

Clinical Science

A short-duration restrictive diet reduces visceral adiposity in the morbidly obese surgical patient



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Abstract

BACKGROUND: This study aims to determine if visceral obesity can be reduced after a brief preoperative diet in obese patients.

METHODS: Forty morbidly obese patients were placed on a 1,000 kCal per day diet for 14 days before bariatric surgery. Patients had weight measurements and an abdominal ultrasound performed on days 1 and 14. The ultrasound measured visceral obesity using the distance between the abdominal muscle and the aorta, the fat thickness of the perinephric space, and the distance between the abdominal muscle and splenic vein. Mesenteric fat burden was calculated and compared.

RESULTS: Thirty-eight patients (95%) lost weight on the diet, with a mean loss of 5.2 lbs. Twenty-five patients (63%) had a reduction in mesenteric fat. The average visceral obesity lost was 7.76 cm³ or 3% of the visceral adiposity of the average obese patient (250 cm³).

CONCLUSIONS: A short preoperative calorie restricting diet is well tolerated and results in a reduction in visceral obesity.

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Obesity is epidemic in Western society. In the United States, one-third of the adult population meets the definition of obesity demonstrating a body mass index (BMI) of over 30.¹ This accounts for almost 80 million people, and the problem only continues to increase. Over the last decade, the prevalence of adult obesity has risen from 27% to 35%.¹ In addition to the obvious public health

concerns, there are a number of other medical consequences impacted by obesity. As obesity rates soar, more of these patients require both elective and emergent surgery. Any surgical procedure required in the obese patient is not only technically more challenging but is associated with higher complication rates. The technical challenges associated with laparoscopic surgery are particularly evident.

Visceral adiposity, defined, as the fat surrounding the intestinal mesentery of and the intra-abdominal organs is particularly problematic. It has been demonstrated that visceral obesity is a predictor of technical difficulty associated with laparoscopic surgery.² Abdominal wall adiposity is largely dealt with once the trocars are in place; yet, this is not the case with the visceral adipose, which poses challenges with the conduction of the operative

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procedure itself. The visceral adipose makes it more difficult to manipulate the intestines and due to this as well as more problematic retraction, it makes intraoperative visualization more difficult. A higher level of visceral obesity has been demonstrated to increase the operative time for laparoscopic sigmoid colectomy, even more than prior abdominal surgery.³ In addition, increased visceral obesity is associated with higher wound infections and higher overall complications in patients undergoing laparoscopic colectomy.⁴ Furthermore, visceral adiposity has been demonstrated to increase all serious complications associated with colectomy.⁵

Preoperative caloric restrictive diets are often used in patients undergoing elective bariatric procedures. These diets have been shown to reduce liver size,⁶ decrease the conversion rate from laparoscopic to open procedures, and to decrease intraoperative bleeding.⁷

It has not been demonstrated if preoperative weight loss reduces visceral adiposity. If this is possible, a brief diet could be beneficial for the laparoscopic surgeon performing nonbariatric procedures as well. Laparoscopic intestinal surgery, such as elective colectomy performed for benign disease in particular could be aided in the obese patient population. We sought to determine if a brief preoperative diet could reduce visceral adiposity in the morbidly obese patient before undergoing elective surgery.

Patients and Methods

After obtaining institutional Institutional Review Board approval, 40 adult patients who met criteria for bariatric surgery at a single institution were enrolled in the study. All patients provided signed informed consent before enrolling in the study. All patients were required to have multiple documented attempts at weight loss, pass a psychological evaluation, and meet with a registered dietician before being scheduled for surgery.

Fourteen days before their bariatric procedure, the patients started a 1,000 kCal restrictive diet, which consisted of a single 150 kCal protein shake in the morning, and 400 kCal meals for both their afternoon and evening meals. The patients were instructed that these meals should be rich in protein and low in both fat and carbohydrates. This diet was outlined on a handout provided to each patient. They were instructed to follow the diet until the day of surgery. Each patient was also asked to maintain a dietary journal. Demographic data including age, sex, and race were obtained and recorded.

Before beginning the diet, patients were weighed on a bariatric scale to obtain height, weight, BMI, and body fat percentage. Laboratory tests consisting of prealbumin, transferrin, and urine ketones were performed to assess nutritional status. Before diet assumption, the patients underwent an ultrasound, by a verified ultrasonographer, to measure 3 standard parameters of the abdomen to calculate the visceral adiposity. These parameters included: (1) the

distance between the internal surface of the abdominal muscle and the splenic vein (mm; Fig. 1), (2) the distance between the internal surface of the abdominal muscle and the posterior wall of the aorta at the umbilicus (mm; Fig. 2), and (3) the thickness of the fat layer of the posterior right renal wall (mm; Fig. 3). A single board certified radiologist performed the ultrasound interpretation. A formula devised by comparing ultrasound volume measurements to computed tomography volume measurements by Hirooke et al ($9.008 + 1.191 \times A + .987 \times B + 3.644 \times C$)⁸ was then used to calculate the visceral adiposity (cm³).

On the day of surgery, patients were again weighed, and laboratory values and the ultrasound were repeated. Patients submitted their dietary journals and participated in a brief survey. The survey queried the patients regarding their opinion of the diet. They were specifically asked if they felt they were successful in following the diet, and how many days they were successful. In addition, they were asked to grade the difficulty of following the diet (1-easy, 2-somewhat difficult, 3-moderately difficult, and 4-extremely difficult). They were also questioned whether they would follow a similar diet again if asked to do so.

Mean and median weight loss; percentage fat loss, volume loss, change in prealbumin, and change in transferrin levels were calculated. A paired *t*-test was used to assess the significance of these values. A regression analysis was then used to compare weight loss and volume loss to patient age, sex, and initial BMI. The mean daily caloric intake and the number of days patients followed the restrictive diet based on self-reporting was recorded.

Results

Of the 40 patients, 37 (92%) were female; 19 (47%) were Caucasian, 11 (27%) were African-American, 9 (22%) were Hispanic, and 1 (2%) was Asian. The mean age was 37.5-year old, whereas the mean BMI was 42.7(kg/m²; 35.3 to 55.3 kg/m²). The average initial body fat

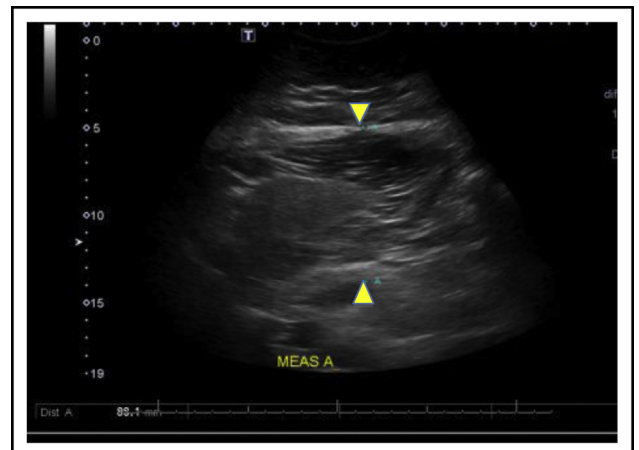


Figure 1 Measurement A, the distance between the internal surface of the abdominal muscle and the splenic vein (mm; arrowheads indicate the abdominal musculature splenic vein).

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