

# Intraoperative BiPAP in OSA Patients

BHAVNA P SINGH<sup>1</sup>, KODANDARAM N SURYANARAYANASASTRI<sup>2</sup>

## ABSTRACT

Obstructive sleep apnea syndrome (OSA) is characterized by recurrent episodes of partial or complete upper airway obstructions during sleep. Severe OSA presents with a number of challenges to the anesthesiologist, the most life threatening being loss of the airway. We are reporting a case where we successfully used intraoperative bi level positive pressure ventilation (BiPAP) with moderate sedation and a regional technique in a patient with severe OSA posted for total knee replacement (TKR). A 55-year-old lady with osteoarthritis of right knee joint was posted for total knee replacement. She had severe OSA with an apnea-hypopnea index of 35. She also had moderate pulmonary hypertension due to her long standing OSA. We successfully used in her a combined spinal epidural technique with intraoperative BiPAP and sedation. She had no complications intraoperatively or post operatively and was discharged on day 5. Patients with OSA are vulnerable to sedatives, anaesthesia and analgesia which even in small doses can cause complete airway collapse. The problem, with regional techniques is that it requires excellent patient cooperation. We decided to put our patient on intraoperative BiPAP hoping that this would allow us to sedate her adequately for the surgery. As it happened we were able to successfully sedate her with slightly lesser doses of the commonly used sedatives without any episodes of desaturation, snoring or exacerbation of pulmonary hypertension. Many more trials are required before we can conclusively say that intraoperative BiPAP allows us to safely sedate OSA patients but we hope that our case report draws light on this possibility. Planning ahead and having a BiPAP machine available inside the operating may allow us to use sedatives in these patients to keep them comfortable under regional anaesthesia.

**Keywords:** Loss of airway, Obesity, Sedation

## CASE REPORT

A 55-year-old lady presented with chief complaint of severe pain in both knees. She was diagnosed of bilateral osteoarthritis and posted for right total knee replacement (TKR) at ESI medical college. She had a long history of OSA which was diagnosed 10 years ago. She had been put on home CPAP therapy but her compliance was poor. She was obese weighing 106 kg and her BMI was 41kg/m<sup>2</sup>. She had a family history of obesity but family history of OSA could not be elicited. On questioning our patient had dyspnea of NYHA [1] (New York Heart Association) grade 2 so we did an Echocardiogram suspecting pulmonary hypertension. As suspected we found moderate pulmonary hypertension MPAP-40mm Hg with right ventricular hypertrophy, both right and left ventricular functions were normal and her arterial blood gases drawn when she was awake on room air was normal. We sent her for sleep polysomnogram which confirmed our diagnoses of severe OSA giving an apnea hypopnea index (AHI) of 35.

Due to the obvious benefits of regional anaesthesia in orthopedic surgeries we chose a combined spinal epidural technique. There was a problem about how much sedation to give her or whether to give her any sedation at all. Total knee replacement is a long procedure and requires the patient to lie in the supine position which is a problem in these patients since it requires a lot of patient cooperation and there is an increased risk of desaturating in this position. Since the benefits of preoperative and postoperative BiPAP have already been recognized, we decided to try intraoperative BiPAP on this patient. After her consent was taken she was shifted to the operating room in a semi reclined position with monitoring of vitals. A peripheral line was inserted and she was preloaded with 500ml Ringer's lactate solution. Monitors including 5 electrode ECG, Non invasive blood pressure, pulse oximetry were attached. Bladder was catheterized for urine output monitoring due to the long duration of surgery. Resuscitation equipment was kept ready which included emergency drugs, a cricothyrotomy kit, defibrillator and treacheostomy kit. In sitting position, L2-L3 interspace was

used to place a 20G epidural catheter by loss of resistance to air technique. After a negative test dose response L3-L4 interspace was used for the dural puncture and 2.5 ml of 0.5% Bupivacaine heavy was injected after confirming free flow of CSF. Her level of block was maintained around T10 throughout the procedure. She was then put on oxygen through a BiPAP machine with 12 cm H<sub>2</sub>O IPAP and 4cm EPAP with a back up rate of 12 breaths per minute. We then sedated her with 1.5 mg midazolam and 50 µg fentanyl. We activated the epidural after 90 min with 6 ml of 0.5% Bupivacaine which was then repeated intermittently every 60 min. She was responsive, comfortable and stable throughout the procedure. She had an uneventful postoperative period; BiPAP was continued postoperatively for 48 h. She recovered well and was discharged after five days.

## DISCUSSION

Obstructive sleep apnea syndrome (OSA) is defined by recurrent episodes of partial or complete upper airway obstructions during sleep [2]. Obstructive sleep apnea is becoming common among patients coming for surgery, due to the increasing incidence of obesity and diabetes. Estimates of disease prevalence are in the range of 3% to 7% [3]. Incidence in obese people has been said to be as high as 40% [4]. OSA has said to be one of the most common causes of daytime sleepiness in adults. The pathology involves a reduction of the expansion forces of the pharyngeal dilator muscles causing collapse of the upper airway in sleep [5]. Studies have suggested various methods to help diagnose and assess the severity of OSA in the pre op clinic and to tailor anaesthesia in the best and safest way possible for them. The STOP-BANG questionnaire has a high sensitivity to pick up these patients but for a definitive diagnosis and to assess severity a complete sleep polysomnogram is necessary [6]. Many patients present directly with complications intra operatively or postoperatively. Untreated OSA results in an increased morbidity and mortality rate. OSA patients are at a greater risk of developing cardiovascular disease, hypertension (10-fold increase) both systemic and pulmonary [7],

and stroke. Cases have been reported where there have been deaths postoperatively due to sedative use [6]. It has already been said by Chung et al., that surgical patients with OSA are vulnerable to sedation, anaesthesia and analgesia which can cause complete airway collapse [6]. Treatment of OSA is initially to correct reversible factors like weight loss, abstinence from alcohol and smoking, exercise, sleeping in lateral position and control of other co morbidities. Home CPAP therapy has been proven to benefit these patients immensely and delay the onset of pulmonary hypertension [8]. Mandibular repositioning appliances (MRAs) and surgeries like uvulopalatopharyngoplasty (UPPP) are being studied as a last resort in severe OSA [8]. There is a role of BiPAP in patients when CPAP fails [9]. Our patient was advised home CPAP therapy but was not compliant because of nasal irritation and sound of the machine. In fact it has been suggested that nearly 30% of patients do not tolerate CPAP therapy. The risks of anesthetizing these patients are numerous, they can have complete airway obstruction and loss of airway, hypoxia, acidosis, cardiac arrest exacerbation of pulmonary and systemic hypertension and hypercarbia. These problems can continue postoperatively as well. Ogan and Plevak stated that even mild sedation can cause complete airway obstruction and respiratory arrest. They also said that many anesthesiologists do not prefer to give any sedatives to patients with OSA. Older studies support the use of general anaesthesia due to good airway control [10]. Marie-Therese et al., have reported a case where the patient has died due to respiratory arrest when they used unrestricted doses of opioids. They later found that CPAP (continuous positive airway pressure) helped their other OSA patients recover well [11]. Regional anaesthesia has several advantages, besides avoiding the need for inhalational agents and airway instrumentation, it produces ideal operating conditions due to good muscle relaxation, lesser blood loss and lesser incidence of deep venous thrombosis, pulmonary embolism, excellent post operative pain relief, faster mobilization and early discharge [12]. The problem with regional techniques is that it requires excellent patient cooperation. Since the patients are awake and they are immobilized for the duration of surgery it is difficult for them to lie still the whole time. They start experiencing discomfort in the non anaesthetized parts and request to move them. We usually sedate our patients when we use regional techniques so they are comfortable and cooperative for the whole procedure. But in OSA patients, sedation comes with its own risks as stated above. There is long standing evidence suggesting that midazolam, in sedative doses, can increase supraglottic airway resistance leading to obstructive episodes. The already compromised airway in OSA patients may exacerbate the respiratory-depressive effects of drugs such as opioids, benzodiazepines, propofol and even dexmedetomidine [13].

Long standing OSA can lead to development of pulmonary hypertension [14]. It has been stated by Price et al., that patients with mild-to moderate pulmonary hypertension, can have peri operative complications in up to 29% of the patients [15].

Precautions to be taken while sedating these patients are to use the drugs in very small doses, titrate it to response, with supplemental oxygen and constant monitoring of saturation and sedation score. Due to fear of losing the airway, these patients are frequently

under sedated and hence become uncooperative and have bitter memories of the surgery and anaesthesia. The uniqueness of our case is the use of intraoperative BiPAP and good quality of sedation in a patient with severe OSA for a long duration surgery without complications. We chose intraoperative BiPAP hoping that this would allow us to sedate her adequately for the surgery. As it happened we were able to successfully sedate her with the commonly used sedatives without any episodes of either intraoperative or post operative desaturation, snoring or exacerbation of pulmonary hypertension. Many more trials are required before we can conclusively say that intraoperative BiPAP allows us to safely sedate OSA patients but we hope that our case report draws light on this possibility.

## CONCLUSION

We are reporting a case where we could successfully sedate a patient with OSA and pulmonary hypertension for a long duration surgery under regional anaesthesia using intra operative bi level positive pressure ventilation (BiPAP). Severe OSA presents with a number of challenges to the anesthesiologist, the most life threatening being loss of the airway. Planning ahead and having a BiPAP machine available inside the operative room can give us some reassurance and allow us to use sedatives to make these patients comfortable under regional anaesthesia.

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### PARTICULARS OF CONTRIBUTORS:

1. Junior Resident, Department of Anesthesiology, Employees State Insurance Medical College and Research Centre, Rajajinagar, Bangalore, India.
2. Head of Department, Department of Anesthesiology, Employees State Insurance Medical College and Research Centre, Rajajinagar, Bangalore, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Kodandaram N Suryanarayanasastry,  
No.180, Deepashri, Near Yediyur Lake, 2<sup>nd</sup> Main, 24<sup>th</sup> Cross, 6<sup>th</sup> D Block,  
Jayanagar, Bangalore – 560011, Karnataka, India.  
E-mail : kodandaramns@gmail.com

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