

COMPARATIVE STUDY BETWEEN INVERSION AND NON-INVERSION OF THE STAPLE LINE IN LAPAROSCOPIC SLEEVE GASTRECTOMY

By

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ABSTRACT

Background: Morbid obesity has become a big health problem due to its multiple co-morbidities. Bariatric surgery proved to be an effective way for management of morbid obesity and its co-morbidities. Sleeve gastrectomy (SG) evolved as a single-stage for treatment of morbid obesity.

Objective: To compare inversion and non-inversion of staple line in laparoscopic sleeve gastrectomy (LSG) as regard post-operative complications.

Patient and Methods: This comparative prospective study was conducted on 40 morbidly obese patients operated upon for LSG 20 without inversion of staple line, and 20 with inversion of staple line, and are followed up afterwards to evaluate postoperative complications rate. Patients were followed up at regular intervals on the first week postoperatively, and then at 1, 3, 6, 12 months in General Surgery Department, Sayed Galal University Hospital, and Ahmed Maher Teaching Hospital during the period between June 2019 and January 2021.

Results: There was no statistically significant difference between group A (LSG without inversion of staple line) and group B (LSG with inversion of staple line) in age (range 23 to 60 years VS 19 to 55 years), mean BMI (49.49 VS 45.06), co morbidities, time of surgery (108 min VS 124 min) and complications which included bleeding, infection, leakage and thromboembolism.

Conclusion: Laparoscopic SG was an effective treatment for morbid obesity with accepted range of complications. Reinforcement of staple line has no significant impact on percentage of suture line bleeding , leakage , operative time or hospital stay. This technique can be restricted to special individual cases depending on the operative findings. However, more intense practice and wide range of cases are required for more precise assessment.

Keywords: Bariatric surgery, Laparoscopy, Morbid obesity, Leakage, Sleeve gastrectomy, Weight loss.

INTRODUCTION

Obesity is known as an excess of body fat relative to lean body mass (*Li et al., 2010*). LSG was developed as an initial stage of a two stage duodenal switch with the intention to decrease risks of this complex technique. Short term follow up showed a better outcome in term of weight loss. Weight loss is comparable

with the gastric bypass, with a EWL% of 65–70% achieved at 2 year follow-up (*Melissas et al., 2013*).

Gagner and Buchwald (2014) reported leak rate with the use of inversion sutures. The overall incidence was 2.1% which increased to 3.3% when buttressing the staple lines with bovine pericardium, and lower when absorbable polymer

membrane was used with an incidence of 1.09%.

The aim of the present study was to compare inversion and non-inversion of staple line in LSG as regard post-operative complications.

PATIENTS AND METHODS

This comparative prospective study was conducted at General Surgery Department, Sayed Galal University Hospital and Ahmed Maher Teaching Hospital during the period between June 2019 and January 2021. Patients have BMIs of 40kg/m² or more, or between 35kg/m² and 40kg/m² with significant comorbidity.

The present study included 40 morbidly obese patients divided into 2 equal groups: Group A: Morbidly obese patients who underwent LSG without inversion of the staple line, and Group B: Morbidly obese patients who underwent LSG with inversion of the staple line.

Inclusion criteria:

The subjects considered appropriate candidates for this study if they were:

1. Willing to give consent and comply with the evaluation and treatment schedule, were 18–65 years old (inclusive).
2. Patients who have BMIs of 40kg/m² or more, or between 35kg/m² and 40kg/m² with other significant disease that could be improved if they lost weight.
3. All appropriate non-surgical measures have been tried but have failed to achieve or maintain adequate

clinically beneficial weight loss for at least six months.

4. Patients received management.
5. Patients were generally fit for anesthesia and surgery.
6. Patients committed to the need for long-term follow up.

Exclusion criteria:

1. Pregnancy or lactation.
2. A documented history of drugs as NSAID or birth control pills, and/or supplements as fish oil within 30 days.
3. Alcohol abuse within 2 years of the screening visit.
4. Previous malabsorptive or restrictive procedures performed for the treatment of obesity.
5. Any condition that would preclude compliance with the study.

All patients were subjected basically to the following:

1. Full history taking.
2. Full clinical examination including pattern of obesity and weight, BMI measurement.
3. Preoperative investigations in the form of:
 - Complete blood count.
 - Lipid profile, blood cholesterol and triglyceride assay.
 - Liver and kidney functions tests.
 - Blood glucose level.
 - Hormonal assay in selected patients (Cushing's disease or myxedema).
 - Pulmonary function tests.

- Chest X-ray.
- Electrocardiogram.
- Abdominal ultrasound.
- Upper gastrointestinal endoscopy.

Preoperative preparation:

1. The operation dates were recorded, with a note on the operative approach and duration of surgery.
2. Antibiotic prophylaxis in the form of intravenous injection of third generation cephalosporin, 2 hours before operation.
3. Thromboprophylaxis in the form of low molecular weight heparin 2 hours before operations.

Arrangement for availability critical care bed if needed postoperatively.

Operative technique:

1. After prophylactic antibiotics and general anesthesia were administered, the patient was placed in the supine split-leg position.
2. Sequential compression boots were placed for DVT prophylaxis.
3. Five or six trocars were used for LSG.
4. The first step consisted of exploration of the entire intrabdominal cavity then the gastrocolic ligament was dissected. Meticulous dissection was performed at the angle of His with full mobilization of the gastric fundus. The mobilization of the stomach continues dissecting the greater gastric curve toward the antrum up to 3-5 cm from the pylorus.
5. At this time, a 36-Fr orogastric tube was inserted then stapler to greater

curve started. methylene blue leaking test at the end of procedure

6. In selected group B, inversion of stable line was done using polyglycolic acid 2/0 with rounded needle.

Follow-Up Assessment: Patients were followed up at regular intervals on the first week postoperatively and then at 1, 3, 6, 12 months, at each visit recording the following:

1. BMI of the patient, and excess weight loss.
2. Full history and clinical examination of the patient after the procedure we assessed. Regarding complications of surgery and resolution of comorbidities, we asked about:
 - a. Regurgitation of food and gastro-esophageal reflux
 - b. Gastritis, nausea and vomiting.
 - c. Upper or lower gastrointestinal bleeding.
 - d. Failure to lose weight.
 - e. Wound infection and fever.
 - f. Diarrhea or constipation.
 - g. Abdominal pain.

Statistical analysis:

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for the Social Sciences (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Data were presented and suitable analysis was done according to the type of data obtained for each parameter. Descriptive statistics: Mean, Standard deviation (\pm SD) and

range for parametric numerical data and were compared by independent t-test or Mann-Whitney U test. Frequency and

percentage were used for non-numerical data and were compared by chi² test. P value < 0.05 was considered significant.

RESULTS

Mean age for patients who had LSG without inversion of staple line was 34.20 years \pm 8.16 with a range from 23 to 60 years. Mean age for patients who had LSG with inversion of staple line was 32.95 years \pm 10.0 with a range from 19 to 55 years with insignificant P-value of 0.667.

Mean BMI for patients who had LSG without inversion of staple line was 49.494kg/m² \pm 6.13 with a range from 42.6 to 67.8 Kg/m². Mean BMI for patients who had LSG with inversion of staple line was 45.067g/m² \pm 4.33 with a range from 40.5 to 57.7 Kg/m² with insignificant P-value of 0.062 (Table 1).

Table (1): Demographic data of the study group as regard age and BMI.

Parameters		Age (N=20)	BMI (N=20)
Group A	Mean \pm SD	34.20 \pm 8.160	49.494 \pm 6.1389
	Minimum	23	42.6
	Maximum	60	67.8
Group B	Mean \pm SD	32.95 \pm 10.002	45.067 \pm 4.3317
	Minimum	19	40.5
	Maximum	55	57.7
P value		0.667	0.012

There was no statistically significant difference as regard sex distribution between both groups. Both groups were

sex matched with a P-value of 0.168 (Table 2).

Table (2): Sex distribution in both group

Groups		Group A	Group B	P value
Females	Count	16	12	0.168
	% within Sex	57.1%	42.9%	
Males	Count	4	8	
	% within Sex	33.3%	66.7%	

There was no statistically significant difference as regard preoperative

comorbidities between both groups (Table 3).

Table (3): Preoperative comorbidities in both groups

Preoperative comorbidities	Group A	Group B
Diabetes mellitus	9	7
Hypertension	7	4
Obstructive sleep apnea	8	5
Arthritis	8	7

There was no statistically significant difference as regard operative time between both groups with a P-value of 0.105 (Table 4).

Table (4): Operative time in both groups

Groups		Operative. Time (N=20)
Group A	Mean±SD	108.45±33.021
	Minimum	63
	Maximum	173
Group B	Mean±SD	124.50±27.860
	Minimum	82
	Maximum	165
P value	0.105	

In group A, one patient had port site bleeding which was managed conservatively, one patient had wound infection which was managed by local wound care and antibiotics according to culture and sensitivity, one patient had postoperative internal bleeding which was managed conservatively with packed RBCs and fluid transfusion without surgical intervention, one patient had postoperative leakage which was managed

with U/S guided pig tail drain and with mega stent insertion endoscopically. As regard group B, one patient had left ileofemoral DVT approved with duplex and treated conservatively by anticoagulation, one patient had port site bleeding which stopped conservatively, two patients had wound infection which was managed by local wound care and antibiotics according to culture and sensitivity (Table 5).

Table (5): Postoperative complications in both groups

Type of complications \ Groups	Group A	Group B
Port site bleeding	1	1
Wound infection	1	2
DVT	0	1
Leak	1	0
Post op bleeding	1	0
P value	0.147	

There was no mortality in both groups.

Although intraperitoneal bleeding occurred only in group A there was no statistically significant difference as regard postoperative bleeding between both groups with a P-value of 0.035.

Although postoperative leakage occurred only in group A, there was no statistically significant difference as regard postoperative leakage between both groups with a P-value of 0.311 (Table 6).

Table (6): Postoperative internal bleeding and leak in both groups

	Groups	
	Group A	Group B
Postoperative internal bleeding		
Count	1	0
P value	0.311	
Postoperative leak		
Count	1	0
P value	0.311	

Hospital stay in both groups: There was no statistically significant difference as

regard hospital stay between both groups with a P-value of 0.882

DISCUSSION

Bariatric surgery is an effective way to treat morbid obesity and decrease the weight, or remission of comorbid, and ultimately a reduction of mortality (*Carvajal et al., 2013*).

SG is a partial gastrectomy where the majority of curvature of stomach was removed. Antrum is divided 4 cm from the pylorus and a tubular stomach is fashioned around a bougie (32 to 40) (*Brethauer et al., 2011*).

Our study was a comparative prospective randomized controlled study between inversion and non-inversion of staple line in LSG as regard the percentage of leakage and percentage of bleeding.

Demographic data showed that 28 patients were females and 12 patients were males, indicating a higher frequency of morbidly obese patients in females as compared to males putting in mind that patients were selected in randomized pattern. This was in concordance with the WHO where obesity was prevalent among women and in urban areas in eastern land (*Soliman et al., 2020*).

According to age and BMI for patients, there were no statistical significant differences between both groups.

As regards obesity related comorbidities in morbidly obese patients in the current study, were almost matched in both groups.

In the current study, although inversion of staple line took a longer operative time yet this was statistically insignificant.

Inversion of staple line has no significant impact in hospital stay.

It can be concluded from the current study that no statistically significant difference between both groups as regard leakage, bleeding, thromboembolism and wound infection. Both procedures were safe and almost having the same early postoperative complications. Leak rate in our study was 2.5%.

Prospective randomized evaluating three different ways of reinforcement (over sewing, absorbable buttress and thrombin matrix) reported similar results (*Gentileschi et al., 2012*).

Choi et al. (2012) in a meta-analysis reported lower incidence of bleeding than non-reinforced.

The study showed that both LSG with and without inversion of staple line have achieved a good reduction in the excess weight. In LSG without inversion of staple line EWL% was at 6 months and 1 year, 50.89% and 67.306%, respectively. In LSG with inversion of stable line, it was 52.56% at 6 months and 69.44% at 1 year. No significant differences to effect of both procedures on EWL% in first year.

Dapri et al. (2010), found that EWL% after SG (35% to 71.6%) in 6 months, 45% to 83% in 1 year, 47% to 83% in 2 years and 66% at 3 years. Five deaths were reported (morbidity was significantly low).

CONCLUSION

LSG is an effective treatment for morbid obesity. Reinforcement of staple line has no significant impact on percentage of suture line bleeding or leakage or on the operative time or hospital stay

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دراسة مقارنة بين تدعيم خط التدبّيس بالغرزو وعدم تدعيم خط التدبّيس في عملية تكميم المعدة بالمنظار

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خلفية البحث: أصبحت السمنة المفرطة مشكلة صحية كبيرة بسبب الأمراض المصاحبة المتعددة. أثبتت جراحة السمنة أنها وسيلة فعالة لعلاج السمنة المفرطة والأمراض المصاحبة لها. في السنوات الأخيرة، تطورت عملية تكميم المعدة من مرحلة واحدة لعلاج السمنة المفرطة.

الهدف من البحث: مقارنة ما بين تدعيم و عدم تدعيم خط التدبّيس اثناء عملية تكميم المعدة بالمنظار من حيث نسبة النزيف و نسبة التسريب.

المرضى و طرق البحث: أجريت هذه الدراسة المستقبالية المقارنة على ٤٠ مريضاً يعانون من السمنة المفرطة المرضية أجريت لهم عملية تكميم المعدة بالمنظار الجراحي وقد تم تقسيمهم الى مجموعتين: مجموعة (أ) عدم تدعيم خط التدبّيس، ومجموعة (ب): تدعيم خط التدبّيس. وتم متابعتهم بعد ذلك لتقييم معدل مضاعفات ما بعد الجراحة، وتمت متابعة المرضى على فترات منتظمة في الأسبوع الأول بعد الجراحة ثم في ١ و ٣ و ٦ و ١٢ شهراً في قسم الجراحة العامة بمستشفى باب الشريعة الجامعي ومستشفى أحمد ماهر التعليمي في الفترة ما بين يونيو ٢٠١٩ ويناير ٢٠٢١.

نتائج البحث: لا يوجد فرق ذو دلالة إحصائية بين المجموعة أ (تكميم المعدة بدون تدعيم خط التدبّيس) والمجموعة ب (تكميم المعدة وتدعيم خط التدبّيس) في العمر (تتراوح من ٢٣ إلى ٦٠ سنة مقابل ١٩ إلى

٥٥ سنة)، ومتوسط مؤشر كتلة الجسم (٤٩.٤٩ مقابل ٤٥.٠٦، والأمراض المصاحبة، ووقت اجراء الجراحة (١٠٨ دقيقة مقابل ١٢٤ دقيقة)، والمضاعفات التي تشمل النزيف، والعدوى، والتسرب، والجلطات الدموية.

الاستنتاج: عملية تكميم المعدة بالمنظار الجراحي هو علاج فعال للسمنة المفرطة مع نسبة مقبولة من المضاعفات. ولم يؤثر تدعيم التدببب بشكل كبير على النسبة المئوية لنزيف أو تسرب خط التدببب أو على وقت العملية أو الإقامة في المستشفى. وتقتصر هذه التقنية على الحالات الفردية الخاصة اعتمادًا على النتائج الجراحية. ومع ذلك، هناك حاجة إلى ممارسة أكثر كثافة ومجموعة واسعة من الحالات لتقييم أكثر دقة.

الكلمات الدالة: جراحة السمنة، منظار البطن، السمنة المفرطة، التسرب، تكميم المعدة، فقدان الوزن.