

# Indications and Results of Reversal of Vertical Banded Gastroplasty (VBG)

Rebecca Thoreson · Joseph J. Cullen

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## Abstract

**Introduction** Vertical banded gastroplasty (VBG) was initiated in 1980 as a weight loss operation that restricted oral intake. **Objective** The aim of our study was to determine the results of patients who presented with complications of the VBG and wanted reversal of the VBG, not a conversion to another gastric weight loss operation.

**Material and Methods** From 1993 to 2008, 27 patients had reversal of a VBG. Of the patients, 85% were female and presented on average 13 years (range 2–27 years) after the VBG. Presenting symptoms included nausea/vomiting in 88%, reflux in 65%, stricture requiring endoscopic dilatation in 38%, while 7% of patients had upper gastrointestinal bleeding or required total parenteral nutrition. Patients were offered conversion to another weight loss operation but decided on reversal of the VBG alone. All reversals were performed in a similar manner by placing a linear stapler through a gastrotomy resulting in division of the polypropylene mesh band, and reversal of the VBG pouch.

**Results** No patients died from the procedure and morbidity included one wound infection and one wound seroma. Preoperative Visick score decreased significantly after reversal, while reflux symptoms resolved in 93% of patients.

**Conclusion** We conclude that reversal of a VBG results in symptomatic relief in the majority of patients.

**Keywords** Gastric surgery · Gastroplasty · Obesity · Reflux

## Introduction

Vertical banded gastroplasty (VBG) was initiated in 1980 as a weight loss operation that restricted oral intake.<sup>1</sup> A small volume pouch of 14–20 ml is created along the lesser curve and the outlet is reinforced with a band of polypropylene mesh or a silastic ring. Advantages of the VBG include a lack of malabsorption and no anastomosis or bypass as in other operations designed for weight loss. In a 10-year follow-up study, VBG was found to be successful (defined as a loss of at least 25% of preoperative excess weight) as a weight loss operation. After 1 year, the average percent excess weight lost was 52.3% and 64.3% in the super obese (more than 225% of ideal weight) and morbid obese (less than 225% of ideal weight) respectively. At 5 years, the average excess weight lost was 51.6% and 58.8%. In addition, morbidity and mortality was found to be low. Operative mortality was 0.24%, the risk of leakage and peritonitis was 0.6%, and the wound infection rate was 1.4%.<sup>2</sup>

## Abbreviations

VBG Vertical banded gastroplasty

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R. Thoreson · J. J. Cullen  
Departments of Surgery,  
University of Iowa Carver College of Medicine,  
Iowa City, IA, USA

J. J. Cullen  
Veterans Affairs Medical Center,  
Iowa City, IA, USA

J. J. Cullen (✉)  
University of Iowa Hospitals and Clinics,  
4605 JCP, 200 Hawkins Drive,  
Iowa City, IA 52242, USA  
e-mail: joseph-cullen@uiowa.edu

The results in other centers have been variable with less than adequate long-term results with regard to weight loss or quality of life. A study of 35 patients who underwent a VBG showed that the operation was safe with minimal complications (early morbidity of 5.7% and late morbidity of 22.8%) and no mortality.<sup>4</sup> However, at 3-year follow-up there were 14 of 29 patients (48%) who were vomiting more than once a week.<sup>4</sup> Another 5-year follow-up study showed that of 100 patients who underwent a VBG, none of them were able to eat regular food without restriction and many patients required reoperation (25%) due to failure of the surgical procedure.<sup>5</sup> A 10-year follow-up of patients who underwent a VBG found that only 26% of patients maintained a weight loss of half of their excess body weight.<sup>3</sup> Frequent vomiting was also found to be a postoperative complication occurring in 21% of patients at least once a week, while gastroesophageal reflux disease (GERD) was found in 38% 3 years postoperatively.<sup>3</sup>

Gastric restrictive operations have late failure rates most commonly due to staple line disruption, enlargement of the gastric pouch, and enlargement of the stoma. Furthermore, stomal stenosis leads to food intolerance and recurrent vomiting and for these patients, weight loss remains satisfactory, but they suffer the sequelae of recurrent vomiting. Using a Kaplan–Meier analysis, Van Gemert and colleagues estimated that 56% of VBG patients and 12% of gastric bypass patients would need revisional surgery over a 12-year period.<sup>6</sup>

Patients who have had a VBG may require reoperation for conversion to other bariatric procedures or reversal due to a number of reasons including inadequate weight loss, vomiting, or gastroesophageal reflux. In some series,<sup>7</sup> GERD symptoms after VBG are relieved by conversion to a Roux-en-Y gastric bypass. Some patients do not desire to have a conversion to operation to induce weight loss for a variety of reasons. Reversal of a VBG is an option that may not lead to further weight loss but could potentially alleviate some of the symptoms associated with this operation. The aim of our study was to evaluate presenting symptomatology in patients who had a VBG reversal including the indications for reversal, any symptoms after reversal, and complications from the reversal procedure. Additionally, we wanted to determine any weight fluctuations after reversal of this gastric restrictive operation.

## Material and Methods

Medical records for all patients who underwent reversal of a VBG were abstracted for details including symptoms (abdominal pain, reflux, nausea, vomiting), nutritional status, diet, requirement of endoscopic dilation of the

pouch, or gastrointestinal bleeding. We also reviewed the pre- and postoperative weights, operative morbidity, and post-takedown outcomes. This study was approved by the University of Iowa Institutional Review Board for Human subjects on November 11, 2007.

There were 27 patients who underwent a reversal of a VBG by the senior author between 1993 and 2008 at the University of Iowa Hospitals and Clinics or Iowa City VA Medical Center. These patients presented with complications of their VBG and wished to have their VBG reversed. They were each offered a conversion to another gastric weight loss operation, which they declined.

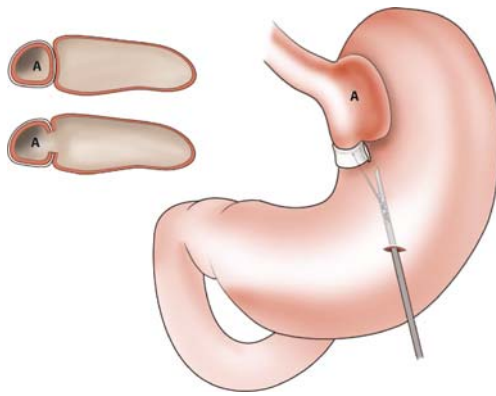
There were 22 females (85%) and five males. They presented on average 13 years (range 2–27 years) after their initial VBG. The average age at the time of the VBG takedown was 52 (range 40–74). The presenting symptoms included nausea and/or vomiting in 89%, reflux in 67%, inability to tolerate solid foods in 48%, stricture requiring endoscopic dilation in 37%, while 7% presented with an upper GI bleed and 7% required supplemental nutrition (one with total parenteral nutrition and one required a gastrostomy tube).

Workup of these patients was very similar. Nearly 90% of the patients had upper gastrointestinal series with barium as an initial evaluation. Two thirds of patients had esophagogastroduodenoscopy (EGD) for diagnosis and potential therapeutic interventions. Half of the patients who had an EGD also had attempts at balloon dilatation to increase the size of the outlet.

*Description of Procedure* All VBG takedowns were performed in a similar manner. The previous upper midline incision is opened from the xiphoid to just superior to the umbilicus. Adhesions along the stomach and liver are taken down and the previous gastroplasty is identified. On the inferior portion of the stomach near the greater curvature a gastrotomy is created and a linear stapler is placed with one of the limbs within the lumen of the gastroplasty and the other within the gastric fundus. The stapler is fired resulting in an intraluminal, longitudinal side-to-side gastrogastrotomy (Fig. 1). The gastrotomy is then closed and then air is used to insufflate the stomach to evaluate for leak.

## Results

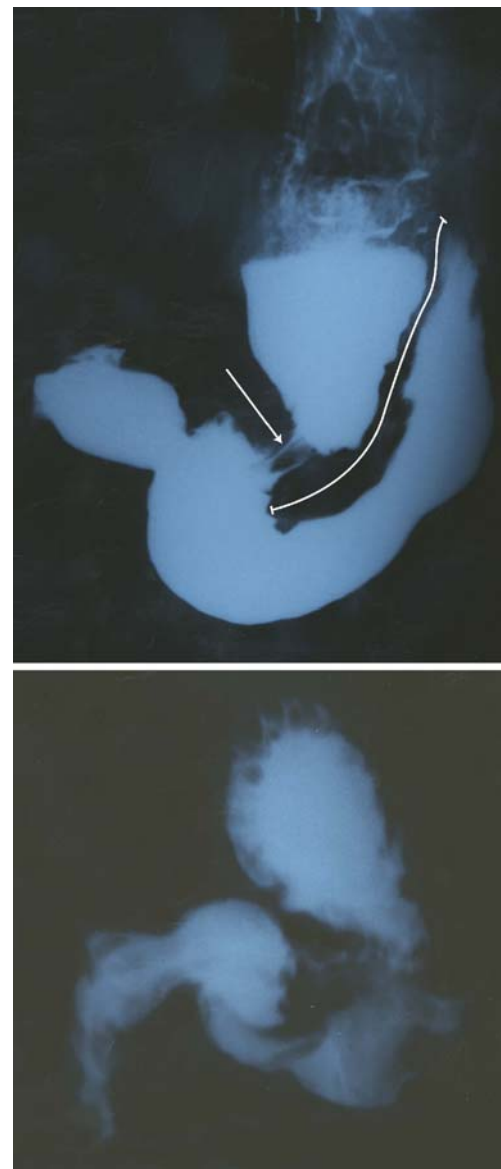
Twenty-seven patients underwent a reversal of their vertical banded gastroplasty. There were no mortalities. Complications included one wound infection, one wound seroma, and one post-operative anemia. There were no gastric leaks. Figure 2 demonstrates a typical upper gastrointestinal series



**Figure 1** Technique of VBG reversal used in all 27 patients. Initially adhesions are taken down between the stomach, liver and colon. The anesthesiologists may place a large bore orogastric tube to aide the surgeon in delineating the anatomy. A gastrotomy is created near the inferior portion of the stomach. Intraluminal palpation of the outlet (which is sometimes severely stenosed) through the gastrotomy, is achieved to guide subsequent placement of a linear stapler. The linear stapler is placed with one of the limbs within the lumen of the gastroplasty (A) and the other within the gastric fundus. The stapler is fired resulting in an intraluminal, longitudinal side-to-side gastrogastrostomy. The gastrotomy is then closed and then air is used to insufflate the stomach to evaluate for leak.

in a patient who presented for reversal of their VBG due to severe reflux symptoms and sustained nausea and vomiting. Postoperatively, a repeat barium swallow was performed demonstrating reversal of the VBG and reestablishment of gastric anatomy (Fig. 2). Other complications were relative minor and did not extend the postoperative hospitalization. The patient with postoperative anemia required transfusion with three units of packed red blood cells during the postoperative hospital admission. The patient with the wound infection required the wound to be opened and packed. All patients were tolerating a solid food diet at the time of discharge postoperatively. All patients initially had relief of their presenting symptoms. However, on follow-up, 7/26 (27%) patients continued to have symptoms of some sort including heartburn, vomiting, and dysphagia. All of these patients had evaluations that included either esophagogastroduodenoscopy or upper gastrointestinal barium radiographs. In all of these patients, there was no obstruction demonstrated, but either reflux or esophagitis was seen. One patient was found to have severe esophageal dysmotility and no obstruction. One patient continued to have dysphagia but without abnormalities noted on EGD. All of the seven patients who continued to have symptoms after the VBG reversal were treated for GERD with improvement in symptoms.

To further quantify outcomes, Visick scores were determined pre- and post-VBG takedown. Although the Visick grading system was originally utilized in post-operative patients following gastric surgery for peptic ulcer



**Figure 2** Upper gastrointestinal series before and after VBG reversal. Prior to reversal, a large, dilated gastroplasty pouch is seen, which correlated with the patient's frequent vomiting and severe GERD symptoms. Barium flow through the outlet was greatly diminished and reflux was also demonstrated. The *arrow* indicates the area of the marlex mesh band that was placed in for the outlet of the VBG. The line indicates the area of the vertical staple line, which is intact. Postoperatively, the patient had a repeat upper gastrointestinal series demonstrating free flow of contrast from the esophagus through the stomach and into the duodenum.

disease,<sup>8</sup> it has been used for various other gastric operations.<sup>9</sup> Grade 1 Visick scores are no symptoms; grade 2 include intermittent/mild symptoms, not affecting life-style; grade 3 are mild symptoms, but refractory to medical therapy; while grade 4 are severe symptoms, not improved (Table 1). The average pre-reversal Visick score was  $2.8 \pm$

**Table 1** Visick Grading System

Grade	Symptoms
Grade 1	No symptoms
Grade 2	Intermittent/mild symptoms, not affecting life-style
Grade 3	Mild symptoms, but refractory to medical therapy
Grade 4	Severe symptoms, not improved

0.1 and decreased significantly to  $1.3 \pm 0.1$  after the reversal ( $P < 0.001$ ). Of the 27 patients, 89% had improvement in their Visick scores and no patient had worsening of their Visick score after VBG reversal. Of the three patients who had no change in their Visick scores after reversal, their preoperative Visick scores were rated as 2 (Intermittent/mild symptoms, not affecting life-style). Of those patients, reflux symptoms were still present at follow-up, but not as severe as preoperatively.

Although follow-up was short, there was not a significant weight gain after reversal of the VBG. Prior to the reversal, patients had significant weight loss ( $P < 0.001$ ) after the initial VBG. The average weight prior to the VBG was 139 kg (range 105–182 kg) and the average weight at the time of the reversal was 96 kg (56–151 kg). There was not a significant amount of weight gained post-reversal ( $P = 0.3$ ). Post-reversal weight was 105 kg (range 63–157 kg). This was seen with a mean follow-up of 32 months (range 2–144 months) (Table 2).

## Conclusions

This study showed that reversal of a vertical banded gastroplasty results in symptomatic relief in the majority of patients who present with nausea or vomiting, reflux symptoms, or inability to tolerate solid foods. This procedure can be done safely with minimal complications or mortality. All patients were tolerating solid foods in the immediate postoperative period. Only a few patients had return of their preoperative symptoms and the severity was decreased. Although follow-up was short, weight gain after the reversal was not significant. However, patients who

desire a reversal of a VBG should also be instructed that weight gain may occur.

To our knowledge, no previous studies have evaluated VBG reversals. Numerous studies have shown that some patients may develop symptoms after VBG.<sup>1–5</sup> A solution that is safe and effective is reversal of the VBG in the way described above. Other options, especially in patients extremely concerned about regaining the lost weight would be conversion to another weight loss procedure such as a Roux-en-Y gastric bypass. One study reviewed 25 patients with severe GERD after a VBG who subsequently underwent a conversion from a VBG to a Roux-en-Y gastric bypass.<sup>7</sup> In this study, 96% of the patients were nearly symptom free after the conversion from a VBG to a Roux-en-Y gastric bypass at a mean follow-up of 37 months.<sup>7</sup> There was also an average weight loss of 13 kg. This operation was also safe with no mortalities and six complications (24%). Both the reversal of the VBG and conversion to an alternative weight loss procedure have been shown to be safe and effective at relieving post-VBG symptoms.

The majority of the patients in our study had some degree of delayed VBG pouch emptying resulting in nausea, vomiting, and GERD symptoms. The delayed emptying of the VBG pouch may be explained by a stomal stenosis or stricture, or a dilated pouch leading to delayed emptying. The results of revisionary surgery for stomal stenosis are poor. In the study by Hunter and colleagues, 80% of revisionary operations were not successful in patients that had failure of a primary operation due to stomal stenosis.<sup>10</sup> In addition, nearly 50% of the patients operated for stomal stenosis required an additional revision and 33% had recurrent stenosis; 16% of the patients ended up with a complete reversal of the original bariatric procedure. Nearly 70% of the patients in this series had multiple endoscopic procedures including balloon dilatation following their revisionary surgery. Thus, in patients with delayed pouch emptying due to stomal stenosis, revision of the stoma would not be recommended but instead a conversion to a gastric bypass or reversal of the VBG would be the procedures of choice.

The reasons for GERD after VBG are not well understood. Reflux symptoms may be related to a number of factors including stasis in the pouch secondary to outlet stenosis, inclusion of acid secreting parietal mucosa with the proximal pouch,<sup>11</sup> or operative damage to the lower esophageal sphincter. Mason has stated that the most common reason for GERD after VBG is the creation of the VBG pouch during the original operation that may have been created too large or without any measurements at all.<sup>12</sup> In our study, two thirds of patients had esophago-gastroduodenoscopy (EGD) and half of these patients also had attempts at balloon dilatation to increase the size of the outlet. This may explain the reflux symptoms in these

**Table 2** Weight Changes Prior to VBG, Prior to Reversal, and Most Recent Weight

Pre-VBG weight (range)	Weight at reversal (range)	Weight after reversal (range)
139 kg (105–182)*	96 kg (56–151)	105 kg (63–157)

\*  $P < 0.001$  vs. weight at reversal



patients may be due to stasis in the pouch secondary to outlet stenosis. Our findings are consistent with the observations of Mason<sup>12</sup> due to the fact that 60% of the patients who had an upper gastrointestinal series were noted to have a dilated pouch, abnormal pouch emptying, or reflux of barium, which also suggests that stasis in the pouch leads to GERD.

Our study has several limitations. Preoperative esophageal manometry or pH studies were not performed in these patients, which limits our ability to ascertain the reasons or the severity of GERD. However, manometry may not be beneficial in demonstrating the cause of GERD in patients with a dilated pouch. Follow-up was short at only 32 months (range 2–144 months). Although we did not see a significant weight gain in our study, we thoroughly counsel patients that significant weight gain may occur after VBG reversal. A possible reason for the lack of weight gain in these patients is a change in diet. Some investigators have demonstrated that many patients adapt to the food intolerances after a VBG by changing their diets to include semisolid food and/or high clear liquids, resulting an increase in caloric intake that is ingested, in turn resulting in an increase in the patient's weight and failure of the VBG (13). Although this is speculation, perhaps after ingesting the high caloric liquids instead of solid foods due to the gastroplasty outlet, patients who have a reversal may resume eating more solid foods instead of the high caloric liquids. Our study does not address this, and only further follow-up studies investigating eating patterns in this group of patients would be needed to support this theory.

In summary, in patients with a VBG who present with nausea, vomiting, reflux, outlet stenosis, or other symptoms of gastric outlet obstruction and who desire relief of their symptoms without a conversion to another weight loss operation, reversal of the VBG is a safe and effective option. There were no deaths in our series of patients and morbidity was low. Postoperative Visick scores decreased significantly after reversal while reflux symptoms resolved in 93% of patients. Due to the fact that follow-up was short in our present study, patients who desire a reversal of a VBG should also be instructed that weight gain may occur.

We conclude that reversal of a VBG results in symptomatic relief in the majority of patients.

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