



mortality rates are much lower for LAGB than for RYGB. Nevertheless, RYGB is currently the most commonly performed bariatric procedure in the United States because it achieves greater weight loss.

In RYGB, the upper stomach is transected, thereby creating a very small proximal gastric pouch measuring 10 to 30 mL. The gastric pouch is anastomosed to a Roux-en-Y proximal jejunal segment, bypassing the remaining stomach, duodenum, and a small portion of jejunum. The standard Roux (alimentary) limb length is about 50 to 100 cm, and the biliopancreatic limb is 15 to 50 cm. As a result, the RYGB serves to limit food intake and induces some nutrient malabsorption.

Sleeve gastrectomy (SLG) is another restrictive surgery in which the stomach is reduced to about 25% of its original size by surgical removal of a large portion of the stomach fundus, resulting in a tube-like structure. Although the procedure permanently reduces stomach size, some dilatation of the stomach may occur later. The procedure is frequently performed by a laparoscopic technique. Because it has low operative risk, the use of sleeve gastrectomy currently is increasing more rapidly than other types of bariatric surgery. Other procedures, including biliopancreatic diversion (BPD), biliopancreatic diversion with duodenal switch (BPD/DS), and staged bariatric surgical procedures, are less commonly performed.

There is a need for more data to guide the choice of bariatric procedures for individual patients. Most procedures currently are being performed laparoscopically. This approach has the advantages of fewer wound complications, less postoperative pain, a shorter hospital stay, and more rapid postoperative recovery with comparable efficacy. However, these advantages may be offset by more frequent complications associated with techniques used for laparoscopic gastrojejunostomy creation, anastomotic strictures, and higher rates of postoperative bowel obstructions.

The Agency for Healthcare Research and Quality (AHRQ) identified a 0.19% in-hospital mortality rate for all bariatric discharges in the United States. A recent meta-analysis showed that mortality rate from bariatric surgery within 30 days was 0.08% and the mortality rate after 30 days was 0.31%. Bariatric surgery is not uniformly a “low-risk” procedure, and judicious patient selection and diligent perioperative care are mandatory. Preoperative patient selection and education as well as careful postsurgical follow-up are important for successful outcomes.

The benefits of bariatric surgery extend beyond calorie restriction and weight loss. Foregut bypass leads to improvement in the physiologic responses of gut hormones involved in glucose regulation and appetite control, including ghrelin, glucagon-like peptide-1 (GLP-1) and peptide YY³⁻³⁶ (PYY). Mechanical improvements include less weight-bearing burden on joints, improved lung compliance, and reduced fatty tissue around the neck, which can relieve obstruction to breathing and sleep apnea.


In an extensive meta-analysis of 22,000 bariatric surgeries, patients lost on average 61% of excess body weight and exhibited improvements in T2DM, hypertension, sleep apnea, and dyslipidemia. The beneficial effect of obesity surgery on T2DM is one of the most important outcomes observed, with gastric bypass and malabsorptive procedures having the greatest impact. A shorter duration of diabetes and greater weight loss are independent predictors of diabetes remission after bariatric surgery.

Improvements in fasting blood glucose levels occur before significant weight loss is achieved. Insulin-treated patients experience significant decreases in insulin requirements, and most T2DM patients are able to discontinue insulin therapy by 6 weeks after surgery. Euglycemia is maintained in some patients for up to 14 years after RYGB. Two recent randomized controlled studies compared RYGB to intensive lifestyle intervention in moderately obese patients with T2DM and found RYGB to be superior in inducing diabetes remission and reducing use of antihyperglycemic medications.

Weight loss after malabsorptive bariatric surgery usually reaches a nadir after 12 to 18 months. Over the following decade, there is weight regain of approximately 10% of body weight. Weight loss is more gradual for the restrictive LAGB procedure and may continue for several years. In purely restrictive procedures, failure to experience optimal weight loss has been associated with consumption of calorically dense liquids that can pass through the stoma without producing satiety.

PROGNOSIS

Although recent clinical data show that patients on average can maintain a 4% to 5% weight loss for 10 years with ongoing medically supervised intensive lifestyle intervention, many patients are subjected to less intensive intervention and regain their initial weight loss over months or years. Weight regain even after bariatric surgery is not uncommon and most often occurs after 2 years of peak weight loss. Loss of 10% to 20% of the initial body weight is associated with a decrease in total and resting energy expenditure, a change that retards further weight loss. Similarly, weight gain is associated with an increase in energy expenditure, which retards further weight gain. These observations suggest that the human body adopts a biologic set point or mechanism that tends to maintain body weight, and they lend support to the theory that behavior is not the sole determinant of obesity. Although long-term intensive lifestyle intervention in obese patients with T2DM resulting in approximately 5% body weight loss can significantly decrease the risks of chronic kidney disease and depression and further improve glucose control, blood pressure, physical fitness, and some lipid parameters, it has not been shown to reduce cardiovascular events or mortality. Further understanding of genetic and hormonal regulation of obesity may help researchers create more effective and long-lasting interventional tools.

 *For a deeper discussion on this topic, please see Chapter 220, “Obesity,” in Goldman-Cecil Medicine, 25th Edition.*

SUGGESTED READINGS

- Aldahi W, Hamdy O: Adipokines, inflammation, and the endothelium in diabetes, *Curr Diabetes Rep* 3:293–298, 2003.
- Angrisani L, Lorenzo M, Borrelli V: Laparoscopic adjustable gastric banding versus Roux-en-Y gastric bypass: 5-year results of a prospective randomized trial, *Surg Obes Relat Dis* 3:127–134, 2007.
- Chang SH, Stoll CR, Song J, et al: The effectiveness and risks of bariatric surgery: an updated systematic review and meta-analysis, 2003–2012, *JAMA Surg* 149:275–287, 2014.
- Després J-P, Moorjani S, Lupien PJ, et al: Regional distribution of body fat, plasma lipoproteins, and cardiovascular disease, *Arteriosclerosis* 10:497–511, 1990.
- Hamdy O: The role of adipose tissue as an endocrine gland, *Curr Diabetes Rep* 5:317–319, 2005.