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The effects of bariatric surgery on the physical functions among obese patients

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Introduction

Overweight is widely considered as one of the major health problems which can induce various chronic conditions, such as hypertension, cardiovascular diseases, type 2 diabetes. Also, a wide variety of musculoskeletal complications are related to obesity. Nowadays, bariatric surgery is considered as a treatment option for extremely overweight people. It has been shown to have the effect in weight loss and metabolic comorbidities, irrespective of the type of surgery. This case series describes 3 patients who underwent bariatric surgery. We compared pre-surgery and post-surgery physical function (performance) including balance and strength.

Patient and measures

Among the patients who underwent bariatric surgery, 3 patients completed pre-surgery, 1 and 3 months post-surgery evaluation. Pre-surgery and post-surgery physical function evaluations include timed up and go (TUG) test, Berg-balance scale (BBS), isokinetic strength test, dynamic posturography, and grip strength test. For TUG test, patients were requested to rise from a chair, walk 3 meters away, and return to the chair and sit down. It has a relation with balance, gait speed, and stair climbing. The isokinetic strength test is intended to measure the isokinetic concentric strength of quadriceps and hamstring muscles, 4 repetitions at the angular velocities of 60°/sec and 15 repetitions at 180°/sec. Peak torque values were recorded. For dynamic posturography measure, limits of stability analysis, which aims to measure the participants' ability to move the center of gravity (COG) was used. The patients were to move COG to 8 directions with fixing their feet on the sensor board. The sum of distances of 8 directions (total surface area) was measured. Area of 28000mm² or more is normal. The grip strength was measured using dynamometer. Additionally, body weight, body mass index (BMI), systolic blood pressure (SBP), body fat, and Hemoglobin A1c (HbA1c) were collected.

Result

The summary of the results is described in table 1, 2. All the patients showed improved BBS and TUG test. Two patients revealed improved total surface area measured by dynamic posturography and 1 patient showed similar normal results of pre-surgery and post-surgery evaluations (Fig 1). Grip strength revealed to have a tendency to increase in all patients. However, the isokinetic strength of knee flexion and extension were shown to have less consistency. All of the patients got total weight, body fat, BMI, SBP, and HbA1c reduction. Patient 1 and 2 showed reduced muscle mass, and patient 3 showed unchanged muscle mass.

Discussion

This case series presented 3 patients who got bariatric surgery. Three months after surgery, the patients showed improved balance, revealed by BBS, TUG test, and dynamic posturography. Also, it showed improved grip strength, although the results of the isokinetic strength of knee flexion and extension were inconsistent. Further studies are needed to verify the results.

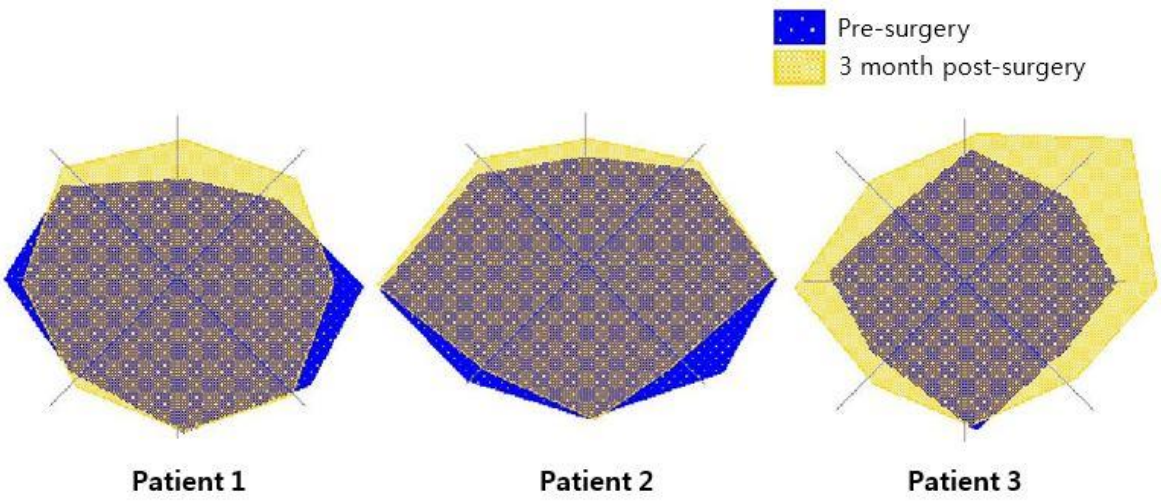

Figure 1. Surface area of dynamic posturography of the patients

Table 1. Pre-surgery and 3 month post-surgery results of BBS, TUG, isokinetic strength, and dynamic posturography.

	Patient 1		Patient 2		Patient 3	
	Pre-surgery	3 month post-surgery	Pre-surgery	3 month post-surgery	Pre-surgery	3 month post-surgery
Berg Balance Scale	53	56	55	56	54	55
Timed up and go test (sec)	7.66	7.39	7.42	7.33	9.96	8.97
Isokinetic strength test						
Knee 60` peak torque						
Extension – Right.	119	122	221	210	194	199
Extension – Left.	146	126	202	197	212	193
Flexion – Right.	42	30	91	107	89	99
Flexion – Left.	60	49	83	84	79	89
Knee 180` peak torque						
Extension – Right.	61	62	129	132	121	115
Extension – Left.	64	66	121	125	146	119
Flexion – Right.	35	33	53	72	61	64
Flexion – Left.	49	35	52	64	64	64
Dynamic posturography						
Total surface area (mm^2)	24307	26078	32040	31311	18132	28450
Hand grip strength						
Right	30	30	26	40	24.3	38
Left	24	32	24	38	21	34

Table 2. Pre-surgery and 3 months post-surgery results of weight, BMI, body fat, muscle mass, systolic blood pressure, and HbA1c

	Patient 1		Patient 2		Patient 3	
	Pre-surgery	3 month post-surgery	Pre-surgery	3 month post-surgery	Pre-surgery	3 month post-surgery
Body weight (kg)	101	85	147	121	139	130
BMI (kg/m^2)	35.1	29.4	49	40.4	41.4	38.9
Body fat (%)	45.5	39.8	52.4	48.9	48.8	45.5
Muscle mass (kg)	31.1	28.3	39.1	34.2	39.6	39.6
Systolic blood pressure	128	114	134	122	148	133
HbA1c*	5.7	5.2	10	6.4	6.7	5.3

* : measured at 1 month after surgery.