Complications of Adjustable Gastric Banding

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Although the initial success and proven safety of adjustable gastric banding (AGB) have led to near extinction of the vertical banded gastroplasty, more recent analyses of rising long-term complications of AGB show the need for ongoing careful study. The mortality is remarkably low, the in-hospital mortality is only 0.02%, and the risk-adjusted mortality index 0.4%, compared with 0.08% and 0.7% for laparoscopic Roux-en-Y gastric bypass (LRNYGB) in a large randomized, prospective trial.1,2 However, AGB is associated with a 13% hospital readmission rate3 and up to a 52% revisional surgery rate.4 Of patients, 73% would not agree to gastric banding again, after removal or deflation for a complication.5

Complications that range from band perforation to failure of weight loss are becoming increasingly apparent as the length of time bands are left indwelling increases. It has been suggested that each year the band is left in vivo increases the complication rate 3% to 4%,6 with a major complication rate of 40% at 10 years. This situation is partially to blame for the tendency of surgeons worldwide to tame their initial enthusiasm for AGB and increasingly offer alternative procedures for surgical weight loss. Although the literature highlights many different complications, short-term studies clearly underreport the long-term incidence of complications, particularly gastric prolapse, pouch dilation, and esophageal failure. Failure of weight loss is considered by many as a complication, but is common to all surgical alternatives and is considered separately.

For the purposes of this discussion, complications are grouped as intraoperative, early postoperative, and late postoperative. The remarkably low mortality cannot overshadow the increasingly described life-altering complications that can occur years later. The increased morbidity and mortality associated with required revisional surgery need to be considered when offering the patient their initial options for surgical weight loss.

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INTRAOPERATIVE COMPLICATIONS

Intraoperative complications associated with AGB are likely underreported in the literature because there has been no requirement for tracking outcomes in bariatric centers until recently (Bariatric Outcomes Longitudinal Database for American Society of Metabolic and Bariatric Surgeons accredited Centers of Excellence, National Surgical Quality Improvement Program for Levels 1A and 2A American College of Surgeons Bariatric Surgery Center Network). Many surgeons who perform AGB are not affiliated with such centers and do not report complications. Nevertheless, in the studies that have been published, intraoperative complications are infrequent.

Technique in placement of the AGB has evolved since the time of its inception. What was first termed the perigastric technique was later modified to include the neurovascular tissue along the lesser curvature, termed the pars flaccida technique, as first described by Fielding in 2001. This technique was particularly important in nearly eliminating posterior gastric prolapse. However, retrogastric dissection through the pars flaccida and along the left crus of the diaphragm toward the spleen is commonly performed blindly, risking damage to all surrounding structures. Splenic bleeding can be frustrating and necessitate use of hemostatic agents or even splenectomy in the most severe cases. Placement of the device through the gastric wall has been reported and has led to patient death. Furthermore, it is theorized that subclinical gastric wall injury may result in later tendency toward erosion (intragastric band migration).

Later, in an effort to decrease the incidence of complications including obstruction and anterior prolapse, gastric fat pad removal was advocated and showed a decrease in the postoperative incidence of dysphagia and anterior gastric perforation. Multiple studies have been published regarding different techniques to optimize outcomes; perhaps the most notable was the recommendation to close the crura in cases of suspected hiatal hernia, as popularized by Fielding and Ren. In Zagzag and colleagues’ recent study of 2334 AGB patients, the rate of prolapse dropped from 3.83% to 1.76% with routine cruroplasty at every band placement, although the study only had 22-month follow-up. More recently, a widely-practiced modification termed the antiprolapse stitch, a gastrogastric plication suture placed along the lesser curve distal to the band, has been shown to provide no additional protection from prolapse complications.

Inferior vena cava (IVC) inclusion in the band is rare but is described, as is inadvertent dissection into the mediastinum. Whereas the former can result in intra-abdominal catastrophe, the latter may simply present as pneumomediastinum or pneumothorax in the immediate postoperative period without clinical consequence. Tube thoracostomy may be advisable because many patients require positive pressure ventilation secondary to obesity-related obstructive sleep apnea. Damage to the device itself, particularly rupture of the balloon reservoir by suture needles during placement of plicating sutures, necessitates immediate explantation with replacement using a second device: a costly complication.

Early Postoperative Complications

Pulmonary

Pulmonary complications are a well-known source of morbidity in all bariatric procedures. Administration of general anesthesia is the most important risk factor and contributes to the development of pulmonary atelectasis, which most often responds to spirometry and early postoperative ambulation. Additional aggressive postoperative pulmonary toilet is needed because many patients carry the diagnosis of obstructive sleep apnea and use home positive pressure airway devices. As a result,
continuous oximetry monitoring has become standard in the postoperative care of the bariatric patient.

In contrast to atelectasis, which does not significantly change the management of patients postoperatively, pulmonary embolism is said to be the most common cause of death, accounting for at least 23% of patient deaths after AGB. Perioperative chemical and mechanical deep vein thrombosis prophylaxis should be instituted in all patients, and extension of treatment to include use after hospital discharge should be considered in those at increased risk, or with a previous history of thromboembolic disease. IVC filter placement may be indicated in selected patients at high risk, although complications associated with this procedure occur in up to 57% of patients.

Cardiac
The risk of perioperative myocardial infarction is less than 1%, but the gravity of this complication requires preoperative preparation to lower the incidence of this dreaded complication. Placement of the AGB, like any major operative procedure requiring general anesthesia in a higher-risk population, requires that attention should be given to thorough preoperative evaluation and risk assessment, and specific cardiology consultation is advised when cardiac risk is increased. Coronary revascularization needs to be accomplished preoperatively to avert cardiac morbidity and mortality. For those higher-risk patients unable to undergo revascularization or with significant nonoperative valvular disease, medical optimization and careful continuous monitoring with transesophageal echocardiography should be considered during surgery. Perioperative and postoperative β-blockade should be continued in patients on that class of antihypertensives preoperatively.

Early Obstruction
Although overfilling the band is a known cause of esophageal outlet obstruction, early obstruction (<24 hours) after band placement is reported in the literature. A retrospective article published in 2007 reported the incidence to be 6% among a study group of 400 patients. Multiple causes for esophageal outlet obstruction exist, including postoperative edema, inappropriately small diameter band, and inclusion of perigastric fat pads. For this reason, the design of the AGB has undergone evolutionary changes. The LAP-BAND (Allergan Inc, Irvine, CA, USA) has eliminated the smaller sizes, including the original 10-cm band, and replaced it with the LAP-BAND AP, which is 10.5 cm long and less likely to result in early obstruction. A larger size is also available at the surgeon’s discretion. The addition of a low-pressure 360° balloon design with creased pillows was introduced to try to decrease the incidence of erosion. The other major product available in the United States is the improved Swedish Adjustable Gastric Band, now owned and marketed as the REALIZE Band-C (Ethicon Endo-Surgery Inc, Cincinnati, OH, USA). This product also has a low pressure and creased but triangular shape to the inflated balloon. There is only a smaller band length available, but the REALIZE has the widest (23 mm) platform, which is an antislip design. Despite the design improvements, most studies are not able to show a significant difference in the incidence of complications between the 2 band systems.

Patients with immediate postoperative obstruction experience intolerance to solids or liquids and in the most severe cases, their own secretions. Contrast esophagram reveals obstruction at the level of the band and the initial management includes intravenous (IV) fluids with nasoenteric decompression and antiinflammatory medications. For those who fail nonoperative management, operative exchange for a larger diameter band combined with perigastric fat pad excision is usually curative. Although
conversion to another procedure has been suggested as an alternative, this should not be necessary unless the largest size band had already been used.

**Late Postoperative Complications**

Late postoperative complications of AGB are frequent and often lead to revisional procedures. The true incidence of long-term complications is not yet known, because the incidence is rising as long-term study results emerge. When patient frustrations mount or anatomic difficulties abound, explantation with replacement or conversion to other procedures is indicated. Patients should be informed that the choice of AGB likely results in future revisional procedures.

Infrequent complications such as gastric artery erosion with near fatal hemorrhage,29–31 cecal volvulus around the tubing,32 thrombosed band tubing,33 paragastric Richter hernia,34 chronic cough,35 pouch necrosis,36 and gastric bezoar formation37–39 have all been reported in the literature, but are rare. Our discussion primarily focuses on common late complications such as port and tubing problems, gastroesophageal reflux disease (GERD), pouch dilation, prolapse, erosion, and esophageal failure.

**Port and Tubing Complications**

Port and tubing complications represent a significant source of morbidity. Although these complications are rarely life-threatening in nature, their incidence is reported between 4.3% and 24%,40–42 and this seems to be related to length of follow-up.40 Failure of the port and tubing may be related to mechanical forces associated with change in abdominal wall anatomy after weight loss, as well as physical changes in the silicone tubing. The initial compliant and flexible nature becomes increasingly firm and brittle over time, and is more likely to fracture. The rate of mechanical problems seems to correlate with weight loss and be directly related to the length of follow-up.43 The banding device is composed of 2 separate pieces coupled together by a metal connector, most often situated inside the peritoneal cavity. Disconnection between these 2 parts of the device has been reported at a rate between 5%44 and 9.4%.45 This problem is easily appreciated at fluoroscopy, and is visualized by addition of the fluid to the band without evidence of increased restriction of contrast through the gastric pouch. This finding can be confirmed by contrast injection into the port with evidence of extravasation under fluoroscopy.

Although presenting in a similar fashion, the diagnosis of both reservoir leakage and tubing fracture is made more difficult with clinical adjustments alone, often necessitating multiple office visits and repeat band-fills until the diagnosis is confirmed with fluoroscopy. Termed a minor complication by most, operative intervention under a general anesthetic is usually required for replacement of the port, especially if entry into the abdominal cavity is needed to retrieve the disconnected tubing.

Further port complications include skin ulceration, persistent port-cutaneous sinus, and port infection/abscess. These complications are typically treated with port removal and subsequent replacement once the infection has cleared. The important consideration is that what seems to be a simple port infection may represent a devastating band erosion. This complication must be ruled out with endoscopy.

A frequent complaint, but not mentioned as a complication in most reports, is the patient who complains of port site pain. This complication can be bothersome to the patient and presents a challenge to the bariatric surgeon. Workup should include fluoroscopic radiologic evaluation to ensure normal port position and absence of a port site hernia by computed tomography scan. In an effort to eliminate port migration and inversion, application of mesh has been advocated to the underside of the port. The efficacy of this intervention is unknown and opinions are at best anecdotal.
Repositioning of the port further from the costal margin and out of natural flexion creases has resulted in resolution of chronic pain in some cases.

**GERD**

Exacerbation of preoperative GERD, as well as new development of reflux symptoms, has been described in as many as one-third of postoperative patients (who had been asymptomatic preoperatively). This condition can be troubling and often leads to patient disappointment when fluid is removed from the band, which is the first-line treatment. The frequency of GERD symptoms can lead to delayed or poor weight loss. Similarly, development of Barrett’s esophagus has been noted as a result of gastric banding, as has adenocarcinoma of the esophagus.

It is routine practice in our bariatric program to perform a preoperative endoscopy, because the incidence of asymptomatic morbidly obese patients with pathologic findings is 57% in 1 study, primarily erosive esophagitis and hiatal hernia. The prevalence of GERD and esophageal motility disorder is higher in the morbidly obese, and is more often asymptomatic. As a result, it has been suggested that morbidly obese patients may have altered visceral sensation. At preoperative endoscopy, if erosive GERD is present, it is our practice to recommend LRNYGB over AGB. If the endoscopic findings reveal hiatal hernia without erosive GERD, then esophageal manometry is performed. If esophageal function is normal without a motility disorder, then AGB with hiatal herniorrhaphy can be offered to the patient. Crural repair should always be performed in the presence of hiatal hernia, even if it is small in size. The presence of an anterior dimple has been described as a reliable guide to performing an anterior crurorrhaphy at the time of AGB and has been shown in numerous studies to decrease the incidence of GERD postoperatively.

After placement of the band, should GERD symptoms develop, sequelae such as esophagitis, ulcerations, and Barrett’s esophagus are easily appreciated on endoscopy. Treatment includes band deflation and proton pump inhibitor medical therapy. Most authorities agree that GERD recalcitrant to nonoperative management indicates the need for conversion to LRNYGB as the rescue procedure of choice.

**Esophageal Failure**

It is customary in many bariatric centers, including ours, to perform preoperative esophageal anatomy and function studies before placement of an AGB. It has been shown that preoperative manometry can predict development of esophageal dilation after AGB. Furthermore, some form of esophageal dilation is seen in nearly half of patients and is believed to be only partially reversible. When esophageal dilation is encountered in the symptomatic band patient, removal of the fluid allows reversal of the dilatation with recovery of esophageal function in most (87%) cases. However, in 13% of patients, no recovery from their achalasia-like dilatation was observed. These patients regain their weight and fail, requiring conversion to a secondary bariatric procedure. Normal preoperative manometry does not preclude post-AGB esophageal complications. Normal manometry was found in 4 of 5 patients who developed megaesophagus 32 months postoperatively.

Attenuation of the lower esophageal sphincter has been confirmed under manometric testing. A 2010 study revealed that an intact lower esophageal contractile segment was seen more often in successful band patients than in those with postoperative symptoms of poor weight loss, volume reflux, regurgitation, or fluid intolerance by mouth. Furthermore, esophageal dysmotility disorders are seen more commonly in symptomatic patients. Despite the fact that more than two-thirds of AGB patients develop esophageal motility disorders at long-term follow-up and 25% develop
significant dilatation of the esophagus, it remains difficult to predict these problems from preoperative manometry. Nevertheless, it is responsible to evaluate the prospective AGB patient fully and recommend an alternative bariatric procedure, such as LRNYGB, for the patient with a known esophageal motility disorder.

**Slippage/Prolapse**

Gastric band prolapse is reported in the literature to occur at a rate as little as 0.5%\(^57\) or as frequently as 36%\(^58\). The broad range of frequency is explained by differences in definition of the term, differences in the technique and implant used, and duration and completeness of follow-up.\(^59\) Early publications cited a decrease in the rate of prolapse after changing from the perigastric technique to the pars flaccida technique.\(^60-62\) Further reduction was reported using gastrogastric sutures and gastro-pexy techniques.\(^63\)

Band prolapse occurs when a portion of gastric wall herniates or prolapses under the band, causing clockwise or counterclockwise rotation of the band. Patients present with any combination of dysphagia, GERD exacerbation, food intolerance, or nausea and vomiting. Diagnosis is confirmed by contrast swallow, which reveals horizontal band positioning in the case of anterior prolapse or vertical positioning of the band in the case of posterior prolapse (Fig. 1). Contrast pools in the excess prolapsed stomach overhanging the band. Endoscopy can also be valuable and reveals enlargement of the pouch above the level of the band.

Theoretic causes of gastric prolapse are many and include failure of suture fixation of the stomach over the band. This situation can result from poor eating habits, or overstuffing the pouch, persistent vomiting, or any combination that causes mechanical stress on the sutures or the anchoring portions of the gastric wall. These causes may lead to disruption of the plication and subsequent allowance of stomach distal to the band to herniate in a cephalad direction under the band. The prolapsed stomach may then incarcerate above the level of the band, and even strangulate in some cases (Fig. 2).

Initial treatment of gastric prolapse requires band deflation. If initial nonoperative techniques are unsuccessful in relieving symptoms, surgery should ensue. The safety and feasibility of treatment using the laparoscopic approach has been shown.\(^64\) Some surgeons prefer unbuckling, reduction of the prolapsed stomach, and then rebuckling the band. The rebuckling can also be performed at a second procedure to allow resolution of edema and ischemia. Most centers now understand that recurrence is common with this approach and recommend removal of the band, with replacement through a newly created retrogastric tunnel cephalad to the original tunnel. If repositioning or replacement is not feasible, simple removal is an acceptable alternative. Future plans for replacement or conversion to another weight loss procedure, such as LRNYGB or sleeve gastrectomy, can then be discussed with the patient. However, this approach can be problematic in that previous authorization for revisional surgery is not always granted by third-party payors until the patient has become morbidly obese again. As a result, this approach should be discussed with the patient in detail preoperatively.

Symptoms of prolapse overlap those of both band overtightening and gastroesophageal dilation. Acute prolapse is treated with hospital admission, pouch decompression with nasogastric tube, and IV fluid administration. Should the patient develop a concerning abdominal examination or pain out of proportion to the physical examination, the diagnosis of pouch ischemia or necrosis should be entertained and ruled out with emergent laparoscopic evaluation.
Fig. 1. Anterior prolapse as seen on contrast swallow. Note the horizontal position of the band.

Fig. 2. Prolapse as seen during laparoscopy.
**Pouch Dilation**

Concentric pouch dilation is believed to be an entity separate from prolapse or slippage. A recently published review of the literature surrounding gastric band prolapse analyzed 40 studies from an initial 121 and revealed that 25% of these studies lumped concentric pouch dilation together with slippage data, thus diluting the data. Normal positioning of the band (Fig. 3) along its axis is seen, which differentiates pouch dilation from a prolapse. Endoscopy reveals the symmetry of the concentric dilation and contrast swallow reveals poor flow across the band. Furthermore, treatment differs from that of prolapse in that band fluid removal is usually curative in the short-term.

Again reported are the symptoms of GERD, dysphagia, food intolerance, and vomiting, similar to prolapse. Dilation may be severe enough to weaken the lower esophageal sphincter and enable the patient to use the distal esophagus as a food reservoir. Concentric pouch dilation is most often caused by overtightening of the band, effectively causing a gastric outlet obstruction, in addition to the patient habitually overeating, or failing to stop eating at the first sensation of satiety.

As mentioned earlier, treatment is to give the patient a band holiday, consisting of complete fluid removal. Over a period of several weeks resolution of the dilation occurs in most patients. Should repeat contrast swallow reveal persistence of the dilation, additional time before a fill is recommended. If after slow and judicious reinstallation of fluid, pouch dilation becomes a chronic problem, then discussion about removal and possible alternative procedures should ensue. If the dilation resolves, attempts to reinstill fluid into the band can again be undertaken, although lower volumes and closer follow-up are indicated.

**Erosion**

Band erosion, or intragastric migration of the device, is a feared complication of AGB. The incidence ranges from 0% to 5.8%, with the average more often quoted between 0.6% and 3%. The risk of development of erosion remains as long as the device is indwelling. Foreign material surrounding a dynamic organ can lead to eventual erosion, a lesson learned from the historical experience of the Angelchik prosthesis in decades.

![Fig. 3. Normal band position. Note oblique angulation.](image)
Unlike the Angelchik, which encircled the lower esophagus, the AGB is placed over the thicker and serosalized fundus of the stomach. In addition, chronic band erosions have not proved to be dangerous complications leading to mortality.

Theories regarding cause include subclinical gastric wall injury at the time of placement, plication over the buckle mechanism, overtightening, and abnormal reaction of gastric tissue in contact with the prosthesis. The diagnosis is surprisingly subtle and elusive. The patient may present initially with vague abdominal pain and weight regain, but rarely peritonitis. Some patients present with port site infections, which should always trigger endoscopy to assure that intragastric migration has not occurred. Diagnosis is made by endoscopic visualization of the prosthesis located within the lumen of the stomach on retroflexed endoscopic viewing (Fig. 4).

Treatment of the erosion includes removal of the band, repair of the gastric wall, and possible revision to another procedure at a later date. Band removal is normally accomplished by laparoscopy, but can also be successfully treated by endoscopic band removal.70–72 Band replacement at the time of its removal is ill advised, because there is not enough evidence at this time to consider conversion to another procedure at the same time.

Failure of weight loss

AGB boasts many attractive benefits that led to an exponential increase in use over recent years. Hinojosa and colleagues73 report a 329% increase in band usage over a 4-year period between 2004 and 2007. However, the most troublesome complication is likely underreported in the literature because patients who have failed with the device are often the ones lost to follow-up. Failure of weight loss is multifactorial and it is nearly impossible to predict which patients will fail before placement.

In a 2008 review of gastric banding versus gastric bypass, Tice and colleagues58 highlight data from 14 studies published between 2000 and 2007 that reveal a range of 1-year excess weight loss (EWL) from 31% to 54% with the band. There was only 1 high-quality study (randomized, controlled) that compared banding to bypass. In this 5-year study by Angrisani and colleagues, preoperative body mass index (BMI), calculated as weight in kilograms divided by the square of height in meters, averaged 43.4 kg/m², and follow-up was 96% at 12 months. The AGB achieved a 35% EWL at 1 year, compared with 51% EWL with the LRNYGB. Weight loss failure (BMI >35 kg/m² at 5 years) was observed in 34.6% of AGB patients and in 4.2% of LRNYGB patients ($P<.001$).74

![Fig. 4. Band erosion as identified on endoscopic retroflexion.](image)
Although the slower weight loss associated with the band does not seem to be a problem in the short-term (because EWL continues to improve for several years), there is a large percentage of AGB patients who fail to lose weight over the long-term. Early reports indicated this percentage to be low but more recent reports reveal failure to lose more than 50% EWL in as many as 46% of patients at 5 years.\textsuperscript{75}

Long-term data are surfacing that reveal 7-year success rate as defined by EWL of more than 50% to be present in 43% of patients.\textsuperscript{6} Nguyen and colleagues\textsuperscript{2} reported treatment failure (as defined by EWL <20%) in 16.7% of patients. Conversion to a different weight loss procedure occurs at an astonishing rate of 25% to 58% after as little as 7 years.\textsuperscript{6,76}

The approach to the patient who fails to lose weight with an AGB is to initially ensure good function of the components of the device. This situation is investigated by aspiration of the fluid in the band. If no fluid returns, concern exists for the integrity of the system and the leak must be identified and addressed. If the system seems to be functioning well, an in-depth discussion is undertaken with the patient to evaluate eating habits, especially eating between meals and consumption of liquid calories. Review of a diet log in the presence of family members may elucidate the cause and direct therapy to include other members of the patient-care team such as the bariatric dietician and the bariatric psychologist. The psychologist must have specific knowledge of eating disorders in addition to experience in the diagnosis and treatment of bariatric patients.

 Failure to lose weight after appropriate adjustments, device interrogation, and confirmation of patient compliance indicates failure of the device as a weight loss tool. Further debate surrounds management of the patient who has failed to lose weight with the AGB, and there is no consensus as to which procedure is most appropriate for the failed AGB.

Options after failed gastric banding include removal, replacement, or conversion to another procedure. Removal of the band leads to weight regain in most patients, with rapid recurrence of morbid obesity and return of comorbidities.

Replacement of the band after a failed band should be discouraged based on current literature. Muller and colleagues\textsuperscript{77} describe a 45% reoperative rate in patients who undergo rebanding after having failed their first band.

**Adjustment difficulty**

The ability to titrate the volume of fluid within the band can be difficult and many algorithms have been published describing optimal technique. Finding the green zone or the sweet spot can be challenging in certain individuals who seem to have a narrow window between too much restriction and too little. However, detailed discussion with the patient over time is the most valuable aspect of this part of the patient’s care. Patients with an indwelling band can become compulsive about the amount of fluid in the band, and the need to remove fluid for any reason can be met with resistance because of concern over weight gain. Frequent outpatient visits (monthly) with counseling to help the patient learn to stop eating when they begin to feel the sensation of fullness is essential for long-term success.

Overtightening of the band causes intolerance to food and sometimes even liquids in severe cases. Maladaptive eating then ensues, which can be frustrating for the patient, because this usually results in weight gain. Patients frequently present to clinic hours to days after instillation of fluid and require fluid removal for acute obstruction. Removal of all the fluid is not necessary. Many bariatric centers remove a quantity equivalent to the last 2 fills.\textsuperscript{78}

**Treatment of the failed adjustable gastric band**

Treatment of late complications leading to failure of AGB has been discussed by numerous investigators, but to date there are no trials with sufficient numbers of
patients to make firm conclusions regarding revisional surgery. The Weight Loss Center at the Minnesota Institute for Minimally Invasive Surgery has performed a retrospective review of late complications associated with AGB that required revisional surgery. Data were collected on all 296 AGB patients from June 2003 to March 2011 (7.75 years). The average follow-up measured 4.02 years. Of a total of 296 patients in our database, 16 were referred from outside practices for revisional procedures, and were excluded. A total of 62 of 280 (22.14%) of the patients who received their index procedure at our facility required 1 or more revisional procedures. A total of 77 procedures were performed in these 62 patients, for a revision rate of 27.5%. Follow-up data were obtained on 61 of 62 (98%) revisional surgery patients. In this subgroup of major late AGB complications requiring surgery, the average preoperative BMI was 42.3 and EWL was 39.3%.

Of the 62 patients who required band revision, 51 patients had the original 10-cm LAP-BAND, 6 had the LAP-BAND AP, and 5 had the 11-cm Vanguard.

Indications for revisions are summarized in Fig. 5. They consisted of 31 cases of prolapse (45%), 20 cases of port/tubing complications (29%), 6 cases of erosion (9%), 5 cases of weight loss failure (7%), and 1 case each (1%) of pouch dilation, GERD, and esophageal failure. Unusual indications consisted of 1 case of chronic pain, 1 case requiring dialysis, 1 case desiring to join the military (and unable to do so with the LAP-BAND in place), and a single case of port infection secondary to self-adjustments.

Revisional procedures consisted of 28 removal/replacements (36%), 20 port/tubing revisions (26%), 12 single-stage AGB to LRNYGB (16%), 3 2-stage AGB to LRNYGB (4%), and 14 band removals (18%) (Fig. 6). All were successfully performed laparoscopically, without need for conversion to open.

Our conversion procedure of choice is the LRNYGB. Controversy exists regarding technical considerations, specifically as to where the gastrojejunostomy should be created (above, at, or below the band). We prefer transection of the stomach above the level of the band, which leaves a small gastric pouch but healthy tissue less prone to leak or stricture. Excision of the proximal stomach damaged by the previous surgery is performed. Of the 15 patients, initially 2 of 3 patients who had transection below the band suffered complications: 1 leak and 1 stricture (at the band site, despite release of the capsule). Since our dismal early experience below the band, all 12 patients had the

![Fig. 5. Indications for revision.](image-url)
anastomosis above the band, and only 1 had a complication of stricture at the gastro-
jejunalostomy. This complication was successfully treated by endoscopic balloon
dilation.

SUMMARY

The AGB is a popular, rapidly proliferating option for surgical weight loss. It has a remarkably low mortality rate and an excellent safety profile for intraoperative and early postoperative complications. However, late complications are frequent and lead to a high rate of revisional surgery. There is substantially increased risk for revisional surgery, and the incidence of late complications increases 3% to 4% per year. Prospective studies are needed to identify patients at risk for late complications. Certainly a subset of patients are successful with AGB, but the methodology for selection preoperatively remains elusive.

REFERENCES


