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Anastomositis in the Structure of Postoperative Complications of Mini Gastric Bypass

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ABSTRACT

Bariatric surgery is the most effective intervention to reduce obesity-related morbidity and mortality. In this regard, one of the most common and well-studied bariatric procedures is laparoscopic mini-gastric bypass. Increased insulin sensitivity detected shortly after performing such surgeries, even before significant weight loss occurs, suggests immediate systemic changes in metabolism after surgery, which are early, as even ten years after surgery, beneficial effects on glucose, lipid, and blood pressure metabolism can be seen. However, although this method of surgery is more than 25 years old, the mechanisms underlying the development of postoperative complications remain not fully understood.

Keywords: mini-gastric bypass, early postoperative complications, late postoperative complications

Bariatric bypass surgery combines restrictive and malabsorptive effects. This is achieved by combining a reduction in the volume of the stomach and a reduction in the functioning part of the small intestine. The frequency and types of anatomical and physiological complications of bypass surgery depend on the number of formed (one or two) anastomoses.

In some cases, the development of postoperative complications is determined by the particular nature of the operations performed. These include inappropriate size of the stomach, length of the intestinal loop, anastomosis in front of or behind the transverse colon, etc. For example, in case of short mesentery of the small intestine, it is preferable to place an anastomosis behind the transverse colon. This reduces the risk of developing anastomosis tension, but increases the risk of developing an internal hernia [1].

To date, it is generally accepted to divide the complications of gastric bypass operations into intraoperative, as well as early and late postoperative complications.

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Early postoperative complications are characterized by their development during the first month after surgery. Along with this, all types of gastric bypass surgery, as well as all other types of surgical treatment, can also have general complications [2].

Narrowing of the distal interintestinal anastomosis develops quite rarely and accounts for less than 1% of cases. With this type of complication, patients complain of the presence of diffuse, cramping pain over the entire surface of the abdomen [3].

In the case of persistent cicatricial narrowing of the gastroenteroanastomosis, functional disorders in the form of gastroesophageal reflux disease may develop. This type of complication of gastric bypass surgery can be corrected only with the use of a special diet and the use of conservative therapy [4].

To date, there are no specific recommendations for the treatment of gastroenteroanastomosis obstruction as a result of the development of anastomositis. There are recommendations to abandon the long-term use of a gastric tube to decompress the remaining part of the stomach, as the possibility of gastric perforation is likely. For example, in 2019, the use of percutaneous fine-needle puncture and decompression after the installation of drainage was proposed, and in case of recurrence or rupture of the anastomosis, surgical methods of treatment were proposed [5].

Another method of treating anastomositis and stenosis of the anastomosis due to the development of its edema after gastric bypass operations is based on the use of therapeutic measures of decongestant and infusion therapy. Against this background, fibrogastroscopy and endoscopic bougienage of the gastroenteroanastomosis are performed. It is recommended to complete this procedure with the installation of two drains. The first, thin drainage is carried out behind the gastroenteroastomosis, and the other, ordinary nasogastric tube was inserted into the stump of the stomach. Such procedures must be performed from 2 to 5 times. In the absence of an effect from such manipulations, reconstructive surgical interventions are required [6].

The formation of gastro-gastric fistulas is one of the types of complications associated with the technical features of the operation. In particular, this can happen during the formation of the gastric stump, with insufficiently thorough mobilization of the stomach in the area of the His angle, when the last hardware application does not cut off the main stomach and communication with the forming stump remains [7].

In less than 2% of cases, purulent-septic complications develop (abdominal abscess, peritonitis). The causes of such complications are the failure of the anastomosis sutures. They are characterized by development during the first week of the postoperative period.

The literature also describes in detail such types of complications of mini-gastric bypass grafting as: intestinal obstruction, internal hernias, deep vein thrombosis, dumping syndrome, pulmonary embolism, bleeding, infection of trocar wounds, the development of postoperative hernias through trocar openings, cholelithiasis, hyperoxalaturia, hypocitraturia and various deficiencies (of vitamins and trace elements), which lead to a subsequent chain of complications in other bodies [8].

Anastomositis after minigastric bypass surgery is not uncommon. The incidence of this type of complication varies from 0.9% to 15.8%. Anastomositis can develop both in the early postoperative period and in the late postoperative period. This type of complication is easily diagnosed by performing fibrogastroscopy. If it is impossible to perform this type of study, some authors recommend performing computed tomography with contrast, which allows you to study this type of complication in more detail. The main sign of the development of anastomositis on computed tomography is considered to be the presence of signs of accumulation of a contrast agent in the area of gastroenteroanastomosis with wall thickening [9].

Among the proven risk factors for the development of anastomositis in the postoperative period are smoking and the use of non-steroidal anti-inflammatory drugs. These factors have already been proven in the development of this type of postoperative complications. However, the frequency of development, etiology and pathogenesis of this type of complication remains an unexplored problem today. Information is described about the difficulty of achieving positive results of the treatment of patients with postoperative anastomositis, which requires a more detailed study in this direction.

Bariatric surgery is widely recognized as the most effective and stable treatment for morbid obesity and linking subsequent metabolic disorders such as type 2 diabetes mellitus [10].

Proposed in 1997 by the American surgeon R. Rutledge [11], a new combined bariatric operation, minigastric bypass, has found wide application in the treatment of morbid obesity complicated by type 2 diabetes mellitus. The introduction of this bariatric surgery is recognized as promising and promising due to the stability of treatment results in the remote period.

At numerous scientific conferences, congresses and meetings of societies of bariatric surgeons, consensus has been adopted regarding the safety of minigastric bypass grafting and the low rate of postoperative complications. At the same time, most studies in this direction were carried out in comparison with the gold standard of gastric bypass according to the Roux-en-Y method. In particular, it has been repeatedly noted that the use of minigastric bypass, in contrast to gastric bypass according to the Roux-en-Y method, should be considered promising in terms of the possibility of using reversal or revision of bariatric intervention.

Over the past decades, the effectiveness of minigastric bypass surgery has been studied and characterized as an operation that allows not only to achieve weight loss, but also to have a positive effect, as well as to control the course of concomitant diseases. This indicates a high potential for improving the quality in comparison with the alternative method of treatment of gastric bypass according to the Roux-en-Y method [12].

Meanwhile, due to the presence of one anastomosis in minigastric bypass grafting, the focus of discussion is on the topics of chronic risks associated with potential biliary reflux in the esophageal-gastric zone in the flesh before the development of anastomosites [13].

Minigastric bypass, like other surgical operations according to the Omega-loop strategy, is characterized by the formation of a direct anastomosis of the biliopancreatic loop into the stomach, and not the imposition of an alimentary loop, as in gastric bypass according to the Roux-Y method. The small volume of the left cardiac portion of the stomach, which has a direct path to the esophagus, is a favorable condition for the action of bile acids on the mucous membrane, causing the formation of anastomositis. This phenomenon has been described in a number of studies and requires the formation of Omega-Loop-Bypass, known in the literature as Brown's interintestinal anastomosis [14].

Anastomositis as a result of the action of bile acids and pancreatic juice on the mucous membrane of the resected part of the stomach is fraught with the presence of potential and appropriate causal conditions for the possible development of esophageal carcinogenesis. Such a mechanism of possible development of the pathological process in the postoperative period was studied on experimental models in the formation of esophagojejunal and esophagododenal anastomoses. They have been accepted as carcinogenic lesions of the esophagus [15].

Moreover, numerous studies during the period of active resection surgical methods for the treatment of gastric ulcer, the use of anastomoses during surgery according to the Billroth II method, were associated with a high risk of anastomositis. The same results were noted when performing gastric resections according to the Billroth II method in patients with gastric cancer. Compared to these types of interventions in Roux-en-Y reconstructive surgery, the potential for possible postoperative complications was much lower [16].

The anatomical-physiological hypothesis of these complications after single-anastomosis minigastric bypass surgery may be that reflux of bile acids and pancreatic juice, as well as the translocation of the small intestinal microflora into the remainder of the stomach, may be responsible for the development of anastomositis, chronic inflammation, and oxidative stress. All these factors can directly serve as factors for the initiation of intestinal metaplasia of the esophagus and the possible development of adenocarcinoma [17].

Confirmation of the above hypothesis was confirmed in the known first cases of the development of anastomositis, which turned into the development of adenocarcinoma of the esophageal-gastric portion of the resected stomach. The first case was described in the development of carcinoma of the cardiac portion of the esophagus after minigastric bypass grafting [18], and in the second case, a description of the development of adenocarcinoma of the esophagus itself was presented [19]. These clinical examples were characterized by the development of anastomositis at the first stage, followed by malignant neoplasms. The unifying point of these two cases was the presence of chronic reflux in patients both before and after surgery.

Another controversial and insufficiently studied point is the possible influence of nutritional status on the development of complications after minigastric bypass, up to malignant neoplasms. On the one hand, this approach to the study of the issue is associated with the hypothesis of a close relationship between morbid obesity and the incidence of gastrointestinal cancer [20].

On the other hand, there are a number of experimental studies that prove that a lack of folic acid, magnesium or vitamin D can act as concomitant factors in the development of anastomositis after surgery and carcinogenic lesions of the human gastrointestinal tract.

All of the above factors are well known that they can develop after minigastric bypass due to the development of deficiency and malnutrition [21].

Despite the fact that minigastric bypass grafting with one anastomosis has been performed for more than 20 years, the effects of this operation in the remote period are still not fully understood, which could be based on objective data, and, accordingly, could indicate the reasons for the development of negative treatment results. As mentioned above, several cases of gastric cancer have been reported after gastric bypass surgery, including minigastric bypass. However, all of these cancers were localized to the stomach area that had been eliminated from the digestive tract. Only one of these cases was localized to the gastric sac. Two more publications confirm the development of esophageal and stomach cancer in patients after minigastric bypass. However, long-term endoscopic control data have not been performed to date. At the same time, special studies to study the long-term results after minigastric bypass grafting with induced biliary reflux in experimental animals have shown that in a not so distant period (up to 16 weeks) the possibility of developing esophagogastric cancer was not revealed [22].

In order to identify the pathophysiological relationship between the development of anastomositis and malignant neoplasms after minigastric bypass, M. Siebert et al. [23], conducted studies aimed at assessing the effect of surgery on changes in the gastric mucosa and cardiac esophagus using a validated experimental model. Comparisons were made between two models of surgery: minigastric bypass grafting and Roux-en-Y gastric bypass [24].

Taking into account the formation of one anastomosis, an assumption was made about the possibility of the development of anastomosites during minigastric bypass. As an additional potential for the development of anastomositis after minigastric bypass, the researchers also studied the effect of the length of the biliopancreatic part of the anastomosis loop, the possibility of its effect on the mucous membrane of the anastomosis zone, the remaining part of the stomach and the cardiac portion of the esophagus. The study included the assessment of the mucosal inflammatory response, the concentration of bile acids in the gastric sac, and the extent of malabsorption after a long follow-up period [25].

As early as 30 days after minigastric bypass and Roux-en-Y gastric bypass surgery, the researchers showed that none of the animals showed signs of metaplasia, dysplasia, Barrett's esophagus, or esophagogastric cancer. Nevertheless, it should be noted that in 35% of animals after minigastric bypass grafting, morphological signs of anastomositis and esophagitis were revealed. Against this background, perianastomotic hyperplasia was identified compared to the group of animals with Roux-en-Y gastric bypass [26].

A high incidence of anastomositis, esophagogastric lesions that may correspond to reflux, has been noted in animals with a longer biliopancreatic loop of the adductor intestine. In the same animals, cases of malabsorption were recorded in the dynamics of the studies. In other cases, the researchers did not find any link between the presence of the lesion and malabsorption, weight loss, or gastric bile acid concentration.

As a result of anatomical gastric remodeling, the risk of developing biliary reflux and, as a result, long-term complications still leaves minigastric bypass surgery a controversial procedure. Numerous studies provide evidence that the risk of developing anastomositis after minigastric bypass surgery remains possible after observing lesions of the gastric mucosa until the development of esophagitis.

Despite the fact that anastomositis is a sign of chemical gastritis and cannot be strictly interpreted as a precancerous lesion, the physiological mechanisms leading to this pathological condition may be similar to those that lead to damage to the gastric mucosa.

The presence of these lesions indicates the earliest stage of the carcinogenic sequence of lesions of the gastric stump.

The involvement of bile acids in the pathogenesis of reflux after minigastric bypass was revealed in up to 60% of cases in the group of patients with minigastric bypass grafting compared to gastric bypass according to Roux-en-Y (no more than 10%). Several studies have suggested a complex role for biliary reflux, either as an unassociated independent factor or as a potential factor that previously existed in patients with gastroesophageal reflux [27].

Nevertheless, it has been experimentally proven that the residual concentration of bile acids in the gastric sac was not associated with the occurrence of anatomical lesions. This interesting finding suggests that the effect of bile acids on the gastric mucosa alone cannot contribute to the development of esophagogastric anatomical lesions. In addition, a longer adductor loop of the stomach was associated with a higher incidence of anastomosite compared to a shorter loop, despite a tendency to reduce the concentration of bile acids in the gastric sac. This observation contradicts the notion that a longer loop of the adductor portion of the small intestine may reduce the risk of anastomositis due to partial reabsorption of bile acids [28].

Other researchers suggest that nutritional status, in particular malnutrition, may be a contributing factor in esophageal lesions that provoke carcinogenesis. It is well known that gastric bypass surgery can lead to micronutrient deficiencies [29]. It is assumed that the development of mucosal lesions in the anastomosis area is associated with an increased level of sarcopenic malnutrition, and a longer postoperative period is known to increase complications and malnutrition [30].

Experimental studies on rats have shown that minigastric bypass grafting with a longer adductor loop of the intestine led to progressive weight loss of the animal in the early stages after surgery, followed by weight gain in the long term of experimental studies. Against this background, a progressive decrease in the level of vitamin D in blood plasma was observed in animals. In animals with a long adductor loop of the small intestine after minigastric bypass grafting, it led to a more frequent development of esophageal lesions too. Thus, malnutrition and micronutrient deficiencies can weaken the esophageal mucosa against aggressive phenomena secondary to biliary reflux, inhibiting the benefits of minigastric bypass and increasing the likelihood of anastomositis and carcinogenesis.

Contrary results were obtained in other studies, where an association was found to reduce weight loss without the development of anastomositis. The authors suggest that this physiological adaptation promoting nutrient absorption in food-depleted animals has been noted among models with short loop syndrome. However, experimental models with short loop syndrome, malnutrition, and hyperplasia have been described in the colon and small intestine, while changes in the esophagus and stomach have not been studied. Jejunal transposition has been reported to induce hyperplasia of the transposed jejunum. However, studies on the adaptation of the anastomosis zone mucosa (anastomositis) and its contribution to nutrient uptake in malnourished animal models have never been published and deserve further attention.

Despite the fact that the safety of minigastric bypass surgery in the remote period after surgery has not been unequivocally established. It appears that the specific characteristics of minigastric bypass grafting and Roux-en-Y gastric bypass grafting may protect the gastric mucosa from the effects of biliary reflux.

In other experimental studies, esophagojejunal anastomosis in rats resulted in Barrett's esophagus in 92% of cases after 30 weeks and cancer rates of up to 8% without any cocarcinogen in rats, and esophageal metaplasia and mucosal ulcers were observed in 41.7% and 50% of Wistar rats with esophagojejunal anastomosis. These and other experiments suggest the presence of putative protective factors specific to gastric bypass surgery.

The gastrojejunal anastomosis bypasses the pylorus, which probably results in reduced acid production and gastric pressure. This hypothesis is confirmed by the positive results of the study of gastric bypass according to Roux, the symptoms of the disease and the preservation of the function of the esophagus in humans. This explains why Roux-en-Y gastric bypass surgery is considered a therapeutic option in the case of resistant disease. As for the surgical intervention in minigastric bypass, the acidic gastric secretion formed in the gastric sac can be neutralized by basic bile acids, reducing their aggressiveness [31].

In clinical practice, in humans, a long tubular gastric sac left behind after minigastric bypass surgery should mechanically reduce the impact of gastric contents on the esophagus, as opposed to a small gastric sac after Roux-en-Y gastric bypass. In addition, weight loss after bariatric surgery leads to a decrease in the absorption process. Combined, these factors may explain why no cases of esophageal cancer have been described and why only one case was reported 20 years after the first case of minigastric bypass surgery in humans.

One of the most common postoperative complications of gastric resection surgery is the development of gastritis due to reflux of bile and pancreatic juice. This type of complications in the postoperative period is accompanied by a number of characteristic clinical symptoms in the form of pain in the epigastric region of the abdomen, the presence of heartburn, periodic nausea, bile belching. All this is characterized by reflux of bile into the stomach and in the postoperative period reduces the quality of life of patients [32].

Characteristic changes in the mucous layer of the stomach in anastomositis are formations described in detail in most studies devoted to endoscopic monitoring of post-resection operations on the stomach. The authors identified changes in the form of thickening of the gastric mucosa in the area of anastomoses, resembling papillomas with a thick base.

Such formations have the form of thickened adhesions like intestinal villi. Between these thickenings, pits are formed in the gastric mucosa, which take the form of corkscrews. They are covered with a thickened epithelial layer. Histologically, basophilic cytoplasm is revealed, which is saturated with ribonuclease against the background of mucous insufficiency. The nuclei of the altered epithelium of the integumentary layer can be located at

different levels. They acquire an increased color, deform to the point of exfoliation. The nuclei take the form of vesicles [33].

Extracellular changes are characterized by swelling of the plates of the stromal part of the gastric mucosa. The vessels in the area of anastomositis expand and acquire a full-blooded shape, the walls of the vessels thicken. At the same time, the muscle plates continue the process of proliferation and germinate in different opposite directions in the form of leaf branching.

In the areas of the submerged layer of the gastric mucosa, mononuclear infiltration is noted, which is moderately expressed, and in some places weak. In such zones (interfoveal), an increased concentration of neutrophil impurities can sometimes be detected. The infiltrate zones are filled with cells. Among them are plasma cells, fibroblasts and lymphocytes. Moreover, cells that produce immunoglobulins are noticeable. Single cells that produce immunoglobulin-A are detected on the apical parts of epithelial cells. These cells increase in number as you move towards the pits between the shafts. Meanwhile, the most popular are plasma cells that can produce immunoglobulins-G. The maximum level of cells that are found in the area of anastomositis contains plasma cells that produce immunoglobulins-E. Labrocyte cells are also present in large quantities [34].

Apocrine cells of the gastric mucosa directly in the area of anastomosis acquire an altered appearance, characteristic of the pyloric portion of the stomach. Glandulocytes undergo such changes. They are replaced by cells (mucocytes) that actively produce mucus [35].

The development of anastomositis after bariatric surgery is a phenomenon not only associated with the development of bile acid reflux. This pathological process, of course, can be associated with other pathological manifestations, which can be characterized as a complex of pathological changes in the entire gastrointestinal tract. This is due to both the initial state of the system and its restructuring, which occurs against the background of changes in the intestinal microflora [36].

Pro-inflammatory gut microflora can also trigger an immune response through bacterial translocation or influx of lipopolysaccharides and flagellin into the bloodstream to metabolically active tissues [37].

We decided to describe these fundamental aspects of the development of anastomosites after minigastric bypass grafting in the following paragraphs of this chapter of the dissertation.

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MINIGASTRIK SHUNTLASH OPERATSIYADAN SO'NGI ASORATLARI STRUKTURASIDA ANASTOMOSITLAR O'RNI

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Abstrakt

Bariatrik operatsiya semizlik bilan bog'liq morbidlik va o'limni kamaytirish uchun eng samarali aralashuvdir. Shu munosabat bilan eng keng tarqalgan va yaxshi o'rganilgan bariatrik protseduralardan biri laparoskopik minigastrik shuntlash hisoblanadi. Bunday operatsiyalarni amalga oshirgandan ko'p o'tmay aniqlangan insulin sezgirligining oshishi, hatto sezilarli vazn yo'qotish sodir bo'lishidan oldin ham, operatsiyadan keyin metabolizmning zudlik bilan tizimli o'zgarishini ko'rsatmoqda. Bu o'zgarishlar erta, hatto operatsiyadan o'n yil o'tgach ham glyukoza, lipid va qon bosimi metabolizmiga foydali ta'sirlarni ko'rish mumkin. Biroq, operatsiyaning bu usuli 25 yoshdan oshganiga qaramay, operatsiyadan keyingi asoratlarning rivojlanishini asoslovchi mexanizmlar to'liq tushunilmaganligicha qolmoqda.

Tayanch iboralar: minigastrik shuntlash, operatsiyadan keyingi erta asoratlar, operatsiyadan keyingi kech asoratlar

АНАСТОМОЗИТ В СТРУКТУРЕ ПОСЛЕОПЕРАЦИОННЫХ ОСЛОЖНЕНИЙ МИНИГАСТРОШУНТИРОВАНИЯ

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[3]Областная многопрофильная клиника

Абстракт

Бариатрическая хирургия является наиболее эффективным вмешательством для снижения заболеваемости и смертности, связанных с ожирением. В связи с этим одной из наиболее распространенных и хорошо изученных бариатрических процедур является лапароскопическое минигастрошунтирование. Повышенная чувствительность к инсулину, обнаруженная вскоре после выполнения таких операций, еще до получения значительной потери веса, предполагает немедленные системные изменения в метаболизме после операции, которые являются ранними, так как даже через десять лет после операции можно увидеть благотворное влияние на метаболизм глюкозы, липиды и кровяное давление. Однако, несмотря на то что данному методу операции уже более 25 лет, механизмы, лежащие в основе развития послеоперационных осложнений остаются не до конца изученными.

Ключевые слова: минигастрошунтирование, ранние послеоперационные осложнения, поздние послеоперационные осложнения