ELSEVIER

Surgery for Obesity and Related Diseases ▮ (2015) 00–00

SURGERY FOR OBESITY AND RELATED DISEASES

Original article

Feasibility and outcomes of laparoscopic sleeve gastrectomy after solid organ transplantation

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Received February 25, 2015; accepted April 4, 2015

Abstract

Background: Obesity is common after solid organ transplantation and is associated with worse transplantation-related outcomes. Laparoscopic sleeve gastrectomy (LSG) may be the preferred bariatric operation in transplantation patients over other techniques, such as gastric bypass, given the concerns about medication absorption. However, little is known about LSG outcomes in post-transplantation patients.

Objectives: We report the outcomes in 10 consecutive patients who underwent solid organ transplantation followed by LSG.

Setting: An academic medical center.

Methods: Primary outcomes studied were weight loss, perioperative complications, resolution or improvement of obesity-related co-morbidities, and markers of graft function following LSG.

Results: The types of transplantation before LSG were as follows: liver = 5, kidney = 4, and heart = 1. Mean body mass index (BMI) at LSG was 44.7 ± 1.7 kg/m^2. All patients had hypertension, and 6 had type 2 diabetes. Perioperative complications occurred in 2 patients, and there were no deaths. Excess weight loss at 12 and 24 months after LSG was 45.7% and 42.5%, respectively. At 1 year after LSG, there was a significant reduction in the number of antihypertensive medications (2.4 to 1.5; $P = .02$). Three patients achieved complete remission of type 2 diabetes, and the other 3 significantly reduced their dosages of insulin. Graft function remained preserved in liver transplantation patients; left ventricular ejection fraction (LVEF) increased by 10% in the heart transplantation subject, and the estimated glomerular filtration rate (eGFR) increased significantly in kidney transplantation patients (53 ± 3 to 82 ± 3 mL/min; $P = .03$).

Conclusions: We concluded that LSG, in selected patients with severe obesity after solid organ transplantation, results in significant weight loss, improvement or resolution of obesity-related conditions, and preservation or improvement of graft function. Larger studies are needed to determine tolerability standards. (Surg Obes Relat Dis 2015;▮:00–00.)

Keywords: Laparoscopic sleeve gastrectomy; Bariatric surgery; Transplantation; Liver transplantation; Kidney transplantation; Heart transplantation; Immunosuppression; Obesity; Type 2 diabetes; Graft function

Obesity (body mass index [BMI] >30 kg/m^2) and its associated co-morbidities are prevalent in solid organ transplant recipients, and 17% to 33% of patients awaiting liver, kidney, or heart transplantation are reported to have a BMI >30 kg/m^2, 2% to 12% of whom have a BMI >35 kg/m^2 [1–5]. Patients with a BMI >35 kg/m^2 (severe

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http://dx.doi.org/10.1016/j.soard.2015.04.002

obesity) are known to have worse perioperative and long-term outcomes after solid organ transplantation. They are at increased risk for wound infections [6] and have decreased rates of graft and patient survival following kidney, liver, pancreas, and simultaneous pancreas and kidney transplantations [3,7,8]. In fact, the leading cause of graft loss shifted over the last few decades from graft rejection to patient death due to cardiovascular disease [9], indicating that obesity-related co-morbidities, such as type 2 diabetes (T2DM) and hypertension (HTN), and their association with higher mortality may be important predictors of outcome following transplantation. In addition, many centers have limited provision of transplantations to patients with BMI <35 kg/m^2 while others consider BMI between 35 and 40 kg/m^2 as a relative contraindication for transplantation [10,11]. With increasing evidence that obesity leads to poor outcomes in transplantation patients, strategies to reduce risk are being investigated.

Bariatric surgery is the most effective treatment for severe obesity. It is known to provide significant and sustained weight loss [12], improvement in quality of life [13], remission of obesity-related diseases [14,15] and reduced mortality [16] in most patients in the general population. Bariatric surgery has been shown to be safe and effective before organ transplantation [17] in addition to improving candidacy in obese patients awaiting transplantation [18,19]. Importantly, laparoscopic sleeve gastrectomy (LSG) may be the preferred technique for transplantations due to concerns regarding anastomotic complications and medication absorption with other techniques, such as gastric bypass.

However, limited data are available on the feasibility, tolerability, and efficacy of LSG after solid organ transplantation. The purpose of this study was to report perioperative and long-term outcomes (weight loss, impact on obesity-related diseases, and markers of graft function) with LSG after solid organ (liver, kidney or heart) transplantation.

Methods

We conducted a retrospective review of a prospectively maintained database and electronic medical records (Epic, Verona, WI) to identify patients who had undergone solid organ transplantations and subsequently underwent LSG at our institution from 2008 to 2014. Patients were considered candidates for LSG if they had a BMI ≥ 40 kg/m^2 or BMI ≥ 35 kg/m^2 with obesity-related co-morbidities and had failed a 6-month medically supervised weight loss program. Before LSG, all patients had comprehensive medical evaluations and underwent individual preoperative evaluation and counseling by a multidisciplinary team that included dieticians, a physician assistant, psychologists, and bariatric surgeons. The patients participated in 4 classes with a total of 7 to 10 hours of educational sessions with the same multidisciplinary team. Following LSG, the patients were seen in the clinic by the multidisciplinary team at 2 weeks; at 3, 6, and 12 months; and subsequently, once a year.

Patient characteristics studied included age, sex, weight (kg), BMI, type and indication of transplantation, and time from transplantation to LSG. Obesity-related co-morbidities studied were HTN, T2DM, obstructive sleep apnea (OSA), and hyperlipidemia. Co-morbidities were noted at the time of transplantation and before bariatric surgery. These obesity-related co-morbidities were determined on the basis of provider notes in addition to medications used.

Outcomes studied included weight changes between transplantation and LSG; perioperative complications; operative time and estimated blood loss with LSG; percentage of excess weight loss (%EWL) and percentage of weight loss (%WL) at 6, 12, 18, and 24 months after LSG; changes in immunosuppressive medications 1 year after LSG; markers of graft function (serum alkaline phosphatase [ALP], alanine transaminase [ALT], aspartate aminotransferase [AST] and total bilirubin for liver transplantation; serum creatinine, blood urea nitrogen [BUN], and estimated glomerular filtration rate [eGFR] for kidney transplantation; and ejection fraction for cardiac transplantation patients) before and after LSG; and resolution or improvement in obesity-related co-morbidities after LSG. eGFR was calculated from serum creatinine using the Modification of Diet in Renal Disease (MDRD) formula. Patients who were taking no medications for HTN were considered to be in remission, and those who were receiving $<50\%$ of their initial medications and/or medications dosage were considered to have improved. T2DM remission was defined as hemoglobin A_{1c} (HbA_{1c}) level at $<6.5\%$ and disuse or discontinuation of antidiabetic medications; those receiving $\leq 50\%$ of their initial dosage of insulin or oral medications were considered to have improved. Changes in immunosuppression medications and tacrolimus levels before and after LSG were also noted.

Sleeve gastrectomy was performed laparoscopically in all patients. Initially, the greater curvature of the stomach was mobilized by dividing the gastrocolic and gastrosplenic ligaments from about 5 cm proximal to the pylorus all the way to the angle of His till the left crus was seen. The sleeve was created over a 40-French bougie by using multiple firings of an Endo GIA stapler. At the end of the procedure, a leak test was performed by using orogastric tubing connected to 1 L flow of oxygen, and the resected stomach was removed through an enlarged 12-mm port. Immunosuppression was continued throughout the perioperative period.

Paired samples t tests were used to compare baseline weight and BMI, as well as outcomes including weight loss, medication changes, markers of graft function, and tacrolimus level. One-way ANOVA was used to compare the weight loss outcomes of the 3 transplantation groups (liver versus kidney versus heart). Data are reported as mean ± standard error of the mean (SEM) unless otherwise