Table 1. BMI with time after lap-band

	Preoperation	3 months	6 months	9 months	12 months	15 months	18 months	22 months
No. of patients	169	151	115	70	50	30	20	7
BMI (kg/m^2)	43.3	39.6	36.6	35.3	35.0	32.6	32.5	32.7

BMI, body mass index.

als of the band. All were carried out laparoscopically.

The following procedures are advised to reduce the incidence of hernial dilatation: (1) minimum dissection in the retrogastric passage above the bursa omentalis, (2) precise anchorage to the posterior wall of the greater and lesser curvatures of the small pouch, and (3) adjusting of the band only when necessary and not on request of the patient. We never observed band decubitus; it is probably due to technical errors in the retrogastric passage, such as coagulation and incorrect gastric wall dissection. In patients with hiatal hernia, the hernia can be corrected with hiatoplasty and also fundoplication, and the band be positioned simultaneously by laparoscopic surgery.

Conclusions

The lap-band technique thus far has proved to be a safe and minimally invasive operation. Successful results are obtainable. Advanced surgical knowledge of laparoscopic techniques is generally needed. Specific technical knowledge is also required to obtain successful results and to apply any modifications that single cases may need.

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Videolaparoscopic Treatment of Gastric Banding Complications

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Key words: Gastric band, laparoscopy, morbid obesity, surgical complications.

Laparoscopic surgery for the treatment of morbid obesity has been developed on the basis of the technical knowledge and the results obtained by some groups with laparoscopic cholecystectomy in obese and superobese patients. These clinical observations reported in the international literature show that obesity, instead of being a contraindication to the laparoscopic approach, is rather a good indication for laparoscopy.[1] The lap-band (BioEnterics, Carpinteria, CA, USA) procedure was the first of the laparoscopic surgical operations to be proposed for

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Table 1. Contraindications of LAGB

Gastroenterological pathologies
Peptic ulcer disease (nonresponders)
Inflammatory diseases (i.e., Crohn's)
Portal hypertension
Congenital diseases (i.e., atresia, stenosis)
Previous abdominal surgery (upper abdomen)
Psychiatric diseases
Infections
Age < 16 years

LAGB, laparoscopic adjustable gastric banding.

the treatment of morbid obesity. In 1994, Bellachew and Cadière independently proved the technical feasibility of this procedure, opening up the new area of minimally invasive bariatric surgery.[2,3] Later, the feasibility of the videolaparoscopic approach was shown for vertical banded gastroplasty, gastric bypass, and recently for biliopancreatic diversion.[4,5] Among laparoscopic operations for obesity, the most commonly performed in Europe is adjustable gastric banding (1770 procedures in Europe in 1996). This operation carries a complication rate requiring reoperation in 10% of cases.[6] The aim of this study is to evaluate the complications following laparoscopic adjustable gastric banding (LAGB) and their treatment by minimally invasive techniques.

Patients and Methods

The selection criteria for patients to enter in the preoperative investigations followed those of the NIH Consensus Conference. The contraindications are shown in Table 1. Laboratory and clinical investigations are shown in Table 2. The operation was performed with the patient under general anesthesia, and in the lithotomy and anti-Trendelenburg position. After a closed CO_2 pneumoperitoneum (12–14 mm Hg) was obtained, five trocars (Endopath 10-mm, Ethicon Endosurgery) were inserted according to the Natalini technique (Figure 1). The proximal gastric pouch was calibrated (15 ml) By use of a dedicated probe (McGhan Medical, Verona, Italy). The retrogastric passage for placement of the prosthesis was made through an avascular space of the hepatogastric ligament, between the vagus nerve and the lesser gastric curvature. Later, the phrenogastric ligament was sectioned to identify the left diaphragmatic pilaster and the esophagogastric junction. The subcostal left trocar was replaced by an 18-mm trocar (Endopath, Ethicon Endosurgery) to enable the prosthesis to be placed intraperitoneally (9.75 lap band, McGhan Medical).

Table 2. Preoperative protocol

Blood tests
Routine
Hepatitis markers
Thyroid hormones
Hypophysis hormones
Urinary cortisol
Gastrin
Insulin
Consults
Cardiology
Psychiatry
Endocrinology
Dietetic
Pneumology
Anesthesiology
Orthopedic
Gastroenterology
Radiological tests
Chest
Head
Sella turcica
Gastrointestinal tract
Sonography
Heart
Thyroid
Liver and biliary tree
Pancreas
Pelvis
Others
ECG
Spirometry
Endoscopy
Doppler lower limbs

After band closure, two or three polypropylene stitches (Prolene, Ethicon) were sutured between the distal and proximal gastric compartments to cover the prosthesis, preventing its dislocation. The operation was completed by placement of a subcutaneous port anchored on the left anterior rectus aponeurosis. The port was connected through a tube. All patients underwent esophagogastric transit radiography with Gastrografin 3 days postoperatively.

Results

The results are expressed by means ± standard deviation.

From January 1996 to January 1998, 31 patients were operated on. Their characteristics were as follows: 29 women, 2 men; mean age 36.3 ± 12.6 years (range 18–59); mean body mass index (BMI) 44.7 ± 5 (range 37.3–58.2). The mean operating time was 185 ± 72 min (range 90–360). Laparoscopic operations associated with LAGB were included for 5/31

Figure 1. Sites of trocar insertion. T1, camera; T2, operator; T3, operator (lap-band insertion); T4, gastric retractor; T5, hepatic retractor.

(16.1%) patients: cholecystectomy in 4/4 patients with cholelithiasis, and hiatoplasty in 1/4 patients with hiatal hernia. The last-named patient had grade II esophagitis and a lower esophageal sphincter pressure <6 mm Hg. The results in terms of weight loss expressed by BMI preoperatively and at follow-up are shown in Fig. 2.

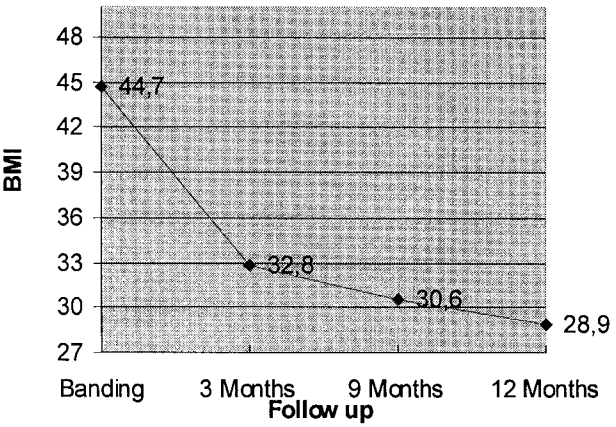

Figure 2. Weight loss after laparoscopic adjustable gastric banding. Mean BMI ± standard deviation (range):
Initial = 44.7 ± 5 (37.3–58.2)
3 mo = 32.8 ± 11.6 (36.5–51.7)
9 mo = 30.6 ± 4 (24.3–36)
12 mo = 28.9 ± 4 (23.4–33)

The hospital stay for patients without postoperative complications was 3 ± 1 days. Eight (25.8%) patients experienced postoperative complications; the complications and their treatment are shown in Table 3.

Laparoscopic reoperation was performed on 4/31 (12.9%) patients in our series and on a single patient who had undergone laparoscopic noninflatable gastric banding at another center. This patient required debanding because of rupture of the Silastic tube used for gastric banding, followed by LAGB 2 years after the first operation. Five laparoscopic reoperations were performed for complications of LAGB. All but one were performed with closed CO_2 pneumoperitoneum. In the remaining patient, an open pneumoperitoneum technique was used 4 days after the first operation; in this case, the previous access routes for trocars were used, and the inflatable band was reopened using laparoscopic instruments and replaced above the gastric fundus (rebanding). The hospital stay for patients undergoing laparascopic reoperation was 3 ± 1 days. No complications were reported in the laparoscopic reoperations, either intraoperatively or postoperatively.

Discussion

Weight loss following LAGB and the success rate on the total number of patients needs long-term follow-up. Some disappointing results of LAGB have been reported, with a high incidence of reoperations and failure of the procedure.[11] In our series, seven reoperations were performed. Two of them were performed with the patient under local anesthesia because of port dislocation for inappropriate fixation on the muscular aponeurosis (patients 1 and 4 in Table 3); this complication did not occur again in our series. Rupture of the band, which was used as nonadjustable gastric banding, also represents a rare indication for reoperation (patient 8 in Table 3). We believe the use of this type of prosthesis should be abandoned.

The main indication for laparoscopic reexploration in our series, in four patients, was proximal gastric pouch dilation, which occurred nine times in six patients. Two patients did not undergo reexploration and were treated by band deflation. This represents the main, and unique, failure of the procedure in our series. Clinical diagnosis has been always confirmed radiologically by the presence of the gastric fundus above the prosthetic ring with or without stoma obstruction. The pathogenetic mechanism still remains controversial, and depends on

Table 3. LAGB complications and treatment

Patient no.*	Complication	Time of presentation†	Treatment
1	Port dislocation	3 months	Local anaesthesia, repositioning
	Gastric pouch dilatation	7 months	Debanding
2	Gastric pouch dilatation	7 days	Medical treatment
	Gastric pouch dilatation	8 months	Band deflation
	Gastric pouch dilatation	14 months	Debanding
3	Gastric pouch dilatation	20 days	Debanding
4	Port dislocation	3 months	Local anaesthesia, repositioning
5	Atelectasis	7 days	Medical treatment
6	Gastric pouch dilatation	20 months	Band deflation
7	Gastric pouch dilatation	11 months	Band deflation
	Gastric pouch dilatation	13 months	Band deflation
8*	Noninflatable band rupture	2 years	Debanding
9	Gastric pouch dilatation	4 days	Rebanding

LAGB, laparoscopic adjustable gastric banding.
*Patient 8 had laparoscopic nonadjustable gastric banding performed at another center.
†Postoperatively.

the time of occurrence during the postoperative period, and it may sometimes be difficult to establish if band dislocation is the cause or the consequence of pouch formation.[7] A diagnostic therapeutic algorithm has been proposed by Chelala that considers as the first option complete band deflation.[11] In four cases of our experience, this manouver has been successful, and the stoma has reopened. Two of three treated patients were completely rehabilitated, showing radiologic evidence of gastric pouch disappearance 7 days following deflation (cases 6 and 7 in Table 3). In the remaining case (patient 2 in Table 3), although satisfactory oral alimentation was reestablished, no resolution was obtained of the gastric pouch, which had been present since the first postoperative radiograph. This patient, who has a noninflated band, underwent debanding 14 months postoperatively for gastric pouch dilatation and stoma obstruction. Retrospectively, in this case, it is clear that a large gastric pouch was made by the surgeon at the time of first operation. Band desufflation was not useful in patient 1 (Table 3), who experienced vomiting for 3 weeks and in whom a radiologic diagnosis of stoma obstruction and band dislocation was made. Dislocation was not reversible by band desufflation, and there was no resolution of the symptoms. Debanding was performed 7 months after the first procedure.

Patient 3 (Table 3), whose postoperative radiograph was satisfactory, started to vomit on day 4 after operation. After treatment with parental nutrition for 1 week, radiologic investigation showed gastric pouch dilatation with complete stoma obstruction. This patient underwent debanding.

Patient 9 (Table 3) experienced gastric fundus above the ring with total liquid intolerance. On postoperative day 4, the gastric stitches were removed, and the band was opened laparoscopically and repositioned in the subcardial region. In this rebanding operation, the band was not fixed by stitches. The prosthesis was found to be well positioned and working perfectly at radioagraphic examination 2 months after operation.

Conclusions

Eight of 31 patients (25.8%) in our series experienced complications, but only 4/31 (12.9%) of them required reoperation under general anesthesia. The band stayed in place in one of them. None of the patients experienced postoperative complications after reoperation, being discharged within the 3rd postoperative day. During the learning curve, the failure rate of LAGB was 10% on account of technical mistakes of band implantation and lack of psychological patient compliance. A clinical situation potentially reversible may appear late and be resolved successfully by conservative medical treatment. Obesity surgery in general, and this operation particularly, needs an intense multidisciplinary team approach to be successful. The results of our initial experience show a low incidence of serious complications. There has been no postoperative morbidity after the second operation, and the prosthesis can be successfully recuperated.

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Laparoscopic Surgery for Morbid Obesity: Preliminary Results from SICE Registry (Italian Society of Endoscopic and Minimally Invasive Surgery)

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The reason why a National Registry of obesity surgery was established can be found in the need for reliable results of the different techniques of this specific surgery and in the setting of updated guidelines. On January 1, 1996, the Italian Registry of Laparoscopic Surgery for Morbid Obesity was established, issued by the SICE (Italian Society of Endoscopic and Minimally Invasive Surgery). Our department has been designated as the main center for the gathering and computing of all data coming from the activity at Turin and 12 other Italian centers.

Three parameters give meaning to the registry: (1) the evaluation of the efficacy of surgical therapy and the analysis of complications, related to the different techniques; (2) the availability of a wide range of homogeneous data (otherwise obtained over a long time by means of single-center series); and (3) an instrument of comparison between series and