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Original article

Co-morbidity resolution in morbidly obese children and adolescents undergoing sleeve gastrectomy

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Abstract

Background: Bariatric surgery is becoming important for the reversal of co-morbidities in children and adolescents. We previously reported the safety and efficacy of laparoscopic sleeve gastrectomy (LSG) in the pediatric population. However, evidence pertaining to the effect of LSG on co-morbidities in this age group is scarce. The objective of this study was to assess the remission and improvement of co-morbidities (dyslipidemia, hypertension, diabetes, and obstructive sleep apnea) after LSG in children and adolescents.

Methods: Anthropometric changes, complications, remission, and improvement in co-morbidities were assessed over 3 years. OSA was diagnosed using the Pediatric Sleep Questionnaire (PSQ) and polysomnography and its resolution was assessed according to PSQ score alone. Diabetes, pre-diabetes, hypertension, prehypertension, and dyslipidemia were assessed using standard pediatric-specific definitions.

Results: The review yielded 226 patients; 74 patients were prepubertal (5–12 yr of age, mean: 9.8 ± 2.3), 115 adolescents (13–17 yr of age, mean: 15.4 ± 1.7), and 37 were young adults (18–21 yr of age, mean: 19.2 ± .8). Overall mean age was 14.4 ± 4.0 years (range: 4.94–20.99), and 50.4% were females. Mean body mass index (BMI) and BMI z score were 48.2 ± 10.1 kg/m^2 and 2.99 ± .35, respectively. Mean BMI z score at 1, 2, and 3 years postoperative was 2.01 ± .87, 2.00 ± 1.07, and 1.66 ± .65, respectively. Mean preoperative height was 158.0 ± 15.1 cm, and at 1, 2, and 3 years postoperative, it was 160.3 ± 13.4, 161.4 ± 14.1, and 163.2 ± 11.1, respectively. All patients at different age groups experienced normal growth velocity. Within 2 years of follow-up, 90.3% of co-morbidities were in remission or improved, 64.9% of which were within the first 3 months postoperatively. No further improvement or remission was observed beyond 2 years, and there was no recurrence up to 3 years in patients who were seen in follow-up. The lost to follow-up in each of the 3 years was 4.2%, 7.6%, and 15.3%, respectively.

Conclusion: LSG performed on children and adolescents results in remission or improvement of >90% of co-morbidities within 2 years after bariatric surgery with few complications, no mortality, and normal growth. (Surg Obes Relat Dis 2014;▮:00–00.)

Keywords: Co-morbidity resolution; Pediatric; Children; Bariatric surgery; Sleeve gastrectomy

With the alarming rise in the prevalence of childhood obesity, a parallel and disturbing increase in associated co-morbidities is evident. The metabolic syndrome, diabetes mellitus, hypertension, dyslipidemia, obstructive sleep

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apnea, and a variety of other conditions are being seen more frequently in the pediatric age [1–3], and attaining such diseases at an early age carries severe long-term health consequences including early mortality and a shorter life-span [1,4,5]. Nonsurgical approaches to pediatric obesity are modest at best and ineffective in reversing the co-morbidities developed [6,7]. In adults, bariatric surgery has a proven record for inducing weight loss and resolution of obesity-associated co-morbidities. Moreover, it reduces mortality and improves the quality of life [8–19].

As a standalone bariatric procedure, laparoscopic sleeve gastrectomy (LSG) gained wide and rapid popularity with high safety and efficacy in weight loss and sustained resolution of co-morbidities [20–23]. In the pediatric age group, and in spite of encouraging experience reported by us, as well as other authors, bariatric surgery is still debated, let alone LSG.

We previously demonstrated the success of LSG in treating morbidly obese children and adolescents [24], and reported the similarity of the outcomes in adult and pediatric patients [25]. However, evidence pertaining to the effectiveness of resolving and improving co-morbidities in morbidly obese children and adolescents is scarce, and apart from few case reports, the effect of bariatric surgery on prepubertal children has not been studied. In this review, we evaluate the effect of LSG on the resolution of obesity-related co-morbidities in 226 pediatric patients who underwent LSG. Furthermore, we report weight loss attained by the patients and their growth velocity.

Methods

A review of data extracted from King Saud University Obesity Chair Research Database, which was developed to prospectively collect outcomes of pediatric bariatric surgery including demographic, anthropometric, and clinical and biochemical measures was performed. All pediatric patients under the age of 21 who underwent LSG between March 2008 and August 2013 were included in this review, including 108 of whom we previously reported [24]. The primary outcome included in this review was resolution of co-morbid conditions, while the secondary outcomes were weight loss, complications, and annual growth rate. Co-morbidity data were abstracted in addition to other variables of interest through baseline, operative, and follow-up data.

Patient diagnosis and management

A multidisciplinary team consisting of a pediatric endocrinologist, a pediatric bariatric surgeon, dieticians, nurses, psychologists, and health educators followed and assessed patient eligibility for bariatric surgery. Patient requirements included: (1) a body mass index (BMI) of at least 40 kg/m^2 (or having multiple co-morbid conditions with a BMI >35 kg/m^2 or above the 99th percentile for age), (2) failure to achieve weight reduction of at least 10% of baseline weight during a 6-month period of follow-up with the multi-disciplinary team, (3) presence of a dedicated caregiver from the patient's family, and (4) supportive psychological evaluation in the form of behavioral, cognitive, emotional, and psychosocial assessment. Additionally, the patient and their family must be motivated and have realistic expectations.

Follow-up visits were scheduled for 1, 3, 6, and 12 months postoperatively and annually thereafter. The visits included evaluation of co-morbidity status, weight loss, complications, as well as annual growth. All data were collected using case report forms specifically developed to feed this data into King Saud University Obesity Chair Research Database.

The clinical pathway and the study protocol for all patients including prepubertal children received approval of King Saud University Institutional Review Board. All LSG procedures were performed by the same surgeon using a previously described surgical technique including a standardized perioperative protocol [24,25].

Definition of co-morbidities

Blood pressure was measured at all visits using a standard sphygmomanometer with appropriate cuff size. Hypertension was defined as systolic or diastolic blood pressure that is higher than the 95th percentile for sex, age, and height on 3 or more preoperative visits during the weight management period. Prehypertension was defined as systolic or diastolic blood pressure levels between the 90th and 95th percentiles for age, gender, and height according to the 4th Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents [26]. Dyslipidemia was defined according to the report of the expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents [27]. Diabetes and prediabetes were diagnosed according to the American Diabetes Association definition, which employed a cutoff point of 7.0 mmol/L for diabetes and 5.5 mmol/L for prediabetes [28]. Obstructive sleep apnea (OSA) and sleep-related breathing disorders were assessed clinically through the Pediatric Sleep Questionnaire (PSQ) and were investigated using polysomnography. OSA was diagnosed in patients who had an Apnea/Hypoapnea Index that was above 2 [29] and a PSQ score above .33 [30]. Assessment of nonalcoholic fatty liver disease was performed through histologic examination of liver biopsy obtained intraoperatively, while musculoskeletal pain was assessed using The Brief Pain Inventory. Annual growth velocity was assessed using charts developed from longitudinal standards described by Tanner and Davies [31].