LETTER TO THE EDITOR

Safety of a perioperative strategy for the management of obstructive sleep apnea in bariatric surgery patients: a single Bariatric Center of Excellence experience

Introduction Obstructive sleep apnea (OSA) frequently occurs in patients considered for bariatric surgery,[1,2] and the presence of OSA has been associated with an increased risk of perioperative complications.[3] The initial practice at our bariatric center was to perform polysomnography (PSG) in every patient considered for a bariatric procedure. In the absence of any respiratory and cardiac perioperative complications, and considering increasing demand on our sleep laboratory services, at the beginning of 2009 we changed the protocol to perform PSG only in selected patients. Specifically, our practice was to screen patients with the Berlin Questionnaire[4] and refer for PSG only those scoring high risk for OSA. Most of the sleep studies were done in our center, and the results were reviewed by the same sleep specialist. The guidelines used for the administration of continuous positive airway pressure (CPAP) were consistent with those of the Adult Obstructive Sleep Apnea Task Force of the American Academy of Sleep Medicine[5] but modified to include significant sleep hypoxemia, irrespective of the apnea-hypopnea index (AHI).

We conducted a retrospective analysis to evaluate the outcomes of patients who underwent the strategy of using the Berlin Questionnaire to screen patients for OSA and referring for PSG only those patients scoring high risk.

Methods We performed a single-center, retrospective chart review of 251 consecutive patients who underwent bariatric surgery between June 2009 and August 2010. We reviewed all outpatients' bariatric charts during this period for anthropometric and demographic characteristics. We recorded the results of the Berlin Questionnaire and sleep studies, including the AHI defining no OSA, mild, moderate and severe OSA using the cutoffs of less than 5, 15, and 30 AHI, respectively.[6] For all 160 patients with an unknown OSA status at presentation who were screened using the Berlin Questionnaire, we reviewed hospital charts, anesthesiologist consult notes, anesthesia operative record, postanesthesia recovery record, postoperative disposition, and physician and nursing progress notes. We defined adverse respiratory outcomes as: death; intubation for respiratory distress; the need for transfer within the hospital to a more highly monitored setting (step down unit [SDU] / intensive care unit); urgent unplanned use of CPAP or bilevel positive airway pressure (BiPAP); and/or the use of the fraction of inspired oxygen of 40% or more for desaturation. We defined adverse cardiac outcomes as all incidents of nonfatal and fatal cardiac arrest and myocardial infarction.

Results Between June 2009 and August 2010, 251 patients underwent bariatric surgery at our center. Of these 251, 81 patients were identified as having OSA and using CPAP at the time of their initial visit; in 170 patients OSA status was unknown. Out of 170 patients, the first 10 patients underwent PSG without screening; among those 10 patients 6 had no OSA, 3 mild OSA, and 1 severe OSA.

Of the 160 patients who underwent screening with the Berlin Questionnaire, 68 patients (42%) scored high risk and 92 patients (58%) scored low risk (TABLE). The average body mass index (BMI) of this cohort patients with unknown OSA status who were screened with the Berlin Questionnaire was just below 46 with 15% having BMI over 50.

Patients classified as "high-risk" underwent PSG. Patients classified as "low-risk" proceeded to surgery without any further investigations.

The prevalence of OSA of any severity among the 68 patients scoring high risk on the Berlin Questionnaire was 78% (FIGURE). The management of OSA was determined by the sleep specialist. CPAP treatment was prescribed for 1 of 30 patients diagnosed with mild OSA for positional

TABLE Unknown obstructive sleep apnea status: characteristics of patients scoring high and low risk on the Berlin Questionnaire

Characteristcs	High risk	Low risk
total patients, n	68	92
mean age, y	46	42.7
female/male	59/9	89/3
average BMI, kg/m^2	45	47
max. BMI, kg/m^2	60	66.2
BMI ≥50, kg/m^2	9	15
BMI ≥60, kg/m^2	1	2

Abbreviations: BMI – body mass index

presumed symptomatic OSA; 2 of 11 patients diagnosed with moderate OSA; and 9 of 12 patients diagnosed with severe OSA. No BiPAP was prescribed. Postoperative disposition varied across the groups. Of the 30 patients with mild OSA, 28 were admitted to a regular surgical floor and 2 to a surgical SDU which provided continuous oximetry and cardiac rhythm monitoring. Of the 11 patients with moderate OSA, 6 were admitted to a general surgical floor and 5 to an SDU. Of the 12 patients with severe OSA, 6 were admitted to a regular surgical ward and 6 to an SDU.

No major clinical complication occurred in patients with OSA known prior to the program entry or those who scored low risk on the Berlin Questionnaire. No adverse outcome occurred also in patients with mild or moderate OSA diagnosed as a result of our screening. One patient diagnosed with severe OSA required 50% oxygen after extubation while still in the postanesthesia recovery room. This female patient received 12 mg of morphine and 1 dose of 50 mg of intravenous dimenhydrinate over a short period of time. Her subsequent episode of hypoxia was corrected with the application of 50% oxygen. Her home CPAP was initiated and the patient was transferred to a surgical SDU with no further complications and without oxygen requirement beyond the first night.

Discussion Although OSA is common in patients considered for bariatric surgery and the standard criterion to diagnose OSA is a PSG, the benefits of conducting PSG in all patients prior to surgery are not clear. The position taken on the issue depends on the short- or long-term view (can we safely manage perioperative patients vs. can we improve their long-term health), considerations of respiratory and cardiovascular physiology vs. considerations of potential pressure-related complications (anastomotic leaks as possible complications of using noninvasive positive pressure ventilation postoperatively), and cost.

One of the management options is to limit full sleep studies to prescreened patients. We screened patients with the Berlin Questionnaire, which consists of 10 questions, is widely used to screen patients, and is validated in primary care[4] and in general surgical patients.[7] It has demonstrated a moderate level of sensitivity and specificity for evaluating patients with suspected OSA; sensitivity of 77% (confidence interval [CI], 73–80) and specificity of 74% (CI, 65–81) with a likelihood ratio (LR) for a positive test of 2.96 and a LR for a negative test of 0.31.[8,9]

The strengths of our study include the use of consecutive patients who were managed consistently according to a prespecified protocol, the thorough and detailed chart review we undertook, and our focus on patient-important outcomes. Our study was limited in that we did not demonstrate the reliability of our data abstraction through duplicate abstraction.

We interpret our data as indicating that the management strategy for screening bariatric patients for OSA, which currently limits the use of full sleep studies only to patients identified as high-risk by the use of the Berlin Questionnaire, appears to be safe: none of our patients experienced adverse events in the immediate postoperative period. One adverse respiratory outcome highlights the need to ensure that patients with severe OSA on CPAP treatment are started on their own CPAP machines postoperatively and are admitted to a monitored bed with continuous oximetry with the possibility of early nursing intervention. Our strategy of limiting PSG to patients that scored high risk on the Berlin Questionnaire resulted in limiting sleep studies to 42% of the patients who would otherwise undergo PSG. Our selective strategy, relative to

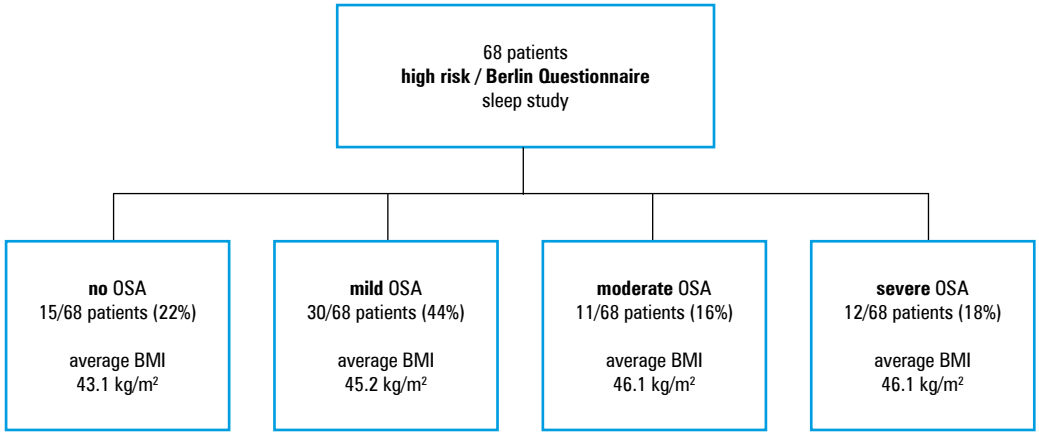

FIGURE Results of polysomnography in patients scoring high risk on the Berlin Questionnaire
Abbreviations: OSA – obstructive sleep apnea, others – see **TABLE**

conducting PSG on all patients, may therefore have substantial resource implications.

Although our results may give some guidance to similar programs, they should not be directly extrapolated to other surgical patients since bariatric surgery patients are a distinct group, highly selected and motivated, extensively investigated prior to surgery, and having structured postoperative care aimed at minimizing opiate use and encouraging early mobilization. Our results should also not be unconditionally generalized to other bariatric centers, as the skills, experience, and technical abilities of each nursing unit may be institution-dependent. For example, our institution has very recently incorporated teleoximetry to the bariatric surgical ward, which provides an additional safety net for undiagnosed OSA patients. Those considering applying our results should also bear in mind that the average BMI of this cohort patients with unknown OSA status who were screened with the Berlin Questionnaire was less than 50.

Future observational or experimental research should address the advantages and disadvantages of different screening and management strategies, examining their association with patient-important outcomes and resource use. As the patient population changes (older patients with more comorbidities and higher BMI enter the program), ongoing monitoring of the consequences of our own strategy remains very important.

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