

# Continuous Oximetry Offers Promise To Reduce the Risk of Perioperative Complications in OSA Patients

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#### Letter to Editor

Obstructive sleep apnea (OSA) is common in surgical patients and patients with this diagnosis who remain unrecognized or untreated are at higher risk of complications in the perioperative period. Effective, protocolized approaches to identify at risk patients who require OSA evaluation before surgery, and to monitor compliance and adequacy of PAP therapy are essential to minimize these risks. Continuous nocturnal oximetry offers promise as an effective monitoring strategy to address these areas of need.

The prevalence of sleep disordered breathing in patients undergoing elective surgery is at least as common as the general population, with studies reporting rates of mild-moderate obstructive sleep apnea (OSA) of 22% [1]. The vast majority of these patients go undiagnosed prior to surgery, prompting the development of such screening tools as the STOP-Bang (snoring, tiredness, observed apneas, elevated BP and BMI, age, neck circumference, and male gender) questionnaire that has been shown to effectively identify at risk patients with moderate to severe OSA using a threshold score of 5-8 [2].

OSA patients adherent with positive airway pressure (PAP) therapy preoperatively have a lower incidence of postoperative complications and shorter hospital length of stay, prompting recommendations to identify and treat OSA before proceeding with elective surgery [3]. Unfortunately many OSA patients go undiagnosed, and studies examining PAP adherence in patients newly diagnosed prior to surgery have reported poor adherence [3]. These stark realities highlight the need for better identification and management of at risk individuals in the perioperative setting.

OSA increases the risk of difficult intubation, reintubation, hypercapnea, hypoxemia, cardiac arrhythmia, myocardial injury, delirium, unplanned ICU transfer, prolonged hospitalization, and death after surgery [4]. Anesthetic agents can reduce pharyngeal muscle tone, exacerbating upper airway narrowing and pharyngeal collapse in these patients. Opioids and benzodiazepines decrease ventilation and blunt arousal from sleep, with amplified effects in patients with untreated OSA because recurrent chronic hypoxemia can increase the number of available central opioid receptors [5]. Surgical stress and pain can cause postoperative sleep deprivation and fragmentation; the subsequent rebound in REM sleep during recovery can result in several days of increased vulnerability to airway obstruction. Common coexisting illnesses such as obesity, heart disease, insulin resistance, and secondary pulmonary hypertension can further compromise cardiopulmonary function in the perioperative period. Despite this, there is no evidence based management plan for OSA in the perioperative period.

The American Society of Anesthesiologists recommends early identification and preparation for perioperative management of patients with suspected OSA. Special considerations in this setting include consideration of regional over general anesthesia when possible, preparation for possible difficult airway management, judicious use of opioid analgesics and non-opioid adjuncts during and after surgery, careful observation of oxygenation and hemodynamics in the post-anesthesia recovery unit, and positioning patients at a 30 degrees head up or lateral position for a minimum of 2 hours after surgery [2]. Early and aggressive use of PAP in the immediate postoperative setting reduces the risk of complications [6]. Yet, there is little data that examines if pressures titrated in the outpatient setting or initiated in the immediate post-operative period are sufficient to counter these complicating perioperative physiologic considerations.

Brar et al. [7] examined these questions in an observational study, performing continuous nocturnal oximetry on 38 OSA patients during their first post-operative night [7]. All patients were treated with their outpatient PAP devices and predetermined pressures. They were monitored using a sleep apnea protocol with vitals and SpO2 measurements every 2 hours. PAP use, removal, and attempts to replace were also documented.

The investigators found 18% of these patients developed significant hypoxemia while on PAP, defined as > 30 minutes with a SpO2 <89%; 42% of the nocturnal tracings in the hypoxic group (HG) were consistent with uncontrolled OSA. The HG received more fluids, opioids and had more atelectasis during the first postoperative day. They also had more severe and positional OSA than patients who did not manifest hypoxemia while on PAP; however, there was no difference in the outpatient PAP levels between the groups.

The results of this study are important, but remain hypothesis generating due to several limitations. The reliance on subjective reporting of pre-operative PAP adherence provides wide latitude for non-compliance, which could be a major confounding factor in these results. Ideally all patients would have had objective adherence documented with smart card technology. Patients in the HG received more fluids, medications, and were noted to have more atelectasis. It is unclear based on oximetry tracing data alone how much of the hypoxia was from OSA, central apneas, atelectasis or cardiopulmonary disease. While OSA has characteristic findings on oximetry, it is by no means definitive. The study was underpowered to determine if patients with low cardiopulmonary reserve are more prone to hypoxia and thus require closer monitoring. While BMIs and surgical procedures were similar, further information on truncal obesity would have been helpful. Truncal obesity should be readily apparent in the perioperative setting, and may further decrease functional residual capacity and contribute to hypoxemia.

This paper highlights the promising potential role of continuous oximetry in improving the pre- and postoperative care of OSA patients. Patients on PAP therapy with  $\geq 5$  desaturations per hour documented by nocturnal oximetry have a significantly higher rate of postoperative complications, demonstrating the utility of this simple test as a preventive strategy to address noncompliance and inadequately titrated PAP therapy [8]. This paper demonstrates that continuous oximetry can identify patients whose outpatient PAP pressures are inadequate in the postoperative setting. Taken together, the use of preoperative assessment, prediction tools and desaturation frequency in the post-anesthesia care unit affords clinicians the opportunity to further risk stratify patients and adjust their management plan-perhaps through a respiratory therapist driven protocol to maximize PAP perioperatively in a more monitored setting to prevent hypoxemia and optimize outcomes.

It is important to note the excellent outcome of patients in this study holds promise that meaningful prevention of OSA associated complications is both plausible and possible. Additional research is required to determine if the use of continuous oximetry in the perioperative setting translates into meaningful clinical improvements in larger cohorts of patients with OSA undergoing elective surgery.

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