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FEB 11, 2010

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Title: Obesity surgery
 Title Abbrev: Obes Surg
 Citation: 2010 Jan;20(1):114-7. Epub 2009 Oct 21
 Article: Bariatric surgery in the management of childhood o
 Author: Dan D;Harnanan D;Seetahal S;Naraynsingh V;Teelucksingh S
 NLM Unique ID: 9106714 Verify: PubMed
 PubMed UI: 19844765
 ISSN: 0960-8923 (Print) 1708-0428 (Electronic)
 Publisher: Springer Science + Business Media, New York :
 Copyright: Copyright Compliance Guidelines
 Authorization: MWT
 Need By: FEB 19, 2010
 Maximum Cost: **Free**
 Patron Name: Singh, Miss Sheree
 Referral Reason: Not owned (title)
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Routing Reason: Routed to TNUCKK in Serial Routing - cell 2

Received: Feb 11, 2010 (03:29 PM EST)

Lender: Gateway Medical Center/ Clarksville/ TN USA (TNUCKK)

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Bariatric Surgery in the Management of Childhood Obesity: Should There be an Age Limit?

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Received: 26 March 2009 / Accepted: 30 September 2009 / Published online: 21 October 2009
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Abstract We report a case of a 6-year-old girl suffering from morbid obesity, Blount's disease, and significant social and functional impairment who underwent a laparoscopic sleeve gastrectomy. One year later, she has shown remarkable improvement in all aspects of her health emphasizing the success of the procedure. A follow-up laparoscopic Roux-en-Y gastric bypass or biliopancreatic diversion (BPD) are options if she regains weight as she gets older. This case is noteworthy for several reasons. The age of the patient is younger than any currently on record who has had this treatment. Additionally, the utilization of a sleeve gastrectomy as a first-step procedure, to be followed by Roux-en-Y gastric bypass or BPD, remains a novel treatment for morbid obesity in a pediatric population.

Keywords Obesity · Childhood · Pediatric · Sleeve gastrectomy

Introduction

Obesity is defined as having a body mass index (BMI) of 30 kg/m² or greater [1]. It has been established as a major global health concern in adults, and has subsequently been recognized as being analogously sinister in children. As many as 83 (83%) of obese children will become obese adults [2]. Bariatric surgery, in its multiple guises, is recognized as an effective option in obesity management [3]. We report a case of laparoscopic sleeve gastrectomy performed in a 6-year-old female for morbid obesity. This case is significant in that no bariatric procedure has previously been described in a patient this young.

Case Report

The patient at age six was referred to the senior author by the pediatrician to be assessed for surgical options pertaining to her obesity. At presentation she was 1.2 m tall, weighed 75 kg, and had a BMI of 53.18 kg/m². She was delivered via a spontaneous vaginal delivery at term with a birth weight of 3.1 kg. At 1 year of age she was noted to be at the 95th percentile (95%) for her age; by 2 years she weighed 63 kg. At age three she had already started to experience bowing of her legs with pain in her knees and was diagnosed with Blount's disease, a growth disorder of the tibia that causes the lower leg to angle inwards. She continued to gain weight until seen by the surgeons (Fig. 1).

Extensive evaluation for a cause of obesity by pediatric endocrinologists revealed no obvious underlying cause.

Financial Information: There are no financial constraints or conflicts of interest associated with this manuscript.

The processes involved in the construction of this article, as well as the final version of this article have been granted appropriate ethical approvals. Additionally, parental consent has been procured for the submission of information contained within this article.

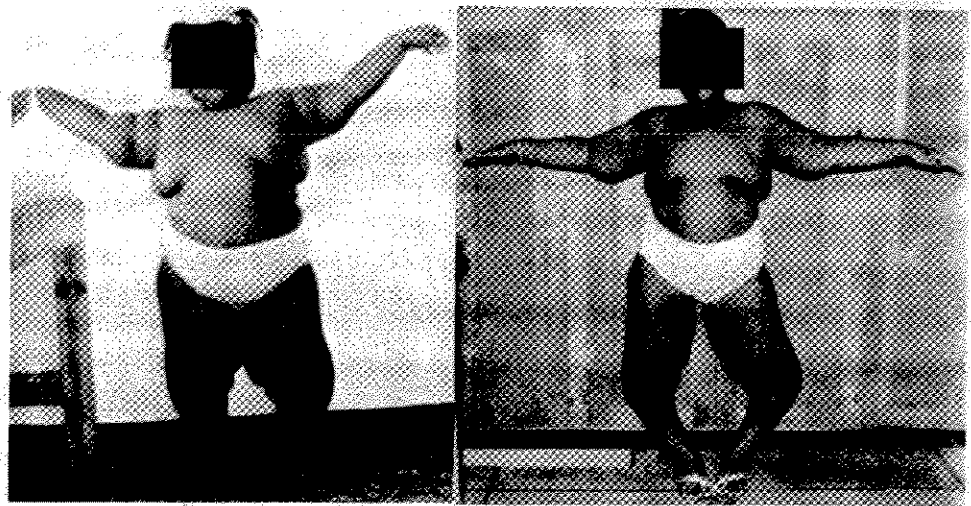
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Fig. 1 The patient before and after surgery



Full blood count, thyroid function tests, liver function tests, glucose tolerance test, cortisol, growth hormone, and sex hormones were all within normal limits. The patient had no family history of morbid obesity or genetic abnormality. Chromosome studies and sleep apnea assessment were not available. CT and MRI showed a structurally normal pituitary, sella, and hypothalamus. The ovaries and liver were normal on ultrasound. Her eating habits certainly contributed to her condition. Meals were frequent, large, and nutritionally indiscriminate, usually comprising whatever the patient was hankering after at the time. Little effort was made initially to curb her appetite, as her parents were not savvy to basic dietary principles, and locally a large appetite is often associated with health and vitality. Eventually she was assessed by dietitians and over the course of 6 months numerous dietary regimens were recommended, including fat and overall caloric restriction, with little success. During this period, her parents were counseled on the virtues of balanced meals and healthy portioning, specifically with relation to their daughter. Although removal of a child from the home has been recommended when obesity-related medical neglect is identified, this is not possible in our setting where proper child support services are not at the level of sophistication or efficiency as in first world countries [4]. Her ability to exercise was extremely hindered by her severe progressive tibia vara. Despite all measures, she failed to lose weight. The orthopedic surgeons advised that it would be better to achieve weight loss before attempting to correct her tibia vara.

The patient suffered immense restrictions on account of her obesity. Apart from the associated health complications, she was physically unable to walk and relied upon her mother to carry her 75 kg frame bodily from place-to-place. Her social functioning was almost non-existent and she was virtually confined to her home and bed, being unable to attend school or even venture out. Understandably, her emotional health suffered tremendously and she had become a shy, withdrawn, and depressed child.

Given these circumstances, and after group consultation with the medical team and her parents, surgery as a therapeutic option was entertained. Several options were available, but a sleeve gastrectomy was preferred to avoid the malabsorptive potential associated with a Roux-en-Y bypass and the use of a foreign body with the gastric band [5]. Her parents were informed as to the potential complications of this procedure including anesthetic complications, surgical leakage, gastrointestinal symptoms post-op, and possible growth impairment later on in life. Additionally, it was explained that the surgery still necessitates dietary restriction post-op in order to optimize weight loss. The patient and her caregivers were also evaluated by a psychiatrist and dietitian prior to surgery. After these consultations, her parents were satisfied that surgery represented the best option for their child's long-term health, and gave written consent. A laparoscopic sleeve gastrectomy was performed using a technique similar to that described by Kueper et al. [6]. A five-port technique was used and the procedure began with the greater curve of the stomach being completely mobilized from the angle of His to within 4–6 cm of the pylorus, using the Harmonic Scalpel™. The stomach was then stapled starting at 6 cm from the pylorus to the angle of His, leaving a very narrow sleeve (1–2 cm) along the lesser curve (the pediatric endoscope being utilized for verification). The staple line was oversewn and assessed for leaks with air insufflation. Her post-operative recovery was uneventful. She was started on 600 kcal liquid diet by day 3. This was well tolerated and she was discharged on day 5 post-operatively.

At the time of reporting, she is now 12 months post-op, 1.4 m tall and has lost 28 kg, with a BMI 33.33 kg/m², a 37% reduction in weight, and a 50% reduction in excess body weight (Figs. 1 and 2). Her physical mobility has improved tremendously and she is now independently ambulant and capable of a much broader spectrum of

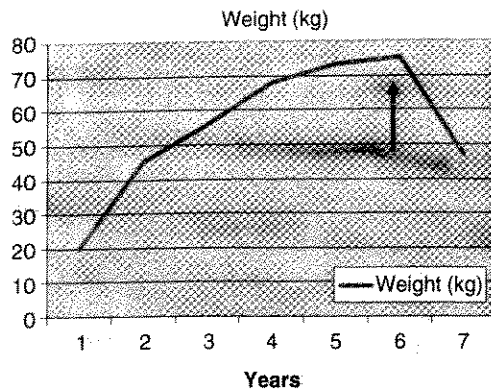


Fig. 2 Graph showing patient's weight; the arrow indicates time of surgery, with subsequent weight loss in the year following

activities, including exercise. Her tibia vara is being monitored by orthopedic doctors with an aim to possible surgical correction in the future. Her emotional status at 12 months post-op is almost unrecognizable from the shy, introverted girl previously encountered. Her parents confirm her burgeoning self-confidence and happier disposition. She was placed on a 600 kCal/day diet for 6 weeks, followed by a 1,200 kCal/day diet, which she still follows. Additionally, she is using children's multi-vitamins and has not displayed any signs of vitamin deficiency or growth impairment. She has, for the first time, started attending school at age seven.

Discussion

Obesity has been described as a "plague" of the twenty-first century [1]. The US Surgeon General report claims that 300,000 lives are lost annually to obesity-related diseases in the USA alone. This epidemic of adult obesity is rooted in increasing incidences of childhood obesity. A Norwegian longitudinal study, published in 2008, concluded that adolescent obesity was associated with a significant rise in middle-age mortality from cardiovascular, metabolic, endocrine, and even certain cancer-related diseases [7].

Beyond these glaring mortality statistics, the morbidities associated with childhood obesity are often underestimated and underappreciated. Obese children account for 66–80% with tibia vara, and 50–70% of slipped upper femoral epiphysis. More than 15% of obese children have steatohepatitis. Polycystic ovarian syndrome, pseudotumor cerebri, biliary disease, depression, lack of self-esteem, and poor self-image are all associated with obesity in children [8]. This ultimately results in underperformance in both school and society.

Thus, the goal of weight loss in the overweight child improves not just life-span and physical health, but also emotional, psychological, and social well-being.

For individuals who are extremely obese, current medical and behavioral interventions have been shown to be ineffective in producing significant weight loss necessary to improve long-term health. This paradigm has led to the advocacy of (bariatric) surgery as a major intervention in the severely obese. Inge et al. proposed that bariatric surgery during adolescence, in individuals with childhood-onset obesity, is a more effective treatment than delaying the surgery until adulthood [9].

Bariatric procedures can be classified as being restrictive, malabsorptive, or a combination of both. It has been postulated that malabsorptive procedures performed in adolescents carry a higher risk of nutritional deficiencies than do restrictive procedures, such as sleeve gastrectomy [3]. Furthermore, laparoscopic sleeve gastrectomy (LSG) has been shown to be effective as a first-step procedure in the super-obese and/or high-risk patient, which can be later followed by a more definitive procedure such as laparoscopic biliopancreatic diversion or Roux-en-Y gastric bypass [10].

Current patient selection criteria for bariatric surgery among adolescents are more conservative than for adults; these did not cater for the obvious needs of our patient. In general for adolescents and children with severe obesity, bariatric surgery can be considered if the patient:

1. has a BMI > 40 (or 99.5 percentile for respective age) and at least one co-morbidity
2. has failed at least 6–12 months of organized weight reducing attempts in a specialized center
3. shows skeletal and developmental maturity
4. is able to commit to comprehensive medical and psychological evaluation before and after surgery
5. is willing to participate in a post-operative multidisciplinary treatment program
6. can access surgery in a surgery unit with specialist pediatric support [11]

These guidelines have been criticized as being too conservative, especially with respect to the standards concerning patients' BMIs [12]. It is noteworthy however, that there is no explicit mention of age, but rather only of sexual and growth maturity. This stems directly from the concerns of the deleterious effects of nutritional deficiencies on the growing child, as the criteria consider bariatric surgery in general—both restrictive and malabsorptive procedures. As noted, LSG carries a much lower risk of such nutritional sequelae [5]. Its usefulness among a pediatric population, however, has never been documented and is still a subject of study.

Our patient represents a unique case in which a LSG was performed as the initial bariatric procedure, not in a high-risk adult, but in a morbidly obese child. Perhaps more significantly, the age of our patient is well below that in the

established guidelines [13,14]. Given the success of this patient, who was a long way away from meeting established criteria, perhaps new criteria can be considered for morbid childhood obesity. Where, as in our case, the child is physically incapacitated and socially and psychologically disadvantaged, age and skeletal maturity should not be used to limit the child's opportunity for recovery. When conservative measures fail, we recommend LSG as superior technique in this age group as it is associated with minimal nutritional and malabsorptive sequelae. It also obviates the need for strict dietary and psychological modifications.

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