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Original Research Article

Laparoscopic greater curvature plication as a stomach sparing gastric sleeve: is it a worthy weight losing procedure for morbid obesity?

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ABSTRACT

Background: Although laparoscopic sleeve gastrectomy (SLG) considered a gold standard way of management of morbid obesity, it still has serious complications as bleeding and staple line leak. Laparoscopic greater curvature plication (LGCP) was introduced as a trial gastric restrictive procedure and recently modified and standardized to obtain a gastric sleeve without resection and hence lower complications rates with the advantage of being a reversible procedure.
Methods: 28 patients suffered from morbid obesity with body mass indices less than 50 kg/m^2 filling the selection criteria of the study were prepared for Stomach Sparing Gastric Sleeve (SSGS). After devascularization of the greater curvature, double in-folding of the greater curvature using non-absorbable 2-0 sutures starting at the angle of His to 3-4 cm proximal to the pylorus, were done.
Results: 28 patients with preoperative mean total body weight (TBW) of 118.7±15.5 kg and a mean BMI of 38±6.5 kg/m^2 were the target of this study. The mean operative time was 103±11 min. Early minor postoperative complications were detected in 18 patients (64%) and included nausea, vomiting and sialorrhea. Postoperative reflux esophagitis was detected in 2 patients (7%). Postoperative % EWL (excess weight loss) was 32.2% at 1 month, 48.9% at 3 months, 53.3% at 6 months, 66.7% at 12 months and 70.2% at 15 months. The improvement of the pre-existent co-morbidities occurred in 7 patients (53.8%).
Conclusions: SSGS is a promising low cost restrictive bariatric operation. It is reversible and effective weight losing procedure in the short term.

Keywords: Greater curvature plication, Laparoscopy, Morbid obesity, Stomach sparing sleeve

INTRODUCTION

Morbid obesity is a rapidly growing health problem all over the world. It threatens the life of different peoples and different age groups.[1] Bariatric surgery today is considered as the most effective way of management for persistent weight loss and for relieving the associated comorbidities and to improve the quality of life.[2] However, surgeons still have debates regarding the ideal weight loss procedure. Laparoscopic sleeve gastrectomy (LSG), which is one of the most popular bariatric surgery worldwide, has 2 serious complications leakage and bleeding from staple line with variable incidence ranging from 1.2 and 3.6 % respectively and can lead to serious outcome.[3,4] In an attempt to reduce these serious complications, another gastric restrictive technique came into view, notably, gastric plication that was first used as weight reducing procedure through an open approach.[5] Talebpour and Amoli were the first to perform the procedure through laparoscopy.[6] A

modification was introduced in some series to augment weight loss by using gastric plication and adjustable gastric band.[7,8]

The idea of laparoscopic greater curvature plication (LGCP) is apparently similar to that of LSG, in formation small gastric tube by elimination of the greater curvature without gastrectomy.[9] Recently, the original LGCP technique was modified by Rodriguez et al and a new standardized procedure was registered as the Stomach Sparing Gastric Sleeve (SSGS).[10] They stated that SSGS reduces the capacity of the stomach by double in-folding of the greater curvature without the need for resection or stapling, hence decreasing the incidence of complications. However, more studies are required to fully evaluate the long-term efficacy of this procedure. There are few studies comparing it with LSG.[11,12]

The aim of this study is to evaluate the impact of laparoscopic stomach sparing gastric sleeve as a low cost restrictive procedure regarding the excess body weight loss and the postoperative complications in morbid obese patients.

METHODS

28 patients suffering from morbid obesity were the target of this study in October 6 university hospital in the period from 2013 to 2015. All patients were bulk eaters and having body mass index (BMI) less than 50 kg/m^2 and with or without co-morbid diseases.

We excluded patients with BMI more than 50 kg/m^2, those having previous bariatric or upper abdominal surgeries, those who were unfit for anesthesia and those having associated stomach pathology as peptic ulcer evidenced by preoperative upper endoscopy.

The selected patients were prepared for laparoscopic greater curvature plication (stomach sparing gastric sleeve). The procedure was explained for the patients and written consents were taken. All patients were investigated preoperatively by lipid profile, upper endoscopy, abdominal ultra-sonography, ECG and other routine laboratory investigations. Prophylactic low molecular weight heparin was started on the day before surgery.

All patients were operated upon in October 6 University Hospital under general endotracheal anaesthesia by the same surgery team. The patients were placed in an anti-Trendelenburg's position and main surgeon between the legs and an assistant on each side of the table

Trocars placement were the same in all cases. After creation of the Pneumo-peritoneum 14 mmHg, Trocars placement were as follows: a 10 mm trocar put above and slightly to the right of the umbilicus for the 30º laparoscope; and a 10 mm trocar introduced in the upper left quadrant for the needle used for suturing, and for the surgeon's right hand. Another 5 mm trocar into the upper right quadrant below the 10 mm trocar at the axillary line for the assistant; a 5 mm trocar used below the xiphoid process for liver retraction; and a 5 mm trocar introduced into the upper left quadrant for the surgeon's left hand. Mobilization of the greater curvature was performed using a Harmonic scalpel was used to mobilize the greater curvature by sealing the vessels, at first distal to the pylorus and then proximal to the angle of His (Figure 1).

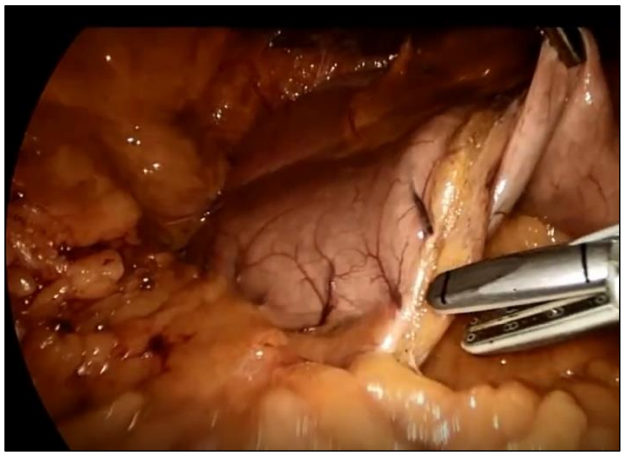

Figure 1: Devascularization of the greater curvature.

We used bougie of a diameter of 32 F. We performed double invaginations of the greater curvature using non-absorbable 2-0 polypropylene sutures of Ethicon. The greater curvature plication was started by applying the first row of sero-muscular interrupted stitches started 1cm below the angle of His and stopped at 3-4 cm before the pylorus (Figure 2) followed by 2nd plication with continuous layer of sutures (Figure 3).

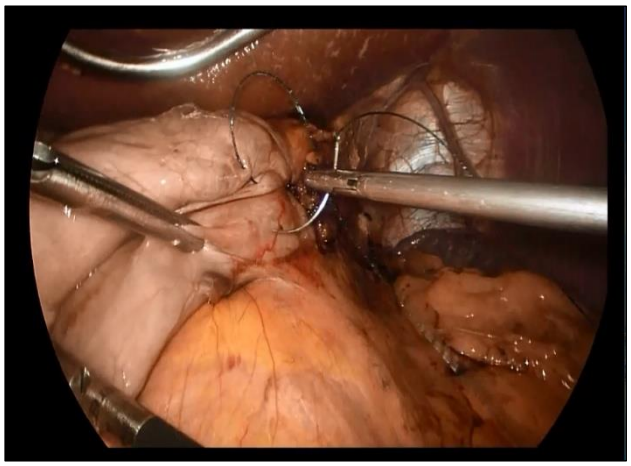

Figure 2: First interrupted layer of plication.

We kept the maximal distance between stitches to be not more than 1 cm. The double in-folding resulted in a stomach similar to a sleeve (Figure 4). Dexamethasone

injections were administered during the procedure and on the first postoperative day to reduce vomiting because of gastric wall edema.

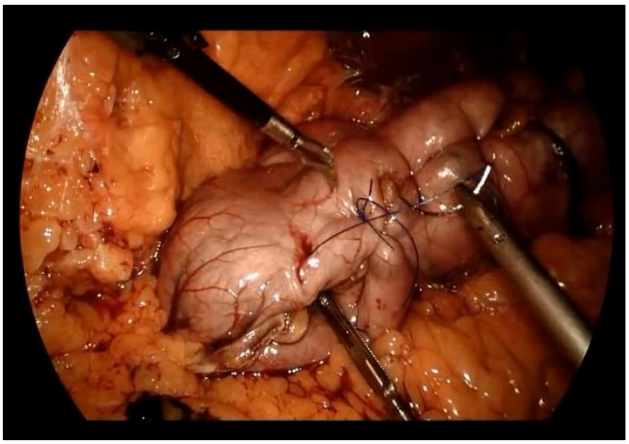

Figure 3: The second continuous layer of plication.

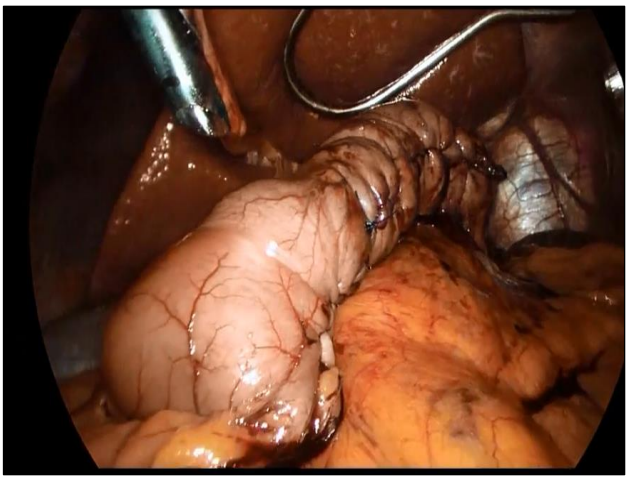

Figure 4: Stomach plication is completed.

Methylene blue leak test was performed in all cases. Intra-peritoneal drains were left in all cases. Oral fluids started on 2nd postoperative day in most of the cases. Liquid diets were initiated at first and when tolerated soft diets were followed for 2 weeks, and lastly solid food after 4 weeks supplemented with iron and multi-vitamins. Regular follow up intervals were every 3 months for 1.8 year and then yearly. Follow up parameters included initial and subsequent weight (kg), body mass index (Kg/m^2), excess weight loss (% EWL) and postoperative complications, all were recorded. Frequencies and mean values with standard deviations were used to describe the data and results.

RESULTS

28 patients (17 females and 11 males) with a median age 34±7.4 were the target of this study. The patients' demographic data were listed in Table 1. The preoperative mean Total Body Weight (TBW) of 118.7±15.5 kg and a mean BMI was 38±6.5 kg/m^2.

Table 1: Patients' demographic data.

Patient's characteristic	
Age (years)	34±7.4
Sex (n %)	
Males	11 (39%)
Females	17 (61%)
Mean BMI (Kg/m^2)	38±6.5
Mean TBW (Kg)	118.7±12.5

The existent co-morbidities were as follow; 4 patients had hypertension, 3 patients had type II diabetes mellitus, and 6 patients had joint pain (Table 2).

Table 2: Preoperative co-morbidities.

Morbidity	Number (28)	%
Hypertension	4	14
Type II diabetes	3	10.7
Knee Joint pain	6	21.4

The mean operative time was 103±11 min (range 85-122 min). We did not encounter any mortality or major intraoperative complications and all cases were completed laparoscopically. Postoperatively, the early distressing complications were nausea in 9 patients (32%) and vomiting in 6 patients (21.4%) and sialorrhea in 3 patients (10.7%) (Table 3), and they were attributed to edema of the gastric fold that responded well to dexamethasone therapy and relieved within 5 to 7 days.

Table 3: Postoperative complications.

	Early complications		Late complications	
Type	**Nausea**	**Vomiting**	**Sialorrhea**	**Reflux esophagitis**
No. (28)	9	6	3	2
%	32	21.4	10.7	7

All patients have started oral feeding on average 2nd postoperative day. The mean hospital stay was 3.3±1.6 days (3-5 days). The BMIL (body mass index loss) and % EWL (Excess Weight Loss) were recorded for all patients after 1, 3, 6, 12 and 18 months postoperatively (Table 4 and figure 5).

Table 4: Outcome of BMIL and % EWL during the follow up periods.

	After 1 month	After 3 months	After 6 months	After 12 months	After 18 months
BMIL (kg/m^2)	4.3	6.1	7.8	9.1	10.3
% EWL	32.2	48.9	53.3	66.7	70.2

BMIL was 4.3 kg/m^2 after one month, 6.1 kg/m^2 at 3 months, 7.8 kg/m^2 at 6 months, 9.1 kg/m^2 at 12 months and 10.3 kg/m^2 at 18 months. % EWL at the same time was reported as 32.2% at 1 month, 48.9 % at 3 months, and 53.3% at 6 months and 66.7% at 12 months and 70.2% at 18 months. Inadequate weight loss (% EWL less than 50%) was detected in 6 patients (21.4%). Of the later, 3 patients (10.7%) with % EWL less than 30% considered failed cases (Table 5). The mean TBW after 18 months was 85.3±9 Kg.

Table 5: Patient satisfaction as regards total body weight loss (TBWL).

	Satisfactory TBWL	Inadequate TBWL	Failure TBWL
N = 28	19	3	3
%	67.8	10.7	10.7

No malnutrition was detected in patients during the follow up period. The improvement of the pre-existent co-morbidities was noticed in 7 patients (53.8%) (1 diabetic, 3 with hypertension and 3 with joint pain) (Table 6).

Table 6: Effects of LGCP on the preoperative existing co-morbidities.

	Type II diabetes (n = 3)	Hypertension (n = 4)	Knee Joint pains (n = 6)
N (%)	1 (33.3)	3 (75)	3 (50)

We recorded 2 cases (7%) suffering from symptoms of reflux esophagitis responded adequately to conservative medical treatment in the form of proton pump inhibitors.

DISCUSSION

Recently, restrictive bariatric surgery has gained popularity, in particular sleeve gastrectomy that can produce excellent weight loss. However, serious complications are attributed to sleeve gastrectomy due to its long staple line with increased incidence of bleeding and leakage.[13] Gastric leak constitutes a major complication, which is difficult to treat. It significantly prolongs hospital stay and may be a cause of mortality.[14]

In addition, the irreversible nature of the sleeve gastrectomy might be less attractive to many patients.[13] Hence, the thinking about stomach sparing gastric sleeve technique was developed in an attempt to obtain the same results as LSG, in terms of excess weight loss, and having lower complication rate than LSG.[9]

Talebpour and Amoli were the first to describe laparoscopic gastric plication on a large series of patient with outcome similar to that of sleeve gastrectomy.[6]

A systemic review done by Abdelbaki et al on many articles concerned with LGCP. He reported % EWL in all studies was around 50% in 6 months, ranging from 40 to 60%.[13] Another study had demonstrated the impact of preoperative BMI on the % EWL following LGCP. Patients having a preoperative BMI <40 kg/m^2 had significantly greater % BMIL at 6 months those with a preoperative BMI of >40 kg/m^2. This significant difference was no longer present at 9 months follow up.[11] Skrekas et al, have reported different EWL in patients with BMI >45 kg/m^2 or <45 kg/m^2.[15] % EWL was significantly higher in the patients with BMI <45, and inadequate weight loss was doubled in patients with BMI >45 kg/m^2. In a recent important study done by Rodriguez et al, on 624 cases with morbid obesity, with a median follow up of 3 years, the % EWL was 56.36±21.83 during the first year and a maintenance of 49.37±30.82 by the third year of follow-up (p = <0.0005).[16] In addition, patients having BMI of 20-30 Kg/m^2 had EWL of 60.46% during the first 6 months after surgery and EWL of 74.84% in the first year and a maintained EWL after 3 years of 60.45%. They concluded that, SSGS has a weight loss comparable to other restrictive procedures, with excellent mid-term excess weight loss in the 20-30 Kg/m^2 BMI category.

In our study, BMIL was 4.3 kg/m^2 after one month, 6.1 kg/m^2 at 3 months, 7.8 kg/m^2 at 6 months, 9.1 kg/m^2 at 12 months and 10.3 kg/m^2 at 15 months. The % EWL at the same time was reported as 32.2% at 1 month, 48.9 % at 3 months, and 53.3% at 6 months and 66.7% at 12 months and 70.2% at 15 months. In the present study those who have % EWL less than 50% was 6 patients and considered to be of inadequate weight loss. Of the later, 3 cases (10.7%) have considered failure; in them the % EWL was less than 30%. The inadequate weight loss and failed patients could be explained by increased stomach capacity after 6 to 9 months postoperatively detected by upper gastro-intestinal endoscopy or dye study and partially due to insufficient lowering of Ghrelin hormone in those patients. Another explanation of failure to lose weight sufficiently was due to insufficient lowering of Ghrelin hormone release from the gastric fundus.[17] The hospital stay in the present study was 3.3±1.6 days (3-5 days) and patients started oral feeding on 2nd day.

The most common complications following greater curvature plication, were nausea, vomiting and sialorrhea, and the incidence of these complications was higher than in the LSG and were partially related to edema and irritation of the gastric fold.[9] Another study demonstrated more serious complications following gastric plication as minor leaks and suture line bleeding.[15] These complications presented at a rate of 4.4%. The bleeding was managed conservatively by endoscopic haemostasis in 0.6% and micro-leaks managed conservatively in 0.4%. In 1.5%, leaks were due to suture line disruption and herniation in 0.7%, and gastric fistula in 0.1%. Gastric obstruction detected in 3% that required reoperation, and was mostly due to fold prolapse, fold edema, adhesions, or accumulation of fluid within the gastric fold.[18] In the present study the patients got minor

complications in the form of nausea, vomiting and sialorrhea in the early postoperative period in 18 patients (64%). Reflux esophagitis was detected in 2 patients (7%) and managed conservatively. We did not encounter any case of gastric prolapse or obstruction in our patients.

Revision of the surgery will be considered for the failed cases (3 cases) in the present study.

The revision or re-do in other series was resorted to those who developed complications as gastric prolapse, major leak, gastric obstruction or marked gastric dilation with disruption of the sutures.[19] Different studies had shown marked improvement in the preoperative co-morbidities following stomach plication technique.[9,17] In the present study improvement in co-morbidities was evident in 7 patients of 13 patients (53.8%). The improvement was more in those complaining of hypertension (3/4) and those who have joint pains (3/6) and lastly those having type II diabetes (1/3). The most important advantage made SSGS an interesting and promising procedure for morbid obesity as it does not involve any gastric resection, nor does it leave a staple line behind, and hence reducing the risks of staple line-related complications. Another major advantage is the reversibility of the procedure in a simple way through either replication or revision to another bariatric procedure.[20,21] Another advantage for SSGS is the definite lower cost when compared by other bariatric procedures as LSG that requires expensive staplers. SSGS became attractive for many obese patients who cannot afford for other expensive bariatric procedures.

CONCLUSION

Stomach sparing gastric sleeve is a promising restrictive bariatric operation and the current data pointed that it is safe and effective weight losing procedure on the short term. It has low a complication rate and being reversible and of low cost encourages many morbid obese patients to choose it and many surgeons to handle it.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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