Case Report

Continuous Positive Airway Pressure Prevents Hypoxia in Dental Patient with Obstructive Sleep Apnea Syndrome under Intravenous Sedation

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Abstract

Use of sedation in patients with obstructive sleep apnea (OSA) in dentistry is limited. Hypoxia may develop during medication sleep in dental patients with OSA because of repetitive partial or complete obstruction of the upper airway. In this regard, anesthesiologists prefer not to give any sedative to surgical patients with OSA or support the use of general anesthesia due to good airway control. We report a case where we could successfully sedate a dental patient with OSA using intraoperative continuous positive airway pressure (CPAP) without hypoxia. Use of sedation and intraoperative CPAP in patients with OSA may be considered only if the effectiveness at home CPAP therapy is proven.

Keywords: Dentistry, safety, sedation, sleep apnea

Introduction

Use of sedation in patients with obstructive sleep apnea (OSA) in dentistry is limited. Hypoxia may develop during medication sleep in dental patients with OSA because of repetitive partial or complete obstruction of the upper airway. In this regard, anesthesiologists prefer not to give any sedative to surgical patients with OSA or support the use of general anesthesia due to good airway control. We report a case where we could successfully sedate a dental patient with OSA using intraoperative continuous positive airway pressure (CPAP) without hypoxia. The patient reviewed the Russian translation of this manuscript and gave written permission for the authors to publish the report.

Case Report

A 60-year-old woman applied for treatment at a dental clinic with complaints of impairment of her masticatory function associated with the instability of the mandibular denture. She was diagnosed with partial edentulism of the mandible at region 4.4–4.5 and offered treatment implant installation. From the medical anamnesis, it became known that she had had a long history of OSA syndrome which had been diagnosed 5 years before. She had been put on home CPAP therapy 1 year ago. One year later, the patient had noticed 12 kg weight loss, sleep improvement, decrease in fatigue, and normoglycemia recovery. However, at the moment of applying for treatment at the dental clinic, she weighed 105 kg, her body mass index was 37 kg/m², and her neck and waist circumferences were 45 cm (17.7 inches) and 120 cm (47.2 inches), respectively. Her oxygen saturation value on room air comprised 94–93%. Results of sleep polysomnogram confirmed diagnoses of moderate OSA, giving an apnea–hypopnea index of 34. The patient was offered surgery with regional anesthesia. However, the patient got frightened before treatment and required sedation. The patient refused surgery under general anesthesia and mechanical ventilation and accepted this type of anesthesia only in case of dangerous ventilation disorders during sedation. It was determined to operate under regional anesthesia with intravenous sedation and intraoperative CPAP. The choice of midazolam for sedation was due to known pharmacokinetic and pharmacodynamic effects of midazolam.
this drug and antidote-flumazenil availability. Administration of opioids was excluded. The patient was informed about the continuous monitoring of the vital body functions throughout the treatment period. The scope of monitoring is defined by the current recommendations on patient safety.\(^1\) In addition, the patient has been given information on the risk of complications during sedation and on the actions to be taken in case of these complications, based on the current clinical recommendations.\(^2,3\) She received comprehensive answers to all her questions. After being informed about that, the patient agreed to the proposed treatment and was then transported to the operating room. In the operating room, she was set in a semi-reclined position. Monitoring of vitals including pulse oximetry, sidestream capnography, electrocardiography, and noninvasive blood pressure (BP) was attached. After nasal mask fixation, CPAP machine with CPAP level 6 cm H\(_2\)O was connected. For the last 3 months, this pressure had been determined at home CPAP therapy. Resuscitation equipment was kept ready which included various types of air ducts, cricothyrotomy kit, defibrillator, emergency drugs, and respirator. Intravascular catheter 20-gauge was inserted into the saphenous vein of the left forearm. The initial dose of midazolam was 2.5 mg, total of 11.0 mg. The patient’s condition during the intraoperative period was stable. She was able to respond to voice commands or tactile stimulation. The vital signs remained steady during the procedure and were as follows: Respiration rate - 12–16/min, Sp\(_\text{O}_2\) - ≥92%, PetCO\(_2\) - ≤43, heart rate - 64–82 bpm, and BP - 155/85–120/76 mm Hg. The surgery took 2 h. When the surgery was finished, midazolam injection was stopped. Flumazenil 0.3 mg was administered intravenously to eliminate sedative effects of midazolam. Repeated administration of flumazenil was not required. At 2 h after the surgery, the patient was allowed to leave the clinic with assistance.

**DISCUSSION**

OSA is caused by repetitive partial or complete obstruction of the upper airway, characterized by episodes of apnea during sleep, which lasts for ≥10 s.\(^4\) Frequent hypoxia episodes during apnea may cause complications in the intraoperative period. Surgical patients with OSA are vulnerable to sedation, anesthesia, and analgesia which can cause complete airway collapse.\(^5\) Hence, preparation of patients with OSA for elective surgery demands an important prior assessment of their health status to determine procedure of operation and anesthesia. It is important to note not only symptoms intensity in patients with OSA but also an effectiveness of the OSA treatment. This case is of interest in anesthesia in dental patients with OSA on an outpatient basis. The important point is to assess the dynamics of the patient’s health after the administration of CPAP therapy. Our case demonstrates the improvement in the patient’s health resulted from outpatient CPAP therapy, and it allowed us to assume that it is safe to use it during sedation to prevent intraoperative hypoxia. Positive airway pressure is a standard treatment for patients with OSA, a sleep-related breathing disorder characterized by full or partial occlusion of the upper airway during sleep.\(^5\) CPAP therapy acts as an airway stent and is the primary treatment for patients with OSA. An observational study reports lower frequencies of serious postoperative complications when preoperative at home CPAP is compared with no preoperative CPAP.\(^6\) In the case described, health condition of the patient improved after a year of home CPAP therapy. Twelve kilograms weight loss, sleep improvement, decrease in fatigue, and normoglycemia recovery should be noted in evidence. We believe that intraoperative CPAP may reduce hypoxemia and/or hypercarbia in patients with OSA undergoing moderate sedation in this case. There is a known case of successful sedation in a patient with severe OSA using intraoperative bi-level positive pressure ventilation.\(^7,8\) In fact, nasal high-flow system prevents hypoxia in dental patients under intravenous sedation.\(^9\) However, its effectiveness in patients with severe OSA has not been studied. The risks of anesthetizing these patients can have complete airway obstruction and loss of airway, hypoxia, and hypercapnia and therefore should be managed according to the “Practice Guidelines for Management of the Difficult Airway: An Updated Report.”\(^10\) Thereby, anesthesiologists prefer not to give any sedative to patients with OSA or support the use of general anesthesia due to good airway control.\(^11\) The uniqueness of our case is the use of intraoperative CPAP and good quality of sedation in a dental patient with severe OSA for a long duration surgery without complications. We were able to successfully sedate her with the commonly used sedatives without any episode of intraoperative or postoperative desaturation and hypercapnia.

**CONCLUSION**

We have reported a case where we could successfully sedate a dental patient with OSA using intraoperative CPAP. Use of sedation and intraoperative CPAP in patients with OSA may be considered only if the effectiveness at home CPAP therapy is proven.

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**Conflicts of interest**

There are no conflicts of interest.

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