simple snoring. To the best of our knowledge, this is the first study to investigate previously undiagnosed OSAS patients undergoing UGE under conscious sedation using polysomnography.

The use of anesthetic agents for endoscopic sedation has significantly increased in recent years. A regimen of moderate sedation is recommended for the majority of gastrointestinal endoscopic procedures [10]. Choice of medication for sedation is largely operator-dependent and midazolam, fentanyl, and propofol are typically used for endoscopic procedures. Drug combinations are applicable as they create a synergistic effect. Midazolam is thought to increase supraglottic resistance when administered at sedative doses, while the combination of opioids and benzodiazepines may cause hypoxia and apnea. The use of propofol too has increased in recent years [11, 12]. Although its use has been determined to be safe; propofol has a narrow therapeutic window and may increase cardiopulmonary complications during endoscopy [1]. In particular, it has been suggested that perioperative cardiorespiratory complications increase in patients with OSAS. In these patients; repetitive collapse of the upper airway leads to snoring, frequent episodes of sleep interruption, hypoxemia, hypercapnia, variation in intrathoracic pressure, and increased sympathetic activity [13].

In the present study, oxygen saturation with conscious sedation decreased in both the study and control groups, however, the rate of oxygen saturation decline was significantly higher in the study group. Using the STOP-BANG questionnaire, Corso et al. found that patients undergoing routine endoscopic procedures are more likely to become hypoxic during deep sedation [14]. Airway compression caused by the gastroscope, an increased risk of aspiration, and difficult emergency airway management in remote locations outside of the operating room all increase the risks of anesthesia in patients with OSAS undergoing UGE procedures [15]. Indeed, these patients may have cardiovascular instability and sensitivity to sedation [3]. Even if polysomnography is not performed; the Berlin, STOP,

or STOP-BANG questionnaires should be administered prior to performing a sedative procedure [16].

Several studies have reported contradictory results regarding periprocedural complications in patients with OSAS undergoing endoscopic examination. Increased adverse events were not observed in patients with OSAS in studies by Khiani et al. [17] and Mador et al. [18]. All patients undergoing endoscopic procedures were administered the Berlin questionnaire that stratifies patients with either a high or low risk of OSAS. However, Coté et al. [19] observed a higher incidence of hypoxemia in patients with OSAS who underwent more advanced endoscopic procedures. In that study, the STOP-BANG questionnaire was used to identify patients at high or low risk of OSAS. Using portable nocturnal polysomnography, Sharara et al. showed that moderate to severe OSAS was detected in 14 of 20 patients who snored during colonoscopy vs. 1 of 18 control subjects who did not snore. In their study, oxygen saturation decreased to <90% in 6 of 24 snoring patients necessitating supplemental oxygen, when compared with 5 of 107 non-snoring patients (20). Polysomnographic evaluation was not performed on patients in the afore-mentioned studies, whereas in our study, polysomnography was used as the gold standard for the diagnosis of OSAS. However, the cost of testing and shortage of sleep disorder laboratories limits access to this procedure. Simple and reliable diagnostic tools other than polysomnographs are needed and various questionnaires are thus commonly used in the clinical setting. In the present study the STOP questionnaire was used in both the study and control groups as it is easy to administer and is a concise and reliable tool.

During the procedure, oxygen saturation decreased with conscious sedation in both the study and control groups, however, the rate of decline was greater in the study group compared with the control group. These minor complications were easily overcome using both the head tilt-chin lift maneuver and administration of supplemental oxygen at higher concentrations. Decreased oxygen saturation may be explained by the relatively low rate of supplemental oxygen administered to patients as well as undetected short-term deep sedation during the procedure. Patel et al. reported that deep sedation occurs at least once during the elective EGD with meperidine and midazolam when used with the intent of moderate sedation (21). Moreover, apneic episodes have been found to be more common with the use of propofol when compared with fentanyl. In a study by Corso et al. where the STOP-BANG questionnaire was used, a greater risk of hypoxemic events with sedation using propofol was found in patients at high risk for OSAS when compared with patients at low risk for OSAS (15% vs. 1.5 %) (14). In certain studies, sleep apnea questionnaires have been used to identify subjects at high or low risk for OSAS. In addition, studies do differ in terms of prophylactic supplemental oxygen use. While Adler et al. reported the use of 6 L supplemental oxygen (22), Mador et al. reported that all patients received a minimum of 2 L supplemental oxygen with higher levels (3 or 4 L/min) administered to obese patients (18)

This study has several limitations, including the relatively small number of patients in each group. A further potential limitation is the absence of polysomnographic evaluation in the control group, as 2 patients with STOP questionnaire scores of 2 points did not agree to undergo polysomnography. Future prospective studies with a greater number of patients could clarify the afore-mentioned concerns.

In conclusion, this study revealed three important findings. First, patients with sedation-induced snoring and decreased arterial oxygen saturation under conscious sedation during UGE are more likely to have OSAS. Second, sedoanalgesia performed outside the operating room is critical for prevention of adverse outcomes. Third, patients with suspected OSAS should be referred to a pulmonary specialist. Considering the extremely dangerous consequences, recognition of this association is important and patients should be treated appropriately.

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