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Treatment Options in Morbid Obesity

Tülay Diken Allahverdi

Abstract

Obesity has become the most common fatal and the second most common preventable epidemic disease after smoking in the world. Although it causes many morbidities, the psychosocial challenges it creates in the patients and the huge financial burden for its treatment are the main problems. Medical treatment for weight loss is usually inadequate, and surgery has become a major part of morbid obesity treatment. Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy (SG), adjustable gastric band (AGB), and biliopancreatic diversion (BPD) are the most common current surgical procedures, and all can be performed laparoscopically. Eating less and early satiety due to the reduction of gastric volume with surgery and the disruption of absorption as a result of the bypass lead to significant weight loss.

Keywords: morbid obesity, surgical treatment, laparoscopy

1. Introduction

Obesity is a chronic disease and is the result of the energy obtained from food being higher than the energy consumed and is characterized by an increase in the body's fat mass compared to the lean mass. Obesity is an important health problem that can cause various problems and even death by affecting all organs and systems of the body and especially the cardiovascular and endocrine systems. Obesity is accepted as one of the ten most risky diseases by the World Health Organization (WHO), which has also found it to be closely associated with cancer in recent studies. The prevalence of obesity and being overweight has been increasing in many industrial countries and is now creating a difficult problem for many populations [1]. There has been no other problem affecting humanity that is as common as obesity. Obesity develops by a mechanism that depends on many factors such as eating habits, toxic chemicals, and lifestyle unlike diseases caused by an infectious agent such as the plague, tuberculosis, or AIDS. What this mechanism is or whether obesity is really a disease is not yet clear.

The surgical treatment of obesity is named bariatric surgery. Long-term permanent weight loss is provided, many comorbid diseases are prevented, and survival is increased by decreasing the metabolic effects of obesity as a result of bariatric surgery. Sustainable weight loss can only be achieved by bariatric surgery, and it decreases the excess weight by 50% [2]. Patients scheduled to undergo surgery should be clearly informed on the expected benefit, risk and long-term outcomes of surgery, and the requirement for lifelong nutritional counseling and biochemical follow-up.

1.1 Bariatric surgery indications

- BMI $>40 \text{ kg/m}^2$ or the presence of additional disease (type 2 diabetes, hypertension, sleep apnea, hyperlipidemia) together with BMI $>35 \text{ kg/m}^2$
- Acceptable surgical risk
- Unsuccessful nonsurgical treatments
- Being psychologically stable and lack of alcohol or drug addiction
- The patient being well motivated and being informed about the surgery and its sequelae
- Lack of medical problems that will prevent the increased life expectation as a result of the surgery
- Lack of uncontrolled psychotic and depressive disorders
- Presence of full family and social support

1.2 The most commonly performed bariatric surgical procedures

- Restrictive procedures
- Laparoscopic adjustable gastric band (LAGB)
- Sleeve gastrectomy (SG)
- Vertical banded gastroplasty (VBG)
- Absorption-disrupting procedures
- Biliopancreatic diversion (BPD)
- Jejunioileal bypass (JIB)
- Combined restrictive and absorption-disruptive procedures
- Roux-en-Y gastric bypass (RYGB)
- Duodenal switch (DS) along with BPD

The mechanism of action of bariatric surgical procedures is related to the complex interactions between gastric resection and malabsorption as well as the hormonal and neural signals affecting hunger and satiety. Buchwald et al. [3] reported the rate of improvement in diabetes with bariatric surgery as 56.7, 79.7, 80.3, and 95.1% following adjustable gastric band (AGB), Roux-en-Y gastric bypass, and biliopancreatic diversion with duodenal switch (BPD-DS), respectively, in a meta-analysis. Complete diabetes remission was observed in 78% of the patients. The lipid profile is also improved in 70% of the patients after bariatric surgery. The total cholesterol, LDL, and triglyceride levels are decreased, but no significant change has been reported for HDL levels.

Mortality rates in bariatric surgical procedures are equal to those observed with small intra-abdominal operations such as laparoscopic cholecystectomy (0.3–0.6%) [4].

2. Laparoscopic Roux-en-Y gastric bypass (LRYGB)

LRYGB is the most commonly used restrictive method. It is reported to be the gold standard in the surgical treatment of morbid obesity as it provides long-term weight loss and has acceptable morbidity and mortality [5]. The gastric bypass method in bariatric surgery was first suggested by Edward E. Mason [6]. While 90% of the stomach volume is reduced, malabsorption is ensured by bypassing the duodenum in this method. The main aim is to create a proximal small-volume (<20 ml) gastric pouch that is completely detached from the stomach (**Figure 1**). The Roux limb can be pulled up from the front of the colon and stomach, from the front of the colon and the back of the stomach, or from the back of the colon and stomach for gastrojejunostomy. Transoral circular stapling, linear stapling, manual suturing, or transgastric circular stapling can be used for gastrojejunostomy. The biliopancreatic limb is prepared at a length of 50 cm and the Roux limb at a length of 100–150 cm distal to the Treitz ligament. Once the stomach is cut perpendicularly to the small curvature and 3–5 cm distal to the esophagogastric junction with a linear stapler (60 mm long and 3.8 mm thick), the pouch is formed by completing the cutting action toward the angle of His. Postoperative fluid support and ensuring adequate urine output are very important. The results and any nutritional deficiency should be checked at the postoperative third week, the third and sixth months, and the first year [7]. These patients lose 60–80% of their extra weight within 1 year after the surgery. Consequently, a significant improvement is seen in



Figure 1.
Roux-en-Y gastric bypass.

the comorbid diseases. Mortality is <1% and morbidity is 15%. Complications such as postoperative leakage (1–2%), stenosis (1–19%), small bowel obstruction-internal hernia (7%), and marginal ulcer (3–15%) can be seen. Urgent surgical intervention is required when intestinal obstruction is suspected as it may cause long segment necrosis. Roux-en-Y gastric bypass is more effective than a laparoscopic adjustable gastric band especially in the treatment of type 2 DM and gastroesophageal reflux disease (GERD) symptoms.

3. Sleeve gastrectomy (vertical gastrectomy)

Sleeve gastrectomy was first introduced as a restrictive component of duodenal switch surgery. Adequate weight loss at an early period is seen with sleeve gastrectomy alone in patients who are very obese and at risk with duodenal switch (DS) surgery [8, 9]. This method has been put into practice as a risk-reducing method in patients who cannot tolerate high-risk and long-term procedures [9]. Laparoscopic sleeve gastrectomy (LSG) has become a safe and efficient primary bariatric surgical method with increasing frequency of use and high popularity for both surgeons and patients [2]. Laparoscopic sleeve gastrectomy constitutes 5% of all bariatric surgical procedures, and the number of patients is increasing rapidly [10]. A narrow tubular stomach is created with this method (**Figure 2**). Stomach resection is performed after releasing the large curvatura pylori 2–3 cm proximal to His angle. A tissue stapler 4.5 mm in size (thick) is used in the antrum and 3.8 mm in size (medium) for the other parts of the stomach. To avoid leaving a large fundus pouch, meticulous posterior dissection should be performed so that the His angle is visible. If the lateral traction of the stomach is not good, a spiral-shaped resection line may develop. To decrease the risk of leakage, 1 cm of gastric serosa should be seen on the left side of the stapler cartridge before firing the final stapler. After resection, leakage and hemorrhage in the stapler line is checked with the endoscope. In the case of possible leakage, the omentum is sutured to the suture line in order to create a potential barrier. The sleeve tube is fixed and bending of the stomach from the incisura angularis is prevented by suturing the omentum or gastrocolic fat [11–13].

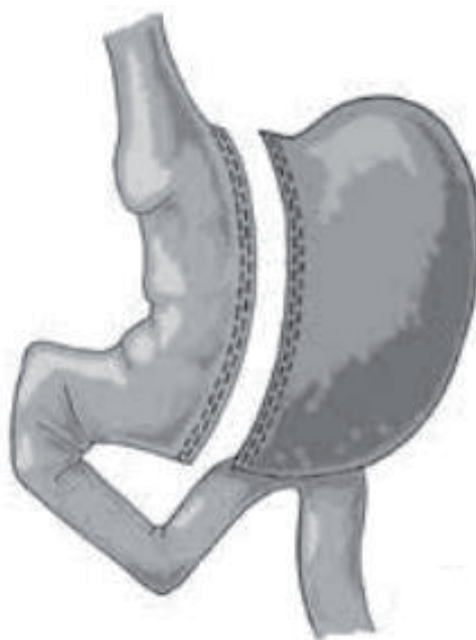


Figure 2.
Sleeve gastrectomy.

Laparoscopic sleeve gastrectomy is preferred in the super obese and in patients who have a BMI of $<50 \text{ kg/m}^2$ and want to undergo surgery with this method. Mean loss in excess weight was reported as 55% with a complication rate of 8% and mortality rate of 0.19% in the review of 2500 patients (mean BMI: 51.2 kg/m^2) where this method had been preferred [9]. While the diabetes remission rate following laparoscopic sleeve gastrectomy is reported to be 66.2%, a new bariatric procedure may be required later on in 15% of the patients [9]. Laparoscopic sleeve gastrectomy has become a commonly preferred method by itself or combined with other methods in the treatment of morbid obesity [14]. The most important complication is leakage (2%) and is often seen near the angle of His. Placing the end of the stapler line close to the esophagus, stenosis of the incisura angularis and bending of the tubular stomach are among the causes of leakage. Gastroesophageal reflux occurs in 26% of the patients after laparoscopic sleeve gastrectomy [7]. Revision surgery should be performed in the case of treatment-resistant gastroesophageal reflux.

4. Laparoscopic adjustable gastric band

The laparoscopic adjustable gastric band method has been available in the USA since 2001 [15]. This method decreases the food intake with its complete restrictive effect and results in loss of weight. An inflatable silicone band is wrapped around the stomach 3 cm below the esophagogastric junction, and a reservoir of 25–30 cm long is formed at the proximal section. At the other end of the band, there is a subcutaneously placed port (**Figure 3**). The calibration of the gastric opening can be changed by fluoroscopy-guided filling and emptying of the silicone band. The band is initially inserted in completely deflated form. The pars flaccida technique has become the standard since band prolapse and erosion are less common in this way. The laparoscopic adjustable gastric band method requires frequent follow-up and should therefore only be performed in patients who live in close proximity to the hospital. Only multivitamins are recommended after the surgery. Adjustment of the band is as important as the surgery itself, and weight loss of 0.5 kg per week is ideal with this method [16]. Patients lose 58–60% of their extra weight in 7–8 years after



Figure 3.
Laparoscopic adjustable gastric band.

the surgery. The complication and mortality rate are less than the absorption-disrupting techniques [7]. Prolapse (3%), displacement (<3%), band erosion (1–2%), and port and tube complications (5%) can be seen. Although a high reoperation ratio is the major disadvantage, the technique is still popular in the USA [17].

5. Biliopancreatic diversion with duodenal switch

The biliopancreatic diversion with duodenal switch (BPDDS) procedure is often referred to as DS surgery. This technique is a modification of the original biliopancreatic diversion defined by Scapinaro et al. [18, 19] in 1979. The three main components of this technique are pylor-protected gastric tube formation, distal ileoileal anastomosis, and proximal duodenoileal anastomosis (**Figure 4**). Three intestinal limbs are formed in this method. Food passes through one limb (Roux limb), the fluid of the digestive organs (bile) from one limb (biliopancreatic limb), and food and digestive fluids from the common limb. While the small curvature of the stomach is removed and the pylorus is preserved in biliopancreatic diversion with duodenal switch surgery, the pylorus was also removed by distal gastric resection in the original surgery of Scapinaro. The gastric pouch is 250 ml in size, and malabsorption is created by Roux-en-Y reconstruction of the distal intestines in both techniques. The main limb length is 50–100 cm and the alimentary limb 250 cm, and the biliopancreatic limb is connected to a location 100 cm proximal to the ileocecal valve. Since the pylorus is preserved in the biliopancreatic diversion with duodenal switch technique, complications such as loop formation, dumping, and marginal ulcers are less common. The method can also be performed in stages to reduce complications. If adequate weight loss cannot be provided with laparoscopic sleeve gastrectomy, the biliopancreatic diversion with duodenal switch procedure is performed 6–12 months later. Glucose control in severely obese patients with type 2 diabetes is better with biliopancreatic diversion with duodenal switch surgery than medical treatment. Although the technique is well described and provides effective weight loss, biliopancreatic diversion with duodenal switch procedure is not commonly used. While early weight loss is provided by the sleeve gastrectomy, impaired fat absorption is responsible for the long-term weight loss. The decrease in ghrelin and increase in peptide YY after the biliopancreatic diversion with duodenal

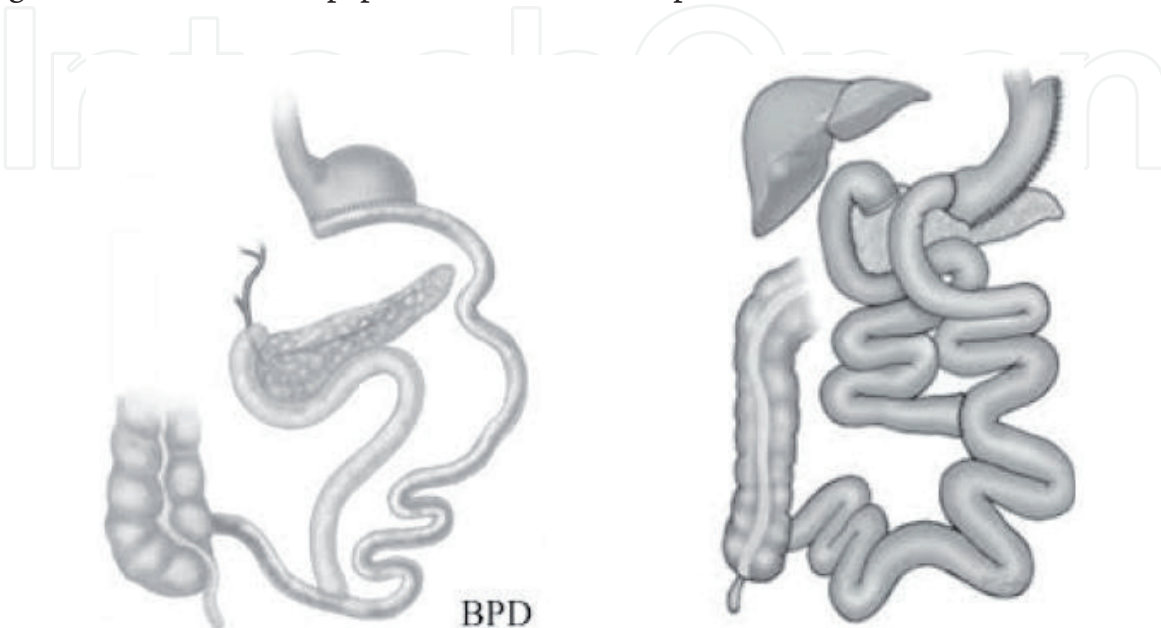


Figure 4.
Biliopancreatic diversion and duodenal switch.

switch procedure also increase weight loss. Mechanical changes as well as hormonal changes may therefore be responsible for the weight loss in this technique [20]. The surgical mortality rate is around 1%. The patients require high doses of vitamin and mineral supplementation after the surgery. There is significant improvement in the comorbid conditions after biliopancreatic diversion with duodenal switch. While 92% of diabetics and 90% of those with sleep apnea show full resolution, 80% of asthmatics decrease the dose of their medication [21, 22]. Close follow-up and vitamin supplements are necessary to prevent postoperative malnutrition. This method can be recommended as a revision method for severely obese patients, those who cannot exercise and stick to a diet after restrictive methods, and after any previous unsuccessful surgeries. This method should not be performed in those who cannot be monitored closely, who do not have adequate income for vitamin support, and previously suffered from calcium, iron, vitamin, and mineral deficiencies.

Vertical banded gastroplasty, laparoscopic mini-gastric bypass (LMGB), and laparoscopic large curvature plication (LLCP) are methods that are rarely used in morbid obesity surgery.

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