

Useful Notes for the Obese: Bariatric Surgical Procedures

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Introduction

Obesity has reached epidemic proportions in the United States. Current estimates suggest that more than 30 percent of the U.S. population is obese, and obesity is now one of the leading causes of health-related disorders [1-12]. Obesity is defined as body mass index (BMI) of 30 kg/m² or greater, with severe obesity defined as a BMI of 35-39.9 kg/m², and morbid obesity defined as BMI \geq 40 kg/m² [2]. In general, most morbidly obese individuals are more than 100 lbs over their ideal body weight. From 2000 to 2005, the prevalence of morbid obesity increased by 50 percent in the United States [13]. Obesity is linked strongly too many chronic diseases, such as type II diabetes, heart disease, hypertension, and hyperlipidemia [14-16]. Weight loss is associated with substantial improvements in these obesity-related disorders [17]. As such, treatments for obesity, both medical and surgical, have become increasingly common.

Surgery Produces Substantial Weight Loss

For patients who are severely obese, most nonsurgical treatments—such as diet, exercise, and medications—are not very effective at producing significant weight loss and, more importantly, maintaining weight loss. A recent meta-analysis by Li found that medications, along with diet and other exercise interventions, produce only modest weight loss (5 kg lost at one year) [18]. Similarly, controlled studies of diets have shown mostly minimal weight loss [19]. In contrast, observational reports have concluded that surgical treatments for severe obesity result in substantial weight loss that patients are able to maintain over the long term [17]. A recent meta analysis by Maggard et al. reported that bariatric procedures generate, on average, 20-30 kg of weight loss and that the weight loss can be maintained for at least 10 years [20].

Bariatric Surgical Procedures

A variety of surgical procedures have been used to induce weight loss for obese patients. These procedures result in weight loss via different mechanisms, and some employ a combination of mechanisms. In general, bariatric surgery employs three mechanisms to induce weight loss: (1) restricting the size of the stomach limits the quantity of food a patient can consume at a single meal (2) malabsorptive procedures decrease the proportion of nutrients that are absorbed from a meal and (3) a combination of hormonal changes are induced by creating a small gastric pouch (and outlet) along with a proximal bypass. Details of selected bariatric procedures (those performed frequently now) are provided below.

Adjustable Gastric Banding

Gastric banding achieves weight loss by creating gastric restriction. The uppermost portion of the stomach is encircled by a band to create a gastric pouch with a capacity of approximately 15 to 30 cubic centimeters (cc). The band consists of an inflatable doughnut-shaped balloon whose diameter can be adjusted in the clinic by adding or removing saline via a reservoir port positioned beneath the skin. The bands are adjustable to allow the size of the gastric outlet to be modified as needed, depending on the rate of a patient's weight loss. Weight loss is achieved mainly by restricting caloric intake. Currently, almost all of the banding procedures are performed laparoscopically. While this

procedure is technically reversible (e.g., removal of the band for failed weight loss), doing so exposes the patient to potential risks associated with a second operation and, of course, will necessitate identifying an alternative method for weight loss.

Vertical Banded Gastroplasty (VBG) and Other Gastroplasty Procedures

VBG uses the strategy of mechanical restriction to cause weight loss. The upper part of the stomach is stapled to create a narrow gastric inlet or pouch that remains connected with the remainder of the stomach. In addition, a nonadjustable band is placed around this new inlet in an attempt to prevent future enlargement of the stoma. As a result, patients experience a sense of fullness after eating small meals. Weight loss from this procedure results entirely from eating less: There is no component of malabsorption. VBG was one of the more common surgical procedures for weight loss in the late 1980s and early 1990s but has been superseded since 1995 by adjustable band procedures and procedures that combine mechanical restriction with bypass (see below).

Biliopancreatic diversion (BPD)

BPD involves removing 70 percent of the stomach along with bypassing a significant proportion of small intestine. By reducing the size of the stomach, less acid is produced, but the remaining capacity is generous compared to that achieved with gastric bypass. As such, patients eat relatively normal-sized meals and do not need to restrict intake severely. Malabsorption is caused by (1) the diversion of food downstream, decreasing the opportunity for nutrient absorption and (2) reduction in the quantities of enzymes and bile in the bypassed segment, which decreases absorption. Patients develop steatorrhea from the decrease in fat absorption.

Although this procedure is not as commonly performed as either banding procedures or gastric bypass, the approach is strongly favored by some bariatric surgery specialists. The partial biliopancreatic diversion with duodenal switch is a variant of the BPD procedure that, until recently, was performed mostly in Italy and only rarely performed in the United States. Recently, a number of centers in the United States and Canada have begun to perform this procedure, which involves resection of the greater curvature of the stomach, preservation of the pyloric sphincter, and transection of the duodenum above the ampulla of Vater with a duodeno-ileal anastomosis and a lower ileo-ileal anastomosis.

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Gastric bypass

Roux en Y gastric bypass (RYGB), which we will refer to as “gastric bypass” throughout the report, achieves weight loss through a complex mechanism. The surgery involves creating a small gastric pouch (and outlet) along with a proximal intestinal bypass. This small pouch (30 cc) is connected to a segment of the jejunum (which is downstream), thus bypassing the duodenum and very proximal small intestine. Although the procedure generates minimal malabsorption, significant changes in hormones (e.g., ghrelin, PYY) and neural signals to the gastrointestinal tract lead to hunger control and satiety. In addition, following ingestion of high-density carbohydrates, many patients will experience the resultant “dumping” syndrome, whose unpleasant symptoms include flushing, palpitations, abdominal pain, cramping, and diarrhea. As a result, patients develop an aversion to high-carbohydrate foods. The overall result is that patients make major changes in their diet and eating habits. Gastric bypass for weight loss has been performed regularly since the early 1980s. It was first performed laparoscopically in the early 1990s and is now one of the most common types of weight loss procedures.

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