

Two-step laparoscopic duodenal switch for superobesity: a feasibility study

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Abstract

Background The laparoscopic duodenal switch (LDS) is a complex bariatric procedure that can be split into two steps to lower the rate of morbidity and mortality. This strategy also identifies patients who do not require the second malabsorptive step to achieve substantial weight loss.

Methods From October 2005 to January 2008, 77 superobese patients underwent laparoscopic sleeve gastrectomy. The 15 patients (19.5%) who underwent the second step (LDS) up to March 2008 are the subjects of the current study. The indications for the second step were insufficient weight loss (<50% of excess weight [EW]), progressive weight regain, and persistence of comorbidities.

Results The mean initial body mass index (BMI) was 54 kg/m² (range, 50.7–59 kg/m²), and the mean EW was 84.8 kg (range, 57–111 kg). There were 21 comorbid conditions experienced by 8 of 15 patients. The two-step procedure resulted in a mean BMI of 39 kg/m², an excess weight loss

(%EWL) of 47.6%, and an excess BMI loss (%EBL) of 51.7% at 1 month. The respective values were 35.6 kg/m², 57.6%, and 63.4% at 3 months and 33.1 kg/m², 64.6% and 72% at 6 months. There were no deaths, and only one postoperative complication was recorded (strangulated incisional hernia), for a complication rate of 6.7%. Of the 21 comorbid conditions recorded before surgery, namely, hypertension ($n = 6$), sleep apnea syndrome ($n = 4$), diabetes ($n = 4$), joint disease ($n = 3$), dyslipidemia ($n = 4$), hypertension remained unchanged in one case and improved in three cases after the two-step LDS. One patient still needed insulin, but the dose decreased from 500 to 100 IU/day.

Conclusions Two-step LDS is feasible, safe, and effective. It leads to substantial weight loss and improvement in comorbidities over the short term for superobese individuals.

Keywords Duodenal switch · Laparoscopy · Obesity · Sleeve gastrectomy · Weight loss

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Duodenal switch (DS) is a bariatric procedure with a mechanism of action based mainly on malabsorption of food. This procedure is a modification of biliopancreatic diversion described by Scopinaro et al. [1]. The main differences between the two procedures are preservation of the pylorus, sleeve gastrectomy (SG) to reduce the gastric reservoir, and a common channel with a length of 100 cm rather than 50 cm as described originally by Scopinaro et al. [1].

A stable loss reaching 80% of excess weight (EW) can be achieved with DS [2–4]. However, because of the potential nutritional complications resulting from malabsorption such as anemia, proteic malnutrition, and bone

demineralization [5, 6], DS is performed in only a few bariatric centers. In addition, the fact that DS generally is reserved for patients with extreme obesity (body mass index [BMI] $>50 \text{ kg/m}^2$) further complicates this already technically demanding procedure, especially when the laparoscopic approach is preferred.

Studies have shown that the laparoscopic approach to DS is both feasible and safe, with results similar to those achieved using the standard open technique [7]. More recently, the procedure has been split into two steps, with the restrictive component (SG) being the first step. After a substantial weight loss has been achieved, the patient undergoes the second step to increase the weight loss further. This report aims to assess the feasibility of the two-step surgical approach to laparoscopic DS (LDS) for a prospective cohort of superobese patients.

Patients and methods

Between October 2005 and January 2008, 77 superobese patients with a mean BMI of 53.1 kg/m^2 (range, $50\text{--}72.3 \text{ kg/m}^2$) underwent laparoscopic SG (LSG). A total of 75 comorbid conditions were found in 44 patients, namely, hypertension ($n = 28$), diabetes ($n = 13$), sleep apnea syndrome ($n = 17$), dyslipidemia ($n = 4$), and joint disease ($n = 13$). The LSG procedure resulted in a mean BMI of 36.2 kg/m^2 , an excess weight loss (%EWL) of 56.1%, and an excess BMI loss (%EBL) of 60.6% during a mean follow-up period of 24 months (range, 3–31 months). Figures 3 and 4 show the evolution of weight loss and comorbidities after LSG.

Of the 77 superobese patients, 15 (19.5%) underwent the second step, LDS, up to March 2008 and are the cohort of the current study. Patients were considered for the second step (LDS) if the weight loss they achieved with LSG was deemed insufficient due to the persistence of comorbidities expected to improve with further weight loss, the loss of less than 50% excess weight, or the progressive regaining of weight. Only patients the bariatric team judged likely to be compliant with future follow-up assessment were retained for DS.

All the patients gave their written, informed consent before surgery. The presence and resolution of obesity-related comorbidities were quantified according to the use and discontinuation of medication postoperatively in the instance of diabetes, hypertension, or dyslipidemia. The presence of preoperative sleep apnea syndrome was quantified by sleep studies for all patients and postoperative resolution by discontinued use of continuous positive airway pressure masks. Joint problems were quantified by recording history, medication use, or both.

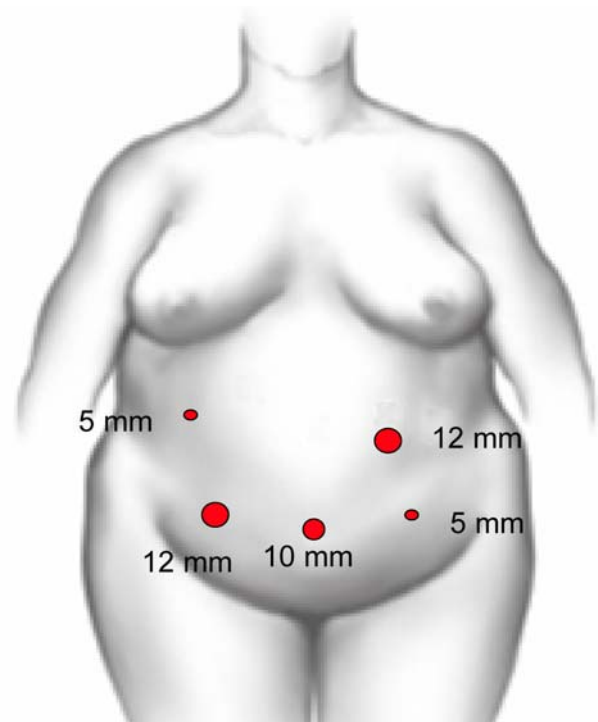


Fig. 1 Positioning of cannulas in a patient placed in the French position

Surgical technique

The first step was LSG, performed as previously reported [8]. Relevant surgical details included sparing of the gastric antrum, with gastrectomy started 6 cm proximal to the pylorus over a 34-Fr intraluminal boogie. The LDS procedure was performed with the patient in the French position using a five-port approach (Fig. 1).

The duodenum was divided using a linear stapler with a blue cartridge 3 to 4 cm distal to the pylorus at the level of the gastroduodenal artery. The small bowel was measured with a 50-cm-long tape along the unstretched antimesenteric border. It then was divided with the linear stapler 250 cm from the ileocecal valve, and the distal end was anastomosed to the proximal duodenum with an intracorporeal hand-sewn continuous absorbable suture. The proximal end of the divided bowel was anastomosed to the ileum 100 cm from the ileocecal valve to create a 100-cm common channel and a 150-cm alimentary limb. The mesenteric and Petersen spaces were closed with nonabsorbable running sutures.

Postoperative management

An oral fluid diet was started for the patients on postoperative day 2 after upper gastrointestinal examination had shown no leak. They were systematically discharged on day 5 if no postoperative complications had occurred.

Follow-up visits were scheduled at 1, 3, 6, and 12 months, then every 6 months thereafter.

Data were entered into a prospectively held database and included age, gender, BMI, %EW, %EWL, %EBL, duration of surgery and hospital stay, postoperative complications, and comorbidities before LSG, at the time of LDS, and at follow-up visits.

Results

The indications for the second step were insufficient weight loss (<50% of EW) in six cases, progressive weight regain in four cases, and persistence of comorbidities in six cases. The study included 14 female patients and 1 male patient with a mean age of 43.6 years (range, 22–59 years). The mean initial BMI was 54 kg/m² (range, 50.7–59 kg/m²), and the mean EW was 84.8 kg (range, 57–111 kg) (Table 1). A total of 21 comorbid conditions were found in 8 of 15 patients (Fig. 2).

The LSG procedure resulted in a mean BMI of 40.3 kg/m² (range, 32.6–47.6 kg/m²), a mean %EWL of 43% (range, 30.9–67%), and a mean %EBL of 47.2% (range, 32.3–73.8%) during a mean interval of 15.8 months (range, 8–31 months) (Fig. 3).

Comorbid conditions showed improvement. Hypertension improved in four of six patients, and two patients experienced complete resolution of hypertension. Diabetes resolved in three of four patients. For the fourth patient, insulin units were lowered from 500 to 200 IU/day. Dyslipidemia was resolved for all four patients. Continuous positive airway pressure treatment was discontinued for two of four patients who had sleep apnea syndrome. Joint disease improved for two of three patients and resolved for the third patient (Fig. 4A).

The duodenal switch was completed laparoscopically in all cases, and no intraoperative complications were

recorded. The mean operative time was 130 min (range, 100–180 min). One patient experienced a strangulated incisional hernia that required an emergency bowel resection (complication rate, 6.7%). The hospital stay was 5 days for all the patients except the one with the strangulated hernia. This patient was discharged on postoperative day 31.

Follow-up assessment at 1 month found a mean BMI of 39 kg/m², a mean %EWL of 47.6%, and a mean %EBL of 51.7%. These respective values at 3 months were 35.6 kg/m², 57.6%, and 63.4%, and at 6 months were 33.1 kg/m², 64.6%, and 72% (Fig. 3). At a mean follow-up of 7.3 months (range, 1–24 months), hypertension improved (blood pressure stabilized with mono- or bi-therapy) for three of four patients. For the one patient with insulin-dependent diabetes, the insulin was lowered to 100 IU/day. Continuous positive airway pressure was discontinued for the two patients with sleep apnea syndrome, and joint disease resolved for all the patients (Fig. 4B).

Discussion

Although large studies with long-term follow-up evaluation have demonstrated the safety and effectiveness of DS for superobesity (morbid obesity), this procedure has not yet gained widespread consensus among bariatric surgeons [6, 7]. Two main concerns are expressed. On the one hand, the potential for severe metabolic complications such as proteic malnutrition and bone demineralization is high [5, 6]. On the other hand, DS is a technically challenging operation that becomes even more difficult when performed by laparoscopy for the superobese patient. Regan et al. first reported the two-stage approach to Roux-en-Y gastric bypass (RYGBP) for patients with a BMI exceeding 60 kg/m², showing favorable results in terms of reduced morbidity and mortality [9].

The rationale for the staged approach is that the easy part of a complicated procedure, LSG, is performed first for high-risk patients. The complex part of the same procedure, LDS or RYGBP, then is performed once enough weight has been lost to render the second step technically easier and expose the patient to a lower risk of complications.

The rationale for a staged approach to LDS comes not only from the reduced risk of postoperative morbidity and mortality, but also from the fact that a second procedure after LSG is not always necessary because some patients achieve a considerable weight loss after LSG and decline the second step. Himpens et al. reported an EWL of more than 60% in 40% of patients after LSG during a follow-up period longer than 5 years. The remaining patients either needed a second procedure (23%) or had inadequate weight loss (37%) [10].

Table 1 Demographic and clinical characteristics of the superobese patients who underwent laparoscopic sleeve gastrectomy (LSG) and laparoscopic duodenal switch (LDS)

	Patients (n)	Mean	Range
Sex (M/F)	14/1		
Age (years)		43.6	22–59
Weight (kg)		143.3	111–178
BMI (kg/m ²)		54	44–59
EW (kg)		84.8	57–111
Banding	1		
VBG (Mason)	1		

BMI body mass index, EW excess weight, VBG vertical banded gastroplasty

Fig. 2 Distribution of comorbidities, namely, hypertension (HT), joint disease (JD), sleep apnea syndrome (SAS), and dyslipidemia (DL)

	Patients (n)	(%)
• Blood Hypertension (HT)	6	40
• Joints Disease (JD)	3	20
• Dyslipidemia	3	20
• Sleep Apnea Syndrome (SAS)	4	26,7
• Diabetes (NIDD ; IDD)	4	26,7

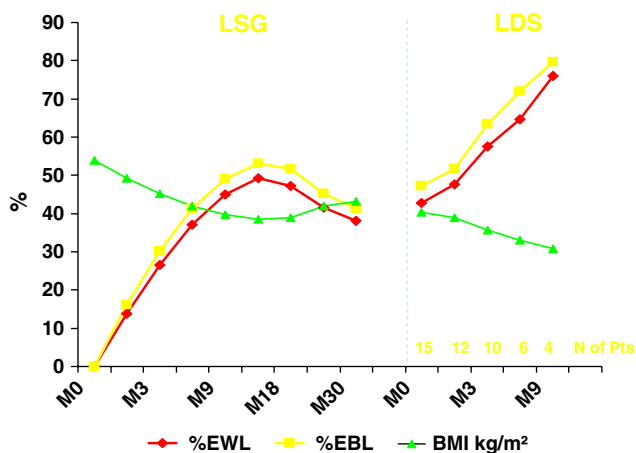
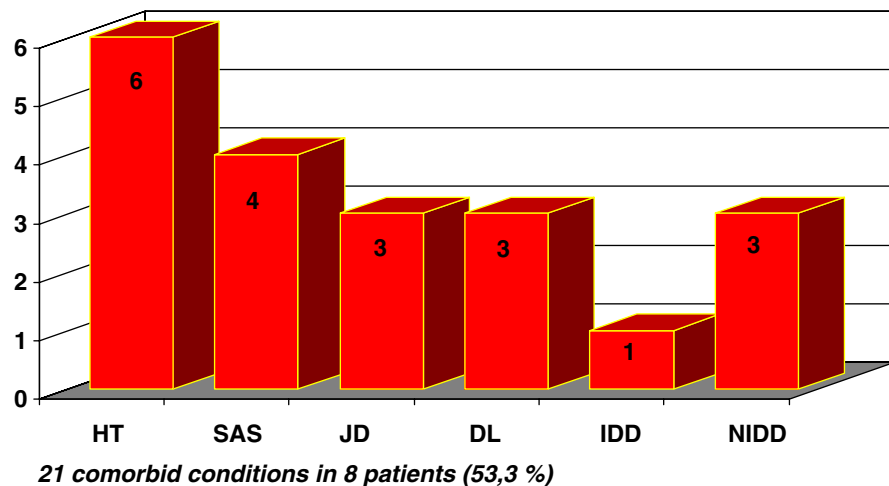


Fig. 3 Effect of laparoscopic sleeve gastrectomy (LSG) and laparoscopic duodenal switch (LDS) on body mass index (BMI), percentage of excess BMI loss, and percentage of excess weight loss for the 15 patients undergoing two-step LDS

These data are interesting because LSG offers several advantages over more complex procedures such as LDS and laparoscopic RYGBP, not only in terms of lower postoperative morbidity and mortality rates but also in the setting of mineral and vitamin deficiency [8, 10]. Until long-term results for LSG from large series are available, our policy is to treat superobesity with LSG, calibrated over a 34-Fr intraluminal boogie to achieve the highest weight loss. We then perform the second step, LDS, for selected patients who require further weight loss.

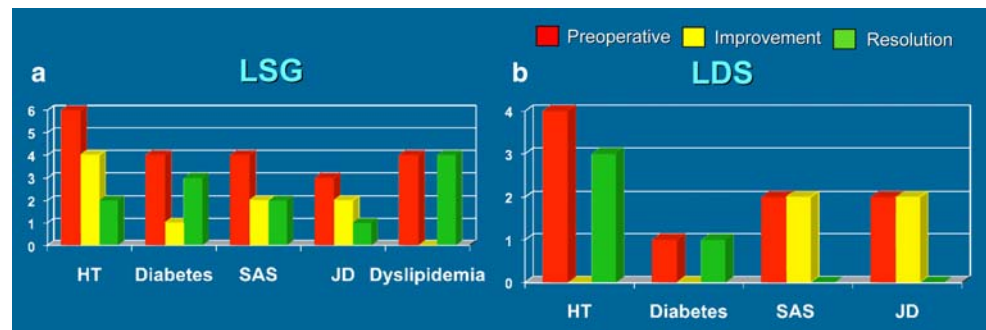
In the current study, the staged approach showed favorable results in terms of postoperative complications. These occurred for only one patient, in the form of a strangulated incisional hernia that had not been considered for repair during LDS. The LSG procedure showed excellent results in terms of %EWL and %EBL, which reached 43% and 47.2%, respectively, at a mean interval of 15.8 months before LDS. The loss of weight was followed by a consequent improvement in comorbidities, explaining the smooth postoperative course after LDS.

The interval between the two procedures was 15.8 months (range, 8–31 months) in our series. However, it is not clear how long it is reasonable to wait after LSG before performing LDS. We believe a good rule is to follow patients strictly and advise the second step once the slope of weight loss either stabilizes at a weight loss deemed as insufficient or reverses. A moderate weight regain often occurs after weight loss stabilization in any bariatric procedure and can be tolerated as long as the EWL remains at more than 50%.

Another parameter to consider is improvement in comorbidities such as sleep apnea syndrome, joint disease, and diabetes after considerable weight loss. Hypertension generally improves rapidly after the initial weight loss but may not improve further with subsequent weight loss.

Given the short follow-up period in this study, we cannot state a conclusion on the long-term metabolic safety and functional efficacy of the two-staged laparoscopic approach in terms of weight loss. However, we can

Fig. 4 A Effect of laparoscopic sleeve gastrectomy and **B** laparoscopic duodenal switch (LDS) on the comorbid conditions of the 15 patients undergoing two-step LDS, namely, hypertension (HT), joint disease (JD), sleep apnea syndrome (SAS), and dyslipidemia (DL)



speculate that large published studies of the open one-stage DS counterpart will not show significant differences even in long-term follow-up results [1, 2, 6].

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