



## Original research

# Laparoscopic gastric bypass versus laparoscopic sleeve gastrectomy: A retrospective multicenter comparison between early and long-term post-operative outcomes



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## HIGHLIGHTS

- We performed a retrospective review of patients undergoing LRYGB or LSG.
- Post-operative complication rate and hospital stay resulted statistically significant lower in LSGs compared with LRYGBs.
- Mean 1-year EWL resulted statistically significant lower in LSGs.
- Not statistically significant differences were found about leakage, bleeding, short-term mortality, mean 2- and 3-yr EWL.
- Basal weight and BMI, age, gender were not associated with re-intervention rate and with combination of re-intervention or death.

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## ABSTRACT

**Background:** Laparoscopic Roux-en-Y gastric bypass (LRYGB) and laparoscopic sleeve gastrectomy (LSG) are the most commonly performed procedures for morbid obesity.

**Methods:** We performed a retrospective review of patients undergoing LRYGB or LSG between August 2000 and November 2014.

**Results:** Data from 581 (280 LSG and 301 LRYGB) were gathered. Operating time (77.6 vs 250.5 min;  $p < 0.001$ ), post-operative complication rate (3.9% vs 11.6%;  $p < 0.001$ ), overall occlusions ( $p = 0.004$ ), need for re-intervention ( $p < 0.001$ ), hospital stay (5.7 vs 9.2 days;  $p < 0.001$ ) and mean 1-year EWL (49% vs 61%;  $p = 0.001$ ) resulted statistically significant lower in LSGs compared with LRYGBs.

Not statistically significant differences were found about leakage, bleeding requiring transfusion, infections, short-term mortality and mean 2- and 3-years EWL. Upon univariate analysis, basal weight, basal BMI, age and gender were not associated with the rate of re-intervention and with the combination of re-intervention or death.

**Conclusions:** LRYGB resulted associated with higher post-operative morbidity rate and increased 1-year EWL than LSG. Prospective studies are needed to assess the impact of these two surgical procedures on the long-term weight loss.

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## 1. Introduction

During the last decades, obesity has become an increasingly prevalent public health and socioeconomic problem of concern throughout western society and elsewhere, since it results in both a significant reduction in quality of life, as well as in life expectancy

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### Abbreviations

LRYGB	laparoscopic Roux-en-Y gastric bypass
LSG	laparoscopic sleeve gastrectomy
BMI	body mass index
COPD	chronic obstructive pulmonary disease
GERD	gastro-esophageal reflux disease
EWL	excess weight loss

[1]. The growing prevalence of morbid obesity and the increasing incidence of super-obese patients have led to a search for surgical techniques that achieve durable weight loss with minimal morbidity.

Bariatric surgery has proved to be the only effective treatment of morbid obesity in terms of long-term weight reduction, remission of co-morbid conditions and decreasing of obesity-related mortality rate during long-term follow-up [2,3].

Since Wittgrove and Clark first reported the laparoscopic Roux-en-Y gastric bypass (LRYGB) in 1994, this restrictive and mal-absorptive irreversible procedure has become the reference standard procedure for morbid obesity [4–6].

Despite the good results achieved with LRYGB, the dramatically increasing prevalence of obesity has led to the development of alternative strategies including new operative techniques, such as the laparoscopic sleeve gastrectomy (LSG), the irreversible restrictive procedure first described by Regan in 2003 [7].

Since then, LSG has gained popularity because it is considered a technically less demanding operation than LRYGB, offering some potential benefits if compared to LRYGB: the intestinal passage is left intact after LSG, allowing the endoscopy of the remaining stomach and the access to the duodenum, and there are no bowel diversions, thus eliminating the risk of internal hernia, comparing to LRYGB [8–10]. However, there has been some concern regarding the leakage of the suture line (rather demanding to treat) and the onset and/or worsening of gastroesophageal reflux after LSG [11].

In 2012 the American Society for Metabolic and Bariatric Surgery published a revised position statement which assessed that LSG is a valid alternative to LRYGB, and currently LRYGB and LSG are the most commonly performed techniques in morbid obesity [12]. However, the long-term weight loss is still debatable in literature to date, when comparing LRYGB and LSG.

We performed a retrospective study with the aim to compare LRYGB versus LSG in terms of short-term complications and long-term weight loss.

## 2. Materials and methods

We performed the retrospective review of the data of all patients undergoing LRYGB or LSG at the General Surgery of “San Giovanni Battista” Hospital of USL Umbria 2, Foligno, Italy and at the General Surgery of “San Giovanni” Hospital of Bellinzona, Switzerland, between August 2000 and November 2014. Patients operated before the 2005 were not considered in order to eliminate the bias due to the learning curve of both procedures.

Demographic information and the data about hospital stay and follow-up (performed 1 month after surgery and later every 6 months for 3 years) were collected in computed databases. Revisions and conversions to a different bariatric procedure were excluded from analysis.

The aim of the study was to compare the short and long-term results in obese patients who underwent LRYGB versus LSG. The

primary endpoint was weight loss. Secondary endpoints were short and long-term complication rates. In particular, leakage was diagnosed by radiography or CT scan with hydrosoluble iodate contrast enema; bowel occlusion was diagnosed by CT scan with hydrosoluble iodate contrast enema.

### 2.1. Surgical technique: laparoscopic sleeve gastrectomy (LSG)

The operative technique was standardized as follows. From 3 to 5 trocars were used according to the surgeon's discretion. The gastrosplenic omentum was divided from the greater curvature close to the stomach wall using ultrasounds (Harmonic Scalpel, Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) or radiofrequency (Ligasure, Covidien Medtronic Inc., Minneapolis, MN, USA) devices. This dissection was started 40 mm from the pylorus. The greater curve was completely dissected and the angle of His was fully delineated and mobilized. Posterior adhesions to the pancreas were lysed. The sleeve of the stomach was created over a 32 Fr gastric tube using a linear stapler (Echelon, Ethicon Endo-Surgery Inc., Cincinnati, OH, USA, or EndoGia, Covidien Medtronic Inc., Minneapolis, MN, USA), starting distally towards the angle of His. The methylene blue test was performed to check a possible leak. The specimen of the stomach was removed and a passive drainage was placed close to the suture. The drainage was removed on the 4th post-operative day.

### 2.2. Surgical technique: laparoscopic Roux-en-Y gastric bypass (LRYGB)

The operative technique was standardized as follows. A total of 4–6 trocars were placed according to the surgeon's discretion. A 40 cc gastric pouch was performed and the Roux limb was constructed by transecting the small bowel 50 cm distal to the ligament of Treitz (bilio-pancreatic limb). Then, the alimentary limb was performed with a hand-sewn antecolic antegastric end-to-side gastro-jejunostomy and a hand-sewn side-to-side jejuno-jejunostomy. The length of the alimentary limb was 100 cm (BMI <50) or 150 cm (BMI >50 or conversion from gastric banding). Mesenteric defects were closed in all cases using non-absorbable sutures. A passive drainage was placed close to the gastro-jejunostomy. The drainage was removed on the 4th post-operative day.

### 2.3. Statistical analysis

Differences in continuous clinical variables were tested with an independent *t*-test and their values are presented as mean  $\pm$  SD. Differences in categorical clinical characteristics were compared with a Fisher exact test or and the  $\chi^2$  test and their values are presented as percentages. Logistic regression was used to model the association between clinical features and re-intervention or the combination of re-intervention or death. P values < 0.05 were considered to be statistically significant. Statistical analysis was performed with SPSS software (IBM Corporation, Armonk, NY, USA).

## 3. Results

### 3.1. Demography

Overall, 583 obese patients undergoing LSG or LRYGB as primary intervention were included in a prospective cohort. Among the 282 patients receiving LSG, 1 was converted to LRYGB; among the 302 patients receiving LRYGB, 1 underwent a modified procedure. Therefore, data from 581 patients (280 LSGs and 301 LRYGBs) were

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