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EDITORIAL

Management of obesity in childhood and adolescence: From diet to surgery[☆]

El manejo de la obesidad en la infancia y adolescencia: de la dieta a la cirugía

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Obesity in children is one of the most important public health problems in our society, not only because its incidence is substantially increasing, but because there is a trend for obesity to continue during adolescence, and for adolescent obesity to continue into adulthood. In children and adolescents, obesity represents a risk factor for the short (childhood and adolescence) and long-term (adulthood) occurrence of orthopedic, respiratory, cardiovascular, gastrointestinal, dermatological, neurological or endocrine complications, and some types of cancer, and for an overall decrease in life expectancy. Moreover, obese children have a poor self-image and express feelings of inferiority and rejection. The harassment to which they are often subjected makes their short- and long-term social and psychological development difficult.^{1–3}

Obesity is the most common nutritional disorder during childhood and adolescence, and its prevalence has progressively increased in recent years. Recent data from the 2008 Spanish Growth Study show that the overweight rate in children, adolescents, and young adults aged 4–24 years has increased by approximately 10% in the past 20 years. It is estimated that 20% of male children and adolescents and 15% of female children and adolescents are currently overweight, and that 5% of this population and in this age range

are obese according to the international criteria defined by Cole in 2000.⁴

Living in a “society of abundance”, in which a wide availability of hypercaloric nutrients coexists with lifestyle changes (predominance of sedentary lifestyles), poor dietary habits (ignorance, sometimes total, of the nutritional characteristics of food), and a food intake mainly based on its sensory and palatable characteristics, has led to this increase in overweight and subsequent obesity.⁵

Our understanding of the mechanisms that regulate weight and body composition has greatly advanced in recent years, and new hormones and regulatory pathways have been discovered.⁶ However, the management of obesity continues to be one of the greatest challenges in clinical practice. Some clinical trials conducted in adults with new drugs acting upon the regulatory pathways of appetite, weight gain, and body composition have reported discouraging results despite the fact that the drugs were combined with dietary measures and the stimulation of physical activity. Changes in dietary behavior, the stimulation of physical activity, and emotional support continue to be the mainstays for the management of obesity in adults, children, and adolescents.⁷ A significant additional factor during childhood is family environment. Dietary and physical activity habits are influenced at an early stage by family habits: children learn from their parents how to feed themselves and to be active or inactive. These habits become established in childhood and tend to persist into adult life. The management of childhood obesity must take all of these premises into account and be based on a multidisciplinary approach involving joint and coordinated efforts by dietitians, psychologists, pediatricians, and pediatric endocrinologists.

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This management should be aimed not only at children, but also at their environment, including family and school. It should focus on three aspects: the dietary reeducation of children and their families, psychological support, and increased physical activity. Treatment objectives include weight loss with normal growth and the creation of adequate conditions for preventing subsequent weight recovery through changes in dietary habits and lifestyle.

The dietary reeducation of children and their families is of paramount importance and involves the design by qualified professionals of a meal regimen that is varied, attractive, feasible, and adapted to the child and his/her family. Pre-established diets should be avoided, and children and their families must be involved in diet design. Diets must provide the nutrients needed to allow for adequate growth while restricting the intake of calories from carbohydrates and fat. Diets must also have an educational component, for which information should be given about the nutrient composition and energy value of the most commonly used food items, about how they should be cooked to make them more palatable, and about the need for adapting the palate to the different food flavors. Psychological support is a significant tool for securing the adaptation of children and their families to changes in feeding habits made through diet and for providing a positive stimulus in the event of weight loss.

Increased physical activity is essential in order to achieve greater energy consumption and thus counteract the trend of the body to save energy when weight loss occurs. In many children who do not usually practice sport, one-hour daily walks should be encouraged as an appropriate form of exercise. Participation in school sports and sport activities during the weekend is advisable. The practice of sport by children who are not trained should not be recommended. Any increase in physical activity should always be gradual.

An important aspect is how the reeducation of children and their families may be achieved and how long-term habits may be established. Standard management, often by a single professional (the pediatrician) and based on the recommendation of changes in dietary patterns and the stimulation of physical activity, fails early and does not provide for either short or long-term favorable results. Programs which encompass all the aspects involved in the occurrence and maintenance of pediatric obesity, focusing attention on the physical and emotional health of children and their family and social environment, rather than on weight alone, as often occurs, are therefore needed.

Our group has developed the "Children in Motion" program,⁸ aimed at children and their family environment, which has been used at our Pediatric Endocrinology unit for children aged 6–12 years and adolescents with overweight and/or obesity. This program encompasses the social, physical, and emotional areas and was devised on the basis of the recommendations and guidelines of national and international medical associations for the prevention and treatment of childhood obesity. Cognitive, behavioral, and affective techniques are used. It is a group program (6–7 children per group) where emotions related to overweight, obesity, and their short and long-term consequences are analyzed and expressed simultaneously in two different rooms, one for the children and the other for the relatives (1–2 per child, preferably parents and/or grandparents).

The program promotes a normocaloric and balanced diet and does not pursue rapid BMI decreases, but mid and long-term reductions, taking into account the fact that the child is growing and that a balanced diet will contribute to the progressive normalization of BMI.

Drug treatment for obesity should not be used alone, but rather as a complement to the basic measures of dietary reeducation, physical activity, and lifestyle changes. A recent report by the expert committee for the prevention and treatment of childhood obesity of the American Academy of Pediatrics recommends the use of drug treatment in adolescents when weight loss objectives have not been achieved with lifestyle changes alone and there are metabolic complications associated with obesity.⁹ Two drugs approved for use in childhood obesity are currently available: orlistat for children over 12 years of age, and metformin for adolescents with glucose intolerance.^{10,11}

Orlistat is a potent inhibitor of gastric and pancreatic lipase activity that prevents the hydrolysis of dietary triglycerides and cholesterol, causing a 30% reduction in the absorption of free fatty acids and glycerol (16 g/day), so contributing to the development of a negative calorie balance. The side effects of orlistat are derived from its mechanism of action and mainly include flatulence, oily spotting, meteorism with bowel movements, fecal urgency, fatty/oily stools, an increased number of stools, and fecal incontinence. These untoward effects usually become less common after the first few weeks of treatment. Supplementation with lipid-soluble vitamins is required during treatment because of increased gastrointestinal losses. A randomized, double-blind, one-year clinical trial in 539 obese adolescents aged 12–16 years demonstrated a significant decrease in BMI (-0.55 kg/m^2) in patients treated with orlistat, while a slight increase in BMI ($+0.31 \text{ kg/m}^2$) was seen in placebo patients.¹² In our experience, weight loss is small and compliance is very poor, because the drug is not reimbursed by the public health system.

Because of the increased prevalence and severity of childhood obesity in recent years, we are now seeing as new patients children and adolescents with severe obesity (BMI higher than 35), and significant comorbidities associated with obesity in older patients. In these patients, measures aimed at changing dietary habits and promoting physical activity, and even drug treatment have been shown to be unable to reverse the severity of their obesity, which results in deficient states of physical health and psychological well-being. In this situation, surgery is the last therapeutic option.

Surgical treatment for morbid obesity in adolescents is accepted and performed at most American and European hospitals, and is the only procedure that maintains weight reduction in the long-term, improving associated diseases and patient quality of life and self-esteem. Surgery only started to be used very recently and the available experience is therefore very limited. This has prompted controversy and position statements by different medical associations. Unlike in surgery for the control of severe obesity in adults (for which abundant efficacy and safety information is available), there is no randomized, controlled trial of surgery in adolescents, and little information is available about the effects of surgery on development, psychological aspects, and the potential impact on metabolism.

Surgery for severe obesity should therefore only be considered in adolescents under exceptional circumstances and after comprehensive evaluation by a multidisciplinary team experienced in the treatment of obesity in adolescents.

An international expert committee consisting of pediatric surgeons, endocrinologists, and psychiatrists recently issued recommendations and criteria for the selection of pediatric patients with morbid obesity as candidates for bariatric surgery.¹³ It was stated that the use of surgery should only be considered in adolescents when weight control had not been achieved after intensive, organized attempts to change lifestyle, whether or not associated with drug treatment, for six months of longer and when the following criteria had been met: (a) BMI of 35 kg/m² or more and severe comorbidity (type 2 diabetes mellitus, sleep apnea-hypopnea, intracranial hypertension, and severe steatohepatitis) or BMI of 40 kg/m² or more and less severe comorbidities (uncomplicated HBP, dyslipidemia, insulin resistance and glucose intolerance, gastroesophageal reflux, non-alcoholic fatty liver disease, stress urinary incontinence, limiting joint disease, venous stasis, intertriginous soft tissue infection, psychosocial stress, and severe impairment of everyday activities), (b) genetic and rare or treatable causes of obesity are ruled out, and (c) each and every one of the following requirements are strictly met: for patients, Tanner 4–5 pubertal development and at least 95% of adult height based on bone age, psychological maturity, favorable evaluation by a pediatric psychiatrist, understanding of the consequences of bariatric surgery, informed consent, commitment to the medical care required before and after bariatric surgery and the capacity to follow dietary and physical activity instructions, favorable family environment, and the capacity to assume permanent clinical follow-up after surgery, as well as the availability of surgeons experienced in obesity and a multidisciplinary team that would allow for adequate long-term follow-up.

Relative contraindications for bariatric surgery in adolescents include: (a) alcohol or drug abuse during the previous year, psychiatric, dietary, or cognitive disorder that impairs understanding of the procedure or adherence to subsequent dietary and drug treatment, (b) pregnancy, breast-feeding, or planned pregnancy in the next two years, and (c) patients not adhering to the dietary and physical activity principles.

In this setting, the Bariatric Surgery Program for Adolescents was implemented four years ago at our hospital within the structure of the Pediatric Obesity unit. The program includes a multidisciplinary team of pediatric endocrinologists, pediatric surgeons, anesthesiologists, dietitians, psychiatrists, psychologists, and nurses in order to guarantee the adequate treatment of these patients. At this first stage, we decided to start our activity by evaluating the efficacy and safety of the endoscopic implantation of intra-gastric balloons (IGB) in adolescents with morbid obesity. This was mainly for two reasons. First, the scarce information available on the use and the mid and long-term results of this procedure in adolescents,¹⁴ and second, because this is a minimally invasive, reversible method with few complications that does not impair nutrient absorption and could reinforce behavioral therapy and lifestyle changes already started by these patients. Our preliminary experience with this procedure was restricted to eight patients aged 13.9–17.9 years (five girls and three boys) with a mean

BMI of 46.2 ± 6.4 , who had one or more severe comorbidities and met the internationally agreed selection criteria. Intra-gastric balloons were placed by the endoscopic route under general anesthesia and were maintained for six months. At 18–24 months of IGB explantation, four patients had sustained weight loss (BMI [SD] reduction, 11.0 ± 3.7), while the remaining patients had a weight similar to or slightly higher than the weight prior to IGB implant (BMI [SD] $+2.3 \pm 2.4$). Patient age was similar in both groups (15.4 years), as was BMI (46 kg/m²), but weight loss at the time of explantation was greater in the group of patients with sustained weight loss (BMI, 35.9 ± 5.3) as compared to adolescents with weight recovery (BMI, 40.7 ± 6.9). In addition, dietary transgressions during the period of the IGB implant were more common in the latter group.¹⁵ Although this was a small series, the results led us to think that there may be two phenotypes of adolescent patients with morbid obesity showing different dietary behavior and hormonal response patterns, and that deeper research into these aspects is required. We also think that widespread recommendation of this option as therapy is premature until more conclusive results have been achieved in a larger group of patients. In our experience, however, this is a safe method virtually free of complications in experienced hands which, according to these preliminary results, may benefit a significant number of adolescents with morbid obesity before bariatric surgery has been decided on. We also think that it would be interesting to assess the efficacy of this procedure in adolescent obese patients with less severe obesity (BMI ranging from 35 to 40) and to emphasize the need for these patients to be subject to a subsequent lifestyle reeducation program especially aimed at consolidating the weight loss achieved. Finally, we think that the implantation of this device may be useful as a prior procedure to restrictive or malabsorptive surgery in patients with extreme obesity, in order to facilitate surgery by decreasing abdominal fat contents and liver volume.

While the surgical procedure most commonly used for treating morbid obesity in the pediatric age is Roux-en-Y gastric bypass (RYGB), a new treatment option, the gastric sleeve procedure, is available. As compared to other bariatric surgery procedures, gastric sleeve surgery has been shown to be faster and easier, and to provide similar results as regards both weight loss and the resolution of associated comorbidities.¹⁶ In addition, it is the only procedure that leaves a possibility of rescue surgery in adult age, except in patients in whom no adequate weight loss has been achieved with the initial surgery. Incorporation of the Da Vinci robot (Intuitive Surgical, Sun Valley, CA) has allowed our unit to accumulate considerable experience in robotic bariatric surgery, which has been performed in more than 70 adult patients over the past two years. Therefore, because of prior experience with laparoscopic and robotic surgery at our hospital, it was decided to use robotic sleeve gastrectomy as the procedure of choice for adolescents with morbid obesity. Short-term data suggest that this is a safe alternative, with less nutritional risks than RYGB. It should be noted that the procedure is not standardized and no long-term follow-up data are available, and this must therefore be considered as an experimental technique. This surgery should be done by trained surgeons at hospitals with adequate facilities for laparoscopic surgery and postoperative

care, thus significantly reducing the complications of open surgery. The cumulative experience with robotic bariatric laparoscopic surgery at our hospital in adult obese populations and in the medical and postoperative management of such patients is undoubtedly a strong basis to guarantee the success of this program in adolescents with morbid obesity. However, we think that programs subsequent to bariatric surgery, similar to those we are implementing at our hospital (Adolescents in Motion), are indispensable as a long-term tool in order to guarantee and consolidate the weight loss achieved with surgery.

Finally, we would like to emphasize the need for pediatric patients who are candidates for drug treatment or surgery to be evaluated and monitored at specialized pediatric obesity units within tertiary hospitals, because the comprehensive management of morbid obesity and its multiple associated morbidities requires the participation of a multidisciplinary team consisting of endocrinologists, dieticians, psychologists, neurophysiologists, orthopedic surgeons, anesthesiologists, and pediatric surgeons. Such units can guarantee the excellence and quality of care these patients require, and objectively and independently assess the efficacy of the procedures used.

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