Postoperative Considerations for Patients with Obesity and Sleep Apnea

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Over the past several decades, obesity has developed into a series health problem of epidemic proportions. Few countries have escaped this phenomenon, but obesity is most prevalent in the Unites States. Obesity is most commonly defined using the body mass index (BMI) criterion. BMI is expressed as a ratio of weight (kg) to height (m²). Normal BMI range from 19.5 to 24.9 kg/m², overweight is defined as a range of 25.0 to 29.9 kg/m², and obesity is defined by a BMI greater than 30 kg/m². Current estimates are that 65% of US adults are classified as overweight or obese, over 30% of adults are classified as obese, and the prevalence of obesity has doubled over the past 20 years [1]. Accounting for over 400,000 deaths annually, obesity is second only to tobacco-related disease as a cause of preventable and premature death [2]. With the increasing obesity health epidemic, an increase in obesity-related health problems also has been seen. The prevalence of diabetes has increased by 33% over the past 10 years [3], and the prevalence of hypertension has doubled over the past 25 years, from 15% in 1976 to 30.1% in 2000 [4,5].
Epidemiology of obstructive sleep apnea

Obstructive sleep apnea (OSA), a well-recognized comorbid illness of obesity, is a relatively new disease in its strictest definition. Charles Dickens’ famous novel of 1837, The Posthumous Papers of the Pickwick Club, describes a character named Joe who is obese and always sleepy. Sir William Osler later described any obese and sleepy person as “Pickwickian.” This eloquent but medically nondescript term has persisted until recently. It was not until the field of sleep medicine was established in the 1960s and 1970s that such Pickwickian patients’ sleep patterns were examined and the sleep apnea syndromes were more precisely defined [7,8].

The prevalence of OSA depends on the methodology of defining patients with sleep apnea, but the prevalence of OSA is estimated to be 4% in men and 2% in women [9]. OSA is a serious, life-threatening condition with an estimated 8-year mortality rate of nearly 40% [10]. Obesity is a well-established risk factor for sleep apnea, with the incidence of OSA increasing in direct proportion with the level of obesity [11–13]. For patients with clinically severe obesity (BMI ≥ 35 kg/m²) who present for bariatric surgery, the incidence of sleep apnea ranges from 71% to 77% [14,15]. In addition to obesity, other comorbidities associated with OSA include hypertension, stroke, congestive heart failure, coronary artery disease, cardiac arrhythmias, and pulmonary hypertension [16]. Although the precise mechanisms of these comorbid conditions are incompletely understood, they most likely result from a combination of chronic hypoxemia, chronic hypercarbia, and hemodynamic changes associated with the inappropriate termination of sleep.

Pathophysiology of sleep apnea

The sine qua non of obstructive sleep apnea is the physical collapse of the pharyngeal airway during sleep. This phenomenon should be distinguished from central sleep apnea, which results from the physiologic inhibition of breathing. In obstructive sleep apnea, the upper pharyngeal muscles lose tone during sleep, which leads to a narrowing of the upper-airway. Problems stem from an individual’s progressive attempts to inhale against a partially occluded airway. The phenomenon of OSA is compounded in obese individuals, from both a physical and physiologic standpoint. The weight and distribution of soft tissue fatty infiltration in patients with larger necks leads to turbulent airflow within the upper pharynx. The shear weight of such structures also tends to collapse the upper-airway musculature resulting from direct compression [17]. The culmination of these physical impediments leads to intermittent reduction of the alveolar oxygen saturation. Additionally, obese individuals exhibit a decrease in expiratory reserve volume and a reduction in all lung volumes. As an individual becomes more obese, the muscular work required and concomitant total body
oxygen consumption increases. In patients with OSA, this places further demands on an already diminished alveolar oxygen saturation [18].

**Implications during recovery and the immediate postoperative period**

The intraoperative anesthetic management of patients with OSA merits special attention and has been reviewed by Boushra [19]. See the article by Passannante and Rock elsewhere in this issue for further exploration of this topic. Postoperatively, these patients present an additional challenge, beginning with their stay in the postanesthesia care unit (PACU). While they are in the PACU, all patients are continually monitored and frequently assessed for signs and symptoms of airway problems. Of all the patients admitted to the PACU, approximately 1 in 500 patients will require reintubation [20]. Obese patients and patients with OSA deserve special attention because they may be very difficult to intubate. In a recent study by Siyam and Benhamou [21], difficult intubation occurred in 21.9% of patients with OSA, compared with 2.6% in control subjects. Furthermore, in obese patients, neck circumference not BMI is predictive of difficult intubation [22].

Pharmacologic sedation has been shown to decrease upper pharyngeal muscle tone. Although decreased muscle tone is well tolerated in most patients, the combination of OSA and sedation could lead to airway compromise. Continuous oxygen should be provided through a nasal cannula or facemask to maintain adequate arterial oxygen saturation. Continuous positive airway pressure (CPAP), which may be delivered through a nasal or oronasal facemask, may also be necessary in patients who exhibit signs of upper-airway collapse while they are in the recovery room. For patients who arrive at the recovery room with a nasogastric tube in place, the nasal CPAP mask will not likely provide an adequate seal, making its use impractical in this subset of patients.

Particular attention to posture and positioning are very important in patients with OSA. The head of the patient’s bed (HOB) should be elevated to at least 30°. Upper body elevation relieves OSA by increasing the stability of the upper airway [23]. The HOB position to 30° should be used by the OSA patient at all times while in the PACU and throughout his or her hospital stay.

Adequate blood pressure control should be the next focus of care for the OSA patient while in the recovery room. Postoperative hypertension may result from pain, hypercarbia, or anxiety. Of those patients who experience acute postoperative hypertension, almost 60% have a history of hypertension [24]. Given the high incidence of pre-existing hypertension in obese patients with OSA, invasive arterial monitoring should be considered while the patient is under general anesthesia, especially because standard, oscillometric, blood pressure cuffs have proven unreliable. Newer, noninvasive blood pressure monitors, such as the Vasotrac device (Medwave, Arden Hills, MN), also may prove useful in obese individuals [25]. The Vasotrac, placed around the wrist of the patient, continuously measures pulse and blood pressure and will provide an arterial
waveform similar to that of an invasive arterial line. Such a device, if used during the operative procedure, would also prove useful while the patient is in the PACU.

**Disposition from the postanesthesia care unit**

Once the patient has recovered adequately from surgery, preparations need to be made to transfer the patient to the home, a standard medical or surgical unit, or an ICU. This is perhaps the most difficult category of decision-making for managing the patient with morbid obesity and OSA. In the setting of OSA, it is important to know the patient’s preoperative apnea-hypopnea index and his or her dependence on CPAP for sleep, both of which yield valuable information about the vulnerability of the patient’s airway. Other factors to be considered in determining postoperative placement include the presence of right or left ventricular heart failure, the presence of underlying lung disease, the degree of obesity, and the nature of the surgery. Patients with mild sleep apnea and minimal comorbidities who have undergone minor surgical procedures will likely be discharged home on the day of surgery. For patients with moderate sleep apnea and intermediate comorbidities who have undergone intermediate-risk surgery, admission to a standard medical or surgical unit should suffice. Patients with severe sleep apnea who require home CPAP or those with numerous comorbidities merit closer observation in an intermediate care unit or an intensive care unit, depending on the nature of the surgical procedure. The most suitable postoperative environment is also determined by the particular conditions within each hospital. There is scant sense in placing a patient on a ward nursing unit with oximetric monitoring if the nursing coverage at night is too thin for the alarms to be noted.

Fortunately, most complications that require more intensive postoperative observation become manifest in the recovery room within the first 2 hours of surgery [26]. More intensive monitoring also may be required depending on the presence or absence of intraoperative complications.

Some of the specific postoperative risks go beyond the simple presence of OSA. It is not uncommon for patients with OSA to have congestive heart failure, right- or left-sided, resulting from either systolic or diastolic dysfunction [16]. In that setting, postoperative fluid shifts will be more difficult to manage than in the typical patient. Aggressive postoperative fluid administration may lead to or worsen biventricular heart failure. Furthermore, in the setting of severe peripheral edema, fluid mobilization from the legs can occur when placing the patient from a long-term sitting position to the supine position, leading to cardiac decompensation from acute volume overload.

The importance of adequate blood pressure control in the immediate postoperative period cannot be overstated. As mentioned previously, patients with OSA have a high incidence of hypertension. Unfortunately, postoperative hypertension, which might result from pain or anxiety, could result in surgical site bleeding. In patients with OSA, narcotics and sedatives should be used judiciously
and perioperative α- and β-blockade may need to be used. Therefore, patients with OSA and postoperative hypertension deserve closer postoperative monitoring.

Postoperative pain management

Patients do and should expect adequate pain relief following surgery. When properly administered, narcotic analgesics provide safe and effective control of postoperative pain. Postoperatively, patients with OSA present the anesthesiologist, surgeon, and nursing staff with a difficult situation. Although diminution of pain is the goal of every caregiver, the use of narcotics is especially dangerous in patients with OSA. After the use of any general anesthetic, the patient with OSA will exhibit a propensity for rapid eye movement (REM) sleep during the first several days after surgery [27]. In the patient with OSA, the genioglossus muscle is virtually paralyzed during REM sleep, allowing the tongue to fall posteriorly to the retroglossal space [28]. Normally, such patients would arouse and terminate REM sleep, but this reflex is diminished with the administration of narcotics or sedatives. For patients with severe pain and the need for opiates, the risk of oversedation and airway compromise is clearly increased. Because it is reasonable to be concerned that the OSA will be worsened in the postoperative period, an assessment of the patient’s baseline respiratory difficulty may aid in determining the postoperative vulnerability.

In patients with OSA, respiratory depression culminating in respiratory arrest has been reported after an intravenous “push” of opioid analgesics [29], an epidural infusion of opioid analgesia [30,31], and with the use of patient-controlled opioid analgesia [32]. Such respiratory events can be prevented with proper patient positioning (eg, HOB to 30°), the administration of CPAP, and the limited use of narcotic analgesics. Nonsteroidal anti-inflammatory drugs (NSAIDs) should be used as an adjunct for postoperative pain control. Ostermeier et al [31] have noted that the use of NSAIDs can decrease opioid use by 20% to 35%.

The first line of therapy whenever respiratory depression occurs includes the provision of supplemental oxygen and the careful titration of intravenous naloxone. If this approach fails, a nasal or oral airway may immediately temporize the problem, and CPAP should be administered as soon as possible. Positioning the patient in a sitting position also may be beneficial.

Patients whose respiratory depression fails to respond to the aforementioned measures or any patient in respiratory failure will need emergency endotracheal intubation. Endotracheal intubation may be difficult in such patients, as would emergency cricothyroidotomy. The very obese patient can desaturate very rapidly, and cardiac arrest can occur surprisingly fast. Skilled airway management is crucial. Even if the patient is known from recent operating room experience to be an “easy intubation,” the potential difficulty in the emergency setting must be appreciated. The hard operating room table, where the patient is in a perfect intubating position, is very different from the soft hospital bed, with a large, strong, struggling patient. In the awake and breathing patient, the intubation may
need to be performed with the patient sitting up, either through a “blind” nasal technique or with the use of a fiber-optic bronchoscope, also often performed though the nasal route.

Additional considerations for the obese patient

Ambulation of the severely obese patient (BMI $\geq 60$ kg/m$^2$), many of whom will have degenerative joint disease, presents a special challenge. In the setting of postoperative pain or sedation, early ambulation and even proper postural positioning while in bed, although crucial, may prove to be very difficult. Many obese patients prefer to sleep sitting up, and in such patients, respiration is very uncomfortable in the flat, supine position. Respiration will be compromised ultimately if pain, weakness, or inadequate labor constrains the patient to a supine position. The nursing staff needs to be educated about the importance of proper positioning and early mobility. Assisting these very large patients with ambulation may easily overwhelm a typical medical-surgical floor nursing staff. Therefore, physical therapy should be generously prescribed to ensure appropriate ambulation after surgery.

Skin breakdown is another special concern in the obese patient in the postoperative setting. Adequate oxygen delivery to the skin and subcutaneous tissue is determined foremost by cardiac function, specifically cardiac output, and by respiratory function, which establishes the level of hemoglobin saturation and the partial pressure of arterial oxygen. As mentioned previously, both cardiac and respiratory function may be impaired, especially in the setting of OSA. The impairment is compounded by the poor vascularity of adipose tissue, which further predisposes to soft tissue ischemia. Pressure sores are likely to develop in these individuals if they are not appropriately padded, turned, and repositioned [33]. Unfortunately, obese individuals may be difficult to reposition, often requiring several staff members to adequately turn the patient. Excessive adipose tissue should not be viewed as extra padding. Rather, proper padding of the upper and lower extremities is essential. Until the patient ambulates freely, padding should be placed underneath the patient’s calves to avoid any pressure on the heels. This point further emphasizes the need for appropriate nursing education to avoid these otherwise avoidable complications.

Summary

Sleep apnea and obesity are two prevalent and often coexisting conditions that are a challenge to treat medically, anesthetically, and surgically. Any obese patient with OSA who undergoes surgery requires a thorough preoperative evaluation. A knowledge of the magnitude of the sleep disorder as well as concomitant medical comorbidities leads to the proper appraisal of anesthetic and operative risks. Although routine monitoring in the ICU is unnecessary, high-risk patients
should be monitored postoperatively in an ICU-type setting. Realizing that the overzealous use of opioids in patients with OSA can lead to respiratory arrest, pain control should include the use of NSAIDs to help minimize the use of narcotics.

References