The American Journal of Surgery 193 (2007) 364–367

Potentially life-threatening sleep apnea is unrecognized without aggressive evaluation

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Manuscript received August 12, 2006; revised manuscript September 20, 2006

Presented at the 49th Annual Meeting of the Midwest Surgical Association, Mackinac Island, MI, August 6–9, 2006

Abstract

Background: Many patients undergoing bariatric surgery have severe comorbidities, including obstructive sleep apnea (OSA). We suspected that sleep apnea was underdiagnosed in our study population.
Methods: A retrospective chart review of our bariatric database was conducted comparing OSA evaluation based on clinical parameters (Era 1) with mandatory OSA evaluation for all patients (Era 2).
Results: In both Era groups approximately 19% of patients presented to our program with an established diagnosis of OSA. In Era 1 this increased to 56% based on clinical parameters and in Era 2 this increased to 91% with mandatory polysomnography testing of all patients.
Conclusions: OSA is grossly underdiagnosed in patients with morbid obesity presenting for bariatric surgery. Clinical evaluation continues to miss a substantial percentage of patients with OSA. Mandatory testing of all patients for OSA with polysomnography before bariatric surgery is recommended.

Keywords: Sleep apnea; Gastric bypass; Morbid obesity; Bariatric surgery

The prevalence of obesity and morbid obesity continues to increase [1]. Between 12 and 15 million people in the United States are morbidly obese. It has been estimated that in the United States obesity accounts for at least 300,000 deaths annually and is now a stronger predictor of mortality than smoking [2,3]. Olshanky et al [4] recently estimated that obesity could shorten overall life expectancy in this country by 2 to 5 years. Currently, bariatric surgery is considered to be the most effective treatment for morbid obesity, and the most effective modality for achieving sustained weight loss with subsequent control of obesity-related complications [5]. The American Society for Bariatric Surgery estimates that more than 170,000 procedures for morbid obesity were performed in 2005. Most patients undergoing bariatric surgery have serious comorbidities such as diabetes mellitus, hypertension, and obstructive sleep apnea (OSA) [6,7].

In the general population, the prevalence of sleep apnea is reported to be 4% in men and 2% in women [8]. OSA is associated with a number of severe comorbidities including diabetes, hypertension, cardiac arrhythmias, congestive heart failure, stroke, hypercoagulability, and myocardial infarction [9,10]. Sleep apnea also is associated with increased postoperative complications including respiratory distress and prolonged hospital stay [11,12]. Sleep apnea is correlated strongly with obesity and is particularly prevalent in the morbidly obese (ie, patients with a body mass index [BMI] of ≥40 or a BMI of ≥35 with a significant associated comorbid disease) [13–15].

We suspected that sleep apnea was underdiagnosed in our bariatric population. Consequently, beginning in December of 2003 we required all patients undergoing Roux-en-Y gastric bypass to have a preoperative sleep study. This article details our results comparing mandatory OSA screening by a polysomnogram with our program's approach prior to December 2003 when selective screening was used based on clinical suspicion and the Epworth Sleepiness Score.

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0002-9610/07/$ – see front matter
doi:10.1016/j.amjsurg.2006.09.022

Table 1
Demographic data from Era 1 versus Era 2

	Era 1 (n = 101)	Era 2 (n = 249)	*P* value
Mean age (SEM; range)	44 (± 1.0; 21–63)	45 (± .7; 19–66)	.43*
Mean BMI (SEM; range)	49 (± .8; 36.8–87.0)	49 (± .5; 37.5–74.6)	.96*
% Female	86% (87/101)	87% (218/249)	.72†
Race			
Caucasian	79% (80)	74% (185)	.41†
African American	19% (19)	25% (62)	.26†
Hispanic	2% (2)	1% (2)	.33†
Hypertension	46% (47)	52% (131)	.07†
Diabetes mellitus	19% (19)	31% (76)	<.03†
OSA	57/101 (56%)	227/249 (91%)	<.0001†

SEM = standard error of the mean.
* Student *t* test.
† Fisher exact test.

Methods

We obtained approval from the Institutional Review Board at Case Medical Center for a retrospective chart review. A review of our prospectively maintained bariatric database was conducted from July 2003 through August 2005. These patients were divided into 2 periods, Era 1 from July 2003 until November 2003, and Era 2 from December 2003 through August 2005. Era 1 consisted of 101 patients. Nineteen Era 1 patients presented with a history of OSA. Of the remaining 82 patients, OSA testing was performed only on those patients who presented with clinical symptoms for OSA. Era 2 consisted of 249 consecutive patients. Of these, 48 presented with a diagnosis of OSA. All remaining patients (n = 201) were tested for OSA irrespective of the presence or absence of clinical symptoms suggestive of OSA. All patients from both groups were required to have a referral from their primary care physician before being evaluated for bariatric surgery in our program. The patients initially were seen by 1 of our 3 bariatric surgeons (P.H., T.S., and J.J.), and a bariatric nurse coordinator. A history and physical examination was performed when the presence of previously diagnosed sleep apnea was noted. In addition, all patients were evaluated before surgery by a board-certified pulmonologist. A polysomnogram was ordered for patients in Era 1 only if sleep apnea was suspected clinically. In contrast, all patients in Era 2 underwent overnight polysomnography preoperatively. If found to have sleep apnea, continuous positive airway pressure (CPAP) therapy was initiated well in advance of the gastric bypass procedure. Patients in both Era groups diagnosed with sleep apnea were asked to bring their CPAP machine to the hospital for continued treatment during their hospital stay. All patients subsequently underwent either a laparoscopic or open Roux-en-Y gastric bypass.

Age, sex, race, BMI, diabetes mellitus, hypertension, and OSA were documented from the initial evaluation. All sleep studies were interpreted by independent sleep specialists. The scores were reported as mild, moderate, or severe based on the Respiratory Disturbance Index, with scores of 5 to 14 indicating mild, scores of 15 to 30 indicating moderate, and scores higher than 30 indicating severe. Statistics were performed with GraphPad Prism software (GraphPad Software Inc, San Diego, CA). The Student *t* test and the Fisher exact test were performed as indicated. Results were reported as significant if the *P* value was less than .05.

Results

Demographic data are summarized in Table 1. Nineteen of 101 patients (19%) in Era 1 presented with a diagnosis of sleep apnea. Forty-five of the remaining 82 patients had a sleep study; of these, 38 of 45 patients (84%) were positive for sleep apnea. Thus, in Era 1, 57 of 101 patients (56%) had a diagnosis confirmed for OSA. In Era 2, the same percentage of patients (19%, 48 of 249) presented with sleep apnea as a comorbidity. All remaining 201 patients in Era 2 who did not initially present with OSA underwent a polysomnogram irrespective of the presence or absence of clinical symptoms suggestive of OSA. Of those 201 patients, 179 (89%) were diagnosed with sleep apnea. Thus, in Era 2, 227 of 249 (91%) had a confirmed diagnosis of OSA (Fig. 1).

Table 2 describes only those patients in Era 1 who did not present with sleep apnea at the time of assessment for surgery. In this subset, patients who had clinical symptoms of OSA and subsequent OSA testing before surgery were compared with those patients who did not manifest clinical symptoms of OSA and thus were not evaluated. The only significant difference between the groups in this subset of Era 1 was BMI score. The prevalence of OSA across BMI

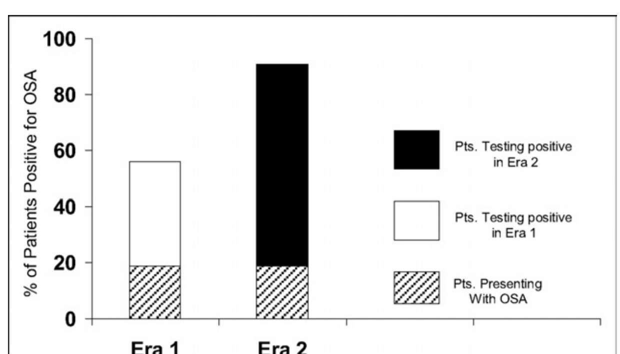

Fig. 1. Percentage of patients with diagnosed OSA in Era 1 when selective evaluation was performed versus Era 2 in which all patients were tested for sleep apnea. ■, patients testing positive in Era 2; □, patients testing positive in Era 1; ///, patients presenting with OSA.

Table 2
Demographic data from Era 1 patients tested for OSA versus patients not tested

	OSA tested (n = 45/82)	OSA not tested (n = 37/82)	*P* value
Mean age, y (SEM; range)	43 (± 1.5; 26–63)	44 (± 1.6; 21–61)	.61
Mean BMI score (SEM; range)	50 (± 1.4; 37–87)	46 (± .85; 38–61)	.02
Women	87% (39/45)	89% (33/37)	1.0
Caucasians	82% (37/45)	84% (31/37)	1.0
Hypertension (% positive)	46% (21/45)	43% (16/37)	.82
Diabetes mellitus (% positive)	16% (7/45)	16% (6/37)	1.0
Mean neck circumference, in (SEM; range)	16 (± .3; 14–19)	16 (± .36; 12–19)	.55

categories is presented in Fig. 2. This prevalence ranged from 69% to 100%. Comparison of the percentage of patients with mild, moderate, and severe sleep apnea between Era 1 and Era 2 is shown in Fig. 3. When all patients were tested, we identified more patients with severe OSA than mild.

Comments

Only 19% of patients presenting to our program for bariatric surgery during the study period had a diagnosis of OSA. When clinical parameters and the Epworth Sleep Score were used (Era 1), the identification of OSA increased to 56% of patients. However, when all patients were evaluated by a polysomnogram (Era 2), the diagnostic yield increased to 91%. This suggests that sleep apnea was grossly underdiagnosed in our bariatric population before these patients entered our bariatric surgery program, and clinical evaluation including the Epworth Sleep Score is inadequate to identify the true incidence of OSA in morbidly obese patients. We likely missed 33 patients (33%) with OSA in Era 1 based on our results from Era 2 in which all patients were tested. Redline and Strohl [16] reported that clinical evaluation is diagnostic for sleep apnea only 50% to 60% of the time in experienced clinical hands. Our data support this observation. Although an increasing amount of literature exists highlighting the association between sleep apnea and morbid obesity [13–15], this information is not reflected in clinical practice, as evidenced by the extremely low diagnostic rate of 19%.

In Era 1 clinical suspicion and evaluation of OSA at the time of bariatric surgery identified 38 more patients (46%, 38 of 82) with OSA before surgery. This increased detection of OSA, however, still was substantially lower than in Era 2, in which we tested everyone and found 179 additional patients (89%, 179 of 201) with OSA. One could argue that in testing everyone we detected clinically insignificant OSA; however, when we critically studied the percentage of patients with mild, moderate, and severe OSA, there was no significant shift toward mild OSA. Interestingly, the shift was toward more severe sleep apnea. OSA was highly prevalent across all BMI categories in the patients who presented for bariatric surgery. Because sleep apnea is absent in a small number of patients and some patients have mild OSA not requiring treatment, testing should be performed on all patients presenting for bariatric surgery. Most patients have a screening study first and then if they have sleep apnea a second study to titrate CPAP therapy. For patients with morbid obesity it may be more cost effective and patient-friendly to schedule a split-night sleep study. A split-night sleep study consists of a diagnostic evaluation for OSA and a titration for CPAP if OSA is identified, all in the same evening.

Another significant finding in this study and the study by O'Keefe and Patterson [15] was the high prevalence of OSA. In both studies the majority of patients with OSA were unrecognized before evaluation by the bariatric surgery team and mandatory OSA screening with polysomnography. It is estimated that bariatric surgeons see only 1% of the eligible population for bariatric surgery. This suggests that the vast majority of patients at significant risk for OSA are not evaluated.

Unrecognized OSA may have serious and possible lethal consequences in the postoperative period. Hung et al [10]

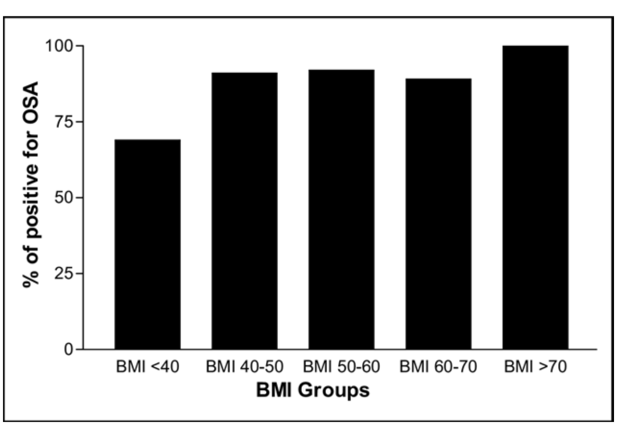

Fig. 2. Prevalence of OSA by BMI in Era 2, showing a high prevalence of OSA in patients evaluated for bariatric surgery.

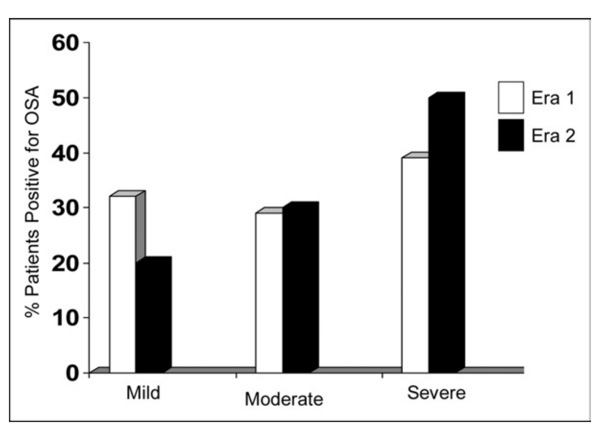

Fig. 3. Severity of sleep apnea in Era 1 versus Era 2, with an increase in severity when all patients were tested for OSA.

showed that OSA was associated independently with myocardial infarction. Untreated moderate to severe sleep apnea in male patients had an almost 40% mortality rate at 8 years [17]. Patients with OSA are at risk for respiratory depression and failure, especially with narcotic analgesia in the postoperative setting [11]. Respiratory distress or failure in the morbidly obese postoperative patient can be a challenging and difficult clinical problem for the surgical team. In 1 study in orthopedic patients by Gupta et al [12], patients with OSA had higher complication rates, primarily respiratory and cardiac, and had a longer length of hospital stay. Previously we showed that with intensive preoperative evaluation and treatment, a limited length of stay can be achieved in bariatric patients [6]. Our current study suggests that additional benefits may result with aggressive preoperative evaluation for OSA in all patients undergoing bariatric surgery. These benefits may include further improvement in length of stay and a decreased need for postoperative intensive care use.

Conclusions

An overnight polysomnogram is the most sensitive test for sleep apnea in the morbidly obese patient. The most significant risk factor for OSA is obesity, but this is evaluated rarely in morbidly obese patients. Sleep apnea is a serious comorbid problem that should be evaluated and treated before undergoing bariatric surgery. All patients with BMIs greater than 40 should be screened for OSA. This is especially important for primary care physicians because they will interact with the majority of patients at risk. Our data support more aggressive screening in the morbidly obese population. OSA screening using a polysomnogram should be mandatory in all patients embarking on bariatric surgery.

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Discussion

Donald J. Scholten, M.D. (Grand Rapids, MI): Was there an actual clinical reason to do the OSA testing routinely? Was there a sentinel event or a patient adverse event in your Era 1? What is it that you do different and has that difference translated into an improved outcome in your patients?

Peter T. Hallowell, M.D. (Cleveland, OH): There was no sentinel event that caused us to change to testing everyone. We noticed that a significant number of patients were positive for sleep apnea, so we began to test everyone and then we were quite shocked at what the results were after that. Anybody who is positive for sleep apnea brings his or her machine to the hospital, and we continue the therapy throughout his or her hospital stay. We have not seen any significant events in the patients. We have not been able to show a significant decrease in our length of stay because our length of stay times have been probably as short as we can possibly get them.

David Linz, M.D. (Canton, OH): We are struggling with this issue right now in the general population. There was a sentinel event in Northeast Ohio with an unrecognized sleep apnea patient. We are screening now all of our patients with a BMI greater than 35 and a neck circumference greater than 17 or any history of sleep apnea.

We found that up to 30% of our patients coming in through outpatient surgery are at risk for sleep apnea, which is an astounding number. The question is, how long do you watch them, how long do you admit them? The ASA [American Society of Anesthesiologists] came out with guidelines as far as how to screen these patients. There are no guidelines on what to do with them after you diagnose them.

Peter T. Hallowell, M.D.: I recommend that you screen all of those patients with a polysomnography. It is unclear where they fall less than a BMI of 35, but you certainly are going to be safer to test anybody over 40 with an overnight sleep setting.

Kenneth J. Printen, M.D. (Wilmette, IL): What kind of criteria do you have to put people in the intensive care unit specifically to watch for their respiratory progression or depression after surgery?

Peter T. Hallowell, M.D.: We do not send any of our patients to the ICU [intensive care unit] for preventative monitoring of their respiratory depression. They all go to a general surgery with special expertise in bariatrics. We extensively test the patients preoperatively, both with pulmonary function testing and with the polysomnography. We are getting them up in 4 hours to walk and that seems to be very helpful.