ONE MINUTE CONSULT

BRIEF ANSWERS TO SPECIFIC CLINICAL QUESTIONS

Q: Should we routinely screen for hypercapnia in sleep apnea patients before elective noncardiac surgery?

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A: Yes. Obesity hypoventilation syndrome (OHS) is often undiagnosed and greatly increases perioperative risk. Therefore, we recommend trying to detect OHS in a timely manner. Treatment should begin without delay to avoid adverse perioperative outcomes, which can include acute-on-chronic respiratory failure requiring intensive-care monitoring and invasive mechanical ventilation, or death.

ALSO CALLED PICKWICKIAN SYNDROME

OHS is also known as Pickwickian syndrome, named for a character—a "fat boy" who is constantly falling asleep—in *The Posthumous Papers of the Pickwick Club* by Charles Dickens.

Salient features of OHS are:

- Obesity (body mass index ≥ 30 kg/m^2)
- Sleep-disordered breathing (most patients with OHS are morbidly obese and have severe obstructive sleep apnea[1])
- Chronic daytime alveolar hypoventilation: ie, $Paco_2$ ≥ 45 mm Hg (normal range 35–45 mm Hg) and Pao_2 < 70 mm Hg[1] (normal range 85–95 mm Hg)
- No other identifiable cause of hypoventilation such as pulmonary disease (severe obstructive or restrictive), chest wall deformities, severe hypothyroidism, or neuromuscular disease.

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WHY SCREEN FOR OHS?

Both obstructive sleep apnea and OHS worsen quality of life and increase the risk of serious disease and death.[2–3] Patients with severe sleep apnea, particularly those with hypercapnia (ie, OHS) are at higher risk of cardiopulmonary complications in the perioperative period.

Compared with eucapnic patients with obstructive sleep apnea, patients with OHS have higher health care expenses, are at higher risk of developing serious cardiovascular diseases such as pulmonary hypertension and congestive heart failure, and are more likely to die sooner.[4,5]

Nowbar et al[5] prospectively followed a group of severely obese patients after hospital discharge. At 18 months, 23% of those with OHS had died, compared with 9% of those without OHS. The groups were well matched for body mass index, age, and a number of comorbid conditions. Most of the deaths occurred in the first 3 months after hospital discharge. During the hospital stay, more patients with OHS were admitted to the intensive care unit and needed endotracheal intubation and mechanical ventilation, and more were discharged to a long-term facility.

A high level of suspicion can lead to early recognition and treatment, which may reduce the rate of adverse outcomes associated with undiagnosed and untreated OHS. Routine screening for hypercapnia in patients with sleep apnea might help to identify patients with OHS and allow for modifications in surgical approach, anesthetic technique, and postoperative monitoring, increasing patient safety.

HOW PREVALENT IS OHS?

Obstructive sleep apnea affects up to 20% of US adults and is undiagnosed and untreated in up to 90%

of cases.[6] Simple screening questionnaires have been shown to reliably identify patients at risk.[7,8]

To date, no population-based prevalence studies of OHS have been done.

The overall prevalence of OHS in patients with obstructive sleep apnea is better studied: multiple prospective and retrospective studies across various geographic regions with a variety of racial or ethnic populations have shown it to be between 10% and 20%.[1,9] This range is very consistent among studies performed in Europe, the United States, and Japan, whether retrospective or prospective, and whether large or small.

The prevalence of OHS in the general adult population in the United States can, however, be estimated. If approximately 5% of the general US population has severe obesity (body mass index ≥ 40 kg/m^2), if half of patients with severe obesity have obstructive sleep apnea,[10] and if 15% of severely obese patients with sleep apnea have OHS, then a conservative estimated prevalence of OHS in the general adult US population is 0.37% (1 in 270 adults).

WHAT CAN BE DONE BEFORE ELECTIVE SURGERY?

Patients with OHS have an elevated serum bicarbonate level due to metabolic compensation for chronic respiratory acidosis. Moreover, they may have mild hypoxemia during wakefulness as measured by finger pulse oximetry.

The serum venous bicarbonate level is an easy and reasonable test to screen for hypercapnia in obese patients with obstructive sleep apnea because it is readily available, physiologically sensible, and less invasive than arterial puncture to measure blood gases.[9]

Arterial blood gas measurements, however, should be obtained to confirm the presence and severity of daytime hypercapnia in obese patients with hypoxemia during wakefulness or an elevated serum bicarbonate level.

Pulmonary function testing and chest imaging can exclude other causes of hypercapnia if hypercapnia is confirmed.

An overnight, attended polysomnographic study in a sleep laboratory is ultimately needed to establish the diagnosis and severity of obstructive sleep apnea and to titrate continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BPAP) therapy. Since most patients with OHS have severe obstructive sleep apnea, in-laboratory attended polysomnography allows the clinician to both diagnose and intervene with PAP therapy (a "split-night" study). Home titration with an auto-CPAP device is not recommended because it does not have the ability to titrate PAP pressures in response to hypoxemia or hypoventilation. Patients with OHS require attended, laboratory-based PAP titration with or without supplemental oxygen.

CPAP or BPAP therapy should be started during the few days or weeks before surgery, and adherence should be emphasized. Anesthesiologists might reconsider the choice of anesthetic technique in favor of regional anesthesia and modify postoperative pain management to reduce opioid requirements. Reinstituting CPAP or BPAP therapy upon extubation or arrival in the postoperative recovery unit can further reduce the risk of respiratory complications. Additional monitoring such as continuous pulse oximetry when the patient is on the general ward should be considered.

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