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Management of staple line leaks after laparoscopic sleeve gastrectomy: Single-center experience

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ABSTRACT

Objective: In obesity surgery, laparoscopic sleeve gastrectomy (LSG) is a frequently applied method. However, there are certain complications. Leakage is one of the most serious complications after surgery, causing postoperative morbidity and sometimes mortality. There is no consensus about management of leaks after LSG. In our study, we aimed to present our experience on the management of LSG leaks.

Patients and Methods: Patients who underwent LSG between 2010-2017 in a tertiary university hospital were analyzed retrospectively. Demographic characteristics, endoscopic and surgical interventions, morbidity, and mortality rates of patients diagnosed with LSG leak were analyzed from prospectively recorded data.

Results: Leak was observed in 11 (2.15%) of a total of 510 LSG patients. Six (54%) patients were diagnosed as acute and 5 were early leaks. Stent was applied to most of the patients (72%) with or without surgical exploration. The average length of stay in hospital was 21 days. Mortality was observed in 2 patients.

Conclusions: Consequently, leakage after LSG is a complication that requires multimodal therapy. Surgical treatment combined with endoscopic intervention may increase success.

Keywords: Obesity, Morbid / surgery, Sleeve gastrectomy, Leakage management

1. INTRODUCTION

Obesity is a global epidemic with substantial health and economic burden. Based on the World Health Organization data, 650 million adults (13% of all adults) and more than 340 million children and adolescents are overweight or obese [1]. Laparoscopic sleeve gastrectomy (LSG) is one of most common surgical procedures performed frequently in recent years [2]. Regardless of its success for weight loss and improvements of comorbidities, LSG is associated with low but significant complication rates between 2 – 15% such as staple line leaks, bleeding, and stricture [3]. Leak, which is the most concerning complication after surgery, may result in morbidity, prolonged hospital stays, and even mortality. Leak rates can occur between 1-7% in different series, and the mortality rates can be up to 9% [3, 4].

Management modalities of staple line leaks after LSG consists of surgical methods such as early revision with reinforcement sutures, drainage (open or laparoscopic), conversion to gastric by-pass and endoscopic methods such as insertion of clips, stenting and fibrin glue application [5]. In the last decade, endoscopic interventions using the self-expanding metal stents (SEMS) had a significantly increasing role in the control of postoperative leakage [6, 7]. Although, the patient-based approach is appropriate, different centers have their own algorithms in the management of LSG leaks [8-10]. In this regard, there is no consensus on a comprehensive and validated management algorithm for suture line leaks after LSG. Herein, we aim to present our approach to patient management who have developed leakage after LSG.

2. PATIENTS and METHODS

Study design

A retrospective analysis of morbidly obese patients treated in a university hospital was performed. Patients who had the radiological and clinical diagnosis of leakage after LSG between 2010-2017 were included in the study. Demographic characteristics of patients, time of diagnosis for suture line leaks, radiological methods, endoscopic treatment and duration, operative approach, morbidity and mortality rates were analyzed from prospectively collected database. Exclusion

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criteria included staple line leaks after bariatric surgeries other than LSG, loss of follow-up data and stenosis concomitant with staple line leak. Primary outcome was the clinical response to management of staple line leaks, secondary outcome included timing and clinical presentation of post-operative staple line leaks, length of hospital stays and adverse events after endoscopic or radiological intervention and overall surgical complications.

LSG technique and postoperative assessment

All patients were operated by two bariatric surgeons. Reinforcement of the staple line with suture was performed according to the surgeon's preference, 38 Fr bougie was used in all patients. All patients were tested for leak with upper gastrointestinal contrast diagnostic X-ray with diatrizoate meglumine and diatrizoate sodium solution (Gastrografin; Bayer, Leverkusen, Germany) on post-operative day (POD) 1. After a negative leak test, patients were allowed to start oral liquid feeding, and they were routinely discharged from the hospital on POD 3. Within a two-week period, patients followed a semi-solid diet, and a solid diet was allowed 15 days after the surgery.

Definition of post-operative leak and management strategies

Post-operative staple line leaks were classified regarding diagnosis time after the operation. Leaks detected within the postoperative 1st week were evaluated as acute leaks detected within post-operative 1-6 weeks were diagnosed as early and leaks detected later than post-operative 6 weeks were assessed as late leaks [11]. Radiological diagnosis of staple-line leak was defined as contrast extravasation into the abdominal cavity, abscess near the operation area or as free fluid in the abdominal cavity. Clinical diagnosis of staple-line leak was diagnosed as the presence of fever (over 37.5°C), tachycardia (over 100 beats/min), tachypnea (over 20 breathing/min), abdominal pain, distension, vomiting and abnormal drain content. For diagnosis and follow-up, computed tomography with peroral and intravenous contrast was performed on all patients with staple-line leaks. The management approach of staple-line leaks with surgery, endoscopy and/or interventional radiology was determined according to the patients' symptoms and hemodynamic status.

Hemodynamically unstable patients, characterized by unresponsive hypotension and tachycardia, with or without signs of peritonitis, underwent immediate surgical intervention. The majority of patients were managed with endoscopy (stent insertion, clip) and/or ultrasound-guided drain placement. All endoscopic and surgical procedures were performed by the bariatric surgery team. Surgical intervention consisted of intraabdominal irrigation and drain placement on leakage site. Visible and confirmable leakage sites were sutured with 2/0 silk suture.

This study was approved by the Ethics Committee of Marmara University School of Medicine Clinical Research Ethics Committee (Number: 08.10.2021.1087)

Statistical analysis

We performed statistical analysis using the Statistical Package for Social Sciences (Version 24 for Mac, IBM Corporation). Descriptive data for continuous variables were expressed as mean and standard deviation. Frequencies procedure was used on categorical variables.

3. RESULTS

Between 2010 and 2017, 510 LSGs were performed in our clinic. The staple-line leak was detected in 11 (2.15%) patients; 8 of the 11 patients were female, and the mean age of the patients was 36 (22-53) years. The mean pre-operative body mass index (BMI) of patients with staple-line leak was 46 kg/m^2 (range: 40-63). The median time to diagnosis of post-operative staple-line leak was 6.9 days (range: 1-17 days). Six (54%) patients had acute leak (<7 days); five patients had early leakage. None of the patients was diagnosed with late leakage. Ten patients had leak from cardia, 1 patient's leak site was cardia and antrum. The most frequent symptoms were fever and abdominal pain that was found in 7 (63%) patients. The characteristics of the patients and the treatments applied are shown in Table I.

Surgical intervention with/without endoscopic procedure

Five (45%) laparotomy and one (9%) laparoscopic exploration and drainage were performed. Endoscopic stent application was performed in 4 of these 6 patients in the same session. In 6 patients with surgical intervention and drainage, only in 2 patients, the leak site was repaired with reinforcement sutures.

Table I. *Patient characteristics and treatments applied*

Patients	Age	Sex	BMI	Days to diagnose	Stent	Stent revision	Clip	Operation	Length of stay in days	Radiologic Intervention
1	42	Female	44.0	9	-	N/A	-	+	mortality	-
2	40	Female	46.0	11	-	N/A	+	-	23	+
3	41	Male	45.3	2	+	+	-	-	47	+
4	53	Female	46.0	8	+	+	-	+	37	-
5	35	Female	46.4	4	+	-	-	-	20	-
6	36	Female	63.6	17	+	+	-	+	38	-
7	29	Female	52.0	1	+	-	-	+	5	-
8	51	Female	43.0	5	+	-	-	-	14	+
9	46	Female	40.0	3	+	-	-	+	mortality	-
10	26	Male	40	15	+	-	-	-	15	-
11	22	Male	50	1	-	N/A	-	+	14	-

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Endoscopic procedure with/without radiologic drainage

Endoscopic stent was placed in 4 patients, whereas radiologic drainage was performed in 2 patients. In 1 case, intervention was completed with endoscopic clip application and drainage by interventional radiology. Patients' management scheme according to hemodynamic status and leakage time is shown in Figure 1 and Figure 2 respectively.

Evaluation of patients with stent

Eight (72%) patients underwent stenting using straight fully covered self-expandable metallic stents 20cm in length and 20mm in diameter which are not specifically designed for sleeve gastrectomy leaks (Micro-Tech, Nanjing Co., China). We changed these stents with fully covered metallic stents with 23 cm in length-24 Fr in diameter specifically designed for sleeve gastrectomy leaks (HANAROSTENT, M.I. I. Tech, Seoul, Korea) in 3 (24%) patients.

The median duration of stay time for stents was 34 days (range:14-77). All patients were assessed with contrast enhanced computed tomography before and after stent removal to determine whether the leak was under control. The mean length of hospital stay was 21 (5-47) days. Mortality was observed in 2 (0.3%) patients due to sepsis and multiorgan failure.

4. DISCUSSION

Laparoscopic sleeve gastrectomy is a technically feasible surgical treatment method for obesity and obesity-related morbidities with negligible long-term nutritional deficiencies [12]. Despite the appealing options of this surgery, post-operative complications following LSG, particularly staple-line leaks, remains a significant concern. The postoperative staple-line leaks are managed with multidisciplinary approach, however, there is still no consensus on comprehensive management algorithm [13, 14]. The majority of leaks are acute or early, rather than late. We preferred to use multiple treatment modalities in combination. The operative approach with or without stenting was the most selected method. Evaluation of leak control is performed using contrast-enhanced computed tomography before and after stent removal. Despite treatment efforts, the average hospital stay remains considerable at 21 days, and there is a low but notable mortality rate of 0.3%, primarily attributed to sepsis and multiorgan failure.

Csendes et al., evaluated 343 patients and reported a 4.7% leak rate, and they declared that most of the LSGs were performed by residents. Many of the acute leaks were managed by surgical intervention in contrast to early and late leakage. They refused to suture defects exceeding three days postoperatively due to edema and inflammation. They preferred drainage and nasojejunal feeding as adequate leakage control [3]. In our series, we could apply primary sutures only in 2 of 6 patients who underwent surgery. These patients were diagnosed as acute leakage. Due to the edema and inflammation of the leak site, suturing was hardly completed.

Studies showed that early surgical drainage was recommended in acute leaks, however, conservative treatment including adequate hydration, proton pump inhibitors, zero per os, nutritional support, percutaneous drainage of any collection, and broad-spectrum antibiotheraphy were suggested for the late leaks [5, 15]. In this study, 3 patients with early leak had hemodynamic instability and necessitated emergency exploration. Also, 3 patients with acute leak were treated with laparotomy and drainage with/without stent placement.

Abou et al., suggested endoscopic intervention for hemodynamically stable patients that do not recover using conservative treatment in 2 weeks [5]. In our series, endoscopic therapies without surgical drainage were performed in 5 patients. 3 of them were patients with an acute leak. In another study, all patients with leaks were treated only by endoscopic methods (washing, stenting, clip, and glue). The majority of the patients were referred to this clinic and half of them were classified as late leakage. They concluded that patients with the early leakage needed fewer endoscopic intervention than late leakage [16].

On the other hand, the usage of short-length stents was shown to be ineffective on management. Longer stents are recommended to cover all stomach and leak area [14,17]. In our cohort, 3 stents were replaced with specific longer stents due to refractory leakage and dislocation.

In a study including 19 patients (all patients underwent laparoscopic drainage), authors suggested using pigtail drain for fistulas smaller than 1cm and using the stent in case of fistula wider than 1cm [15]. However, we have no experience on the application of pigtail stent.

Southwell et al., treated 21 patients with LSG leak and only 1 patient required gastric-bypass surgery. 95% of patients were treated with endoscopic treatments. Stent migration rate was 48%. They recommended use of proximal uncovered, anti-migratory and wider stents [17]. Stent migration rate was even higher in our cohort (87%). A retrospective study showed that 37 patients with a stent replacement had 94.5% success healing rate. In this study author used endoscopic suturing for nearly half of the patients to prevent stent migration and the migration rate decreased from 41% to 15%. They concluded that specialized stents are needed for leak management after bariatric surgery [19]. In our study, we applied specified stents to three patients. However, they are not cost-effective.

Alazmi et al., retrospectively analyzed the effectiveness of stent application. Two staged method was used as metallic stent and plastic stent. All patients had surgical or radiological drainage. Among 17 patients, 10 patients with acute leaks were healed successfully. However, early and late leaks had lower healing rates [20]. El Hassan et al., concluded that treatment of patients with the operative approach without endoscopic stents was feasible after unsuccessful treatment and especially in chronic failure [21].

In our series, 2 patients were treated with stent application only, while 4 patients were treated with stents and surgical drainage.

Since, the number of patients is low, it is not appropriate to compare acute or early leaks.

Smaller sample size and retrospective nature are the limitations of this study. It is difficult to conduct randomized controlled studies to be carried out on this issue. There is no gold standard approach or guideline for LSG.

Conclusion

Leakage after LSG may result in morbidity and mortality. Leakage control through drainage with interventional radiology or minimally invasive procedures such as laparoscopic drainage with or without endoscopic stenting may reduce mortality and morbidity. Although, hemodynamic status is crucial, in case of acute leakage, rapid recovery is observed after immediate surgical intervention.

Compliance with Ethical Standards

Ethical approval: Ethical approval was obtained from Marmara University , School of Medicine Clinical Research Ethics Committee (approval no:: 08.10.2021.1087).

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