

# Adolescent and children obesity surgery: current trends and future perspectives

**Abbreviations:** OSA, obstructive sleep apnea; LAGB, laparoscopic adjustable gastric banding; FDA, food and drug administration; QOL, quality of life; RYGB, roux-en-y gastric bypass; LSG, laparoscopic sleeve gastrectomy

## Editorial

During the past few decades, pediatricians and primary care physicians have witnessed an unprecedented rise in childhood obesity, a major problem that is reaching epidemic proportions worldwide, therefore becoming a major public health concern. Recent studies report that approximately 1 in 5 children in the US, between the ages of 6-19 years is diagnosed with morbid obesity. Moreover, 80% of this population will go on to become obese adults. Current prevalence rates of childhood and adolescent obesity are as high as 16-18%.<sup>1,2</sup>

This disorder, is not only characterized by metabolic and physical derangements of the normal physiology, but also affects substantially the emotional health of these patients. Moreover, due to the multifactorial nature of this condition, children and adolescents affected by obesity are afflicted by medical comorbidities such as hypertension, stroke, insulin resistance, glucose intolerance, type 2 diabetes, fatty liver disease, obstructive sleep apnea (OSA), myocardial infarction, renal failure, menstrual irregularities and dyslipidemia, which were previously only seen in adults.<sup>2-4</sup>

Initial medical interventions in obese patients include lifestyle changes such as diet, exercise and counseling psychology. However, there is strong evidence that these strategies are generally not effective and obese children are at increased risk of becoming severely obese adults. In fact, only a small percentage of this population achieves the goals set and improve their quality of life.<sup>3</sup>

Considering the factors explained above, researchers and practitioners have suggested weight loss surgery (bariatric surgery) as an alternative for the treatment of severe obesity in children and adolescents. In support of surgical intervention, recent clinical trials have reported encouraging results in terms of safety and longitudinal efficacy. Although, while in adult patients, there are well-established guidelines and criteria including clear indications for surgical management; the role of bariatric surgery in the pediatric patient is still controversial. It has long been established that children and adolescents are not to be considered mini-adults, and their care should involve a multidisciplinary team comprised of the following specialists: a pediatric bariatrician, a bariatric surgeon, a pediatric psychologist, a pediatric nutritionist, an exercise physiologist, nursing support and a patient advocate.<sup>5-7</sup>

It should be highlighted that different medical associations and professional societies have made significant strides during the past several years towards defining guidelines and criteria for bariatric surgery in the pediatric population. In 2009, the International Pediatric Endosurgery Group published the first guidelines for bariatric surgery in children and adolescents, based on the preliminary results of the most recent clinical trials, evaluating the impact of bariatric surgical interventions on the resolution of comorbidities and weight loss.

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Furthermore, a multidisciplinary panel from the Nutrition Committee for the North American Society of Pediatric Gastroenterology, Hepatology and Nutrition, and the National Association of Children's Hospital and related institutions, reviewed the medical literature searching for evidence-based practices for pediatric patients undergoing bariatric surgery and suggested the following parameters as criteria for surgery in adolescents:

- Minimum age: 15 years (surgery is considered at age 14 only in exceptional circumstances).
- Tanner stage 4 or 5 of pubertal development.
- Attainment of final or near-final adult height (i.e. bone age  $\geq 13.5$  in females and  $\geq 15.5$  in males).
- Persistence of the level of obesity despite involvement in a formal multidisciplinary and supervised program of lifestyle modifications and pharmacotherapy. A minimum of 6 months of supervised multidisciplinary therapy should be provided prior to bariatric surgery.
- The family of the child or adolescent understands, and is motivated to actively participate in the on-going treatment, lifestyle changes and follow up after surgery.
- The patient is able to provide informed consent for the surgery.<sup>2,4,6</sup>

Bariatric surgery in pediatric patients is contraindicated in the following circumstances:

- Adolescents under the age of 14 years.
- Pregnant or breast-feeding adolescents.
- Patients with significant cognitive disabilities.
- Patients with Prader-Willi syndrome and other similar hyperphagic conditions.

Based on the patient's medical, psychological and social issues, and after a thorough discussion of the potential risks and benefits of surgery, a decision on the type of procedure to be performed is

made. Bariatric surgical interventions in children and adolescents are divided into two groups: restrictive and malabsorptive procedures. Restrictive surgical procedures include: Laparoscopic adjustable gastric banding (LAGB), Laparoscopic Sleeve Gastrectomy (LSG) and insertion of an intragastric balloon. Malabsorptive procedures include: Biliopancreatic Diversion and Roux-en-Y Gastric Bypass.<sup>8,9</sup>

Several case series and meta-analyses evaluating the role of bariatric surgery in obese adolescents have been published in the last few years. In these preliminary studies the evidence suggests that weight reduction and total or partial resolution of comorbidities is accomplished with the use of surgical interventions. Among the most common surgical procedures performed is the Laparoscopic Adjustable Gastric Banding (LAGB). Despite the fact that the Food and Drug Administration (FDA) has not issued official approval of this practice in adolescents and children, its use has increased dramatically.<sup>4</sup> The outcomes after LAGB in this particular population have been recently published. Treadwell et al.,<sup>4</sup> reported in 2008 the use of this procedure in 352 obese adolescents with a 3 year follow up. The authors found a significant and sustained Body Mass Index (BMI) reduction for at least 3 years (loss of excess body weight in the range 37-63%). In this study, cases with surgical complications were sporadic, however events such as hiatal hernia, band erosion, wound infections and pouch dilatation were described in 3-9% of the patients.<sup>4,8</sup>

Another commonly used restrictive surgical procedure performed in this population is Laparoscopic Sleeve Gastrectomy (LSG). This procedure has been shown to be an effective and safe alternative for weight loss with lower rates of complications compared to other approaches. In 2008, Alqahtani et al.,<sup>10</sup> reported a retrospective study of 108 obese children and adolescents between the ages of 5 and 21 years old. Interesting clinical outcomes were described in this series. The excess weight loss experienced in this study was: 28.9%, 48.1%, 61.3% and 62.3% at 3, 6, 12 and 24 months follow-up, respectively. No major postoperative complications were reported and comorbidity resolution rates showed improvement in hypertension (75%), dyslipidemia (70%), diabetes mellitus (93%) and obstructive sleep apnea (OSA) in 90% of the cases.<sup>7,9,11</sup>

On the other hand, the most commonly used malabsorptive surgical procedure performed is the Roux-en-Y Gastric Bypass (RYGB). The efficacy of RYGB on weight loss is well documented, however the complication rates remain high. A study published in 2008, reported the clinical experience of 131 adolescents that underwent RYGB. Researchers found that BMI decreased between 17.8 and 22.3% during the first 6-month follow up period. Frequent postoperative complications were reported, including: pneumonia, deep venous thrombosis, pulmonary embolism, gastrointestinal hemorrhage, anastomosis obstruction and rupture of gastric pouch.<sup>4,11-13</sup>

In 2015, a prospective, multicenter, observational study was published by Inge et al.,<sup>9</sup> reporting 242 adolescents that underwent weight-loss surgery (RYGB= 161, LSG=67), LAGB=14). After 3 years of follow-up, the weight had decreased by 28% (RYGB) and 26% (LSG) respectively. Overall remission of type 2 diabetes mellitus (95%), remission of abnormal kidney function (86%), and improvement of elevated blood pressure (74%) was observed. In addition, weight-related quality of life was also significantly improved.<sup>9</sup>

A critical aspect in the integral management of childhood obesity is comprised of the psychological and social support that these patients

need. White et al.,<sup>14</sup> recently conducted a systematic review examining the psychosocial outcomes and predictors of success after bariatric surgery in adolescents.<sup>14</sup> The authors reported an overall improvement of the quality of life (QOL) and rates of depression remission, regardless of the surgical procedure performed. Unfortunately, limited data on other psychological and social outcomes was identified. Therefore, the authors concluded that there was a lack of reliable data at the time of the analysis, to support evidence-based recommendations in terms of the psychosocial predictors of success to aid in patient selection for bariatric surgery.<sup>14</sup>

Despite remarkable advances in the field (*i.e.* promising clinical and psychosocial outcomes and the emergence of a national consensus regarding pediatric surgical obesity management), significant challenges lie ahead (*e.g.* skepticism among primary care providers, limitations in the access to healthcare and the lack of open dialogue between medical practitioners). These obstacles need to be addressed and overcome in order to achieve universal application of bariatric surgery for children and adolescents.<sup>5-13</sup>

## Conclusion

In conclusion, obesity and associated comorbidities in children and adolescents has become a major public health concern with significant long-term implications. Surgical management has emerged as an effective alternative to lifestyle changes and exercise interventions, yet significant challenges lie ahead for the field despite the promising results in weight loss and clinical outcomes reported to date. A multidisciplinary-team approach that includes all the parties involved in the care for these patients certainly has the potential to reduce the significant barriers that healthcare systems face while providing care for this particular population. Many questions remain unanswered regarding patient selection, type of procedure and the ideal time to intervene. Furthermore, while surgical alternatives remain as the only effective management of morbid obesity both in adults and children, long-term follow up studies are still needed particularly in the pediatric population to address the specific needs of these patients.

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## Conflict of interest

The author declares no conflict of interest.

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