

Laparoscopic sleeve gastrectomy with duodenojejunal bypass

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ABSTRACT

Bariatric surgeries can help resolve metabolic derangements concomitant to obesity; therefore, they are now referred to as metabolic surgeries. Duodenojejunal bypass (DJB) is a new procedure of metabolic surgery relying on foregut hypothesis. DJB has been described as standalone procedure to treat non-obese diabetic patients; however, loop DJB may also be performed in combination with sleeve gastrectomy (LDJB/SG) for obese patients. Literature review revealed 59 patients who underwent LDJB/SG in 3 clinical studies. Operation time, complication rate, improvements in preoperative comorbidities, and weight reduction in these patients were assessed. Effect of LDJB/SG on type 2 diabetes was observed to range from 70% to 92.9%, and it improved hypertension by 80% to 85.7% and hyperlipidemia by 100%. Obese patients lost nearly 80% of their excess weight. LDJB/SG is a safe and effective procedure to maintain weight loss in the long term and to achieve perfect outcomes in comorbidity improvement. However, there is a need for long-term follow-up studies.

Keywords: Duodenojejunal bypass; obesity; sleeve gastrectomy; type 2 diabetes.

Introduction

Today, type 2 diabetes (T2DM) and obesity are global public health problems. Obesity is implicated the most important risk factor in the pathogenesis of T2DM since 80% of patients with T2DM are overweight or obese.^[1] Surgery has proved to be the most effective treatment option for obesity that could not be controlled through dietary and life style changes and the associated metabolic problems, especially T2DM.^[2]

Bariatric surgery has been demonstrated to be highly effective in both preventing the development of T2DM and in its treatment in the obese population. Swedish Obese Subject Study compared bariatric surgery with standard

medical treatment by the end of a 15-year follow-up and reported that the condition of T2DM patients undergoing bariatric surgery was improved by 78% while ten out of every thirteen obese subjects who did not have any comorbidities but underwent bariatric surgery did not develop T2DM during the follow-up period.^[3] Bariatric surgery contributes positively to the overall survival with its curative effect on metabolic syndrome, hypertension, and dyslipidemia in addition to its impressive antidiabetic efficacy.^[4] The term bariatric surgery is now replaced by the term metabolic surgery since it enables the resolution of diabetes independently from weight loss and



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such an effect is also observed among non-obese T2DM patients.

Laparoscopic Roux-en-Y gastric bypass (LRYGB) is one of the most common bariatric procedures and it is effective in weight loss and resolution of comorbid conditions. Studies have shown that among the restrictive/malabsorptive procedures, this procedure achieves 68–85% excess weight loss within one to five years depending on its efficacy on ghrelin hormone and according to the foregut hypothesis.^[5]

Laparoscopic sleeve gastrectomy is an effective procedure that has recently come to the forefront due to the endocrinological changes it achieves basically through restrictive approach. It is, nevertheless, too early to suggest that the long-term outcomes of this procedure are similar to those of LRYGB. Indeed, findings have already indicated that LRYGB is more effective in weight loss and resolution of comorbidities.

Although LRYGB has positive effects, it also poses a disadvantage which is the failure to diagnose possible pathologies that might develop in the remnant stomach. It is challenging to detect duodenogastric reflux, ulcer, hemorrhage, perforation and malignancy that might develop in the remnant stomach through endoscopic or radiological examination. In order to eliminate this disadvantage, some surgeons, especially in regions with high malignancy risk, are in search of a procedure for remnant gastrectomy during LRYGB or a different procedure.^[6] Cohen and Ramos have performed Laparoscopic Duodenojejunal bypass (LDJB) in non-obese T2DM patients due to its positive results in their animal experiments based on Rubino's foregut hypothesis.^[7,8] Kasama et al. on the other hand, have combined LDJB with sleeve gastrectomy, which is a restrictive procedure, enabling them to avoid leaving a blind remnant stomach and obtain similar outcomes with LRYGB in weight loss and resolution of comorbidities.^[9]

Materials and Methods

In PubMed search on LDJB/SG, three clinical studies were found while one of these studies was related to non-obese patients with T2DM.^[9-11] It was understood from the papers published that this procedure was performed in fifty-nine patients (Table 1).

Indications

1. Obese patients with a body mass index (BMI) >40 kg m²,

Table 1.

	Kasama et al.	Raj et al.	Navarrete et al.
Number of patient	21	28	10
BMI (kg/m ²)	41	48.3	<30
Mean weight (kg)	108	–	27.2

2. Obese patients with a BMI >35 kg m² with accompanying diabetes mellitus or another two significant comorbidities related to obesity,

3. Obese patients unable to lose weight or maintain weight loss through dietary or other forms of medical management, and

4. Patients aged between 18 and 65.

A relative contraindication for sleeve gastrectomy is the diagnosis of sliding hiatus hernia during routine pre-operative upper gastrointestinal endoscopy.

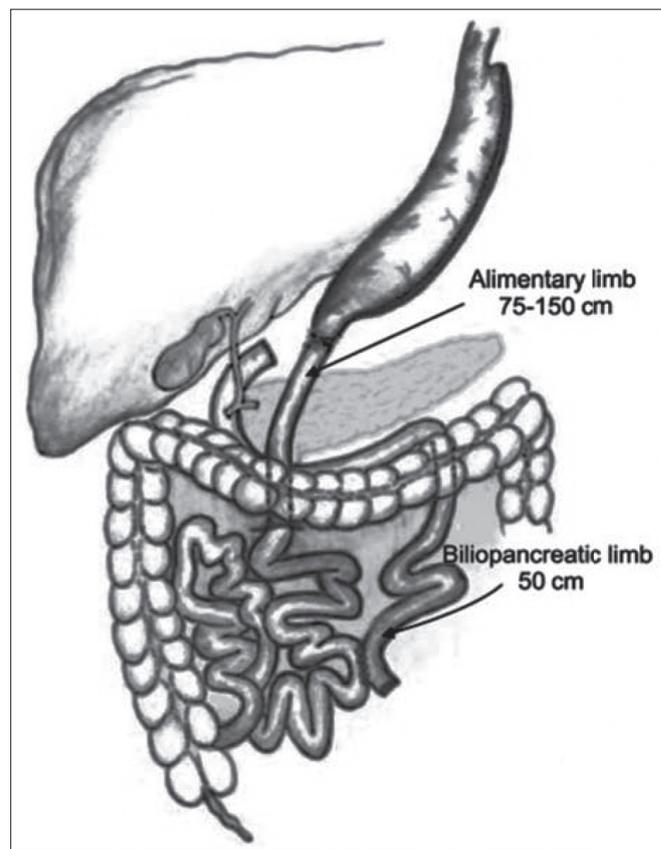


Figure 2. Raj P. Praveen, R. Kumaravel, C. Chandramalteeswaran, V. Vaithiswaran, and C. Palanivelu. Laparoscopic duodenojejunal bypass with sleeve gastrectomy; preliminary results of a prospective series from India. *Surg Endosc.* 2012 Mar;26(3):688-92.

Surgical Technique

The patient was placed in the gynecological position under general anesthesia. Five ports were used during the operation (Figure 1). Supraumbilical port was used for laparoscope while 5 mm-port in subxiphoid area was used for liver retraction. Two 12 mm-ports were placed in the left subcostal margin and 10 cm caudal side. 15 mm-port was placed in the right upper quadrant. Sleeve gastrectomy was performed with 45 F boogie with linear stapler starting about 5 cm to prepyloric region. During the operation, biological materials could be used for stapler-line reinforcement or sleeve-line could be sutured. The posterior wall of the duodenum was carefully dissected and the first part of the duodenum was devascularized. Duodenum was divided with a blue cartridge of linear stapler with an absorbable buttress material. Biliopancreatic limb was measured 50–100 cm from the ligament of Treitz and divided by a white cartridge. The alimentary tract was also measured 150 cm (Figure 1). Jejunojunostomy was performed with a white cartridge and the entry hole was closed by hand-suturing. Mesenteric defect was closed by suturing. Omentum majus was divided to prevent the tension of anastomosis. Duodenojejunal end-to-side bypass was performed on two planes with 2/0 PDS absorbable suture for antecolic reconstruction. After checking for leakage, the operation was finalized with the insertion of drain.

Results

Kasama, Raj and Navarrete have reported the operation

time as 217, 152 and 148 min, respectively (Table 2).

At the sixth and twelfth month follow-up, Kasama et al. have reported 25 kg (63%) and 31 kg (78%) excess weight loss, Raj et al. have reported 38.86 kg (61.89%) and 51.4 kg (81.9%) excess weight loss, and Navarrete et al. have reported 8.5 kg (12.1%) excess weight loss (Table 2). T2DM remission has been 92.9%, 80% and 70% respectively in the above mentioned studies.

Hypertension remission has been reported to be 87.8% in Kasama et al.'s study and 80% in Raj et al.'s study. Kasama and Raj have found improvements in hyperlipidemia in all patients (100%) in the postoperative third month.

As regards the complications, Kasama et al. have observed postoperative hemorrhage in one patient controlled by blood transfusion and wound-side infection in another patient. In the study by Raj, however, internal herniation has been found in one patient whereas Navarrete et al.

have detected leakage in one patient, repaired by reoperation.

Discussion

There are various procedures in bariatric surgery for the treatment of obesity and metabolic syndrome. LRYGB has evolved as both a restrictive and a malabsorptive procedure. It is one of the most effective procedures in weight reduction and contributes to the resolution of diabetes by 80% for over a 10 year follow-up period.^[12,13] Sleeve gas-

Table 2.

	Kasama et al.	Raj et al.	Navarrete et al.
Mean operation time (min)	217	152	148
Excess weight loss			
6 th month	25–63%	38.6–61.89%	–
12 th month	31–78%	51.4–81.9%	8.5–12.1%
T2DM remission %	92.8	80	70
Hypertension remission %	85.7	80	–
Hyperlipidemia resolution	100	100	–
Complications			
Leakage	–	–	1
Bleeding	1	–	–
Wound infection	1	1	–
Herniation	–	–	–

treotomy is an effective bariatric procedure that reduces ghrelin levels playing a role in weight loss while turning out to be more than just a restrictive procedure.^[14] LDJB/SG combines the advantages of both the restrictive procedure and the malabsorptive procedure while sleeve plays the role of the restrictive component and the bypass functions as the malabsorptive component like in RYGB.

The operation time was 217, 152 and 148 minutes in the studies conducted by Kasama, Raj and Navarrate, respectively. The operation time was much longer compared to LRYGBP (153±75 min) and LSG (92±22 min), indicating that this result is not mature yet on the learning curve.^[15]

Two studies (Kasama-Raj) on obese patients have not found any significant difference between LSG/DJB and LRYGBP in terms of change in BMI. The reduction of EB-MIL percentage was better in LSG/DJB at the sixth and twelfth month follow-up compared to the reductions in LSG and LAGB. LSG/DJB is a combined procedure with the addition of malabsorptive component to LSG. Therefore, LSG/DJB achieves more effective weight loss than LSG and LAGB.^[15,16]

In regions where the risk of gastric cancer is high, especially in South India and Japan, the occurrence risk of remnant gastric cancer seems to rise due to LRYGB since it is very challenging to assess the excluded stomach after reconstruction. Several pathologies such as duodenogastric reflux, perforation, ulceration, hemorrhage, and malignancy might develop in the remnant stomach after GBP due to its susceptibility. Tagaya has reported that a double balloon enteroscopy is useful to examine the remnant stomach.^[17] However, it is not easy to use for screening of the patients not manifesting symptoms. In Japan, most gastric cancers are detected at early stage through a screening endoscopy. Therefore, LSG/DJB creates an excluded stomach, which helps avoiding the surgical procedure. After this procedure, standard endoscopic instruments can help exploring the remnant stomach easily.

Improvement was achieved after this procedure in all preoperative comorbidities including diabetes mellitus, hypertension, and hyperlipidemia. These findings showed similar or superior outcomes compared to those of LRYGBP. LSG/DJB is an effective treatment for the resolution of comorbidities.

Contrary to LRYGBP and LSG, there is only a limited number of studies exploring the postoperative complications

of LSG/DJB. Therefore, it is hard to suggest which technique is superior with regard to complications. In light of these findings, it can be proposed that LSG/DJB will become one of the reliable procedures for bariatric surgery.

Conclusion

Perfectly combining the principles and advantages of sleeve gastrectomy and those of foregut hypothesis, LSG/DJB is an effective alternative to LRYGBP that does not compromise the outcomes including weight reduction and resolution of comorbidities in short-term follow-up. This procedure is proposed as an ideal alternative to LRYGBP thanks to the following advantages: (1) easy post-operative endoscopic surveillance, (2) preservation of the pyloric mechanism, which prevents dumping syndrome, and (3) reduced alimentary limb tension. However, there is a need for long-term follow-up in order to evaluate the efficiency of LSG/DJB.

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