

Research Paper: Prevalence and Management of Gastric Leakage After Laparoscopic Sleeve Gastrectomy: A Case Study in Modarres Hospital, Tehran, Iran



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ABSTRACT

Background: Sleeve gastrectomy is an effective procedure for weight loss. However, some serious complications may occur during this operation such as strictures, bleeding, and leak. According to previous studies, the rate of leak was 1.06%. Using endoscopic stents have been hampered by some drawbacks the most important of which is repeated migration. The current study aimed to discuss the prevalence and management of leak after laparoscopic sleeve gastrectomy operated at Modarres Hospital, Tehran, Iran.

Methods: This cross-sectional study was conducted on patients with morbid obesity undergone laparoscopic sleeve gastrectomy at Modarres Hospital, Tehran, Iran. In addition to the patients' demographic data; their leak complications, first symptoms and signs, WBC count, and method of management were extracted and collected from their medical files.

Results: A total number of 1263 patients were enrolled in this study. Of them 8(0.63%) patients suffered from leak after the operation. The mean (SD) age of patients with leak was 32.33(6.02) year. The mean (SD) BMI of patients with leak was 45.75(2.07) kg/m². The mean (SD) of WBC count of the patients with leak was 13680(7272.68). The symptoms of the patients began on different days (3-240 day). Management of the patients was different but most of the patients underwent endoscopic stent.

Conclusion: It seems that stent insertion is a useful method for treatment of leak after sleeve gastrectomy, especially in immediate leak.

1. Introduction

S

leeve gastrectomy is an effective procedure to lose weight and treat morbid obesity [1]. This procedure is easy to perform,

well tolerated by the patients and resolve the co-morbidities with minimum nutritional deficiencies [2]. However, serious complications may occur during operation such as strictures, bleeding, and leaks [3]. The most unfavor-

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able complication of this procedure is gastric leak. According to previous data, the rate of leak is 1.06% [4].

Management of this important complication is variable including early over sewing, drainage, endoscopic modalities, using fibrin glue, Roux-en-Y gastrojejunostomy and at last total gastrectomy [5]. Most often, patients with this complication are poor candidates for surgery due to the presence of many comorbidities and the inherent technical difficulties in operating on such patients [6, 7]. However, stents have been hampered by some drawbacks the most important of which is repeated migration [8]. The current study aimed to discuss the prevalence and management of gastric leak after laparoscopic sleeve gastrectomy operated at Modarres Hospital, Tehran Iran.

2. Materials and Methods

The study was a cross-sectional study that conducted on patients with morbid obesity undergone laparoscopic sleeve gastrectomy at Modarres Hospital, Tehran Iran between 2015 and 2017. All medical files of patients with morbid obesity having Body Mass Index (BMI) more than 40 kg/m², who underwent sleeve gastrectomy, were used in this study. Patients who underwent other types of bariatric surgery were excluded.

The researchers were committed to the ethical guidelines of the Declaration of Helsinki [9]. The ethical approval for the study was obtained from the Institutional Review Board at Shahid Beheshti University of Medical Sciences. Signed consent forms were also obtained from all study participants.

Assessments

We evaluated the relevant data by using a structured questionnaire. The patients' demographic data when admitted to hospital along with their WBC count, first signs and symptoms after leak, and method of management were recorded.

Laparoscopic sleeve gastrectomy

All laparoscopic sleeve gastrectomy were performed by a specific team. Patients were operated in the supine and reverse Trendelenburg position. The primary surgeon positioned between the lower limbs. The second surgeon and the nurse were on each side. Pneumoperitoneum was performed with direct abdominal puncture with a trocar on the left side above the umbilicus kept up with inflation pressure of 15 mm Hg. Five ports were used for the procedure. The operation began with the dis-

section and removal of fat pad from the greater curvature of the stomach, followed by a longitudinal resection of approximately 6 cm proximal to the pylorus of the stomach to the angle of His using a linear stapler (Echelon Flex, Johnson & Johnson).

The remaining stomach was calibrated by a 32-French bougie inserted along the lesser curvature. The staple line was reinforced by the omentum through continuous over-sewing with an absorbable 2.0 Polydioxanone (PDS) suture [10]. A 16-French drain was placed along the staple line and externalized through the 5-mm port from the left flank. At the end of the laparoscopic procedure, the peritoneal cavity, above the stomach, under the diaphragm, and the bed of the spleen were irrigated using bupivacaine solution to reduce post operative pain.[11].

Endoscopic stenting

After IV sedation, first we find the leak location with endoscope, next a wire is inserted into the stomach, afterwards a full covered stent (hanarostent) with 240 mm length and 28 mm diameter is inserted with wire guide, and finally the stent is widely opened.

Postoperative screening

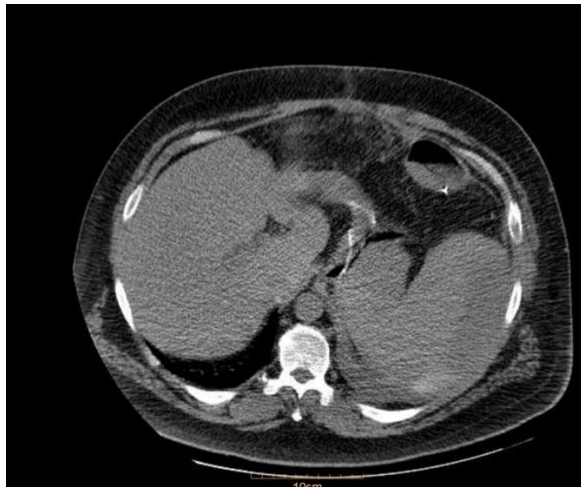
We followed up all patients with WBC count and any symptoms and signs. We just performed abdominal CT scan with contrast on patients with clinical manifestation who were at risk of developing complications.

Statistical analysis

SPSS version 22.0 was used for statistical analysis (IBM, Chicago, IL, USA). Relative frequency percentages were reported in order to describe the nominal and or categorical variables.

3. Results

A total number of 1263 patients with morbid obesity who underwent laparoscopic sleeve gastrectomy were enrolled in this study. The mean (SD) age of the participants was 34.1(6.8) year. The majority of this study samples were female (n=513, 76.2%). The mean (SD) BMI of the patients was 45.44(1.90) kg/m². Of them, 8(0.63%) patients were diagnosed with leak complication after the operation. The mean (SD) age of the patients with leak was 32.33(6.02) year. The mean (SD) BMI of the patients with leak was 45.75(2.07) kg/m². The mean (SD) WBC count of the patients with leak was 13680(7272.68). The symptoms of the patients be-



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Figure 1. Site of leak in CT scan

gan on different days (3-240 day). [Table 1](#) presents the first symptoms and signs of the patients with leak. Six patients with leak had history of addiction. All patients with probable symptoms admitted at hospital and underwent abdominal and pelvic CT scan ([Figure 1](#)). Five patients with leak had history of diabetes mellitus. Four patients had a history of respiratory disorder. [Table 2](#) presents the site of the leak. Management of the patients was different and presented in [Table 3](#).

4. Discussion

Morbid obesity is an important problem worldwide. Laparoscopic sleeve gastrectomy is a known and safe procedure in patients with morbid obesity. It is easy to perform, well tolerated by the patients and resolve comorbidities with minimum nutritional deficiencies [2]; however, the serious complications may occur during this procedure such as strictures, bleeding, and leaks. Gastric leak of luminal contents from a suture line between two hollow viscera is the most unfavorable com-

plication of laparoscopic sleeve gastrectomy with 1.06% prevalence [4, 12]. Leaks can be classified by time of onset, clinical presentation, radiological appearance, site of leak, or mixture of them.

Patients with leak complication are presented by various symptoms such as sepsis, hemodynamic instability, multiple organ failure, perigastric abscesses and chronic fistulas [13, 14]. These symptoms may occur suddenly or gradually. In our experience, the patients were presented with symptoms of sepsis and abdominal pain, cough, or nausea and vomiting. Abdominal pain was the most common symptom in our patients. Previous studies demonstrated [15] that a combination of clinical signs of fever, tachycardia and tachypnea have the predictive value by 58.33% sensitivity and 99.75% specificity for the detection of anastomotic leaks. In our experience all the cases had fever and tachycardia. Furthermore, leukocytosis was seen in all patients as an important finding.

Suture-line leaks as a laparoscopic sleeve gastrectomy complication occurs in about 5% [5, 16]. In our study, this rate was about 1.1%. Previous studies demonstrated that careful patient selection ($BMI < 50 \text{ kg/m}^2$) and adopting the use of a 40-French or larger bougie may decrease the risk of leak [17]. Also diabetes mellitus and sleep apnea were associated with a greater incidence of anastomotic leak [18]. In our hospital, we select patients with morbid obesity and $BMI \geq 40$ for laparoscopic sleeve gastrectomy. Before the sleeve gastrectomy, all candidates should be examined by gastrointestinal specialists, nutritionist, psychiatrist, pulmonologist, cardiologist and anesthetist to shortlist the selected patients for the operation. All this process helps us to decrease complications of laparoscopic sleeve gastrectomy such as leak.

Furthermore, one month after surgery is a critical time because a majority of the leaks occur after patient's discharge [16]. In our study, leak occurred at average of 35.12 days



Figure 2. Full covered stent

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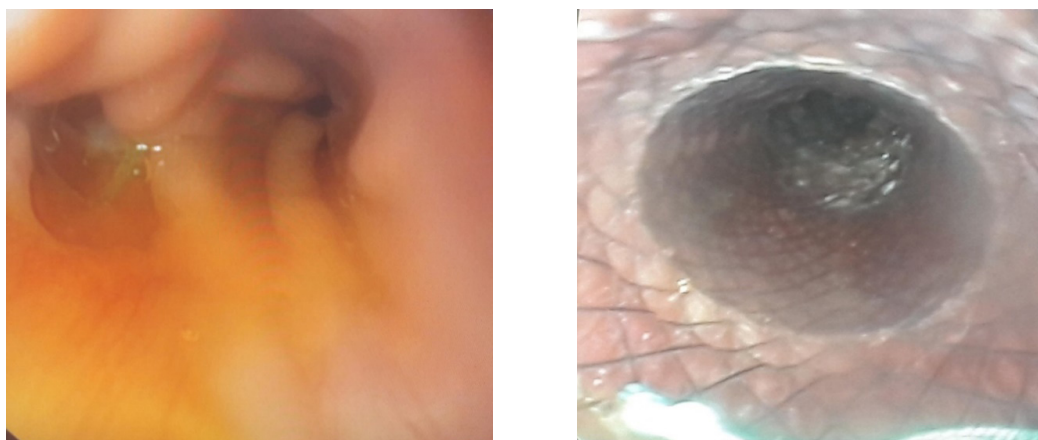


Figure 3. Site of leak before and after stent replacement

after surgery [range: 3-240]. Most of the cases occurred in first ten days. Leaks after laparoscopic sleeve gastrectomy can also be due to mechanical or ischemic causes. According to a previous study, mechanical cause is due to technical mistake and occurs within 2 days post-operative and ischemia occurs within 5-6 days after surgery [19].

For the management of the leak, it is classified to acute (<7 days), early (1-6 weeks), late (6-12 weeks), and chronic (>12 weeks). Also the majority of surgeons agree that stenting is a valid option for proximal acute or early leak as a primary management or after failure of conservative therapy [20].

In our experience, we inserted stent for all leaks after laparoscopic sleeve gastrectomy regardless of to the time of leak. All stents were inserted by special team of surgeons at Modarres Hospital. After IV sedation, first we find the leak location with endoscope then a wire is inserted into

the stomach, next a fully covered stent (Figure 2) with the length of 240 mm and diameter of 28 mm is inserted with wire guide, and finally the stent is widely opened (Figure 3). After stent replacement, patients' symptoms and signs improved dramatically. Leukocytosis decreased 6 hours after the replacement (WBC= 7000-7800 /m³).

Patients, who are presented with pure leakage without chronic fistulae, can usually be treated effectively by the conservative methods. Rescue operation was necessary in only 15% [4] of patients with a pure leakage. In the rare event of a patient with leakage requiring rescue operation, an open procedure was usually performed. In our experience, one patient improved only with drainage after laparoscopy, two patients needed laparotomy after laparoscopy then the stent placement and five patients were inserted stent and drainage under CT scan guidance without additional procedure. All stents were removed after 4 weeks and controlled CT scan showed absence of

Table 1. Signs and symptoms of patients with leak after sleeve gastrectomy

| Cases | Day of Admission to Hospital | First Symptom(s) | First Signs |
|-------|------------------------------|------------------------|--|
| 1 | 10 | Abdominal pain | Fever, tachycardia |
| 2 | 240 | Left flank pain | - |
| 3 | 12 | Abdominal pain | Fever, tachycardia, abdominal Tenderness |
| 4 | 8 | Nausea | Fever, tachycardia |
| 5 | 11 | Cough, vomiting | Fever, tachypnea, tachycardia |
| 6 | 5 | Abdominal pain, nausea | Fever, tachycardia, abdominal tenderness |
| 7 | 14 | Abdominal pain | Fever, tachycardia, abdominal tenderness |
| 8 | 13 | Abdominal pain | Fever, tachycardia, localized tenderness |

Table 2. Site of leak in cases

| Cases | Site of Leak |
|-------|---------------------------|
| 1 | Gastroesophageal junction |
| 2 | Gastroesophageal junction |
| 3 | Gastroesophageal junction |
| 4 | Gastroesophageal junction |
| 5 | Greater curvature |
| 6 | Gastroesophageal junction |
| 7 | Gastroesophageal junction |
| 8 | Gastroesophageal junction |

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leak in patients except one case that had leak 8 months after operation.

Insertion of stent is usually a safe procedure but sometime it has complications. Previous studies demonstrated that some of these complications included stent contact ulceration and stent-related discomfort [21]. Major concerns with stents are migration and difficulties of their removal [21]. In our experience migration occurred only in one case. It seems that early placement of a full covered stent is a successful method to treat leak. It appears that stent insertion decreases length of hospital stay and increases ability to feed.

The present study has some limitations because of its cross-sectional design and validity as it was based on the medical files and some data were missed. Furthermore, due to the low prevalence of leak, so the small sample

size, studies with large sample size are suggested. We suggest multicenter prospective studies for large sample size to decrease the missing data.

5. Conclusion

Leak is the most important complication after laparoscopic sleeve gastrectomy. It seems that inserting stent for leak is a useful method for the treatment of early leak after sleeve gastrectomy.

Ethical Considerations

Compliance with ethical guidelines

The ethical approval for the study was obtained from the Institutional Review Board at Shahid Beheshti University of Medical Sciences.

Table 3. Intervention in each case with leak

| Cases | First Intervention | Second Intervention | Third Intervention |
|-------|--------------------|---------------------|--------------------|
| 1 | Laparoscopy | Drainage | - |
| 2 | Drainage under CT | Stent | - |
| 3 | Laparoscopy | Laparotomy | Stent |
| 4 | Drainage under CT | Stent | - |
| 5 | Laparoscopy | Laparotomy | Stent |
| 6 | Drainage under CT | Stent | - |
| 7 | Drainage under CT | Stent | - |
| 8 | Drainage under CT | Stent | - |

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Conflict of interest

The authors declared no conflict of interest.

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References

- [1] Chang S-H, Stoll CR, Song J, Varela JE, Eagon CJ, Colditz GA. The effectiveness and risks of bariatric surgery: An updated systematic review and meta-analysis, 2003-2012. *JAMA Surgery*. 2014; 149(3):275-87. [DOI:10.1001/jamasurg.2013.3654]
- [2] Kehagias I, Zygomalas A, Karavias D, Karamanakos S. Sleeve gastrectomy: Have we finally found the holy grail of bariatric surgery? A review of the literature. *European Review for Medical and Pharmacological Sciences*. 2016; 20(23):4930-42. [PMID]
- [3] Lalor PF, Tucker ON, Szomstein S, Rosenthal RJ. Complications after laparoscopic sleeve gastrectomy. *Surgery for Obesity and Related Diseases*. 2008; 4(1):33-8. [DOI:10.1016/j.soard.2007.08.015] [PMID]
- [4] Rosenthal RJ, Diaz AA, Arvidsson D, Baker RS, Basso N, Bellanger D, et al. International sleeve gastrectomy expert panel consensus statement: Best practice guidelines based on experience of >12,000 cases. *Surgery for Obesity and Related Diseases*. 2012; 8(1):8-19. [DOI:10.1016/j.soard.2011.10.019]
- [5] de Aretxabala X, Leon J, Wiedmaier G, Turu I, Ovalle C, Maluenda F et al. Gastric leak after sleeve gastrectomy: Analysis of its management. *Obesity Surgery*. 2011; 21(8):1232-7. [DOI:10.1007/s11695-011-0382-5]
- [6] Swinnen J, Eisendrath P, Rigaux J, Kahegeshe L, Lemmers A, Le Moine O, Devière J. Self-expandable metal stents for the treatment of benign upper GI leaks and perforations. *Gastrointestinal Endoscopy*. 2011; 73(5):890-9. [DOI:10.1016/j.gie.2010.12.019]
- [7] Bege T, Emungania O, Vitton V, Ah-Soune P, Nocca D, Noël P et al. An endoscopic strategy for management of anastomotic complications from bariatric surgery: A prospective study. *Gastrointestinal Endoscopy*. 2011; 73(2):238-44. [DOI:10.1016/j.gie.2010.10.010]
- [8] van Boeckel PG, Sijbring A, Vlegaar FP, Siersema PD. Systematic review: Temporary stent placement for benign rupture or anastomotic leak of the oesophagus. *Alimentary Pharmacology & Therapeutics*. 2011; 33(12):1292-301. [DOI:10.1111/j.1365-2036.2011.04663.x]
- [9] World Medical Association. World medical association declaration of Helsinki: Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization*. 2001; 79(4):373.
- [10] Alamdari NM, Abdolhoseini M, Askarpour H, Bakhtiyari M. Evaluating the effect of staple line reinforcement on reducing the complications of laparoscopic sleeve gastrectomy: A randomized clinical trial. *Acta Medica Iranica*. 2018; 56(5):334-40.
- [11] Alamdari NM, Bakhtiyari M, Gholizadeh B, Shariati C. Analgesic effect of intraperitoneal bupivacaine hydrochloride after laparoscopic sleeve gastrectomy: A randomized clinical trial. *Journal of Gastrointestinal Surgery*. 2018; 22(3):396-401. [DOI:10.1007/s11605-017-3659-8]
- [12] Peel AL, Taylor EW. Proposed definitions for the audit of postoperative infection: A discussion paper. *Surgical Infection Study Group. Annals of The Royal College of Surgeons of England*. 1991; 73(6): 385-388. [PMID] [PMCID]
- [13] Burgos AM, Braghetto I, Csendes A, Maluenda F, Korn O, Yarmuch J, et al. Gastric leak after laparoscopic-sleeve gastrectomy for obesity. *Obesity Surgery*. 2009; 19(12):1672-7. [DOI:10.1007/s11695-009-9884-9]
- [14] Márquez MF, Ayza MF, Lozano RB, Morales Mdel M, Díez JM, Poujoulet RB. Gastric leak after laparoscopic sleeve gastrectomy. *Obesity Surgery*. 2010; 20(9):1306-11. [DOI:10.1007/s11695-010-0219-7]
- [15] Kolakowski S, Kirkland ML, Scuricht AL. Routine post-operative upper gastrointestinal series after Roux-en-Y gastric bypass. *The Archives of Surgery*. 2007; 142(10):930-4. [DOI:10.1001/archsurg.142.10.930]
- [16] Praveenraj P, Gomes RM, Kumar S, Senthilnathan P, Parthasarathi R, Rajapandian S, et al. Management of gastric leaks after laparoscopic sleeve gastrectomy for morbid obesity: A tertiary care experience and design of a management algorithm. *Journal of Minimal Access Surgery*. 2016; 12(4):342-9. [DOI:10.4103/0972-9941.181285]
- [17] Aurora AR, Khaitan L, Saber AA. Sleeve gastrectomy and the risk of leak: A systematic analysis of 4,888 patients. *Surgical Endoscopy*. 2012; 26(6):1509-15. [DOI:10.1007/s00464-011-2085-3]
- [18] Sarkhosh k, Birch DW, Sharma A, Karmali S. Complications associated with laparoscopic sleeve gastrectomy for morbid obesity: A surgeon's guide. *Canadian Journal of Surgery*. 2013; 56(5):347-52. [DOI:10.1503/cjs.033511]
- [19] Baker RS, Foote J, Kemmeter P, Brady R, Vroegop T, Serveld M. The science of stapling and leaks. *Obesity Surgery*. 2004; 14(10):1290-8. [DOI:10.1381/0960892042583888]
- [20] Guzaiz N, Arabi M, Khankan A, Salman R, Al-Toki M, Qazi S et al. Gastroesophageal stenting for the management of post sleeve gastrectomy leak: A single institution experience. *Saudi Medical Journal*. 2016; 37(12):1339-1343. [DOI:10.15537/smj.2016.12.15761]
- [21] El-Sayes IA, Frenken M, Weiner RA. Management of leakage and stenosis after sleeve gastrectomy. *Surgery*. 2017; 162(3):652-61. [DOI:10.1016/j.surg.2017.04.015]