



Comparative results of gastric banding in adolescents and young adults



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ABSTRACT

Background/purpose: Obesity has become a major public health priority. Because of disappointing results obtained with dietary and medical programs, bariatric surgery has been offered to adolescents, although this practice remains controversial. Our aim was to evaluate laparoscopic adjustable gastric banding (LAGB) in adolescents at 2-year follow-up.

Material and methods: This prospective study, from 2008 to 2013, compared results between adolescent patients and young adult controls. The LAGB technique and the follow-up program were similar. Weight loss and comorbid disease were analyzed.

Results: Thirty-six adolescents (mean age at surgery = 16.7 ± 1.3 years) were operated on and compared to 53 young adults (mean age at surgery = 21.7 ± 1.9 years). The mean weight and BMI at surgery were 124.4 ± 20.7 and 43.9 ± 5.5 kg/m², respectively. Among the adolescents, none were diabetic or hypertensive. The mean glycated hemoglobin was $5.6 \pm 1.2\%$. In four cases (11%) dyslipidemia was observed. There was no significant difference between the two groups in terms of initial preoperative weight or BMI. The absolute BMI values at 6, 12 and 24 months after surgery were comparable between adolescents and young adults: 38.7 vs 39.8, 36.0 vs 37.6 and 33.5 vs 36.1 kg/m², respectively. The excess weight loss was higher in adolescents at 12 and 24 months: 48.6 vs 37.6% ($p = 0.03$); and 62.3 vs 45.5% ($p = 0.02$). During this period, insulin resistance and dyslipidemia decreased similarly in both groups.

Conclusion: Provided there is careful selection of patients and a supportive multidisciplinary team, satisfying results can be obtained after LAGB in adolescents, comparable to those obtained in young adults at 2-year follow-up.

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Obesity has become a priority of public health policy in many developed countries. It is now considered a chronic disease because of its medical consequences and its psychological impact. Metabolic obesity related-diseases (hypertension, insulin resistance or dyslipidemia) are found in 11% of obese adolescents [1], nonalcoholic hepatic steatosis (NASH syndrome) in 10 to 30% [2] and sleep apnea in 8 to 20% [3]. Moreover, changes in the vascular endothelium have been observed in the obese pediatric population, accounting for early vascular consequences [4]. The persistence of obesity over several years is a major contributing factor in cardiovascular disease, responsible for an increased risk of death before the age of 55, wherein risk seems to be related to patient age at obesity onset and to obesity duration [5,6]. Finally, there is also a major psychological impact of obesity at a pivotal stage in an individual's development, including loss of self-esteem, stress, social isolation and depression [7,8]. As in adults, the results obtained in adolescents by medical programs are disappointing in

terms of weight loss and inefficient in controlling cardiovascular risk factors [7,9]. Presently, bariatric surgery appears to be the only effective treatment of obesity, and has already been proposed in the pediatric population, especially by North American teams [10,11].

In France, bariatric surgery is not recommended by the National Health Agency in the management of obesity in adolescents. However, some pediatric surgical centers have begun bariatric programs, based on different surgical procedures according to the surgical team preferences: gastric banding, sleeve gastrectomy and gastric bypass.

In 2008 we have established a bariatric program for adolescents in our hospital. The gastric banding procedure was chosen because it is easily reversible and is associated with low perioperative morbidity. Considering the controversial nature of bariatric procedures in adolescents, we compared our results to those obtained in a cohort of young adults treated at a reference bariatric center.

1. Material and methods

This is a bicentric prospective study carried out from January 2008 to December 2013. It was approved by the institutional review board.

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All adolescents undergoing laparoscopic adjustable gastric banding (LAGB) at the Necker-Enfants Malades Hospital and all the young adult patients aged 18–25 years operated on at the University Regional Hospital of Lille were included.

Adolescent candidates for bariatric surgery were included according to the European recommendations [12,13]. This included patients aged 14 to 18 years with a bone age >13 years for females and >15 years in boys and BMI >35 kg/m² with significant comorbidities. Failure to achieve weight loss or failure to maintain weight loss after multidisciplinary care at a specialized center for at least 12 months was required.

Bariatric surgery was contraindicated in the case of defective understanding, severe mental disorders or uncontrolled psychiatric illness, syndromic obesity or a previous history of craniopharyngioma and predictable difficulties in follow-up or compliance.

In the adult and adolescent population, patients were included if BMI is >40 kg/m² or BMI is >35 kg/m² with comorbidity (diabetes mellitus, HTA, metabolic syndrome, dyslipidemia).

For the pediatric population, parents were systematically involved in the education of their child: they were asked to be supportive and to make lifestyle changes for all the family.

A systematic psychological evaluation was performed before surgery, including clinical interview, self-report questionnaires to assess depression, binge eating behavior, self-esteem and quality of life. For adolescents the “quality of life inventory Peds QL” was used. This multidimensional questionnaire comprises four scales: physical, emotional, social and school functioning. For young adults, the Nottingham Health Profile was used. This multidimensional questionnaire comprises six scales: energy, pain, emotional reactions, sleep, social isolation and physical mobility. For each patient, the score before surgery was compared with the score 2 years postoperatively.

The multidisciplinary program includes visits, alternatively with the pediatrician, the surgeon, the nutritionist and the psychologist, for all patients. It also includes recommendations on dietary habits and physical activity. A nutritionally balanced, age-appropriate diet was recommended and specific or restrictive diets, such as high-protein diets, were prohibited. Dietary interventions are aimed at reducing the intake of high-fat foods, simple sugars and sweetened beverages and increasing the intake of “low-calorie, high-fiber foods” such as fruits and vegetables. Structured daily meals are proposed: skipping meals, snacking and eating out were discouraged, portion size had to be controlled. More than 60 min of active daily activity was required: transport-related (walking), physical activity, increasing movement through daily routines, and two sessions per week of structured exercise supervised by a trainer or physician; and less than 1 hour of screen time per day was recommended.

Because of their preoperative overweight condition, no particular recommendations were made for sports practice at this time, contrary to what was requested after the surgery and the weight loss. After surgery, sports based on endurance or resistance practice at least twice a week were proposed.

The gastric band was placed under general anesthesia by laparoscopy [14]. Four incisions were used: one 5 mm epigastric, two 10 mm in the right hypochondrium and supraumbilical and one 15 mm in the left hypochondrium. The band was inserted through the 15 mm-port in the left hypochondrium and ultimately positioned in the upper portion of the stomach through the pars flaccida, creating a first chamber with a capacity of about 20 cm³. To minimize the risk of slippage, an anterior gastric valve was tailored. After surgery, the tubing, connected to the chamber that was fixed in the left hypochondrium, was externalized.

The duration of the postoperative hospital stay was 48 hours with a fluid intake during the evening of the surgery, a semi-liquid meal the next day and a mixed diet on the third day, maintained for 3 weeks. Monthly consultations were planned, alternating between different medical staff in the first year and then gradually spaced according to the patient's progress.

The adolescent group was entirely managed by a dedicated pediatric team and the young adult control group by a confirmed bariatric surgery team.

Band adjustments were not systematically performed, but only on the basis of insufficient weight loss or because of a loss of sense of satiety. Adjustments were never performed before the second postoperative month and were always conducted with X-ray imaging to ensure correct band placement and to control pouch dilation.

The specific values used for the follow-up at 6, 12 and 24 months were:

- Body mass index (BMI): weight in kilograms (kg) divided by height in meters squared.
- Excess weight (EW): percentage of excessive weight compared to the ideal weight, defined as the weight to reach BMI = 25 kg/m².
- Excess weight loss (EWL): percentage calculated as [(preoperative weight – follow-up weight)/preoperative weight – ideal weight] × 100.
- Dyslipidemia was defined as the presence of more than one of any of the abnormalities in serum triglyceride or in HDL levels. Normal values for triglyceride: 0.4–1.5 mmol/l, HDL cholesterol: 1.3–3 mmol/l, LDL cholesterol: 2–4 mmol/l or total cholesterol: 3.2–7 mmol/l.
- Average blood glucose (mmol/l).
- Homeostasis model assessment (HOMA) index = fasting insulin (μ U/ml) × fasting glucose (mmol/l)/22.5. Insulin resistance (IR) was defined by a HOMA index >3.1 [14].

1.1. Statistical analysis

Nonparametric Mann–Whitney or Wilcoxon tests were used to compare the groups.

Univariate tests were performed by Student t-test for quantitative data. *p*-Values less than 5% were considered significant.

2. Results

There was a single gastric perforation in each group during placement of the band, sutured in both cases without further consequences.

There was no immediate postoperative complication.

Revision procedures were carried out laparoscopically on two patients in each group, in all cases for band slippage. In the adolescent group, both were removed at 12 and 16 months after surgery without a conversion procedure. In young adults, both were converted to bypass at 11 and 23 months.

2.1. Population

Thirty-six teenagers were operated on at the Necker-Enfants Malades Hospital. Mean age at surgery was 16.7 ± 1.3 years. Among the adolescents, none was diabetic or hypertensive. In four cases (11%) dyslipidemia was observed.

Fifty-three adults aged from 18 to 25 years were operated on at Claude Huriez Hospital. Mean age at surgery was 21.7 ± 1.9 years. In adults, diabetes mellitus type 2 was observed in one patient (2%), hypertension in eight patients (15%) and dyslipidemia in 22 patients (41%).

Clinical and biological preoperative data of the two populations are summarized in Table 1. There was no significant difference between the two groups in terms of initial preoperative weight or BMI.

2.2. Weight loss

The average BMI at 6, 12 and 24 months follow-up was compared among adolescents and adults, without significant difference between the two groups at each time of follow-up (Fig. 1).

The corresponding percentage of excess weight loss at 24 months was 62.3 ± 27.4% in adolescents and 45.5 ± 23.5% in adults. Significant

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