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CHANGES IN SLEEP-DISORDERED BREATHING FOLLOWING BARIATRIC SURGERY FOR MORBID OBESITY

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Abstract—Obstructive sleep apnea (OSA) is highly prevalent in the patient received bariatric surgery. We aimed to study the impact of surgical related weight loss on the patterns of OSA and daily activity. Overweight adult patients undergoing bariatric surgery in National Cheng-Kung University Hospital were recruited. Preoperatively, all these subjects received overnight polysomnography, 7-day activity evaluation (actigraphy) and complete questionnaires regarding daytime sleepiness, snoring severity. After 6-month follow-up, these assessments were repeated for each patient. A total of 22/43 (48.8%) patients completed the whole assessments in the preoperative and postoperative periods. The preoperative mean body mass index (BMI) , mean systolic and diastolic blood pressure, Apnea Hypopnea Index (AHI), lowest O2 saturation, average of daytime wake efficiency . After 6-month follow up, the reduction of BMI, blood pressure, heart rate, AHI and lowest O2 saturation all were obvious ($p<0.05$). But the daytime wake efficiency was improved limitedly.AHI showed significantly improvement in the period of 6-month. Bariatric surgery could be considered an effective therapy for OSA in the severely obese patient. But surgery is less like to improve daily activity

Keywords—Obstructive sleep apnea; bariatric surgery; polysomnography

I. INTRODUCTION

Sleep apnea (OSA) is highly prevalent in the patient received bariatric surgery. We aimed to study the impact of surgical related weight loss on the patterns of OSA and daily activity.

II. MATERIALS AND METHODS

Overweight adult patients undergoing bariatric surgery in National Cheng-Kung University Hospital were recruited. Preoperatively, all these subjects received overnight polysomnography, 7-day activity evaluation (actigraphy) and complete questionnaires regarding daytime sleepiness, snoring severity. After 6-month follow-up, these assessments were repeated for each patient (Figure 1).

III. RESULTS

A total of 22/43 (48.8%) patients completed the whole assessments in the preoperative and postoperative periods. Laparoscopic sleeve gastrectomy was performed in 13 patients (59.1%), laparoscopic Roux-en-Y gastric bypass in 7 (31.8%), and laparoscopic adjustable gastric banding in 2 (9.1%). Of the 22 patients, eight (36.4%) were male. The average of age was 36.8 years (SD=9.6). The preoperative mean body mass index (BMI) was 45.2 (SD=8.6). The preoperative mean systolic and diastolic blood pressure was 131.2 and 82.2 mmHg, respectively. Preoperatively, Apnea Hypopnea Index (AHI) was 29.4 (/hr) (SD=28.7); lowest O2 saturation was 74.0%; the average of daytime wake efficiency was 86.8%. Furthermore, 59.1% of the 22 patients had an AHI > 15. After 6-month follow up, the reduction of BMI, blood pressure, heart rate, AHI and lowest O2 saturation all were obvious ($p<0.05$). But the daytime wake efficiency was improved limitedly (Table 1). We found that female had more reduction of AHI. And those with smaller neck and waist size, less severe OSA and oxygen desaturation pre-operatively will have better result (table 2-1). The post-operative results also revealed that more reduction of neck size and improvement of oxygen saturation correlated with AHI reduction (table 2-2).

IV. CONCLUSION

AHI showed significantly improvement in the period of 6-month. Bariatric surgery could be considered an effective therapy for OSA in the severely obese patient. But surgery is less like to improve daily activity.

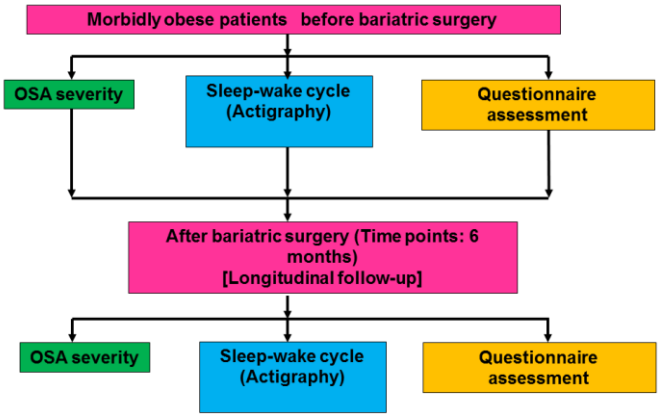

Figure 1. Study protocol

Variable	Pre-op Mean (SD)	Post-op Mean (SD)	Difference (post - pre)	
			Mean (SE)	P-value
BW (kg)	121.7 (28.9)	92.2 (19.3)	-29.5(15.6)	<0.001
BMI (kg/㎡)	45.2 (8.6)	34.1 (5.6)	-11.1 (5.4)	<0.001
Neck circumference (NC)(cm)	43.2 (5.6)	38.6 (3.9)	-4.6 (3.1)	<0.001
Waist circumference (WC)(cm)	125.0 (19.3)	103.3 (14.2)	-21.7(12.0)	<0.001
Hip circumference (HC)(cm)	133.5 (17.5)	114.4 (12.0)	-19.1(10.3)	<0.001
Blood pressure_systolic (mmHg)	131.2 (12.9)	121.0 (12.0)	-10.8(12.8)	0.001
Blood pressure_diastolic (mmHg)	82.2 (12.1)	75.2 (7.5)	-7.4 (14.3)	0.032
Heart rate (times/min)	82.0 (12.8)	64.6 (9.9)	-18.2(15.3)	<0.001
PSG_AHI (/hr)	29.4 (28.7)	10.0 (14.3)	-19.4 (19.0)	<0.001
PSG_average O2 (%)	93.5 (4.4)	96.0 (2.0)	2.5 (3.4)	0.002
PSG_lowest O2 (%)	74.0 (12.6)	83.7 (6.8)	9.6 (8.4)	<0.001
PSG_snore index /hr)	276.7(286.2)	100.8 (152.4)	-176.0(225.8)	0.002
Actigraphy_nap number	3.1 (3.3)	3.1 (1.6)	0.5 (1.5)	0.228
Actigraphy_wake efficiency (%)	86.8 (9.8)	86.9 (6.7)	-1.2 (8.9)	0.574
ESS score	7.9 (4.9)	5.9 (4.3)	-2.0 (6.5)	0.166
SOS score	59.2 (13.6)	78.2 (10.3)	20.1 (13.1)	<0.001
PSQI score	7.2 (4.4)	5.1 (3.1)	-2.1 (3.4)	0.009
PSG_AHI (/hr)	29.4 (28.7)	10.0 (14.3)	-19.4 (19.0)	<0.001
PSG_average O2 (%)	93.5 (4.4)	96.0 (2.0)	2.5 (3.4)	0.002

Table 1. Change of study parameters among these subjects receiving bariatric surgery after 6-month follow up. (n=22)

Variable	AHI reduction		
	β	R^2	P-value
Age	-0.267	0.018	>0.05
Gender: Male	-35.538	0.432	< 0.001
Female	-10.214		
Pre-BW (kg)	-0.274	0.175	0.053
Pre-BMI (kg/㎡)	-0.758	0.119	0.115
Pre-Neck circumference (cm)	-1.810	0.290	0.010
Pre-Waist circumference (cm)	-0.427	0.189	0.043
Pre-Hip circumference (cm)	-0.359	0.110	0.132
Pre-Blood pressure_systolic (mmHg)	0.145	0.010	0.663
Pre-Blood pressure_diastolic (mmHg)	-0.453	0.083	0.193
Pre-Heart rate (times/min)	0.015	<0.001	0.964
Pre-PSG_AHI (/hr)	-0.594	0.805	<0.001
Pre-PSG_average O2 (%)	299.199	0.481	<0.001
Pre-PSG_lowest O2 (%)	82.476	0.303	0.008
Pre-PSG_snore index (snores/hr)	-0.024	0.126	0.105
Pre-Actigraphy_daytime nap number	-1.833	0.111	0.140
Pre-Actigraphy_wake efficiency (%)	0.341	0.034	0.423
Pre-ESS score (0-24)	-0.584	0.023	0.505
Pre-SOS score (0-100)	0.294	0.045	0.346
Pre-PSQI score (0-21)	0.123	0.001	0.899
Bariatric surgery: Band	-20.500	0.001	0.992
Sleeve	-19.631		
Bypass	-18.729		

Table 2-1. Regression analysis of different parameters relating to AHI reduction after 6-month follow up. (n=22)

Variable	AHI reduction		
	β	R^2	P-value
△-BW (kg)	0.335	0.076	0.215
△-BMI (kg/㎡)	0.755	0.046	0.336
△-Neck circumference (cm)	2.687	0.197	0.038
△-Waist circumference (cm)	0.444	0.079	0.205
△-Hip circumference (cm)	0.501	0.074	0.220
△-Blood pressure_systolic (mmHg)	-0.076	0.003	0.835
△-Blood pressure_diastolic (mmHg)	0.412	0.091	0.196
△-Heart rate (times/min)	0.127	0.010	0.665
△-PSG_average O2 (%)	-332.923	0.352	0.004
△-PSG_lowest O2 (%)	-100.277	0.197	0.039
△-PSG_snore index (snores/hr)	0.022	0.070	0.236
△-Actigraphy_daytime nap number	-3.780	0.100	0.217
△-Actigraphy_wake efficiency (%)	0.762	0.132	0.151
△-ESS score (0-24)	0.116	0.002	0.860
△-SOS score (0-100)	0.232	0.025	0.490
△-PSQI score (0-21)	1.033	0.034	0.408

Table 2-2. Regression analysis of different parameters relating to AHI reduction after 6-month follow up