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# **Bariatric Surgery in Adolescents : a multidisciplinary Approach**

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## **1. Introduction**

Great societal changes have been found in the world with fast lifestyle, less activity or exercises in recent 30 years. The epidemic of obesity continues to grow and affect almost every aspect of the lives of patients and human life especially in children and adolescents. The growing prevalence of diabetes and cardiovascular disease (CVD) parallels the increased prevalence of obesity.

The Center for Disease Control (CDC) in the United States defines overweight as a body mass index (BMI,  $\text{kg/m}^2$ ) of 25.0 to 29.9 and obesity as a BMI greater than 30.0  $\text{kg/m}^2$ . It is different from CDC in Asia or in China with the definition as overweight 24.0 to 27.9 and obesity as a BMI greater than 28.0  $\text{kg/m}^2$ .

Obesity is strongly associated with severe medical problems including increased risk for cardiovascular morbidity and mortality, hypertension, cholelithiasis, nonalcoholic steatohepatitis (NASH), sleep apnea, orthopedic dysfunction, depression, breast, colon and uterine cancers. The disease profile changes in the adolescent population increasing of metabolic syndrome or Type II diabetes and cancer. The great challenges associated with or directly responsible for multiple medical problems or comorbidities to the traditional culture, education, medical system, multidisciplinary medical workers and healthy professionals.

It necessitates attention to care bariatric healthcare professionals. A multidisciplinary Approach, to help healthcare professionals navigate the difficult road of treating adolescent obesity.

## 2. The causes of obesity

The causes of obesity are multifactorial roles with genetics, environmental factors, food consumption, and family interactions.

All obese children and adults develop from consistaining a positive-balance between energy intake (high-calorie, nutrient-dense foods) and energy output (physical activity and exercise). Parents have a major influence on their children regarding their intake and activity/inactivity. Children from overweight/obese families have higher obesity rate with low cognitive stimulation and less physical activity than normal weight families

Exercise Prescription Guidelines for the obese Child and Adolescents

The emergence of Type 2 diabetes (T2D) in children and adolescents parallels the rising rates of childhood obesity. As a condition of impaired insulin sensitivity and relative insulin deficiency resulting in hyperglycemia, T2D has a complex underlying physiology that is reflected by the multiple approaches used to optimize medical care and prevent the myriad of diabetes-related complications [2].

Chinese famous philosopher Lao-Tzu said: The journey of a thousand miles begins with the first step.

All the children and adolescents need eating disorder treatment [3]. They need an negative-balance between energy intake (low-calorie, nutrient-dense foods) and energy output (physical activity and exercise). Obese children or adolences have to work harder than normal weight children or adolences to accomplish the same task and thus need adjusted workloads. An exercise program and assessment for obese child and adolescents should be designed to increase caloric expenditure rather than to improve cardiovascular fitness. However, medical intervention is failure for long-term weight loss in most morbidly obese persons.

## 3. Effect of weight reduction or bariatric surgery in type 2 diabetes and prediabetes

It has been demonstrated that weight reduction – even modest loss of 6 to 10 percent had a remarkable effect on diabetes control in patients with type 2 diabetes and reduced the risk for prediabetes patient developing to diabetes by a profound effect on preventing natural progression of glucose intolerance from IGT to type 2 diatetes.

The weight reduction reduces the incidence of most obesity complications and improves overall sense of wellbeing. Although lifestyle modification has been the traditional clinical recommendation for overweightand obese prediabetic and diabetic patients, bariatric surgery became another valid and effective option for long-term weight control among these high risk patients because diabetes is a major comorbid condition.

The incidence of adolescent bariatric surgery is increasing with safely as evidenced by low complication rates [5]. Extremely obese diabetic adolescents experience significant weight loss

and remission of type 2 diabetes mellitus after Roux-en-Y gastric bypass with Improvements in insulin resistance, beta-cell function, and cardiovascular risk factors support Roux-en-Y gastric bypass as an intervention that improves the health of these adolescents. It suggests that Roux-en-Y gastric bypass is an effective option for the treatment of extremely obese adolescents with type 2 diabetes mellitus [6].

#### **4. Indications for bariatric surgery**

The 1998 NHLBI obesity clinical guidelines for adults set the patient selection criterion for obesity surgery as a BMI of 40 or more or a BMI between 35 and 40 accompanied by high-risk obesity comorbidities such as type 2 diabetes, hypertension, sleep apnea, asthma, or osteoarthritis of weight-bearing joints. Surgery is recommended only for patients who have an acceptable risk for surgery, are well-informed, motivated, and able to participate in treatment and long-term follow-up. Patients who choose surgery will require lifelong medical care and should work with a multidisciplinary team including medical, nutritional, and behavioral specialists (NHLBI, 1998). While the NIH guidelines have remained unchanged since 1991. Newer criteria for adults are being evaluated. The current BMI standard is changed by evidence that bariatric surgery can reverse comorbidities such as type 2 diabetes even in patients with a BMI of less than 30 (Pories, 2010) or 28 (Huang ZK,) that applying an adjusted BMI which takes into account race, sex, age, fitness, or body fat composition, would be a more realistic criterion.

#### **5. Opinions of healthcare professionals in the world regarding bariatric surgery**

Opinions of healthcare professionals in the world regarding bariatric surgery in adolescents are largely unknown. Although surgery may be a promising treatment for extreme obesity in youth, the acceptability of bariatric surgical interventions for obese children and adolescents remains a topic of controversy among patients, healthcare practitioners, researchers, policy-makers, and general public. An investigation study on the disagreement of bariatric surgery for adolescent showed that almost half of the participating physicians would never refer an obese adolescent for a bariatric operation, some physicians would referred with the minimum age of 18 years (Woolford, 2010).

There is a study from the UK to explore the perspectives of medical professionals regarding adolescent bariatric surgery [7]. Members of the British Obesity and Metabolic Surgery Society and groups of primary care practitioners based in London were contacted by electronic mail and invited to complete an anonymous online survey consisting of 21 questions. 66% of professionals felt that adolescents with a body mass index (BMI) >40 or BMI >35 with significant co-morbidities can be offered surgery. Amongst pre-requisites, parental psychological counseling was chosen most frequently. 58% stated 12 months as an appropriate period for

weight management programs, with 24% regarding 6 months as sufficient. Most participants believed bariatric surgery should only be offered  $\geq 16$  years of age. However, 17% of bariatric surgeons marked no minimum age limit. Over 80% of the healthcare professionals surveyed consider bariatric surgery in adolescents to be acceptable practice. Most healthcare professionals surveyed feel that adolescent bariatric surgery is an acceptable therapeutic option for adolescent obesity. These views can guide towards a consensus opinion and further development of selection criteria and care pathways.

## 6. Age limits

There are some specific limit for bariatric surgery although it may achieve a sustained weight loss. For old adults age guidelines from the American Society for Metabolic & Bariatric Surgery (ASMES) suggest that patients eligible for surgery should be 18 to 65 years old. Individuals outside that age range who undergo surgery should have significant health conditions related to obesity and the expectation of improved life expectancy or quality of life should outweigh the risk of surgery (Mechanick, 2008). The NHLBI clinical guidelines summarized the available data regarding any type of weight reduction after age 65 and recommended: A clinical decision to forgo obesity treatment in an older adult should be guided by an evaluation of the potential benefits of weight reduction for day-to-day functioning and reduction of the risk of future cardiovascular events, as well as the patient's motivation for weight reduction. (NHLBI, 1998).

The recommendations are supported by the Pediatric Surgical Association and the American Society of Bariatric Surgery based on the opinions of "experts". The adolescents should be limited in age for girls (13 years) and boys (15 years).

### 6.1. Contraindication

The suggested contraindications would include an extremely high operative risk, such as severe cardiovascular disease or severe respiratory problems. To help avoid adverse postoperative outcomes, patients are also screened for severe depression, untreated mental illnesses, active substance abuse, or binge eating disorders, severe cardiovascular disease or severe respiratory problems. Patients who cannot comprehend the nature of the surgical intervention and the lifelong measures required to maintain health, should not be offered this procedure (Mechanick, 2008).

## 7. Surgery for severe obesity

Although the increasing incidence of obesity is due to an imbalance of energy intake and energy output, long-term weight loss is difficult to achieve with diet, exercise, or pharmacotherapy. Lack effective treatment for obesity is also a significant contributor to this serious public health problem. To date, bariatric surgery has been shown to be the only intervention to induce significant weight loss in patients with severe obesity and improve chronic health conditions,

survival, and quality of life. Most bariatric surgery patients have already experienced numerous attempts to achieve a sustained weight loss by using nonsurgical treatment options.

Bariatric surgical procedures have increased exponentially for Severe Obesity in the world. The three commonly performed procedures in obese adults are laparoscopic Roux-en-Y gastric bypass (LRYGB), laparoscopic adjustable gastric banding (LAGB), and the novel laparoscopic sleeve gastrectomy (LSG) have acceptable efficacy and safety for resolution of obesity-related comorbidities [8]. The best option from the different developing surgery procedures with evaluated results are the new clinical problems.

A systematic literature review (2004 from Royal Australasian College of Surgeons) compared the safety and efficacy of laparoscopic adjustable gastric banding with vertical-banded gastroplasty and gastric bypass [9]. The results showed that LAGB was associated with a mean short-term mortality rate of approximately 0.05% and an overall median morbidity rate of approximately 11.3%, compared with 0.50% and 23.6% for RYGB, and 0.31% and 25.7% for VBG. Overall, all 3 procedures produced considerable weight loss in patients up to 4 years in the case of LAGB (the maximum follow-up available at the time of the review), and more than 10 years in the case of the comparator procedures. The Australian Safety and Efficacy Register of New Interventional Procedures-Surgical Review Group concluded that the evidence base was of average quality up to 4 years for LAGB. Laparoscopic gastric banding is safer than VBG and RYGB, in terms of short-term mortality rates. LAGB is effective, at least up to 4 years, as are the comparator procedures. Up to 2 years, LAGB results in less weight loss than RYGB; from 2 to 4 years there is no significant difference between LAGB and RYGB, but the quality of data is only moderate. Although Laparoscopic adjustable gastric banding is now promoted as a safer, potentially reversible and effective alternative to Roux-en-Y gastric bypass.

A systematic review [10] comparing the two most popular bariatric procedures-Gastric banding or bypass? The conclusion strongly favored Roux-en-Y gastric bypass over laparoscopic adjustable gastric banding for weight loss outcomes. Patients treated with laparoscopic adjustable gastric banding had lower short-term morbidity than those treated with Roux-en-Y gastric bypass, but reoperation rates were higher among patients who received laparoscopic adjustable gastric banding. Gastric bypass should remain the primary bariatric procedure used to treat obesity in the United States. Lee WJ [11] conducted a randomized trial of moderately obese Chinese patients (BMI < 35) with troublesome, difficult diabetes. Patients were followed for 1 year. Nearly all patients (93%) in the gastric bypass group had a remission of diabetes, compared with less than half of patients (47%) with sleeve gastrectomy. Weight loss was also more pronounced after gastric bypass. A meta-analysis of international bariatric surgery studies from 2003 to 2012 provides reassurance that the surgery is effective for candidates of procedures with 3 main types of bariatric surgery [12]. Gastric bypass resulted in more effective weight loss, but was associated with more complications. Adjustable gastric banding was linked with lower mortality and complication rates; however, it had a higher reoperation rate and was associated with less substantial weight loss than gastric bypass. Sleeve gastrectomy, which is becoming more popular, resulted in weight loss comparable to that obtained with gastric bypass and greater than that with adjustable.



A first report [13] from the American College of Surgeons Bariatric Surgery Center Network showed that laparoscopic sleeve gastrectomy has morbidity and effectiveness positioned between the band and the bypass. for data up to 1 year.

A retrospective short-and mid-term follow-up of a single institution of the American College of Surgeons Bariatric Surgery Centers of Excellence reviewed the experience and the procedure-related morbidity among all 3 procedures between the years 2005 and 2011 to identified and compared complications, mortality, readmissions, and reoperations in patients who underwent LRYGB, LAGB, and LSG. A total of 2,199 bariatric procedures were performed during this period of time. Of those procedures, 1,327 were LRYGB, 619 were LSG, and 253 were LAGB. Perioperative mortality was not applicable for all 3 procedures. The leak rate was 0.5% for LRYGB and 0.3% for LSG, and was not applicable for LAGB. The average number of readmissions postoperatively was less than 2 times for all 3 procedures: LRYGB 1.96 times, LSG 1.49 times, and LAGB 1.54 times. The percentages of procedures requiring reoperations due to complications or failures were 14.6% in the LAGB group, 6.6% in the LRYGB group, and 1.8% in the LSG group. The conclusion showed that LSG appears to have the lowest procedure-related morbidity when compared with LRYGB and LAGB in short-and mid-term follow-up [14].

## 8. Bariatric surgery in adolescents

Medical therapy to lose weight including exercise, diet, psychological behavior modification, and pharmacotherapy. Published long-term in obese and morbidly obese patients are non-existent. It is estimated that failure of medical therapy to reduce significant weight for a sustained amount of time is close to 100 percent in the morbidly obese person.

Surgery as an alternative procedure to treat morbidly obese patients was first performed in the mid-1960s with the negative results due to high incidence of complications, temporary weight loss, and significant metabolic complications. In the last decade, the laparoscopic minimally invasive procedures performed to treat morbid obesity have been established as preferred weight loss method for safe and effectiveness with 20 years follow-up with less comorbidities.

An increasing number of young people with a BMI of greater than 40 and severe comorbidities, such as type 2 diabetes, and sleep apnea, are undergoing bariatric surgery. Supporting research shows bariatric surgery in adolescents is associated with weight loss, reducing the risks associated with metabolic disorders, and improved self-image and socialization (Lawson, 2006; Xanthakos, 2008). Long-term data including information on malabsorption of critical nutrients and effects on maturation is needed by long-term follow-up MDT clinical study. Experts advise that bariatric surgical therapy should be reserved for full-grow adolescents with treatment by experienced multidisciplinary teams who can provide comprehensive medical and psychological care (Livingston, 2010b). Bariatric procedures are generally contraindicated for preadolescent age groups, as long-term health effects, durability of the weight loss, and life expectancy for teens who undergo operations remain largely unknown.

The lack of data regarding bariatric surgery in adolescents has created a significant controversy regarding the benefits and indications.

Bariatric surgery should be offered to adolescents using a set of more conservative criteria. These could include failure of medical therapy for at least 3-6 months.

Bariatric surgery is an increasingly utilized option for the treatment of morbid obesity among adolescents [15]. The procedures can be performed safely as evidenced by low complication rates. There is plenty of evidence that three procedures have been performed with LAGB, Sleeve gastrectomy and gastric bypass by the different weight loss results. The follow-up studies in 2003 showed the majority of adolescent patients with good results by losing over 50 percent of excess body weight (EBW) after LAP-BAND at 2 to 3 years and lose more weight (60-80% of EBW) after gastric bypass at 1 to 2 years.

There are very few complications with band slippage in 5 percent, port leak in 5 percent, and erosion of the band in 2 percent. Intolerance to food, nausea, and vomiting, bowel obstruction, and vitamin deficiencies or regaining problems during long-term follow-up which increased the re-operating procedures. The complications were more frequent in the gastric bypass procedure that including pulmonary embolism, strictures, anastomotic leaks and bleeding, and bowel obstructions. There are more data indicating that LAGB procedure may not be as effective in "superobese" patients (BMI > 50) because of insufficient weight loss. However, this concept is currently challenged by different mechanism studies in different bariatric procedures. In fact, many patients and also surgeons are preferred one procedure.

There is increasing consensus that bariatric surgery is superior to medical intervention for long-term weight loss in morbidly obese persons. Most postoperative patients are able to lose a significant amount of weight, profit from reduced or resolved comorbidities with an improved quality of life (QOL). Despite these benefits from bariatric surgery, 5-30% patients either lose little weight or unable to maintain their weight loss or regaining weight over the long term. Aside from medical or surgical complications, postoperative weight loss success depends upon the patient's abilities and willingness with family to follow the prescribed nutritional and lifestyle guidelines by Multidisciplinary team (MDT). Whereas the surgery provides the tool for weight loss the patient must provide the motivation and ability to obtain the long-term success. New researches, mechanisms new operating options and evaluation or effects of obesity on the causes, continues to evolve.

## 9. Multidisciplinary care for obese patients

Obesity is strongly associated with severe medical problems. Before bariatric surgery, we need to set up the multidisciplinary team in hospital.

Multidisciplinary care for obese patient is an integrated, collaborative approach to treatment planning and ongoing patient care and management. To understand the roles and the management of MDT is important to realize the safe and efficiency for bariatric surgery purpose.



To understand the benefits of the MDT approach on obese patient outcomes, we need to know the problems of obese patients. Morbidly obese patients may have significant symptoms of depression, evidence of eating disorders, negative body image, low QOL, and other coexisting mental disorders. Bariatric surgery candidates have a variety of psychiatric and behavioral problems such as anxiety depression, eating disorders, and history of sexual abuse. Psychopathology and various psychological difficulties exist prior to the bariatric surgery can direct adverse effects on the postoperative outcome.

Physical system exam, preoperative weight loss, psychological and preoperative tests or assessment may prove identified and valuable factors predicting postoperative success.

An MDT comprises all relevant medical and allied HCPs from different disciplines who are required to effectively plan personalised treatment and care for obese patients [17]. This involves: 1. To comprehensive review of clinical and diagnostic findings; 2. To consideration of all treatment options relevant to the case; 3. To educate the patient with the parents and families; 4. To development of an individual treatment plan for each patient. To follow-up and resolve the problems and complications such as regaining or nutrition deficiency.

The carrier of treatment for obese and morbidly obese individuals must be a multidisciplinary approach.

Members of an bariatric surgery with MDT include core members and supported members. Core members including general surgical surgeons or GI surgeons, endocrinologists, dietitians, radiologists, cardiovascular specialists, respiratory and anesthesia specialists, psychologists and behavioral specialists. Supported members include nurses, data managers, researchers, healthcare practitioners, social workers.

## **10. Before surgery — Psychological test and education assessment**

From a psychological perspective, bariatric surgery is unique because it is a behavioral surgery in which the “outcomes are independent of the technical performance of the operation.” Surgery outcome, especially long-term maintenance of weight loss, relies almost completely on patient ability and / or willingness to make significant changes in eating and exercise habits and often in the emotional relationship with food. Bariatric surgery provides anatomical tools that make it easier to restrict food consumption and nutrient absorption, allowing patients to correct imbalances in caloric intake and metabolic demand. In addition to the numerous behavioral demands following surgery, there are significant risks for serious postoperative complications, even death.

For these reasons, patient education and knowledge play critical roles in bariatric surgery, influencing nearly every part of the surgery process and outcome, including patients’ abilities to give informed consent, develop realistic expectations, prepare psychologically, and succeed in making the behavioral changes that lead to sustained weight loss. Unfortunately, there is often a gap in patient’s knowledge and misconceptions about surgery that interfere with the

goals. The knowledge of patient with their parents and family would impact on bariatric surgery outcome.

In order to improve the patient education process in bariatric surgery, it is necessary to identify areas of knowledge that tend to be problematic. It also suggested that patient knowledge needs to be assessed after educational interventions to insure that information has been assimilated.

As healthcare professionals we need continue to educate and update ourselves with the growing and difficulty road of surgical Intervention or treating obesity, weight management, and multidisciplinary approaches surrounding this obese patients with their parents and family.

## 11. Conclusions and recommendations

Obesity is a major worldwide problem in public health, reaching epidemic proportions in many countries, especially in urbanized regions. Bariatric procedures have been shown to be more effective in the management of morbid obesity, compared to medical treatments in terms of weight loss and its sustainability

Management of Pediatric and Adolescent Type 2 Diabetes is a special long-term healthcare and research work. All of the bariatric surgery adolescent patients should be managed in a comprehensive multidisciplinary program and operated on in hospitals and centers with extensive experience performing bariatric surgery [16-17]. The decision and the type of surgery should be individualized for each patients and experience of the individual surgeon.

The LAGB insertion should be the first choice for adolescent patients to bring behavior changes with less obstacles to the growth after bariatric surgery. However, in recent years surgeons are likely to perform LAP-sleeve gastrectomy with the better results and less complications especially for “superobese” patients or LAGB failed patients. All the adolescent patients and their parents should be informed in detail on the advantages and disadvantages of each available procedure, possibly in several interviews and always accompanied by a specialized interdisciplinary team. The long-term follow-up evaluation. Studies should to be continued.

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