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Interest in Bariatric Surgery Among Obese Patients with Obstructive Sleep Apnea

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Abstract

Background—Standard obstructive sleep apnea (OSA) therapies are poorly tolerated. Bariatric surgery is a potential alternative but the level of interest in this intervention among OSA patients is unknown.

Objectives—Determine the proportion of OSA patients who would be interested in bariatric surgery.

Setting—Sleep clinics, United States.

Methods—Consecutive adult patients with untreated severe OSA and a body mass index of 35–45 kg/m^2 were approached. Patients at low peri-operative risk and no urgent indication for OSA treatment were invited to a separate informational visit about bariatric surgery as primary treatment for OSA.

Results—Of 767 eligible patients, 230 (30.0%) were not at low peri-operative risk, 49 (6.4%) had drowsy driving, and 16 (2.1%) had no insurance coverage for bariatric surgery. Of the remaining 482 patients, over one-third (35.5%) were interested in bariatric surgery. Surgical interest was 47.2% in women vs. 27.6% in men ($p < 0.01$) and 67.3% in diabetics vs. 31.0% in non-diabetics ($p<0.01$). In multivariable adjusted models, female gender (odds ratio 1.89, 95% CI [1.10–3.25]) and diabetes (odds ratio 3.97, 95% CI [1.97–8.01]) remained highly predictive of bariatric surgery interest.

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Summary of Conflicts of Interest:
None of the authors report any relevant conflicts of interest.

Conclusions—Nearly two-thirds of obese patients with severe OSA are good candidates for bariatric surgery. Among candidates, over one-third are interested in this treatment. Interest rates are highest among women and diabetics, indicating that metabolic improvements continue to be a major driver of surgery even in patients with severe OSA. Given patient interest, the role of bariatric surgery should be routinely discussed with obese OSA patients.

Keywords

Obstructive sleep apnea; bariatric surgery; obesity; diabetes; peri-operative risk

Introduction

Obstructive sleep apnea (OSA) is an increasingly common disease associated with numerous adverse effects including excessive daytime sleepiness, motor vehicle accidents, and cardiovascular disease.[(1)] Obesity is the most common risk factor for OSA, with over 50% of OSA cases attributable to excess weight.[(2)] As such, OSA commonly co-exists with obesity and may exacerbate other obesity-related complications such as type 2 diabetes and hypertension.[(3–5)]

Continuous positive airway pressure (CPAP) is an efficacious treatment for OSA,[(6,7)] however, its effectiveness is frequently limited by suboptimal adherence.[(8)] Although CPAP treats OSA, it does not target obesity or obesity-related co-morbidities. In fact, CPAP may cause weight gain.[(9)] Furthermore, weight loss has a greater cardiovascular benefit than CPAP alone in OSA, supporting an important role for weight loss therapies in the management of OSA.[(10)]

Bariatric surgery as treatment for OSA offers several advantages as compared to CPAP. Importantly, it offers a potential cure of OSA to patients, whereas in most cases CPAP is recommended as a lifelong therapy. Equally significant, it offers health benefits beyond treatment of OSA, in that it treats co-morbid obesity and co-existing obesity-related diseases.[(11)] Among sleep clinics, however, bariatric surgery remains infrequently utilized. Reasons are unclear but may include the perception that many OSA patients are poor surgical candidates, a belief that patients are not interested in this option, sleep provider discomfort surrounding discussion of weight management, and/or a lack of familiarity with bariatric procedures. In this study, we sought to assess candidacy for bariatric surgery and the interest level in this treatment among obese patients presenting to sleep clinic for treatment of OSA.

Materials and Methods

Study population

Consecutive patients presenting to sleep disorders clinics with untreated OSA were screened for potential eligibility for a randomized trial comparing effectiveness of bariatric surgery versus CPAP (NCT01187771). Initially, recruitment took place throughout a network of for-profit sleep clinics throughout the metropolitan Boston, MA, as well as an academic medical center. After the for-profit sleep clinics closed due to bankruptcy, screening expanded to two additional academic sleep programs. The institutional review boards governing all of the participating sleep clinics approved the study.

Inclusion criteria were: 1) aged 18–65 years, 2) body mass index (BMI) 35–45 kg/m^2, 3) severe OSA with at least one referable symptom (such as excessive daytime sleepiness), 4) no CPAP therapy in the past 2 years, and 5) no prior bariatric surgery. All patients had undergone either in-laboratory attended polysomnography or an unattended home-based study with a type 3 monitor as dictated by clinical provider and insurance coverage. Severe OSA was defined as an apnea hypopnea index (AHI) ≥ 30 events/hr based on the 2007 American Academy of Sleep Medicine (AASM) alternative scoring criteria.[12] For studies where this index was not available (primarily due to a home-based study), severe OSA was defined as an AHI ≥ 20 events/hr based on the 2007 AASM recommended scoring criteria.

Study protocol

All English-speaking patients being seen for OSA were screened. Patients who had 1) a history of congestive heart failure or ischemic heart disease, 2) other major health condition such as end-stage renal disease, cirrhosis, or any disease requiring chronic systemic steroid use, 3) poor functional status (e.g. inability to walk 200 ft) or other unstable health condition such as uncontrolled hypertension or diabetes mellitus, cancer being actively treated, or uncontrolled mood disorder, 4) active tobacco use, 5) history of venothromboembolism, 6) hypoventilation syndrome, and/or 7) were pregnant were considered to be at elevated risk for peri-operative complications from bariatric surgery. Patients who reported drowsy driving were deemed poor candidates for primary surgical treatment due to a need for urgent therapy. Interest level was also not assessed in those lacking insurance coverage for bariatric surgery.

For remaining patients, permission was obtained to approach the patient about bariatric surgery. If the patient expressed interest, a separate informational session about OSA and bariatric surgery was scheduled with a sleep physician and bariatric surgeon. Patients who agreed to the visit or who already planned to obtain bariatric surgery were considered “interested” in bariatric surgery. Patients who declined the informational visit due to a lack of interest in bariatric surgery or preference for CPAP, oral appliance, medical weight loss, or no treatment were considered “not interested” in bariatric surgery. Patients who declined involvement due to other reasons such as difficulty attending appointments (e.g., for time, travel, family, or financial concerns) or lack of interest in research were excluded from analyses of interest in bariatric surgery.

Data collection

Information regarding demographics, co-morbidities, medications, and prior CPAP use was obtained from the electronic medical record. Co-morbidities were defined primarily based on medication use. If medication information was unavailable, physician diagnosis of the co-morbidity documented in the medical record was used.

Data analysis

Differences between groups were compared using Fisher's exact test for categorical variables and Student's t-test for continuous variables. Multivariable logistic regression models were used to identify predictors of interest in bariatric surgery adjusting for potential confounders. Base models adjusted for age, gender, and clinic site. An additional model included BMI, AHI, prior CPAP use, hypertension, dyslipidemia, gastroesophageal reflux disease/peptic ulcer disease, and diabetes mellitus. All analyses were performed using SAS 9.3.

Results

A total of 792 new sleep clinic patients were identified that met minimal eligibility criteria of age, BMI, and OSA severity who were not already on active OSA therapy and had no history of bariatric surgery. The 25 patients who did not speak English were not further assessed. The final study sample therefore consisted of 767 subjects.

Of these, 62.8% patients (n=482) were good candidates for bariatric surgery. Among those patients who were not good surgical candidates (n=285), 80.7% were at elevated risk for peri-operative complications. Reasons included congestive heart failure or ischemic heart disease (32.3%), other major health conditions (33.0%), unstable health/poor functional status (14.0%), active tobacco use (13.0%), history of venothroembolic disease (5.6%), hypoventilation syndrome (1.4%), and pregnancy (0.4%). Another 49 patients (17.2%) were poor surgical candidates due to drowsy driving. Finally, 16 patients (5.6%) were not surgical candidates due to lack of insurance coverage (Figure 1).

Among the 482 patients who were considered good candidates for bariatric surgery, 124 patients declined involvement due to difficulty attending appointments or lack of interest in research. The characteristics of this group were similar to the remaining population in terms of age (46.3 vs. 47.4 years), BMI (38.6 vs. 39.2 kg/m2), and AHI (58.1 vs. 57.0 events/hour). Men were more likely to decline involvement for these reasons (29.1% men vs 20.0% women; $p = 0.03$).

Of the 358 patients for whom interest in bariatric surgery could be assessed, mean age was 47.5 years and 59.8% were men. Over one-third (35.5%) of these patients were interested in bariatric surgery. Characteristics of those interested versus not interested in bariatric surgery are displayed in Table 1.

As expected, patients had severe OSA, with a mean (±SD) AHI of 57.0 ±27.8 events/hour. Only a small percentage of patients had prior experience with CPAP (8.8%). Age, BMI, and prior experience with CPAP did not differ between the interested and not interested groups. Severity of OSA was slightly higher among those who were not interested in bariatric surgery (mean AHI 59.3 ±27.6 versus 52.8 ±27.8 events/hour; p=0.04). Among those interested in bariatric surgery, female gender, hypertension, diabetes, and dyslipidemia were more common ($p < 0.05$ for each condition).

Overall, 47.2% of women versus only 27.6% of men were interested in surgery. In addition, two-thirds of diabetics (67.3%) were interested as compared to less than one-third (31.0%) of non-diabetics. After adjusting for clinic site and demographics, female gender, dyslipidemia, and diabetes remained predictive of interest in surgery (Table 2).

After additionally adjusting for OSA severity, prior CPAP use, BMI, and obesity-related co-morbidities, female gender and diabetes remained the only independent predictors of interest in bariatric surgery. The adjusted odds ratio for interest in bariatric surgery was 1.89 (95% CI [1.10–3.25]) in women and 3.97 (95% CI [1.97–8.01]) in diabetics.

Discussion

Our study demonstrates that among morbidly obese OSA patients newly presenting to sleep clinic, almost two-thirds (62.8%) would be good candidates for bariatric surgery. This is the first study to assess the candidacy for bariatric surgery among severe OSA patients in general sleep clinics. In contrast to what many sleep providers may believe, we found a substantial proportion of OSA patients are open to bariatric surgery as treatment (over one third in our study). Given that interest in bariatric surgery was assessed by a research team, this is likely an underestimate of the true interest level. Patients may be even more accepting of bariatric surgery if the topic is broached by a care provider within the framework of their routine care. Additionally, interest was not assessed in patients with a BMI > 45 kg/m^2. Patients with greater obesity may have even greater interest in this treatment given that they have even more to gain from bariatric surgery.

Nearly half of women were interested in bariatric surgery, and female gender was an independent predictor of surgical interest. Though not previously assessed in an OSA population, this finding is consistent with overall bariatric utilization data, where women comprise 76–83% of bariatric patients.[13–15] Nevertheless, because of the high prevalence of men with OSA, our study is unique among bariatric surgery studies in that men comprised nearly half of the interested population.

We also found diabetes was as an independent predictor of surgical interest with two-thirds of diabetics interested in bariatric surgery. The role of diabetes as a predictor of surgical interest has not been previously evaluated in OSA or general populations. However, given strong evidence of the efficacy of bariatric surgery in improving or reversing diabetes, [16] diabetic OSA patients may be more motivated to pursue bariatric surgery in hopes of simultaneously curing both diseases.

A strength of our study is that consecutive patients were approached at their initial sleep clinic visit across multiple clinical sites. As a result, our findings are likely generalizable to a broad population of obese OSA patients. Indeed, patients were not primed to the fact that a discussion about bariatric surgery was going to take place at this encounter and the sleep physician did not specifically recommend bariatric surgery.

Several limitations should also be noted. First, our study assessed interest in learning more about bariatric surgery but this does not necessarily translate into a decision to pursue surgery. Nevertheless, we believe the willingness to attend a separate medical visit about bariatric surgery suggests sufficient interest to justify recommending a discussion about this treatment option by the sleep clinician. In addition, due to the design of the study, we were unable to assess interest in bariatric surgery among patients who declined an informational visit due to difficulty attending visits or lack of interest in research. There may be important differences among these patients that we were unable to capture. Finally, we only assessed interest among patients who were clearly at low pre-operative risk. However, many of the 30% of patients at elevated peri-operative risk, particularly those with stable heart disease or active tobacco use, may have been interested in bariatric surgery. These patients may still be candidates after optimization (e.g. tobacco cessation) and may have even more to benefit from this intervention due to the severity of their co-morbid disease.

Our findings support the fact that there is sufficient patient interest in bariatric surgery to warrant routine discussion of this treatment option among morbidly obese OSA patients. This discussion needs to be nuanced. While observational studies suggest OSA severity improves by up to 76%,[17] a recent randomized trial found no significant difference between bariatric surgery and intensive medical weight loss as ancillary therapy for OSA.[18] However, gastric banding was the only surgical procedure offered in that trial suggesting greater benefits may have been achieved with more aggressive surgical procedures. Further studies are clearly needed to better define the role of bariatric surgery in the management of OSA.

Conclusions

A majority of obese OSA patients are good candidates for bariatric surgery and there is a high level of interest in considering this treatment option with greatest interest among women and diabetics. Sleep disorders clinics represent an important opportunity to discuss bariatric surgery with patients who may derive significant benefit from this intervention. Closer collaboration between sleep physicians and bariatric surgeons is recommended.

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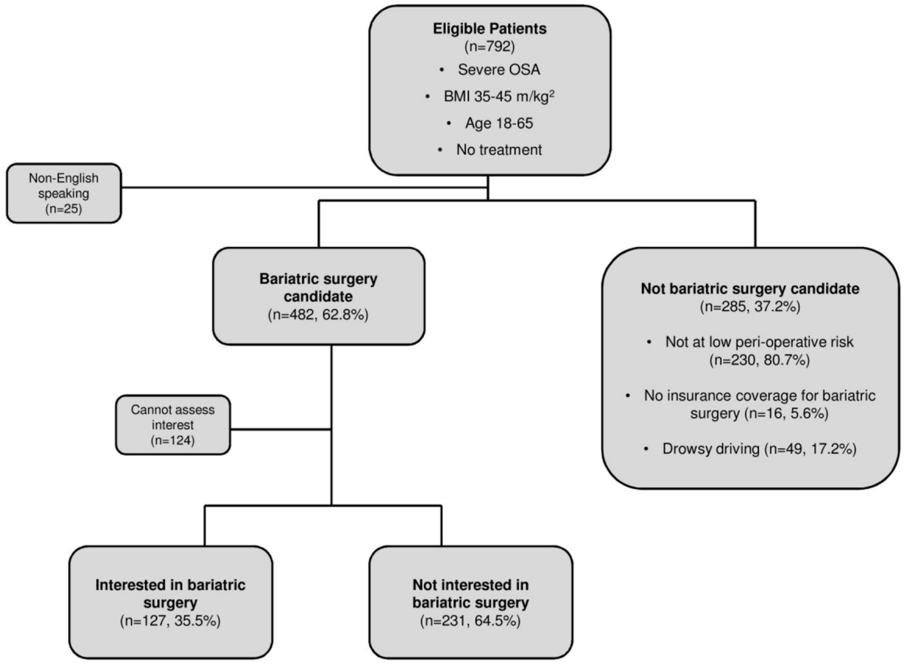

Figure 1.

Assessment of Bariatric Surgical Candidacy and Surgical Interest

Classification of obstructive sleep apnea patients by eligibility and interest in bariatric surgery. Some patients who were not candidates for bariatric surgery were in multiple categories (e.g. not at low peri-operative risk and also had drowsy driving).

Table 1

Patient Characteristics by Interest in Bariatric Surgery

	Interested (n= 127)	Not interested (n=231)	*p* value
Age (years)	47.4 ± 11.0	47.4 ± 10.3	0.99
Female	68 (53.5%)	76 (32.9%)	<0.01
Body mass index (kg/m^2)	39.5 ± 3.2	39.0 ± 3.0	0.15
Apnea hypopnea index (events/hr)	52.8 ± 27.8	59.3 ± 27.6	0.04
Prior CPAP use	12 (10.4%)	14 (7.7%)	0.53
Hypertension	70 (58.3%)	92 (45.5%)	0.03
Diabetes mellitus	37 (30.8%)	18 (8.9%)	<0.01
Dyslipidemia	42 (35.0%)	48 (23.8%)	0.04
Gastroesophageal reflux disease/peptic ulcer disease	29 (24.2%)	51 (25.3%)	0.89

Values provided as mean ± SD or number (percentage). CPAP = continuous positive airway pressure.

Table 2

Predictors of interest in bariatric surgery

	Age, sex, and clinic site adjusted models Odds ratio (95% CI)	**Fully adjusted models* Odds ratio (95% CI)**
Age (years)	0.99 (0.97–1.01) [a]	0.99 (0.96–1.01)
Female Gender	2.42 (1.54–3.80) [b]	1.89 (1.10–3.25)
Body mass index (kg/m^2)	1.03 (0.96–1.11)	1.00 (0.92–1.09)
Apnea hypopnea index (events/hr)	1.00 (0.99–1.00)	1.00 (0.99–1.01)
Prior CPAP Use	1.47 (0.64–3.37)	1.14 (0.48–2.71)
Hypertension	1.59 (0.97–2.62)	1.22 (0.69–2.16)
Diabetes mellitus	4.65 (2.46–8.81)	3.97 (1.97–8.01)
Dyslipidemia	1.91 (1.12–3.26)	1.28 (0.69–2.39)
Gastroesophageal reflux disease/peptic ulcer disease	0.79 (0.46–1.37)	0.79 (0.43–1.43)

[a] Adjusted for sex and clinic site.

[b] Adjusted for age and clinic site.

* Fully adjusted model includes age, sex, clinic site, body mass index, apnea hypopnea index, prior CPAP use, hypertension, dyslipidemia, diabetes, gastroesophageal reflux disease. CPAP = continuous positive airway pressure.