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Original article

Laparoscopic sleeve gastrectomy in patients with heart failure and left ventricular assist devices as a bridge to transplant

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Abstract

Background: Obesity is an epidemic that is closely associated with heart failure. The ultimate treatment for end-stage heart failure is cardiac transplantation. Patients with morbid obesity are often excluded from receiving donor organs. Many transplant centers use body mass index (BMI) >35 kg/m^2 as a contraindication to listing for heart transplant. Left ventricular assist devices (LVADs) were developed as a bridge to transplant for many heart failure patients, but bariatric surgery for LVAD patients has not been well described.

Objectives: The purpose of our study was to evaluate the safety and efficacy of laparoscopic sleeve gastrectomy (LSG) in LVAD patients and the impact on heart failure recovery as a bridge to cardiac transplantation.

Setting: University hospital.

Methods: A retrospective study was conducted to evaluate the outcomes of patients with morbid obesity and LVADs who underwent LSG at a large academic medical center between 2013 and 2017. Age, BMI, percent excess weight loss, cardiac ejection fraction, listing status for transplantation, and success of transplant were reviewed.

Results: Eleven patients were identified with morbid obesity and heart failure with LVAD support who underwent LSG. There were no perioperative deaths. Four patients (37%) achieved BMI <35 and were successfully listed for and received cardiac transplantation. An additional 3 patients (27%) achieved BMI <35 kg/m^2 and are listed for cardiac transplantation.

Conclusions: LSG can be safely used in patients with morbid obesity and end-stage heart failure requiring LVAD support to lower their BMI and become eligible for cardiac transplantation. (Surg Obes Relat Dis 2018;000:1–5.)

Keywords: Laparoscopic sleeve gastrectomy; Bariatric surgery; Left ventricular assist device (LVAD); Cardiac transplantation

Obesity is an epidemic that is progressive, costly, and closely associated with cardiac disease and death. Obesity causes structural and functional changes in the heart due to increases in metabolic demand, total blood volume, and stroke volume, all of which cause left ventricular dilation, cardiac muscle hypertrophy, and atrial enlargement [1,2]. Heart failure is a deadly condition, affecting up to 5.8 million people in the United States with associated healthcare costs exceeding $30 billion per year [3,4]. Heart failure carries a dismal prognosis, with up to 50% mortality over 5 years [5]. The ultimate treatment for advanced heart failure, which affects approximately 800,000 patients in the United States, is cardiac transplantation [6]. Cardiac

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transplantation improves 5-year survival for advanced heart failure patients to 80% and 10-year survival to >50% [7]. However, wait lists are extensive with only approximately 2200 donor hearts available each year for over 100,000 listed patients [8]. Additionally, transplant is not an option for many morbidly obese patients given the difficulty with size-matching larger recipients and increased complication rates for size-mismatched heart transplants. In fact, many centers use body mass index (BMI) >35 kg/m^2 as a contraindication to listing for heart transplant [9].

Left ventricular assist devices (LVADs) have emerged as a bridge to transplant [10,11]. These devices involve cannulation of the left ventricle and aorta with circulation powered by an implanted pump to increase cardiac output and improve survival until transplantation [12]. LVAD support drastically improves cardiac output and quality of life for heart failure patients. LVADs also reduce mortality by 50% over 2 years compared with optimal medical management in these patients [13]. LVADs typically result in significant improvement in functional status as measured by the New York Heart Association (NYHA) classification. The NYHA classification is a functional measure, with Class I corresponding to no limitation of physical activity, Class II corresponding to slight limitation, Class III corresponding to marked limitation with symptoms at less than ordinary activity, and Class IV corresponding to inability to perform any physical activity without discomfort [14]. LVAD implantation results in improved quality of life that can be associated with increased appetite and occasionally accelerated weight gain, which can preclude transplantation for a patient with morbid obesity. Bariatric surgery is well known to be the most effective treatment for morbid obesity to improve weight loss and reduce comorbidities [15,16]. The use of bariatric surgery to rescue high-BMI heart failure patients with LVADs and improve their eligibility for transplantation has not been well described. Case reports and small retrospective series suggest that bariatric surgery is potentially safe and efficacious for these high-risk heart failure patients [17–24].

The purpose of this study was to review the experience at a large academic medical center performing laparoscopic sleeve gastrectomy (LSG) for heart failure patients with LVADs. The goal is to evaluate perioperative safety, long-term outcomes regarding weight loss, eligibility for cardiac transplant listing, and successful transplantation.

Methods

This retrospective observational study was conducted between January 2013 and December 2017 at a 996-bed academic medical center hospital. The institutional review board approved this study the before initiation. Patients with morbid obesity (BMI >35 kg/m^2) and end-stage heart failure with LVAD support who were referred for weight loss surgery to improve eligibility for cardiac transplant were identified. At the time of referral, all patients were ineligible for transplant listing given their obesity. All patients met national consensus guidelines for weight loss surgery and underwent a thorough screening and counseling program through the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program–accredited bariatric center to qualify for surgery. After completing preoperative workup, all patients were preadmitted to the heart failure service in preparation for elective LSG. The heart failure team closely monitored the patients' volume status, and euvolemia was achieved. Oral anticoagulation agents were ceased 2 to 5 days preoperatively, and patients were bridged with a continuous heparin infusion until transport to the operating room. The cardiac anesthesia team was notified at the time of admission for each patient to complete preoperative evaluation and ensure cardiac anesthesia management intraoperatively. LSG was performed by 1 of 2 attending bariatric surgeons. The anesthesia team placed a radial arterial line preoperatively given that noninvasive blood pressure measurement is unreliable in pulseless LVAD patients. The patients' LVAD nurse coordinator was present in the operating room for each case, assisted with identification and protection of the subcutaneous LVAD device and drivelines, and managed LVAD settings during the case. LSG was performed by carefully placing 5 ports to avoid the LVAD drivelines. One port was a 12-mm working port and the remainder were 5-mm ports for the surgeon's left hand, camera, assistant, and liver retractor. The pylorus was identified and then the gastrocolic ligament was divided along the greater curvature cephalad through the short gastric vessels to the left crus. The crura were dissected to rule out a hiatal hernia, which was repaired if one was present. The anesthesia team placed a 36-Fr bougie. LSG was then performed by using two 60-mm green loads fired along the bougie approximately 5 cm proximal to the pylorus. Approximately 4 additional blue loads of the stapler were used to complete the LSG. All staple loads were loaded with buttressing material. An intraoperative esophagogastroduodenoscopy was then performed to evaluate for any leak. The omentum was then fixated to the staple line to prevent twisting of the sleeve. The specimen was then removed from the 12-mm port. The 12-mm port site fascia was closed with a laparoscopic port closure device and all skin incisions were closed with absorbable subcuticular sutures and topical skin adhesive. Patients then recovered from general anesthesia, were extubated in the operating room, and were transferred to the postanesthesia care unit. The arterial line was removed in the postanesthesia care unit once the patient was deemed stable by the anesthesia team. Patients were returned to the heart failure floor and LVAD settings and function were closely monitored throughout the admission. The heparin infusion was restarted 6 hours after completion of the case. Oral pain medications and a liquid diet were started on postoperative day 0 and a liquid diet with protein

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