ORIGINAL CONTRIBUTION

Surgical vs Conventional Therapy for Weight Loss Treatment of Obstructive Sleep Apnea

A Randomized Controlled Trial

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Context Obstructive sleep apnea (OSA) is strongly related to obesity. Weight loss is recommended as part of the overall management plan for obese patients diagnosed with OSA.

Objective To determine whether surgically induced weight loss is more effective than conventional weight loss therapy in the management of OSA.

Design, Setting, and Patients A randomized controlled trial of 60 obese patients (body mass index: ≥35 and <55) with recently diagnosed (<6 months) OSA and an apnea-hypopnea index (AHI) of 20 events/hour or more. These patients had been prescribed continuous positive airway pressure (CPAP) therapy to manage OSA and were identified via accredited community sleep clinics. The trial was conducted between September 2006 and March 2009 by university- and teaching hospital–based clinical researchers in Melbourne, Australia. Patients with obesity hypoventilation syndrome, previous bariatric surgery, contraindications to bariatric surgery, or significant cardiopulmonary, neurological, vascular, gastrointestinal, or neoplastic disease were excluded.

Interventions Patients were randomized to a conventional weight loss program that included regular consultations with a dietitian and physician, and the use of very low-calorie diets as necessary (n=30) or to bariatric surgery (laparoscopic adjustable gastric banding; n=30).

Main Outcome Measures The primary outcome was baseline to 2-year change in AHI on diagnostic polysomnography scored by staff blinded to randomization. Secondary outcomes were changes in weight, CPAP adherence, and functional status.

Results Patients lost a mean of 5.1 kg (95% CI, 0.8 to 9.3 kg) in the conventional weight loss program compared with 27.8 kg (95% CI, 20.9 to 34.7 kg) in the bariatric surgery group ($P<.001$). The AHI decreased by 14.0 events/hour (95% CI, 3.3 to 24.6 events/hour) in the conventional weight loss group and by 25.5 events/hour (95% CI, 14.2 to 36.7 events/hour) in the bariatric surgery group. The between-group difference was −11.5 events/hour (95% CI, −28.3 to 5.3 events/hour; $P=.18$). CPAP adherence did not differ between the groups. The bariatric surgery group had greater improvement in the Short Form 36 physical component summary score (mean, 9.3 [95% CI, 0.5 to 18.0]; $P=.04$).

Conclusion Among a group of obese patients with OSA, the use of bariatric surgery compared with conventional weight loss therapy did not result in a statistically greater reduction in AHI despite major differences in weight loss.

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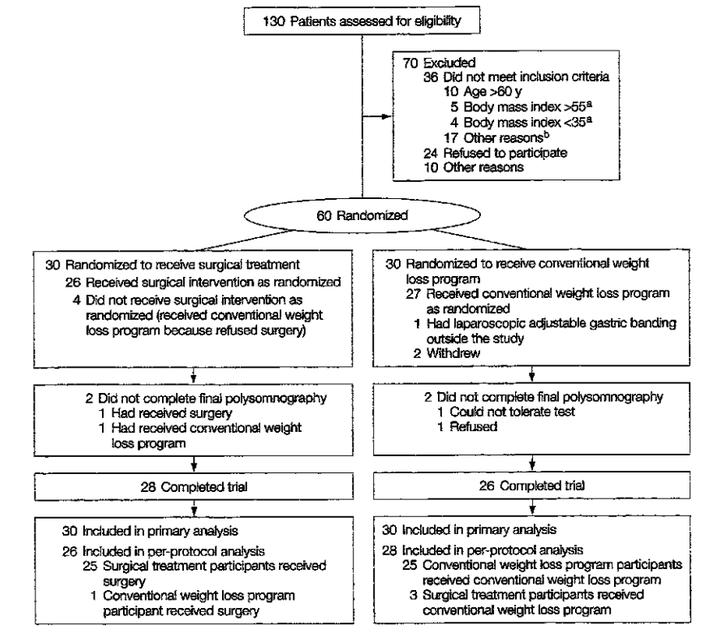
For editorial comment see p 1160.

OBESITY IS A MAJOR RISK FACtor for obstructive sleep apnea (OSA). The estimated prevalence of OSA in obese adults varies from 42% to 48% in men and 8% to 38% in women.[1] Obstructive sleep apnea is strongly related to obesity and associated conditions such as type 2 diabetes and hypertension.[2] Individuals with OSA are at greater risk of stroke, cardiac disease, psychosocial morbidity, cognitive dysfunction, and impaired quality of life.[3-5]

Therapy for symptomatic OSA focuses on methods to reduce upper airway resistance and prevent obstruction, such as continuous positive airway pressure (CPAP),[6] oral appliances,[7] and upper airway surgery. However, in severely obese patients, none of these options treats the accompanying obesity. Observational studies of major weight loss following bariatric surgery suggest substantial remission of OSA symptoms in up to 60% to 80% of patients.[8] However, in the studies where repeat polysomnography was avail-

Outcome

Figure 1. Participant Recruitment, Exclusions, and Flow Throughout the Study



[a] Calculated as weight in kilograms divided by height in meters squared.
[b] Included obesity hypoventilation syndrome, previous bariatric surgery, contraindications to bariatric surgery, or significant cardiopulmonary, neurological, vascular, gastrointestinal, or neoplastic disease.

Table 2. Longitudinal Analysis With Multiple Imputation for Missing Data for Polysomnography Variables and Weight at 2 Years

	Mean (95% CI)				
	Surgical Treatment (n = 30)	Conventional Weight Loss Program (n = 30)	Between-Group Difference	No. (%) Missing at 2 y	*P* Value
Weight, kg	107 (99 to 116)	121 (113 to 129)			
Change in weight, kg	−27.8 (−34.7 to −20.9)[a]	−5.1 (−9.3 to −0.8)[a]	−22.7 (−31.1 to −14.3)	2 (3)	<.001
Apnea-hypopnea index, events/h	39.5 (28.4 to 50.5)[a]	43.2 (34.9 to 51.9)[a]			
Change in apnea-hypopnea index, events/h	−25.5 (−36.7 to −14.2)	−14.0 (−24.6 to −3.3)	−11.5 (−28.3 to 5.3)	6 (10)	.18
Total sleep time, min	373 (348 to 399)	333 (297 to 370)			
Change in total sleep time, min	22.0 (−5.5 to 46.5)	10.5 (−25.5 to 46.4)	11.5 (−39.0 to 62.1)	6 (10)	.65
Sleep latency, min	18.6 (11.3 to 26)	24.5 (15.0 to 34.1)			
Change in sleep latency, min	−6.3 (−13.7 to 1.0)	4.2 (−4.4 to 12.8)	−10.6 (−24.4 to 2.3)	6 (10)	.11
Sleep efficiency, %	79.8 (75.8 to 83.8)	72.4 (65.3 to 79.6)			
Change in sleep efficiency, %	1.6 (−3.4 to 6.6)	−3.04 (−9.70 to 3.70)	4.7 (−4.6 to 13.9)	6 (10)	.32
Supine sleep, %	47.1 (35.5 to 58.6)	37.0 (25.1 to 48.8)			
Change in supine sleep, %	2.9 (−7.6 to 13.4)	−1.7 (11.5 to 8.0)	4.6 (−11.3 to 20.5)	6 (10)	.57
Slow wave sleep, %	15.3 (10.5 to 20.1)	21.1 (13.1 to 29.1)			
Change in slow wave sleep, %	0.7 (−2.7 to 4.1)	2.6 (−3.5 to 8.7)	−1.9 (−10.0 to 6.3)	7 (12)	.65
Rapid eye movement sleep, %	15.5 (12.8 to 18.2)	11.3 (8.4 to 14.2)			
Change in rapid eye movement sleep, %	2.6 (−1.1 to 6.3)	−1.6 (−4.7 to 1.5)	4.2 (−1.1 to 9.5)	7 (12)	.12
Apnea-hypopnea index rapid eye movement sleep, events/h	34.0 (21.8 to 46.2)	54.5 (43.6 to 65.4)			
Change in apnea-hypopnea index rapid eye movement sleep, events/h	−32.2 (−49.7 to −14.7)[a]	−13.5 (−26.7 to −0.3)[a]	−18.7 (−44.8 to 7.5)	10 (18)	.16
Arousal index, events/h	29.9 (23.2 to 36.7)	33.6 (27.8 to 39.4)			
Change in arousal index, events/h	−14.9 (−28.0 to −1.8)[a]	−24.9 (−62.5 to 12.7)	10.0 (−32.0 to 52.5)	15 (27)	.64
Available hemoglobin saturated with oxygen During sleep, %	95.5 (94.9 to 96.1)	95.2 (94.9 to 95.9)[a]			
Change during sleep, %	1.2 (0.3 to 2.0)[a]	0.2 (−1.1 to 1.4)	1.0 (−0.6 to 2.6)	9 (17)	.22
Minimum, %	79.0 (73.9 to 84.0)	76.2 (68.0 to 84.3)			
Change in minimum, %	7.2 (1.9 to 12.5)	3.7 (−2.8 to 10.2)	3.4 (−6.5 to 13.4)	9 (17)	.50
Period when level <90%, min	23.4 (10.3 to 36.5)	28.9 (9.1 to 48.7)			
Change in period when level <90%, min	−59.4 (−95.6 to −23.2)[a]	−28.1 (−50.8 to −5.3)	−31.3 (−77.7 to 15.1)	13 (22)	.19

[a] Indicates significant within-group improvement ($P<.05$).