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THE IMPROVED METHODS AND THEIR ANALYSIS IN BARIATRIC SURGERY.

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Objective: Analysis of bariatric surgery outcomes, risk factors, and prevention of possible complications.

Materials and methods.

At the multidisciplinary clinic of the Tashkent Medical Academy 120 patients underwent bariatric surgery during 2021-2023. Retro- and prospective methods were used.

The results: Early and late complications were significantly reduced after the use of improved techniques.

Conclusion: First of all, the use of high technologies in the implementation of LSR creates a wide opportunity to prevent its intraoperative complications. Early and late complications - metabolic acidosis, carrying out new scientific researches predicting the development of stenoses in advance and developing treatment tactics will avoid uncorrectable complications in the postoperative period.

Key words: BMI, Sleeve gastrectomy, MGS, ligamentum of treitz, obesity surgery, type II diabetes, dyspeptic disorders, stenosis, metabolic acidosis

Relevance of the topic.

It's no secret that along with weight gain, the system of organs performing an important function in the human body goes out of work. According to statistics, those with a body mass index (BMI) of 25-30 kg/m² make up 20% of the society, while those with a body mass index (BMI) of 30-40 kg/m² are more than 21% [4,7,10]. We can see in the data provided by Professor Yashkov Y.I. [1]. It seems that the problem of excess weight is becoming a modern hot topic.

Bariatric surgery currently focuses on two major areas, surgical procedures that reduce the size of the stomach and reduce absorption in the digestive system. Laparoscopic gastric sleeve resection (LSR) is a longitudinal reduction of the stomach volume, in which approximately 60-70% of the total stomach volume is removed. In this way, weight loss is achieved by reducing the intake of food products into the body. Minigastroshunting (MGS) is a small stomach with a transverse resection of the stomach, and by placing a gastroenteroanastomosis in the small intestine 150-180 cm away from the length of the trachea, the absorption of food content in the small intestine is reduced. The efficiency of weight loss in LSR is 75-80%, and in MGS it is 80-85% [3,8]. According to scientists, the tendency to obesity again in LSR is 30% after 5 years, while after MGS this indicator is 20% [3,4]. For patients with diabetes, the reduction of blood sugar to normal values is up to 77% in the early periods after LSR, and more than 80% after MGS [2,5].

In turn, each surgical procedure has risk factors and the possibility of developing complications. According to the information given in the "Journal of Visceral Surgery", the rate of intestinal stenosis after LSR is higher than that of MGS, which is 5%, while the rate of calcium deficiency and enterocolitis after MGS is 15% [1].

Objective: Analysis of bariatric surgery outcomes, risk factors, and prevention of possible complications.

Material and inspection methods.

At the multidisciplinary clinic of the Tashkent Medical Academy, Faculty No. 1 and the clinical base of the Department of Hospital Surgery, 120 patients underwent bariatric surgery during 2021-2023. Surgical operations were performed on patients aged 18 to 60 years. By gender, 77 (64.2%) were women, 43 (35.8%) were men. Patients with a BMI above 32 kg/m² were admitted to surgical procedures, so that BMI 32-35 kg/m² 22 (18.3%), 36-40 kg/m² 33 (27.5%), 41-45 kg/m² 46 (38.3%) and 47 kg/m² and above 19 (15.9%) patients were operated on (tab. 1). 96 (80%) patients underwent LSR and 24 (20%) patients underwent MGS.

Table 1.

Indicators of patients according to BMI (n=120)

BMI kg/m ²	Number of patients	%
32-35	22	18,3
35-40	33	27,5
41-45	46	38,3
46≤	19	15,9

Additional diseases: Ischemic heart diseases were observed in 38 (31.7%) patients, diabetes mellitus 2 degrees in 26 (21.7%), fatty hepatosis in 96 (80%), aseptic necrosis of the femoral head after Covid in 13 (10.8%) patients . In addition, chronic stone cholecystitis 56 (46.7%),

postoperative hernia 14 (11.7%), chov hernia 9 (7.5%), hernia of the esophageal opening of the diaphragm 9 (7.5 %) 37 (30.8%) hanging belly, 18 (15%) patients with post-surgery scars in the abdominal cavity underwent simultaneous surgery.

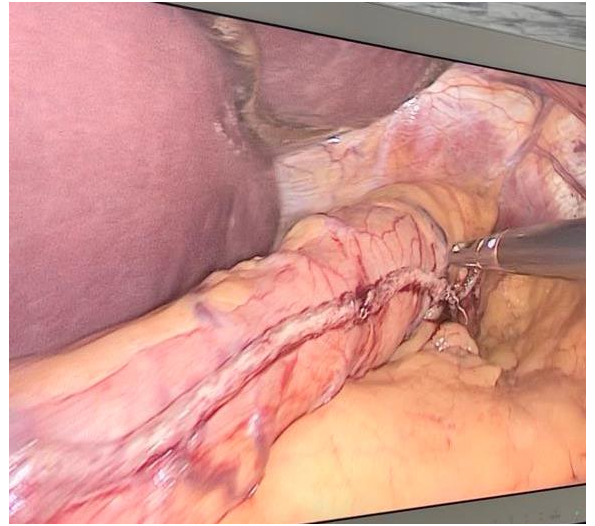
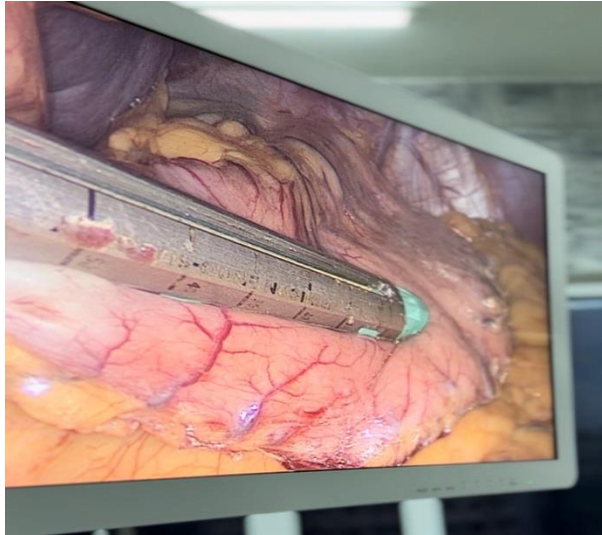
Each patient was monitored by endocrinologist, cardiologist, anesthesiologist. Acute ulcers of the stomach and duodenum, obesity due to endocrinological diseases, decompensation stage of coagulopathy and other somatic diseases were considered as indications against surgical practice.

Clinical and laboratory analyzes were performed by standard methods. From the laboratory analysis, the main attention was paid to the biochemical tests, in which some of the parameters were high limits: ALT and AST were 40 ± 3 ME/l and 49 ± 2 ME/l in 47 (39.2%) patients, total bilirubin in 23 (19.2%) patients. It was 19-20 $\mu\text{mol/l}$. In 63 (52.5%) patients, the amount of cholesterol was $5\pm 0.3\text{mg/l}$.

Depending on the amount of insulin, glycosylated hemoglobin and C peptide in the blood, it was determined that patients are prone to type 2 diabetes. If the patient's blood sugar level is higher than 8.0-10 mmol/l, insulin, glycosylated hemoglobin and C peptide are elevated, respectively, or the patient has been suffering from type 2 diabetes for a long time and the prescribed conservative treatment is ineffective, Such patients were subjected to a MGS. In all other cases, LSR was performed.

LSR surgery was performed as follows. Under general intubation anesthesia, a pneumoperitoneum was established using a Verish needle through the 1st incision 15 cm below the epigastric line and 3 cm to the left of the midline. A 10-mm trocar along the lower umbilical line and a laparoscope were inserted into the abdominal cavity. Abdominal organs are inspected during laparoscopy. The remaining 4 working trocars were inserted from standard points. Mobilization along the greater curvature of the stomach is performed with the help of ultrasonic dissector "Sonosijn" and "LigaSure".

Mobilization, the duodenum was separated from the beginning part to the fundal part, gastric diaphragm, gastric splenic ligaments were dissected. A special 36 Fr bariatric orogastric tube was passed from the stomach to the duodenum and secured. With the help of an echelon 60 mm linear stapler, longitudinal resection of the stomach is performed in order to form a tube-shaped stomach with a diameter of 2-3 cm, parallel to the inserted orogastral probe. In this case, 12 fingers started from the pyloric part 2-3 cm from the beginning of the intestine, and were resected to the fundal part, keeping the angle of Hiss. Continuous sero-serous sutures are placed using Vicryl 2-0. The tightness of the stomach is checked. The cut part of the med is removed. The abdominal cavity is drained. Stitches are placed in the holes (pic.1.).

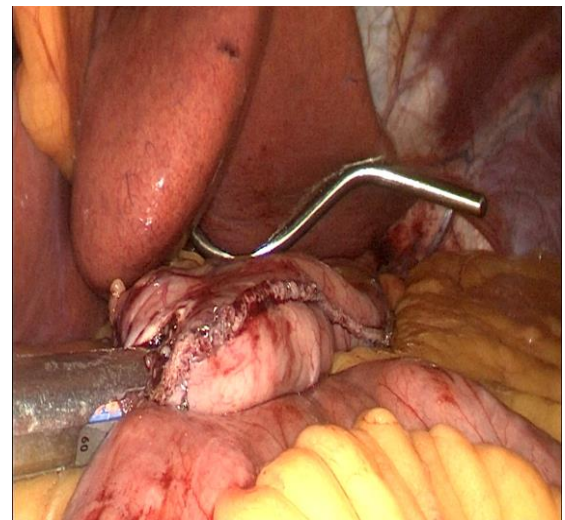
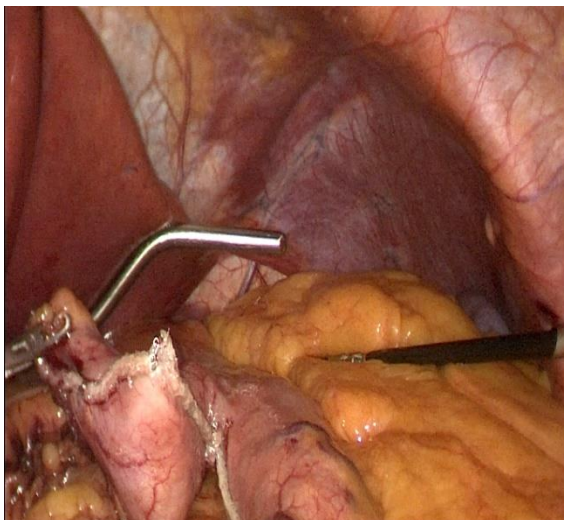


Pic.1. The angle of placement of the suture device when separating the stomach from the pyloric part in LSR.

MGS surgical practice was carried out as follows. Under general intubation anesthesia, optics are inserted 2 cm above the navel using the Hassan method. Abdominal organs are inspected during laparoscopy. Working trocars were inserted from standard points. With the help of ultrasound "LigaSure", a window is opened by coagulating the gastric mesentery from a small curvature angle of the stomach. Through this window, a 60 mm transverse incision is made into the stomach using an Echelon 60 mm linear stapler. A special 36 Fr bariatric orogastral probe is inserted into the stomach. In order to form a tube-shaped stomach with a diameter of 2-5 cm, a longitudinal resection of the stomach is performed from the corner of the end of the transverse section upwards with the help of staplers. The small intestine is measured at a distance of 160-180 cm from the ligament of Treitz, and a "side-to-side" gastroenteroanastomosis is performed using an Echelon 60 mm linear stapler, passing a transverse loop in front of the small intestine in the middle of the lower back pocket of the small intestine. The window with a linear stapler inserted is closed with continuous sutures using Vicryl 2-0. The hermeticity of the stomach and anastomosis is checked. Stitches are placed in the holes (pic.2.).

Pic.2. Stage of establishment of gastroenteroanastomosis in MGS

Simultaneous surgical operations were carried out in standard methods after the primary bariatric operations were performed.



Results and analysis.

Due to the superiority of laparoscopic surgical operations, the low invasive nature, despite the high volume of the operation, most patients were active from the first day after LSR and MGS.

The technical difficulties of LSR are evident in the primary implementers. The correct choice of trocar point should be made individually for each patient. It is appropriate to choose the distance diameter with respect to the optic trocar, taking into account the body consistency.

We placed the second trocar point 10 cm away from the optic in patients, and the third trocar was always positioned 10 cm away and 5 cm above the second trocar. The fourth trocar was placed 4-5 cm above the navel on the lateral edge of the rectus muscle on the right side of the midline. The placement of the fourth trocar is critical because it is through this trocar that the Eschelon gastric resection and suturing device is inserted. Here, in the lower triangular part of the stomach, at the time of resection, we used the method we developed to install the bariatric probe and correctly choose the angle of the incision in order not to cut the inner surface.

That is:

- Improved method of inserting linear stapler cassettes in LSR. The sewing Eschelon Flex hardware cassette we use is 6 cm long, the 1st cassette is placed parallel to the pyloric part of the stomach, and the end part is set at a perpendicular angle of 45° from the area of the incisura angularis to the cassette. The next cassettes are carried parallel to the small curvature. The small stomach thus formed is of uniform diameter throughout its length, and dyspeptic cases are greatly reduced.

- The method of using a nasogastric probe in LSR. The method is as follows. The nasogastric tube we use is 36Fr with a diameter of 1.2cm. Surgery is performed by inserting a nasogastric probe into the stomach. After checking the tightness of the formed small stomach, a nasogastric probe with a small diameter of 16Fr is inserted into the probe during liquid aspiration, liquid aspiration is performed. In this way, the trauma of the mucous membrane of the stomach is prevented.

- An improved method of using auxiliary equipment for inserting linear stapler cassettes in LSR.

The proximal part of the suture apparatus does not fully compress the stomach. But while sewing through the machine, the last 1 cm is also compressed. It is at this time that the stomach is pulled through the auxiliary gastric clamp while the cassette is being sutured. This ensures that the stapler line is straight and does not bend. The next cassettes are carried parallel to the small curvature.

The duration of LSR was longer, the higher the excess weight, the more diabetes mellitus type 2.

If BMI is 35-40 kg/m², 60±5 min. if there is no DM 2 type, 80±5 min. if there is DM2. BMI 40-50 kg/m² if there is no DM 90±5 min., if there is DM2 type 100±5 min. In those with BMI above 50 kg/m², it was 100±5 minutes without DM2 type, and 110±5 minutes if DM2 type was present (Table 2).

LSR was performed in 60 ± 5 minutes in 36 (37.5%) patients with BMI up to $40\text{kg}/\text{m}^2$. In DM 2 types and BMI above $50\text{kg}/\text{m}^2$, the working angle radius of the instruments is reduced.

Table 2.

Duration of surgical procedures

BMI, kg/m^2	Practice time (minutes) in patients without type DM 2	Procedure time (minutes) in patients with type DM 2
35-40	60 ± 5	80 ± 5
40-50	90 ± 5	100 ± 5
50	100 ± 5	110 ± 5

In addition, it is determined that there are scar processes between the back surface of the stomach and the pancreas. The duration of LSR took a little longer than the time taken for laparoscopic dissection of such scars and averaged 110 ± 5 minutes in 33 (34.3%) patients. Accordingly, additional time of $60-70\pm 5$ minutes was added for simultaneous surgical operations.

Table 3.

Early and late complications after LSR (n=96)

Complications	In the early period	After 2 months
Dyspeptic conditions	11 (11,4%)	2 (2,1%)
Stenosis	3 (3,1%)	1 (1,05%)
Metabolic acidosis	0	5 (5,2%)
Total	14 (14,5%)	8 (8,3%)

After LSR operations, the days of intensive inpatient treatment of patients were 3 ± 1 days. In the early postoperative period, 48 (50%) patients had no complaints. 18 (39.6%) patients had dyspeptic symptoms from the first day and were prescribed drugs belonging to the group of dopaca receptor blockers, after which dyspeptic symptoms disappeared. In 2 (2.1%) patients, despite the prescription of conservative drugs, dyspeptic symptoms persisted for 1 month. Intraoperative analyzes showed that the angle of Hiss is not widely preserved and the stapler of the gastric incision line is not in the same line, resection by tilting the anterior and posterior walls can lead to the violation of gastric synchronous peristalsis. Accordingly, in the following procedures, we tried to maintain the intraoperative angle of Hiss in the form of a long ridge at an acute angle in patients, that is, to perform the resection leaving a distance of 4 cm from the front surface of the diaphragmatic legs of the stomach dome, and the same location of the stapler cutting line from the pyloric part to the fundal part. In total, 11 (9.16%) patients had dyspeptic symptoms in the early period after surgery. In the long term, dyspeptic symptoms were not observed.

In the second month of LSR, 5 (5.2%) patients referred to us with symptoms of metabolic acidosis. The study of the reasons for the development of acidosis in 3 (3.1%) of the patients showed that in these patients, according to the preoperative blood biochemical analysis, ALT, AST, blood sugar, glycosylated hemoglobin, and C peptide were in the upper limit of the norm, and for unknown reasons, in the short term, the average It was found that it may be related to those who lost 20 ± 5 kg. In the remaining 2 (2%) patients, these parameters were found to be in the middle

range, weight loss was 10 ± 2 kg. Metabolic acidosis resolved in all patients after conservative treatment.

After LSR, 3 (3.1%) patients had early and 1 (1.05%) late gastric partial stenoses. Gastroduodenoscopy examination was conditionally performed 30 days after the operation, and the same patients underwent barium contrast examination of the gastrointestinal tract. According to the results, in the post-operation period, 2 (2.1%) patients had a narrowing of the inner surface of 2 cm in the body part of the stomach, and 3 cm above the pyloric part in 1 (1%) patient. Patients were treated with conservative measures, anti-inflammatory and secretion-reducing, anti-spasmodic drugs, and amplipulse physiotherapy. After that, in 2 (2.1%) patients, the symptoms of stenosis were eliminated, in 1 (1.05%) patient, due to retention, endoscopic balloon dilatation was performed in 2 sessions and the symptoms of stenosis were eliminated.

No adverse changes were observed in patients in the early stages after MGS procedures. Average days of inpatient treatment of patients were 4 ± 1 days. 13 (54.16%) patients had an average blood sugar level of 5 ± 2 mmol/l from the first day after the MGS. In 2 (8.33%) patients, the amount of sugar in the blood was 9 ± 2 mmol/l, and these patients were prescribed insulin according to the conclusion of the endocrinologist. Weight loss continued synchronously in all patients. In the late period, 4 (16.7%) patients showed signs of enteritis with rapid diarrhea. Patients were prescribed additional enzyme and anti-diarrheal medications. 3 (12.5%) patients had hair loss, broken nails, tooth loss, neurosis symptoms. It was found that the average amount of calcium in the blood is below 2.25 mmol/l. The patients were prescribed calcium preparations and vitamin complex, and the above symptoms disappeared. In 1 (4.16%) patient, it was observed that the amount of total protein decreased to below 40 mmol/l, and in this patient, the distance of gastroenteroanastomosis was 180 cm along the length of the trachea. Our results showed that 98 (81.67%) of the patients who underwent bariatric procedures had positive results, and no complications were observed in the patients during the postoperative period. Body mass index decreased by $40\pm 5\%$ on average. In 22 (18.3%) of our patients, early and late complaints remained and were eliminated by conservative measures, respectively. According to statistical data, the percentage of dyspeptic cases after LSR is 24%, which in most cases depends on the technique of surgical practice [1,4,8]. After using several technical improvements, dyspeptic symptoms can be observed in our results to lower rates, but in 12% of our patients, it is observed that they persist for up to 1 month.

Metabolic acidosis appears in the body as a result of several pathological conditions. Often, rapid changes in liver function, severe degrees of fatty hepatosis, and kidney failure are the clinical manifestations [3,4,9,10]. In our case, metabolic acidosis after LSR was mainly due to rapid weight loss and high normal values in the preoperative period due to biochemical analysis. Nevertheless, in some cases, the normal biochemical index and its development even in the case of slow weight loss indicate the need to predict the development of metabolic acidosis in advance. According to the European Association of Bariatric Surgeons in 2022, late stenoses are one of the dangerous complications of LSR [10]. Often in stenoses, further reconstructive surgical procedures are suggested. The development of early stenoses often depends on the technical aspects of surgical procedures, while the late stenoses depend on the long and rough continuation of mucosal fibrosis in the processes of scarring in the body. From surgical practices, measures aimed at determining who may be prone to this and preventing the development of stenoses have been developed to prevent such complications [3,5].

Treatment of type 2 diabetes has become a very hot topic now. Prof. According to Scott Shikora, a radical solution in the treatment of this disease is bariatric procedures. After LSG, the blood sugar level returns to normal in 77% of cases, and after MGS, a good result is achieved in 88% [4]. However, the development of enteritis, avitaminosis, calcium and protein deficiency in the late period after MGS indicates that MGS should be performed individually. Today, there are several causes of obesity, and bariatric surgery is generally considered to be beneficial only in cases of alimentary obesity. However, clinical analyzes show that in the hyperthyroid form of gout, there is a mixed form of obesity, that is, the presence of an alimentary factor. Accordingly, the appropriateness of bariatric surgery in such cases remains a controversial situation. Thus, a large proportion of the results obtained in our bariatric surgery practices have been positive. However, this surgical practice requires the development of technical and tactical individual choices. Our analysis showed that, in relative terms, diabetes is more effectively treated by MGS for 2 types of diabetes, LSG for obesity is more effective, but there is no clear limit when choosing to perform LSG and MGS, because both practices are not free from shortcomings..

Conclusions:

1. First of all, the use of high technologies in the implementation of LSG creates a wide opportunity to prevent its intraoperative complications. Correct choice of the angle in the pyloric part of the stomach after the insertion of the suturing equipment in the LSG, holding the stapler line in the same plane and replacing the bariatric probe with a 16Fr zone to check the tightness of the stomach at the end of the operation, firstly expands the radius of the intraoperative working area, and secondly, prevents postoperative complications.
2. LSG surgery should be performed in patients with a BMI above 32 kg/m², for which insulin, S-peptide and glycosylated hemoglobin values must be normal.
3. Early and late complications - metabolic acidosis, carrying out new scientific researches predicting the development of stenoses in advance and developing treatment tactics will avoid irreparable complications in the postoperative period.
4. It is advisable to take insulin, S-peptide and high glycosylated hemoglobin levels and uncontrollable blood sugar levels as a guideline for performing the MGS. It is necessary to individually select the distance of gastroenteroanastomosis and develop strict requirements for this surgical practice.
5. It is necessary to determine the role of bariatric surgery in mixed obesity and develop guidelines.

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