

Obese teenagers treated by Lap-Band System: The Italian experience

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Background. Little is known about obesity surgery in young and adolescent patients. The aim of this study is to evaluate results of laparoscopic adjustable gastric banding in obese teenagers.

Methods. Patients ≤ 19 years old selected from the database of the Italian Collaborative Study Group for Lap-Band were analyzed according to mortality, comorbidities, laparotomic conversion, intra- and postoperative complications, body mass index (BMI), and % excess weight loss (EWL) at different times of follow-up. Data were expressed as mean \pm SD.

Results. Fifty-eight (1.5%) of 3813 patients who underwent operation with the Lap-Band System were ≤ 19 years old: 47F/11M; mean age, 17.96 ± 0.99 years (range, 15-19); mean BMI, 46.1 ± 6.31 Kg/m² (range, 34.9-69.25); mean % excess weight, 86.4 ± 27.1 (range, 34-226.53). Sixteen (27.5%) of the 58 patients were superobese (BMI ≥ 50). In 27/58 (46.5%) patients, 1 or more comorbidities were diagnosed. Mortality was absent. Laparotomic conversion was necessary in 1 patient with gastric perforation on the anterior wall. Overall postoperative complications occurred in 6/58 (10.3%). The band was removed in 6/58 (10.3%) patients for gastric erosion (3 patients), psychologic intolerance (2 patients), and in the remaining patient was converted 2 years after surgery (BMI 31) to gastric bypass or gastric pouch dilatation. Patient follow-up at 1, 3, 5, and 7 years was 48/52 (92.3%), 37/42 (88.1%), 25/33 (75.7%), and 10/10, respectively. At these times, mean BMI was 35.9 ± 8.4 , 37.8 ± 11.27 , 34.9 ± 12.2 , and 29.7 ± 5.2 Kg/m². Mean %EWL at the same time was 45.6 ± 29.6 , 39.7 ± 29.8 , 43.7 ± 38.1 , and 55.6 ± 29.2 . Five/25 (20%) patients had $\leq 25\%$ EWL at 5 years follow-up, while none of the 10 patients subject to follow-up at 7 years had $\leq 25\%$ EWL.

Conclusions. Lap-Band System is an interesting option for teenagers suffering obesity and its related comorbidities, which deserves further investigation. (Surgery 2005;138:877-81.)

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THE NUMBER OF children and adolescents categorically considered obese is growing steadily in the American and European populations, and the disease is now recognized as a global phenomenon.¹⁻³ Unhealthy eating patterns and, especially, inactivity are thought to be responsible for the weight gain. The greatest concern and potential public health effects are the risk that the overweight will persist into adulthood.^{4,5} The physical and social effects of severe obesity in young people are devastating; effective treatment is essential both to aid weight reduction and to reduce the impact of comorbid health and psychosocial problems. Young

obese individuals have a much greater chance of maintaining their obesity into and throughout adulthood. In a recent literature review, Serdula⁵ found that numerous studies in this area suggested that about one third of obese preschool children were obese as adults, and about half of obese school-age children were obese as adults. The trend is similar both in males and females. The later into childhood that obesity is present, the greater likelihood that obesity will continue in adulthood.⁵ Despite the progressive and debilitating course of obesity in teenagers and the ineffectiveness of conservative approaches such as hypocaloric diets, very-low calorie regimens, exercise, behavior modification and pharmacologic agents, surgery rarely is considered an option.⁶⁻¹⁰ Ethical issues have presented obstacles to the development of pediatric bariatric surgery, and very few articles have been published on this topic. Recently, however, surgical experiences with severely obese adolescents treated by laparoscopic approaches have been reported in the international

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literature.¹¹⁻¹³ The increasing incidence of obesity in teenagers, the explosion of laparoscopic obesity surgery, and the large worldwide application of adjustable gastric banding are now consistently affirming the justification for surgery as a treatment option in this special subgroup of patients. The aim of this study is to report the national experience of the Lap-Band System in morbidly obese Italian teenagers.

PATIENTS AND METHODS

A retrospective multicenter study on the Lap-Band System in patients ≤ 19 year old was performed. Data were collected from the electronic database of the Italian Collaborative Study Group for Lap-Band. Criteria for patients to be considered for surgery were as follows: BMI ≥ 40 or ≥ 35 kg/m² with comorbidities, supportive family environment, failure to obtain weight loss after ≥ 1 years of conservative medical treatment, psychologic maturity of patients with demonstration of decisional capacity, and willingness to be operated on and to follow postoperative guidelines. Preoperative assessment was obtained by a multidisciplinary team on the basis of internist and psychiatric evaluations (Table I). Patients affected by psychiatric or genetic disorders (ie, Prader-Willy syndrome) were excluded. All patients were operated on under general anesthesia in lithotomy and reverse (30°-45°). Closed CO₂ pneumoperitoneum was usually performed. All patients underwent antithrombotic and antibiotic prophylaxis. The band was placed via perigastric access in all but 3 patients, in whom the pars flaccida technique was completed.¹⁴ On the first postoperative day, intravenous saline, proton pump inhibitors, and antiemetics were given. Patients were discharged when able to tolerate oral fluids with oral therapy. For the purpose of this study, teenagers' data were analyzed for mortality, preoperative and postoperative comorbidities, laparotomic conversion, intra- and postoperative complications, BMI, BMI loss, and %EWL at different times of follow-up. Data were expressed as mean \pm SD.

RESULTS

Fifty-eight (1.5%) of 3813 patients operated on with the Lap-Band System from January 1996 to December 2003 were ≤ 19 years old (Figure 1). There were 47F/11M; mean age was 17.96 ± 0.99 years (range, 15-19); mean BMI was 46.1 ± 6.31 kg/m² (range, 34.9 - 69.25); and mean % excess weight was 86.4 ± 27.1 (range, 34 - 226.53). Sixteen of the 58 (27.5%) patients were superobese (BMI \geq

Table I. Protocol of preoperative investigations of candidates for Lap-Band System

Clinical consultation of
• Cardiology
• Psychiatry
• Endocrinology
• Dietology
• Pneumology
• Anesthesiology
• Orthopedics
• Gastroenterology
Ultrasonography scan of
• Heart
• Thyroid
• Liver and biliary tract
• Pancreas
• Pelvic organs
Radiologic examinations of
• Chest
• Head
• Gastrointestinal tract
Blood tests
• Routine
• Hepatitis markers
• Thyroid hormones
• Serum cortisol and gastrin
Others
• ECG
• Spirometry
• EGDS (HP test)
• Doppler ultrasonography of lower limbs

ECG, Electrocardiogram; EGDS, Esofago Gastro Duodenscopy; HP, Helicobacter Pylori.

50). In 27/58 (46.5%) patients, 1 or more comorbidities were diagnosed: anxiety or depression (n = 11), hypertension (n = 8), dyslipidemia (n = 6), diabetes (n = 8), osteoarthropathy (n = 12), sleep apnea (n = 10), and amenorrhea (n = 4). Intra- and postoperative mortality was absent. Laparotomic conversion was necessary in 1 patient with gastric perforation on the anterior wall during perigastric band positioning. This patient did not report intragastric migration in following controls. The overall postoperative complication rate was 6/58 (10.3%): Band slippage was observed in 1 patient and was treated by laparoscopic repositioning after 4 days, gastric pouch dilatation was observed in 2 patients and was treated by band repositioning, and intragastric migration was observed in 3 patients and was treated with band removal. The band also was removed in 2 patients for psychologic intolerance, and 1 patient was converted 2 years after surgery (BMI 31) to laparotomic gastric bypass.¹⁵ The overall band removal rate was 6/58 (10.3%). Biliopancreatic diversion with gastric preservation and band left in situ (Band-Inaro) was performed in 2 patients (3.4%).

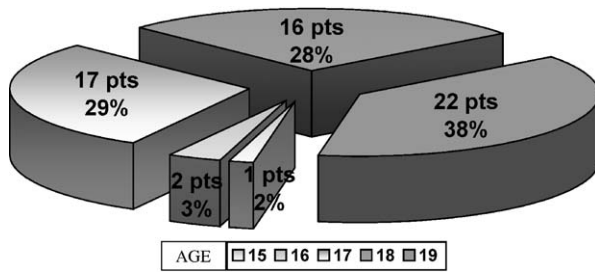
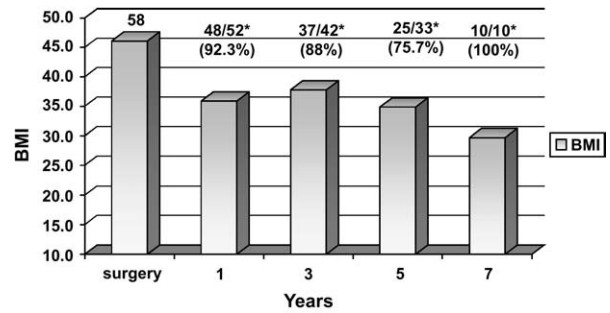


Fig 1. Italian obese teenagers submitted to Lap-Band system (January 1996-December 2003). Number of patients/age distribution.

Independent of the type of procedure, the postoperative courses of the 8 adolescents who underwent reoperation were uneventful. Patient follow-up at 1, 3, 5, and 7 years was 48/52 (92.3%), 37/42 (88.1%), 25/33 (75.7%), and 10/10, respectively. At these times, mean BMI was 35.9 ± 8.4 ; 37.8 ± 11.27 ; 34.9 ± 12.2 ; and $29.7 \pm 5.2 \text{ kg/m}^2$ (Fig 2). Mean %EWL at the same time was 45.6 ± 29.6 ; 39.7 ± 29.8 ; 43.7 ± 38.1 ; and 55.6 ± 29.2 . Five of 25 (20%) patients had $\leq 25\%$ EWL at 5 years follow-up, while none of the 10 patients subject to follow-up at 7 years had $\leq 25\%$ EWL, according to Reinhold criteria.¹⁶

DISCUSSION

Obesity surgery in morbidly obese adults has not been proved scientifically beneficial as yet, but, in light of the failure of conservative medical therapy, it remains the only method of treatment.^{9,10,17,18} Because of the growing epidemiologic incidence of obesity and the evolution of surgical techniques, obesity surgery currently is considered the most rapidly expanding subspecialty in the field of general surgery.^{19,20} Recently, the indication criteria for obesity surgery have been reconsidered by the major scientific organizations, but the choices regarding the type of procedure remain controversial.^{7,9,10} There is no evidence, in fact, to support one or another type of operation, even when taking into consideration the different grades of obesity. Therefore, the surgeon's choice is based on a number of anecdotic considerations, and, in many centers, the same procedure is performed in the entire obese population without any kind of preoperative patient selection. Only a limited number of surgeons use different operations for different patient categories. The indication for obesity surgery in teenagers fundamentally is based on the concept that the vast majority of these patients will remain severely obese in their adulthood.^{4,5} The fact that



*Follow-up rate = present/eligible

Fig 2. Italian obese teenagers submitted to Lap-Band system (January 1996-December 2003). Mean BMI during follow-up. *BMI*, body mass index.

children and adolescents are now exhibiting a dramatically increased incidence of obesity is even more disturbing. The morbidity they experience, in addition to social exclusion and loss of self-esteem, has the potential to scar them for life, thereby adding to the human and financial cost of this disease.¹⁻⁴ Very few papers have been published on this topic in the international literature; their results are summarized in Table II. Initial historical reports of adolescents treated by jejunoileal bypass have been excluded since this kind of procedure seems to have been completely abandoned.²¹

Before the introduction and diffusion of laparoscopic bariatric surgery, Mason et al⁸ reported their experience with vertical banded gastroplasty (VGB). Mortality, leaks, and wound infections were absent in this series. In the conclusions of his paper, Mason stated that morbidly obese young people needing a bariatric surgical procedure should receive a reversible operation, without malabsorption and its predisposition to life-long complications, side effects, or the risks associated with a complex operation. Greenstein²² and Breaux²³ reported, in the same publication period, similar results in VGB-operated patients. Breaux,²³ Strauss,²⁴ and Capella²⁵ reported a number of obese adolescents treated by laparotomic gastric bypass. In these series, early mortality was absent and comorbidities disappeared, but the revision rate of the primary operation was consistent. According to these authors, gastric bypass remains a last resort option for obese adolescents in whom other approaches have been unsuccessful. Only a very limited number of patients received biliopancreatic diversion.²²

After the development and large diffusion of laparoscopic bariatric surgery, some experiences with obese teenagers were then published in the international literature. Endres et al¹³ recently reported their experience with laparoscopic Roux-en-Y

Table II. Bariatric surgery in adolescents, an international literature review

Author (year of study)	Bariatric procedure	No. of pts	Age (y)	Mortality	Complications	Preop BMI	Postop BMI (years of follow-up)
Mason (95)	VBG	47	<21	No	No	48.1	36.2 (5)
Greenstein (95)	VBG	14	<21	2 (late)	NR*	59 (F) 45 (M)	35 (F) 33 (M) (3)
Breaux (95)	VBG	5					
	RYGBP	14	8-18	2 (late)	9/21	56.4	35.5 (5)
	BPD	4					
Capella (03)	VBG-RYGBP	19	13-17	No	No	49	28 (1-10)
Endres (03)	LRYGBP	33	<19	No	NR	45.92	
Dolan (03)	Lap-Band	17	<20	No	Slippage (1)† Port leak (1)	44.7	30.2 (1-4)
Abu-Abeid (03)	Lap-Band	11	11-17	No	No	46.6	32.1 (2)
GILB (04)	Lap-Band	58	15-19	No	Slippage-GPD (3) IG migration (3)	46.1 ± 6.3	39.7 ± 5.2 (7‡)

BMI, Body mass index; BPD, biliopancreatic diversion; GILB, Italian Collaborative Study Group for Lap-Band; GPD, Gastric Pouch Dilation; IG, intragastric; LRYGBP, laparoscopic Roux-en-Y gastric bypass; *postop*, postoperative; *preop*, preoperative; *pts*, patients; RYGBP, Roux-en-Y gastric bypass; VBG, vertical banded gastroplasty.

*Not reported.

†Laparoscopic repositioning (after 11 months).

‡In 10 patients.

gastric bypass since 1995. Results were similar to the open series with a reduced number of revision operations.

The present experience with 58 morbidly young obese patients operated on with the Lap-Band System is among the larger reported in the literature. Abu-Abeid et al¹¹ and Dolan et al¹² reported a similar experience with a total number of 28 teenage patients undergoing Lap-Band System with a mean follow-up of less than 3 years without mortality. In the present series, overall postoperative complication rate was 6/58 (10.3%). These patients underwent reoperations, and, in 3/6 patients, band removal for intragastric migration was performed. This complication was not reported by Dolan or Abu-Abeid in adolescents. Although it may represent a significant problem for this patient population considering their growth and developmental period, intragastric migration in the present series was observed in patients who underwent a perigastric technique at 18 years of age, well beyond their growing phase. Moreover, this complication occurred within the first postoperative year, implying that gastric wall injury during dissection maneuvers had probably taken place. Currently, there is no evidence that the expected long-term band implantation in this patient population with longtime life expectancy increases the incidence and risk of intragastric migration. Band repositioning for slippage or gastric pouch dilation was performed successfully through laparoscopy, as also confirmed in the Dolan experience.¹²

Five other patients in the present series received surgical revision for psychologic intolerance (n = 2) and insufficient weight loss (n = 3). Mortality with these reoperations was absent. The simplicity and total reversibility of Lap-Band operation is particularly suitable for this delicate and vulnerable young patient population in which the laparoscopic approach can be easily adopted. In contrast, reversibility is possible in more invasive and complex bariatric procedures, but at the price of longer and risky operations.

Insufficient weight loss is a common cause of surgical revision in bariatric surgery. Lap-Band failure leaves open the ability to perform all other surgical options. In fact, 2 patients in the present series were converted to biliopancreatic diversion, leaving the band in situ, and 1 was converted to Roux-en-Y-isolated gastric bypass.

Operating on this young population is a great responsibility, but, at the same time, submitting these young people to a multitude of ineffective nonsurgical weight loss modalities is not indicated and may even be unacceptable ethically. Obesity in teenagers should be treated aggressively to avoid progression to superobesity and/or complications. Early surgical intervention should be offered to adolescents to minimize the emotional and physical consequences of morbid obesity. The current choice between Lap-Band and laparoscopic Roux-en-Y gastric bypass, which is available in the adult population of bariatric patients, cannot be considered in teenagers. The surgical approach must be

laparoscopic and conservative, at least in the first instance. Only in patients with high-grade psychosocial disorders or previous bowel surgery is a malabsorptive option indicated. In adolescents presenting with BMI <45, the Lap-Band System is highly advisable and can be safely offered to this group of patients. Those adolescents with BMI \geq 45 should be treated preoperatively with BioEnterics Intragastric Balloon (BIB) System positioning to reduce their risk of operative complications and laparotomic conversion.^{26,27} None of the patients included in the present study was treated by BIB since it was not clinically introduced in Italy until 1998.

CONCLUSION

The results of this national series support the evidence that laparoscopic adjustable gastric banding operation provides an effective conservative surgical solution for the morbidly obese teenagers and avoids the risk of metabolic problems associated with bypass procedures. This strategy is based on the concept that, in case of failure of the Lap-Band System, it is always possible to submit the patient to further surgical revision: gastric bypass or biliopancreatic diversion. Further surgical revision is possible because of the unique features of this modern device, which leaves completely intact not only the digestive anatomy but also its physiology. For this reason, Lap-Band System is an interesting option for teenagers suffering obesity and its related comorbidities, and deserves further investigations.

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