The Sleeve Gastrectomy in Adolescents

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1 Introduction

The rapid development in science and technology has significantly impacted our lives. The lifestyle of the whole of society has changed, and people tend to adopt a sedentary way of living. Consequently, children nowadays prefer playing with technological equipment and electronic games to those that require physical activity. They tend to go for fast food and the unhealthy snacks which add to this harmful behaviour and results in them becoming overweight or obese.

The obesity in children and adolescent (2–19 years old) is measured by growth charts to determine age- and sex-specific body mass index (BMI), with a BMI ≥95th percentile being defined as obesity [1]. Approximately 18.5% of youth in the U.S. are obese, while 8.5% of those 12–19 are categorized as severely obese (BMI ≥120% of the 95th percentile); representing approximately 4.5 million children [2]. Children with obesity have a significantly higher risk of diabetes mellitus (DM), hypertension (HTN), and coronary artery disease (CAD) when they become obese adults. This risk decreases significantly if the child is non-obese by adulthood [3].

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Bariatric surgery (BS), has proven its effectiveness in treating obese children [3, 4]. Recently, the American Society for Metabolic and Bariatric Surgery (ASMBS) has issued the paediatric metabolic and bariatric surgery guidelines which recommended sleeve gastrectomy (SG) as the best option for obese children alongside the roux en Y gastric bypass (RYGB) [2].

2 Eligibility

A broad range of moral issues is associated with BS for children and adolescents [3]. The adolescents' age group is very sensitive, and their lives are characterized by peaked physical, psychological and social development. Therefore, the decision of undergoing BS in children is multidisciplinary. The recent ASMBS guidelines consider BS as the standard of care for treatment of obese children and should be offered early to reverse the associated co-morbidities. However, the multidisciplinary approach for these patients is essential and of high importance. A team composed of paediatricians, bariatric physicians, psychotherapists and surgeons will be needed to offer the most appropriate care which will ultimately influence the patient's outcome.

The paediatricians and primary care physicians must be aware of the eligibility criteria and refer the paediatric patients to a specialized bariatric surgery centre to obtain the standard of care. There is an observed lack of enthusiasm to refer obese young patients to undergo bariatric surgery. However, all the published data as well as the recently issued guidelines encourage children to undergo bariatric surgery as early as possible.

2.1 Who is Eligible?

According to the ASMBS guidelines [2]: patients with a BMI >120% of the 95th percentile with a comorbidity or with a BMI>140% of the 95th percentile is eligible for bariatric surgery.

Adolescents are defined by the World Health Organization's (WHO) as persons between the ages of 10–19 years, however, younger children who meet the aforementioned criteria for bariatric surgery could be considered for the procedure, when benefit outweighs risk [2]. LSG has even proven its effectiveness in the pre-pubertal age group [5].

3 Which Procedure is Right for Adolescents

As mentioned above, the current guidelines recommend sleeve gastrectomy as the best surgical option for adolescents. LSG is known by its relative simplicity in comparison to the other bariatric procedures. However, it is the best option when it is chosen for the right patient.

An important controversial topic that needs to be considered is the link between LSG and gastroesophageal reflux disease (GERD) and its possible association with hiatal hernia (HH). Obese adolescents have a higher risk of GERD compared to their non-obese peers [6]. Data about the outcomes of GERD post LSG in adolescents is limited, nevertheless authors reported the incidence of new-onset GERD after LSG in 5.7–16.7% of adolescents [7].

The risks of long-standing GERD are well recognized; and those include the eventual development of reflux esophagitis, Barret's oesophagus and consequently oesophageal adenocarcinoma. Furthermore, the significant effect of GERD on patients' daily lives and dietary habits have been shown to severely impact the quality of life of patients suffering from it. Considering all the above factors and the early performance of LSG in youngsters, GERD symptoms should be evaluated cautiously during the pre-operative assessment. Pre-operative esophagogastroduodenoscopy is recommended routinely for all patients. Moreover, it is important to perform a meticulous intra-operative dissection and exploration of the hiatus for the presence of a hernia while undergoing BS. If present, it is crucial to combine hiatus repair alongside the sleeve. HH repair with LSG has been proven to relieve and improve GERD symptoms in LSG patients [8]. Another option for GERD patients would be RYGB, which has proven its effectiveness as the best option for obese patients with severe GERD.

Application of these principles to our clinical practice in the adolescent age group revealed that out of 696 adolescents; 667 patients (95.8%) had LSG, ten (1.4%) had RYGB, three (0.4%) had one anastomosis gastric bypass (OAGB) and sixteen had LSG with HH repair (2.3%). Laparoscopic adjustable gastric banding (LAGB) is still not FDA approved for patients less than 18-year-old [2]. However, some authors reported median BMI loss of 10 kg/m^2 at 4 years post-LSG [9]. Authors reported good results in term of weight loss and resolution of comorbidities in adolescents post (OAGB), with no incidence of growth disorders or malnutrition observed [10].

4 Pre- and Post-operative Nutritional Care

Assessment of the possible nutritional deficiencies post-LSG is crucial. Authors suggested that the existence of pre-operative nutritional deficiencies in adolescents (vitamin D, anemia, and hypoalbuminemia) persist or worsen post-operatively [11]. Hence, adolescents need vigorous pre-operative surveillance and appropriate post-operative monitoring. It is imperative to explain to the patient and his attendees the importance of post-operative compliance with vitamins and nutritional supplementation. A regular monthly follow-up after surgery for the first 3 months, then every 3 months for the first 2 years is highly recommended.

5 Psychological Concern

The current adolescents' guidelines have suggested that, except for active psychosis, suicidality, or substance abuse, mental health disorders are not a contraindication to metabolic and bariatric surgery in adolescents [2]. Nevertheless, these

patients should be carefully monitored to promote positive mental health and reduce the potential risk of further mental health complications (i.e. new substance abuse or suicidality) [2].

Obese kids tend to suffer from bullying and insults by their peers. Weight loss could be the leading solution for this problem. Literature has proven that LSG has a positive psychosocial impact on paediatric patients and significant improvement of patients' quality of life [12]. The satisfactory weight loss results boost their self-esteem and perception of body image. Adolescent patients became more involved in social life and adopt a new lifestyle that is more constructive to their mental health.

6 The Outcomes of SG

Previous literature has been able to show satisfactory weight loss results in adolescents and children after undergoing sleeve gastrectomy [3, 5]. Patients had been able to maintain their weight loss in the long-term when compared to the older population. Authors relayed this to the easy implementation of life-style changes in the younger patients [3], as well as the age differences in physical activity and the basal metabolic rates that accompany the younger population.

The positive results of BS on obesity associated co-morbidities (DM, HTN, CAD, obstructive sleep apnoea) are well known. Having a child with an obesity associated co-morbidity has been shown to increase the risk of future morbidity and mortality. The impact of SG on obesity associated co-morbidities in the paediatric age group was very influential. Pre-diabetes was resolved completely in young populations [3]. DM was resolved in 63–100% of patients and no relapse was noticed at 5 years after SG [3, 13].

There is a worldwide lack of keenness to perform BS in children. However, it has been proven that there is well-established data that support and encourage the early intervention on this age group. Our previously published studies related to LSG on adolescents stressed on the importance of medical trials of weight loss before surgery. But the latest reviews and evidenced based clinical practice encourage interfering with the obesity problem in children as early as diagnosed. This will help the obese children to restart a new life and progress in their schools and social life easier and faster.

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