Original
ISSN 2413-0516

Evaluation of Effective Factors on Pain in Patients Undergoing Sleep Apnea Surgery

Reihaneh Heidari[1], Mahsa Najafzadeh[2], Reza Erfaniyan[3], Ebrahim Razmpa[1], Hamed Emami[1], Matineh Heidari[4*]

[1]Otorhinolaryngology Research Center, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran.
[2]School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.
[3]Otorhinolaryngology Research Center, Amiraalam Hospital, Tehran University of Medical Sciences, Tehran, Iran.
[4]Department of Neurology, Firoozgar Hospital, Iran University of Medical Scienses, Tehran, Iran.
*Correspondence to: Matineh Heidari (Email: dr.matinehheidari@gmail.com)
(Submitted: 21 November 2021 – Revised version received: 16 December 2021 – Accepted: 27 December 2021 – Published online: 26 February 2022)

Abstract

Introduction: Sleep apnea is associated with complete or partial obstruction of the upper airway. This disease can cause various problems for the individual. In most cases, surgery and pharyngoplasty are needed to treat this complication. Depending on the type of surgery, its duration, the patient's age, the type of opioid prescribed after surgery and other factors, different amounts of postoperative pain have been reported in different studies. Therefore, the aim of this study was to investigate the factors affecting postoperative pain.

Materials and Methods: This descriptive cross-sectional study was performed on patients referred to the hospital to determine the factors affecting postoperative pain for patients with obstructive sleep apnea (OSA). Patients' information was recorded: age, sex, weight, height, body mass index, duration of surgery, possible complications, and anesthesia. Patients were evaluated for pain according to VAS criteria. The first time a patient requested a drug was recorded in 24 hours after surgery and data was then analyzed.

Results: A total of 40 patients were enrolled in the study, including 14 women (35%) and 26 men (65%). The mean age of patients was 41.55 ± 7.43 years. Examination of the relationships between other variables with patients' pain intensity showed a statistically significant difference between patients' pain intensity with other variables such as history of stroke ($P = 0.005$), history of cardiovascular disease ($P = 0.048$), history of drug abuse ($P = 0.046$) and type of analgesia received after surgery ($P = 0.032$). In multivariate analysis of the studied data, no statistically significant relationship was found between any of the variables with the intensity of patients' postoperative pain. The variances of height, weight, body mass index, duration of surgery and the first time of application of analgesic after surgery did not differ in different groups of pain intensity variables. But a significant difference was found between the two variables of age and pain intensity of patients ($P < 0.05$).

Conclusion: The results of this study showed a statistically significant difference in pain intensity with a history of stroke, cardiovascular disease, history of drug abuse and also the type of analgesia received after surgery. The serious complications caused by tolerating acute postoperative pain, especially the long-term effects of experiencing severe pain, necessitates more attention to pain control.

Keywords: Obstructive sleep apnea, pain intensity

Introduction

Obstructive sleep apnea (OSA) is characterized by complete or partial upper airway obstruction that frequently occurs during sleep. This disease can cause various medical and social problems.[1] OSA can lead to a lack of oxygen in the blood or an increase in carbon dioxide, which is accompanied by clinical symptoms associated with nighttime drowsiness, loud snoring, awakening out of suffocation due to respiratory obstruction at least five times in every hour of sleep. There is a complex interaction between physiological factors of respiratory obstruction, opioid drug effect, and pain.[2] OSA commonly affecting 2–3.5% of children is usually treated with pharyngoplasty.[3] Positive airway pressure is an alternative treatment commonly utilized to treat OSA; however, 5 to 50% of patients may fail to respond well to this treatment.[4] Surgery and placement of oral appliances are alternative solutions used depending on the patient's condition and severity of the disease. OSA surgical treatment usually removes the obstruction by removing excess tissue or reshaping the upper airway. Uvulopalatopharyngoplasty (UPPP) is the most common procedure performed to remove this obstruction,[5] but surgeons use less invasive procedures such as anterior palatoplasty and lateral pharyngoplasty due to postoperative complications.[6]

Enhanced surgical techniques have significantly decreased the rate of postoperative complications. Nonetheless, postoperative pain remains one of the critical aspects of OSA surgical treatments. The experience of severe pain during the early hours after surgery renders patients reluctant to opt for surgical treatments. Opioids are mainly used to control postoperative pain. However, opioid-induced depression of respiratory centers limits the application of opioid-based analgesics and further imposes a challenge in postoperative pain management of OSA patients undergoing surgery.[2] Furthermore, some patients may suffer from multiple obstructions along different levels of the respiratory tract.

Respiratory complications may arise during surgery and require treatment in more than 10% of children undergoing pharyngoplasty. Moreover, patients commonly suffer from multiple obstructions along different levels of the respiratory tract; prolonged time of surgery in such patients requiring multilevel pharyngoplasty adds to the risk of complications. Additionally, various factors such as obesity and young age, especially less than three years, are reported among risk factors of intraoperative respiratory complications.[3]

Conversely, more than 60% of early respiratory complications occur postoperatively. It is conceivable that some of these mild postoperative complications are due to factors such as the

effects of anesthetics, bleeding, and edema in the surgical site, which in children with OSA increases respiratory problems and decreases the neuromuscular function of the airways. In addition, many OSA patients at the same time suffer from nasal septum deviation. Subsequently, pharyngoplasty in OSA patients may be accompanied by a septoplasty. Postoperative care of concomitant septoplasty that leaves nasal airways obstructed obligates mouth breathing, which in turn may cause dry mouth, prolonged discomfort, and increased postoperative pain.

Various approaches employed in different studies to reduce pharyngoplasty postoperative pain in OSA patients require further evaluation. Accordingly, researchers in the current study sought to investigate factors affecting the intensity and duration of postoperative pain to provide a perspective on reducing the need for opioid-based analgesia, which, especially in children, is associated with complications.

Materials and Methods

This descriptive cross-sectional study was performed on patients referred to Imam Khomeini Hospital in Tehran, Iran, in 2017 to determine the factors affecting pain after surgery for OSA. Data were collected by census, and patients meeting inclusion criteria without having any of the exclusion criteria were included in the study.

Inclusion criteria include: OSA, primary surgery to repair the lesion, having informed consent.

Exclusion criteria include: all patients with clinical presentation of severe bleeding, patients who were dissatisfied with participation or continuation of the study for any reason, pregnant patients, and patients with a history of psychiatric disorders, patients with cultural, linguistic, and cognitive differences with the community.

Sample Size

Between April and March 2017, 40 patients were enrolled in the census.

Procedure

OSA patients were visited after initial referral to the ENT department of Imam Khomeini Hospital and evaluated regarding clinical manifestations and imaging findings. Surgical attention offered to OSA patients in our END department consists of expansion pharyngoplasty either with or without septoplasty and turbinoplasty. After collecting demographic and clinical information, the standard treatment was performed according to each patient's clinical condition. All patient information, including age, sex, education, postoperative complications, and other related factors, were carefully recorded and checked out by the project manager. The data entry sheet according to the inclusion and exclusion criteria has several main domains, including demographic information, patient's medical conditions, postoperative complications, and related follow-ups. Defective data were completed through extraction of the required information from patients medical records, patients interview, or physical examination if necessary.

Drug Regimen

Intraoperative anti-inflammatory regimen including 8 milligrams of dexamethasone and 100 milligrams of hydrocortisone was applied the same for all patients. All patients received dexamethasone every 12 hours and acetaminophen every 4 hours for two days postoperatively. Morphine was cautiously administered at patients' request for additional analgesia. Opioid dosage was tailored to each patients' medical condition to prevent respiratory depression.

Data Analysis

To analyze the data, first, the descriptive indices of the variables including, the mean and standard deviation for the research variables, were reported. The Kolmogorov–Smirnov test was reported to check the normality of data. Then, in the inferential findings section, the assumptions are presented. After examining the most important assumptions related to the statistical test, the test results were reported, and the data were analyzed by SPSS software version 16.

Ethical Consideration

After receiving a written letter of introduction from the university and selected research centers, the purpose of the study was explained to all research units, and then written consent was obtained. All patients' information was kept confidential. Ethical declarations of Helsinki and ethics research committees of the University of Medical Sciences were considered. The study was finally approved by the Code of Ethics (IR.TUMS.IKHC.REC.1398.73).

https://ethics.research.ac.ir/EthicsProposalView.php?&code=IR.TUMS.IKHC.REC.1398.073.

Results

A total of 40 OSA patients undergoing pharyngoplasty with or without septoplasty and turbinoplasty were included in the study. Of all patients, 14 were women (35%), and 26 were men (65%). The mean age of patients was 41.55 ± 7.43 years, and the minimum and maximum ages were 28 and 57 years, respectively. In terms of marital status, 28(70%) were single, and 12(30%) were married. Furthermore, 16 patients (40%) were illiterate, followed by primary and secondary education (15 patients; 37.5%), diplomas (8; 20%) and university education (1; 2.5%).

Also, 24 patients (60%) had a history of drug abuse, and 16 patients (40%) had no such history. After surgery on patients, patients were evaluated for complications after surgery, 20 patients (50%) developed postoperative pain, followed by nausea (12 patients; 30%), fever (3 patients; 7.5%), respiratory apnea (3 patients), and bleeding (2 patients; 5%).

Morphine was administered for 13(32.5%) patients in response to the patients' request for additional analgesia. 5(12.5%) patients additionally received non-steroidal anti-inflammatory drugs (NSAID) for further pain relief.

Figure 1 shows the severity of postoperative pain. In 30% of the studied patients, the pain intensity was 7, and the lowest was related to the pain intensity of 8, 9, and 7.5%. The average time to request additional analgesia after surgery was 195 minutes. Examination of the relationships between other variables with patients' pain intensity showed that having a history of stroke (P = 0.005), a history of cardiovascular disease (P = 0.048), a history of drug abuse (P = 0.046), and type of postoperative analgesia (P = 0.032) were significantly associated with

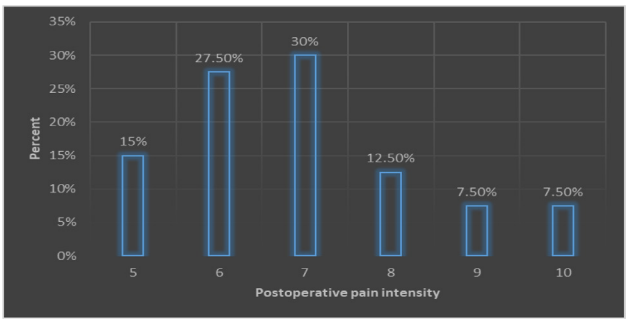

Fig. 1 **Comparison of postoperative pain intensity.**

Table 1. **Study variables**

Variables			Frequency	Percent
Sex	Male		26	65
	Female		14	35
Marital status	Single		12	30
	Married		28	70
Education rate	Illiterate		16	40
	Elementary and cycle		15	37.5
	Diploma		8	20
	University		1	2.5
Complications after surgery	Pain		20	50
	Hemorrhage		2	5
	Respiratory distress		3	7.5
	Fever		3	7.5
	Nausea		12	30
Cigarette smoking history	Yes		24	60
	No		16	40
Intraoperative dexamethasone	Yes		10	25
	No		30	75
Receiving hydrocortisone during surgery	Yes		17	42.5
	No		23	57.5
Type of analgesic received after surgery	Acetaminophen		22	55
	NSAID		5	12.5
	MS		13	32.5
Underlying disease	Diabetes	Yes	10	25
		No	30	75
	Blood pressure	Yes	20	50
		No	20	50
	Cardiovascular disease	Yes	24	60
		No	16	40
	Kidney	Yes	22	55
		No	18	45
	Stroke	Yes	9	22.5
		No	31	77.5
	Respiratory	Yes	25	62.5
		No	15	37.5

Table 2. **Comparison of means of quantitative variables**

Variables	Min	Max	Mean
Age	28	57	41.55 ± 7.43
Height	150	186	173.88 ± 9.19
Weight	52	97	77.64 ± 9.79
Body Mass Index	19.1	37.78	25.83 ± 4.03
The first time you apply for postoperative housing	12	24	195 ± 20.12
Duration of surgery	105	300	163.37±45.64

pain intensity. In multivariate analysis of the studied data, it was shown that there was no statistically significant relationship between any of the variables with the intensity of patients' pain after surgery.

The mean of quantitative variables of this study was compared in different groups of pain intensity by Kruskal-Wallis test. Due to the fact that *P* value was greater than 0.05, Leven test hypothesis (equality of variance) was accepted.

The variances of height, weight, body mass index, duration of surgery, and the first time applying analgesia after surgery did not differ in different groups of pain intensity variables. However, a significant difference was found between the two variables of age and pain intensity of patients ($P < 0.05$). Due to this difference, the groups were compared with each other by Post Hoc test with the highest sensitivity and lowest specificity to report the slightest difference if there is any, and the results showed no statistically significant difference between age and pain intensity groups.

Discussion

In recent years, many advances have been made in the management of postoperative pain. The use of newer methods, such as catheters and non-pharmacological methods, is increasing in developed countries. Much research has been done on different types of pain relief methods and compares them with each other in developed countries. In a few studies, the prevalence of analgesic methods has also been investigated.[7,8] Therefore, the aim of this study was to evaluate the factors affecting the pain of patients undergoing sleep apnea surgery. The results of this study showed that there was a statistically significant difference between patients' pain intensity with other variables such as a history of stroke ($P = 0.005$), cardiovascular disease ($P = 0.048$), drug abuse ($P = 0.046$), and type of analgesia received after surgery ($P = 0.032$). In multivariate analysis of the studied data, no statistically significant relationship was found between any of the quantitative variables with patients' pain intensity after surgery. In this regard, various studies have been conducted, including the study of Dabbagh et al., which was conducted in 2009 to show the relationship between pain-related factors, including age, sex, and use of anesthesia prodrug with the incidence of postoperative pain. Such findings are consistent with our findings. In other words, age, sex, and the use of anesthesia pre-medication all affect the incidence of postoperative pain. Another study using numerical criteria reported patients' pain intensity in the surgical department other than heart surgery, in which the mean maximum pain on the first day after surgery was 6.3 and

decreased to only 5.6 on the third day after surgery. The results of this study were consistent with our results.[9]

Patients undergoing surgery experience severe pain in the first 24 hours after surgery. The intensity of pain may vary depending on the type of operation and the treatment protocol given to the patient. In Lynch's study, the mean maximum pain on the first day after surgery was 6.3 based on the visual pain score. Gynecological surgeries have been reported to have a mean maximum pain of 8.1 ± 2.47.[10] In the study of Bameshki et al., the mean maximum pain was 8.4 2 2, which was slightly higher than the results of other studies and indicates the inadequacy of conventional methods of pain control in this area.[11]

In a study of 3170 patients, it was found that a visual pain score above 7 indicates severe pain, so it can be said that 82.1% of patients in the Bameshki study experienced a period of severe pain in the first 24 hours after surgery.[11] This figure has been reported between 87–9% in studies in Iran and 46–28%[10-12] in foreign studies, and 26% for outpatient operations. However, the average pain was severe in only 34.1% of patients, and the majority of patients reported their average pain as moderate, which was not acceptable because patients should have mild pain or visual pain score less than 5.[11] The articles indicate that the pain threshold was lower in women. In the present study, women reported more severe pain than men, although this was not statistically significant. This finding is consistent with a study that showed that despite 66.8% of women complained of pain compared to 48% of men, but this difference was not statistically significant.[10]

While all patients received dexamethasone and acetaminophen postoperatively for pain management, 13(32.5%) requested additional analgesia and were treated with morphine. Moreover, 5(12.5%) postoperatively received NSAD. In Bameshki study, methadone (85.1%), diclofenac (31%), and morphine (10.8%) were the most prescribed analgesics. Regarding the high intensity of patients' pain after surgery, using strong analgesics such as morphine in appropriate amounts is necessary.

It seems that less than the required amount of medication is used due to the fear of medical and nursing staff about the side effects of narcotics, especially respiratory failure or lack of knowledge on how to properly control postoperative pain, resulting in severe pain tolerance by patients.[11]

After surgery, patients were evaluated for complications, and 20 patients (50%) developed postoperative pain, followed by nausea (12 patients; 30%), fever (3 patients; 7.5%), respiratory apnea (3 patients), and bleeding (2 patients; 5%).

Intraoperatively, dexamethasone and hydrocortisone were administered for all patients. The results of the study by Elhakim et al.[13] showed that dexamethasone could not reduce the time of onset of oral feeding but significantly reduced the overall frequency of early and late vomiting (37% vs. 74%). Based on the findings of studies in this field and the above explanations, it seems that intravenous injection of dexamethasone during surgery can reduce pain and morbidity after pharyngoplasty and pharyngoplasty without any side effects.

It is believed that other studies with different doses of dexamethasone and more precise control of confounders can respond to the existing contradictions in the investigations of the effect of dexamethasone on morbidity after postoperative pharyngoplasty.

Conclusion

Given the serious complications of tolerating acute postoperative pain, especially the long-term effects of experiencing severe pain, it is needed to pay more attention to pain control. ■

References

1. Osman AM, Carter SG, Carberry JC, Eckert DJ. Obstructive sleep apnea: current perspectives. Nat Sci Sleep. 2018;10:21–34.
2. Lam KK, Kunder S, Wong J, Doufas AG, Chung F. Obstructive sleep apnea, pain, and opioids: is the riddle solved? Current Opinion in Anesthesiology. 2016;29(1):134–140.
3. Gozal D, Tan HL, Kheirandish-Gozal L. Treatment of obstructive sleep apnea in children: handling the unknown with precision. J Clin Med. 2020;9(3):888.
4. Kakkar RK, Berry RB. Positive airway pressure treatment for obstructive sleep apnea. Chest. 2007;132(3):1057–72.
5. MacKay SG, Lewis R, McEvoy D, Joosten S, Holt NR. Surgical management of obstructive sleep apnoea: a position statement of the Australasian Sleep Association. Respirology. 2020;25(12):1292–1308.
6. Pang KP, Tan R, Puraviappan P, Terris DJ. Anterior palate-plasty for the treatment of OSA: three-year results. Otolaryngology—Head and Neck Surgery. 2009;141(2):253–6.
7. Waxman JA, Shenouda KG, Lin HS. Assessment and management of postoperative pain associated with sleep apnea surgery. Otolaryngol Clin North Am. 2020 Oct;53(5):765–777.
8. Strutz PK, Kronzer V, Tzeng W, et al. The relationship between obstructive sleep apnoea and postoperative delirium and pain: an observational study of a surgical cohort. Anaesthesia. 2019;74(12):1542–1550.
9. Dabbagh A, Ghorbanloo M, Taherian M, Hosseini SM, Tavakkolpour AA, Rzavi SS, et al. Frequency of postoperative pain and its associated factors in Taleghani hospital. Pejouhesh dar Pezeshki (Research in Medicine). 2010;33(4):265–9.
10. Nikandish R, Ghafari M. Evaluation of post-operative pain management in females in the first 24 hours after surgery. Journal of Medical Research. 2004-2005;3(2-3):120–131.
11. Bameshki A, Jahanbakhsh S, Jangjoo A, Zandi H, Fathi M. Evaluation of acute postoperative pain and patient satisfaction in laparotomy, cholecystectomy and herniorrhaphy. Anesthesiology and Pain. 2013;4(2):196–201.
12. Tavakoli A, Nourouzi M, Haji Ze. Patients' satisfaction from pain soothing after the surgery in Kerman Hospitals (205). Journal of Kermanshah of University of Medical Science. 2007;11(2):206–214.
13. Elhakim M, Ali NM, Rashed I, Riad MK, Refat M. Dexamethasone reduces postoperative vomiting and pain after pediatric pharyngoplasty. Canadian Journal of Anesthesia. 2003;50(4):392–7.
14. Lynch EP, Lazor MA, Gellis JE, Orav J, Goldman L, Marcantonio ER. Patient experience of pain after elective noncardiac surgery. Anesthesia & Analgesia. 1997;85(1):117–23.
15. Patil SP, Ayappa IA, Caples SM, Kimoff RJ, Patel SR, Harrod CG. Treatment of adult obstructive sleep apnea with positive airway pressure: an American academy of sleep medicine clinical practice guideline. J Clin Sleep Med. 2019;15(2):335–343.