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Before and after study

# Laparoscopic sleeve gastrectomy in the South Pacific. Retrospective evaluation of 510 patients in a single institution

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## HIGHLIGHTS

- Excess weight loss diminished among patients undergoing sleeve gastrectomy.
- Sleeve gastrectomy is effective to reduce cardiometabolic parameters.
- Sleeve gastrectomy is a safe means of treating morbid obesity.

## ARTICLE INFO

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## ABSTRACT

*Introduction:* The South Pacific has a high prevalence of obesity and super-obesity. We reviewed our experience with laparoscopic sleeve gastrectomy (LSG) to evaluate its efficacy and safety.
*Methods:* A retrospective review of a prospectively collected database of LSGs carried out by one surgeon in one center. The percentage of excess weight loss and the rate of resolution or improvement of comorbidities reflected efficacy, and major complications or mortalities reflected safety.
*Results:* From January 2008 to February 2013, we performed 510 surgeries and included 494 consecutive patients (367 females) (45.5 ± 11.2 years) in our study. LSG was the primary procedure in 384 patients, 6 patients had redo bariatric surgery after failure of initial LSG, 57 patients had a history of gastric banding with insufficient weight loss or band-related complications, and 46 super-obese patients had an intragastric balloon placed before LSG. Average starting body mass index was 47.8 kg $m^{-2}$. Mean percent excess weight loss was 64.3% at 1 year; 67.3% at 2 years and 66.4% at 3 years. The percentages of resolved comorbidities were as follows: hypertension: 48.3%, type 2 diabetes mellitus: 72.5%, dyslipidemia: 61.0%, and obstructive sleep apnea: 77.8%. The mortality rate was 1/494. The postoperative morbidity included gastric fistula in 3.0%, hemorrhaging in 2.4%, and postoperative gastroesophageal reflux in 9.4%.
*Conclusions:* In the South Pacific, LSG is a safe and effective means of treating morbid obesity with sustained weight loss and resolution of comorbid medical conditions.


## 1. Introduction

The prevalence of obesity and its associated disorders, such as metabolic syndrome and type 2 diabetes, has substantially increased worldwide over the last several decades. In the South Pacific, especially New Caledonia, the situation has become critical with 54.2% of the population overweight and 26.5% obese (vs 32.3% and 15% in France) [1,2]. This situation and the increasing incidence of super-obese patients (body mass index [BMI] > 50 kg $m^{-2}$) seeking surgical treatment has prompted the development of surgical techniques designed to provide adequate excess weight loss (EWL) [3]. A substantial majority of patients with diabetes, hyperlipidemia, hypertension, and sleep apnea syndrome (SAS) has experienced complete resolution or improvement of symptoms after surgical treatment [4,5]. Sleeve gastrectomy is becoming a potentially stand-alone bariatric operation, as it can be performed laparoscopically with some ease. Yet it should be noted that after laparoscopic sleeve gastrectomy (LSG), the %EWL and weight regain

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reported over the long term is highly variable [6] and the number of reported series with >5-year outcomes is small [7]. Moreover, laparoscopic Roux-en-Y gastric bypass (LRYGB) has been reported to result in either comparable or more adverse events compared with LSG ([8–10]. Possible confounding factors are the wide variation in the techniques practiced by several surgeons in multicenter settings, and analyses of LSG data in fewer than 100 patients [6,11]. In the South Pacific, where surgical settings are developing, no study has yet demonstrated the efficacy and safety of bariatric surgery in general and LSG in particular. This retrospective study reports 494 patients who underwent LSG in a single bariatric center in the South Pacific with a single experienced surgeon (>5 years). The study aimed to evaluate the efficacy and safety of this procedure in morbidly and severely obese subjects of this region.

## 2. Material and methods

Retrospective analysis of a single center was carried out by querying all the LSG cases managed between January 2008 and February 2013. All patients consented preoperatively to the collection of personal data in a prospective database, which was analyzed retrospectively. The study was approved by the Protection of Persons Committee Sud Méditerranée IV and the French Data Protection Authority before analysis of the data. The information collected included baseline patient demographic and anthropometric data, and operative and perioperative data, including weight loss, resolution of comorbidities, and development of complications. Mortality and morbidity were respectively defined as death and complications or reoperations during the first 30 days postsurgery or during the hospital stay. Follow-up visits were scheduled for 3, 6, 12, 18, 24 months postoperatively and annually thereafter. The methods used to detect and manage leaks and to determine the interval between surgery and diagnosis, as well as the interval between detection and leak closure, were recorded. Patients were asked to complete a questionnaire during an office consultation. This information was verified and crossed with the patients' medical records. In all cases, the surgical decision was made in collaboration with a multidisciplinary group (with surgeon, cardiologist, pulmonologist, endocrinologist, dietitian, psychologist and coach), as recommended by the National Authority for Health [12]. Briefly, the preoperative evaluation of all patient candidates (between 6 and 12 months beforehand) for the LSG included the following: (i) screening for comorbidities (cardiovascular, metabolic, respiratory), (ii) screening for eating disorders (TCA), as well as the assessment of nutritional and vitamin status and (iii) physical activity training, and (iv) psychological and psychiatric evaluation. Hypertension, diabetes, and dyslipidemia were diagnosed using standard definitions [13]. The persistence or resolution of comorbidities was defined according to the American Diabetes Association [14]. Regular postsurgical dietary/nutritional evaluation (at 1, 3, 6 and 12 month) and daily supplementation with vitamins and minerals were recommended for all patients, with good compliance obtained (78% followed the center's nutritional supplementation recommendations). The preoperative presence of SAS was diagnosed by polysomnography for all patients. Persistence, development or resolution of gastroesophageal reflux disease (GERD) was confirmed by the need for proton pump inhibitors, endoscopic diagnosis, and/or GERD-associated symptoms (pyrosis, retrosternal burning, nocturnal cough). Postoperatively, all patients received proton pump inhibitors for one month and treatment was continued after reevaluation, if necessary.

### 2.1. Surgical technique

All operations were performed laparoscopically under general anesthesia using the French position (legs abducted with the surgeon standing between the patient's legs). Each procedure required five trocars. One open trocar in the supraumbilical region and two 12-mm ports were placed in the upper right and left quadrants. Two 5-mm ports were placed in the upper left quadrant and the xiphoid region for liver retraction (Nathanson liver retractor). Pneumoperitoneum was induced by primary trocar insertion and maintained at a pressure of 15 mm Hg. Dissection began on the greater curvature, 3 cm from the pylorus; however, dissection began 6 cm from the pylorus for the first 30 patients. The gastrocolic ligament along the greater curvature of the stomach was opened using an impedance coagulator (UltraCision, Ethicon Endo-Surgery®, Johnson & Johnson, Inc., NJ, USA) and was freed as far as the cardioesophageal junction at the root of the left pillar of the hiatus. The short gastric vessels close to the spleen were carefully and separately coagulated. A 33-F plastic tube was then inserted perorally into the stomach by the anesthesiologist and was directed toward the pylorus. A laparoscopic linear stapler (EndoGIA; Ethicon), with systematic reinforcement since October 2011 (GORE® SEAMGUARD® Reinforcement, W.L. Gore & Associates, Inc., AZ, USA), was introduced into the peritoneal cavity and positioned so that it divided the stomach parallel to the bougie along the lesser curvature. The instrument was fired and reloaded, and the maneuver was then repeated; two sequential gold cartridges were used to staple the antrum, followed by three or four sequential blue cartridges to staple the remaining gastric corpus and fundus. The diameter of the bougie was therefore 33 F. After five or six firings of the stapler, the greater curvature was completely detached from the stomach. The learning curve was assessed on the basis of the decrease in operative time and complications as the surgeon gained experience. In order to identify the effects of the learning curve, the patients were divided into three subgroups (n1 = 164, n2 = 165, n3 = 165) defined consecutively.

### 2.2. Data and statistical analysis

The BMI was calculated on the basis of the following formula: weight in kg/height$^2$ in meters. On the basis of height, the ideal patient body weight was expressed and the ideal BMI was defined as 25 kg m$^{-2}$. Weight loss was expressed as the percentage of excess weight loss (%EWL): (preoperative weight − follow-up weight)/(preoperative weight − ideal weight) × 100) and the percentage of excess BMI loss (%EBMIL): (preoperative BMI − follow-up BMI)/(preoperative BMI − ideal BMI) × 100). Super-obese patients (BMI > 50 kg m$^{-2}$) or super-super-obese patients (BMI > 60 kg m$^{-2}$) were compared with lower BMI patients (BMI < 50 kg m$^{-2}$); the effects of the dissection size (3 cm vs 6 cm from the pylorus) and the staple line reinforcement (before Oct 2011 vs after Oct 2011) were also analyzed.

All statistical analyses were performed using the SPSS statistical package 21.0 (SPSS, Inc., Chicago, IL, USA). Distributions of continuous variables were assessed for normality using the Kolmogorov–Smirnov test (cutoff at $p = 0.01$). Normally distributed continuous variables are described using mean ± standard deviation, whereas continuous variables with distributions significantly deviating from normal are described as medians (minimum–maximum). Continuous variables were compared using Student's *t*-test for independent samples or the Mann–Whitney *U* test as appropriate. Categorical variables are described using frequency distributions and are presented as frequency (%). Categorical variables were compared by leakage using Chi-square of independence or Fisher's exact test as necessary, to test differences in the prevalence of complications between categories of variables of interest. All tests were two-tailed and considered significant at $p < 0.05$.