Surg Endosc (2003) 17: 857–860
DOI: 10.1007/s00464-002-8804-z

SURGICAL ENDOSCOPY
and Other Interventional Techniques

Prospective study of 250 patients undergoing laparoscopic gastric banding using the two-step technique

A technique to prevent postoperative slippage

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Received: 9 August 2002/Accepted: 29 October 2002/Online publication: 28 March 2003

Abstract
Background: The use of LAP-BAND adjustable gastric banding (LAGB) has gained tremendous popularity, but creation of the retrogastric tunnel is a considerable challenge, especially in the surgeon's early experience, and is associated with up to 10% band slippage and occasional gastric perforation. The two-step technique involves a crural dissection toward the angle of His through a pars flaccida approach. The technique facilitates passage of the band with no extensive posterior gastric wall dissection.
Methods: A prospective study investigated 250 patients (207 women and 43 men) who underwent LAGB from January 1999 to May 2002 using a two-step dissection technique. The mean age of these patients was 37 years (range, 18–58 years). Their mean preoperative weight was 120 kg (range, 90–169 kg), and their mean body mass index was 44 kg/m^2 (range, 36–68 kg/m^2).
Results: All the procedures except two were completed laparoscopically, and there were no deaths. The mean operative time was 61 min (range, 35–150 min), and the mean hospital stay was 1.2 days (range, 1–5 days). At 3 years, the mean body mass index had decreased from 44 kg/m^2 to means of 39.9, 37.3, 34.4, 32.4, and 31.7 kg/m^2 at 3, 6, 12, 24, and 36 months, respectively. The mean excess weight loss was 42.1% at 1 year, 51.4% at 2 years, and 55.5% at 3 years. There were four band slippages (1.6%), no band erosion, and no major morbidity.
Conclusions: The use of LAGB with the two-step technique is technically simple, avoids intimate posterior gastric wall dissection, and facilitates tight posterior band support. It therefore is associated with only minimal perioperative complications and a low slippage rate.

Key words: Laparoscopic surgery — Obesity — Gastric banding

In recent years, LAP-BAND (Bioenterics, Carpinteria, CA, USA) adjustable gastric banding (LAGB) has gained tremendous popularity. Advantages of the procedure have been well documented: it is performed laparoscopically, respects gastric integrity, does not alter gastrointestinal continuity, and is completely reversible [2, 4, 10, 14, 17]. However, slippage of the stomach through the band and band erosion through the gastric wall have been reported in approximately 10% of cases in which the standard retrogastric tunnel technique was used [4–6, 8–11, 14, 16, 17].

In the past few years, the techniques for placing of the LAP-BAND and the optimal band position have been modified. The recently introduced pars flaccida technique seems to overcome many of the problems associated with the perigastric technique. However, for some patients, especially those with a higher body mass index, a nonselective LAP-BAND placement using the pars flaccida approach may be too tight or may require significant gastroesophageal junction dissection and thinning, especially in the United States, where only the 9.75- and 10-cm bands are available.

After our preliminary report comparing the perigastric with the two-step technique in a small series of patients [13], we describe our experience with 250 patients who underwent LAGB procedures using the two-step dissection technique. We suggest this technique as a primary technique for LAP-BAND placement, or at least as an alternative for selected patients.

Presented at the 8th World Congress of Endoscopic Surgery/Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) meeting, New York, NY, USA, 13–16 March 2002

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Materials and methods

Patients

Prospective data were registered for the 250 patients (207 women and 43 men, ages 18–58 years of age; mean, 37 years) who underwent laparoscopic placement of the LAP-BAND using the two-step technique [13] between January 1999 and May 2002. All these patients had failed conservative weight control management. Preoperatively, the mean body mass index was 44 kg/m^2 (range, 35–68 kg/m^2), and the mean weight was 120 kg (range, 90–169 kg).

The two-step technique

A similar technique was first described by Weiner et al. [18]. Under general anesthesia, the patient is positioned in a lithotomy and reverse Trendelenburg position. The surgeon stands between the patient's legs with an assistant on the left side and a scrub nurse on the right side. Five ports are used, placed similarly to those used with laparoscopic procedures for the gastroesophageal junction [15].

Dissection begins at the base of the left crus, well above the first short gastric, to free up the angle of His. The anesthesiologist inserts a system-calibrating balloon by the oral route to the stomach, inflates the balloon to 25 ml of normal saline, and pulls it back to the gastroesophageal junction. The surgeon dissects the fat, the nerve of Latarget, and vessels away from the lesser curvature at the equator of the balloon. This dissection goes about 1 or 2 cm deep and posteriorly, adjacent to the gastric wall. The pars flaccida is exposed and dissected open just below the hepatic branch of the vagus nerve.

After identification of the right crus, the assistant retracts the lesser curvature fat to the left. The surgeon begins the crus dissection about 2 cm inferiorly to the site for fundoplication and aims the dissection to the angle of His. A blunt articulating 5-mm curved grasper is passed through this line of dissection and placed at the angle of His. The band is introduced to the abdomen through the puncture site of the left-side 11-mm trocar. The tubing of the band is grasped by the curved grasper and pulled from left to right below the stomach, to be left in place at the pars flaccida dissection site.

The surgeon then returns to the first line of dissection in the perigastric area and continues this dissection from the perigastric area toward the pars flaccida dissection line, where the tubing is to be placed. When the two dissection planes meet, the surgeon pulls the tubing through the lesser curvature plane of dissection. The band follows, being positioned around the stomach and locked in place. Anterior gastro–gastric sutures are placed securing the band and creating a small gastric pouch (Fig. 1). There is no need for posterior suturing because the band is held very tightly by the posterior and lateral perigastric tissue. The tube is brought out through the left-side trocar hole and tunneled to the subxiphoid area, where it is connected to the access port. The access port then is sutured to the subxiphoid fascia.

Results

All the procedures were completed laparoscopically except those for two patients. In these two patients, the procedure was aborted (a band was not placed) because of an extremely large left liver lobe. These patients were placed on a low-calorie diet and underwent successful laparoscopic surgery several months later. In 12 patients, we could not apply the two-step technique, usually because large branches of left gastric artery or perigastric vessels crossed in the area. In these cases, the band was placed using the pars flaccida technique. In 23 patients, a cholecystectomy also was performed. In seven of these patients, closure of hiatal hernia also was performed. The mean operative time was 61 min (range, 35–150 min), and the mean hospital stay was 1.2 days (range, 1–5 days).

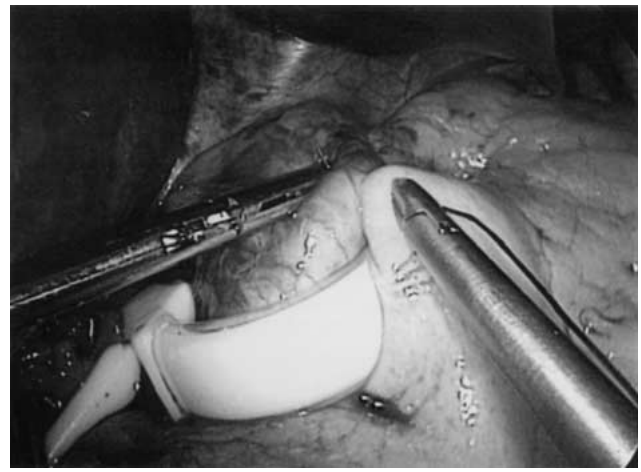

Fig. 1. Creation of a small gastric pouch with gastro–gastro sutures.

Table 1. Complications of the LAP-BAND System

Complication	Cases *n* (%)
Access port tube breakage	13 (4)
Twist of access port	12 (4)
Gastric/esophageal dilation	7 (2.6)
Slippage	4 (1.6)
Postoperative dysphagia	3 (1)
Abortion of procedure	2
Tonsil injury (tube related)	2
Trocar gastric wall injury	1
Respiratory failure: ICU care	1
Band leakage	1
Access port-site hernia	1
Access port infection	1

ICU, intensive care unit

During the follow-up period, four anterior slippages (1.6%) occurred in this group at 6, 11, 18, and 19 months after surgery. Two band slippages were corrected laparoscopically using the original band, and two bands were removed. One patient received a new band later.

Table 1 describes other operative-related complications. Three patients had prolonged (3 to 5 days) but reversible postoperative dysphagia caused by edema at the operative site. Two patients had tonsil injury during placement of the calibrating tube system. These injuries were not severe and were treated conservatory. One patient had a trocar injury to the anterior wall of the stomach during introduction of the first trocar to the abdomen. This injury was repaired laparoscopically. In 25 patients (8%), a broken or twisted port was found, which required an additional minor surgical procedure for correction. This occurred before we began to tunnel the tube to the subxiphoid area and suture it to the fascia.

In a mean follow-up period of 24 months (range, 1–36 months), the mean body mass index decreased from a preoperative 44 kg/m^2 to means of 39.9, 37.3, 35.3, 34.4, 33.6, 32.4, 31.7 kg/m^2 at 3, 6, 9, 12, 18, 24, and 36 months respectively (Fig. 2). The mean excess weight loss was, respectively, 42.1% at 1 year, 51.4% at 2 years, and 55.5% at 3 years (Fig. 3). Of the 212 patients who required band adjustment (85%), 85 needed more than

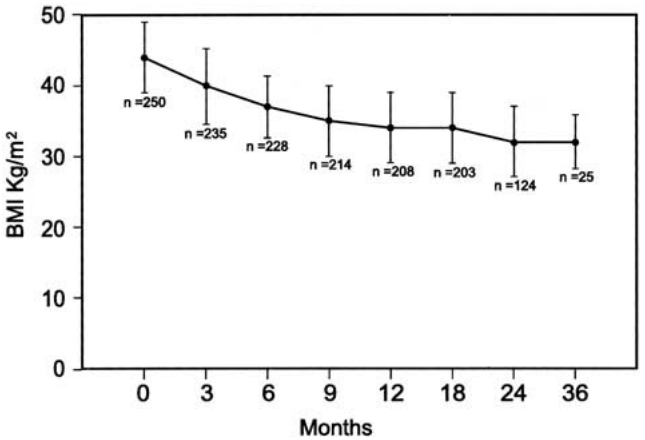

Fig. 2. Evolution of body mass index (BMI) with time.

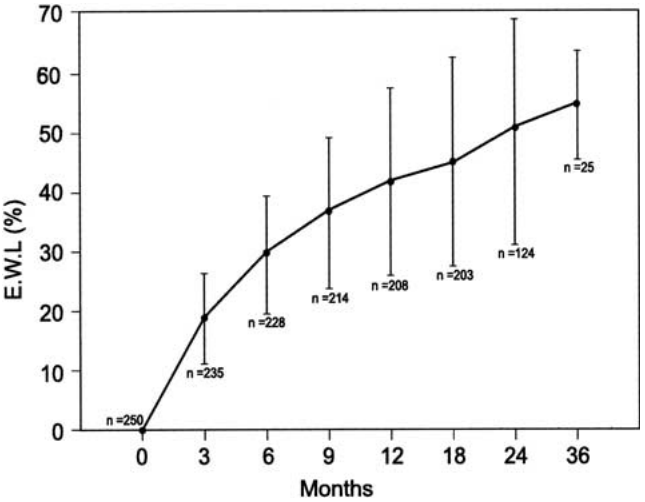

Fig. 3. Evolution of excess weight loss (EWL) with time.

one adjustment. All the adjustments were performed in the radiology suite under fluoroscopy. Contrast studies performed immediately after surgery and during the follow-up period showed that the band placements were identical to those achieved with the retrogastric tunnel (RGT) in the previous studies. Two patients with significant esophageal dilation and five patients found to have gastric pouch dilation during contrast esophageal studies for band adjustment were treated by band deflation, follow-up assessments, and mild reinflation. There was no posterior slippage and no band erosion. During the first year after the procedure, eight patients became pregnant and subsequently delivered healthy babies. One patient underwent successful endoscopic retrograde cholangiopancreatography for removal of a retained common bile duct stone. Another patient underwent laparoscopic cholecystectomy, and still another patient underwent laparoscopic appendectomy 1 month after band placement.

Discussion

The LAP-BAND system has become the principal bariatric procedure in many countries and has been approved recently in the United States. The advantages of the procedure, especially its minimal invasiveness and adjustability, make it a good choice for morbidly obese patients and bariatric surgeons. However, the standard technique of placing the band by retrogastric dissection, as described by Belachew et al. [2], has been reported in some series to be associated with both major and minor complications [6, 9, 11, 16]. Furthermore, the rate of slippage of the band reportedly reaches 5% to 10% in the series of experienced surgeons who have mastered the learning curve [9, 11, 12, 14, 16, 17]. O'Brien et al. [12] have reported the occurrence of slippage at a median interval of 8 months after surgery, and Weiner et al. [18] concur that slippage usually occurs within the first year [18].

In our experience, the advantages of the two-step technique over the RGT rapidly became evident [13]. In our small RGT series (11 patients) during the first 2 years, the technique was associated with a high slippage rate (3 patients, 27%), whereas in the current series of 250 patients undergoing two-step banding, there were only four cases of slippage (1.6%) during both the initial experience and a longer follow-up period. In a recent prospective randomized study, Weiner et al. [18] compared the two techniques of band placement and found no postoperative complications in a group of 50 patients who underwent esophagogastric placement (similar to the two-step technique), as compared with the 6% rate of slippage or pouch dilation within 3 years among those undergoing the traditional retrogastric placement [18].

The main advantages of the two-step technique over RGT is avoidance of direct posterior gastric wall dissection because the two-step dissection is made over the crura. The two-step dissection also creates a smaller posterior space than the RGT technique because the band is pulled through a very tight space in the second step of the band placement from the pars flaccida to the perigastric position.

Creation of the RGT may cause posterior weakening of the ligaments and attachments that are expected to hold the band in place. Furthermore, perigastric dissection creates a wide posterior gap that probably is associated with an increased risk for posterior slippage, gastric injury, and band erosion. Many investigators acknowledge the potential problems with posterior perigastric dissection and have recommended adding posterior sutures or even a synthetic mesh to anchor the band and prevent posterior slippage [1, 3, 7, 18]. With the two-step technique, there is no need for any further posterior enforcement because the band is held tight as a consequence of minimal perigastric dissection.

The recently introduced pars flaccida approach has improved the complication rate associated with the perigastric technique. Nevertheless, application of the small-diameter bands (9.75 and 10 cm) for patients with a thick gastroesophageal (junction requires a significant dissection to thin this area. Alternatively, during surgery when a thick gastroesophageal junction anatomy is found, the surgeon can choose to apply the two-step technique and avoid extensive dissection. We agree with other investigators who have recommended that to attain optimal results, the gastric pouch should be smaller than that originally considered necessary. However, we

do not consider that the two-step technique actually is an esophagogastric banding, as suggested by Weiner et al. [18]. In our experience using the TS technique, the band position is identical to that with RGT, at least as far as can be judged by the postoperative contrast study. Although the left aspect of the band is positioned at the angle of His (i.e., the esophagogastric junction), a couple of technical points can further aid in the creation of a desirably small gastric pouch. First, the dissection at the right cruse should be made as low as possible, and not at the dissection plane used for fundoplication. Second, sutures should be made over an inflated 15-ml gastric pouch balloon, or the surgeon should pull the gastric pouch wall from within the band to secure the gastro–gastric sutures. Specifically, the surgeon should avoid suturing to the fat pad at the gastroesophageal junction. As long as gastro–gastric sutures are placed, a small gastric pouch is created (Fig. 2).

In conclusion, although a longer follow-up evaluation period is desired, LAP-BAND placement using the two-step technique gives every indication of being safe and effective, and can be considered as a technique of choice for LAP-BAND placement. It offers better results than the traditional RGT technique, and in some cases may offer an intraoperative alternative to the pars flaccida approach.

References

1. Belachew WM, Legrand M, Deffechereux TH, Burthenet MP, Jacquet N (1994) Laparoscopic adjustable silicone gastric banding in the treatment of morbid obesity. Surg Endosc 8: 1354–1356
2. Belachew M, Jacquet P, Lardinois F, Karler C (1993) Vertical banded gastroplasty vs adjustable silicone gastric banding in the treatment of morbid obesity: a preliminary report. Obes Surg 3: 275–278
3. Belva P, Takieddine M, Lefebvre JC, Vaneikem P (1994) How to reduce complications rate in laparoscopic gastric banding. Obes Surg 7: 303–309
4. Cadiere GB, Bruyns J, Himpens J, Favretti F (1994) Laparoscopic gastroplasty for morbid obesity. Br J Surg 81: 1524–1526
5. Chelala E, Cadiere GB, Favretti F, Himpens J, Vertruyen M, Bruyns J, Maroquin L, Lise M (1997) Conversions and complications in 185 laparoscopic adjustable silicone gastric banding cases. Surg Endosc 11: 268–271
6. DeMaria EJ, Sugerman HJ, Meador JG, Doty JM, Kellum JM, Wolfe L, Szucs RA, Turner MA (2001) High failure rate after laparoscopic adjustable silicone gastric banding for treatment of morbid obesity. Ann Surg 233: 809–818
7. Favretti F, Cadiere GB, Segato G, Bruyns G, Marchi F, Himpens J, Floetto M, Lise M (1995) Laparoscopic adjustable silicone gastric banding: technique and results. Obes Surg 5: 364–371
8. Fielding GA, Rhodes M, Nathanson LK (1999) Laparoscopic gastric banding for morbid obesity: surgical outcome in 335 cases. Surg Endosc 13: 550–554
9. Granstrom I, Backman L (1987) Technical complications and related reoperations after gastric banding. Acta Chir Scand 153: 215–220
10. Kirby RM, Ismail T, Crowson M, Baddeley RM (1989) Gastric banding in the treatment of morbid obesity. Br J Surg 76: 490–492
11. Morino M, Toppino M, Garrone C (1997) Disappointing long-term results of laparoscopic adjustable silicone gastric banding. Br J Surg 84: 868–869
12. O'Brein PE, Brown WA, Smith A, McMurrick PJ, Stephens M (1999) Prospective study of a laparoscopically placed adjustable gastric band in the treatment of morbid obesity. Br J Surg 86: 113–118
13. Rubin M, Benchetrit S, Lustigman H, Lelcuk S, Spivak H (2001) Laparoscopic gastric banding for morbid obesity: two-step technique may improve outcome. Obes Surgery 11: 1–3
14. Sjoberg EJ, Andersen E, Hole R, Reinertsen S, Soreide O (1989) Gastric banding in the treatment of morbid obesity: factors influencing immediate and long-term results. Acta Chir Scand 155: 31–34
15. Spivak H, Lelcuk S, Hunter JG (1999) Laparoscopic surgery of the gastroesophageal junction. World J Surg 23: 356–367
16. Subhi AA, Szold A (1999) Results and complications of laparoscopic adjustable gastric banding: an early and intermediate experience. Obes Surg 9: 188–190
17. Weiner E, Wagner D, Bockhorn H (1999) Laparoscopic gastric banding for morbid obesity. J Laparosc Adv Surg Tech 1: 23–30
18. Weiner R, Bockhorn H, Rosenthal R, Wagner D (2001) A prospective randomized trial of different laparoscopic gastric banding techniques for morbid obesity. Surg Endoc 15: 69–71