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Original Article

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Abdominal Drains After Laparoscopic Sleeve Gastrectomy: Should They Be Used?

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ABSTRACT

Purpose: Laparoscopic sleeve gastrectomy (LSG) is one of the most common surgical procedures worldwide for the treatment of morbid obesity. Blake-type drains are widely used in this procedure despite the lack of clear evidence regarding their benefits in the diagnosis and treatment of common postoperative complications such as gastric suture line leak (GSLL) and postoperative bleeding (PB).
Materials and Methods: A retrospective descriptive study with prospective case registry was conducted, analyzing all patients who underwent LSG between January 2012 and December 2022 at a high-volume center. Our primary outcome was to evaluate the role of drains for diagnosis and treatment of GSLL and PB in LSG. Our secondary outcome was to determine drain related surgical site infection (DRSSI) rate.
Results: A total of 335 LSG were performed in the studied period. In all patients one abdominal drain was placed during surgery. Six GSLL (1.79%) and 5 PB (1.49%) were recorded. Drain placement did not prove to ensure early diagnosis or conservative management of GSLL or PB after LSG. Furthermore, an incidence of DRSSI of 4.1% (14 patients) was found.
Conclusion: In our study, no clear diagnostic or therapeutic benefits of the systematic use of drains for GSLL or PB in LSG was found; but drain use did show a considerable rate of DRSSI, which must be taken into consideration prior to considering drain systematic use. While no randomized prospective trials have been performed, the retrospective data does not support drain systematic use.

Keywords: Bariatric surgery; Drainage; Complications, postoperative; Anastomotic leak; Bleeding

INTRODUCTION

As rates of morbid obesity continue to rise [1], surgical treatment has become the most effective approach for this disease [2]. Laparoscopic Roux-en-Y gastric bypass (LRYGB) and laparoscopic sleeve gastrectomy (LSG) are 2 of the most performed bariatric procedures worldwide [3]. LSG continues to be the most commonly performed procedure for the surgical treatment of morbid obesity globally [4], probably due to its less demanding surgical

Conflict of Interest

None of the authors have any conflict of interest.

Author Contributions

Conceptualization: Aragone L; Data curation: Aragone L, Thibaud F; Formal analysis: Pirchi D; Investigation: Aragone L; Methodology: Toffolo M; Project administration: Aragone L; Supervision: Mihura M; Validation: Mihura M, Pirchi D; Visualization: Thibaud F; Writing - original draft: Aragone L; Writing - review & editing: Aragone L.

technique compared to the LRYGB. The fact of being less technically demanding may also contribute to the reduced LSG's risk of gastric suture line leak (GSLL) when compared to LRYGB [5]. Studies analyzing each procedure have reported a GSLL incidence as low as 1.2% after LRYGB and 0.5% after LSG [5].

Blake-type drains are widely used in both procedures in an effort to mitigate morbidity [6], despite the lack of clear evidence regarding their benefits. The role of drains remains controversial, both in terms of diagnostic and therapeutic benefits for GSLL and postoperative bleeding (PB) [7], raising the possibility of disregarding their systematic use. Due to the lack of prospective randomized studies, the diagnostic and therapeutic utility of drainage in LSG still remains controversial. The utility of abdominal drains after bariatric surgery has not been clearly determined yet, but the morbidities related to drains, like drain related surgical site infection (DRSSI), are widely known, although their rates have not been precisely measured.

LSG accounts for a minority of the bariatric procedures performed in our department, where the LRYGB indication is selective. Exhaustive preoperative screening for diabetes, glucose intolerance or gastroesophageal reflux disease was done, which for our department are selective indications for LRYGB. In this way, the LSG indication was limited to a reduced and homogeneous group of patients, which can be analyzed allowing us to obtain results that can be extrapolated to all LSG, excluding LRYGB since their results may be different.

The aim of our study is to analyze the diagnostic and therapeutic role of drains in patients who experienced GSLL or PB after LSG. Secondary, our aim is to determine the DRSSI rate.

MATERIALS AND METHODS

A retrospective descriptive study with prospective case registry was conducted, analyzing all patients who underwent LSG between January 2012 and December 2022 at a high-volume center. All patients who underwent other bariatric procedure prior to LSG, such as gastric banding, were excluded. All surgeries were performed by the same team of attending surgeons. In our department, Blake-type drains were systematically used in LSG.

Demographic data, including age, sex and body mass index (BMI); data regarding the surgical procedure such as operative time; as well as postoperative data including length of stay, morbidity (including GSLL and PB) and mortality was evaluated. DRSSI rate was also recorded.

GSLL was defined as one of the following: presence of gastric or purulent fluid in the abdominal drain, a positive methylene blue test (the presence of methylene blue in the drain after drinking a solution of methylene blue and water) or leak of oral contrast medium on upper gastro intestinal x-ray series (UGIS) or computerized-tomography scan (CT-scan).

PB was determined as the presence arterial hypotension, orthostatism, tachycardia or other systemic repercussion of bleeding associated to drop of blood hemoglobin level over 2 g/dL or the presence of blood in the drain with an output greater than 150 mL/day.

DRSSI were also registered. These were defined by the presence of fever or leukocytosis associated with redness, swelling or purulent secretion in the wound of the surgical drain.

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These were grouped in superficial (those involving only the skin or subcutaneous tissue), deep incisional (those involving deep soft tissues of an incision) and organ space (those involving organs or body spaces) DRSSI [8].

It was recorded and analyzed, regardless of the result, whether the presence of drains altered the evolution of the diagnosis or treatment of LSG's complications, such as GSLL and PB. The diagnostic utility of the drain was determined based only on changes in the drain content. In this way, drain diagnostic effectiveness was defined as an alteration of the content (infectious or hematic) collected, confirmed at examination. Drain therapeutic effectiveness was determined in those patients in which non-surgical management was allowed due to the output of fluids through the drain.

1. Objective

Our primary outcome was to analyze the diagnostic and therapeutic role of drains in patients who experienced GSLL or PB after LSG. Our secondary outcome was to determine the DRSSI rate.

2. Statistical analysis

A descriptive study to evaluate the utility of drains for the diagnosis and treatment of GSLL and PB in LSG was conducted. The descriptive variables are set as mean and standard deviation and the qualitative variables as percentages.

3. Ethics statement

Appropriate institutional ethical approval has been obtained. Our study was performed in accordance with the ethical principles of medical research involving human subjects, as outlined in the Declaration of Helsinki.

4. Statement of informed consent

The Institutional Review Board (IRB) approved this study (IRB approval number: 12223) and the written informed consent was waived by the IRB owing to the study's retrospective nature.

5. Operative technique and postoperative care

In our department, a 4-trocar technique is used, with an additional wound for the Nathanson liver retractor. The first port is introduced in the left upper quadrant with an optic-view technique. Mechanical suture is used for the confection of the sleeve which is calibrated with a 38-Fr boogie, as described by Albanopoulos et al. [7]. In all patients, a Blake type drain is placed routinely along the staple line.

Intraoperative methylene blue test is performed in every case and all patients undergo UGIS with water-soluble oral contrast medium on the first postoperative day (POD). If the UGIS is negative for a leak, a new methylene blue test is performed and then the patient begins a full liquid diet. Drain output is measured hourly and routine laboratory tests are performed daily during hospital stay. Patients are discharged home on POD 1 on a full liquid diet if able to control pain and urinate, with the abdominal drain placed which is removed as outpatients on POD 7.

Patients are monitored postoperatively during hospital stay and as outpatients at POD 7; 1, 3, 6, 12 months and annually.

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Table 1. Preoperative and postoperative data

Variables	Values
Sex	
Female	185 (55.2)
Male	150 (44.8)
Age (years)	46.6±12.1
BMI (kg/m^2)	42.7±5.8
Weight (kg)	114.4±19.6
ASA score	
II	203 (60.6)
III	132 (39.4)
Comorbidities	
Hypertension	94 (28.1)
Dyslipidemia	52 (15.5)
Diabetes type II	77 (22.9)
History of previous abdominal surgery	124 (37.1)
Length of stay (days)	1.2±0.8

Values are expressed as mean ± standard deviation or number (%).
BMI = body mass index, ASA = American Society of Anesthesiologists.

RESULTS

A total of 335 patients who underwent LSG were included, out of which 55.2% (185) were women with a mean age of 46.6 years (±12.1) and a mean preoperative BMI of 42.7 kg/m^2 (±5.8). Mean hospital stay was 1.2 days (±0.8) (**Table 1**). There were no conversions to open surgery.

Total complication rate was 8.6% (29/335) out of which 5.9% (20 patients) were minor Clavien-Dindo surgical complications (I/II) [9]. There was an incidence of 4.1% (14 patients) of DRSSI. Six patients presented GSLL (1.7%) and 5 had PB (1.4%). Other minor morbidities were presented: delayed tolerance to oral intake in 2 patients (0.5%) and acute urinary retention in one patient (0.2%) that required only medical treatment. One patient (0.2%) underwent intestinal perforation, followed by peritonitis that required multiples reinterventions (**Table 2**).

Regarding GSLL, none of these were diagnosed based on changes in the drain output. None of them showed a leak in the initial UGIS nor in the methylene blue test on POD 1. All cases were diagnosed with CT-scan after clinical suspicion. The mean time to diagnosis was 5 days (3–7). As for treatment, one patient required only conservative maneuvers with antibiotics, intravenous fluids and *nil-per-os* for 7 days without variations on drain output; another required endoscopic treatment with a fully covered stent placement; one required percutaneous drain, one required both endoscopic and percutaneous treatment and 2 patients required re-laparoscopy with gastric suturing (**Table 3**).

Table 2. Postoperative complications after laparoscopic sleeve gastrectomy

Variables	Values
Total number of procedures	335
Overall complication rate	29 (8.6)
Gastric suture line leak	6 (1.7)
Postoperative bleeding	5 (1.4)
Drain related surgical site infection	14 (4.1)
Others	4 (1.1)

Values are presented as number (%).

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Table 3. Clinical course summary

Patients	Age	Sex	ASA score	Preoperative BMI	Complication	Time to diagnosis	Clinical presentation	Drain's output	Diagnostic tool	Treatment
Patient 1	56	Female	II	41	Gastric suture line leak	POD 3	Fever	Unremarkable	Leak on CT-scan	NPO and antibiotics
Patient 2	39	Female	II	48	Gastric suture line leak	POD 6	Fever	Unremarkable	Leak on CT-scan	Endoscopic stent
Patient 3	65	Female	III	52	Gastric suture line leak	POD 5	Abdominal pain	Unremarkable	Leak on CT-scan	Percutaneous drainage
Patient 4	58	Female	II	45	Gastric suture line leak	POD 7	Fever	Unremarkable	Leak on CT-scan	Endoscopic stent and percutaneous drainage
Patient 5	41	Female	II	43	Gastric suture line leak	POD 4	Abdominal pain and fever	Unremarkable	Leak on CT-scan	Reoperation
Patient 6	37	Female	II	45	Gastric suture line leak	POD 5	Abdominal pain	Unremarkable	Leak on CT-scan	Reoperation
Patient 7	41	Male	III	39	Postoperative bleeding	POD 3	Tachycardia	Unremarkable	Leak on CT-scan	Intravenous fluids and RBC
Patient 8	45	Female	III	46	Postoperative bleeding	POD 3	Orthostatism	Hematic	Drop in hemoglobin	Intravenous fluids and RBC
Patient 9	57	Female	II	42	Postoperative bleeding	POD 1	Hypotension	Hematic	Drop in hemoglobin	RBC and reoperation
Patient 10	46	Male	III	47	Postoperative bleeding	POD 1	Hypotension	Hematic	Drop in hemoglobin	Reoperation
Patient 11	45	Female	III	45	Postoperative bleeding	POD 1	Hypotension	Hematic	Drop in hemoglobin	Reoperation

ASA = American Society of Anesthesiologists, BMI = body mass index, POD = post operative day, CT = computerized tomography, NPO = *nil-per-os*, RBC = red blood cells.

Regarding PB, the use of drains was diagnostic in 4 out of the 5 cases, in which hematic output was higher than 150 mL/day. Nevertheless, in all patients, PB was initially suspected by symptoms and confirmed by a drop in hemoglobin levels of 2 g/dL or more. In this way, in all patients PB was diagnosed by clinical suspicion, independently and prior to changes in the drain output. The time to diagnosis was 1.6 days (1–3). All patients were resuscitated with intravenous fluids and 3 patients required transfusion of 1 unit of red blood cells. Three patients required re-laparoscopy with surgical drainage of intra-abdominal hematoma, without active bleeding being found in any of them (**Table 3**).

Regarding DRSSI, 9 patients were diagnosed with superficial DRSSI, 4 patients were diagnosed with deep incisional DRSSI and 1 patient was diagnosed with organ space DRSSI. All patients were treated as outpatients with oral antibiotics and drain removal.

DISCUSSION

This retrospective study of 335 patients undergoing a LSG demonstrates that the routine use of abdominal drains has no clear diagnostic or therapeutic benefits regarding GSLL or PB. In our experience, no clear diagnostic or therapeutic role was found for the systematic use of drains in the management of GSLL. In the case of PB, although drains could identify bleeding, their diagnostic utility for early identification was easily replaced by patients close monitoring and routine blood test.

GSLL is one of the leading causes of readmission and reoperation after bariatric surgery [10]. Routine abdominal drains have been commonly used in an effort to reduce the morbidity associated with GSLL by allowing earlier detection and treatment [11]. Studies evaluating the efficacy of drain usage have shown controversial evidence for their routine

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use in bariatric procedures [12]. Albanopoulos et al. [7] reported similar incidence of GSLL, PB, reoperations and mortality rates between patients with or without drain including 201 patients with systematic drain usage. In a retrospective study of the 2015 MBSAQIP database, Doumouras et al. [6] found that in patients with abdominal drain after bariatric surgery the rate of reoperation and odds of leak increased. However, the bias of this study is that, being non-randomized, the patients who had drains placed intraoperatively were probably those with greater comorbidities and a higher likelihood of having postoperative complications. GSLL can be highly challenging for bariatric surgeons to detect, but in our experience, drain placement has not proven to facilitate diagnosis or reduce the reinterventions. In some cases, conservative management of GSLL can happen, but there is no clear evidence in our cases that it was due to the drain. In the only patient in our series where only conservative management was needed, there were no changes in the drain output during the patient's treatment, showing that it did not change the patient's outcome. Though the question of whether drain placement may avoid reinterventions in patients with GSLL has been raised, in our series this could not be proved.

PB is a relatively common complication after LSG [13]. Although drains can sometimes be helpful in PB diagnosis, we believe that thorough monitoring of patients and confirmation of PB suspicion with hemoglobin measurements, can easily replace the use of drainages for PB detection. This strategy provides a safe management in all patients, even in those whose drains did not have hematic output. When bleeding was identified, conservative management such as discontinuing anticoagulation and appropriate fluid or blood resuscitation was sufficient in most of cases.

On the other hand, DRSSI is one of the most common complications associated to prolonged and outpatient management of drains. Although patients are strictly advised on drain management prior to hospital discharge, how drains are handled can vary between individuals and this could increase the risk of infections. Several studies have shown how drain usage was associated to increased risk of superficial, deep incisional and organ space DRSSI [11]. In our work, the 4.1% incidence of DRSSI indicates that this morbidity must be specifically evaluated.

Furthermore, regarding trends in drainage use, it was observed that its use is declining in LSG and a selective use approach is preferred [14].

Our study´s strength lies on the fact of it being a single high-volume center with a depurated surgical technique performed by the same group of bariatric surgeons. Every patient was tested systematically for GSLL and closely monitored for PB. However, it is a descriptive retrospective study with prospective case registry that could carry data recollection bias.

CONCLUSION

The diagnostic and therapeutic role of drains in LSG still remains controversial. Our study concluded that there was no clear diagnostic and therapeutic benefit of the systematic use of drains for GLSS and PB. On the other hand, drain use did show a considerable rate of DRSSI, which must be taken into consideration prior to choosing systematic drain placement in LSG. Prospective randomized studies are needed to confirm this trend.

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