Obesity: Bariatric Surgical Options

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Purpose

The purpose of this course is to familiarize the health practitioner with different types of bariatric surgeries, including surgical procedures, advantages, disadvantages, and complications common for each procedure.

Goal

Upon completion of this course, the health practitioner should be able to:

- Explain the NIH criteria for weight-loss surgery.
- Explain 3 different types of surgical procedures and identify at least 2 procedures for each type.
- Describe the difference between adjustable band gastroplasty and vertical banded gastroplasty.
- Describe the vertical sleeve gastrectomy.
- Describe the intragastric balloon, including 2 common uses.
- Explain the difference between the roux-en Y gastric bypass and the mini-gastric bypass.
- Discuss postoperative nutritional considerations, including at least 4 symptoms of dumping syndrome and blockage.

Introduction

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While all health practitioners agree that the best way to lose weight is through diet and exercise, the fact remains that about a third of Americans are overweight, many morbidly so, and have been unsuccessful at weight loss despite repeated attempts and health-related problems. Bariatric surgery is sometimes a viable solution if weight loss has failed, and about 225,000 Americans have bariatric surgery each year. The NIH has developed criteria for weight-loss surgery, and the basic principals still apply although newer procedures have been developed. Criteria include:

- BMI ≥40 (usually about 100 pounds overweight) or BMI ≥35 with severe health problems related to obesity. Increasingly, patients with BMI <35 are being considered for bariatric surgery to control health problems, such as diabetes, type 2.
- History of attempted and failed efforts at diet, exercise, lifestyle changes, or medications to lose weight.
- Ability to understand risks, benefits, and side effects of procedure.
- Commitment to changes in lifestyle and long-term follow-up (at least 5 years).
- No medical, psychiatric, or emotional conditions that might prohibit surgery.
- Motivation to have surgery and realistic expectations regarding outcome.

The first surgery to control obesity, the jejunoileal bypass, had significant complications and is no longer recommended, but a number of other surgical procedures are now available. Three different types of bariatric surgery include:

Type	Function	Surgeries
Malabsorptive	Restricts absorption of calories and fat (as well as other nutrients) by bypassing part of the small intestine.	Biliopancreatic diversion +/- duodenal switch (BPD +/- DS.

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Restrictive	Restricts the size of the stomach and the ability to eat and reduces production of Ghrelin (hormone that regulates appetite), glucose metabolism, gastric secretion, and emptying.	• Adjustable band gastroplasty. • Vertical banded gastroplasty. • Vertical sleeve gastrectomy. • Intragastric balloon (not FDA approved).
Combined	Restricts both ability to eat and absorption.	• Roux-en-Y gastric bypass> • Mini-gastric bypass.

Biliopancreatic diversion +/- duodenal switch (BPD +/e DS)

Biliopancreatic diversion, a primarily malabsorptive procedure, involves removal of about 70% of the stomach with creation of a pouch at the upper part of the stomach and small bowel rerouting. The stomach is partially removed instead of bypassed to decrease the amount of gastric acids produced. The stomach pouch is directly attached to the distal jejunum where food passes into the ileum and cecum, bypassing the duodenum and more of the jejunum than the roux-en Y procedure. This procedure is not now commonly done because of severe problems related to lack of nutrients. However, this procedure does retain more of the stomach than the roux-en Y procedure, allowing people to eat more before feeling full. The bile and pancreatic fluids that are usually released into the duodenum to digest food (breaking down fat, protein, and carbohydrate molecules so they can be absorbed) are diverted to much lower in the intestinal tract (to the ileum), where there is less absorption. Thus, this procedure blocks absorption by decreasing digestive aids (bile, pancreatic enzymes) and decreasing intestinal surface area.

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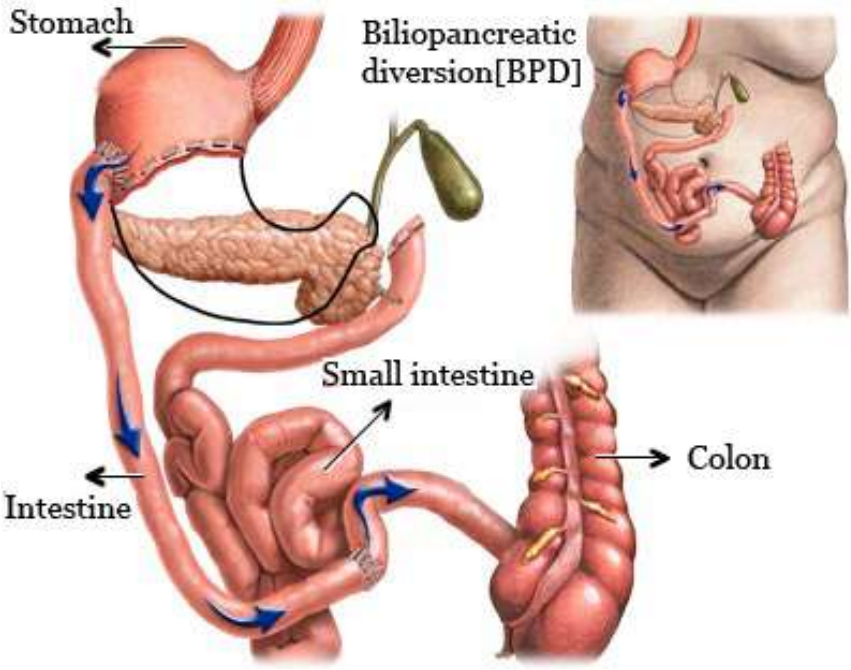

Because fat is not absorbed properly, undigested fat in the diet can cause bloating as gas builds up and steatorrhea, loose foul-smelling stools. One problem with this procedure is that the lower small intestine is more sensitive to gastric acids than the duodenum, so ulcerations sometimes occur at the site of anastomosis. Reversal is possible to some degree, although the reduction in stomach size remains. The intestines, however, may be restored to their anatomic positions to improve absorption.

Duodenal switch

A variation of the biliopancreatic diversion includes a duodenal switch. This procedure creates a vertical sleeve gastrectomy, retaining the part of the stomach with the pyloric valve that releases food into the small intestines and 2-4 centimeters of the duodenum to help to prevent the dumping syndrome and decrease protein-calorie malnutrition. The duodenum tolerates stomach acids better than the jejunum, so this procedure decreases incidences of ulceration at the anastomosis site. The remaining stomach, however, is smaller than with the original procedure so there is increased gastric restriction with the malabsorptive component of the surgery much the same. This surgery is partially reversible, but surgery is complex and with associated health risks.

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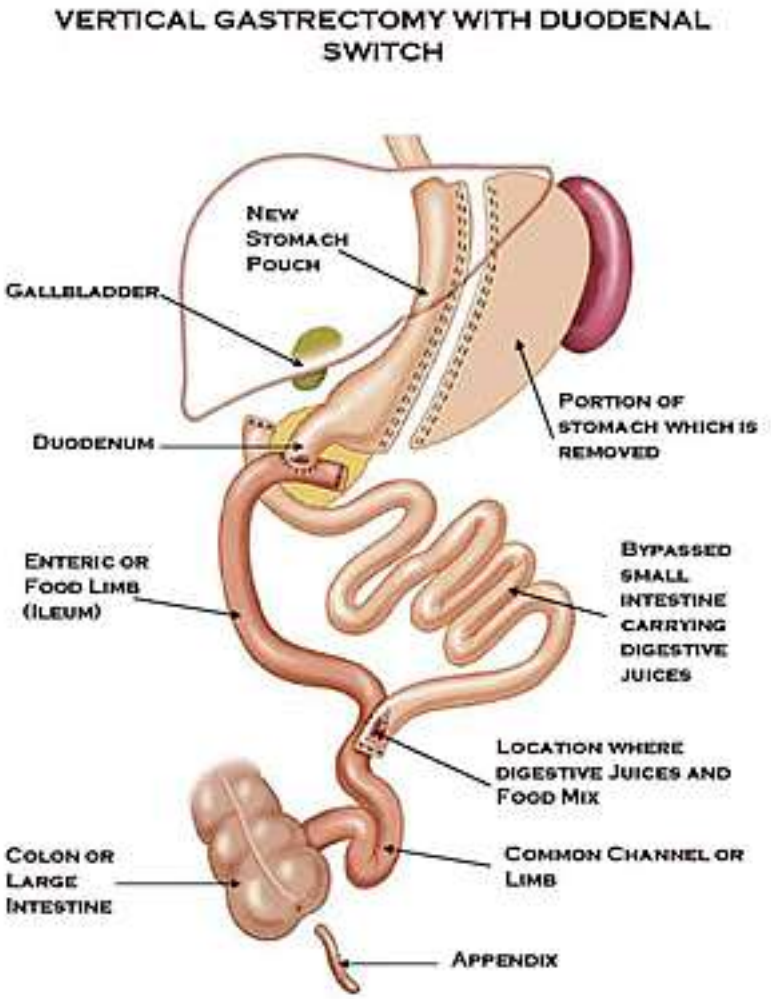

Both procedures can be done laparoscopically. Advantages of both procedures include increased food intake compared with banding or bypass, less food intolerance, and usually more rapid weight loss. However, most people experience 3-4 foul loose stools daily, dumping syndrome (less common with the DS procedure), multiple vitamin deficiencies (A, D, E, K), iron deficiency, and protein-calorie malnutrition without adequate supplementation.

Adjustable Banded gastroplasty

Adjustable banded (LapBand® or REALIZE®) gastroplasty is performed laparoscopically using small incisions and long shafted instruments. With adjustable banded gastroplasty, the gastrointestinal system is left intact; however, a restrictive silicone band is placed about the upper portion of the stomach, creating a pouch that holds about 0.5 to 1 ounce of food and later stretches to hold 2-3 ounces. The created stoma into the larger part of the stomach is very small (like a funnel) so that emptying of the pouch slows, and the

person feels full more quickly and for longer periods. The band can be adjusted to make it more or less constrictive.

Wikimedia commons

During the surgical procedure, an electro-cautery tool is used to cut away fatty tissue to create a tunnel about the upper part of the stomach, using care to avoid damage to the liver and spleen. Graspers pull the band under and around the top portion of the stomach. An NG is inserted into the stomach during surgery with an inflated balloon in the appropriate size to guide creation of the pouch. The band has a buckle that snaps into place and locks into the correct size. After placing the band, a portion of the stomach may be pulled up above the band and sutured into place to secure the band. The lap band that is not secured poses the risk for failure because it may migrate.

The underside of the band is inflatable, and saline is injected into the inflatable portion to tighten, cushion, and secure the band. The band is connected to a tube and an access port that is fixed to the muscle wall right below abdominal skin so it can be accessed with a special needle to deflate and reinflate the band with normal saline to find the correct degree of restriction for the individual.

Advantages of adjustable gastric banding are that there is no cutting or stapling, so complications are reduced, and the pouch and stoma size can be individualized. Additionally, the procedure is completely reversible through a laparoscopic procedure. Complications include gastric perforation (rare), nausea and vomiting (>50%), gastroesophageal reflux (34%), band slippage/dilation of

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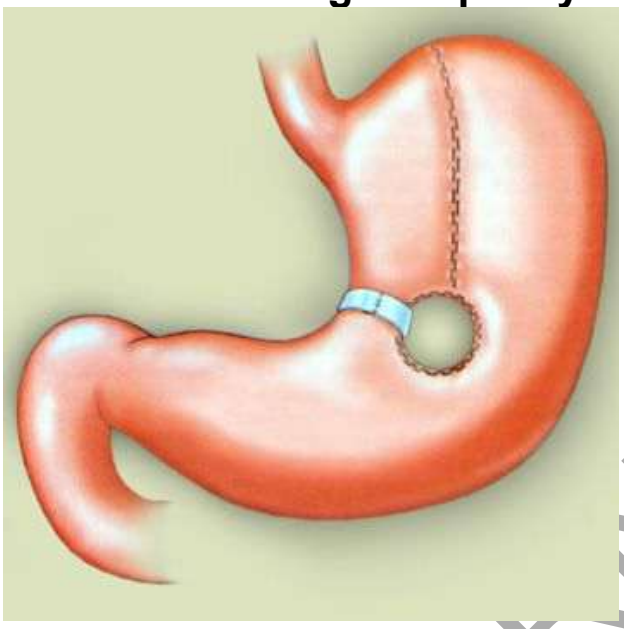
pouch (24%), and stoma obstruction. Because this procedure essentially creates a hiatal hernia to serve as the stomach, some people experience irritation and dilation of the esophagus. One study showed that 25% of patients had their bands removed because of adverse effects. A study in Sweden indicated that 80% of lap bands may need removal within 10 years.

Vertical banded gastroplasty



Vertical banding, one of the first bariatric procedures, is similar in principle to adjustable banding, but a small pouch is created by stapling the stomach vertically, creating a small circular opening and placing a silicone or polyurethane band around the outlet of the pouch. There is less danger of the band migrating in this procedure. The pouch is usually about 10% the size of the original stomach. This procedure is usually done laparoscopically. As with other restrictive procedures, advantages include a decrease in the amount of food that can be eaten at one time, slowed emptying of the stomach with faster satiety, adequate absorption of nutrients, and no dumping syndrome although blockage may occur.

Complications can include leakage from failure of staples and infection. The band (usually silicone) can cause obstruction or perforation and cannot be adjusted as with adjustable banding procedures. Because of the small stomach capacity, nausea and vomiting can occur if food not chewed properly or too much food is eaten. Over time, the pouch may stretch, allowing people to eat more, and some people regain weight. Long-term studies indicate that 80% of patients lose weight after the procedure, with 30% of those achieving a normal weight and 40% losing less than half of excess weight. This procedure is now losing favor to adjustable gastric banding procedures, which do not involve stapling or cutting of the stomach, are safer, and are more effective for long-term weight loss.

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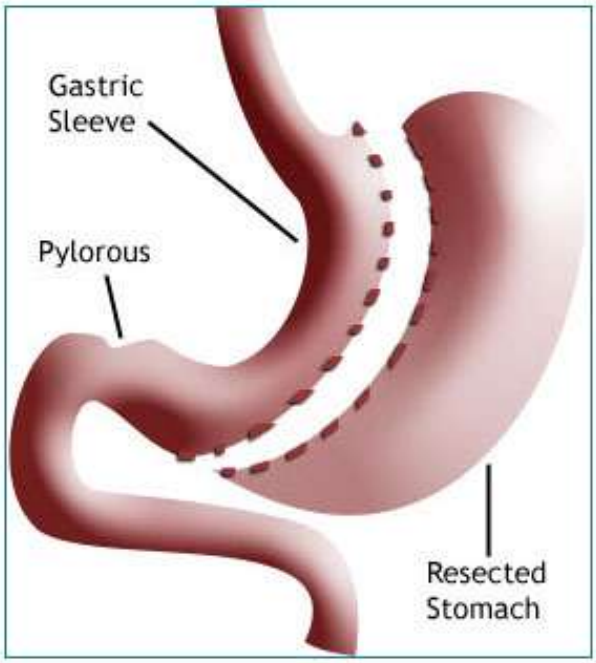
Reversal procedures are more complicated than the initial procedure because of problems involved with scar tissue (especially with polyurethane bands) and removal of staples. Vertical gastric banding is sometimes converted to roux-en Y or biliopancreatic diversion with or without duodenal switch, but any revision carries substantially increased health risks.

Vertical sleeve gastrectomy (VSG)

The vertical sleeve gastrectomy (VSG) to some degree evolved from the biliopancreatic diversion with DS, which includes a sleeve gastrectomy and small bowel rerouting. Because of the difficulty involved, it began to be done as a staged procedure with the sleeve gastrectomy done first and then the rest later, but many patients found they lost the majority of the weight after the first procedure (the vertical sleeve gastrectomy) and didn't want the second procedure. The VSG is a restrictive, not malabsorptive, procedure and is usually done laparoscopically. A special stapling tool with MRI-safe titanium staples is used to create a vertical pouch, which may vary in size from 90 to 120 mL, depending on the surgeon. The stomach is partitioned but left in place and not removed as in the roux-en Y procedure, and the pyloric valve is retained.

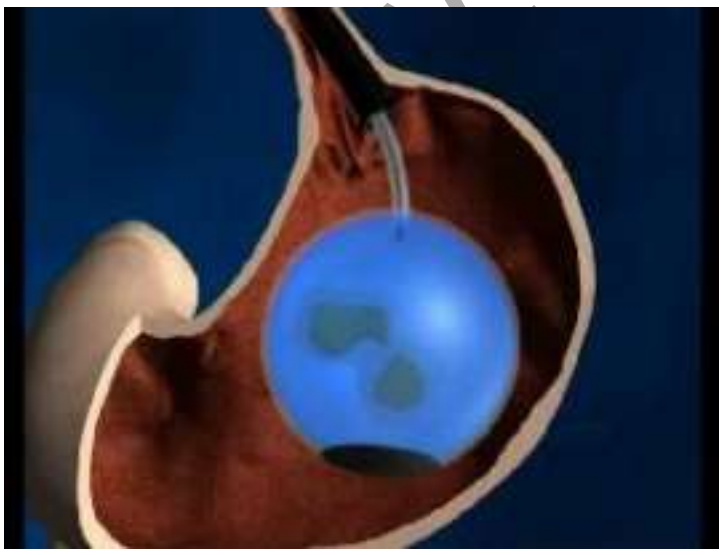


There is no intestinal bypass, so many of the adverse effects associated with other procedures, such as ulceration of anastomoses site, dumping syndrome, intestinal obstruction, and vitamin deficiencies, are avoided. The part of the stomach that is partitioned produces Ghrelin, and this level reduces to almost zero after surgery although it's unclear to date whether levels increase again over time as some people report increased appetite as time passes.

VSG is increasingly used to control metabolic disease, such as diabetes, in patients with BMI <35. VSG is done as a banding alternative and sometimes after banding failure. While dumping syndrome does not occur and absorption remains intact, people should monitor diet and take a daily multivitamin after surgery because of decreased intake. Most people lose 50 to 60% of excess body weight during the first year.

While safer than more extensive procedures, some complications can occur, such as leakage or bleeding from staple lines, injury to tissue, blood clots that migrate to lungs, heart, or brain, wound separation and infection. Studies indicate that 80% people with type 2 diabetes are able to stop oral medications after VSG and 20% are improved. Some people with type 1 diabetes are able to transition to oral medications or have better control of their diabetes.

Intragastric balloon (not FDA approved in the US).
The silicon intragastric balloon is not FDA approved for use in the United States, but some people travel to Canada, which approved the procedure in 2006, or European countries for the procedure. An inflatable balloon is placed endoscopically into the stomach and inflated with normal saline to 500 to 700 mL to create a feeling of fullness and reduce usable stomach size. The balloon is used pre-surgically to begin weight loss for patients at high surgical risk or for primary weight loss (BMI >35). While the balloon is resistant to gastric acids, they may begin to damage the balloon after 6 months, so the balloon must be removed by 6 months. During the time the intragastric balloon is in place, the person must take oral medications to reduce stomach acid.



Studies show that weight loss usually ranges from 25 to 40% of excess body weight. The balloon should be used as an aid to diet and exercise in conjunction with a program that teaches about nutrition and behavior modification. Complications include intestinal obstruction by partially deflated balloon, bleeding or perforation resulting from insertion or removal, gastric discomfort, nausea and

vomiting (usually just for the first few days), and gastroesophageal reflux. Removal is done endoscopically.

Roux-en-y gastric bypass (RYGB)

The Roux-en Y gastric bypass (RYGBP) can be done laparoscopically or open surgically and remains one of the most common bariatric surgeries. It is usually recommended for those morbidly obese with severe health risks.

- The restrictive element of RYGBP involves dramatically reducing the size of the stomach so people are not able to eat as much. The lower part of the stomach is no longer involved in receiving or mixing food, but continues to produce digestive enzymes, which drain into the small intestine.
- The malabsorptive element of RYGBP involves dissecting the small intestine in order to bypass the upper part that absorbs calories and fat and bringing a loop of the jejunum up and attaching it to the new pouch. The distal segment of the dissected small intestine is sutured onto the small intestine at a lower point, resulting in a Y configuration.

Topknife at en-wikipedia

When food is eaten, it enters the small pouch and then the jejunum, bypassing the rest of the stomach (which is partitioned) and the upper part of the small

intestine. Because the body absorbs fewer calories and fats, the body uses fat stores, resulting in weight loss.

While RYGBP usually results in weight loss up to two-thirds of excess body weight by 2 years, significant risks are involved. Surgical risks, such as bleeding, infection, and blood clots, are present as with all surgeries. Additionally, other complications include gallstones, gastritis, nausea and vomiting, vitamin B12 deficiency anemia, iron deficiency anemia, and calcium deficiency, resulting in osteoporosis. Some people experience significant hair loss initially, but this is usually reversible as the body adjusts. Most patients experience dumping syndrome. Removing the upper part of the small intestine from the digestive process interferes with absorption of nutrients, so the person must receive supplements. RYGBP is potentially reversible because the entire GI system remains, but the procedure is rarely done, especially after 6 weeks, and requires more extensive surgery and risk of health-related complications

Mini-gastric bypass

In the early 1970s, a mini-gastric bypass procedure was developed. It involved a small pouch created from the stomach and then attached directly to the small bowel. However, the attachment was near the esophagus and resulted in reflux and esophageal erosion, so the procedure was abandoned. However in 1997, Dr. Rutledge developed a different laparoscopic mini-gastric bypass (MGB) procedure. The complete surgical system (pre-, intra-, and post-operative care) is owned by Dr. Rutledge and can only be done by those trained and licensed to do so, so access to surgeons for this procedure is limited. However, thousands of MGB procedures have been carried out.

In the mini-gastric bypass, the stomach is reduced in size by about 90% through creation of a vertical pouch. The pouch is formed by stapling, and the rest of the stomach is partitioned. A loop of the small intestine is brought up to the pouch, and the side of the intestine is attached directly to the distal end of the vertical pouch with about 6 feet of the small intestine bypassed (the portion that primarily absorbs fat and calories).

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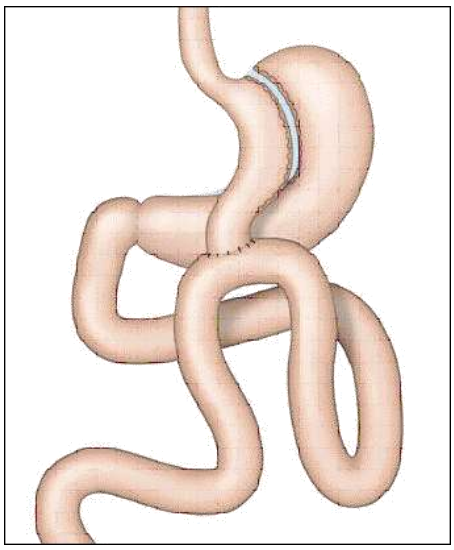

This procedure is less extensive than the more traditional gastric bypass, less expensive, and takes only about 45 minutes to complete. People usually are able to leave the hospital within 24 hours, and pain is minimal. Because most of the stomach is partitioned, the hormone Ghrelin is reduced, so appetite is depressed, and the small size of the pouch causes early satiety. Dr. Rutledge and others doing the surgery report excellent weight loss results and few complications; however, some other surgeons are cautious about recommending mini-gastric bypass surgery. Although the procedure is fairly safe, all surgeries pose some risk.

Complications, such as dumping syndrome, leak, blood clot, pneumonia, calcium deficiency, and iron deficiency, are similar to other bypass procedures. However, this procedure is reversible because the entire GI system remains although the reversal procedure is more complex than the original procedure.

Post-operative considerations

While nutritional considerations and the need for supplementation vary according to the type of procedures, almost all patients begin by intake of clear liquids, followed by full liquids, pureed foods, and finally soft foods and solid foods (usually by about the 8th week). Patients have to learn to eat all over again—the pace of eating is very important or the pouch may become too full and cause discomfort. Foods that are too fibrous—such as apples with skin or raw vegetable—may cause vomiting. Patient should always take recommended dietary supplements to avoid malnutrition, drink between meals, eat slowly in small amounts, chew thoroughly, and add one new food at a time. Maintaining a food diary helps to identify foods that cause GI upset. Patients frequently complain of two problems:

- **Blockage:** For procedures in which outflow from the stomach is restricted or slowed, food that is too thick or chunky may cause blockage. This can cause epigastric pain that sometimes radiates to the back, increased

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salivation, nausea, and vomiting. Because of the small stomach capacity, people are usually advised not to drink while eating, but people sometimes drink to help relieve blockage, but this often compounds the problem and causes vomiting. Altering diet, eating more slowly, and eating in smaller amounts may prevent symptoms.

- **Dumping syndrome:** For procedures in which the pyloric valve has been removed, food and gastric juices move rapidly from the stomach pouch to the intestines in an unregulated manner. Symptoms often relate to intake of high-sugar foods (including sucrose from sugar and fructose from fruit). Early symptoms (within 30 minutes of eating) include nausea, vomiting, abdominal cramping and pain, bloating, diarrhea, tachycardia, and dizziness. Later symptoms (1 to 3 hours after eating) include the former as well as increased perspiration, weakness, fatigue, shakiness, anxiety, mental confusion, and hypoglycemia in response to increased insulin levels. Most people need to avoid simple sugars (cakes, cookies), simple carbohydrates (pasta, processed cereals), and high-fat carbohydrates (French fries, fast food). Up to 50% of bypass patients have dumping syndrome. Treatment includes Acarbose (100-200 mg TID), a hypoglycemic agent that slows GI absorption of carbohydrates; and octreotide (50 mcg subcutaneously 2 to 3 times daily before meals), an antisecretory agent.

Conclusion

Bariatric surgery is not a magical solution to obesity but essentially a coercive method of dieting with considerable morbidity. People lose weight because they are unable to eat as much as they did before surgery, and/or the food they eat is not completely absorbed. If people continue to overeat, the weight will recur. In fact, studies show that up to 50% of patients begin to regain weight within a few years of surgery. Additionally, pouches may stretch and enlarge with time, reducing the feeling of fullness. In some cases, revision (such as decreasing pouch size or switching to a different procedure) is done If weight regain occurs, but revision carries additional risk. Whether the procedure is malabsorptive (biliopancreatic diversion with/without duodenal switch), restrictive (adjustable band gastroplasty, vertical banded gastroplasty, vertical sleeve gastrectomy, intragastric balloon), or combined (roux-en Y gastric bypass, mini-gastric bypass), the most important factor in success is patient cooperation and adherence to nutritional and behavioral modifications. Patients should be thoroughly educated about bariatric surgery and have a psychological assessment prior to surgery. Studies indicate that people who have had bariatric surgery are at increased risk of committing suicide, with 70% of attempts within 3 years of surgery, suggesting that ongoing support be extended considerably beyond the 6 months now recommended.

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