The obesity epidemic continues to evolve into the greatest public health concern facing this generation. As a result of the rising incidence of obesity worldwide and the adoption of laparoscopic bariatric surgery techniques, there has been an exponential rise in the number of bariatric procedures performed during the past decade. Bariatric surgery continues to be the most effective treatment for morbid obesity; currently more than 300,000 bariatric procedures are performed annually worldwide. Although bariatric surgery results in massive weight loss, the sequelae of redundant skin and adipose tissue can significantly affect the patient's quality of life and satisfaction. Body-contouring surgery therefore represents an important component of comprehensive care for patients undergoing bariatric surgery. A plastic surgeon performing body-contouring surgery must understand the spectrum of bariatric procedures available to patients as well as the anticipated trajectory of weight loss, nutritional issues, and some of the potential complications that can occur with these operations. Surgeons should also have a comprehensive understanding of the disease of morbid obesity and its associated physiologic and psychological health issues. This chapter will outline modern bariatric surgical practices and their implications with respect to body-contouring surgery.

Prevalence of Obesity

Obesity is a disease state that is increasing in incidence and that carries with it a significant health burden, despite the recognition of obesity as a major public health problem and a call to action among developed nations for more than a decade. Since 1980, the incidence of individuals who are overweight or obese has increased threefold in certain regions of North America, Europe, New Zealand, Australia, and Asia. Even developing countries such as India, China, South Africa, Argentina, Guatemala, and the Pacific Islands have been increasingly affected by obesity. Both the National Institutes of Health and World Health Organization have reported that obesity as defined by BMI criteria has been steadily increasing over the last three decades at an average rate of 0.3 to 0.8% per year. Obesity prevalence has risen to such great heights in the United States that currently more than one-third of American adults are considered obese (BMI >30 kg/m^2) and 5.9% are considered morbidly obese (BMI ≥40 kg/m^2). The percentage of people who are morbidly obese is more than double that identified during the 1970s. The morbidly obese group seems to be becoming increasingly prevalent compared with the more moderate classes of obesity. It is expected that 75% of Americans will be overweight by 2025. The prevalence of obesity has increased in both males and females of all ages, in all racial and ethnic groups, and among individuals of all educational levels. The world prevalence of overweight adults is estimated at more than 1.6 billion, with more than 400 million of those individuals considered obese. The World Health Organization predicts that there will be more than 2.3 billion overweight adults and 700 million obese individuals worldwide by 2025.

Associated Health Problems and Societal Impact

Obesity has a widespread effect on an individual's overall health. It has been noted as a major risk factor for a host of health problems, including hypertension, type 2 diabetes, dyslipidemia, cardiovascular disease, and obstructive sleep apnea. It has also been implicated in the development of various malignancies, including breast, colon, prostate, and endometrial cancer. As a result, obesity is on its way to overtaking tobacco use as the main cause of preventable deaths in the United States. It currently contributes to approximately 300,000 premature deaths each year.

Obese patients can be placed in graded categories of obesity on the basis of their BMIs. The relative risk of death increases substantially with increasing BMI, particularly for individuals who have BMIs of ≥35 kg/m^2 (severe obesity). Studies have found that mortality rates among the morbidly obese (BMI >40 kg/m^2) are 2.5 to 12 times higher than those of individuals of normal weight. Although there appears to be a direct correlation between climbing BMI and mortality, this relationship is likely more complex. Underlying genetic factors as well as other anthropometric indices (e.g., hip–waist circumference) may better define obesity-related risk in the individual patient (**Table 1.1**).

Table 1.1 Categorization of body mass index measurements

Body mass index value (kg/m^2)	Category
25 to 29.9	Overweight
30 to 34.9	Obesity
35 to 39.9	Severe obesity
40 to 49.9	Morbid obesity
50 to 59.9	Super obesity
Above 60	Super-super obesity

The financial burden that results from the treatment of obesity and its related illnesses is immense. In the United States, the cost of the management of obesity and its related conditions has been estimated at $150 billion annually. This high cost is further complicated by a health care climate of finite resources and climbing expenditures. The management of obesity and the prevention of its related health problems has already become an important focus of public health care legislation and policy initiatives. Because we have not yet reached the pinnacle of the obesity epidemic, strategies for the prevention and management of obesity will become increasingly important. As more patients are afflicted with obesity, we can anticipate bariatric surgery becoming increasingly prominent in the future.

Treatments for Morbid Obesity

DIETARY, EXERCISE, AND BEHAVIORAL MODIFICATIONS

Currently the Centers for Disease Control and Prevention (CDC) recommends assessment of weight by BMI category. The goal of most weight loss strategies is to achieve a 1- to 2-pound loss per week until the weight is in the target healthy BMI zone (18.5–24.9 kg/m^2). Evidence would suggest that nonsurgical approaches to weight loss in the form of diet, exercise, and behavior modification have modest success in the short term, but weight loss by these methods alone does not appear to be durable and often fails over the long term. In a systematic review of major weight loss programs in the United States, it was found that 15 to 25% of weight loss was seen over the short term (3–6 months), but less than 9% of patients were able to maintain their weight loss at 1 year. Another review of randomized controlled trials of weight loss involving very-low-calorie diets with 12 to 36 months of follow-up reported losses that ranged between 3.5 and 13.4 kg; long-term weight loss data were not available. There have been some studies with long-term follow-up that have demonstrated significant major weight loss in the short term (≤100 pounds). These studies employed intensive behavioral interventions (residential nursing programs, weight-loss camps, outpatient courses featuring weekly meetings, midweek phone calls, and close staff follow-up) and were quite expensive, thereby making them cost prohibitive for the majority of obese individuals. Despite these efforts, most of the studied patients had regained 34 to 41% of their lost weight at 1 to 5 years of follow-up.

MEDICAL MANAGEMENT

There are a large number of anti-obesity medications in preclinical development, although none have yet proven to be the elusive panacea for weight loss. The criterion currently used by the U.S. Food and Drug Administration (FDA) for measuring the efficacy of appetite-suppressing drugs is the demonstration of statistically significant weight loss. This is considered weight loss that is 5% better in the treatment group than in the placebo group according to data from a randomized, double-blind, placebo-controlled clinical trial. Currently those patients who are unable to lose weight through diet, exercise, and behavioral modification alone who have a BMI of more than 30 kg/m^2 or of more than 27 kg/m^2 and a comorbid condition are eligible for drug treatment. Sibutramine (a serotonin reuptake inhibitor) and orlistat (a lipase inhibitor) have both been used as pharmaceutical adjunctive agents for weight loss therapy. Sibutramine was removed from the European market because of a significant number of reported adverse events, including tachycardia, hypertension, and arrhythmias; it was subsequently removed from the U.S. market as well. Another medication, rimonabant, has been approved in the United Kingdom for weight loss and weight loss maintenance. These medications have demonstrated short-term successes involving the loss of 5 to 10% of body weight from baseline. In addition to the various side effects associated with orlistat (loose stools, flatulence), psychiatric disturbances associated with sibutramine have been described.

BARIATRIC SURGERY

Bariatric surgery has undergone a dramatic evolution since its inception. The tenets of restriction and malabsorption were central to a variety of surgical operations described during the last three to four decades, although it has become apparent throughout the course of this evolution that the mechanisms behind bariatric surgery are much more complex. Neurohormonal changes play a significant role in affecting weight loss and the resolution of comorbidities after bariatric surgery. The concept of metabolic surgery has emerged to more accurately reflect the complexity of these physiologic changes. Mason and Ito conceived the original gastric bypass operation during the 1960s as a variation of gastric ulcer surgery. Currently the most commonly performed surgeries in the United States are gastric bypass, adjustable gastric banding, and sleeve gastrectomy. Biliopancreatic diversion and duodenal switch comprise less than 1% of procedures performed in the United States; they are limited to specialized centers and to patients for whom other alternatives failed, or they may be part of a staged approach for the super obese.

Bariatric surgery is the best available treatment for morbid obesity. It can produce weight loss within 1 year postoperatively that is far greater than that achieved with nonsurgical weight-management programs. In 1991, the National Institutes of Health's Consensus Conference stated unequivocally that surgery is the only approach that provides consistent and permanent weight loss for morbidly obese patients and that surgery is indicated for patients with BMIs of 40 kg/m^2 or more or for those with BMIs of 35 to 40 kg/m^2 with obesity-related comorbidities.

In addition to providing a durable solution for weight loss in the obese patient, bariatric surgery has also been demonstrated to improve obesity-related comorbidities, particularly type 2 diabetes, hypertension, dyslipidemia, and obstructive sleep apnea. An increasing amount of evidence exists to substantiate the remission or improvement of type 2 diabetes after bariatric surgery. Multiple retrospective cohort studies have shown that all major bariatric procedures result in diabetes remission rates of 45% to nearly 100% with significant durability. Weight loss from interventions such as bariatric surgery may also halt the progression of disease. Even modest weight loss in high-risk populations has been demonstrated to reduce the incidence of new diagnoses of diabetes. Two well-designed randomized controlled trials that studied the efficacy of bariatric surgery as a treatment for type 2 diabetes mellitus were recently published in the same issue of the *New England Journal of Medicine* and provided further level 1 evidence that bariatric surgery is an effective treatment for type 2 diabetes.

Data also support the improvement and normalization of lipid profiles after bariatric surgery. Across studies, however, the rates of normalization do not always reach statistical significance. When these data are considered collectively with the results of diabetes and hypertension remission rates, it becomes increasingly clear that bariatric surgery plays an important role in reversing the metabolic syndrome that is responsible for coronary heart disease. Many studies have also documented the

long-term efficacy of bariatric operations for treating the comorbidities of obesity, including sleep apnea, obesity hypoventilation, pseudotumor cerebri, nonalcoholic liver disease, polycystic ovary syndrome, gastroesophageal reflux, urinary incontinence, degenerative joint disease, and venous stasis disease.

The dramatic effects on weight loss and the resolution of comorbidities have led to an improved survival rate among patients undergoing bariatric surgery. Some of the most compelling evidence of this improved survival comes from the Swedish Obese Subjects study, which was published in 2007. This study followed 4,047 obese individuals; 2,010 of these subjects underwent bariatric surgery and 2,037 underwent conventional treatment. Over an average follow-up period of 10.9 years, there was a mortality rate of 6.3% among subjects in the matched control group as compared with a 5% mortality rate in the surgery group. This represented a 29% adjusted (all-cause) mortality reduction associated with bariatric surgery. Another prospective study published by the McGill bariatric group demonstrated an 89% reduction in the relative risk of death in the group of patients who had undergone bariatric surgery at 5 years of follow-up. Yet another study demonstrated a 40% reduction in long-term mortality for patients after bariatric surgery. In this cohort of patients, bariatric surgery was shown to significantly reduce cause-specific mortality associated with coronary artery disease, diabetes, and cancer.

Modern Bariatric Surgery

Laparoscopy has become the preferred approach for most bariatric procedures. It has several advantages, including less pain, earlier discharge, and a lower incidence of wound complications. The last two decades have seen the widespread adoption of laparoscopic surgical approaches to bariatric surgery. Currently more than 90% of bariatric procedures performed in the United States are accomplished via the laparoscopic approach. The wide adoption of laparoscopic bariatric surgery has also improved the public's perception of bariatric surgery, and this has contributed to the increase in the number of bariatric surgical procedures performed during the last two decades. The last two decades have also demonstrated a decrease in the overall mortality rate associated with bariatric procedures. This is a result of additional experience with these procedures as well as improved patient selection and better perioperative patient care.

INDICATIONS FOR BARIATRIC SURGERY

The National Institutes of Health consensus statement issued in 1991 outlined the patient qualifications for bariatric surgery. These guidelines included patients who are morbidly obese (BMI >40 kg/m^2) as well as those with severe obesity (BMI of 35–39.9 kg/m^2) with one or more obesity-related comorbidities for whom nonsurgical weight loss attempts have been unsuccessful. Patients should also generally have a chronic history of obesity with no underlying endocrine abnormalities that

can contribute to the condition. These qualifications for bariatric surgery are endorsed by numerous professional societies and government agencies, including the Centers for Medicare & Medicaid Services. Despite the prevalence of obesity and the recent growth in the number of bariatric surgery operations being performed, patient access to the best available treatment for morbid obesity remains limited. Currently less than 2% of patients who qualify for bariatric surgery undergo operative therapy.

CONTRAINDICATIONS TO BARIATRIC SURGERY

There are no absolute contraindications to bariatric surgery. Relative contraindications include mental or cognitive impairment with the inability to comprehend the need for long-term follow-up and nutritional supplementation, uncontrolled psychiatric illnesses, active cancer, advanced liver disease with portal hypertension, unstable cardiopulmonary disease, and pulmonary hypertension (pulmonary systolic pressure >30 mm Hg). Age is no longer considered an absolute contraindication to surgery.

SURGICAL WORKUP

Comprehensive multidisciplinary evaluation is a critical component of the preoperative workup of the morbidly obese patient, and multidisciplinary care should continue into the postoperative period. The best outcomes after surgery occur in the motivated patient who understands the importance of diet, exercise, and long-term follow-up. The role of the surgeon in guiding the patient toward a procedure that appropriately balances the patient's goal for weight loss with the risks associated with surgery is critical.

The goals of the preoperative workup of the bariatric surgical patient are to establish his or her candidacy for bariatric surgery, to identify any undiagnosed obesity-related medical problems, and to establish the patient's general fitness for surgery by optimizing his or her current health problems. A large proportion of the morbidly obese patient population will have medical conditions that require optimization before surgery. An accurate history and physical examination are important to ascertain the patient's overall risk related to general anesthesia. The history and physical examination are also important to guide further workup, which may include a sleep study to detect obstructive sleep apnea, an arterial blood gas measurement to detect obesity hypoventilation syndrome, and a cardiac evaluation for patients who are suspected of having coronary artery disease.

Patients are routinely assessed by a team of specialists that includes a bariatric surgeon, a dietitian, a social worker, and a psychologist. A psychological evaluation is performed to detect the presence of underlying mental health disorders that require additional counseling or medical treatments. Patients are also required to attend a mandatory informational and educational session. Here the various surgical options are introduced, the risks and benefits of each procedure are discussed, the typical

postoperative course is reviewed, and the patients are counseled about the necessity of ongoing long-term follow-up and the need for nutritional supplementation during the postoperative period. The informational session helps patients to create reasonable expectations regarding surgical outcomes, and it allows them to be better informed about the various surgical options available to them.

Preoperatively candidates must be knowledgeable about the bariatric surgical procedure that they have selected. They need to understand the changes involved in the anatomy of the gastrointestinal tract; the potential complications that may occur during or after surgery and how to prevent or recognize them; the medication changes that will take place postoperatively; and the various associated postoperative concerns and recommendations, such as excess skin laxity, hair loss, nausea, constipation, and diarrhea. The patient should also be educated about the surgical process, including the average duration of the surgical procedure, the approximate length of the hospital stay, and the period of time required before he or she can return to daily activity. Signs and symptoms of potential problems and the use of preventative techniques, such as using an incentive spirometer and performing antithrombotic exercises, are also explained.

Standard preoperative investigations include a comprehensive blood chemistry panel and a complete blood cell count. A lipid panel, a glycated hemoglobin value, and various vitamin and mineral levels (such as vitamin D25, B12, B1, and A, and iron) are routinely obtained. All patients also undergo an upper gastrointestinal contrast study preoperatively to assess for the presence of a hiatal hernia. If discovered, the hiatal hernia would be repaired concomitantly with the bariatric procedure.

PORT PLACEMENT

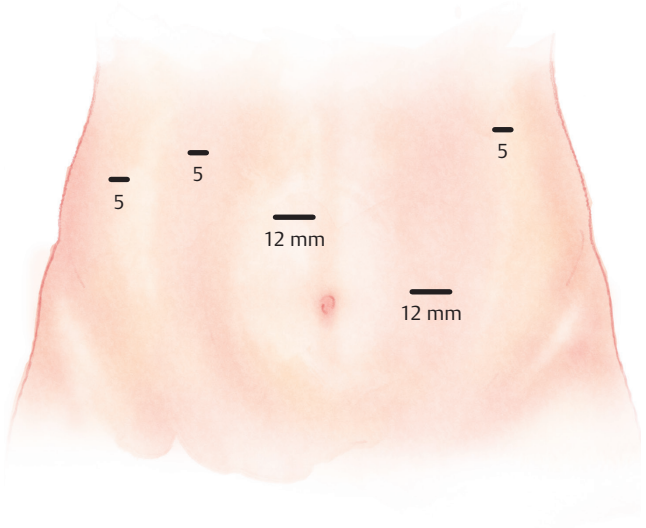

Fig. 1.1 Laparoscopic port placement for bariatric surgeries.

Port placement for bariatric procedures varies among surgeons and institutions. Most procedures can be performed with five to six abdominal trocars that range in size from 5 to 12 mm. Other approaches have been described that involve a reduced number of ports, and some surgeons perform select bariatric procedures through a single-port access. A common port placement scheme used at our institution is shown in (**Fig. 1.1**). This consists of the establishment of a pneumoperitoneum with the use of a Veress needle placed in the left abdominal wall lateral to the umbilicus at the edge of the rectus abdominis. A 12-mm trocar is then placed at this site. A 5-mm port is placed in the subcostal region beneath the inferior edge of the liver at the right midaxillary line for the use of a fixed liver retractor. A 5-mm port is placed in the subcostal region at the right midclavicular line, and a 12-mm port is placed just slightly cephalad and to the right of the umbilicus to serve as the surgeon's main operating port. A final 5-mm trocar is placed in the left upper quadrant for use by the assistant.

LAPAROSCOPIC GASTRIC BYPASS

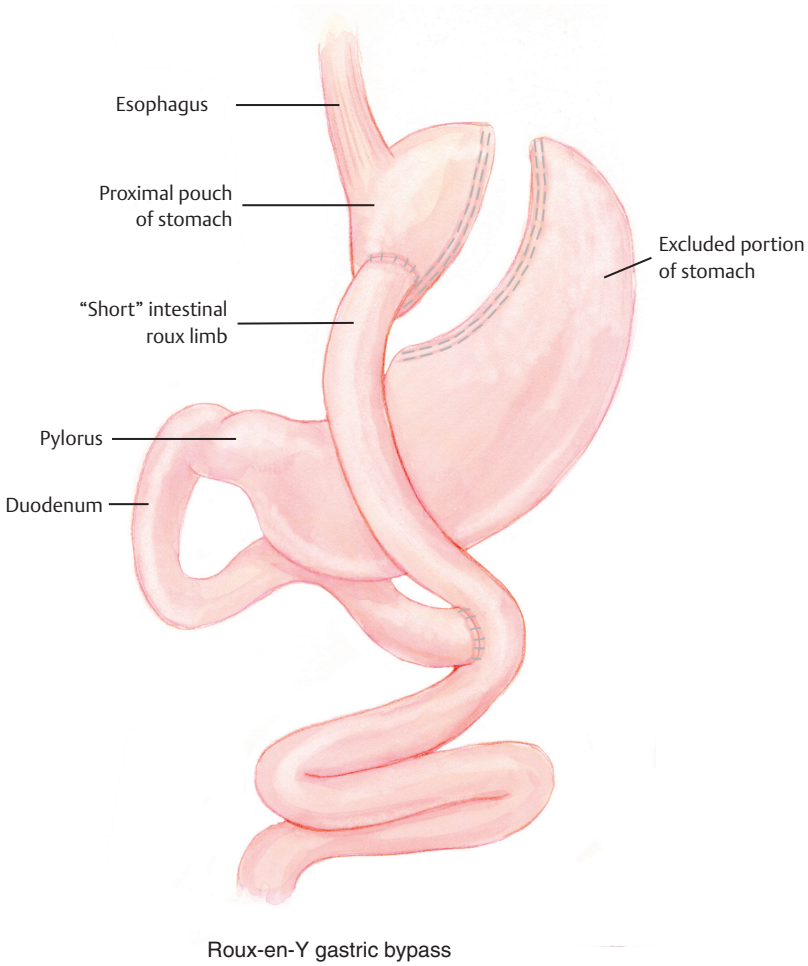

Fig. 1.2 Roux-en-Y gastric bypass.

The gastric bypass was first described for weight loss in 1966 by Mason and Ito at the University of Iowa. The concept was based on observations of weight loss among patients who had undergone partial gastric resections for peptic ulcer disease. These patients were observed to lose weight postoperatively, and they had difficulty regaining weight over the long term. Further refinements led to the development of the Roux-en-Y gastric bypass, which has become the most commonly performed bariatric procedure currently used in the United States. This surgery combines elements of restriction and malabsorption. It is becoming increasingly recognized that bypass of the proximal small bowel causes dramatic changes in the neurohormonal milieu of the foregut; this plays an important role in effecting weight loss and resolving associated comorbidities. A small gastric pouch of 15 to 30 mL that is based on the lesser curvature of the stomach is constructed, and the proximal foregut is bypassed with a 150-cm Roux limb that is anastomosed to the gastric pouch proximally (**Fig. 1.2**). A jejunojejunostomy is created distally. Operative times typically last between 2 and 3 hours.

Outcomes

Gastric bypass is a very effective procedure for induction of weight loss in morbidly obese patients. Studies would suggest an expected estimated weight loss of between 60 and 75% of the total body weight to occur over the 18 to 24 months after the operation, and a great deal of long-term data support the durability of weight loss incurred after gastric bypass. In 75% of patients, the gastric bypass is also very efficacious for causing the resolution of obesity-related comorbidities. Comparisons between patients undergoing gastric bypass and those receiving medical management alone have demonstrated that gastric bypass patients have a lower 5-year mortality rate than nonsurgical patients (0.68 vs. 6.17%), despite a 0.4% risk of perioperative mortality for the patients undergoing surgery.

Mortality associated with gastric bypass surgery ranges from 0.3 to 1% in the published literature. Of the associated perioperative complications, wound infection, anastomotic leak, gastrointestinal tract hemorrhage, bowel obstruction, and pulmonary embolus have been reported most frequently. Anastomotic leak is a dreaded complication after gastric bypass. Leaks can occur at the gastric pouch, the staple line of the gastric remnant, or the jejunojejunostomy. Early detection and management are key to minimizing the progression to sepsis. The management of leaks requires fluid resuscitation, intravenous antibiotics, wide operative drainage, and occasionally the placement of a T-tube into the defect to control the source.

The most frequently reported late complications are stomal stenosis, bowel obstruction, and incisional hernia. Early obstruction at the level of the jejunojejunostomy is likely the result of a technical error and usually requires operative revision. Later episodes of obstruction are usually caused by ulceration, inflammatory changes, or ischemia. These often can be successfully managed with a combination of medical

therapy and endoscopic dilatation and stenting. Marginal ulcerations at the gastrojejunostomy can also occur, and they can usually be managed with medical therapy in the form of antisecretory medications and cytoprotective agents. Unlike typical peptic ulcer disease, marginal ulcers require prolonged medical therapy to allow for mucosal healing. A significant proportion of patients with marginal ulcers will have some intraluminal foreign body (such as a staple or suture) that contributes to the local inflammatory process and that should be removed endoscopically if it is identified. The minority of cases will require operative revision, but this should only be considered after medical management has been found to be ineffective for the compliant patient.

Although it is uncommon, the unrecognized internal hernia is one of the most feared complications after gastric bypass. This condition can be difficult to diagnose clinically and radiologically, and it can only be excluded as a potential cause of abdominal pain after the bowel is evaluated laparoscopically. Small bowel strangulation as a result of a missed internal hernia can be a clinical disaster. Although a contrast computed tomography scan can be helpful for identifying an internal hernia, it can also be falsely negative. Surgeons should have a low threshold for performing diagnostic laparoscopy in patients with persistent abdominal pain if they do not have evidence of an alternative cause such as cholelithiasis or marginal ulceration.

LAPAROSCOPIC SLEEVE GASTRECTOMY

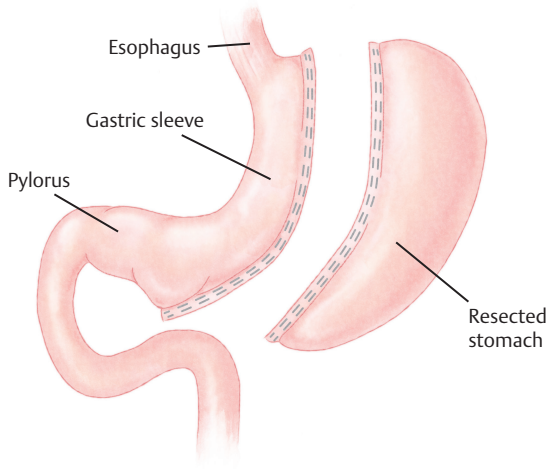

Fig. 1.3 Vertical sleeve gastrectomy.

Sleeve gastrectomy was initially described by Hess and Marceau as part of the biliopancreatic diversion and duodenal switch operation (**Fig. 1.3**). It was later popularized as a result of its use as the first of two stages for high-risk patients undergoing laparoscopic Roux-en-Y gastric bypass or duodenal switch. This staged approach

was associated with an improved safety profile for high-risk patients and for the super obese. The laparoscopic sleeve procedure has subsequently been performed as a primary bariatric operation with alterations in technique, including the use of a smaller bougie size and the initiation of the sleeve closer to the pylorus. In 2007, the American Society for Metabolic and Bariatric Surgery published a clinical statement recognizing the use of laparoscopic sleeve gastrectomy as an option for carefully selected patients undergoing bariatric surgical treatment, particularly those at high risk and those who were classified as super-super obese. This statement was subsequently updated again in 2011 to reflect the growing literature demonstrating that sleeve gastrectomy effectively provides clinically significant and durable weight loss. This is now accepted as a valid primary bariatric surgery as well as for use with high-risk patients or as part of a staged approach. Data support that, in the United States, sleeve gastrectomy is now becoming increasingly used as an effective primary weight loss procedure.

Sleeve gastrectomy, comparatively, is a technically straightforward procedure to perform. The stomach is reduced to approximately 25% of its original volume via the vertical division of the greater curvature against a bougie. Although the sleeve gastrectomy primarily accomplishes weight loss by restriction, there are other factors (neurohormonal changes, increased gastrointestinal transit) that likely play a role. In addition, this procedure does not require a gastrointestinal anastomosis, and it maintains the integrity of the pylorus, thereby avoiding the anastomotic problems and dumping syndrome seen with laparoscopic Roux-en-Y gastric bypass.

Outcomes

There are now several studies that support sleeve gastrectomy as being efficacious for providing clinically significant and durable weight loss. Current data demonstrate that sleeve gastrectomy provides a mean percent excess weight loss of 55%, and it has assumed a position between gastric banding and gastric bypass with regard to both clinical effectiveness and overall risk of complications. Most currently available studies have mean follow-up periods of less than 3 years; however, those reporting follow-up durations of more than 5 years have had complication rates that range up to 15%. The reported leakage, bleeding, and stricture rates in the systematic review were 2.2, 1.2, and 0.63%, respectively, and the postoperative 30-day mortality rate was 0.19%. Although they are uncommon, staple line leaks are a major source of postoperative morbidity for patients undergoing sleeve gastrectomy. These most commonly occur 1 to 2 weeks after surgery, which is well after the patient has been discharged from the hospital. It is thought that most of these leaks are likely the result of a high pressure at the angle of His due to narrowing at the incisura. The literature would suggest that these complications occur in 0.7 to 7% of sleeve gastrectomies; they most commonly occur in the proximal stomach, often adjacent to

the gastroesophageal junction. The management of a staple line leak involves fluid resuscitation and source control. Self-expanding retrievable stents have been used with good success, but occasionally this treatment requires repeat laparoscopy or reoperation and oversewing of the involved area.

LAPAROSCOPIC ADJUSTABLE GASTRIC BANDING

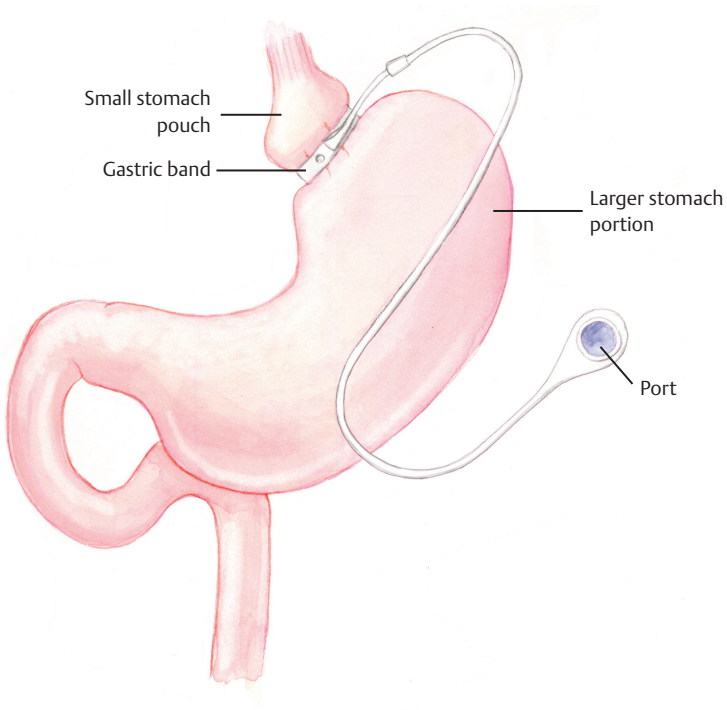

Fig. 1.4 Gastric banding.

Laparoscopic adjustable gastric banding was developed as an adjustable method of controlling gastric restriction (**Fig. 1.4**). This surgery was approved by the U.S. FDA in June 2001, and was for many years the second most commonly performed operation for weight loss in the United States. Current data suggest that this operation is being performed with very low frequency and has been handily surpassed by sleeve gastrectomy.

During this procedure, a silicone band is placed around the proximal stomach. A self-sealing port is implanted beneath the skin through which the band reservoir volume can be percutaneously adjusted to the desired level of restriction without dysphagia. The instillation of saline narrows the stoma between the proximal pouch and the distal stomach, thereby creating earlier satiety. Often patients require multiple adjustments to achieve an appropriate level of restriction that causes weight loss but avoids dysphagia.

Outcomes

Advantages of this procedure include its technical ease, its reversibility, and the fact that it can often can be performed as an ambulatory surgical procedure. Laparoscopic gastric band placement surgery is associated with short operating room times (<1 hour), low morbidity and mortality rates (0.1%), and short hospital stays (<1 day). Weight loss is usually in the range of 0.5 to 1 kg per week. Maximal excess body weight loss generally occurs over a period of 18 months to 3 years. According to a systematic review, the 3-year mean excess body weight loss for the Lap-Band system was 50.20%, and the BMI reduction was 11.81 kg/m^2 from baseline. The rate of resolution of comorbidities after the procedure was 60.29% for diabetes and 43.58% for hypertension. The gastric band is not as effective a weight loss procedure as either sleeve gastrectomy or gastric bypass; nearly one quarter of patients will fail to lose 50% of their excess body weight at 5 years, and it will be considered that their treatment has failed. Male gender and a BMI of more than 50 kg/m^2 have been identified as predictors of the failure of adjustable gastric banding.

In the short term, laparoscopic adjustable gastric banding has the lowest risk of immediate complications and overall mortality. According to case series and systematic reviews, the perioperative mortality rate of this type of procedure lies between 0.1 and 0.3%. It has the disadvantages inherent to an implanted foreign body, and, as compared with other surgical alternatives, it appears to be the least durable with respect to weight loss. Patients must be compliant with ongoing surveillance, repeated band adjustments, and dietary and lifestyle modifications to obtain good outcomes. Furthermore, approximately 33% of patients will require revisional surgery for any of a number of reasons, including band malfunction, erosion, or slippage. Occasionally these complications will necessitate band removal.

EVOLVING THERAPIES

Newer endoluminal technologies such as endosleeves and intragastric balloons provide potential alternative strategies for weight loss without the intent of permanence that is inherent to bariatric surgery. These procedures are designed to be reversed at a clinically appropriate time without permanently altering the gastrointestinal tract. Currently these therapies lack sufficient long-term data to determine their overall efficacy. It may be that these technologies will evolve to fulfill a "bridging" role in the surgical management of the high-risk bariatric patient or as a potential stand-alone therapy for patients with lower BMIs. In addition, they may provide a means of weight loss before necessary orthopaedic or vascular operations as well as a cost-effective method for preoperative weight loss and risk reduction.

PROCEDURAL SELECTION

The patient is ultimately responsible for selecting the procedure that he or she feels most appropriately balances his or her goals for weight loss with the operative risks of surgery. Occasionally patients' preconceptions regarding the options available to them can complicate surgical procedure selection. One example would be the morbidly obese patient with insulin-dependent diabetes who is convinced that a gastric band is the most appropriate procedure for him or her when in fact he or she would be better managed with gastric bypass or sleeve gastrectomy. The surgeon's role in this process is to educate patients and fully inform them about the advantages and disadvantages of each surgical procedure and its associated risks.

POSTOPERATIVE CARE

At most institutions, patients are kept for 1 to 2 days after surgery. Patients routinely undergo a water-soluble upper gastrointestinal contrast study to assess for any potential leakage or obstruction. Patients are discharged from the hospital when they are tolerating fluids. They are typically sent home on a graduated diet that progresses from full liquids to soft foods over the course of several weeks. Patients are seen 1 week and 1 month postoperatively and then quarterly thereafter. Regular evaluation is important to screen for nutritional issues, to enhance ongoing weight loss, and to motivate the patient.

Multidisciplinary care during the postoperative period is associated with improved outcomes. At each visit, patients are seen and assessed by a multidisciplinary team that includes the surgeon, a dietitian, a nurse, and a social worker. The attending of support group meetings is an important ongoing activity that allows patients to share their experiences with other patients who have undergone bariatric surgery. These groups also provide ongoing education regarding diet and lifestyle choices. Those patients who are actively involved in support group sessions postoperatively have been shown to lose more weight and to have better sustained weight loss.

Considerations for Body-Contouring Surgery after Bariatric Surgery

Massive weight loss induced by bariatric surgery generally results in redundant and amorphous skin of the abdomen, breasts, arms, and thighs. This scenario is often dependent on patient factors such as age and preoperative BMI. Loose skin can cause physiologic problems such as intertrigo as well as difficulty walking, urinating, or performing sexual activity. It is well established that these issues can result in

social isolation for these patients, and they adversely affect the individual's psyche and self-confidence. More than two-thirds of patients who have undergone bariatric surgery consider their excess skin to be a negative consequence of surgery. This disappointment is stronger when massive weight loss has been incurred. Patients who lost weight with bariatric surgery and gained years of life as a result often desire body-contouring surgery to fully regain their self-esteem and to function more normally in society. Furthermore, body-contouring surgery after bariatric surgery has been demonstrated to significantly improve patients' physical and emotional states, and it may also encourage them to be more attentive to weight maintenance. Studies have demonstrated that patients who have undergone body-contouring surgery after gastric bypass surgery experience a higher health-related quality of life than those who have undergone only gastric bypass surgery.

TRAJECTORY OF WEIGHT LOSS AFTER BARIATRIC SURGERY

Weight loss after bariatric surgery typically plateaus around 12 to 18 months after surgery. It is critical to wait until the patient's weight loss has stabilized before proceeding with body-contouring surgery. Evidence would suggest a significantly lower incidence of complications after body-contouring surgery in those patients undergoing body-contouring procedures after having achieved a stable weight for at least 3 months. Most authors recommend that a 6-month period of stable weight maintenance be required before referring patients to a plastic surgeon with expertise in body-contouring surgery. Some insurance companies require the patient's weight to be stable for 6 months to 1 year before they will consider covering any surgical procedures of this type.

It is also critical to ascertain and manage any potential nutritional or vitamin deficiencies before embarking on body-contouring surgery. Patients who have undergone bariatric surgery are at risk of the development of protein deficiency as well as a variety of vitamin and mineral deficiencies. Patients who have undergone malabsorptive procedures such as gastric bypass or biliopancreatic diversion and duodenal switch are at higher risk of having these deficiencies. If they are not corrected, these conditions can negatively affect wound healing during planned body-contouring procedures.

BODY CONTOURING AFTER GASTRIC BANDING

The goals of body-contouring surgery include producing the best possible aesthetic and functional outcomes for the patient. The band port can occasionally limit abdominal wall plication during body-contouring surgery, especially if it is located in the midline; it can also be a source of residual deformity and pain. In addition, changes in abdominal wall compliance with abdominal wall plication can have an

effect on the amount of gastric restriction. A recent study suggested that the existing port can be exchanged for a low-profile port and filled to 50 to 75% of its original volume during body-contouring surgery. With this approach, the researchers were able to maximize the cosmetic outcomes of gastric band patients undergoing body-contouring surgery while maintaining the existing level of gastric restriction.

Conclusions

Obesity is not merely a cosmetic problem but rather a life-threatening and progressive disease state that is associated with reduced quality and quantity of life. Bariatric surgery is the best long-term treatment currently available for morbid obesity. Weight loss with bariatric surgery resolves or improves most comorbid conditions, and it also results in a significant reduction in the risk of mortality. The progressive nature of obesity, the potential complications and specialized requirements of the bariatric procedure, and the psychosocial and nutritional needs of this population require the services of numerous health care experts. The sequelae of massive weight loss after bariatric surgery can involve loose and redundant skin that can negatively affect the quality of life of these patients. Available expertise in body-contouring surgery after massive weight loss is an important part of the high-quality, comprehensive care of the bariatric patient. The plastic surgeon is an important addition to the bariatric multidisciplinary team. With the use of body contouring, he or she helps patients to improve their appearance, self-confidence, and vitality, which helps motivate them to maintain their weight loss.

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