

Laparoscopic Adjustable Silicone Gastric Banding (Lap-Band®): How To Avoid Complications

F. Favretti; G.B. Cadiere¹; G. Segato; J. Himpens¹; L. Busetto²;
F. De Marchi; M. Vertruyen¹; G. Enzi²; M. De Luca; M. Lise

Department of Surgery, University of Padova, Italy; ¹Department of Surgery, Free University, Bruxelles, Belgium; ²Department of Internal Medicine, University of Padova, Italy

Background: The laparoscopic application of LAP-BAND is gaining widespread acceptance as a gastric restrictive procedure. At the same time the reported morbidities (i.e., gastric perforation, stomach and/or band slippage) are cause for some concern.

Methods: From September 1993 until May 1997, 260 patients underwent LAP-BAND at the Department of Surgery at the University of Padova, Italy.

Results: The mortality rate was zero and the morbidity rate requiring reoperation was 3.4% (stomach slippage, gastric perforation, erosion). In order to avoid complications the key points of the technique are reviewed: (1) reference points for dissection (equator of the balloon, left crus); (2) retrogastric tunnel within the layers of the phrenogastric ligament; (3) embedment of the band; (4) proper outlet calibration; and (5) retention sutures.

Conclusions: Attention to technical details is of paramount importance for a safe, standardized and effective operation.

Key words: gastric banding, laparoscopy, morbid obesity, surgery, surgical technique.

Introduction

The laparoscopic application^{1,2} of the LAP-BAND® system, based on the adjustable silicone gastric band introduced by Kuzmak in 1986³, is gaining widespread acceptance as a gastric restrictive procedure (LAP-BAND® is a registered trade-

mark of BioEnterics Corporation). The attractiveness of an operation which does not open the gastrointestinal tract and which can be performed laparoscopically is obvious. At the same time, the reported morbidities (i.e. gastric perforation, stomach and/or band slippage, pouch dilatation, etc.) are cause for some concern.^{4,5}

The procedure by the laparoscopic approach has been performed in our Institutions since 1992¹ with fewer general complications than the open procedure.^{6,7} The aim of this paper is to describe the details of the surgical technique which, in our own experience, are of paramount importance, in order to minimize the rate of a few of the most common complications.

Patients and Methods

In 1992, one of us¹ first showed the feasibility of using the laparoscopic approach for the Kuzmak adjustable gastric banding technique in five patients. A few modifications had to be introduced to make the band suitable for laparoscopy.

Patients' Characteristics

After these changes, from September 1993 and May 1997 a total of 260 patients (203 female, 57 male), selected on the basis of the criteria of the American Society for Bariatric Surgery, underwent laparoscopic adjustable gastric banding (LAP-BAND) at the Surgical Department of Padova University. Median age was 38 years (range 15–65). The average body weight was 124 kg (range 92–200),

Presented at the 14th Annual Meeting of the American Society for Bariatric Surgery, Chicago, USA, June 5, 1997. Correspondence to: Dr Franco Favretti, Primario, Divisione di Chirurgia Generale, Ospedale Civile di Belluno, Unita' Locale Socio-Sanitaria No. 1, Belluno, Padova, Italy. Tel: 0437 216468; Fax: 0437 216478.

the percentage of excess body weight was 199 (range 155–278), and the mean body mass index was 45.5 kg/m² (range 35–60). Sixty-five patients (25%) had had previous abdominal surgery.

Laparoscopic Technique

The main steps of the procedure^{2,8,9} are summarized here.

After initiation of pneumoperitoneum, five trocars are needed. A calibrated balloon-tipped orogastric tube is inserted into the stomach. The balloon is inflated with 25 ml of air and withdrawn upwards to the gastro-oesophageal junction. It allows correct identification along the lesser curvature and into the phreno-gastric ligament, to perform the blunt dissection. These two sites are chosen to correspond with the most bulging part of the balloon and are marked with the coagulating hook. Therefore, the reference

point on the lesser curvature is the equator of the balloon which, on the phreno-gastric ligament (greater curvature), corresponds to the left crus. The left crus is dissected.

To avoid stomach wall injuries, the calibration tube has to be withdrawn during dissection, which should be carried out perpendicularly so as not to enter the inferior mediastinum along the oesophagus.

A tunnel is created behind the stomach joining the two dissected reference points. The bursa omentalis should not be entered, and the dissection should be performed into the phreno-gastric ligament above the peritoneal reflection of the bursa omentalis itself (Figure 1). A reticulating grasper is passed through the tunnel and will grasp one end of the prosthesis.

The band is introduced through the path of the left subcostal port. To introduce the band there is no need for ports wider than 10 mm. The port is removed and its path is utilized.

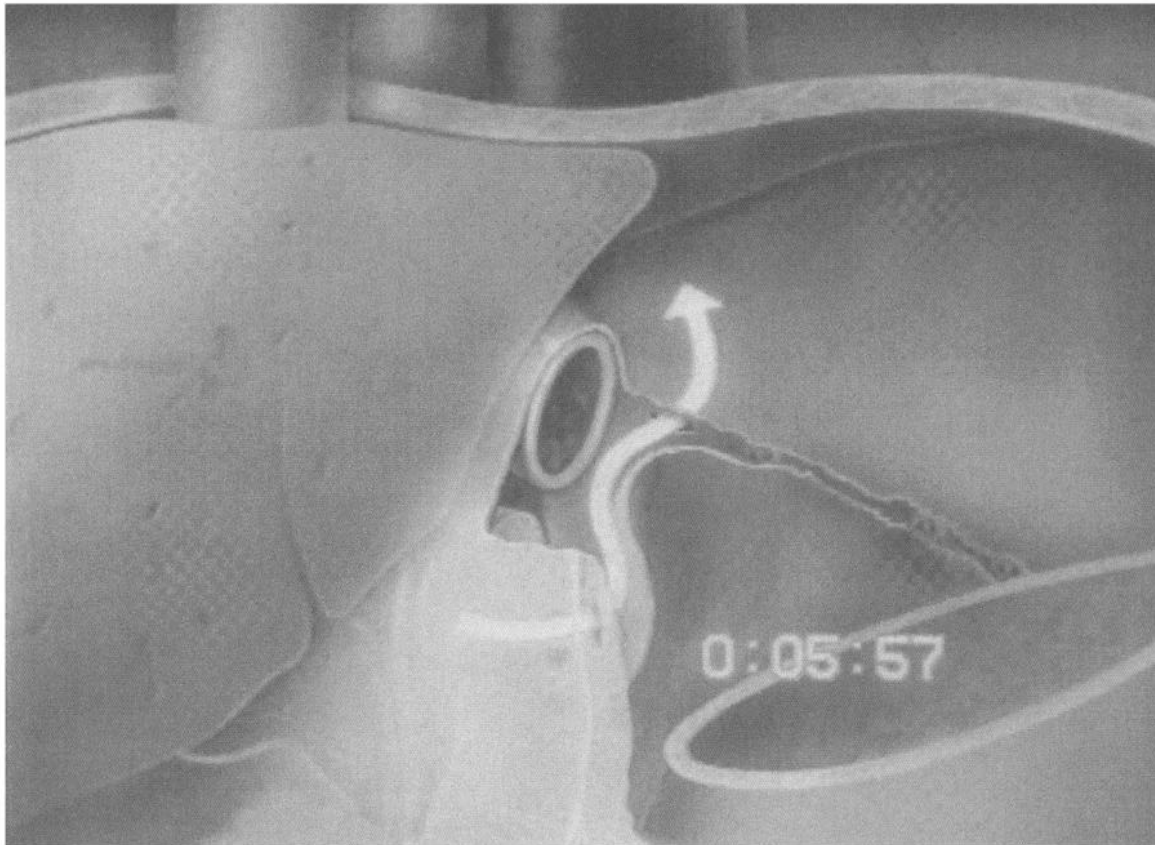


Figure 1. The bursa omentalis should not be entered and the dissection has to be performed above the peritoneal reflection of the bursa omentalis.

Once the band has been closed and the stoma calibrated, retention sutures are applied which, together with the previous point of dissection, are crucial for the creation of the pouch. Retention sutures prevent band and/or stomach slippage and are placed between the sero-muscular layer of the stomach just proximal and distal to the band. These anti-slippage sutures should start as close as possible to the greater curvature, achieving an 'embedding' of the band. If there is a gap on the lesser curvature, it has to be closed by applying one or two stitches distal to the band between the lesser curvature and the hepato-gastric ligament, taking care not to damage the vagus nerve.

A 'posterior' stitch should be applied only if the bursa omentalis has been entered (Figure 2), and it is not necessary if the band lies within the phreno-gastric ligament.

Finally a 'virtual' pouch based on a 25 ml measurement is achieved.

The implantable reservoir is fixed on the left anterior rectus sheath, just distal to the costal edge.

Results

In our study, the mean operating time was 90 minutes (range 40–240). In five patients laparoscopy was abandoned at the beginning because of left liver lobe hypertrophy. A total of 10 (3.8%) conversions were necessary, because of risky perigastric dissection (5 patients, 1.9%), gastric perforation (2 patients, 0.7%), too short instruments (2 patients, 0.7%), and bleeding from a retrogastric vessel (1 patient, 0.3%).

The mean hospital stay was 2 days (range 1–10). Gastrographin swallow was performed on the first postoperative day in order to check for leakage.

Five patients (2.1%) showed minor complications requiring reoperations under local anesthesia. In three patients (1.3%), the reservoir twisted, necessitating fixation. In two patients (0.8%) the connecting tube had broken down (Figure 3), and the reservoir was substituted.

Nine patients (3.4%) experienced major complications and required a reoperation. In the early

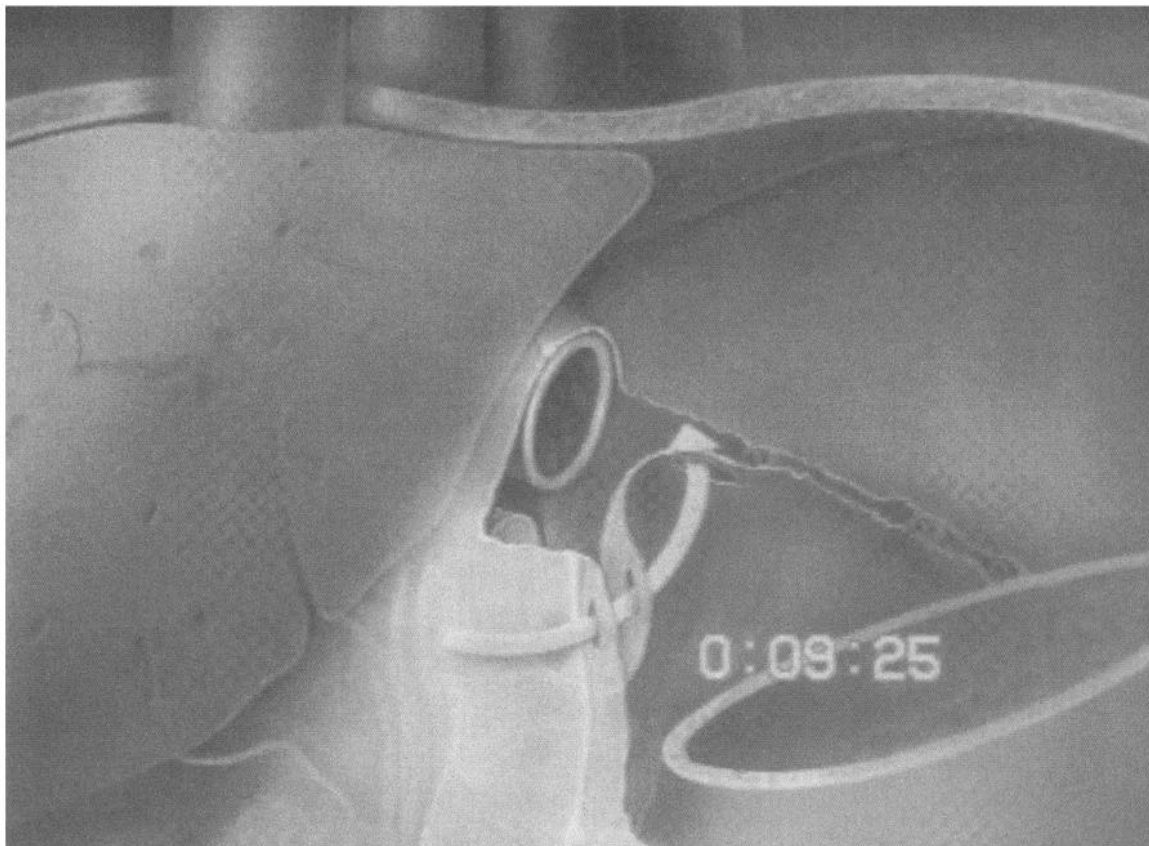


Figure 2. If the bursa omentalis is entered a 'posterior' stitch should be applied.

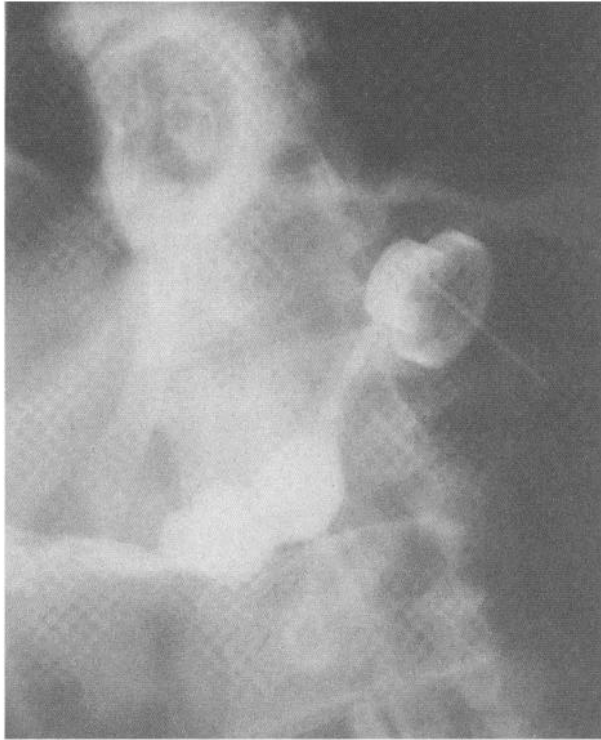


Figure 3. Breaking of the connecting tubing.



Figure 4. Stomach slippage and malposition of the band.

postoperative course, the LAP-BAND had to be removed, due to gastric perforation, in one patient (0.3%) on the first postoperative day. The band had to be repositioned due to stomach slippage (Figure 4) in another patient (0.3%) on day 14 postoperation. In the late postoperative course six patients (2.3%) experienced stomach slippage (Figures 5 and 6); in five, the LAP-BAND was repositioned and in one patient it was removed for psychological reasons. One patient (0.3%) had a band erosion which required removal of the prosthesis 8 months after operation. The reoperation was carried out laparoscopically in four of the nine patients (44%).

The mortality rate was 0. The follow up rate was 100%.

Discussion

With the experience gained with the laparotomic application of Kuzmak's^{3,10} adjustable silicone gastric banding (ASGB) in more than 280 patients,^{6,7} we started using the laparoscopic approach in October 1992.¹ The modification of the technique and the new devices allowed us to reduce our operating time and to report a morbid-

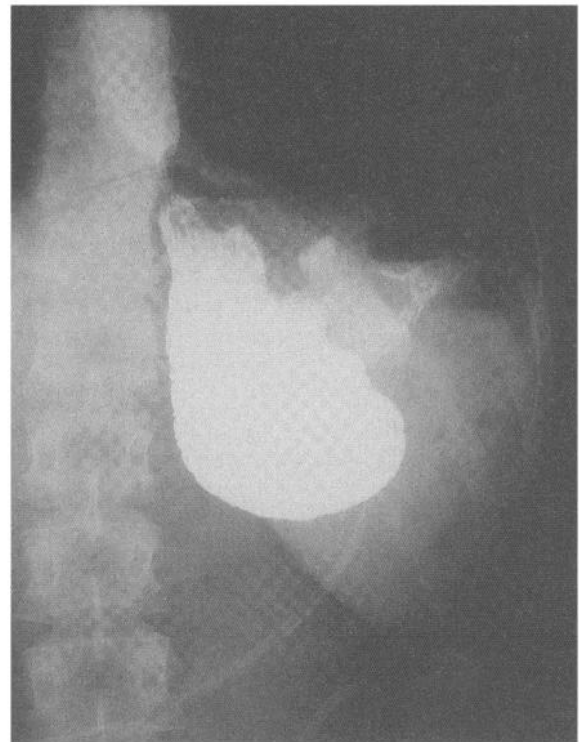


Figure 5. Stomach slippage.

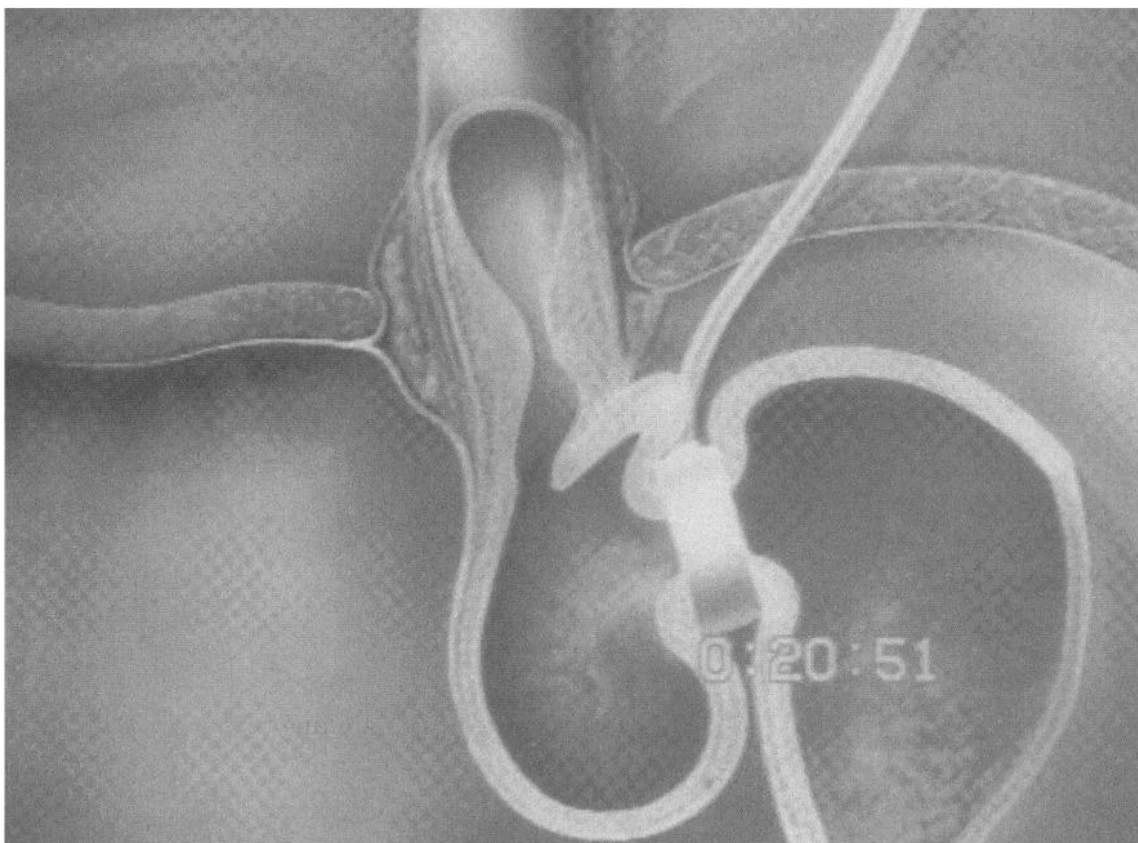


Figure 6. Stomach slippage.

ity rate of 3.4% (major complications requiring reoperation) in our entire personal series. There is a striking difference from the results of a couple of surveys performed in Europe in 1995 (Table 1)⁴ and in Belgium in 1996 (Table 2),⁵ in which the global morbidity rate was 19% and 18% respectively. Our own experience is based on more than 260 patients who underwent the LAP-BAND procedure. We believe that the rate of a few of the most common complications can be reduced as described below.

Table 1. LAP-BAND: European survey (685 patients; October 1995)⁴

Reoperations	%
Early	
Gastric perforation	2
Band repositioning	5
Late	
Pouch dilatation	6
Stomach slippage	5
Erosion	1
Total	19

Table 2. LAP-BAND: Belgian survey (795 patients; July 1996)⁵

Reoperations	%
Erosion	1
Pouch dilatation	8
Stomach slippage	5
Others	4
Total	18

Stomach Slippage. In order to avoid this complication (Figures 5 and 6), it is important to correctly select the sites for dissection along the lesser curvature and into the phreno-gastric ligament. A reliable reference point for dissection is the equator of the balloon (calibration tube filled with 25 ml of air and withdrawn to the gastro-oesophageal junction) which, on the phreno-gastric ligament, corresponds to the left crus.

The retro-gastric tunnel is created by joining the reference points. The dissection has to be perpendicular and has to aim at the left crus. The bursa omentalis should not be entered, and the dissection has to be performed into the phreno-gastric

ligament above the peritoneal reflection of the bursa omentalis.

Once the LAP-BAND has been positioned, an anterior 'embedment' is carried out with a few retention stitches applied from the greater towards the lesser curvature. Following these steps it is unlikely that either the band or the stomach walls can slip.

If the bursa omentalis is entered (Figure 2), a posterior gastro-gastric stitch should be applied.

Malposition of the LAP-BAND®. If the reference points are not respected, depending on the orientation of the retrogastric tunnel, a great amount of fundus and stomach wall can be encompassed by the band (Figures 4 and 7). Since the circumference of the band is fixed, the result is total obstruction.

The correct and routine use of the Gastrostenometer^{3,10} and of the calibration tube is of great help in avoiding this complication. In fact, once the LAP-BAND® has been closed, if the dot on the Gastrostenometer is on No. 3 or even higher, it means that there is too much gastric tissue in the band. The band has to be removed immediately.

Gastric Perforation. This serious complication can be detected easily by an upper gastrointestinal series with Gastrographin which is done routinely on the first postoperative day. During the creation of the retrogastric tunnel there is, in any patient, a

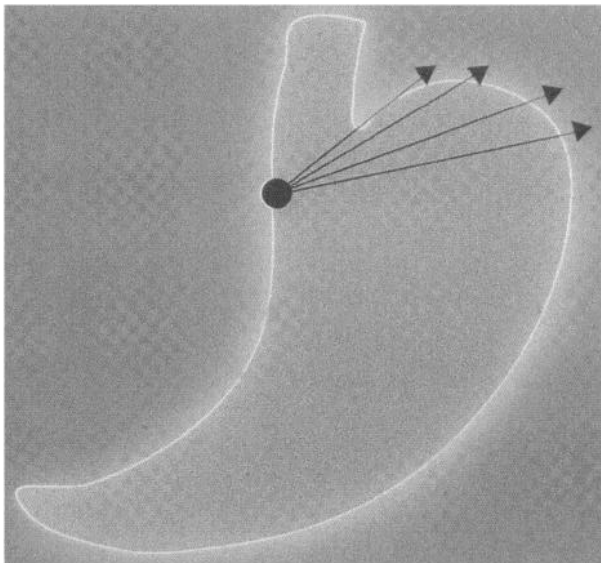


Figure 7. Depending on the orientation of the retrogastric tunnel, a different amount of fundus is encompassed by the band.

'blind area'. If we want to avoid this complication, this area can be reduced by a wider downward exposition of the left crus and by a wider dissection along the lesser curvature.

To avoid stomach wall injuries, the calibration tube has to be withdrawn during dissection that should be undertaken perpendicularly so as not to enter the inferior mediastinum along the esophagus. We found that Articulating Dissector (distributed by BioEnterics) is atraumatic enough to avoid damaging the gastric wall.

If the retrogastric dissection turns out to be risky, a very valuable option is the video-assisted technique. The right hand of the surgeon is introduced into the abdomen through a mini laparotomy. The perigastric dissection is undertaken digitally and the bending instrument is put in place with the control of the scope. The minilaparotomy is closed, and the rest of the operation is completed as usual by laparoscopy.

Pouch Dilatation. We believe that most of the pre-reported cases are due either to stomach slipping or to malpositioning of the band. We avoid this complication by respecting the reference points and carrying out the retrogastric dissection as just described. We do not deal with a pouch of 25 or 14 or 10 ml but with a 'virtual' pouch based on a 25 ml measurement.

While creating the pouch, avoid any cul-de-sac which could be a recipe for further enlargement of the pouch leading to 'food intolerance'. The cul-de-sac is avoided by removing the calibration tube and by applying the retention sutures from below upwards.

A 'posterior' stitch should be applied only if the bursa omentalis has been entered, and it is not necessary if the band lies within the phreno-gastric ligament.

Conclusion

LAP-BAND is indeed advanced laparoscopic surgery, and technical details are of paramount importance in order to reduce the morbidity rate. A longer follow-up is needed to establish the role of LAP-BAND.

References

1. Cadiere G.B, Bruyns J, Himpens J, *et al.* Laparoscopic gastroplasty for morbid obesity. *Br J Surg*

- 1994; **81**: 1524–5.
2. Cadiere GB, Favretti F, Bruyns J, et al. Gastroplastie par Coelio-Videoscopie: Technique. *Le Journal de Coelio-Chirurgie* 1994; **10**: 27–41.
3. Kuzmak L. Gastric Banding. In: Deitel M, ed. *Surgery for the Morbidly Obese Patient*. Philadelphia: Lea & Febiger 1989; 225–59.
4. Inamed-BioEnterics European Survey on 685 LAP-BAND cases. 1995; (Personal communication).
5. Inamed-BioEnterics Belgian Survey on 780 LAP-BAND cases. 1996; (Personal communication).
6. Favretti F, Segato G, De Marchi F, et al. Stoma adjustable silicone gastric banding: A 4-Year Experience. *Acta Chir Aust* 1994; **107** (suppl): 15.
7. Lise M, Favretti F, Belluco C, et al. Stoma adjustable silicone gastric banding: results in 111 consecutive patients. *Obes Surg* 1994; **4**: 274–8.
8. Favretti F, Cadiere GB, Segato G, et al. Laparoscopic adjustable silicone gastric banding: technique and results. *Obes Surg* 1995; **5**: 364–71.
9. Favretti F, Cadiere GB, Segato G, et al. Insight into the technique of adjustable gastric banding (LAP-BAND). *Obes Surg* 1995; **5**: 244 (abstract).
10. Kuzmak L. A review of 7-year experience with silicone gastric banding. *Obes Surg* 1991; **1**: 403–8.

(Received 30 May 1997; accepted 30 June 1997)