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# The effectiveness of routine drain placement in laparoscopic sleeve gastrectomy: Single–center results

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## ABSTRACT

**Introduction:** Routine drainage of the abdominal cavity has been widely accepted in the diagnosis and treatment of complications, but many studies have questioned the usefulness of drainage. In complications after laparoscopic sleeve gastrectomy (LSG), the value of routine drainage is unknown. To determine whether routine drainage is required after LSG, we aimed to compare clinical data and complications between groups.

**Materials and Methods:** This study included a retrospective analysis of LSGs from January 2017 to November 2019. Groups were defined as (Group D) with and without a drain (Group U). Complication diagnosis was confirmed using computed tomography (CT) or endoscopy after suspicion. Clear fluid was administered at the 6th postoperative hour. Data included age, height, body weight, BMI, mean operative time, length of hospital stay, and complications. Data between groups were compared.

**Results:** The mean age of 744 patients (female=570, male=174) was 38 years (18–63), and the mean preoperative BMI was 47.9 kg/m$^2$ (40–76). The hospitalization time was 4.03 days (2–23), and the operations were performed at an average of 83 minutes (30–225). There were Group D=547, Group U=197 patients. The complication rate was 6.7%. Sixteen of the 17 patients who were on the run were in group D and one in Group U. In Group D, 14 of the leaks were treated with stents, and 15 of them were treated with a percutaneous catheter, while in Group U, only one patient was treated using stents. The decrease in hemoglobin value was 3.07 g/dl on average, and bleeding was detected in 33 patients (Group D=22, Group U=11). Percutaneous catheter was applied to five patients in Group D.

**Conclusion:** Routine drainage is not required after LSG. Neglected drainage can contribute to faster recovery, shortened hospital stay, and reduced cost without causing additional surgical complications.

**Keywords:** Drain catheter; leakage; postoperative complications; sleeve gastrectomy.

## Introduction

Morbid obesity has become an important health problem in both Western and Eastern countries.[1] The number of bariatric surgeries is increasing due to the limited long–term effectiveness of non–surgical approaches to weight loss in the treatment of morbid obesity.[2]

The only evidence–based treatment option in the treatment of obesity and related comorbid diseases has been

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accepted as bariatric surgery. In the past, roux–ny gastric bypass and adjustable gastric tape have been the most widely used techniques worldwide, while laparoscopic sleeve gastrectomy (LSG) has become increasingly popular. According to the latest ASBMS (American Society for Metabolic and Bariatric Surgery) data, the most common bariatric procedure was reported to be LSG (54%), followed by gastric bypass (23%), revision surgery (14%), and gastric band (6%).[3]

Bleeding, abscess formation, and staple line leakage are the most common postoperative complications of LSG, although rare. While perioperative minor complications are generally 10.9%, major surgical complications have been reported in 5.3% in large series.[4]

Routine drainage of the abdominal cavity has been widely accepted as a useful aid in the diagnosis and treatment of complications after gastrointestinal surgery over the past century, but many studies have questioned the usefulness of routine drain placement.[5]

However, the true value of a routine intraabdominal drainage, especially in complications after LSG, is unknown. In this study; In order to determine whether routine drainage is required after LSG, we compared clinical data and complications between LSG patient groups with and without drainage.

## Materials and Methods

This is the retrospective operation of all LSGs for a period of approximately 3 years (January 2017–November 2019). Inclusion criteria for bariatric surgery; Being between 18 and 65 years old, initial body mass index (BMI) was 40 kg/m$^2$ or BMI 35 kg/m$^2$ in the presence of obesity related comorbidity and failure of conservative treatment for 2 years.

Routine drain placement was terminated in February 2018, so two groups with and without routine drainage were provided for comparison. Patients with drainage were defined as Group D (drained) and those without drainage as Group U (undrained). Stapler line leak or bleeding suspicion; clinical parameters such as subfebrile fever, tachycardia, hypotension and abdominal pain reflected on the left shoulder were followed up. In all cases, CT or endoscopy was used to confirm the leak.

Study; Especially after LSG, leakage/bleeding findings and patient data related to their management were examined. The results were compared between two groups with and without drains.

### Operation Technique

Each procedure was performed with five trocars accompanied by laparoscopy. A 36F bougie size was used to calibrate the remant stomach volume. Linear gastrectomy started the pilot 2–3 cm proximally and continued to the gastroesophageal junction. According to the decision and experience of the intraoperative surgeon, an endoscopic clip was used to achieve hemostasis of the stapler line. In the drained group, low suction silicon drainage (Jackson–Pratt drainage) was placed adjacent to the stapler line.

### Post–operative Technique

At the end of the 6th postoperative hour, the patients were completely mobilized and allowed to consume liquids orally. The upper gastrointestinal series of a routine gastrograph was not performed. Patients were given a single standard antibiotic prophylaxis and standard deep vein thrombosis prophylaxis for 28 days after surgery.

Stapler line is suspected of leakage or bleeding; Drain follow–up was confirmed by contrast–enhanced CT accompanied by clinical findings and a drop in hemoglobin value of more than 2 g/dl (Fig. 1). Data collected included age, height, body weight, BMI, mean operative time, length of hospital stay, and complications in both groups. Clinical data between the two groups were compared. The study was exempted from the ethics committee because it was a retrospective analysis.

### Statistical Analysis

Descriptive statistics was used to present the demographic characteristics of the study population. Differences between these groups were tested using Pearson chi–square

**Figure 1.** Collection area (arrow).

test or Fisher's exact test for categorical variables, Mann Whitney U test and independent sample t test for continuous variables. All analyses were performed using IBM SPSS Statistics version 24.0 (IBM Corp, Armonk, NY, USA). A p–value <0.05 was considered statistically significant.

## Results

A total of 744 (female=570, male=174) patients with a mean age of 38 years (18–63) received LSG. The mean preoperative BMI was 47.9 kg/m$^2$ (40–76). Average hospital stay is 4.03 days (2–23), and operations were performed in an average of 83 minutes (30–225). The longest operation period was performed during the revision of the patient with laparoscopic adjustable gastric band (LAGB) to sleeve gastrectomy. All surgeries were completed laparoscopically by the same team. Group D=547, Group U=197 patients.

While age, BMI and male/female ratio and duration of surgery were similar between the two groups, the duration of hospitalization was significantly higher in the drained group (p=0.001) (Table 1).

The rate of surgical complications including leakage (n=17) and bleeding (n=33) was 6.7%. In our results, as a surgical complication in patients with clinical suspicion; We accepted bleeding as erythrocyte replacement cases and leakage in CT where we detected contrast extralumination. Sixteen of the 17 patients who were on the run were in group D and one in Group U. In Group D, 14 of the leaks were treated with stents and 15 with percutaneous catheters, while the only patient in Group U was treated with stents.

When the groups were evaluated in terms of bleeding, a total of 33 patients had bleeding (Group D=22, Group U=11). The decrease in hemoglobin value was found to be 3.07 g/dl on average. Percutaneous catheter was applied to 5 patients in Group D due to bleeding accompanied by bleeding in contrast CT (Fig. 2). There was no need for percutaneous catheter in Group U (Table 2).

Three of the patients who required additional intervention with stent or percutaneous catheter due to complications were cases of revision surgery that we performed after LAGB and 2 of them due to weight gain again.

In our series, a patient developed a peroperative complication. This case was 33 years old female patient with BMI=44 kg/m$^2$. It was observed that the nasogastric catheter placed by the anesthesia team for aspiration of stomach content was not pulled and remained within the limits of resection while at the stage of resection with staples. After the remaining probe was removed from the resection margin, resection was performed again with safe margins. The operation was completed laparoscopically

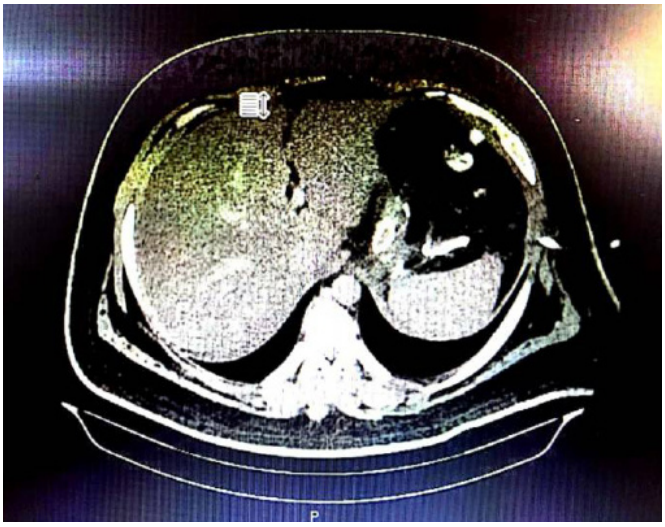

**Figure 2.** Drainage with percutaneous catheter.

**Table 1. Demographic data and follow-up parameters between groups**

| | Group D (n=547) | Group U (n=197) | P |
|---|---|---|---|
| Age (years) | 38.6 (18-63) (±10.93) | 37.7 (18-60) (±11.61) | 0.156 |
| Gender (n/(%)) | | | |
| Male | 127 (23.22) | 47 (23.86) | 0.856 |
| Female | 420 (76.78) | 150 (76.14) | |
| BMI (kg/m$^2$) | 47.7 (±6.32) | 47.8 (±6.02) | 0.689 |
| Operation time (min) | 92.5 | 83.0 | 0.536 |
| Hospitalization (day) | 4.03 (±1.49) | 3.82 (±0.72) | 0.001 |

BMI: Body mass index.

**Table 2. Postoperative major complications and treatment methods**

| | Group D | | Group U | | p |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Surgical complication | 38 | 5.1 | 12 | 1.6 | |
| Leakage | 16 | 2.1 | 1 | 0.1 | 0.054 |
| Bleeding | 22 | 2.9 | 11 | 1.4 | 0.361 |
| Percutaneous catheters | 15 | 2.0 | 0 | | 0.015 |
| Stent | 14 | 1.8 | 1 | 0.1 | 0.134 |
| Mortality | 0 | | 0 | | |

and the patient was discharged 5 days later without additional problems. After this case, all nasogastric probes were placed orogastrically in the stomach in order to increase the awareness of the anesthesia team while advancing the bougie by mouth. Mortality was not observed in our series.

## Discussion

The most common cause of mortality in bariatric surgery is known as leak and embolism.[6] Therefore, early diagnosis and treatment of complications is important in obese patients. For this purpose, intraoperative drain placement has been the subject of interest in other fields of surgery and has been routinely applied. Chowdri et al.[7] reported that subcutaneous drainage may decrease the development of seroma after cholecystectomy in obese patients. On the first postoperative day after lumbar disc surgery, drains have been shown to reduce the incidence of epidural hematoma in a prospective and randomized study.[8] In addition, it was stated that it is beneficial to use drains in both breast and abdomen after breast reconstruction using TRAM flap.[9] Although we focused on the use or neglect of routine abdominal drains after RYGB, when we examined the bariatric surgery group, it was reported that there was no definite conclusion due to the lack of randomized controlled trials.[10]

Intraoperative drain placement is preferred by surgeons for several reasons. These; it can be summarized as suspecting the presence of leakage in the early period, turning the possible leak into a controlled fistula through the drain and eliminating the need for reoperation, discharging excess washing fluid that may be prone to abscess formation and helping diagnose intraabdominal bleeding.

Due to the large intra–abdominal volume of obese patients and thick subcutaneous fat tissues, especially the abdominal examination findings are easily masked. However, due to their weight, mostly tomography devices cannot be carried and therefore imaging examinations, which have an important place in diagnosis, cannot be used. In bariatric surgery, it is frequently preferred by surgeons to perform a peroperative test for major complications such as stapler line and anastomosis leakage caused by technical errors. It is defined for this purpose; Air leak test, methylene blue test and peroperative endoscopy are used as well–known methods in line with technical possibilities. However, there is little literature on the use of these tests, and existing ones are quite contradictory. In fact, the 2012 International Sleeve Gastrectomy Expert Panel could not reach consensus (48% consensus) on whether routine intraoperative leak tests should be performed.[11]

When the literature is examined, it can be observed that early discharge is popularized by the rapid implementation of the ERAS protocol. As a requirement of the application, it can be said that the patients were drained and discharged before the clinical symptoms of the leakage after the LSP. Drain follow–up was reported to be effective since the clinical signs of bleeding (tachycardia, hypotension) occur early in the postoperative period.[5] However, bleeding is rarely intraluminal in patients with bariatric surgery without evidence of active bleeding in the drain, and some series have reported reoperation rates as 1.4% due to intraabdominal bleeding.[12]

Nonoperative treatment approaches are important in leak treatment especially as the most feared complication after LSG and its effectiveness has been emphasized in several studies. Christophorou et al.[13] reported that endoscopic therapy facilitated fistula healing after LSG in 74% of patients. Percutaneous drainage, antibiotics, and parenteral nutrition combined with stents are effective for leak after LSG and are recommended as first–line therapy in stable

patients.[14] Treatment of intraperitoneal abscess that develops after leakage or bleeding is generally drainage by CT–guided laparoscopic or mini–laparotomy.[15] In accordance with the data of our study, all the cases we followed up due to leakage (2.2%) and bleeding (4.4%) were treated nonoperatively and mortality was not observed in our series. However, percutaneous drainage catheter had to be installed in 93.7% of cases with leakage where we placed intraoperative drains with simultaneous interventional radiology. Considering the distribution between groups, percutaneous drainage catheter requirement was found to be statistically higher in the drained group (Group D) (p=0.015).

When our results were evaluated in terms of bleeding, the percutaneous catheter requirement of complicated cases was 22.7% and 0% in group D and Group U, respectively. It was determined that placing an intraoperative drain did not reduce the need for percutaneous drainage catheter, but no percutaneous catheter was required for any patient in the non–drain group. We have seen that drain application is unnecessary in postoperative bleeding management, and in cases where drainage is required due to abscess, treatment can be performed with percutaneous catheter, accompanied by interventional radiology.

As shown in a randomized controlled trial where the routine abdominal drain placement increases postoperative pain following laparoscopic RYGB,[16] drains can cause more harm than discomfort and pain to patients. Surgeons have been arguing for a long time about whether drains are actually causing leakage. For example, drains have been shown to be useless and can increase anastomosis leakage rates after colonic surgery,[17] and in a randomized study performed after total gastrectomy, surgically placed drain increased the morbidity and postoperative hospital stay compared to the non–drain group.[18] However, it is known that the placement of the drain increases the length of hospital stay and increases its cost.[19]

The drain itself can cause some complications. For example; Serious postoperative complications requiring surgery due to bowel obstruction and evisceration of the drain tract after removal of the drain were reported.[20, 21]

Our clinic, which serves as a bariatric surgical reference center in our country's borders, tends to use minimally invasive techniques. Accordingly, all bariatric surgery cases were performed laparoscopically. In the morbid obese patient group, who benefited from technical and technological possibilities limited due to high weights, complication management was performed nonoperatively by interventional radiology and endoscopic methods with the philosophy of minimally invasive approach. In this study where our backward data is compiled; In accordance with the clinical approach, routine drain placement was not effective in the diagnosis and treatment of major complications such as leakage and bleeding in the management of bariatric surgery patients.

The most obvious limitation of our study is the retrospective analysis of the data. We are of the opinion that revision surgery cases in the group with drains may increase the bias. While it was handicap that cases without drains were coincided with high experience period, the presence of the drain in the same period fixed the safety of analysis in its patients.

## Conclusion

We believe that routine abdominal drainage can be neglected in patients with morbid obese after LSG. Drainage negligence can contribute to faster recovery, shortened hospital stay, and reduced cost without causing additional surgical complications.

### Disclosures

**Ethichs Committee Approval:** The study was approved by Clinical Research Ethics Committee of Bakirkoy Dr. Sadi Konuk Training and Research Hospital (2018–34).

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**Conflict of Interest:** None declared.

**Authorship Contributions:** Concept – H.S.; Design – H.S.; Supervision – H.S., F.G.; Materials – H.S., S.F.; Data collection and/or processing – H.S., S.F.; Analysis and/or interpretation – H.S., S.F., F.G.; Literature search – H.S., F.G., M.K.; Writing – H.S., K.D.P.; Critical review – H.A.

## References

1. Lee WJ, Wang W. Bariatric surgery: Asia-pacific perspective. Obes Surg 2005;15:751–7. [CrossRef]
2. Fisher BL, Schauer P. Medical and surgical options in the treatment of severe obesity. Am J Surg 2002;184:9–16.
3. Estimate of Bariatric Surgery Numbers, 2011-2018. Available at: http://asmbs.org/resources/estimate-of-bariatric-surgery-numbers. Accessed Jun 10, 2020.
4. Chazelet C, Verhaeghe P, Perterli R, Fennich S, Houdart R, Topart R, et al. Longitudinal sleeve gastrectomy as a stand-alone bariatric procedure: results of a multicenter retrospec-

tive study. J Chir 2009;146:368–72. [CrossRef]

5. Petrowsky H, Demartines N, Rousson V, Clavien PA. Evidence-based value of prophylactic drainage in gastrointestinal surgery: a systematic review and meta-analyses. Ann Surg 2004;240:1074–84. [CrossRef]
6. Inaba CS, Koh CY, Bhaskar SS, Silva JP, Chen Y, Nguyen DV, et al. One-Year Mortality after Contemporary Laparoscopic Bariatric Surgery: An Analysis of the Bariatric Outcomes Longitudinal Database. J Am Coll Surg 2018;226:1166–74.
7. Chowdri NA, Qadri SA, Parray FQ, Gagloo MA. Role of subcutaneous drains in obese patients undergoing elective cholecystectomy: a cohort study. Int J Surg 2007;5:404–7.
8. Mirzai H, Eminoglu M, Orguc S. Are drains useful for lumbar disc surgery? A prospective, randomized clinical study. J Spinal Disord Tech 2006;19:171–7. [CrossRef]
9. Scevola S, Youssef A, Kroll SS, Langstein H. Drains and seromas in TRAM flap breast reconstruction. Ann Plast Surg 2002;48:511–4. [CrossRef]
10. Liscia G, Scaringi S, Facchiano E, Quartararo GM, Lucchese M. The role of drainage after Roux-en-Y gastric bypass for morbid obesity: a systematic review. Surg Obes Relat Dis 2014;10:171–6. [CrossRef]
11. Rosenthal RJ. International Sleeve Gastrectomy Expert Panel Consensus Statement: best practice guidelines based on experience of 12,000 cases. Surg Obes Relat Dis 2012;8:8–19.
12. Sağlam K, Kayaalp C, Gündoğan E, Sansal M, Aktaş A, Gökler C, et al. Staple line bleeding control with monopolar cautery in laparoscopic sleeve gastrectomy. Laparosc Endosc Surg Sci 2019;26:181–4. [CrossRef]
13. Christophorou D, Valats JC, Funakoshi N, Duflos C, Picot MC, Vedrenne B, et al. Endoscopic treatment of fistula after sleeve gastrectomy: results of a multicenter retrospective study. Endoscopy 2015;47:988–96. [CrossRef]
14. Vix M, Diana M, Marx L, Callari C, Wu HS, Perretta S, et al. Management of Staple Line Leaks After Sleeve Gastrectomy in a Consecutive Series of 378 Patients. Surgical Laparoscopy, Endoscopy & Percutaneous Techniques 2015;25:89–93.
15. Beaupel N, Bruzzi M, Voron T, Nasser HA, Douard R, Chevallier JM. Management of acute intra-abdominal sepsis caused by leakage after one anastomosis gastric bypass. Surgery for Obesity and Related Diseases 2017;13:1297–305. [CrossRef]
16. Gundogan E, Kayaalp C, Aktas A, Saglam K, Sansal M, Gokler C, et al. Influence of Drain Placement on Postoperative Pain Following Laparoscopic Roux-en-Y Gastric Bypass for Morbid Obesity: Randomized Controlled Trial. Obesity Surgery 2018;28:3499–3504. [CrossRef]
17. Wang JY, Hsieh JS, Chen FM, Lee LW, Hou MF, Huang YS, et al. Rectal perforation secondary to surgical drains after low anterior resection: a report of two cases and review of the literature. Kaohsiung J Med Sci 2002;8:146–8.
18. Uslar RA, Molina H, Torres O, Cancino A. Total gastrectomy with or without abdominal drains. A prospective randomized trial. Rev Esp Enferm Dig 2005;97:562–9. [CrossRef]
19. Chang CC, Lee WJ, Ser KH, Lee YC, Chen SC, Tsou JJ, et al. Routine drainage is not necessary after laparoscopic gastric bypass. Asian J Endosc Surg 2011;4:63–7. [CrossRef]
20. Rogers AM, Cherenfant J, Kipnis S, Haluck RS. Drain-associated intesti-nal obstruction after laparoscopic gastric bypass. Obes Surg 2007;17:980–2. [CrossRef]
21. Sozutek A, Dag A, Colak T, Baikoğlu S. A serious complication which may occur after intraperitoneal drainage: intestinal eviscerations. Turk J Surg 2012;28:95–8. [CrossRef]