

Obstructive Sleep Apnea: Implications for the Plastic Surgeon and Ambulatory Surgery Centers

Phillip J. Stephan, M.D.
David Mercier, M.D.
Jayne Coleman, M.D.
Rod J. Rohrich, M.D.
Dallas, Texas

The dynamic growth of surgery in general and plastic surgery in particular has resulted in a greater number of ambulatory surgery centers. The ambulatory surgery center, as well as the plastic surgeon's office, offers a more streamlined, cost-effective practice setting for the plastic surgeon. With the continued rise of healthcare costs, patients and physicians are electing to utilize ambulatory surgery centers to rein in costs and still deliver high-quality medical care. Because most ambulatory surgery centers and plastic surgeons' offices are free-standing, proper patient selection is a key factor in maintaining safety. Unfortunately, patient deaths and adverse outcomes related to plastic surgery are currently receiving tremendous attention in the media. Therefore, patient safety issues, while always important to the physician, have now taken a forefront in the media. Meanwhile, patient safety goals and continuous quality improvement are of paramount importance to medicine in general and the outpatient setting in particular.

One key issue with significant safety implications for both office-based and ambulatory surgical settings is the rising incidence of obstructive sleep apnea. With the increasing population age and girth, obstructive sleep apnea is an ever-increasing public health burden across the United States. It is largely undiagnosed, yet has significant implications relative to anesthesia risk in the ambulatory surgery center.¹ Studies have shown as much as a threefold increase in postoperative morbidity in patients with obstructive sleep apnea versus non-apnea-matched controls undergoing major surgery.² The plastic surgeon, other surgical practitioners, and the anesthesia team must be

acutely aware of the diagnostic criteria and preoperative, intraoperative, and postoperative implications of obstructive sleep apnea in patients undergoing general anesthesia or conscious sedation in the outpatient setting. We will outline the diagnostic criteria for obstructive sleep apnea, discuss perioperative management tools, and review the American Society of Anesthesiologists' practice guidelines.³

BACKGROUND

Obstructive sleep apnea is characterized by periods of episodic apnea, snoring, daytime somnolence, and upper airway obstruction. Obstructive sleep apnea is a significant health issue and affects as many as 18 million Americans. Sleep apnea syndrome occurs in a male-to-female ratio of 3:1 and has a significant correlation to obesity.¹ The diagnostic test of choice is polysomnography (sleep study) with calculation of the apnea/hypopnea index.⁴ Apnea is defined as cessation of airflow from the nose or mouth for a period of at least 10 seconds. Hypopnea is defined as a 50-percent reduction in air flow that causes a greater than 4-percent drop in oxygen saturation. The apnea/hypopnea index is the number of apnea/hypopnea episodes occurring during sleep in a given hour. An apnea/hypopnea index of greater than 5 is diagnostic of obstructive sleep apnea. Obstructive sleep apnea is then qualified as mild, moderate, or severe based on the apnea/hypopnea index.

Obstructive sleep apnea has physiologic effects with tremendous clinical relevance to both surgery and anesthesia. Anatomically, the obstructive

From the Departments of Plastic Surgery and Anesthesiology and Pain Management, University of Texas Southwestern Medical Center.

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tion is caused by upper airway collapse due to excessive soft-tissue forces and negative pressure overriding the opposing forces maintaining a patent airway.^{5,6} Excessive soft-palate and pharyngeal tissue contribute to loss of airway cross-sectional area, and weak muscle tone fails to maintain the patent airway against negative inspiratory pressure. The resulting upper airway collapse during sleep leads to apnea, hypoxia, hypercarbia, and acidosis. Central nervous system receptors sense the oxygen, carbon dioxide, and pH changes and cause arousal, ending the obstructive cycle.⁵ As sleep progresses, the cycle repeats, causing persistent arousal and poor rapid eye movement sleep. Long-term sleep apnea can have deleterious effects on the cardiovascular system, pulmonary circulation, and central nervous system. Both the right and left heart are affected by the hypoxia and acidosis causing vasoconstriction, increased systemic vascular resistance, pulmonary vascular resistance, and eventual systemic and/or pulmonary hypertension. The increase in systemic vascular resistance increases cardiac work and can result in left ventricular hypertrophy, ectopy, and cardiac arrhythmias. The increase in right heart afterload can lead to pulmonary hypertension and possible right-sided heart failure.

CLINICAL IMPLICATIONS

Patients with obstructive sleep apnea present a variety of issues pertinent to the operating surgeon and the anesthesia team: (a) Systemic and pulmonary hypertension can occur due to the hypoxia and metabolic changes of acidosis and hypercarbia. Increased cardiac irritability can be a primer for arrhythmias. (b) The central nervous system in the obstructive sleep apnea patient is more susceptible to the respiratory depressant effects of opiate analgesia. This altered sensitivity and preexisting hypoxia/hypercarbia can narrow the therapeutic window for opioid use. (c) Polycythemia is another physiologic response to chronic hypoxia. Erythropoietin levels are elevated as a response to chronic hypoxia. The resulting increased red blood cell volume can lead to a predisposition to blood clots, stroke, and myocardial ischemia. (d) There is a strong association with obesity and obstructive sleep apnea.^{7,8} The anatomic abnormalities described earlier with the soft palate and pharynx can make for extremely challenging airways in the operating room. Clinical signs of enlarged tonsils, increased neck circumference, or history of prior airway difficulties are all clues to the proper clinical management of the obstructive sleep apnea patient. (e) Pickwickian

syndrome is associated with severe sleep apnea and obesity. These patients have an increased sensitivity to opiate analgesia as well as hypoxia-driven respirations. In the postoperative setting, excessive supplemental oxygen and opioid analgesia can lead to significant respiratory depression, worsening hypercarbia and eventually respiratory arrest.⁹

AMBULATORY SURGERY CENTER

Patients with obstructive sleep apnea present a difficult dilemma in the ambulatory surgery setting. Studies have shown as many as 80 to 90 percent of patients with obstructive sleep apnea are clinically undiagnosed and that 9 percent of women and 24 percent of men have clinically relevant obstructive sleep apnea.^{1,10} A high index of suspicion and a prescreening tool are needed to diagnose surgical patients at risk for obstructive sleep apnea. Because all facets of anesthesia are affected by obstructive sleep apnea, the American Society of Anesthesiologists has established practice guidelines for the recognition and management of patients with obstructive sleep apnea.³ The guidelines were formulated by a 12-member panel of experts with the goal of educating and clarifying current anesthesia practice for patients with obstructive sleep apnea. They are based on literature review and expert opinion. Although the guidelines address both outpatient and inpatient surgery settings, they are clearly relevant to the current topic of ambulatory surgery centers. A summary of the pertinent ambulatory issues is outlined below.³

1. Preoperative Interview/Evaluation

The panel recommends a protocol at each surgery center or institution to evaluate patients before surgery in an attempt to screen for undiagnosed obstructive sleep apnea. At our institution, the screening process begins with a nurse contacting patients before surgery and discussing the issues noted below during a phone interview. Although the American Society of Anesthesiologists task force produced a comprehensive checklist to screen patients for sleep apnea, it is quite extensive. Specifically recommended is a thorough review of medical records, discussion with patient and family related to snoring, hypersomnolence, and review of objective data (body mass index >35, neck circumference >17 inches, etc). A more practical screen (outlined below), the STOP questionnaire, has been produced and validated by Chung et al.¹¹ Thus, a presumptive diagnosis of obstructive sleep apnea can be made

based on the presence of at least two of the four following criteria:

- Snoring (loud enough to be heard through a closed door)
- Tiredness or daytime hypersomnolence (falls asleep easily in a nonstimulating environment, i.e., while watching television or riding in a car)
- Observed pauses in breathing during sleep
- Pressure or history of hypertension

Patients exhibiting the above criteria are referred to the medical director, a board-certified anesthesiologist, of our ambulatory surgery center. At this point, it is important to review the available information to determine whether the patient is an appropriate candidate for ambulatory surgery. The key to choosing an appropriate patient for the outpatient setting is to evaluate the severity of the sleep apnea, the invasiveness of the surgery, and the potential need for postoperative opioids. For those patients for whom the proper choice is not obvious, the American Society of Anesthesiologists' guidelines provide a unique scoring system that can stratify a patient's potential risk for problems in the ambulatory surgery center.³

2. Preoperative Preparation

For patients with known severe obstructive sleep apnea, only the most superficial surgeries are appropriate in this setting. If the patient uses a continuous positive airway pressure or bilevel positive airway pressure machine at home, these devices should be brought to the surgery center for use in the postanesthesia care unit. Airway issues should be addressed at this stage, and any patient with signs of a difficult airway should receive an appropriate evaluation. Patients who have been surgically treated for obstructive sleep apnea are still assumed to have it unless a posttreatment sleep study is normal. The anesthesia team should strive to minimize opioids and sedatives at this stage. Patients with known severe obstructive sleep apnea having more complex or invasive surgeries, or potentially requiring significant postoperative opioids, should be considered for referral to a hospital-based operative setting with 23-hour observation capabilities.

3. Intraoperative Management

Minimal use of intraoperative opioids is crucial to prevent respiratory difficulties in the perioperative period. In addition, the use of nonsteroidal anti-inflammatory drugs is recommended for their opioid-sparing effect. Mild/moderate depth sedation

should have capnography and oxygen saturation monitoring. Anesthesia choice is also important, and the American Society of Anesthesiologists task force recommends definitive airway control over deep sedation. Full reversal of all neuromuscular blockade is recommended before extubation. The task force also agreed that the use of local anesthesia, peripheral nerve blocks, and major conduction anesthesia (epidurals/spinals) rather than systemic opioids reduced the likelihood of adverse outcomes for peripheral surgery.

4. Postoperative Management

Postoperative care is broken down into four areas: (1) Oxygen saturation is maintained at adequate levels with supplemental oxygen until the patient can maintain his or her baseline saturation on room air. (2) Analgesia is maintained with minimal opioids and preferential use of nonsteroidal anti-inflammatory drugs if possible. (3) Postoperative positioning is to be maintained in the semi-upright or lateral position, not supine. (4) Monitors for oxygen saturation should remain in place until the patient is discharged from the postanesthesia care unit.

5. Outpatient Surgery and Length of Postoperative Monitoring

The panel strongly recommends that any surgery center caring for patients with obstructive sleep apnea have emergency difficult airway carts readily available and capabilities to perform advanced respiratory care. Postoperative monitoring of patients with obstructive sleep apnea should be different from that of their non-apnea counterparts. It is recommended that patients with obstructive sleep apnea be monitored 3 hours longer than non-apnea patients and that they have continuous monitoring for at least 7 hours after their last hypoxia/obstructive episode on room air in a nonstimulating environment. The panel advises against performing surgery on patients in an outpatient setting if their obstructive sleep apnea score is 5 or greater based on the scoring system presented as a table in the practice guidelines published by American Society of Anesthesiologists. Finally, ambulatory facilities should have a transfer agreement in place for higher level of care or hospitalization needs.

CONCLUSIONS

The increasing volume of plastic surgery and the need to reduce costs of healthcare delivery have resulted in an increase in ambulatory surgery

centers across the United States. Along with the increasing volume of surgical cases, there is an increasing population of patients with obstructive sleep apnea. The practicing plastic surgeon needs to be mindful of this complicated disease process, the clinical and physiologic criteria for its diagnosis, and the management options for patients scheduled on an outpatient basis. The key to choosing an appropriate patient for the outpatient setting is to evaluate the severity of the sleep apnea, the invasiveness of the surgery, and the potential need for postoperative opioids.³ Finally, to prevent significant adverse outcomes, ambulatory surgical centers should institute their own internal obstructive sleep apnea guidelines.

Rod J. Rohrich, M.D.

Department of Plastic Surgery
University of Texas Southwestern Medical Center
1801 Inwood Road
Dallas, Texas 75390-9132
rod.rohrich@utsouthwestern.edu

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