

## Prevention, Diagnostics and Treatment of Anastomotic Leaks after Laparoscopic Roux-En-Y Gastric Bypass

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### Abstract

**Aim:** Consider of main principles of prevention, diagnostics and treatment of patients with anastomotic leaks after laparoscopic Roux-en-Y gastric bypass (LRGB) for morbid obese patients.

**Material and Methods:** Since 2013 to 2019 there were performed 292 LRGB for morbid obese patients in center of bariatric surgery of the Loginov MCSC. We show an experience in treatment of 4 anastomotic leaks cases in that series and 4 cases with the same leaks from other clinics.

**Results:** Surgical technique of LRGB was improved according experience of Loginov MCSC. The main tips for anastomotic leaks prevention are precise dissection of esophago-gastric junction, transection of gastrohepatic ligament, retrocolic alimentary limb placement and hand sewn technique in gasro-jejuno anastomosis. There was developed protocol of LRGB anastomotic leaks diagnostics and treatment. According that experience the main noninvasive diagnostics methods is ultrasound, X-ray swallow test and contrast CT scan. Best results in treatment of anastomotic leaks has shown according use of interventional surgical techniques.

**Conclusion:** According to retrospective analysis LRGB is safe and effective bariatric procedure. Anastomotic leaks are more frequent LRGB complication. Most leaks occurring after hospital discharge and to be of the main cause of late diagnostics. Interventional surgical techniques give the best results in treatment.

**Keywords:** Bariatric Surgery; Laparoscopic Gastric Bypass; Anastomotic Leak; Prevention of Complications

### Introduction

Morbid obesity is a serious health and social problem caused by the decline in the quality of life and its duration. At the same time, the risk of developing a number of serious diseases such as type 2 diabetes mellitus, hypertensive disease, obstructive sleep apnea, cardiovascular diseases, cerebrovascular diseases, bronchial asthma, degenerative bone and joint disease are increasing [1,2]. According to WHO, excess body weight is observed in 1.6 billion adults and causes more than 2.8 million deaths annually [3].

Conservative treatments of morbid obesity, which is the therapeutic diet with pharmacological, psychological and sports-support, tend to be ineffective and remote results are far from satisfactory. Most authors recognize the advantages of surgical treatments for alimentary-constitutional obesity. The standards adopted at the end of the twentieth century for the surgical treatment of morbid obesity have led to a steady increase in the number of bariatric surgeries performed in the world. In fact, today bariatric surgery is the only long-term mode of treatment for morbid obesity and its associated diseases [4].

The development of technologies and methods for emergency interventions in gastrointestinal tract (GI) that modify the passages and reduce the amount of food consumed make it possible to achieve meaningful results. The methods of operations are changing dynamically with the declining trend of surgical invasiveness and injury operations and with the increasing trend of their safety.

The effectiveness and relative safety of the operation of laparoscopic gastric bypass (LGB) in morbid obesity have contributed to the fact that the surgery is now becoming more common but is also deficient [4]. The formation of several anastomoses in the abdominal cavity increases the frequency of complications related to the failure thereof from 1 to 5.6 per cent [5-7]. Additional risk factors are: male sex, having a history of taking steroid drugs, atherosclerosis, older age, repeated surgical interventions, extreme obesity (BMI > 50 kg/m<sup>2</sup>), lack of surgical experience and equipment, defects in surgical equipment [5,8-10].

Methods of diagnosing the leak of various anastomoses in standard situations are well developed and are a routine general surgical procedure. However, the patients in question have characteristics that make timely and complete diagnosis difficult. These features include, first of all, excess body weight and a significant change in GI anatomy. In addition, the low level of invasive surgery contributes to shortening the patient's stay in hospital, averaging 4 - 5 days after the surgery, and often post-operative complications, including the leak, develop during the deferred period, after the patients are discharged from the hospital. These problems have made this work relevant, which we hope will help to make the right decision when determining treatment strategies.

### Purpose of the Study

The purpose of the work was to consider the basic principles of prevention, diagnosis and treatment of anastomosis insolvency following the operation of laparoscopic gastric bypass.

### Materials and Methods

In the Bariatric Surgery Center of SBHI Moscow Clinical Scientific Center A.S. Loginov MHD was performed 292 LGB between 2013 and 2018. Age of patients 40.5+5.6 years, weight 124.7+11.8 kg, BMI 44.4+5.1 kg/m<sup>2</sup>. Suture failure in anastomotic zone has been diagnosed in 4 (1.4%) of the total number of observations. Additionally, 4 patients who underwent LGB at other health facilities were treated at the clinic for a similar complication. Thus, this article generalizes the experience of treatment of 8 patients with anastomotic leak after LGB.

The SOFA scale was used to determine the severity of the patients' condition. Ultrasound methods, X-rays, CT scans, MRI, and endoscopy were also applied.

### Results and Discussion

Surgical experience is one of the proven factors influencing the frequency of complications. As experience is gained, among several options that appear to be equivalent at first glance, the choice is focused on the simplest, most rational, and therefore the safest. Applicable to the problem in question, these LGB options may include:

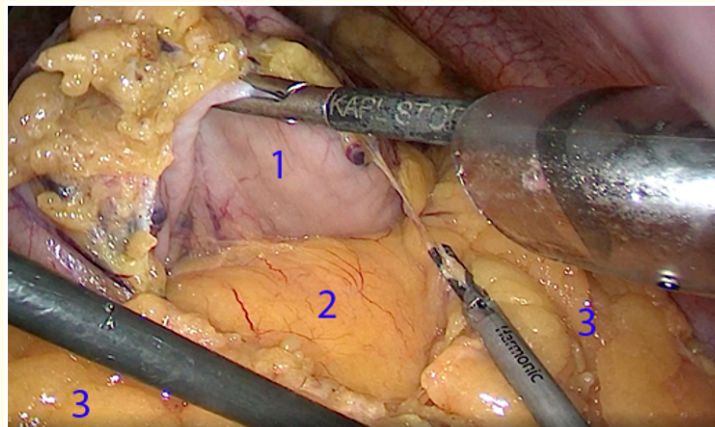
- Mobilization of the gastroesophageal junction;
- Intersection of the gastrohepatic ligament;
- Maintenance of the alimental loop of small intestine behind the colon;
- Use of manual suture technique for additional gastroenteroanastomosis line sealing.

The mobilization of the gastroesophageal junction (GEJ) is carried out after the gastric resection and its stump formation. Manipulation is intended to reduce the proximal gastric stump towards the intestine to form an anastomosis without tension. This is not always required, but only in cases where the small intestine is short mesentery and the tensile appears while trying to form gastroenteroanastomosis, which increases the risk of leak. Mobilization of GEJ is a complex procedure which may damage the vessels that feed the gastric stump. This manipulation should not be resorted to unnecessarily. It is necessary in every tenth case. In our observations, this was done in 31 (10.6%) patients.

The intersection of the gastrophrenic ligament is also intended to preserve the blood supply to the gastric stump. The use of ultrasonic dissector during precision dissection makes it possible to avoid unnecessary damage and to maintain the maximum number of vessels feeding the stomach.

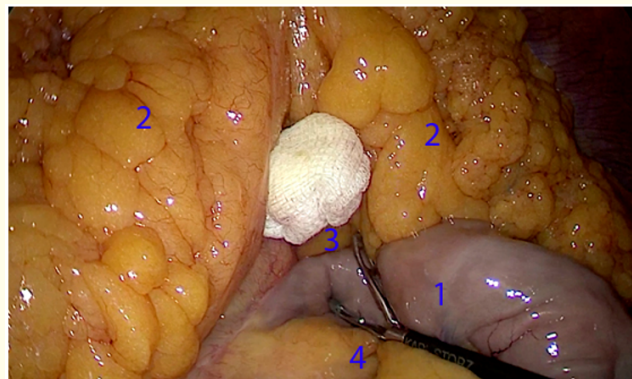
The placement of an alimental loop of the small intestine behind the colon is the shortest way of this loop to the gastric stump and, accordingly, to the anastomosis. This is important because in bariatric patients the mesentery of all intestinal loops contain an excess of fat tissue, which “shortens” them and makes them less mobile. Technically, this is certainly a more complicated option than the gastroenteroanastomosis formation in the front of the colon. The technical difficulties in this reception are the need to form a sufficiently large hole in the mesocolon without damaging the vessels. Since the mesocolon has the same changes as the small intestine (Figure 1), it is not easy to find a non-vascular zone in it. The advantages of this position of the alimentary gut are obvious, therefore we consider it necessary to elaborate on details of the implementation of this procedure.

We start by dissecting the gastrocolic ligament with a length of about 8 cm parallel to a large curvature, receding from the stomach lining by 1.5 cm (Figure 1).



**Figure 1:** Dissection of the gastrocolic ligament. The numbers indicate: 1- stomach; 2- mesocolon; 3- greater omentum.

Penetrate into the omental sac, providing access to the mesocolon, perforate the mesh in the non-vascular zone, form a hole about 5 cm in diameter and pass through it a gauze “holder” (Figure 2). Through this hole we conduct the alimentary loop of small intestine and fix it to a mesocolon around the circumference of formed hole (usually 3 - 4 seams).



**Figure 2:** Formation of a mesocolic window. The numbers indicate: 1- jejunum; 2- greater omentum; 3- mesocolon transverse; 4- mesentery of the small intestine.

The use of hand suture technique in gastroenteroanastomosis formation is also a manipulation aimed at reducing tension [11]. At the same time, we can form anastomosis both on the anterior wall and on the posterior wall of the gastric stump, fixing the intestine to the staple suture.

Once the gastric and small intestine stump has been anastomosed, we use an air sample, which allows us to assess the tightness of the anastomosis. At the end of the operation, we consider it advisable to leave a drainage connected to the anastomosis zone.

All the above-mentioned operational techniques are aimed at forming anastomoses in conditions of good visualization with the least tension and with maximum saving of blood supply.

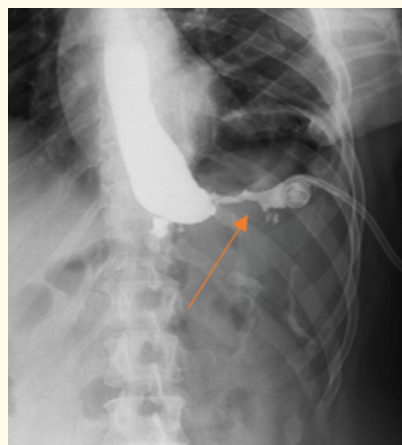
Enteroenteroanastomosis is a less risky area for the development of leak. However, it is necessary to choose the optimal method of anastomosis of the small intestine, which in operation of LGB is considered a linear hardware anastomosis. In all cases, devices with a staple height of 2.5 mm were used.

It is clear that even with the use of all measures to prevent the insolvency of digestive anastomoses, including those we have mentioned, it is only hypothetically possible to completely avoid this life-threatening complication. Early diagnosis is therefore the second key to solving emerging problems. The main purpose of diagnostic measures is to determine the localization of leak and the prevalence of inflammatory process in the abdomen.

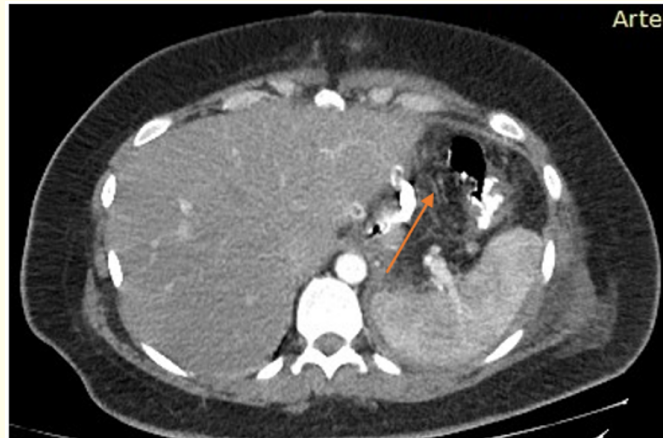
The recommended sequence of diagnostic interventions is as follows. Firstly, we are guided by clinical and laboratory data indicating the presence of inflammation and intoxication: temperature rise, dry mouth, tachycardia, abdominal pain, leukocytosis and etc. Although not specific, these features, together with their history, constitute important diagnostic material [8]. But nothing more. The presence of these features only makes it possible to suspect the problem and move on to a more detailed diagnosis.

One very important feature needs to be pointed out. The installation of a nasal gastric tube, which is one of the treatment and diagnostic measures in patients suspected of having gastroenteroanastomosis leak, is contraindicated in patients of this category. This is due to a change in GI anatomy, and the installation of a standard tube by closed method may result in additional trauma in the gastroenteroanastomosis area. During the operation the tube is installed under endoscopic control.

The next diagnostic stage is X-ray diagnostics. These activities are standard clinical recommendations for the diagnosis of peritonitis - abdominal and chest X-rays, ultrasound scan, contrast radiography, CT scans (Figure 3 and 4). The relevance of using water-soluble contrasts in X-ray diagnostics should be noted [5,12]. The appearance of a contrast in the abdominal cavity is a direct sign of the leak (Figure 3).



**Figure 3:** Formation of a mesocolic window. The numbers indicate: 1- jejunum; 2- greater omentum; 3- mesocolon transverse; 4- mesentery of the small intestine.



**Figure 4:** CT scan of the abdominal cavity of a patient with gastric leak after 10 days after LGB.

However, non-invasive research methods do not always allow to perform accurate diagnostics. In case of a discrepancy between the clinical data and the additional methods of examination, in the absence of reliable data obtained by radiological methods, doubts are resolved in favor of a laparoscopic examination of the abdominal cavity.

Leak is divided into several main criteria: post-operation term, severity level, localization [13]. Early leak (1 - 4 days after the surgery); delayed (5 - 9 days) and late (more than 10 days) are considered. The severity of the patient's condition is determined by the inflammatory reaction, presence or absence of abdominal sepsis and phenomena of multi-organ failure. The distribution of patients according to these characteristics is shown in table 1.

Criteria	Characteristics	Observation number
Term	Early (1 - 4 days)	4
	Delayed (5 - 10 days)	4
Severity level	Slight	5
	Severe	3
Localization	Gastric stump	1
	Gastroenteroanastomosis	5
	Enteroenteroanastomosis	2

**Table 1:** Distribution of patients with disability by time, severity and location.

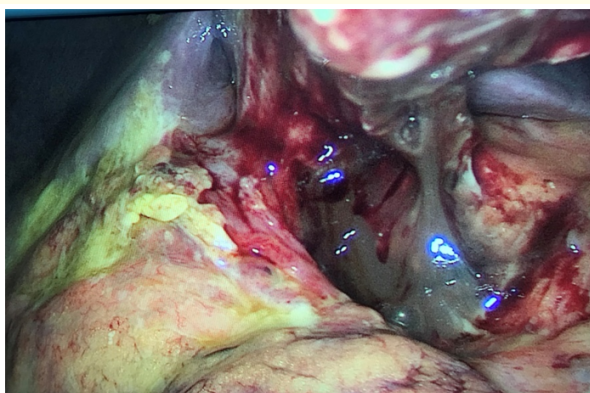
All types of anastomotic leaks after LGB can be divided into 3 groups according to the severity of clinical manifestations:

1. Patients do not have clinical symptoms (according to the SOFA scale with the severity score 0-1) and do not require surgical treatment, anastomotic leak is detected only by radiological diagnostic methods.
2. There is a expressed clinical symptomatic (according to the SOFA scale with the severity score  $\geq 2$ ) - abdominal pain, a picture of enteroplegia or ileus, as well as laboratory signs of pyo-inflammatory complications. Such patients require active therapeutic, low-invasive surgical operations, such as percutaneous drainage of purulent leakages or accumulations of small intestinal contents under US-control using image intensifier tube and contrast investigation on the operating table.



3. There are significant defects in the anastomosis line, the exudate cluster and/or the intestinal contents in the abdominal cavity, accompanied by symptoms of local or common peritonitis and expressed intoxication. Such patients require a relaparoscopy with exploration and sanitation of the anastomosis zone, and also, depending on intraoperative data, the installation of a nasal tube under visual control. In case of impossibility of full sanitation and drainage by laparoscopic method, laparotomy is necessary. Failure to perform active surgery can have fatal consequences.

There are two different options for draining the purulent focus of the relaparoscopic sanitation: draining the abdominal cavity or draining under ultrasound control. With confidence in the diagnosis of leak localization and the prevalence of the process, it is best to install a drainage under ultrasound control in the abscess cavity in the conditions of an X-ray operating room or the presence of X-ray control. This technique is less traumatic, but requires special skills and experience. In cases where the diagnosis is unclear or there is a sign of diffuse peritonitis, a relaparoscopy is prescribed (Figure 5). In the case of the gastroenteroanastomosis leak, it is not possible to apply sutures to restore tightness because of the small size of the gastric stump, the rigidity of its wall and infiltrating changes in the tissues. The same applies to leak in the gastric stump sutures area. The task of draining the purulent focus is to ensure adequate evacuation of the pathological substrate, sanitation and decrease in inflammation cavity, which creates conditions for controlled outer fistula formation with real prospects of its conservative closure. The period of operation of the gradually extracted drainage is from 2 weeks to 6 months. This is considered to be a favorable duration of the process.



**Figure 5:** Relaparoscopy for gastroenteroanastomosis leak.

If enteroenteroanastomosis leak has developed, it is possible to try to restore the integrity of the intestine either by narrowing the hole or by resecting the area in question to form a new anastomosis. In the two cases where we had this problem, we sutured a hole. In both cases it was “fresh” complications on 3 and 4 days after LGB, where pronounced changes of intestinal walls have not yet developed.

During this time, the patient must not eat on his own, and the food is fed through a nasal gastric tube, which goes below the leak zone (50 cm) into the alimentary gut. In the initial stages, a mixed diet (feeding tube: enteral nutrition with additional parenteral correction) is necessary [14]. Preference is given to enteral mixtures with a semi-elemental (oligomeric) protein base. In the case of diabetes mellitus, it is advisable to use a specialized enteral mixture in which the carbohydrate component is complex polysaccharides. For optimal nutrient intake and prevention of diarrheal syndrome, the initial volume is 700 ml, and the infusion rate is 30 ml per hour. During the infusion period, it is necessary to flush the tube 4 - 6 times a day with water in order to prevent it from obliteration. In the future, the amount of enteral nutrition and eliminate parenteral support should be increased. This is usually possible on average on 7 - 10 days of mixed feeding, when the enteral nutrition diet reaches 2,000 ml per day, the maximum speed of injection into the tube is 85 ml/h, but there may still be a need to correct electrolytes and fluids depending on the loss of fistula.

### Conclusion

The LGB is thus an effective bariatric intervention. Although complications are rare, they must be taken seriously and attentively, as they can have serious consequences. Anastomotic leak is one of the most common complications. The clinical picture of leak has specific features and diagnosis may be difficult, including due to the early discharge of patients.

The proposed sequence of diagnostic methods of anastomotic leaks and principles for the treatment of this category of patients makes it possible to treat the peritonitis of this serious category of patients successfully.

The interaction of the in-patient and out-patient services in a single multidisciplinary system and the introduction of continuity in the system of the bariatric care delivery will create prerequisites for the timely diagnosis and treatment of anastomotic leaks in the stage of its developing.

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