
بسم الله الرحمن الرحيم
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The Surgical Management of Obesity

INTRODUCTION

Despite the global pandemic of obesity, there has been little progress in nonsurgical treatment approaches, especially among patients with severe obesity. In addition, the evidence base for bariatric procedures has grown rapidly over the last 10 years, yielding important short- and long-term data on the safety and efficacy of the surgical treatment for obesity and related metabolic disorders. Therefore, the approach for patients considering bariatric and metabolic surgery has now shifted to a well-informed and shared decision-making process as there are significant tradeoffs between the potential risks and benefits of these procedures.

History

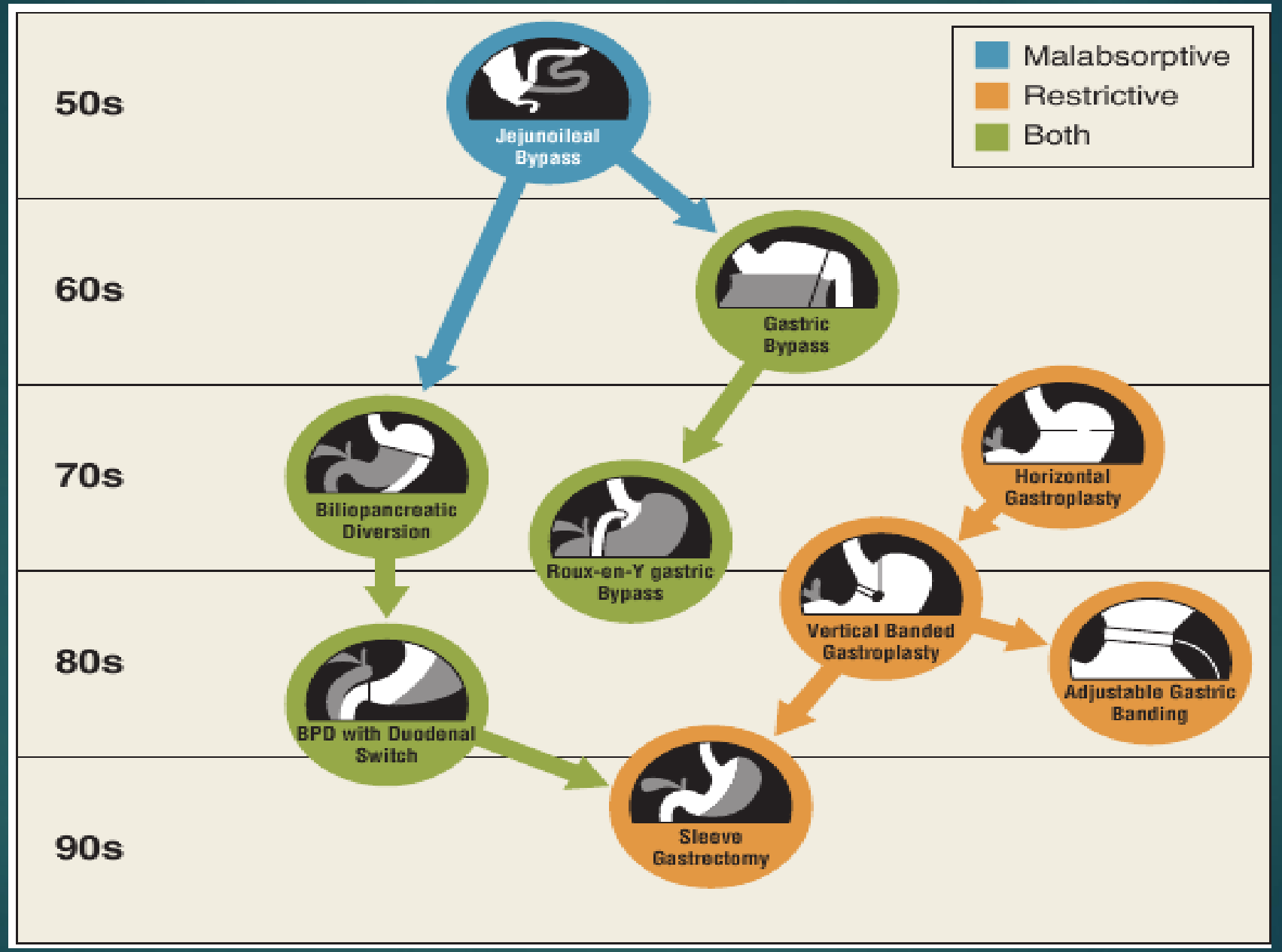
During the 1950s, operations were first performed to treat severe hyperlipidemia with associated obesity. These were ileocolic bypass operations to limit absorption and were associated with severe nutritional complications and liver failure postoperatively. A more modest jejunoileal bypass was performed next, also a malabsorptive operation, but it bypassed only a portion of the small intestine.

In 1969, Mason and Ito performed the first gastric bypass, describing a loop of jejunum connected to a transverse proximal gastric pouch.Bile reflux esophagitis was severe postoperatively, causing Griffin and colleagues to describe the Roux-en-Y modification of the gastric bypass in 1977. The gastric pouch was also altered from transverse to vertical using the upper lesser curvature at this time .

In 1980, Mason first performed the vertical banded gastroplasty (VBG), which was a restrictive procedure using a stapled proximal gastric pouch of the upper lesser curvature of the stomach with a restrictive band for its outlet to the rest of the stomach. This operation produced excellent initial weight loss (50% of excess weight or more) with low morbidity and mortality. It rapidly became the most commonly performed bariatric operation in the United States during the 1980s. However, by the early 1990s, it became clear that patients who underwent VBG modified their diets to highcalorie soft foods and liquids and some regained weight.

the 1990s in the United States, Roux-en-Y gastric bypass (RYGB) became the procedure of choice for bariatric surgery. In the meantime, in Italy Scopinaro had developed and popularized the biliopancreatic diversion (BPD) in the early 1980s.This procedure was also modified to include duodenal switch (DS), the only major malabsorptive operation currently in use.

The laparoscopic approach to bariatric surgery became available in the 1990s, and Belachew performed the first laparoscopic adjustable gastric banding (LAGB) operation in 1994.Wittgrove and Clark performed the first laparoscopic RYGB the same year. LAGB was commonly performed in Europe and Australia during the late 1990s, and in 2001 it was approved for use in the United States. Sleeve gastrectomy (SG) as a primary bariatric operation has grown rapidly in use since 2008.


50s
60s
70s
80s
90s
Malabsorptive
Restrictive
Both
Jejunoileal Bypass
Gastric Bypass
Biliopancreatic Diversion
Roux-en-Y gastric Bypass
Horizontal Gastroplasty
Vertical Banded Gastroplasty
Adjustable Gastric Banding
BPD with Duodenal Switch
Sleeve Gastrectomy

THE DISEASE OF OBESITY

Worldwide obesity has more than doubled since 1980. In 2014,39% of adults age 18 years and over (38% of men and 40%of women) were overweight, and 13% of the world's adult population (11% of men and 15% of women) were obese. In2014, an estimated 41 million children under the age of 5 years were overweight or obese. Overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings. Currently, 65% of the world's population live in countries where overweight and obesity are linked to more deaths than underweight and malnutrition. Obesity is the second leading cause of preventable death in adults in the United States,after tobacco use.

The degrees of obesity are defined by body mass index (BMI = weight [kg]/height [m]2), which correlates body weight with height. The World Health Organization international classification of overweight and obesity is shown in Table .

Table 27-1

The international classification of adult overweight and obesity according to body mass index (BMI)

CLASSIFICATION	BMI (kg/m²)	
	PRINCIPAL CUTOFF POINTS	ADDITIONAL CUTOFF POINTS[a]
Normal range	18.50–24.99	18.50–22.99 23.00–24.99
Overweight	≥25.00	≥25.00
Preobese	25.00–29.99	25.00–27.49 27.50–29.99
Obese	≥30.00	≥30.00
Obese class I	30.00–34.99	30.00–32.49 32.50–34.99
Obese class II	35.00–39.99	35.00–37.49 37.50–39.99
Obese class III	≥40.00	≥40.00

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been an increased intake of energy-dense foods that are high in fat and a decrease in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization. Obesity as a disease was recognized by the American Medical Association in 2013. It is multifactorial in its etiology, and the components of the disease likely include a combination of both environmental and genetic factors.

Causes of Obesity

Both genetic and environmental factors contribute to the development of obesity. Not everyone exposed to the prevailing environment becomes obese, suggesting that genetic mechanisms are operating at the individual level. Estimates vary, but twin, family, and adoption studies show that the rate of heritability of BMI is high, ranging from 40% to 70%.

Individuals with obesity have excessive adipose cells, both in size and number. The number of such cells often is determined early in life; adult-onset obesity is largely a product of increase in adipose cell size. Weight gain results from increase in both adipose cell size and number. Adipose tissue may be deposited in large quantities in the subcutaneous layer of the abdominal wall or the viscera. Generally, males tend to have central visceral fat distribution, whereas females more often have a peripheral fat distribution. Central or visceral fat distribution is associated with metabolic diseases such as diabetes, hypertension, and the metabolic syndrome.

MEDICAL MANAGEMENT OF OBESITY

Treatments should be aligned with the severity of obesity, associated comorbid conditions, and the individual's functional limitations. There are guidelines available to evaluate an individual's health risks and potential treatment options.Three main treatment options exist with sufficient evidence-based support: lifestyle intervention, pharmacotherapy, and bariatric surgery.

Lifestyle Intervention

Lifestyle interventions designed to modify eating behaviors and physical activity are the first option for weight management, given their low cost and low risk. Behavioral therapy, the core of any lifestyle intervention, provides patients with techniques for adopting dietary and activity recommendations .Among these recommendations are regular recording of food intake, physical activity, and weight.

Pharmacotherapy

Medications may be considered as an adjunct to lifestyle modification in adults who have a BMI of 30 or higher or a BMI of 27 to 29 with at least one obesity-related condition. Pharmacotherapy and lifestyle intervention together lead to additive weight losses and should be used together and may also be helpful in facilitating the maintenance of reduced weight.

Phentermine, the most widely prescribed weight-management medication in the United States, is a sympathomimetic amine that was approved by the FDA in 1959 for short-term use of fewer than 3 months long. There are now five newer FDA approved medications for long-term weight management that include three single drugs and two combination drugs. In 1-year pivotal trials, total weight losses for the three single therapies (orlistat, lorcaserin, and liraglutide), the effects of which are mediated by different mechanisms, ranged from 5.8% to 8.8% of initial body weight. The two combination medications (phentermine–topiramate and naltrexone–bupropion) include drugs that act on neural weight-loss mechanisms.

CANDIDATES FOR BARIATRIC SURGERY

There has been significant procedure evolution over the last several years indicating an ongoing major shift in bariatric procedures both in the United States and worldwide. According to a 2016 report from the American Society of Metabolic and Bariatric Surgery (ASMBS), the two most common procedures in the United States are RYGB and SG. The indications for performing bariatric surgery in class II and class III obesity still remain as described in the National Institutes of Health (NIH) .

Contraindications

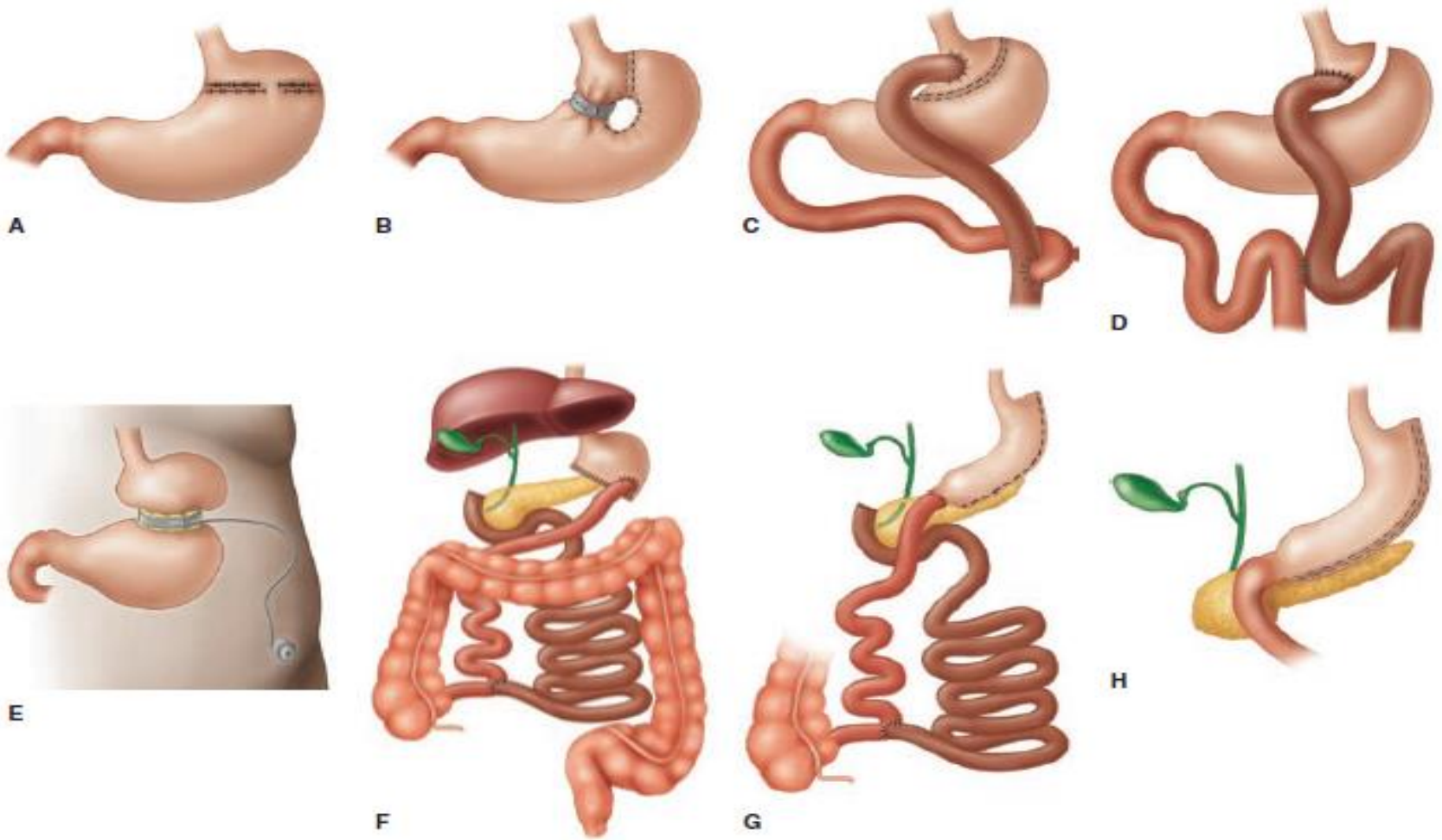
Medical issues that preclude patients from being good surgical candidates include American Society of Anesthesiologists (ASA) class IV disease of a nature that makes surgical therapy extraordinarily high risk. Psychological instability or the inability to understand the implications of the proposed operation and what changes will result from it in terms of the patient's lifestyle are also contraindications. Known and documented active drug or alcohol addiction is a contraindication to surgery . Tobacco use should be completely avoided by bariatric patients at all times, and smoking cessation should occur 6 weeks prior to surgery. After surgery smoking increases risks of poor wound healing, anastomotic ulcers, and impaired health.

A poorly controlled eating disorder, especially bulimia, is also a contraindication to surgery. Non ambulatory status is a relative contraindication to surgery and is associated with increased surgical risk,especially if the obesity is so severe that the patient cannot normally do self-care or would not likely be able to do so after surgery. Finally, lack of sufficient social support or an extremely poor or unsupportive home environment can be contraindications to surgical care, since such environmental factors are important to optimize outcomes once discharged from the hospital.

Patient selection criteria for bariatric surgery

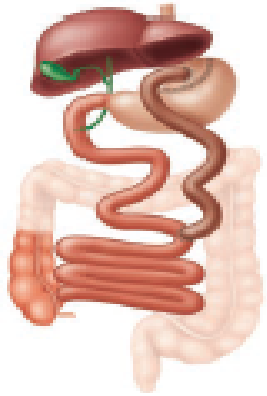
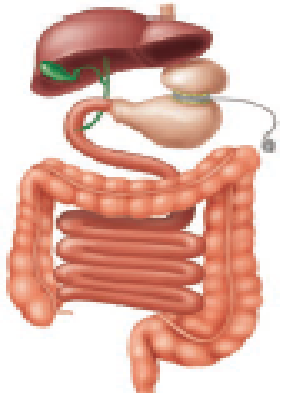
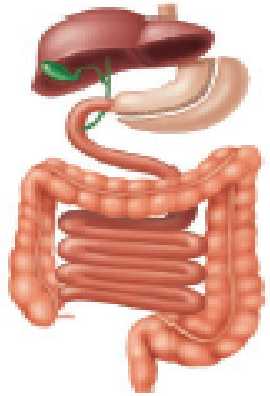
FACTOR	CRITERIA
Weight (adults)	BMI ≥40 kg/m^2 with no comorbid conditions BMI ≥35 kg/m^2 with obesity-associated comorbidity
Weight loss history	Failure of previous nonsurgical attempts at weight reduction, including nonprofessional programs
Commitment	Expectation that patient will adhere to postoperative care Follow-up visits with physician(s) and team members Recommended medical management, including use of dietary supplements Instructions regarding any recommended procedures or tests
Contraindications/ exclusions	Prohibitive surgical risk, ASA IV Reversible endocrine or other disorders that can cause obesity Current drug or alcohol misuse Uncontrolled, severe psychiatric illness Uncontrolled, severe bulimia Lack of comprehension of risks, benefits, expected outcomes, alternatives, and lifestyle changes

MECHANISM OF ACTION OF BARIATRIC AND METABOLIC SURGERY



. Bariatric surgery procedure evolution. **A.** Horizontal gastroplasty; **B.** vertical banded gastroplasty; **C.** Roux-en-Y gastric bypass; **D.** transected Roux-en-Y gastric bypass; **E** astric band; **F.** biliopancreatic diversion; **G.** biliopancreatic diversion with duodenal switch; **H.** vertical sleeve gastrectomy. *(Modified with permission from Arterburn D c surgery for obesity and metabolic conditions in adults,* BMJ. *2014 Aug 27;349:g3961.)*

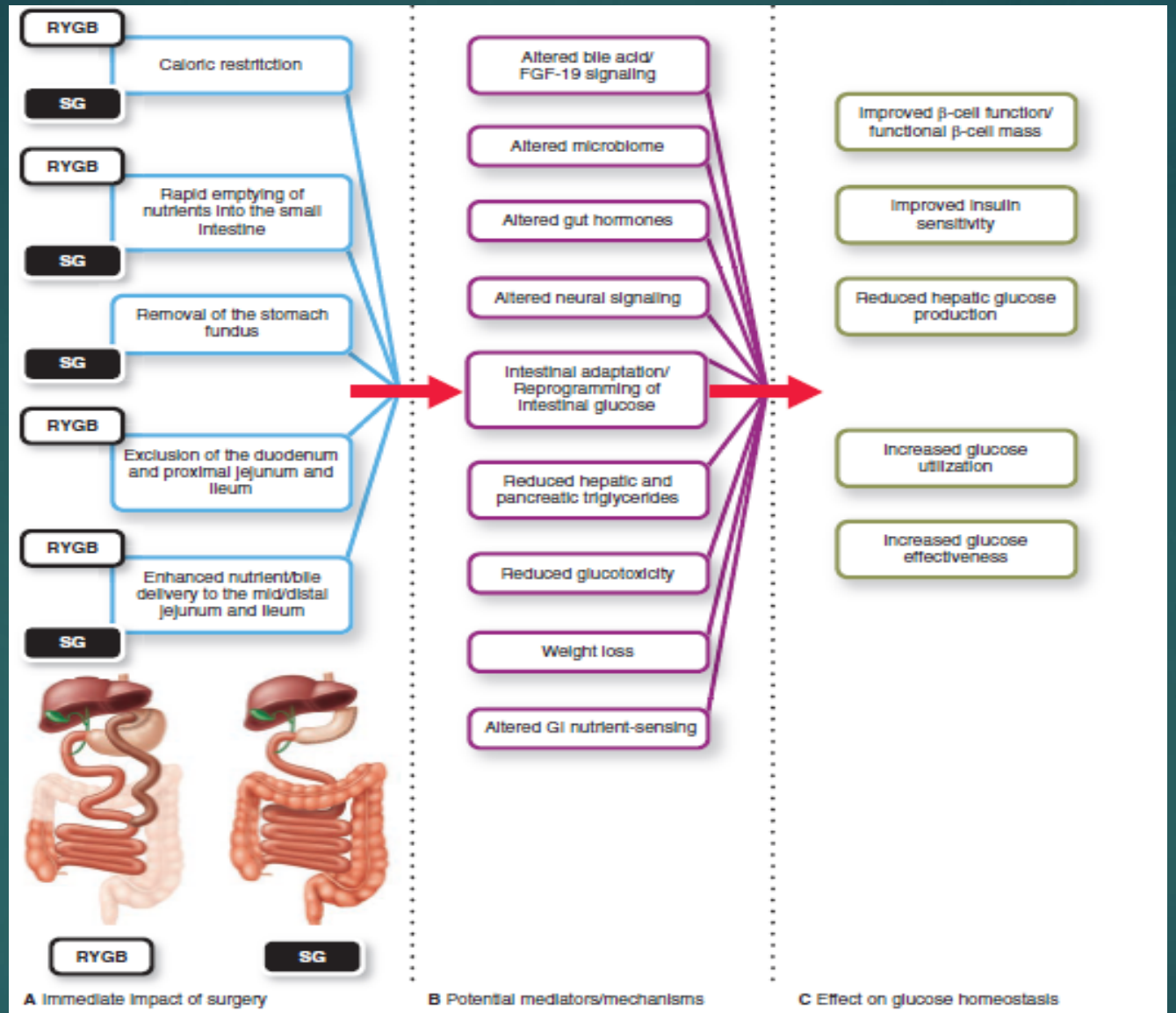
one component mechanism by which RYGB produces weight loss is related to reduced caloric intake and malabsorption brought about by a smaller gastric volume and bypass of the proximal small bowel, so weight loss following LAGB and SG may be explained, at least in part and early on, by gastric restriction and resulting reduced food intake.

	LRYGB	LAGB	SG
			
Lipid	Elevated HDL Reduced triglycerides Reduced total cholesterol, LDL	Elevated HDL Reduction in triglycerides not as dramatic as LRYGB or SG	Elevated HDL Reduced triglycerides
Glucose homeostasis	Improved fasting blood glucose and insulin sensitivity, prior to weight loss	Improvements are slower and not as dramatic as after SG or LRYGB	Improved fasting blood glucose and insulin sensitivity, prior to weight loss
Role of gastric restriction	Has not yet been directly tested	Failure of band leads to less gastric restriction and less weight loss	Gastric restriction is not the critical factor preventing hyperphagia
Gastric emptying	Few published studies	No overall change in gastric emptying rate; Emptying rate of proximal pouch created by band is enhanced	Most papers show increase
Energy expenditure	Controversial	Not reported	Unchanged, but only reported in one study
Leptin	Circulating leptin levels lower than expected for body weight Changes to leptin sensitivity not tested	Plasma leptin reduced, as expected for body weight; Changes to leptin sensitivity not tested	Circulating leptin levels lower than expected for body weight; Body weight changes not driven by changes to leptin sensitivity
Ghrelin	Reduced total ghrelin; Controversial, but no change in acyl-ghrelin levels	Increased circulating ghrelin	Reduced total ghrelin; Controversial, but no change in acyl-ghrelin levels
CCK	No change	No change	Not measured
GLP-1 (postprandial)	Weight loss-independent postprandial increase	Increased circulating GLP-1 but much less than RYGB or SG	Weight loss-independent increase comparable to LRYGB
PYY (postprandial)	Increased postprandial PYY levels; Reduced body weight loss in PYY knockout mice	No change	Increased postprandial PYY levels, comparable to levels after LRYGB
Bile acids	Increased plasma bile acids	Not reported	Increased plasma bile acids
Diet change	Decreased fat intake, more fruits and vegetables	Decrease bread intake and increase in caloric liquids; Greater fat intake and fewer fruits/vegetables than RYGB	Decreased fat intake, similar to LRYGB
Food intolerance	Some dumping syndrome, usually well-tolerated	More persistent and problematic than LRYGB; Mainly vomiting	Little or none

Mechanisms of Metabolic Surgery (Diabetes Improvement)

Understanding the basic mechanism(s) of diabetes improvement following bariatric surgery is an important area of intensive study. Bariatric surgery has been renamed metabolic surgery for T2DM treatment and has emerged as an effective tool for control of hyperglycemia.

More than 20 years ago Pories et al found that bariatric surgery rapidly normalized blood glucose levels in people with obesity and T2DM, and 10 years later the majority remained disease free. He suggested that caloric restriction played a role but that there were likely other factors such as proximal intestinal nutrient exclusion, rapid distal gut nutrient delivery, and the role of gut hormones that would require further investigation. Candidate hypotheses include changes in bile acid metabolism, nutrient sensing and glucose utilization, intestinal adaptation, incretins, possible anti-incretin(s), and the intestinal microbiome. These physiologic and molecular changes lead to reduced hepatic glucose production, increased glucose uptake in tissues, improved insulin sensitivity, and enhanced β-cell function.



igure 27-7. Schematic of potential mechanisms of improved glycemic control after LRYGB and SG. **A.** Immediate effects of RYGB and G due to anatomical changes. **B.** Potential mediators/mechanisms involved. Cross talk occurs among these factors. **C.** Effects on glucose omeostasis. *(Reproduced with permission from Batterham RL, Cummings DE: Mechanisms of Diabetes Improvement Following Bariatric/ Metabolic Surgery,* Diabetes Care. *2016 Jun;39(6):893-901.)*

The end