

The effects of using metal clips to support the stapler line lengthwise on bleeding and leakage in laparoscopic sleeve gastrectomy

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ABSTRACT

Introduction: The aim of our study is to evaluate the results of our patients who underwent laparoscopic sleeve gastrectomy (LSG) procedure due to morbid obesity and to whom we applied hemoclips to reinforce the resection line and provide hemostasis. Morbid obesity is one of the most common health problems today. Satisfactory results are obtained after LSG surgery performed for therapeutic purposes. However, it causes serious complications such as leakage and bleeding from the stapler line.

Materials and Methods: The files of 403 patients who were intervened with LSG for morbid obesity in our clinic and who had hemoclips inserted along the entire resection line for reinforcement and hemostasis were reviewed. The patients' demographic parameters, body mass index (BMI), and changes in hemoglobin (Hb) were evaluated.

Results: About 329 (81%) of the patients were female, whereas 74 (19%) were male. Preoperatively, the mean BMI in women was 42.4 ± 3.56 kg/m² and the mean BMI in male was 47.5 ± 7.72 kg/m². The mean operation time was calculated to be 58.3 min. Pre-operative mean Hb values were calculated to be 13.8 ± 0.77 g/dL, and mean Hb values on the 3rd day of surgery were calculated to be 13.2 ± 0.82 g/dL. Only one of our patients had gastric fundus leakage. Six of our patients experienced bleeding during the first 6 h after surgery.

Conclusion: Following resection with new generation stapler in our clinic, we reinforced the stapler line lengthwise using hemoclips in all patients. In our cases, we found that using hemoclips to support the stapler line is safe in terms of bleeding and leaking.

Keywords: Bariatric surgery, Bleeding, Hemoclip, Leakage

Introduction

Laparoscopic sleeve gastrectomy (LSG) has become one of the most popular procedures in the surgical treatment of obesity because it is safe and effective in the treatment of obesity.^[1,2]

Despite its extensive use and greater safety as compared to Roux-en-Y Gastric Bypass, LSG has complications. The

most common complication thereof is bleeding in the stapler line. The leakage of the stapler line is another common complication.^[3] Transfusions and reoperations, whether due to bleeding or leakage, incur enormous financial costs. Many methods, such as intra-operative tranexamic acid and fibrin filling application as well as stapler line reinforcement, have been developed to prevent such complications.^[4-6]



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There are a very few studies in the literature where hemo-clips are used to reinforce the stapler line. The aim of this study is to determine the bleeding and leakage rates in our patients who underwent LSG procedure and for whom we used metal clips to reinforce the stapler line.

Materials and Methods

The files of 403 patients who admitted to our clinic due to morbid obesity and underwent LSG between 2015 and 2021 were evaluated retrospectively. While making the pre-operative decision, all patients were evaluated by a multidisciplinary committee comprised of an endocrinologist, a dietician, and a bariatric surgeon. In addition, before the council, all patients had one-on-one consultations with a psychiatrist. The patients who were deemed appropriate have been referred for surgery. All patients had body mass index (BMI) over 40 kg/m² or over 35 kg/m² and had comorbidities related to obesity. Patients' cardiac and pulmonary capabilities were assessed, and upper gastrointestinal endoscopy and abdominal ultrasonography were conducted before to surgery. All surgeries were performed by the same surgical team and a single surgeon with the same technique. All excised specimens were sent to pathology for evaluation. The patients' demographic parameters, BMI, duration of surgery, changes in hemoglobin (Hb) values before and on the 1st post-operative day, and post-operative complications were evaluated. Before surgery, all patients provided written informed consent forms. One night before the operation, patients were treated with low molecular weight heparin and were given anti-embolic stockings. Thrombophlaxis was maintained for 2 more weeks following surgery. Because the activities of our patients were restricted due to post-operative pain, the patients were administered with antibiotic prophylaxis with 1 g. ampicillin/sulbactam preoperatively. The patients were put to sleep in the supine position; a 10 mm camera port was opened from the umbilicus with a trocar, and insufflated until a pressure of 12–14 mmHg was achieved. Then, the patients were placed in the reverse Trendelenburg position and the ports were placed. The omentum was separated from the stomach with a vessel sealing device (LigaSure™ 5 mm blunt, LF1637) starting from approximately 2–3 cm proximal to the pylorus and up to the angle of His. The posterior surface of the stomach and the fundus level were then fully freed, and then a 32 F silicone gastric tube was inserted through the orogastric route. Using an endoscopic stapler, the stomach was dissected proximal to the pylorus (starting at the level

of Crow's foot) up to the angle of his. At this step, care was made to leave a small antrum and a narrow tube in a straight line (with the anterior and posterior walls in equal widths). ECHELON FLEX™ ENDOPATH® Staplers 60 mm was used in the antrum, and a stapler (ECHELON FLEX™ ENDOPATH® Staplers 60 mm Articulating Medium/thick reload with) suitable for medium-thick tissues was used in the rest of the stomach.

Following the dissection of the stomach, 50 ml of methylene blue was administered through the orogastric calibration tube, and a leak test was performed. The tubed stomach was controlled with white gauze along the stapler line. The stapler line was supported length-wise with metal clips at 5 mm intervals for reinforcement and controlling bleeding. Following the leak control, an aspiration drain was inserted parallel to the suture line for leakage that may develop due to ischemia (Fig. 1). On the 2nd day of the operation, the patient was given oral contrast (urografin), fluoroscopy was taken, and leak control was performed. In the first 2 days postoperatively, IV fluid replacement is applied to the patients, and oral food intake is started in this period for the patients in whom we do not detect leakage.

Results

A total of 403 patients were enrolled in the study. The mean age of the patients participating in the study was 35.7±7.21 (13–71), and the M/F ratio was 1/5. The mean BMI of the patients was calculated as 47.6 kg/m² (from 35 to 63). For eight patients with a BMI below 40, surgery was decided due to Type 2 diabetes and hypertension. The mean duration for surgery was 58.3 min (ranging from 32 to 75 min). The average length of stay in the hospital after surgery was determined to be 2 days. The mean drain stay was calculated as 1 day, and the mean drain flow as 35 cc. Pre-operative mean Hb values were calculated



Figure 1. Image in operation.

to be 13.8 ± 0.77 g/dL, and mean values on the 1st day of surgery were calculated to be 13.2 ± 0.82 gr/dL (Table 1).

In six of our patients, Hb values decreased more than 2 g/dL. While medical treatment was used to halt the bleeding in three of the patients, the other three were reoperated and had laparoscopic hemostasis performed. These three patients had clinical instability (Table 2).

Only one of our patients developed leakage after surgery, but there was no bleeding. The area where the opening in the stapler line was opened was closed with a suture.

In none of our patients, complications such as pulmonary embolism, stenosis, or twist were noted. All of the procedures were completed laparoscopically, without resorting to open surgery (Table 3).

Table 1. Demographic characteristics

Sex	n (%)
Female	294 (81)
Male	59 (19)
BMI (minimum-maximum) (kg/m ²)	47.6 (32-63)
Comorbid conditions [n (%)]	
Diabetes mellitus	49 (13.8)
Arterial hypertension	56 (15.86)
Obstructive sleep apnea	6 (1.6)
Hyperlipidemia	6 (1.6)

Table 2. Patients hemodynamic instability

Patient	Hypotension	Tachycardia	Hemoglobin
1.	80/50 mmHg	125/min	13, 2 -10, 1 g/liter
2.	90/60 mmHg	110 /min	12-9, 8 g/liter
3.	70/50 mmHg	120 /min	12, 8-9, 6 g/liter

Table 3. Postoperative Outcomes

Operative time (minimum-maximum) (min)	58.3 (32-75)
Hospital stay (d)	2.0
Complications	n (%)
Bleeding	6 (1.5)
Leakage and/or fistula	1 (0.02)
Stricture	0
Twist	1 (0.02)
Pulmonary emboli	0
Mortality	0

Discussion

LSG is the most commonly applied bariatric surgery technique recently.^[6,7] LGS is a preferred technique as it not only contributes to weight loss but also to metabolic recovery. The use of staplers is essential in LSG, and among procedures performed with staplers, LSG has the longest suture line. This long suture line has two significant complications: Suture line leakage and suture line bleeding. It is also true that it raises the cost and lengthens the operation time.^[8,9] In LSG, the duration of surgery lowers as surgical experience increases in tandem with the number of surgeries performed. In a study of 20 patients conducted by Consten in 2004, the operation time was found to be 210 ± 14 min,^[3] while in a study of 75 patients conducted by Dapri, it was found to be 47 ± 10.7 min.^[8,9] In our series, the mean operation time was found to be 58.2 min (ranging from 32 to 75 min). Our own experience also shows that the duration of the operation decreases as the number of surgeries increases.

Many methods have been tried to prevent bleeding and leakage from the suture line. It is reported in the literature that the leakage rate is 7%^[3] and the bleeding rate reaches 8.7%^[3] despite the employment of the methods to reinforce the suture line. It has been reported that the leakage rate of the stapler line is 1–3% in the new series.^[1,10-15] In our study, the leakage rate of the stapler line is 0.02% leakage and 1.5% rate of the stapler line had bleeding.

Pallor, hemodynamic instability, a drop in Hb value of more than 2 g, and intra-abdominal fluid accumulation seen with imaging methods in the post-operative period may all be indicators of possible bleeding after LSG. Post-operative bleeding may originate from the stapler line, the gastrocolic ligament after dissection of the greater curvature, short gastric vessels, or adipose tissue, or the trochar entry site. Sroka et al. compared two groups, in which the stapler line was reinforced with fibrin glue and suture, to the control group, and while no bleeding was observed in the suture group, a drop in Hb values of >2 g/dL was found at a rate of 4% in the fibrin glue group and 10% in the control group.^[16] Another study in the literature revealed that, when the two groups with and without stapler line reinforcement were compared, the risk of bleeding and reoperation was reduced in the group with the reinforced stapler line, while the leakage rate remained the same.^[17]

Shikora reviewed 253 studies and found post-operative bleeding to be 4.94%. In studies with no reinforcers

placed on the stapler line, the risk of bleeding was found to be 2.41%, while it was found to be 2.09% in the studies with reinforcers.^[18] Musella, on the other hand, argued that there was less bleeding in patients for whom fibrin glue was used.^[19]

In the study conducted by Khoursheed, 2% of the patients sustained bleeding in the stapler line supported with sutures, while 0.5% required reoperation. However, the post-operative mortality rate was zero.^[20] In our study, 6 patients (1.5%) had a drop in Hb levels of >2 g/dL. We placed in the bleeding area metal clips for hemostasis in three patients and hemostasis was achieved.

Due to the use of staplers and a long suture line, suture line leakage is a significant issue in LSG. The reasons for the increased risk of leakage are ischemia, stenosis of the incisura, excess fundic, or the use of an inappropriate staple height.^[21] Besides, patient-related factors may also increase the risk of leakage. These are the patient's BMI, smoking, chronic immunosuppressive medication usage, diabetes, and hypertension. Although many methods have been tried to prevent this complication, no methodology has been described to completely reduce the risk of complications. Suture line separation occurs for both technical and physiological reasons. Leaks due to technical reasons occur within the first 48 h, while ischemia-induced separations occur between the 5th and 7th days when the inflammatory and fibrotic response is most intense.^[22] In a study conducted by Simon, in which the suture line was reinforced in 59 patients and not reinforced in 80 patients, the post-operative leakage rates were found to be identical.^[23] In the study conducted by Dapri, SeamGuard was reported to minimize bleeding from the stapler line but had no effect on leaking.^[8] Fibrin glues as another method, on the other hand, have been tried by many authors but resulted in conflicting outcomes. In the study of Aydın et al., fibrin glue was reported not to reduce leakage rate while increasing operation time and expenses.^[24] Systematic review of 148 included studies representing 40,653 patients found that the leak rate in LSG was significantly lower using absorbable polymer membrane staple-line reinforcement than oversewing, non-absorbable bovine pericardial strips reinforcement, or no reinforcement.^[25] Another method used to prevent leakage and bleeding from the stapler line is suturing the stapler line. Shash, in their study, suggests that reinforcing sutures (PeriStripsDry with Veritas) placed on the suture line reduced the frequency and severity of bleeding.

^[26] They did not comment on leakage, as no patient developed leakage in their study. However, Parikh et al. stated in a meta-analysis, in which they evaluated 9991 patients that reinforcing sutures do not provide any contribution in terms of leakage.^[14] In our study, 1 patient (0.02%) had leakage. The leak was noticed on the 1st post-operative day due to draining GIS. The area where the opening in the stapler line was opened was closed with a suture and the patient was discharged without any complications. We concluded that after resection with a new generation stapler in our clinic, supporting the stapler line along the entire length with metal clips is effective in terms of both leakages. The drawbacks of our study include the retrospective design, the limited number of patients.

Conclusion

These data highlight the significance of stapler line reinforcement. Although methods such as suturing and fibrin-glue reinforcement of the stapler line are used to prevent bleeding and leakage from the stapler line, there is no universally accepted method with demonstrated superiority. We concluded that after resection with a new generation stapler in our clinic, supporting the stapler line along the entire length with metal clips is effective in terms of both leakage and bleeding. The study is planned to be conducted as a prospective, randomized, and large case series with a control group in the future.

Disclosures

Ethics Committee Approval: Ethics committee did not evaluate it because it was a retrospective study.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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