ELSEVIER

Surgery for Obesity and Related Diseases ▮ (2013) 00–00

SURGERY FOR OBESITY AND RELATED DISEASES

Original article

Five-Year Results of Laparoscopic Sleeve Gastrectomy

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Received March 22, 2013; accepted June 4, 2013

Abstract

Background: Laparoscopic sleeve gastrectomy (LSG) is gaining popularity, but studies reporting long-term results are still rare. The objective of this study was to present the 5-year outcome concerning weight loss, modification of co-morbidities, and late complications.

Methods: This is a retrospective analysis of a prospective cohort with a minimal follow-up of 5 years. A total of 68 patients underwent LSG either as primary bariatric procedure (n = 41) or as redo operation after failed laparoscopic gastric banding (n = 27) between August 2004 and December 2007. At the time of LSG, the mean body mass index (BMI) was 43.0 ± 8.0 kg/m^2, the mean age 43.1 ± 10.1 years, and 78% were female. The follow-up rate was 100% at 1 year postoperatively, 97% after 2 years, and 91% after 5 years; the mean follow-up time was 5.9 ± 0.8 years.

Results: The average excessive BMI loss was 61.5% ± 23.4% after 1 year, 61.1% ± 23.4% after 2 years, and 57.4% ± 24.7% after 5 years. Co-morbidities improved considerably; a remission of type 2 diabetes could be reached at 85%. The following complications were observed: 1 leak (1.5%), 2 incisional hernias (2.9%), and new-onset gastroesophageal reflux in 11 patients (16.2%). Reoperation due to insufficient weight loss was necessary in 8 patients (11.8%).

Conclusions: LSG was effective 5.9 years postoperatively with an excessive BMI loss of almost 60% and a considerable improvement or even remission of co-morbidities. (Surg Obes Relat Dis 2013;▮:00-00.)

Keywords: Sleeve gastrectomy; Weight loss; Long-term results; Bariatric surgery; Diabetes remission

Laparoscopic sleeve gastrectomy (LSG), first described by Regan et al. in 2003 [1], was initially intended to be a primary intervention in high-risk patients before laparoscopic Roux-en-Y gastric bypass (LRYGB) or as first step of biliopancreatic diversion duodenal switch (BPD/DS) [2]. The technical demands of sleeve gastrectomy seem less than those of LRYGB or BPD/DS and help keep the complication rate after LSG low. Further advantages include a postoperatively still intact intestinal passage as well as the remaining option of surgical expansion into LRYGB or BPD/DS in case of insufficient weight loss.

Contrary to the opinion that the LSG is merely a restrictive procedure, it has been shown that LSG has strong metabolic effects possibly due to accelerated gastric emptying of solid food and reduction of ghrelin levels after resection of the gastric fundus, the part leading human ghrelin production [3–6]. In general, LRYGB was considered superior to LSG regarding the glycemic metabolism. Recently, it became evident that LSG achieves short-term results almost equal to those of Roux-en-Y gastric bypass (RYGB) [7,8], although this does not yet correspond to the common opinion. Based on good short-term and mid-term results concerning weight loss and reduction of co-morbidities, LSG is used more frequently today as a stand-alone procedure in bariatric surgery [9,10] and, in 2012, was recognized by the American Society for Metabolic and Bariatric Surgery (ASMBS) as an eligible alternative

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1550-7289/13/$ – see front matter
http://dx.doi.org/10.1016/j.soard.2013.06.024

operation technique for the LRYGB [11]. So far, long-term studies for LSG are still rare.

The aim of the present study was to evaluate the long-term results of LSG over a minimal observational period of 5 years with emphasis on weight reduction, modification of co-morbidities, and complications.

Patients and methods

In our institution, LSG as a stand-alone bariatric procedure was initially established in the context of a prospective study. Inclusion criteria were relative contraindications for LRYGB (i.e., huge abdominal hernia or history of extensive abdominal surgery), super-obesity (allowing for the possibility of expansion into a more aggressive option, such as BPD/DS), or a history of failed laparoscopic adjustable gastric banding (LAGB) (instead of BPD/DS, which until then was the first choice of a secondary bariatric procedure [12]).

Between August 2004 and December 2007, 68 morbidly obese patients were treated with LSG. The study was approved by the local ethic committee. Inclusion criteria for bariatric surgery were initial body mass index (BMI) >40 kg/m^2 (or >35 kg/m^2 in combination with at least 1 obesity-related co-morbidity), age between 18 and 65 years, and failure of conservative treatment over 2 years.

Preoperative evaluation

The surgical candidates were assessed by an interdisciplinary team consisting of surgeons, endocrinologists, nutritionists, and a psychiatrist. The preoperative assessment comprised abdominal ultrasound, upper gastrointestinal series, gastroscopy, manometry, dual-energy x-ray absorptiometry, and indirect calorimetry. In patients in whom gallstones could be detected by abdominal ultrasound, a laparoscopic cholecystectomy was performed simultaneously to the LSG. Another aim was to find any hiatal hernia, which also could be repaired at the same time. The initial investigation of sleep apnea was performed in all patients on the basis of the Epworth sleepiness scale. In case values that were only slightly elevated, no further measures were taken. Otherwise, a polysomnography was carried out in addition.

We used the following definitions for co-morbidities: hypertension, systolic blood pressure $\geq$140 and/or diastolic blood pressure $\geq$90 mm Hg measured by extrawide sphygmomanometer where appropriate, or antihypertensive drug therapy; dyslipidemia, fasting HDL <40 mg/dL for men, <50 mg/dL for women, and/or triglycerides (TG) >150 mg/dL and/or LDL >100 mg/dL or use of statins; type 2 diabetes (T2 DM), fasting plasma glucose $\geq$126 mg/dL or 2-hour plasma glucose $\geq$200 mg/dL during oral glucose tolerance test or antidiabetic drug with or without insulin therapy; obstructive sleep apnea syndrome (OSAS), repeated upper airway occlusions during sleep with or without sleepiness and high apnea/hypopnea index and need for continuous positive airway pressure during sleep; back and joint pain, clinical and radiologic findings; gastroesophageal reflux disease (GERD), need for proton pump inhibitor (PPI) agents and/or esophagitis diagnosed on endoscopy and/or abnormal manometry; hyperuricemia, serum uric acid >6.4 mg/dL; and depression diagnosed by a psychiatrist. During the entire follow-up by the endocrinologists, remission or improvements of the various co-morbidities were assessed and their treatment adapted to current need. The remission of a co-morbidity was defined when patients no longer needed a drug therapy and had normal blood pressure and lab values. In diabetes, remission was defined as patients with normal fasting glucose, without medication for 1 year, and a glycosylated hemoglobin (HbA_{1c}) $<6\%$. Improvement was defined as changing from insulin to oral antidiabetic drugs or lowering the dose or number of drugs needed.

Bariatric procedure and surgical technique

All patients received low-molecular-weight heparin for venous thromboembolism prophylaxis. As antibiotic prophylaxis, a second-generation cephalosporin was applied before surgery. A 4-trocar approach and a liver retraction hook were used and a 35F bougie was inserted trans-orally and positioned along the lesser curvature. The stomach was dissected by a 6-fold linear stapler beginning 2–8 cm above the pylorus ending at the angle of His. With increased experience, more of the antrum was resected, starting the resection closer to the pylorus. The staple line was oversewn with an absorbable, monofilament running suture and secured by Lapra-Ty (Ethicon Endo-Surgery, USA) clips.

In patients with previous gastric banding, all foreign material was taken out and, wherever possible, a resection of the scar-tissue was carried out.

Postoperatively, an upper gastrointestinal series was performed primarily to judge the size and emptying capacity of the sleeve and secondarily to exclude a leak. Thereafter, oral intake was established starting with clear liquids and soft foods until postoperative week 2. In addition to lifelong multivitamin-supplementation, patients received a PPI-therapy and low-molecular-weight heparin for 4 weeks.

Follow-up

All patients were followed up on an outpatient basis regularly over the entire period. The follow-up consisted of a detailed blood test for detection of vitamin and other deficiencies, as well as a careful documentation of changes in weight and co-morbidities. The preexisting medication, mainly antidiabetic and antihypertensive drugs, was adjusted to the current need.