

Different Parameter of the Detection and Management of Sleeve Gastrectomy Leakage; Our Expert Bariatric Clinic Results

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Abstract

Aim: Laparoscopic sleeve gastrectomy is being performed with increasing frequency for treatment of obesity. In this study, the aim is to explain the management of sleeve gastrectomy leakage.

Methods: A total of 1505 patients on whom we have performed sleeve gastrectomy as a standard treatment for morbid obesity in the last 10 years were included in this study. Thirty-one of these patients with staple line leakage were included. Age, gender, body mass index and comorbidity rates as well as procalcitonin and C-reactive protein levels of the patients were recorded as data.

Results: Of the total 31 patients, 12 (0.80%) were from our center, and 19 were referred from an external center. The mean age of the patients was 34.46 years (17-62 years). The average leak detection time was 21.13 days. All of the 31 patients were stented after the postoperative period. The mean procalcitonin level of the patients with no leakage was 0.4 ng/mL, whereas the level of the patients with leakage was 4.59 ng/mL. Mean C-reactive protein levels of the patients without leakage was 15.84 mg/L, while the level of the patients with leakage was 251.034 mg/L. The mean body mass index was 42.52. The mean hospital stay was 26.34 days (6-61 days).

Conclusions: Our study demonstrates that proper treatment and early detection of leakage are important. Early detection of C-reactive protein and procalcitonin after sleeve gastrectomy is a warning sign to help detect a leakage, which is important for patient's treatment.

Keywords: Sleeve gastrectomy; Leakage; Procalcitonin; C-reactive protein

1. Introduction

Bariatric surgery is a surgical procedure that is rapidly increasing worldwide. According to data from the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO), over 600,000 sleeve gastrectomy operations were performed between 2011 and 2014.^{1,2} The most commonly observed complication after this surgery, is staple line leakage in the postoperative period.^{3,4} The importance of early diagnosis and proper treatment to prevent the possible morbidity and mortality of the patients is crucial for this complication. When the pathology of leakage was observed after sleeve gastrectomy, mechanical or ischemic factors play an important role.⁵⁻⁷ The symptoms of leakage in the postoperative period are not necessarily obvious. For this reason, recognizing leakage helps to organize treatment options in the early period, plan the treatment algorithm and prevent patient morbidity and mortality.⁸

The aim of this study is to observe the risk factors for staple leakage and to determine strategies for early recognition and leakage prevention at our bariatric surgery clinic.

2. Materials and Methods

This study was conducted retrospectively with approval from Istanbul Medipol University, Non-Interventional Clinical Research Ethics Committee dated 03.09.2025 and numbered E-10840098-2023.02-5909. Sleeve gastrectomy has been applied in our clinic since 2007. Since then, we have seen a gradual increase in the number of patients receiving this procedure. Patients who underwent sleeve gastrectomy between January 2007 and January 2017 were included in this study. A total of 1505 patients underwent sleeve gastrectomy, and Table 1 demonstrates demographic data for all patients. Leakage was observed in 31 out of these 1505 patients. The data regarding these leakages were evaluated retrospectively. Age, gender, body mass index (BMI), C-reactive protein (CRP) level, procalcitonin level, duration of hospital stays, duration of operation, time of readmission to hospital after leakage, treatment methods applied after leakage, mortality, and morbidity of patients were recorded as data. These data are evaluated statistically.

2.1. Surgical Procedure

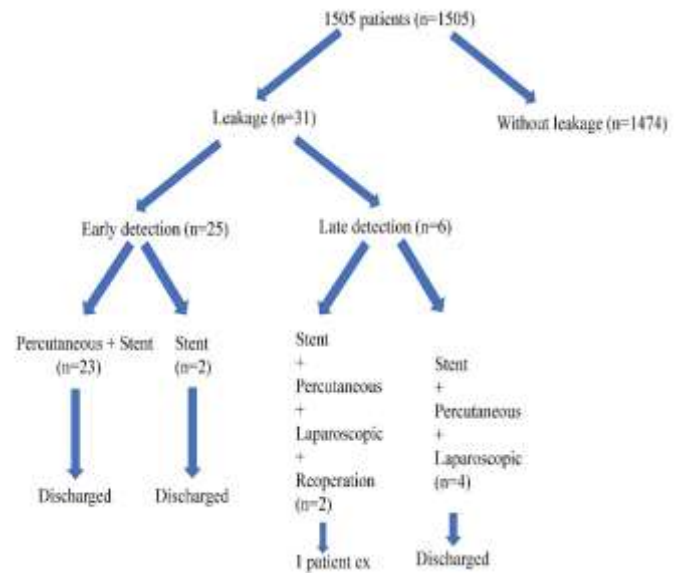
There were four main steps in laparoscopic sleeve gastrectomy. 5 trocars (hub 10 ml, right and left subcostal 12 mm, subxiphoid 5 mm, left subcostal 5mm) were inserted. The first step was to release the greater curvature of the stomach. The second step was dissection, started about 2 cm distal to the pylorus. Echelon 60 mm stapler (Echelon Flex Endopath - Ethicon - Johnson & Johnson Corporation - USA) was used to clip approximately 2 cm from the pylorus. The next step, 34 French bougie was placed transorally to the pylorus. A 32-36 French bougie could be used according to BMI. A 60 mm Endo GIA tri-staple (Echelon Flex Endopath - Ethicon - Johnson & Johnson Corporation - USA) was used to divide stomach. The last step was drain placement close to the anastomosis. 12 mm port locations were closed with sutures, and the operation was terminated.

2.2. Method of Determining Leakage

A total of 31 patients with suspicion of leakage after sleeve gastrectomy all had oral contrast abdominal computerized tomography (CT) procedures, and the presence of leakage was confirmed after these procedures. Leakage was confirmed for all patients through clinical biochemical imaging.

Figure 1

The procedures that had performed to patients



3. Results

Leakage was found in 31 patients. Data from 31 patients who underwent sleeve gastrectomy were analyzed. 12 of these patients (0.80%) were operated on in our clinic and determined leakage. The rest of 19 patients were referred to our clinic from an external center. Of these patients, 21 (67.74%) were women, and 10 (32.26%) were men; the overall mean age of the patients was 34.46 year (17-62). Demographic data of the patients in the postleak period are shown in table 2. The mean number of days' post-surgery that leakage appeared was 21.1304 (1-120 days). Twenty-seven patients (87.1%) presented with a BMI under 50 kg/m², and the remaining 4 patients had a BMI greater than 50 kg/m². Sleep apnea (8 patients), hypertension (10 patients), gastroesophageal reflux (1 patients), diabetes mellitus (9 patients), pulmonary diseases (15 patients) and other cardiovascular diseases (8 patients) were comorbidities. CRP and procalcitonin level are shown in table 3.

A total of 25 patients had leakages in the first 10 days, and a bariatric stent procedure was endoscopically applied in all of these patients. The mean hospital stay was 26.34 (6- 61). Six patients were found to have leakage in the late period, and stent and percutaneous drainage were used to treat them. Laparoscopic drainage was subsequently used for 4 of the patients who did not recover despite the stent and percutaneous drainage treatment. After laparoscopic drainage, 2 patients still did not recover. Open surgical drainage was performed on these 2 patients, but 1 of them did not survive. Figure 1 shows the procedures we performed for all patients with leakage.

Table 3

CRP and procalcitonin level for the patients with leakage

Parameter	Mean
CRP	251,03 mg/L
Procalcitonin	4,59 ng/mL

Table 1

Demographic data of all the patients (n=1505)

		N(%)
Gender	Male	391 (25,98%)
	Female	1114(74,02%)
BMI	≤50 kg/m ²	1482 (98,47%)
	≥50 kg/m ²	23 (1,53%)
Age	16-30	476(%)
	31-40	611(%)
	41-50	324(%)
	51-60	90(%)
	>61	4(%)
Hospital stay		3,8 (2-61d)

Table 2

Demographic data of the patients in the post-leak period

		N(%)
Gender	Male	10 (32,26%)
	Female	21 (67,74%)
BMI	≤50 kg/m ²	27 (87,1%)
	≥50 kg/m ²	4(12,9%)
Comorbidities	Sleep apnea	8
	Hypertension	10
	Gastroesophageal reflux	1
	Diabetes mellitus	9
	Pulmonary diseases	15
	Other cardiovascular diseases	8
Age	16-30	11(35,48 %)
	31-40	13 (41,93%)
	41-50	5 (16,13%)
	51-60	1 (3,23%)
	>61	1 (3,23%)
Hospital stay		26,34 (6-61d)
Mean Leakage day		21,13 (1-120)

4. Discussion

Although leakage is a very uncommon and unexpected complication after bariatric surgery, it causes severe concern in patients when it occurs. A review of the literature shows that leakage occurs after 1.6% of bariatric surgeries.⁹ The sleeve gastrectomy leak rate is on average 0.7 to 5.3%, while our leakage rate is 2% (31). Compared to other reported bariatric procedures in the literature, the sleeve gastrectomy leak rate is higher. Several theories about the cause of this have been proposed. The major causes are the high intraluminal pressure of remaining gastric pouch, staple line weakness and ischemic factors.^{10,11} Additionally, the risk of leakage in revision surgery within bariatric procedures is quite high (18%).¹²

When most patients have leakage, they usually have it at the esophagogastric junction (75%).¹³ In our series, in 20% of the patients, the leakage was near the stomach antrum, and in 5% of the patients, it was in different parts of the stomach. Upon patient examination, it was determined that the hospital readmission period after leakage was longer for these 5% patients. One patient with postoperative mortality was in this 5% of patients. In general, patients are discharged without any problems detecting leakage after sleeve gastrectomy and appropriate treatment modalities. However, if the leakage detection is delayed, the length of stay and the mortality increases.^{14,15} Patients who have sleeve gastrectomy have clinical normotension, normal pulse, stable temperature and no pain when they leave the hospital. If the patient has no symptoms such as pain and tachycardia, it can be said that this patient probably has no problem with leakage. The other detection point is biochemical parameters. One of the parameters is CRP levels.^{16,17} CRP was high in 50 patients and 3 days postoperatively when all 1505 patients in our series were examined, and 31 of those 1505 patients had a leak. Another biochemical parameter is the level of procalcitonin observed after the 3rd day. When the literature was examined, the relationship between CRP, procalcitonin level, and leakage was also determined.¹⁸ In our series, procalcitonin levels were found to be high in 38 patients, and there was leakage in 31 of these patients. In other words, procalcitonin levels were found to be high in 7 patients yielding false positivity. The first important point of detection leakage after sleeve gastrectomy is the clinic status of patients, and the second point is the level of observed CRP and procalcitonin after post op 3rd day.^{16,19,20} Another point is that leakage tests are performed by imaging methods before patients leave the hospital after sleeve gastrectomy.²¹⁻²³ In our clinic, all our patients had contrast abdominal CT before discharge. For 25 (only early stage) of the 31 patients, it was unclear if they had leakage based on CT. These 25 patients were diagnosed as having leakage with CRP and procalcitonin levels. The remaining patient was found to have leakage in the long term after the first week. The other 5 patients were the diagnosed group in the first group. Generally, 80% of the leakage cases occurred in the first 3 days after sleeve gastrectomy. Another 16% occurred within 3 weeks, and the last 4% at other times.

Two of the crucial points after leakage detection are the attempt to treat the patients and the timing. If the general condition of the patients is good, if there is no collection in the abdomen and if the drain is still exists, an endoscopic stent procedure may be considered to close the leakage point at the first time.^{4,24,25} This stent procedure is usually close to the leakage in an experienced center. In our series, a stent was applied in all 31 patients, and 25 patients did not have leakage after the stent procedure, whereas the remaining 6 patients had leakage despite the stent. Meanwhile, two issues are critical. The first issue is, if the pouch of the sleeve gastrectomy was big (out of 32F), there is a possibility that the stent

cannot close the leak because the diameter of the stent is not fully adjusted.²⁶ The second issue is that if the leakage is not in one area, detecting a few areas stent application may not be possible. For this reason, the stent cannot close the defect. In case of not being able to close the defect, leakage continues.

The other significant point in the treatment of leakage is good abdominal drainage.^{27,28} Abdominal drainage can be performed percutaneously as well as laparoscopically. A drain can be used in morbidly obese patients because radiographic analysis can be problematic when there are weight restrictions.²⁹ In our series, drainage was performed percutaneously within 25 patients. When the percutaneous drainage failed in 4 patients, it was performed laparoscopically. In 2 patients, when drainage was unsuccessful despite laparoscopy, it was done by open surgery. One patient who had open surgery in our series did not survive. Mortality could have possibly been avoided by solving the leakage with a minimally invasive procedure. The other point of the leakage treatment is good intensive care support. If these patients are diagnosed together with the occurrence of septic complications in the late period, the recovery period is shorter with aggressive sepsis management in the intensive care unit.

To conclude, leakage is a severe complication after sleeve gastrectomy surgery and carries a risk for mortality. Early diagnosis is the most important point for proper treatment. Diagnostic laparoscopy is a supplemental factor of the treatment if the patients have not been diagnosed clearly. There are various forms to conduct leakage connected with the magnitude of the collection and the clinical presentation. Emergent exploration is needed for patients who have symptoms of sepsis or hemodynamically unstable. Using percutaneous drainage and a bariatric stent procedure have a significant role in controlling leakage before the development of complications in the early period. CRP and procalcitonin should be examined before discharging patients from hospital.

Statement of ethics

This study was conducted retrospectively with approval from Istanbul Medipol University, Non-Interventional Clinical Research Ethics Committee dated 03.09.2025 and numbered E-10840098-202.3.02-5909.

genAI

No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by both authors.

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Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

Data used in this study can be provided on reasonable request. This manuscript has not been presented at any scientific meeting or conference.

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