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Case Report

Anesthesia in multiple sclerosis and obstructive sleep apnea: case report and literature review

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Abstract

While patients with obstructive sleep apnea (OSA) or multiple sclerosis (MS) are at high risk of developing postoperative complications, both of them have special anesthetic considerations in intraoperative and postoperative periods. A careful preoperative evaluation, use of the optimal anesthetic regimen and close postoperative care is essential for these patients. Rarity of coexistence of both obstructive sleep apnea and multiple sclerosis in a surgical patient necessitates careful anesthetic management. We here report anesthetic management of a female patient with OSA and MS who underwent anesthesia three times for surgery and review the literature.

KEYWORDS: Sleep Apnea, Obstructive; Multiple Sclerosis; Anesthesia, General.

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Obstructive sleep apnea (OSA) which is caused by repetitive upper airway obstruction during sleep is relatively common disorder estimated to affect 2% of women and 4% of men in middle age.[1] Most frequent symptoms are snoring, apneas, hypopneas, daytime sleepiness, and cognitive impairment.[2] Multiple sclerosis (MS) is a disease characterised by demyelinization of different parts of brain and medulla spinalis.[3] Common symptoms include paresis, paralysis, impaired vision, sensations of burning or prickling, ataxia, spasticity, cognitive dysfunction, bladder and bowel dysfunction, fatigue and sexual dysfunction.[4]

Both OSA and MS have special anesthetic considerations. A good preoperative preparation, and careful management of the perioperative and postoperative periods are essential while OSA is associated with increased perioperative morbidity and mortality. It is suggested that disastrous respiratory outcomes may complicate the intraoperative management of OSA patients.[5] The reasons for this include difficult airway during induction, respiratory obstruction just after extubation and respiratory arrest with the administration of opioids and sedatives in the postoperative period.[6] All these may result in brain damage and death. Due to the abovementioned risks, the use of neuroaxial and peripheric blockades is a good option in OSA patients depending on the the type of operation performed. However, regional blockades may carry a risk of exacerbation for MS patients.

In patients with multiple sclerosis, perioperative hyperthermia and the stress

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response initiated by surgery and anesthesia can exacerbate the symptoms. The agents used in treatment of multiple sclerosis can interact with anesthetic agents. In spite of contrary opinions, central and peripheral blocks may have negative effects on the course of disease.[7, 8]

While OSA and MS may be coexisting diseases, there is no report of the anesthetic management of a patient with OSA and MS until now. In this case report, we reported the anesthetic management of a patient with MS and coexisting OSA.

Case Report

Thirtythree year-old-female patient complained of pain, swelling and locking in right knee joint was admitted to the Research and Training Hospital of Ankara, Turkey, in February of 2005. After an orthopedic examination, she was diagnosed with osteochondritis dissecans type 3 and an arthroscopic surgery was scheluded.

Aside from this complaint, the patient had a diagnosis of OSA who had been followed for two years and had a diagnosis of MS who had been followed for 3 years. Her complaints included hoarseness, urinary incontinance, difficulty during walking, dyplopia, dizziness, anxiety, headache and hypoesthesia in both lower legs. No cardiac problem was found after cardiologic assessment. An MRI study has revealed plaque formations in right frontal lobe, bilateral centrum semiovale, medulla oblangata and Th_1 and Th_2 levels of medulla spinalis.

The patient had also sleeping disorders and snoring. Her height was 161 cm, weight was 93 kg, body mass index was 35.87 and neck circumference was 39 cm with a Mallampati class III airway. Her apnea-hypopnea index (AHI) was found as 22.36 after an polysomnographic examination. She had used thioridazine, escitalopram and risperidone for depressive disorder in the past, however she hasn't took any medication for six months at that time.

Before the scheluded operation, she had been instructed to use continuous positive airway pressure (CPAP) mask at nights for two months. After this period, AHI value decreased from 22.36 to 8.20. Her preoperative laboratory tests was in normal range except a mild high leukocyte count (12,000 cells/mm^3).

General anesthesia was planned for anesthetic approach (Figure 1). After admission to the operating room, an IV cannula was inserted and ECG, NIBP, and SpO_2 was monitored. An axillary probe and oesophageal probe was used for temperature monitoring. Anesthesia was induced with 0.2 mg/kg midazolam and 0.1 mg/kg fentanyl, after preoxygenation for 3 minutes with 100% oxygen. Atracurium 0.5 mg/kg was given to facilitate intubation. Following endotracheal intubation, 1.8% sevoflurane in 50% N_2O-O_2 mixture was used for maintenance of anaesthesia. Duration of operation was 55 minutes. No reversal agent was given. Extubation was performed after the spontaneous ventilation was completely returned and CPAP mask was performed just after the extubation. After 30 minutes care at postanesthesia care unit (PACU), she was discharged to the intermediate care unit while her vital signs and body temperature was stable. A demand-only IV-PCA with tramadol was used for postoperative pain control for 24 hours. No MS symptoms was observed clinically and no MRI findings related with MS was seen postoperatively.

Eighteen months after the first operation, the patient was hospitalised for incomplete abortus and scheluded for dilation and curettage. Preoperative blood examination was normal except a leucocyte count of 15,400 cells/mm^3. Patient kept using CPAP mask preoperatively. Her complaints were the same as before indicating no MS exacerbation. On the operation room, she was monitored by ECG, noninvasive blood pressure (NIBP), peripheral oxygen saturation (SpO_2) and body temperature. After an IV cannulation, she was preoxygenated for 3 minutes with 100% oxygen. For anesthesia induction 0.2 mg/kg

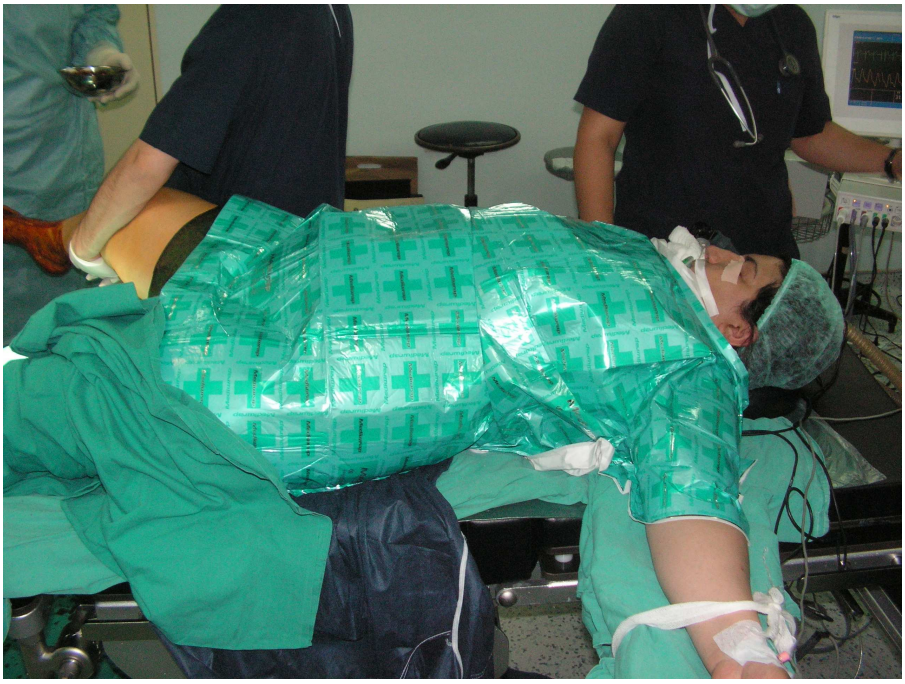

Figure 1.

midazolam and 0.1 mg/kg fentanyl was used. During 20 minutes of operation, mask ventilation was performed and spontaneous breathing was supported. Operating room temperature and body temperature was kept constant during the operation. CPAP mask was also performed after the extubation. She transferred to intermediate care unit after a care period of 30 minutes at PACU. No MS symptoms was observed after the operation.

One year after the second operation, the patient complained of pain on the right foot. After an examination by orthopaedic surgeons, an arthroscopic surgery was planned for a diagnosis of osteochondritis dissecans type 4. In preoperative evaluation, respiratory care physician performed a respiratory function test and found that FVC was 99%, FEV_1 was 92% and FEV_1/FVC was 98%. Patient also kept using CPAP mask during this time. Neurological examination did not reveal any pathologic finding suggesting an MS attack. Preoperative blood tests was normal. In the operation room, an IV route was established and ECG, NIBP, SpO_2 and body temperature was monitored. After preoxygenisation for 3 minutes with 100% oxygen, anesthetic induction was made with 0.3 mg/kg midazolam. Endotracheal intubation was facilitated with 0.5 mg/kg atracurium. For maintenance of anesthesia 1.5% sevoflurane in 50% N_2O-O_2 mixture was used. At the end of the operation no reversal agent was given. Extubation was done after complete recovery of spontaneous ventilation and a CPAP mask was instituted. Vital signs were observed for 30 min at PACU and she then transferred to intermediate care unit. A demand-only IV-PCA with tramadol was used for postoperative pain control for 24 hours.

In all surgeries, dalteparine 2500 IU/0.2 ml was used preoperatively for thrombophylaxis. No arrhythmia, apnea, and oxygen desaturation was seen in perioperative period and she was kept in semi-upright position at PACU and intermediate care unit in all operations.

Discussion

In 1991, Younger et al. first noticed a common inheritance for multiple sclerosis and a kind of sleep disorder (narcolepsy) in two patients.[9] Clark et al. determined that the prevalence of sleep problems which include insomnia, sleep apnea, daytime sleepiness, distortions during sleep, restless leg syndrome, and periodic leg

movement disorder was three times higher in the patients with MS than the population.[10] They also noticed that the presence of "sleep difficulties" was associated with increased levels of depression. Later studies support close association of depression and sleep apnea too.[11]

After MRI scan examinations, Clark et al. suggested that several lesion sites are responsible for the higher incidence of depression and sleep disorders in some patients with MS.[10] Ferini-Strambi et al. made an polysomnographic study and MRI analysis on 25 MS patients and found that two patients had sleep apnea.[12] Tachibana et al. also aimed to determine the association of sleep disorders and MS. Of the 28 patients they studied, 54% reported sleep-related problems. Polysomnography revelaed that two of them had sleep apnea.[13] Close association of these three conditions is true for our patient while she had OSA and MS, and a history of depression. However, no case report until now has been reported for the anesthetic management of these two conditions in a single patient. We here report the anesthetic management of a case who suffered from OSA and MS.

Operation in the patients with MS is an important concern for anesthetist, while it bears a risk of exacerbation of the pre-existing disease after surgery. However, not only the surgery itself cause exacerbations; stress, a rise in temperature and infections are also the factors for it. Therefor, a careful evaluation, monitoring and care should be planned for preoperative, intraoperative and postoperative periods.

There exists a controversy in providing regional techniques to patients with neurological diseases. Although several case reports suggested that spinal/epidural anesthesia can be given to patients with MS without major and sustained effects[14, 15] and a retrospective study have found no subsequent exacerbation of disease process in the patients with MS undergoing neuroaxial anesthesia,[16] it should be known that both intrathecally and systemically administered local anesthetics may unmask silent demyelinated plaques.[7, 17] In addition, hypotension which can be seen with neuroaxial blocks, may be resistant to vasopressor therapy.[18]

Peripheral blockades may also cause adverse effects in patients with MS. Extended duration of anesthesia and severe brachial plexus injury has been reported following paravertebral block or interscalene brachial plexus block in MS patients in recent works.[8, 19]

Although uncommon, subclinical peripheral neuropathy may be accompanied by the other symptoms of MS in some patients.[20, 21] Therefor, aside from anesthetic risk factors including mechanical trauma, local anesthetic neurotoxicity and the effects of vasocontsrictors, preexisting neurologic pathology which mostly remains unrecognized may be associated with neural injury that can be seen after anesthesia.[8, 22] This is based on the "double-crush" phenomenon. This suggests that patients with preexisting neural compromise may be more susceptible to injury at another site when exposed to a secondary insult.[23]

For "the patients with pre-existing neurologic deficits", American Society of Regional Anesthesia and Pain Medicine (ASRA) guidelines stated that these patients "may be at increased risk of new or worsening injury regardless of anesthetic technique" and "a careful risk-to-benefit assessment of regional anesthesia to alternative perioperative anesthesia and analgesia techniques should be considered".[23]

For the operations of our patient, a neuroaxial or peripheral nerve blockade could be an option for anesthesia/analgesia in the perioperative/postoperative period. However, due to absence of defined consensus and guidelines for the choice between regional or general anesthesia and a significant improvements in apnea-hypopnea index (AHI) after preoperative CPAP uses, we preferred to use general anesthesia. In this way, respiratory problems were eliminated and the possible neurologic injuries were prevented.

Epidural anesthesia is not fully innocent for neurological disorders. Patients with various neurological disorders may show exacerbations after epidural anesthesia.[24] Epidural block can also exacerbate the symptoms in MS patients.[25]

It is suggested that both propofol and thiopentone are safe agents for induction of anesthesia.[26] However, midazolam that we used in all three operations offers a great advantage in MS patents with its minimal effect on thermoregulatory control.[27]

Since MS patients have a resistance to the opioids, and perioperative complications are directly correlated to the amount of opioids that were used intraoperatively in OSA patients,[28] we limited the amounts of opioids in perioperative period.

The use of succinylcholine is to be avoided due to risk of hyperkalemia in MS patients.[29] A resistance to nondepolarizing muscle relaxants is also concerned due to an increase in acetylcholine receptors. Although Brett at al. reported a resistance to atracurium in a patient with MS more than 20 years ago,[30] any other report was not found in the literature. We preferred to use atracurium as a muscle relaxant and did not use any reversal agent at the end of operation while the anticholineric drugs impair temperature regulation.[31]

Influence of temperature regulation on MS is an important issue for these patients. Decreases in body temperature improves the symptoms while hyperthermia can lead to the conduction block in neurons. These worsening effects may be persistent in some patients.[32, 33] A close monitoring of body temperature by skin probe and oesephageal probe offered us to keep the temperature within its narrow range.

Anesthesiologists should be aware that undiagnosed OSA is more common than was previously thought. The incidence of OSA in bariatric surgery patients is reported as 78%.[34] It can be expected that the prevalence of OSA in this patient group is greater than general surgical population because obesity is the most significant risk factor for OSA. However, the prevalence of OSA for "non-OSA" surgery is also not smaller than general population. A study by Fidan et al. revealed that this ratio was 3.2% for noncardiac surgery patients.[35]

ASA recommends that patients should be screened for risk of OSA in the preoperative period.[36] Although polysomnography is gold standard in diagnosing OSA, there exists several clinical screening tests to be used for that aim. These include ASA Checklist,[36] Berlin questionnaire[37] and STOP questionnaire.[38] Making a diagnosis by using any of these diagnostic methods and screening tools will improve perioperative and postoperative care of OSA patients.

It is estimated that 80-90% of patients with OSA remains undiagnosed.[39] Fortunately, our case was aware of her diagnosis with a folllow-up period of two years. It allowed us to use preoperative measures to reduce intraoperative and postoperative risks.

The anesthetic management of patients with OSA is complicated due to possible difficulty in the ventilation and intubation of the patient and increased risk of the respiratory problems in the postoperative period. Since OSA is significantly associated with obesity, hypertension, diabetes mellitus and ischemic heart disease, these can increase the risk of adverse effects related to OSA in the perioperative setting. Difficult intubation, postoperative respiratory depression and airway obstruction may result in brain damage or death. It is suggested that prevalance of difficult intubation in OSA patients is higher than in the population.[40-42] A retrospective study by Esclamado et al. showed that airway problems consists of the great majority of the perioperative complications of OSA patients.[28] According to the ASA Closed Claims database, in two thirds of the closed claims in which extubation failure led to brain damage or death, the cases were obese and/or OSA patient.[43]

It is well known that one of the most efficient treatments of OSA consists of CPAP use during sleep at night. The ASA OSA Guideline states that "preoperative use of

positive airway pressure (CPAP) ... may improve the perioperative condition of patients who are at increased perioperative risk from OSA". In this context, preoperative use of CPAP leads to improvement of OSA and reduce the related complicatons.[44, 45] Although the optimal duration of preoperative CPAP therapy is unknown, our patient used CPAP for two months preoperatively, leading to a significant decrease in AHI, from 22.36 to 8.20.

While the risk of postextubation airway obstruction is high in OSA patients,[44] we preferred to extubate our patient when she was fully awake in all three instances. Although it has been suggested that CPAP or noninvasive positive pressure ventilation be used immediately after the end of operation, some simple measures like positioning the patient in the lateral posture and use of a nasopharyngeal airway may also improve postoperative oxygenation.[46] With the use of CPAP, no complications were encountered in the early postoperative period in our patient.

Postoperatively, OSA patients have a higher rate of complications, higher need for intensive care interventions and longer hospital stays.[45] However, with the presence of a low AHI value and a close monitoring in PACU, the patient could be transferred to intermediate care unit in 30 minutes without any adverse effects.

The first postoperative 24 hours is the most critical time while most complications like hypoxemia, arrhythmias and death occurr during this period. These complicatons might be caused by an increase in REM sleep (i.e. REM rebound)[47] and the lingering effects of opioids and sedatives.

Although it is suggested that use of PCA with background infusion will increase the incidence of hypoxemia,[6] demand-only IV-PCA has been used safely for postoperative analgesia in morbidly obese patients,[48, 49] up to 40% of whom may have OSA.[50] In the first and third operations (i.e. knee arthroscopy and foot ankle arthroscopy), we used IV-PCA tramadol without background infusion for postoperative pain control and no episodes of desaturation was encountered.

In this case report, we aimed to discuss the anesthetic management of a patient with MS and coexisting OSA. A comprehensive preoperative evaluation, selecting the optimal anesthetic regimen and close postoperative care is essential for these patients. In the absence of strict guidelines, decision about anesthestic technique should be based upon the balance of risk-benefit for each specific patient.

Conclusion

While both MS and OSA have special anesthetic considerations, a good preoperative preparation and careful intraoperative and postoperative management is essential for decreasing perioperative morbidity and mortality.

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Conflict of Interests

Authors have no conflict of interests.

Authors' Contributions

AC and SEG prepared the article. ETU and IYG gathered the information. All authors participated in anesthetic management of the patient. All authors have read and approved the content of the manuscript.

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