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Original article

Body composition changes in the first month after sleeve gastrectomy based on gender and anatomic site

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Abstract

Background: Sleeve gastrectomy (SG) induces acute weight loss, but its impact on the very early postoperative changes in body composition (BC) is less clear.

Objectives: This longitudinal study examined the BC changes in the first month after SG according to gender and anatomic site.

Methods: BC (lean tissue mass [LTM] and fat mass [FM]) were determined by dual-energy x-ray absorptiometry in 41 obese patients (33 women, 80.5%) just before SG and 1 month later.

Setting: University hospital of Montpellier, France.

Results: One month after SG, mean weight loss was –9.8 ± 2.6 kg, with a significant decrease in LTM and FM (kg) ranging from –7.3% to 9.5%, depending on site. FM (kg) loss in men exceeded that in women at whole body, upper limbs, and trunk. FM (%) and the LTM/FM ratio decreased only in the trunk in men and the lower limbs in women, but the gender difference was only observed for the trunk. In women, age was positively correlated with relative FM variation (% and kg) in the lower limbs and negatively correlated with LTM and LTM/FM. In men, weight was negatively correlated with the relative LTM and FM (kg) variations in the upper limbs.

Conclusion: SG induces acute weight loss, but this loss comprises losses in both FM and LTM. Because excessive LTM loss can have deleterious consequences, preventive strategies should be implemented soon after bariatric surgery. The specific changes in BC are highlighted according to gender and anatomic site. (Surg Obes Relat Dis 2017;▮:00–00.) © 2017 American Society for Metabolic and Bariatric Surgery. All rights reserved.

Keywords: Sleeve gastrectomy; Bariatric surgery; Body composition; Fat mass; Lean tissue mass

Obesity is a major public health concern [1,2], and both overweight and obesity are associated with a wide range of chronic diseases [2]. Bariatric surgery (BS) is considered for weight loss in obese patients when other treatments have failed and when body mass index (BMI) is >40 kg/m² (severe obesity) or >35 kg/m² with obesity-related co-morbidities [3]. Over the last few years, sleeve gastrectomy (SG) is the bariatric technique that has had the highest increase worldwide, in great part because it is highly effective but less invasive than other bariatric techniques

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[4], thereby minimizing the common risks of surgery [5]. SG is as efficient as the gold standard, Roux-en-Y gastric bypass (RYGB), in terms of weight loss, improvement of co-morbidities like diabetes mellitus, and quality of life within the first 12 months after surgery [6].

SG induces acute and early loss of weight and consequently lowers BMI [7]. However, although BMI is a useful index for categorizing obesity severity and evaluating surgical efficiency, this index does not reflect the changes in whole body fat mass (FM) and lean tissue mass (LTM). Yet the precise evaluation of body composition changes is important because the FM and LTM compartments do not have the same physiologic effects. For example, a reduction in LTM, the main metabolically active component of the body [8,9], may reduce resting energy expenditure (REE) [10] and thus influence the rate of weight loss after BS. We recently reported that LTM in obese patients was positively correlated with areal bone mineral density (aBMD), whereas FM was not [11]. Given these differences, the changes in body composition after various BS interventions have been extensively evaluated, but most studies have focused on RYGB [12–15]. Only a few have evaluated the effects of SG, with most of these studies using bioelectrical impedance (BIA) [16–19] and only 1 using the dual-energy x-ray absorptiometry (DXA) technique [20]. Only the data for whole body composition were reported, with no information about localized variations [20], although these data might be more informative for evaluating the risk of various diseases in obese patients [21]. In addition, these investigations were performed at time points when the variations in FM and LTM had already occurred (i.e., 3–4 months to 1 year after SG) [16,19,20] and not when weight loss was maximal, around the first month [7]. Better understanding of the acute effects of SG on body composition changes may help to improve postoperative medical care and inspire new strategies to obtain favorable changes in FM and LTM.

The aim of this prospective study was thus to determine the body composition changes in the first month after SG. We also sought to determine whether the changes would vary with gender and anatomic site (i.e., trunk, upper and lower limbs) and whether basal parameters like age and obesity-related parameters like waist circumference, excess weight, and BMI would predict early FM or LTM variations.

Methods

Patients and method

Study approval was obtained from the Regional Research Ethics Committee and permission for the clinical trials was granted by the French Health Products Safety Agency. Written informed consent was obtained from all participants. The clinical trial number is NCT02310178.

Patients. From October 2014 to June 2015, 41 patients (33 women, 80.5%) from 18.0 to 68.2 years old were recruited from a waiting list of candidates for obesity surgery at the Department of Surgery A at Montpellier University Hospital (France). Patients were selected for surgery if other treatments for weight loss had failed and if BMI was >40 kg/m^2 (severe obesity) or ≥35 kg/m^2 with the presence of obesity-related co-morbidities [3]. All SGs were performed in a single institution. This bariatric procedure consists of resecting most of the greater curvature, which reduces gastric size and leaves a narrow stomach tube.

Methods

All patients were evaluated the day before the operation (baseline) and 1 month after the procedure (mean 1.13 ± .35 mo). During this follow-up period, patients were not encouraged to modify their physical activity and no protein supplementation was proposed. However, the same nutritionist gave the same nutritional recommendations to each patient just after SG. For each visit, standing height was measured with a stadiometer to the nearest .1 cm. Weight was determined using a weight scale with a precision of .1 kg. BMI was calculated as weight (kg) divided by the square of height (m). The ideal weight (IBW in kg) was obtained from the Lorentz equations: (height [cm] − 100) − ([height (cm) – 150] / 4) for men and (height [cm] − 100) − ([height (cm) – 150] / 2) for women. The percentage of total weight loss (%TWL), the excess weight (EBW: weight − IBW), the percentage of excess weight loss (%EWL: 100 × [preoperative weight − current weight] / [preoperative weight − ideal weight]), and the excess BMI (EBMI: current BMI − 25) were also calculated.

Body fat and fat-free soft tissue evaluation. The soft tissue body composition (fat mass [FM, kg], percentage of body fat mass [%FM], and LTM [LTM, kg]) were measured using DXA (Hologic QDR-4500 A, Hologic, Inc., Waltham, MA). To analyze the relative variation of LTM to FM, LTM/FM was calculated. Data at each site (upper limbs, trunk, and lower limbs) were derived from the whole body scan. All scanning and analyses were performed by the same operator to ensure consistency, after following standard quality control procedures. Quality control for DXA was checked daily by scanning a lumbar spine phantom consisting of calcium hydroxyapatite embedded in a cube of thermoplastic resin (DPA/QDR-1; Hologic x-caliber anthropometrical spine phantom). The CVs given by the manufacturer were < 1% for LTM and FM.

Scan procedure. Participants assumed a stationary supine position and were centered on the scanner table with the head, neck, and torso positioned parallel to the long axis of the scan bed and the shoulder and pelvis positioned perpendicular to it. Their arms were out to the side, with