

Evaluation of the corrective effect of modified laparoscopic longitudinal gastric resection practice on existing metabolic changes in morbidly obese patients

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Abstract: To study the corrective effect of laparoscopic longitudinal gastric resection (LLGR) on obesity-related metabolic disorders in morbidly obese patients. This scientific work is based on the results of a comprehensive examination and treatment of 187 patients treated for morbid obesity in our clinical bases from 2021 to 2023. Analysis of comorbidities in the compared groups showed that 64% of the comparison groups had metabolic disorders. The majority of these patients were patients with 3rd degree of obesity. Positive changes in lipidogram analysis were observed in patients after LOBR procedure. Also, when hemostasis indicators were studied, convincing positive changes were observed in the 1st and 3rd stages of coagulation hemostasis. In patients with chronic obesity, our recommended modification of LOBR increased cardio esophageal and gastric stapler line strength, eliminating the 2.2% stapler line failure observed in our control group in our main cohort. It also led to a reduction in gastroesophageal reflux disease symptoms from 14% to 6.1%. In conclusion, these pathological changes are closely related to obesity, and the elimination of obesity led to the elimination of these metabolic disturbances

Keywords: metabolic syndrome, morbid obesity; bariatric surgery; concomitant diseases; laparoscopic longitudinal gastric resection

Actuality. Obesity is a chronic, heterogeneous disease according to its etiology and clinical manifestations, characterized by the progressive development of its natural course and excessive accumulation of fat mass in the body. Morbid obesity is the accumulation of excess fat in the body with a BMI of ≥ 40 kg/m² or a BMI of 35 kg/m² and the presence of serious obesity-related complications. Obesity and related metabolic diseases are urgent problems of modern medicine, because they lead to the development of a number of serious and dangerous diseases [24,27]. Currently, approximately 2.2 billion people worldwide are overweight, of which approximately 1.5 billion are obese, with both indicators continuing to rise [10].

The World Health Organization (WHO) has defined obesity as an increase in the percentage of body fat that in turn impairs human health and well-being, and has declared it a "global epidemic" due to its alarming increase in prevalence. Obesity is a worldwide health problem affecting children, adolescents, and adults, and is associated with comorbidities such as hypertension, dyslipidemia, type 2 diabetes, cancer, osteoarthritis and sleep apnea[12].

Metabolic syndrome is a combination of metabolic, hormonal and clinical diseases in the human body, the basis of which is obesity [5,11,13]. Metabolic syndrome is a complex of symptoms including abdominal obesity, insulin resistance, hyperglycemia, dyslipidemia, and arterial hypertension[8,23]. All these pathological disorders are linked to one pathogenetic chain. In addition, this syndrome is often accompanied by hyperuricemia, impaired hemostasis, subclinical inflammation, obstructive sleep apnea-hypopnea syndrome [1,2,3,4,5,7,9].

Bariatric surgical procedures are recommended for patients with morbid obesity and obesity-related comorbidities. Laparoscopic longitudinal gastrectomy is an important bariatric surgery used in the treatment of morbidly obese patients[14,18, 19, 20, 22].

Objective: To improve the results of surgical treatment in patients with morbid obesity through the corrective effect of modified laparoscopic longitudinal gastric resection on existing metabolic disorders.

Materials and methods: Our research work was conducted on the basis of comprehensive examination and treatment results of 187 patients with morbid obesity during the years 2021-2023 at the bases of the Department of Surgical Diseases in Family Medicine of the Tashkent Medical Academy. In the control group (92 patients), patients with morbid obesity underwent conventional longitudinal gastric resection. The main group (95 patients) consisted of patients who underwent modified gastric longitudinal resection (No. IAP 07203) proposed by us. When studying the age and gender distribution of the patients in our research work, it was found that the main group of patients were young and middle-aged women. 187 patients with different body mass indices with morbid obesity in our research groups were operated on, 153 (81.8%) patients aged 18 to 44 years. 29 (15.5%) patients aged 45 to 59 years, 5 (2.7%) patients aged 60 to 74 years. In our control group, women made up 92.4%, men made up 8%. In our core group, women were the majority, 79% and 21%, respectively.

Data analysis shows that in patients with morbid obesity, when their body mass index (BMI) was studied, bariatric patients with obesity were mainly grade III (77% in the main group, 59% in the control group) and grade II (23% in the main group, 41% in the control group) it was noted that he applied for practice (picture-1.).

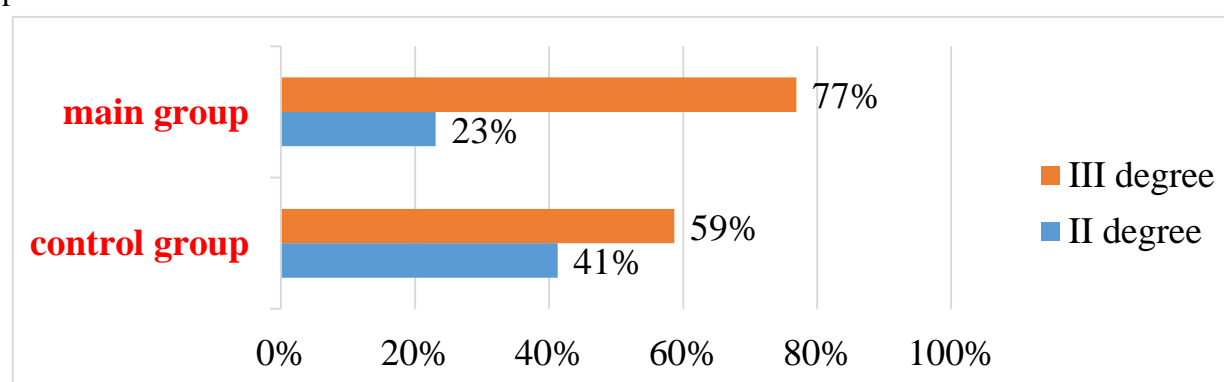


Figure 1.

Distribution of patients with MO in groups according to the level of obesity (WHO, 1997)

In order to study the effect of bariatric procedures on metabolic processes, after 6 months we again determined blood lipid parameters. In particular, it was found that the amount of triglyceride decreased by 2.14 ($P<0.001$) and 1.56 ($P<0.05$) times in the blood serum of the main and control group patients 6 months after surgery (Table 2). In this case, the amount of triglyceride decreased by 2.14 ($P<0.001$) and 1.51 ($P<0.05$) times in patients with 2nd-degree of obesity, and 2.02 ($P<0.001$) and 1.59 ($P<0.05$) in patients with 3rd-degree of obesity. <0.01) times decrease was observed. It should be noted that the proposed surgical procedure resulted in a 1.42 ($P<0.05$) and 1.27 ($P<0.05$) times stronger reduction of triglyceride in the blood serum of patients with 2nd and 3rd degree obesity compared to the control group.

In the blood serum of the main and control group patients, 6 months after surgery, total cholesterol content was found to decrease by 1.24 ($P<0.05$) and 1.18 ($P<0.05$) times. In this case, in patients with obesity of the 2nd degree, total cholesterol content decreased by 1.16 ($P<0.05$) and 1.17 ($P<0.05$), while in patients with obesity of the 3rd-degree, it was 1.21 ($P<0.05$) and A decrease of 1.18 ($P<0.05$) times was observed. It is worth noting that the proposed and conventional bariatric procedures had approximately the same effect on patients' serum total cholesterol. It is worth saying that if hypercholesterolemia was preserved in 4 (8.9%) patients after traditional bariatric, this indicator did not differ from the norm in all patients after the proposed method.

Traditional bariatric practice did not significantly affect the amount of XS in serum HDLs, although the proposed practice led to an increase of this indicator by 1.47 ($P<0.05$) times after 6 months (Table 3). Similar changes were observed in patients with 2nd degree of obesity, that is, if in the blood of control group patients there was a tendency to increase the low amount of XS in HDLs, in the blood serum of patients in the main group this indicator increased 1.41 ($P<0.05$) times. This indicator increased by 1.20 ($P<0.05$) and 1.50 ($P<0.05$) times in patients with 3rd degree obesity of the main and control groups. It is worth noting that the proposed surgery resulted in a statistically significant increase in serum total cholesterol in patients at all levels of obesity compared to the control group.

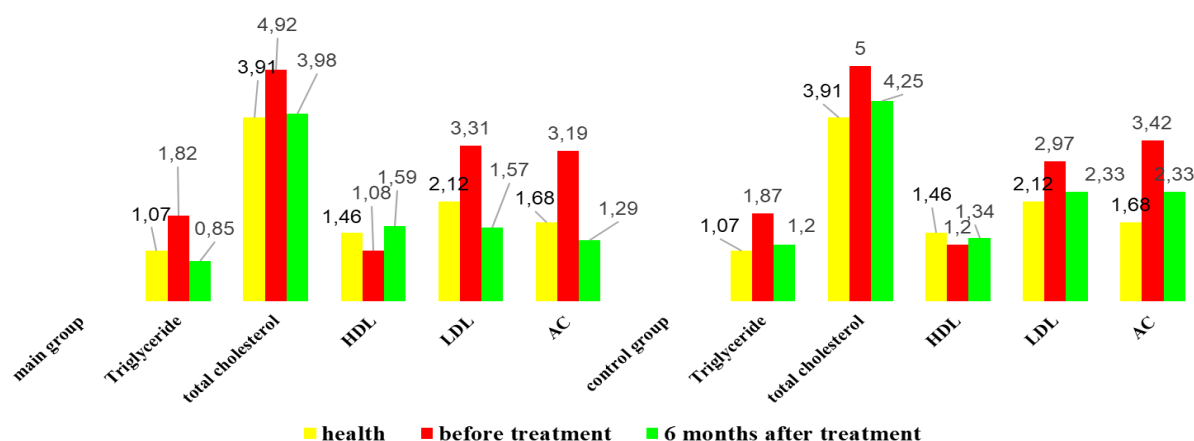


Figure 2. Serum lipid metabolism indicators after LLGR surgery in control groups, M±m

Traditional bariatric procedures tended to decrease the high concentration of XS in LDLs in the blood serum of patients with 2nd degree obesity, while in 3rd degree obesity, we reduced it by a statistically significant 1.31 ($P<0.05$) times. Recommended bariatric treatment resulted in a 1.72-fold ($P<0.01$) and 1.81-fold ($P<0.01$) reduction of this index in patients with 2nd and 3rd degree obesity, respectively. It is worth saying that the proposed surgical operation in the blood serum of patients. In general, if the amount of XS in HDLs in the control group decreased by 1.27 ($P<0.05$) times compared to the initial value, after the proposed operation it was 2.11 ($P<0.001$) times decreased, that is, the difference between the main and control groups was 1.66 ($P<0.01$) organized. It should be noted that hypoalphaproteinemia was not observed after treatment in either the main or control groups, while hyper- β -lipoproteinemia was not observed in the main group, and it remained in 4 (8.9%) patients in the control group.

As we noted above, the atherogenic index was higher in obese patients. After different types of bariatric surgery, this coefficient decreased by 2.47 ($P<0.001$) and 1.47 ($P<0.05$) times in the main and control groups, and 1.29 ± 0.06 and 2.33 ± 0.11 organized. If its indicator decreased by 2.34 ($P<0.001$) and 1.44 ($P<0.05$) times to 1.30 ± 0.08 and 2.34 ± 0.14 in patients with 2nd degree obesity, then in 3rd degree obesity this decrease is 2.8 ($P<0.001$) and 1.43 ($P<0.05$) times decreased, and was 1.29 ± 0.08 and 2.32 ± 0.17 (Fig. 4). It is worth saying that if the atherogenic coefficient in the main group does not differ much from the normative indicators, in the control group they are statistically reliable in the general group, 1.37 in 2nd and 3rd- degree obesity ($P<0.05$); 1.39 ($P<0.05$) and 1.38 ($P<0.05$) times remained high 1.80 ($P<0.001$) compared to the main group indicators; 1.81 ($P<0.001$) and 1.80 ($P<0.001$) times higher.

Therefore, the proposed surgical procedure leads to a decrease in the atherogenic coefficient and prevents dyslipoproteinemia. As a proof of this, hypo-a-lipoproteinemia, type IIb of dyslipidemia and type IV of dyslipidemia were not detected in the main group of patients, while hypo-a-lipoproteinemia was not detected in the control group, type IIb of dyslipidemia - 8.9%, and type IV of dyslipidemia - in 2.2% of patients. was preserved.

Thus, a statistically reliable change in lipid profile and glucose concentration indicators was observed in the main and control group patients after surgery. Interestingly, in the main group compared to the control group, there was a positive change in the dynamic change of HDL, atherogenic coefficient and plasma glucose concentration indicators, higher than that of the control group, on the other hand, no statistically significant change was detected in the indicators of the control group compared to the main group.

Carbohydrate metabolism-specific studies were performed in obese primary (proposed gastric resection) and control (conventional resection) group patients according to degree of obesity. It is known that one of the causes of obesity is carbohydrate products. Obesity is often accompanied by prediabetes and type 2 diabetes. In our study, healthy donors had a blood glucose level of 4.72 ± 0.12 mmol/l, while obese patients tended to increase glucose levels, but these values were around the upper limit of normal values.

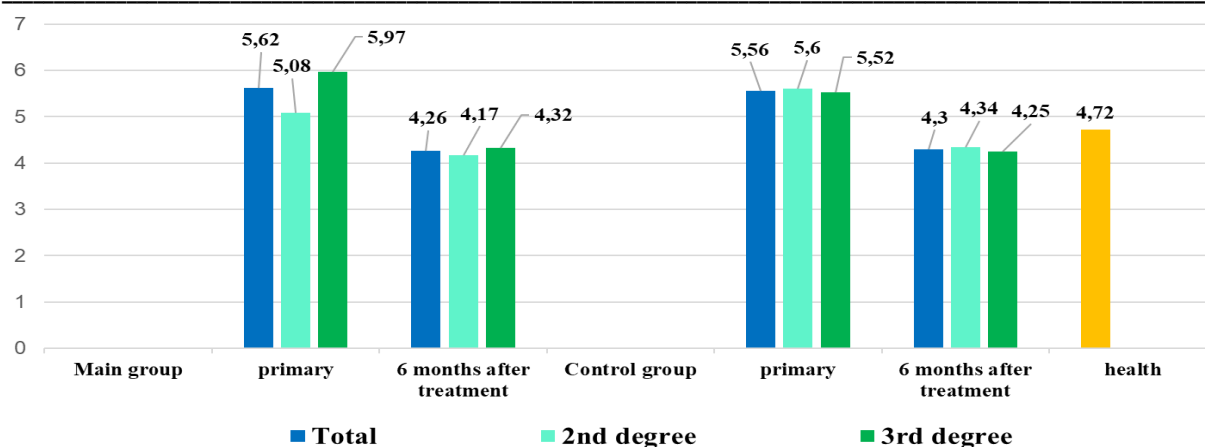


Figure 3. Indicators of carbohydrate metabolism in blood serum after LOBR surgery in control groups, $M \pm m$

It is known that the effectiveness of bariatric surgery is not observed in the early stages. In order to study the effect of bariatric procedures on metabolic processes, we determined the parameters of carbohydrate metabolism again after 6 months. The obtained results showed that after 6 months in the main group, all 20 patients with 2nd degree obesity (100%) were overweight, while in the control group 4 out of 25 patients (16%) had 1st degree obesity, 1 (4%) had normal weight and 20 (80 %) overweight was observed.

Surgery in the main and control groups resulted in a 1.23 ($P < 0.05$) and 1.29 ($P < 0.05$) fold reduction in blood glucose after 6 months. This indicator was 1.22 ($P < 0.05$) and 1.29 ($P < 0.05$) times in patients with 2nd- degree obesity, 1.38 ($P < 0.05$) and 1.3 ($P < 0.05$) in 3rd-degree obesity. < 0.05) times decrease was found.

So, bariatric procedures prevent hyperglycemia. In this case, good positive results were observed in the practice of the proposed longitudinal resection of the stomach. When the aforementioned indicators were compared with the results of a meta-analysis, it was observed that a positive change in the carbohydrate profile occurred in patients as a result of various resections of the stomach.

Coagulation factors are of great practical importance in evaluating the effectiveness of surgical procedures performed in the main and control groups in patients with morbid obesity. To study the vascular platelet stage of hemostasis, we counted the number of platelets in the blood analysis. The study showed that in the control group this indicator was $244 \pm 38.9 \times 10^9/l$, while the average amount of platelets in the patients in the main and control groups was $390 \pm 125 \times 10^9/l$. The obtained results showed that thrombocytosis develops to a certain degree in obesity and that this indicator depends on the degree of obesity. This showed an increase in platelet function and a tendency to hypercoagulability in patients.

Coagulation hemostasis consists of a cascade of reactions involving plasma factors. In the group of healthy donors, APTT was 32.1 ± 0.93 seconds, while in the main and control group of patients suffering from obesity, the APTT time in plasma was 21.82 ± 0.50 ($P < 0.01$) and 24.98 ± 0.57 ($P < 0.01$) was observed to be reduced to seconds. Reduction of APTT index in obese patients compared to healthy donors indicated a hypercoagulable shift in the first stage of plasma hemostasis.

The amount of fibrinogen was determined to characterize the third stage of blood clotting. The study of the amount of fibrinogen showed a significant increase in the concentration of fibrinogen, which indicated the existence of a hypercoagulable shift in the third stage of blood clotting coagulation hemostasis. In particular, in patients in the main and control groups, the amount of fibrinogen increased by 1.66 ($P < 0.01$) and 1.47 ($P < 0.015$) times compared to the standard values, 482.00 ± 21.66 and 426.98 ± 16.83 mg%. The amount of fibrinogen in the 2nd degree of obesity was 1.65 ($P < 0.01$) and 1.33 ($P < 0.05$) times increased to 480.60 ± 31.31 and 386.00 ± 15.88 mg% in the main and control groups the increase was 1.66 ($P < 0.01$) and 1.65 ($P < 0.01$), and these indicators It increased to 483.12 ± 28.81 and 478.20 ± 29.10 mg%. In the group of healthy donors, this indicator was 290.4 ± 60.5 mg%.

Similarly, changes in coagulation parameters depending on the level of obesity as a result of longitudinal resection of the stomach performed in the main group during the study were investigated.

When analyzing the first stage of coagulation hemostasis, 6 months after surgery, there was a tendency to prolong the APTT in the main and control groups. No differences were found between the groups, and all scores remained statistically significant short of the norm. In particular, the time of APTT in the plasma in patients of the main and control groups was shorter by 1.32 ($R < 0.05$) and 1.27 ($R < 0.05$) compared to the standard indicators. In 2nd degree obesity they are 1.29 ($R < 0.05$) and 1.28 ($R < 0.05$) times, and in 3rd degree obesity they are 1.34 ($R < 0.05$) and 1.26 ($R < 0.05$) was found to be short compared to standard indicators. The obtained results show that the tendency to hypercoagulability remains in the first stage of plasma hemostasis.

The parameters of the second stage of plasma hemostasis in the main and control groups were not significantly different from their pretreatment values after surgery. It was found that prothrombin time, PTI and INR shifted in the positive direction in hypercoagulable state observed in morbid obesity.

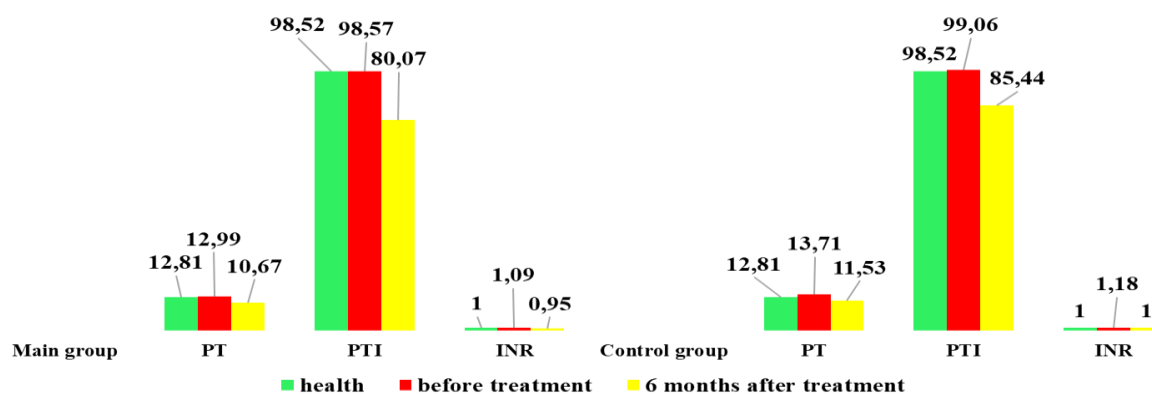


Figure 4. Changes in hemostasis indicators in our comparison group patients.

A statistically significant decrease of 1.46 ($R < 0.05$) and 1.34 ($R < 0.05$) was observed in the main and control groups after 6 months of surgery, which represents the 3rd stage of coagulation hemostasis (Table 7). In the 2nd degree of obesity, fibrinogen content decreased by 1.35 ($P < 0.05$) and 1.32 ($P < 0.05$) times in the groups, compared to the values before treatment, while in patients with the 3rd degree of obesity, it decreased by 1.59 ($P < 0.01$) and 1.36 ($P < 0.01$). Plasma fibrinogen content remained statistically significantly higher than that of the healthy donor group.

CONCLUSION:

- 64% of patients with morbid obesity have metabolic disorders, which aggravate obesity and increase the risk of premature death in these patients.
- After 6 months of bariatric treatment, total cholesterol, cholesterol in LDLs, atherogenic coefficient, and especially triglycerides decreased, cholesterol increased in HDLs, and such positive changes were clearly identified in the main group of patients. If hypo-a-lipoproteinemia, type IIb of dyslipidemia and type IV of dyslipidemia were not detected after the proposed method, hypo-a-lipoproteinemia was not detected in the control group, type IIb of dyslipidemia remained in 8.9%, and type IV of dyslipidemia remained in 2.2% of patients left.
- As a result of the corrective effect of gastric longitudinal resection on existing metabolic indicators in patients suffering from morbid obesity, it improves the course of patients in the early period and concomitant diseases, and has a positive effect on the clinical course of not only prediabetes, but also diabetes.
- Significant statistically significant positive changes were observed in the 1st and 3rd-stages of coagulation hemostasis after longitudinal resection of the stomach compared to the hemostasis parameters of the control group. Surgery performed in the main group showed that the treatment was effective regardless of the degree of obesity in patients.

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