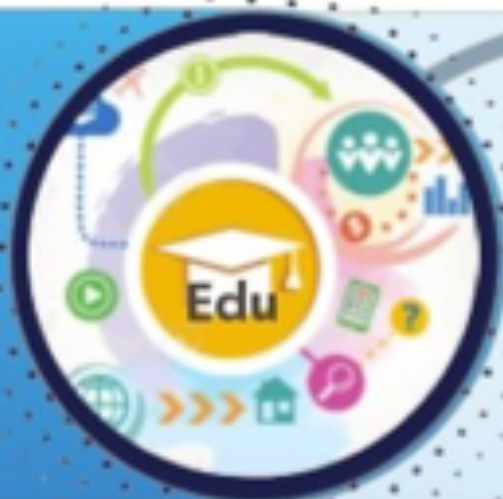


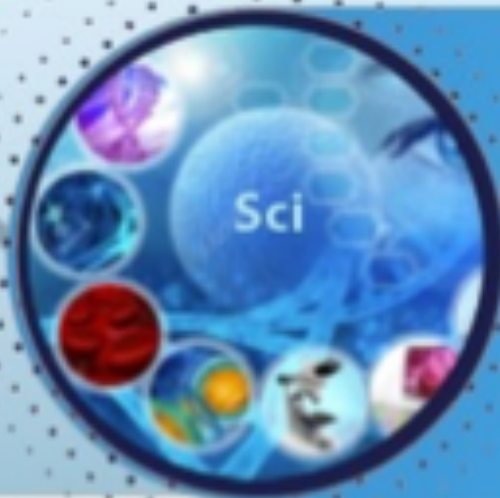


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Efficacy of Bariatric Surgery in the Treatment of Patients with Metabolic Syndrome in Association with Gastroesophageal Reflux Disease

Khakimov M.Sh., ¹Khamdamov A.B.

ABSTRACT

The term "bariatric" surgery, derived from the Greek word baros, meaning weight, defines surgical procedures aimed at significant weight loss. Accordingly, the goals of bariatric surgery initially evolved around achieving substantial, sustainable weight loss. Weight loss is only one of the outcomes of such an operation. Bariatric surgery may be associated with significant other health benefits, including improving or normalizing hyperglycemia. Hyperlipidemia, blood pressure, obstructive sleep apnea, and improved quality of life. Due to the broad benefits of weight loss and the growing evidence that some bariatric surgeries cause metabolic changes that cannot be fully explained by their effects on body weight alone, the name "bariatric metabolic surgery" is becoming more appropriate.

Keywords: bariatric and metabolic surgery, metabolic syndrome, gastroesophageal reflux disease

Most of the literature sources testify to the high effectiveness of bariatric surgery (BS) in treating Obesity and its complications, such as type 2 diabetes mellitus (T2DM). After BS, in contrast to conservative (drug treatment), the patient's weight is significantly reduced, and in the long term, the risk of T2DM progression is reduced in 78% of patients with metabolic syndrome (MS).

Detailed studies in this area have shown that after BS in patients with MS, the risk of developing T2DM is reduced to 87% of cases. Such an effect of BS is ahead of the possibilities of measures to change the patient's lifestyle in patients with insulin resistance and with a moderate level of Obesity (excess body weight).

This reduction in risk is at least twice that of lifestyle interventions in people with moderate Obesity and predi-

¹ **Corresponding author:** Assistant Professor, Department of Surgery, Bukhara State Medical Institute, Bukhara, Uzbekistan, dr.hamdamov@mail.ru

abetes. The unstable effectiveness of lifestyle interventions in overweight patients was described in the publication by J. Lindstrom et al. [1]. The authors emphasize that lifestyle interventions can prevent impaired glucose tolerance from worsening before the onset of MS, at least as long as the intervention continues. As part of an extended follow-up to prevent MS, the authors assessed the extent to which initially achieved lifestyle changes and risk reductions persisted after discontinuing active counselling. They examined overweight patients, middle-aged men (n=172) and women (n=350) with impaired glucose tolerance. All patients were randomly assigned to an intensive lifestyle or control group. After 4 years of the active intervention, participants still free of MS were followed up for an average of 3 years, with a median of 7 years of total follow-up. The study assessed the incidence of MS, changes in body weight, physical activity levels, and dietary intake of fat, saturated fat, and fibre. In studies and follow-up, the incidence of MS was 4.3 and 7.4 per 100 person-years in the intervention and control groups, respectively ($p=0.0001$), indicating a 43% reduction in relative risk. The risk reduction was associated with success in achieving the intervention's weight loss goals, reducing total and saturated fat intake, increasing dietary fibre intake, as well as increasing physical activity. The positive lifestyle changes achieved by participants in the intervention group persisted after discontinuation of the intervention, and the corresponding incidence rates during the post-intervention follow-up period were 4.6 and 7.2 ($p=0.0401$), indicating a 36% reduction in relative risk. Overall, lifestyle interventions in people at high risk of developing MS led to sustained lifestyle changes and a reduction in the incidence of T2DM that persisted after discontinuation of individual lifestyle counselling.

The International Diabetes Federation [2], the American Diabetes Association [3], and other authoritative specialized organizations [4] recognize BS as an option for treating obese patients and T2DM. However, they all agree that it should not be used to prevent T2DM.

Drug treatments for MS aimed at prioritizing glycemic control are ideally also considered an intervention in the patient's lifestyle. Unfortunately, this approach is not always practical in patients with MS due to the need for regular monitoring of glycemia levels and compliance with dietary restrictions, which is sometimes not feasible in the presence of Obesity. In this regard, insulin therapy remains the most popular drug intervention despite the possibility of leading to weight gain in the patient.

BS aims to reduce weight and maintain weight loss by altering energy balance, primarily by reducing food intake and modifying the physiological changes that lead to weight regain. In addition to weight loss, there also appear to be independent metabolic benefits related to the effects of incretins and possibly other hormonal or neural changes after some surgical procedures. For example, rapid and sustained improvement in glycemic control can be achieved within a few days of gastric bypass surgery before significant weight loss becomes apparent.

In the article, J.L. Colquitt et al. [5], including patients with and without T2DM, concluded that BS resulted in greater weight loss than conventional treatment in obesity class I ($BMI > 30 \text{ kg/m}^2$), severe Obesity accompanied by improvements in comorbidities such as T2DM and hypertension, and improved quality of life-related to health.

The Swedish study "Subjects of Obesity" clearly demonstrated the prevention and sustained remission of T2DM in a group of 2037 [6] severely obese patients who decided to undergo BS, compared to the control group after 2 and 10 years of follow-up.

The degree of remission of T2DM depends on the extent of weight loss and weight regain, the duration of T2DM, the requirements for hypoglycemic therapy before surgery, and the choice of BS. In addition, outcomes will be influenced by each patient's desire to change their diet and physical activity level as part of ongoing multidisciplinary treatment.

Notably, there is only one acceptably designed prospective randomized controlled trial in which BS has been explicitly studied as a treatment for MS and T2DM. It compared laparoscopic adjustable gastric banding as part of a comprehensive treatment program with conventional MS therapy, which focused on weight loss through diet and exercise. After 2 years, remission of T2DM was significantly more common in those who underwent surgery (73 versus 13%).

Severe Obesity is associated with a large number of health problems in addition to T2DM. A review of more than 1.4 million participants in prospective studies, mainly from North America, Europe, and Australia, shows a consistent progressive increase in mortality risk ratios with increasing BMI [7]. A similar analysis by the Collaborative for Prospective Studies found that the risk of death associated with MS was quadrupled for those with morbid Obesity [8].

A follow-up of participants in the Swedish obesity study at an average of 11 years found that BS was asso-

ciated with a 29% reduction in all-cause mortality after accounting for gender, age, and risk factors in this severely obese group.

BS has also led to a specific reduction in the incidence of cancer in women. Other studies have confirmed this advantage in mortality compared to control subjects included in the group.

In a large retrospective cohort study, nearly 8000 patients undergoing gastric bypass surgery were compared for long-term mortality with age, sex, and BMI matching control subjects who applied for a driver's license (Utah, USA) [9]. The analysis showed an adjusted long-term reduction in all-cause mortality of 40% in the surgical group. The reduction in specific mortality in the operated group was 56% for coronary heart disease, 92% for T2DM and 60% for cancer compared to the control group.

One would expect that patients with MS who undergo BS as a treatment primarily for T2DM would also experience the benefits of weight loss for other aspects of their health. For example, debilitating osteoarthritis or obstructive sleep apnea. Many studies have demonstrated significant improvements in health-related quality of life after BS using generic and obesity-specific quality-of-life tools.

The costs of treating patients with MS are significant. In the US, annual lifetime costs have been estimated at 172,000 \$ US for a person diagnosed at age 50 and \$US 305,000 for a person diagnosed at age 30. The assessment included both the direct medical costs of MS and its complications, as well as the indirect costs caused by absence from work, reduced productivity, disability and premature death. More than 60% of medical costs were incurred within 10 years of diagnosis. BS for metabolic syndrome, regardless of diabetes status, has been evaluated as cost-effective and, in some analyses, economical or dominant.

A literature review identified three cost-effective analyses of BS in patients with T2DM. All three studies have shown that BS is either very cost-effective or dominant as a therapy for MS compared to standard therapy. Analysis of the studies was conservative. The "cost-effectiveness" conclusion indicates that health benefits are affordable compared to country-specific cost-effectiveness thresholds. The "dominant" outcome indicates that the intervention provides cost savings and health benefits over the cohort's life. This rare result is the most convincing evidence of the need for financing based on economic criteria.

Unfortunately, not in all countries of the world, especially with a low and medium level of development, due

to the low number of high-tech operations for angiopathy of diabetic aetiology, BS can be very successful in patients with MS. BS in patients with MS can prolong the life of patients and reduce the incidence of formidable complications of this disease, including chronic ones. The expediency of performing BS over the possibility of using drug therapy should be determined as a priority for its introduction into everyday life.

There are several recommendations for using BS to treat severe Obesity in general and metabolic syndrome in particular. Most of the existing guidelines reflect the recommendations of experts contained in the March 1991 Statement of the National Institutes of Health (NIH) Consensus Building Conference [10].

In 2010, at the regular summit on metabolic surgery, attended by 50 international experts, gastrointestinal surgery for treating MS and T2DM was considered. Delegates strongly supported the idea that for the treatment of MS and T2DM, acceptable candidates for surgical treatment should be patients with a BMI of >35 kg/m² who are inadequately controlled by lifestyle and drug therapy. Such patients are indicated for the use of traditional bariatric operations: laparoscopic gastric bypass, according to Roux, adjustable gastric banding or biliopancreatic bypass grafting. Further clinical data were considered necessary for inadequately controlled T2DM in candidates suitable for surgery with mild to moderate Obesity, i.e., a BMI of 30–35 kg/m².

Most BS are very effective in achieving rapid weight loss. Such extensive operations involve gastric resection and the creation of shunt anastomoses with distal portions of the small intestine. For example, after Roux-en-Y bypass surgery or mini gastric bypass grafting in the postoperative period, excess weight loss and profound metabolic changes occur very intensively in the near term (up to 1 year) after surgery. Less intense metabolic changes occur after gastric banding.

Roux-en-Y gastric bypass surgery affects the hormonal environment of the gut and provides early, non-weight-related improvements in glycemic control in patients with metabolic syndrome. It is unclear whether these changes are long-term or fundamentally impact the underlying mechanisms that cause metabolic syndrome. In the long run, weight loss can be a crucial benefit. There is no evidence to support subcutaneous lipectomy (liposuction) as a treatment for type 2 diabetes mellitus in obese patients with metabolic syndrome.

A systematic review of the literature by Buchwald et al. [11] showed that type 2 diabetes mellitus weakens or improves in most patients after bariatric surgery. Procedures that result in more significant weight loss lead to

higher remission rates. This review, however, was limited by the quality of the available literature, in which follow-up varied, there needed to be a consistent definition of remission, and biochemical measures of remission were not usually reported.

Choosing bariatric surgery is a complex decision that requires a thorough risk-benefit analysis, as well as acceptance of differences in regional practice and the surgeon's experience. Severely obese patients should make the decision after consulting with their bariatric surgical multidisciplinary team.

It is important to recognize that all traditional surgical procedures differ in their risks and benefits. To date, little reliable data exists to match patients to procedures.

Recommendations made under this consensus apply to currently accepted bariatric surgical procedures and do not apply to new experimental procedures or devices.

The 30-day mortality rate associated with bariatric surgery is estimated to be 0.1–0.3%, which is similar to that of laparoscopic cholecystectomy and described as "low." We did not identify any particular values associated with a high-risk factor for bariatric surgery in patients with metabolic syndrome.

The most common complications of bariatric surgery are anastomosis and brace failure (3.1%), wound infections (2.3%), respiratory complications (2.2%), and bleeding (1.7%). Morbidity rates are lower after laparoscopic surgeries, which account for a steadily growing proportion of bariatric surgeries [12].

A new study by the US Agency for Healthcare Research and Quality reported a 21% reduction in complications after bariatric surgery between 2002 and 2006 [13].

Complications of bariatric surgery in the remote postoperative period and the need for surgical revision are not uncommon, and the expected problems are usually specific to surgery.

Early detection and proper treatment of complications are critical. All patients who manage patients after bariatric surgery should have a low threshold for referral to a surgeon if a complication is suspected. Long-term problems, especially with Roux-en-Y gastric bypass and biliopancreatic bypass grafting, vitamin and mineral deficiencies, osteoporosis, and, less commonly, Wernicke's encephalopathy and severe hypoglycemia due to hypersecretion of insulin. These critical questions are addressed in clinical guidelines developed by the American Association of Clinical Endocrinologists, the Obesity Society, and the American Society for Metabolic and Bariatric Surgery [14].

The risks associated with each procedure must be considered in light of the potential reduction in mortality, morbidity or comorbidity, quality of life and productivity. Realistic expectations are essential, and the risk-benefit ratio is assessed individually for each patient, considering perioperative risk and possible long-term complications.

Ongoing efforts are needed to monitor bariatric surgery's safety, efficacy, and long-term effects. Several national registries for bariatric surgery exist, and long-term studies are ongoing. Metabolic syndrome, morbid Obesity, and type 2 diabetes mellitus are chronic diseases that require an approach to the treatment of chronic diseases.

There are a number of comprehensive guidelines for the use of bariatric surgery for metabolic syndrome, including those of the UK's National Institute of Health and Clinical Excellence (2006) [15], the combined guidelines of the American Association of Clinical Endocrinologists, the Obesity Society, and the American Society for Metabolic and Bariatric Surgery (2008) [16] and the European Clinical Guidelines (2007) [17].

While there is some hype in the field of bariatric and metabolic surgery to date, the efficacy, safety, durability, and clinical utility of many of these surgeries in treating people with metabolic syndrome have yet to be established.

Gastric drain resection leads to stable and adequate weight loss. The efficacy of Plum gastric resection was proven by the disappearance of signs of concomitant diseases characteristic of type 2 diabetes mellitus (84%), arterial hypertension (50%), bronchial asthma (90%), obstructive sleep apnea (90.7%) and gastroesophageal reflux disease (46%).

According to the literature, complications after gastric resection occur in up to 13% of cases. The authors distinguish the development of gastroesophageal reflux disease, stenosis of the remaining part of the stomach, uncontrollable vomiting, stricture of the gastric tube, the formation of gastrocutaneous fistulas, and the recurrence of the growth of body mass index.

According to S.H. Chang et al., the analysis of the results of gastric resection from 2003 to 2012 was fatal in 0.34% of patients in the postoperative period [18].

Having analyzed the literature data, S. Chiu et al. [19], in the review article "Effect of Plum Resection of the Stomach on Gastroesophageal Reflux Disease", noted that not all clinicians noted the development of complications of this kind in the postoperative period and those who did noted that they were all unanimous in the

development of signs of gastroesophageal reflux disease in the late postoperative period. In conclusion, the authors analyze the causes of gastroesophageal reflux disease after gastric drain resection and conclude that the complication develops due to a change in the His angle and with dissection of the diaphragmatic-gastric ligament. In other words, the development of gastroesophageal reflux disease after performing gastric drain resection directly depends on the bariatric surgery technique, not on its type.

Another feature of the pathogenesis of the development of signs of gastroesophageal reflux disease after gastric sleeve is the formation of a small stomach volume, which significantly reduces peristalsis and resistance to the full passage of food through it.

Considering the other side of the effectiveness of gastric sleeve in patients without developing a postoperative complication in the form of gastroesophageal reflux disease, it should be noted that a progressive decrease in intra-abdominal pressure accompanies intensive weight loss in the patient. As a result, emptying the stomach improves, which can be considered the opposite of the above hypothesis. Such opposite opinions may be associated with restoring the His angle after sleeve gastrectomy for three years after the surgical period. The excellent susceptibility of the remaining part of the stomach to regenerative changes makes it possible in the long term to resolve gastroesophageal reflux disease and the disappearance of clinical and endoscopic signs of this disease.

Ce. Dupree and his colleagues [20] 10 years ago analyzed the results of gastric sleeves performed in obese patients who also suffered from gastroesophageal reflux disease. A total of 4832 sleeve gastric resections were performed. For comparison, the same results were analyzed in patients after minigastric bypass. The authors indicated that gastroesophageal reflux disease was found in 44.5% of cases in obese patients in the preoperative period. After gastric sleeve resection, among patients with the initial presence of gastroesophageal reflux disease, in the postoperative period, the signs of the disease were preserved in 84.1% of cases. Disappearance of signs of gastroesophageal reflux disease in the postoperative period disappeared only in 15.9% of patients. At the same time, among obese patients who did not show signs of gastroesophageal reflux disease in the preoperative period, this disease developed in 8.6% of cases in the postoperative period. In a comparative assessment of mini gastric bypass grafting, the authors noted the disappearance of signs of gastroesophageal reflux disease in most patients (62.8%) within 6 months after the surgical

period. In other words, the authors point to the need for mini-gastric bypass grafting in patients with gastroesophageal reflux disease as a more effective method of bariatric surgery.

In another study for an objective assessment of the development of signs of gastroesophageal reflux disease, F. Rebecchi et al. [21] used the DeMeister scale, which allows you to identify the level of acidity of gastric contents. The results of sleeve gastrectomy in 71 patients with metabolic syndrome and gastroesophageal reflux disease diagnosed in the preoperative period were analyzed. In the postoperative period, the authors found a decrease in gastric acidity on the DeMeister scale and total acid exposure from $39.5 \pm 16.5\%$ to $10.6 \pm 5.8\%$, and recurrent symptoms of gastroesophageal reflux disease were diagnosed in 5.4% of cases.

Such opposing opinions regarding the development of gastroesophageal reflux disease after gastric sleeve indicate the need for further research on this problem.

Impaired oesophageal motility in the form of lack of control and changes in the strength and duration of its contraction can lead to symptoms characteristic of gastroesophageal reflux diseases, such as heartburn, nausea, vomiting and dysphagia. A more detailed study in this direction showed that impaired swallowing of food was diagnosed in 19.7% of patients after gastric sleeve. It manifested itself in different ways: from slight discomfort after eating solid food to the inability to take liquid and solid food due to the presence of severe retrosternal pain. Dyspepsia was noted in 59.4% of patients, associated with high pressure in a small stomach after gastric sleeve.

R. Weiner et al. [22] revealed the opposite phenomenon: an increase in intragastric pressure due to the development of simultaneous spasms of the oesophageal and pyloric sphincters.

Unfortunately, it is impossible to make an affirmative conclusion based on this information. More studies are needed to assess the effect of gastric sleeve on changes in gastrointestinal motility.

In conclusion, bariatric surgery has become safer as surgeons gain experience in evaluating and treating patients with Obesity and metabolic syndrome. However, a thorough medical evaluation is a must before choosing the type of bariatric surgery, especially for those patients who already have gastroesophageal reflux disease.

CONCLUSION

As a result of the increase in the number of obesity cases, there is an increase in chronic diseases that form

the basis of metabolic syndrome (type 2 diabetes mellitus, non-alcoholic fatty liver disease, hyperlipidemia, and arterial hypertension). The development of metabolic syndrome is associated with an increase in the need for long-term treatment, which is reflected in the heavy burden on the health care system.

At the same time, the incidence of gastroesophageal reflux disease is increasing as one of the concomitant pathologies of Obesity and metabolic syndrome. Gastroesophageal reflux disease is statistically considered common in countries with developed economies (USA, Western Europe, Scandinavian countries) despite the high level of development of preventive medicine. Unfortunately, there is still no single pathophysiological explanation for this fact.

Meanwhile, there is a direct link between an increase in body mass index, especially in the obesity range, and the symptoms of gastroesophageal reflux disease (some of the mechanisms involved include lower oesophageal sphincter pressure, the presence of hiatal hernia, a good predictor of gastroesophageal reflux disease, visceral fat, organomegaly, and muscle elasticity responsible for the gastroesophageal pressure gradient). There is a high probability of developing gastroesophageal reflux disease after bariatric surgery, especially after laparoscopic longitudinal resection of the stomach, which is considered the most common type of surgical intervention in patients with Obesity and metabolic syndrome.

Thus, bariatric surgery has proven to be the most effective in achieving significant and sustained weight loss in severely obese patients, with good outcomes, reduced comorbidity and mortality. However, in the presence of gastroesophageal reflux disease in patients, the probability of achieving positive results that would lead to an increase in patients' quality of life still needs to be higher. Along with the analysis of the incidence of gastroesophageal reflux disease after various types of bariatric surgery, it is necessary to modify surgical techniques and change the technical aspects of surgical intervention, which would improve the results of treatment of patients with metabolic syndrome against the background of gastroesophageal reflux disease.

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GASTROÖZOFAGEAL REFLUKS KASALLIGI BILAN BOG'LIQ METABOLIK SINDROMLI BE- MORLARNI DAVOLASHDA BARIATRIK JAR- ROHLIKNING SAMARADORLIGI

Xakimov M.Sh, Xamdamov A.B.

**Toshkent tibbiyot akademiyasi,
Buxoro davlat tibbiyot instituti**

XULOSA

Yunoncha "baros" so'zidan olingan "bariatrik" jarrohlik atamasi, vazn degan ma'noni anglatadi, sezilarli vazn yo'qotishga qaratilgan jarrohlik muolajalarini belgilaydi. Shunga ko'ra, bariatrik jarrohlik maqsadlari dastlab barqaror vazn yo'qotishga erishish atrofida rivojlandi. Aslida, vazn yo'qotish bunday operatsiyaning natijalaridan faqat biridir. Bariatrik jarrohlik sog'liq uchun boshqa muhim foydalar, shu jumladan giperqlisemiyaning yaxshilash yoki normallashtirish bilan bog'liq bo'lishi mumkin. giperlipidemiya, qon bosimi, obstruktiv uyqu apnesi va hayot sifatini yaxshilash. Vazn yo'qotishning keng foydalari va ba'zi bariatrik jarrohlik amaliyotlari metabolik o'zgarishlarni keltirib chiqaradigan dalillar tufayli "bariatrik metabolik jarrohlik" nomi tobora mos kelmoqda.

Kalit so'zlar: bariatrik va metabolik jarrohlik, metabolik sindrom, gastroözofageal refluks kasalligi

ЭФФЕКТИВНОСТЬ БАРИАТРИЧЕСКИХ ОПЕРАЦИЙ ПРИ ЛЕЧЕНИИ БОЛЬНЫХ С МЕТАБОЛИЧЕСКИМ СИНДРОМОМ В АССОЦИИ С ГАСТРОЭЗОФАГЕАЛЬНОЙ РЕФЛЮКСНОЙ БОЛЕЗНЬЮ

Хакимов М.Ш., Хамдамов А.Б.

**Ташкентская медицинская академия,
Бухарский государственный медицинский
институт
АБСТРАКТ**

Термин «бариа́трическая» хирургия, происходящий от греческого слова baros, обозначающего вес, определяет хирургические процедуры, направленные на значительную потерю веса. Соответственно, цели бариа́трической хирургии первоначально развивались вокруг достижения существенной устойчивой потери веса. В действительности потеря веса – это лишь один из исходов такой операции. Бариа́трическая хирургия может быть связана с существенными другими преимуществами для здоровья, включая улучшение или нормализацию гипергликемии, гиперлипидемия, артериальное давление, обструктивное апноэ сна и улучшение качества жизни. В связи с широкими преимуществами потери веса и растущими доказательствами того, что некоторые бариа́трические операции вызывают метаболические изменения, которые не могут быть полностью объяснены их влиянием только на массу тела, название «бариа́трическая метаболическая хирургия» становится более подходящим.

Ключевые слова: бариа́трическая и метаболическая хирургия, метаболический синдром, гастроэзофагеальная рефлюксная болезнь