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Original article

Superobese and super-superobese patients: 2-step laparoscopic duodenal switch

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Abstract

Background: Morbidity and mortality after bariatric surgery in superobese (body mass index [BMI] >50 but <60 kg/m^2) and super-superobese (BMI >60 kg/m^2) patients can allegedly be reduced by performing surgery in 2 steps. We report a retrospective study gathered from a prospective database for superobese and super-superobese patients who underwent laparoscopic biliopancreatic diversion/duodenal switch (LBPD/DS) after laparoscopic sleeve gastrectomy (LSG) as the first step.

Methods: From October 2004 to June 2010, 31 patients underwent LBPD/DS after LSG. The mean age was 45.8 ± 10.1 years (range 21–64). The mean interval between the 2 procedures was 13.9 ± 8.4 months (range 6–37). At LSG, the mean weight and BMI was 168.8 ± 35.4 kg (range 127–255) and 58.3 ± 6.7 kg/m^2 (range 50–74.5). At LBPD/DS, the mean weight, BMI, and percentage of excess weight loss was 136.3 ± 32.6 kg (range 92–220), 47.1 ± 7.2 kg/m^2 (range 37.8–64.3), and 31.6% ± 12.2% (range −11.7 to +54.6). At LSG, 26 patients had 43 obesity co-morbidities. Three co-morbidities (6.9%) resolved in 3 patients before the second step of LBPD/DS was performed.

Results: The mean operative time was 175.5 ± 60.6 minutes (range 75–285). There were no deaths or conversions to open surgery. Four patients had early complications (1 anastomotic leak, 1 small bowel perforation, 1 case of renal insufficiency, and 1 case of pneumonia). The mean hospital stay was 6.6 ± 8 days (range 3–35). All patients, with the exception of 3, were followed up for a mean of 28.8 ± 21.4 months (range 4–71). At follow-up, the mean weight, BMI, and percentage of excess weight loss (compared with the pre-LSG weight) was 99.4 ± 23.7 kg (range 62–150), 34.5 ± 5.8 kg/m^2 (range 24.9–46.3), and 54.8% ± 16% (range 18.9–84.8). A total of 22 obesity co-morbidities (51.1%) resolved in 14 patients. Three patients presented with late complications (1 ventral hernia, 1 case of protein deficiency, 1 anastomotic stenosis).

Conclusion: In the treatment of superobese and super-superobese patients with 2-step LBPD/DS, we experienced no deaths and achieved acceptable morbidity, considering the high operative risk in this group. This procedure is effective for both weight loss and resolution of co-morbidities. (Surg Obes Relat Dis 2011;7:703–708.)

Keywords: Superobese patients; Super-superobese patients; Sleeve gastrectomy; Duodenal switch; First step; 2-step

Obese patients with a body mass index (BMI) >50 kg/m^2 or >60 kg/m^2 are termed "superobese" (SO) and "super-superobese" (SSO), respectively. In general, SO and SSO patients are considered high-risk surgical candidates and are reported to have increased morbidity and mortality, even more than severely obese and morbidly obese patients [1–3].

Laparoscopy in bariatric surgery decreases the postoperative pain, parietal trauma, complication rates, and length of

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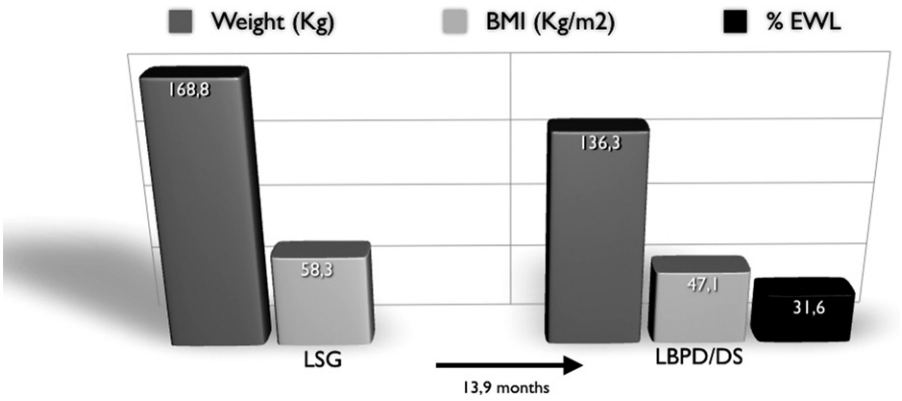

Fig. 1. Comparison of weight, BMI, and %EWL at LSG and LBPD/DS.

stay. Laparoscopic bariatric procedures have been shown to be safe, with low complication and 30-day mortality rates [4]. However, compared with the rates in morbidly obese patients, laparoscopic bariatric procedures in SO and SSO patients have been associated with significantly greater rates of complications, including the 30-day mortality rates.

A variety of bariatric surgery procedures can be performed; however, laparoscopic Roux-en-Y gastric bypass (LRYGB) and laparoscopic biliopancreatic diversion/duodenal switch (LBPD/DS) are the only procedures that can be performed in 2 steps [5,6]. Two-step procedures are performed to decrease the postoperative morbidity and mortality.

LBPD/DS consists of a restrictive procedure (sleeve gastrectomy [SG]) and a malabsorptive procedure (biliopancreatic diversion) [7,8]. Long-term follow-up data have shown a percentage of excess weight loss (%EWL) of 75–76% at 12–15 years [9,10]; however, strict follow-up is required to avoid the side effects due to the malabsorption. LBPD/DS remains an uncommon procedure because of the nutritional complications (e.g., anemia, hypoproteinemia, and bone demineralization). Furthermore, the technical complexity required to perform this surgery, especially by laparoscopy, also limits the use of this procedure.

Laparoscopic SG (LSG) can be performed as a stand-alone procedure [11] or as a revision of a previous surgery, such as laparoscopic adjustable gastric banding [12], vertical banded gastroplasty [13], or LRYGB [14]. LSG is a multipurpose bariatric operation [15] that offers the option of a second procedure during follow-up. This is an important consideration because many SO patients remain in the SO or morbidly obese category even after bariatric surgery [16].

In the present retrospective study, we report our experience in treating SO and SSO patients using LBPD/DS after LSG as the first step.

Methods

From October 2004 to June 2010, 31 patients (10 men and 21 women) underwent LBPD/DS after LSG. Their mean age was 45.8 ± 10.1 years (range 21–64).

The chief inclusion criterion for the use of LSG as a first step was a BMI >50 kg/m^2; patients with a history of bariatric surgery or a preoperative hiatal hernia were excluded. The exclusion criteria for performing LBPD/DS as a second step were a BMI <35 kg/m^2, the presence of SG dilation on barium swallow testing, and gastroesophageal reflux on gastroscopy.

The mean interval between the 2 procedures was 13.9 ± 8.4 months (range 6–37). At LSG, the mean weight and BMI was 168.8 ± 35.4 kg (range 127–255) and 58.3 ± 6.7 kg/m^2 (range 50–74.5), respectively. Of the 31 patients, 20 had a BMI of 50–60 kg/m^2 and 11 had a BMI >60 kg/m^2. At LBPD/DS, the mean weight, BMI, and %EWL was 136.3 ± 32.6 kg (range 92–220), 47.1 ± 7.2 kg/m^2 (range 37.8–64.3), and 31.6% ± 12.2% (range −11.7 to +54.6), respectively (Fig. 1).

At LSG, 26 patients had 43 obesity co-morbidities, and 3 (6.9%) co-morbidities resolved in 3 patients before the second step of LBPD/DS (Table 1).

Technique

First-step LSG was performed using a 34F orogastric bougie. The LBPD/DS procedure was initiated by inserting the 12-mm trocar in the upper quadrant of the abdomen on the left midclavicular line using the Hasson technique. Five additional trocars were placed under view, usually near the same position as the first insertion. No efforts were made to

Table 1
Modifications of obesity-related co-morbidities: comparison among baseline, before second step of LBPD/DS, and during follow-up

Co-morbidity	Before LSG (n)	Before LBPD/DS (n)	After LBPD/DS (n)
Arterial hypertension	16	16	9
Type 2 diabetes	11	10	4
Sleep apnea	6	5	2
Joint pain	10	9	3
Total	43	40	18

LSG = laparoscopic sleeve gastrectomy; LBPD/DS = laparoscopic biliopancreatic diversion/duodenal switch.

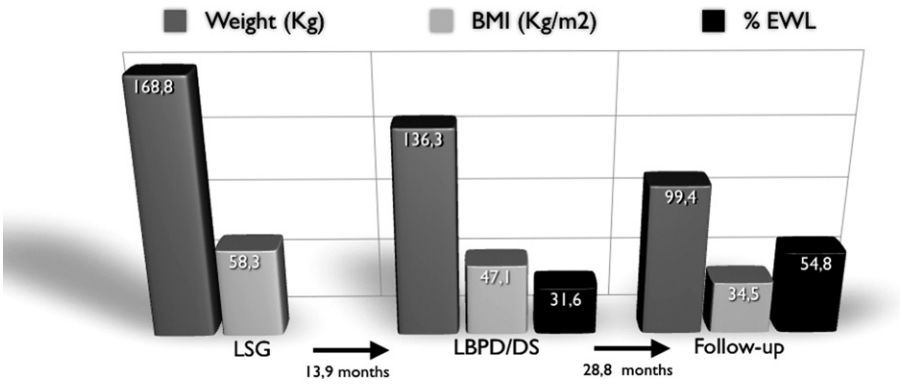

Fig. 2. Comparison of weight, BMI, and %EWL at LSG, LBPD/DS, and during follow-up.

dissect the stomach itself. The procedure began with cholecystectomy. The duodenum was subsequently encircled just lateral to the gastroduodenal artery and sectioned by linear stapler blue load. The right colon was freed to ensure more slack to the distal ileum because of the duodenoileostomy. The common and alimentary limbs were fashioned and measured at 100 cm and 150 cm, respectively. The measurements were made by stretching the bowel along a 25-cm tape. A semimechanical side-to-side ileoileostomy was performed between the alimentary and biliopancreatic limbs, with the final section of the alimentary loop close to this anastomosis. The duodenoileostomy was hand sewn, in 1 layer, using a running suture of absorbable material. The mesenteric defect and Petersen's defect were closed by pursestring sutures of nonabsorbable material. The orogastric tube was advanced by the anesthesiologist until it reached the pylorus. A leak test was used to check the duodenoileostomy. The gallbladder was extracted through the 12-mm trocar opening in the left upper quadrant, which was subsequently closed in layers. A drain was left near the duodenoileostomy. A peroral methylene blue test was performed on the first postoperative day, and, if negative, the patient was allowed to start a liquid diet on the second postoperative day. Typically, the patient was discharged from the hospital on the fifth postoperative day.

Results

The mean operative time was 175.5 ± 60.6 minutes (range 75–285). There were no deaths or conversions to open surgery. Four patients had early complications: 1 anastomotic leak, 1 small bowel perforation, 1 case of renal insufficiency, and 1 case of pneumonia. The mean hospital stay was 6.6 ± 8 days (range 3–35).

All patients, with the exception of 3 who refused our follow-up, were followed up for a mean of 28.8 ± 21.4 months (range 4–71). At follow-up, the mean weight, BMI, and %EWL (compared with the pre-LSG weight) was 99.4 ± 23.7 kg (range 62–150), 34.5 ± 5.8 kg/m^2 (range 24.9–46.3), and 54.8% ± 16% (range 18.9–84.8), respectively (Fig. 2). A total of 22 obesity co-morbidities (51.1%) resolved in 14 patients (Table 1). Three patients presented with late complications (1 ventral hernia, 1 case of protein deficiency, and 1 anastomotic stenosis).

Discussion

LBPD/DS has been reported to have a 38% complication rate in patients with a BMI of ≥65 kg/m^2 compared with an 8% complication rate in patients with a BMI <65 kg/m^2 [3]. From these results, LSG in SO or SSO patients was introduced as a first step before a definitive procedure, such as LBPD/DS or LRYGB [17].

The philosophy of performing LBPD/DS in 2 steps rests on the potential benefits for both patients and bariatric surgeons. From the patient's viewpoint, LSG offers the possibility of weight loss and overall improvements in, or even resolution of, obesity-related co-morbidities, and some patients might not require a second bariatric procedure. That said, the second step is usually well tolerated with a smoother recovery. The interval between the first and second procedures allows time for psychological and physical improvements in the patient's health before additional surgery. From the surgeon's viewpoint, the severity of postoperative complications can be limited because the 2 procedures affect different parts of the digestive system, avoiding potentially challenging postoperative situations that are often difficult to manage [18]. Moreover, LBPD/DS can be performed more easily if weight loss has occurred after LSG, and the surgeon also has the potential to evaluate patient compliance during follow-up, including possible changes in eating behaviors. Because compliance with the postoperative regimen is an essential component of safety after LBPD/DS, this strategy allows one to select those patients for whom there is good evidence of treatment compliance. Considering the frequent development of de novo gastroesophageal reflux disease [19], with or without associated hiatal hernia [20], LBPD/DS can be replaced with the LRYGB procedure as the second step to mitigate

this complication. In our department, we offered all SO or SSO patients the option of LBPD/DS as the second step. However, for patients in whom gastroesophageal reflux disease developed after LSG, we proposed LRYGB, in accordance with the published data [21,22]. This strategy was based on the data from Crookes et al. at the Consensus Summit [23], who reported that all 11 patients (100%) who underwent LRYGB were able to discontinue proton pump inhibitors after conversion, but 3 (42.8%) of 7 patients who had undergone LBPD/DS still required proton pump inhibitors after the revision. As a final consideration, in the case of SG dilation, we propose repeat SG.

All these aspects reflect the absolute need for strict follow-up of patients with an obvious need for a workup before the second stage, including barium swallow testing, gastroscopy, and nutritional and psychological examinations, to better choose the subsequent definitive procedure.

We recorded a %EWL of 31.6% ± 12.2% after LSG and before LBPD/DS, with a BMI decrease of 11.2 points, similar to the decrease of 12.2 points previously reported for 2-step LBPD/DS [24]. Aside from surgery, other weight loss strategies can be used to improve the overall patient status before LBPD/DS. Huerta et al. [25] reported that the use of a low-calorie liquid diet (<900 kcal/d) and an exercise program can decrease the BMI by 12.7 points within 11 weeks. A second option for preoperative weight loss is the placement of an endoscopic intragastric balloon. In SO patients, this technique has resulted in a %EWL of 7–26.1% with a mean weight loss of 6–26.4 kg [26–28]. However, because the endoscopic intragastric balloon must be removed after 6 months, a significant risk exists of regaining weight [29]. One study comparing the endoscopic intragastric balloon and LSG in SO patients as a first-stage procedure showed a decrease in BMI of 8 versus 16 points, with an achieved %EWL of 24% versus 35%, respectively [30].

In previous reports, the interval between the 2 steps varied from 9 to 27 months [24] to 12 months [21,31] and 15.8 months [32]. Also, the individual interests of the patient and surgeon must be considered in the search for the optimal interval.

Our operative time was very close to the 158 minutes reported to perform LRYGB as a second step [17], and it decreased to within the range of 130 [32] to 201 minutes [24] required for second-step LBPD/DS.

In the present series of 2-step LBPD/DS, no conversions to open surgery were required, unlike the experience of other investigators [24,32]. Open conversions, however, have been reported to have an incidence of 3.4–13.9% in 1-step LBPD/DS [33–35] and 0–9.5% in 1-step LRYGB [36–38]. There is probably a substantial difference between the 2-step and 1-step LBPD/DS. In our overall study design, therefore, we considered it important to prospectively decide to perform LSG as the first step, rather than making this decision perioperatively (e.g., in the case of respiratory problems, renal failure, or difficulty in accessing the duodenum) [35].

In our series, we recorded a total of 4 early complications (12.9%): 1 anastomotic leak, 1 small bowel perforation, 1 case of renal insufficiency, and 1 case of pneumonia. Similar complications have been reported after single-step BPD/DS in patients of the same class of obesity [39], with a postoperative mortality rate of 7.8% (SSO) and 0% (SO or morbidly obese). Although our mortality rate was nil, mortality rates of 0–2.5% [3,33,34] and 0–4.7% [16,33,34,36,38,40] have been reported in 1-step LBPD/DS and 1-step LRYGB, respectively, for SO and SSO patients. However, our early complication rate was between the previously reported range of 6.7% [32] to 29.6% [24] for 2-step LBPD/DS. Similar data were also reported after 1-step LBPD/DS, but the complication rates in those studies ranged from 24% to 45.9% [3,33,35,41], and in 1-step LRYGB, the complication rate was of 2.5–32.2% [16,33,36–38,40].

Our length of stay data reflect the policy of discharging the patient before the end of 1 week, except in the case of complications; for example, 1 of our patients had a lengthened hospital stay, similar to the experience of other investigators [32].

In contrast to previous reports [24,32], none of our patients required a reoperation in the early postoperative period. However, 1 of our patients (3.5%) required a feeding jejunostomy tube for protein deficiency after 7 months, and another required reoperation to repair a ventral hernia after 12 months. A third patient presented with stenosis at the duodenoileostomy at 10 months that resolved after 1 session of endoscopic dilation.

In terms of weight loss, with a mean follow-up of 28.8 ± 21.4 months, we achieved a %EWL of 54.8% ± 16%. This represents a 20.3-point improvement compared with the results obtained after LSG alone. These data represent the plateau of the weight loss curve after the initial greater weight loss [10]. These data might appear rather low compared with those from reports for both 1-step and 2-step LBPD/DS [3,32–34,42]. These findings closely resemble the post-LRYGB reports for SO and SSO patients [16,33,34,37,38,40].

Obesity-related co-morbidities have been reported to improve or resolve after the first step of LSG, followed by continued improvement after conversion to LRYGB [21,43]. Similarly, Silecchia et al. [44] reported improvements and cure of co-morbidities 18 months after LSG as a first step, with cure rates of 62.5% for arterial hypertension, 76.9% for type 2 diabetes, and 56.2% for sleep apnea. Our data did not confirm these results, but they did speak to the effect of second step LBPD/DS, after which the number of resolved co-morbidities increased from 3 to 22. Arterial hypertension was resolved in 43.7%, type 2 diabetes in 63.6%, sleep apnea in 66.6%, and joint pain in 70% of our patients. Finally, the second-step LBPD/DS in SO and SSO

patients had a comparable effect on co-morbidities as in previous 1-step reports [9].

Conclusion

In the treatment of SO and SSO patients with 2-step LBPD/DS, we experienced no deaths and obtained acceptable morbidity considering the high operative risk in this group. This procedure is effective in terms of weight loss and the resolution of co-morbidities.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

References

[1] Livingston EH, Huerta S, Arthur D, Lee S, De Schields S, Heber D. Male gender is a predictor of morbidity and age a predictor of mortality for patients undergoing gastric bypass surgery. Ann Surg 2002;236:576–82.

[2] Buchwald H, Consensus Conference Panel. Bariatric surgery for morbid obesity: health implications for patients, health professionals, and third-party payers. J Am Coll Surg 2005;200:593–604.

[3] Ren CJ, Patterson E, Gagner M. Early results of laparoscopic biliopancreatic diversion with duodenal switch: a case series of 40 consecutive patients. Obes Surg 2000;10:514–23.

[4] Kakarla VR, Nandipati K, Lalla M, Castro A, Merola S. Are laparoscopic bariatric procedures safe in superobese (BMI >50 kg/m^2) patients? An NSQIP data analysis. Surg Obes Relat Dis 2011;7:452–8.

[5] Nguyen NT, Longoria M, Gelfand DV, Sabio A, Wilson SE. Staged laparoscopic Roux-en-Y: a novel two-stage bariatric operation as an alternative in the super-obese with massively enlarged liver. Obes Surg 2005;15:1077–81.

[6] Gagner M, Matteotti M. Laparoscopic biliopancreatic diversion with duodenal switch. Surg Clin North Am 2005;85:141–9.

[7] Hess DS, Hess DW. Biliopancreatic diversion with a duodenal switch. Obes Surg 1998;8:267–82.

[8] Marceau P, Hould FS, Simard S, et al. Biliopancreatic diversion with duodenal switch. World J Surg 1998;22:947–54.

[9] Hess DS, Hess DW, Oakley RS. The biliopancreatic diversion with the duodenal switch: results beyond 10 years. Obes Surg 2005;15:408–16.

[10] Biertho L, Biron S, Hould FS, Lebel S, Marceau S, Marceau P. Is biliopancreatic diversion with duodenal switch indicated for patients with body mass index <50 kg/m^2? Surg Obes Relat Dis 2010;6:508–15.

[11] Bohdjalian A, Langer FB, Shakeri-Leidenmühler S, et al. Sleeve gastrectomy as sole and definitive bariatric procedure: 5-year results for weight loss and ghrelin. Obes Surg 2010;20:535–40.

[12] Dapri G, Cadière GB, Himpens J. Feasibility and technique of laparoscopic conversion of adjustable gastric banding to sleeve gastrectomy. Surg Obes Relat Dis 2009;5:72–6.

[13] Iannelli A, Schneck AS, Ragot E, et al. Laparoscopic sleeve gastrectomy as revisional procedure for failed gastric banding and vertical banded gastroplasty. Obes Surg 2009;19:1216–20.

[14] Dapri G, Cadière GB, Himpens J. Laparoscopic conversion of Roux-en-Y gastric bypass to sleeve gastrectomy as first step of duodenal switch: technique and preliminary outcomes. Obes Surg 2011;21:517–23.

[15] Baltasar A, Serra C, Pérez N, Bou R, Bengochea M, Ferri L. Laparoscopic sleeve gastrectomy: a multi-purpose bariatric operation. Obes Surg 2005;15:1124–8.

[16] Suter M, Calmes JM, Paroz A, Romy S, Giusti V. Results of Roux-en-Y gastric bypass in morbidly obese vs superobese patients: similar body weight loss, correction of comorbidities, and improvement of quality of life. Arch Surg 2009;144:312–8.

[17] Regan JP, Inabnet WB, Gagner M, Pomp A. Early experience with two-stage laparoscopic Roux-en-Y gastric bypass as an alternative in the super-super obese patient. Obes Surg 2003;13:861–4.

[18] Almogy G, Crookes PF, Anthone GJ. Longitudinal gastrectomy as a treatment for the high-risk super-obese patient. Obes Surg 2004;14:492–7.

[19] Himpens J, Dobbeleir G, Peeters G. Long-term results of laparoscopic sleeve gastrectomy for obesity. Ann Surg 2010;252:319–24.

[20] Parikh M, Gagner M. Laparoscopic hiatal hernia repair and repeat sleeve gastrectomy for gastroesophageal reflux disease after duodenal switch. Surg Obes Relat Dis 2008;4:73–5.

[21] Cottam D, Qureshi FG, Mattar SG, et al. Laparoscopic sleeve gastrectomy as an initial weight-loss procedure for high-risk patients with morbid obesity. Surg Endosc 2006;20:859–63.

[22] Langer FB, Bohdjalian A, Shakeri-Leidenmühler S, Schoppmann SF, Zacherl J, Prager G. Conversion from sleeve gastrectomy to Roux-en-Y gastric bypass—indications and outcome. Obes Surg 2010;20:835–40.

[23] Gagner M, Deitel M, Kalberer TL, Erickson AL, Crosby RD. The second International Consensus Summit for Sleeve Gastrectomy, March 19–21, 2009. Surg Obes Relat Dis 2009;5:476–85.

[24] Silecchia G, Rizzello M, Casella G, Fioriti M, Soricelli E, Basso N. Two-stage laparoscopic biliopancreatic diversion with duodenal switch as treatment of high-risk super-obese patients: analysis of complications. Surg Endosc 2009;23:1032–7.

[25] Huerta S, Li Z, Anthony T, Livingston EH. Feasibility of a supervised inpatient low-calorie diet program for massive weight loss prior to RYGB in superobese patients. Obes Surg 2010;20:173–80.

[26] Alfalah H, Philippe B, Ghazal F, et al. Intragastric balloon for preoperative weight reduction in candidates for laparoscopic gastric bypass with massive obesity. Obes Surg 2006;16:147–50.

[27] Busetto L, Segato G, De Luca M, et al. Preoperative weight loss by intragastric balloon in super-obese patients treated with laparoscopic gastric banding: a case-control study. Obes Surg 2004;14:671–6.

[28] Weiner R, Gutberlet H, Bockhorn H. Preparation of extremely obese patients for laparoscopic gastric banding by gastric-balloon therapy. Obes Surg 1999;9:261–4.

[29] Genco A, Cipriano M, Materia A, et al. Laparoscopic sleeve gastrectomy versus intragastric balloon: a case-control study. Surg Endosc 2009;23:1849–53.

[30] Milone L, Strong V, Gagner M. Laparoscopic sleeve gastrectomy is superior to endoscopic intragastric balloon as a first stage procedure for super-obese patients (BMI > or = 50 kg/m^2). Obes Surg 2005;15:612–7.

[31] Gagner M, Gumbs AA, Milone L, Yung E, Goldenberg L, Pomp A. Laparoscopic sleeve gastrectomy for the super-super-obese (body mass index >60 kg/m^2). Surg Today 2008;38:399–403.

[32] Iannelli A, Schneck AS, Dahman M, Negri C, Gugenheim J. Two-step laparoscopic duodenal switch for superobesity: a feasibility study. Surg Endosc 2009;23:2385–9.

[33] Søvik TT, Taha O, Aasheim ET, et al. Randomized clinical trial of laparoscopic gastric bypass versus laparoscopic duodenal switch for superobesity. Br J Surg 2010;97:160–6.

[34] Prachand VN, DaVee RT, Alverdy JC. Duodenal switch provides superior weight loss in the super-obese (BMI ≥50 kg/m^2) compared with gastric bypass. Ann Surg 2006;244:611–9.

[35] Topart P, Becouarn G, Ritz P. Should biliopancreatic diversion with duodenal switch be done as single-stage procedure in patients

with BMI > or = 50 kg/m^2? Surg Obes Relat Dis 2010;6: 59–63.

[36] Dresel A, Kuhn JA, McCarty TM. Laparoscopic Roux-en-Y gastric bypass in morbidly obese and super morbidly obese patients. Am J Surg 2004;187:230–2.

[37] Parikh MS, Shen R, Weiner M, Siegel N, Ren CJ. Laparoscopic bariatric surgery in super-obese patients (BMI >50) is safe and effective: a review of 332 patients. Obes Surg 2005;15:858–63.

[38] Artuso D, Wayne M, Kaul A, Bairamian M, Teixeira J, Cerabona T. Extremely high body mass index is not a contraindication to laparoscopic gastric bypass. Obes Surg 2004;14:750–4.

[39] Fazylov RM, Savel RH, Horovitz JH, et al. Association of super-super-obesity and male gender with elevated mortality in patients undergoing the duodenal switch procedure. Obes Surg 2005;15:618–23.

[40] Raftopoulos I, Ercole J, Udekwu AO, Luketich JD, Courcoulas AP. Outcomes of Roux-en-Y gastric bypass stratified by a body mass index of 70 kg/m^2: a comparative analysis of 825 procedures. J Gastrointest Surg 2005;9:44–52.

[41] Buchwald H, Kellogg TA, Leslie DB, Ikramuddin S. Duodenal switch operative mortality and morbidity are not impacted by body mass index. Ann Surg 2008;248:541–8.

[42] Anthone GJ, Lord RVN, DeMeester TR, Crookes PF. The duodenal switch operation for the treatment of morbid obesity. Ann Surg 2003;238:618–28.

[43] Yang OO, Loi K, Liew V, Talbot M, Jorgensen J. Staged laparoscopic sleeve gastrectomy followed by Roux-en-Y gastric bypass for morbidly obese patients: a risk reduction strategy. Obes Surg 2008;18: 1575–80.

[44] Silecchia G, Boru C, Pecchia A, et al. Effectiveness of laparoscopic sleeve gastrectomy (first stage of biliopancreatic diversion with duodenal switch) on co-morbidities in super-obese high-risk patients. Obes Surg 2006;16:1138–44.