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Preoperative considerations for the pediatric patient undergoing metabolic and bariatric surgery

Janey S.A. Pratt^{a,b,*}, Sebastian S. Roque^c, Ruben Valera^c, Kathryn S. Czepiel^{d,e}, Deborah D. Tsao^a, Fatima Cody Stanford^{e,f}

^aStanford University School of Medicine, Palo Alto, CA, USA

^bDepartment of Surgery, Stanford University School of Medicine, Stanford, CA 94305, USA

^cTufts University School of Medicine, Boston, MA, USA

^dDepartment of Pediatrics, Massachusetts General Hospital, Boston, MA, USA

^eHarvard Medical School, Boston, MA, USA

^fInternal Medicine- Neuroendocrine Division and Pediatric Endocrinology, Massachusetts General Hospital, Boston, MA, USA

Abstract

To ensure successful outcomes in pediatric patients with severe obesity who undergo metabolic and bariatric surgery (MBS), a number of pre-operative patient management options should be considered. This manuscript will review the indications and contraindications of MBS and special considerations for youth who might benefit from MBS. The treatment team conducts a thorough pre-operative evaluation, assessing risks and benefits of surgical intervention, and prepares patients and families to be successful with MBS by providing education about the surgical intervention and lifestyle changes that will be necessary. This article reviews the pre-operative considerations for adolescents with severe obesity who are being considered for MBS, based upon recent clinical practice guidelines.

Keywords

Bariatric surgery; Obesity; Pediatrics; Preoperative evaluation; Severe obesity; Adolescents

Introduction

In 1991, the NIH concluded that MBS was indicated for adult persons with severe obesity.¹ Since 2004, published guidelines have provided details of bariatric evaluation and management specific to pediatric age groups being considered for MBS.^{2,3} In July of 2018, the Pediatric Committee of the American Society of Metabolic and Bariatric Surgery (ASMBS) published the most recent guidelines, supported by significant evidence in the literature.⁴ This current article both summarizes these guidelines and discusses the

*Corresponding author at: Department of Surgery, Stanford University School of Medicine, 300 Pasteur Drive, Always Building, M116, Stanford, CA 94305, USA, jsapratt@stanford.edu (J.S.A. Pratt).

indications, contraindications, and management options surrounding MBS for the pediatric population.

Factors influencing medical decision-making

Age

For youth undergoing MBS procedures, cohorts with mean ages ranging from 14–17 years old have been described.^{5–11} Within the studied populations, the range of ages spans from 9–19 years old. Use of MBS procedures in pediatrics remains somewhat controversial due to the widespread belief that children have not yet developed adequate decisional capacity and; therefore, cannot fully consent to MBS or adhere to pre/post-operative regimens. Another concern relates to the potential that a reduction in micronutrient absorption may hinder growth in children who are still developing. Two separate studies have confirmed that absorption of vitamin D and iron decreases in adolescents undergoing laparoscopic Roux-en-Y gastric bypass (LRYGB), increasing the risk of vitamin D and iron deficiencies.^{12,13} These deficiencies occurred despite recommendations for post-operative vitamin supplementation. Recent trends in the use of laparoscopic sleeve gastrectomy (LSG) in pediatric patients may be related to the perception that micronutrient absorption is better after LSG as compared to LRYGB for patients of all ages.⁹ Despite these potential nutritional risks, the detrimental effect of severe obesity on physical health and well-being has been well documented. Indeed, Michalsky and colleagues conducted a review revealing that, the older the patient, the higher the prospect of developing co-morbidities as a result of obesity, highlighting the potential consequences of delaying MBS.^{12,14} Surgical therapy that can reliably result in reversal of severe obesity and the consequent obesity-related health problems is therefore recommended for children with severe obesity, irrespective of age.⁹⁵

Body Mass Index (BMI)

MBS is recommended for children who have class II obesity (BMI ≥120% of the 95th percentile) with a diagnosed co-morbidity or class III obesity (BMI ≥140% of the 95th percentile) as defined by Centers for Disease Control age dependent growth charts.^{4,15,16} This recommendation is concerned mainly with the fact that adolescents with class II or III obesity are at increased risk of developing early-onset obesity-related diseases and of becoming adults with more advanced health problems and even higher weights.^{16,17}

Obesity-related diseases

Cardiovascular disease—Numerous studies have demonstrated an increasing prevalence of cardiovascular disease as weight and BMI increase. Indicators of cardiovascular disease (CVD) include hypertension,¹⁸ atherosclerosis,¹⁹ dyslipidemia,²⁰ insulin resistance,²¹ and there is evidence of long term persistence of these comorbidities.¹⁷ MBS has served as a crucial tool to combat CVD and its risk factors. A majority of children who have undergone MBS demonstrate marked improvement and even remission of CVD.¹⁴ Surgical therapy should therefore be considered for youth with severe obesity, CVD, and/or risk factors for CVD.

Type 2 diabetes mellitus (T2D)—Recent systematic reviews have revealed a growing number of children diagnosed with T2D.²¹ Sadly, most children who develop T2D experience persistence of disease into adulthood or worse, disease progression during their childhood. Use of MBS has been associated with prevention of long-term consequences of T2D. Inge and colleagues and Olbers and colleagues have independently demonstrated successful long term (5 years) remission of T2D in 86% and 100% of adolescents with T2D who underwent LRYGB.^{12,13}

Obstructive Sleep Apnea (OSA)—OSA is another complex disease that is strongly associated with obesity in children.²² OSA results in morbidity and mortality in youth, and can be reversed using MBS.^{23–25} Remission of OSA is well documented after MBS, OSA is considered a strong indication for the use of MBS in children.

Nonalcoholic fatty liver disease (NAFLD) and steatohepatitis (NASH)—As more children have developed obesity, the number of studies reporting NAFLD and NASH pediatric populations has quickly followed.²⁶ Because MBS has led to resolution of NASH in a adolescents,²⁵ and limited success has been seen with non-surgical therapies, NASH should be considered an indication for surgery in the setting of children severe obesity.

Orthopedic disease—Children with obesity are at greater risk of developing orthopedic complications such as slipped capital femoral epiphysis and Blount disease.²⁷ These skeletal conditions and weight-related joint pain²⁸ and activity restriction associated with them result in reduced weight related quality of life (QOL).²⁹ Outcome studies have now shown that as weight decreases, the complications associated with excess weight decrease, extending the indications for use of MBS as effective therapy for orthopedic disorders in children with obesity.³⁰

Gastroesophageal reflux disease (GERD)—Weight loss has been demonstrated to be an effective treatment for GERD across all ages. Although procedure specific differences have yet to be confirmed, LRYGB can significantly improve GERD symptoms. Thus, for children with GERD and severe obesity, LRYGB should be considered rather than fundoplication,⁴ since conversion to LRYGB after a fundoplication can be associated with increased operative difficulty and complications. Use of sleeve gastrectomy in patients with GERD is controversial and should only be undertaken if the risks are understood.³¹

Quality of life (QOL)—Several studies demonstrate that, as BMI increases, a pronounced negative correlation has been observed between obesity and QOL ratings in children.^{29,32} These ratings significantly improve post-operatively, accompanied by reduced depression, anxiety, and health related QOL ratings.^{6,12,13} These findings suggest that MBS, along with psychological intervention, may lead to QOL improvements in youth with severe obesity.

Contraindications

Youth with obesity who cannot tolerate general anesthesia due to respiratory or cardiovascular conditions should only be considered for MBS if the benefits outweigh the risks.^{12,13} Children with active substance abuse disorders should not undergo MBS. Inge and

colleagues, in a recent study, demonstrated that adolescents who undergo gastric bypass, are likely to develop post-operative substance use issues similar to adult MBS patients, with overdose associated with two out of three post-operative deaths.¹² There are no data about the risk of substance abuse disorders following sleeve gastrectomy. Severe untreated psychological disorders such as suicidal ideation, and psychosis should be regarded as contraindications for MBS. However, detrimental inter-personal relationships have not shown to negatively affect post-operative weight loss or weight regain.^{33,34} Interestingly, Zeller and colleagues demonstrated that adolescents who undergo MBS do not significantly increase the amount of psychological stress on their primary caregivers.³⁵ Therefore, negative social contextual factors alone should not be interpreted as a contraindication for MBS.

Pre-operative evaluation

Laboratory studies

Risk factors contributing to morbidity and mortality after MBS include T2D, BMI ≥ 35 kg/m², OSA, and cardiomyopathy.³⁶ The pre-operative evaluation should include assessment of hemoglobin A1c levels, anti-diabetic drugs, and blood glucose values.³⁶ Children with obesity may, also, exhibit micronutrient deficiencies prior to surgery due to a nutritionally poor diet and thus, a malnourished state. Possible micronutrient deficiencies must be addressed by supplementation before MBS to avoid additional deficiencies post-operatively.³⁷ In addition, preoperative laboratory studies should include a comprehensive metabolic panel including serum iron, folate, ferritin, and total iron-binding capacity. The cost effectiveness of routine preoperative micronutrient testing has not been demonstrated. However, some have suggested that additional testing should include: thiamin (B1), vitamin B12, and B6, calcium, parathyroid hormone (PTH), alkaline phosphatase, vitamins A, D, E and K, phosphorus, magnesium, copper, and zinc.^{4,37} Routine preoperative serum thyroid-stimulating hormone level screening is only recommended for patients at risk of developing primary hypothyroidism.³⁶ Also, a fasting lipid panel should be obtained in all patients with obesity.³⁶ Preoperative triglyceride levels were found to be positively correlated with NASH, but high-density lipoprotein (HDL) levels were negatively associated with NAFLD, reinforcing the need for lipoprotein profiling preoperatively.³⁸

Cardiac

Obesity is associated with changes in cardiac function and morphology, an adaptation to increased body mass and metabolic demands.³⁹ Children with severe obesity often suffer from numerous cardiovascular conditions, including hypertension, atherosclerosis, arrhythmias, diastolic dysfunction, and elevated cardiac work-load.^{4,40} Controlling these comorbidities preoperatively is a key component of ensuring optimal surgical outcomes.⁴¹ Thus, a thorough preoperative cardiac evaluation, which includes a medical history, physical examination, and a 12-lead electrocardiogram, should be obtained. For patients at higher risk, a cardiac ultrasound or stress test should be considered. Pharmacological stress echocardiography is, alternatively, an effective alternative to traditional stress testing and can provide an accurate assessment of cardiac function.⁴¹

Pulmonary

Moderate to severe OSA is associated with an increased risk of mortality and adverse outcomes in MBS patients.⁴² Notably, up to half of children with severe obesity may have OSA, with a greater prevalence amongst those seeking MBS treatment.⁴ Within the group considering MBS, up to 38% may have undiagnosed OSA, representing an occult risk factor for perioperative complications.⁴³ Therefore, a standardized questionnaire screening for OSA with confirmatory polysomnography is recommended for patients considering MBS.³⁶ In addition, altered respiratory physiology pre-disposes patients with OSA to intraoperative hypoxemia and hypercapnia, atelectasis, laryngospasm, and the need for reintubation.^{41,44} Selective use of preoperative pulmonary function tests, arterial blood gas measurement, and chest radiographs may identify those at risk for perioperative and postoperative pulmonary complications.⁴¹

Gastrointestinal

Preexisting liver and gallbladder conditions can be evaluated using ultrasound to assess steatosis, while specialized ultrasound or magnetic resonance imaging may be needed to assess liver fibrosis.⁴⁵ Upper endoscopy and H. pylori tests might prove necessary in patients with a history of severe GERD or current proton pump inhibitor use.^{46,47} Likewise, a barium contrast esophagram can reliably identify the presence of a hiatal hernia.⁴⁶

Compliance

Compliance from both patient and family with the pre-operative and post-operative plan is essential for optimal MBS outcomes. Adults compliant with follow-up appointments exhibit greater weight loss in gastric bypass surgery.^{48,49} In addition, compliance with pre and post-op vitamin and mineral supplementation in addition to routine blood work and monitoring should be emphasized due to the higher risks for macronutritional and micronutritional deficiencies post-op.⁴⁸

Psychological

Psychosocial evaluation of children undergoing MBS helps identify potential contraindications of surgical intervention, such as substance abuse or poorly controlled psychiatric illness.⁵⁰ Psychosocial factors, which have significant potential to affect long-term outcomes of MBS include emotional adjustment, adherence to the recommended postoperative lifestyle regimen, eating disorders, and familial factors, both environmental and behavioral.^{36,51} Psychosocial evaluations consist of clinical interviews, questionnaires regarding psychiatric symptoms, and/or objective tests of personality or psychopathological conditions.³⁶

Pediatric bariatric surgery team

Dietitian

The dietitian's assessment should include a full medical and dietary history, including an estimate of the patient's daily sleep and screen time. Clinical tools such as 24-hour recall or the Food Frequency Questionnaire can facilitate patient self-reporting of their current diet.⁵²

The pre-operative biochemical nutrition screen has been discussed above. A substantial proportion of MBS candidates present with pre-operative nutrient deficiencies most commonly iron, vitamin B12, folate, and vitamin D.⁵³ Immediately following surgery, patients should follow a dietician-supervised staged meal progression beginning with clear liquids then full liquids then purees then ground/soft foods.⁵⁴ The post-operative diet plan should emphasize adequate hydration, protein intake, and vitamin supplementation. Because childhood and adolescence is a critical time for skeletal development, maintaining adequate calcium and vitamin D levels is crucial to achieve maximum bone mass.⁵⁵ If post-operative weight loss proves inadequate, the dietician should also assess the patient for compliance with the diet plan.

Psychologist

Mental health diagnoses and symptoms are not contraindications for MBS provided that they are well-managed and monitored. However, a clinical psychologist or psychiatrist should screen carefully for active psychosis, suicidality, or substance abuse, which are absolute contraindications to MBS until treated and stable.

Clinical interviewing and self-report questionnaires can efficiently evaluate psychiatric status. The Center for Epidemiologic Studies Depression Scale or the Patient Health Questionnaire-9 are well-validated self-report questionnaires assessing adolescent psychiatric status.^{56,57} A high proportion of adolescents seeking MBS suffer from eating disorders, particularly loss-of-control (LOC) eating and binge eating disorder (BED).⁵⁸ Thus, psychologists use the Eating Disorders Examination-Questionnaire (EDE-Q), or other appropriate tools to evaluate these conditions.⁵⁹ If diagnosed, the patient should begin psychotherapeutic interventions prior to undergoing MBS.

As with any procedure, a psychologist should also assess and counsel the patient for alcohol and nicotine use or abuse. Adolescents have lower rates of alcohol and drug use compared to adults; however, they tend to engage in higher-risk drinking (e.g. binge drinking).^{60,61} The Brief Screener for Tobacco, Alcohol, and other Drugs can be used to screen patients prior to surgery.⁶² Counselling on alcohol and nicotine use should encourage complete abstinence but focus on harm reduction.

Finally, it is essential to assess the patient's assent capacity. If the patient's capacity is in doubt, tests such as the MacArthur Competence Assessment Tools for Treatment can be administered.^{63,64} In these cases, the surgical team should consider consulting the ethics board.

Pediatric/Obesity medicine physician

The patient's pediatrician or obesity medicine physician should assess causes of obesity. This can include a clinical interview with the patient, detailed family history, and potential testing for genetic or syndromic causes of obesity.

A thorough evaluation must include testing for the many above mentioned comorbidities that can occur with obesity. Cardiometabolic dysfunction, including assessment for hypertension,

T2D, and dyslipidemia.⁶⁵ A careful medical history can suggest OSA, but diagnosis requires overnight polysomnography.²³ NASH can be screened for with serum transaminase levels. Idiopathic intracranial hypertension (pseudotumor cerebri) is also associated with childhood obesity, and in the presence of symptoms such as frequent headaches and visual field impairment, may warrant fundoscopic exam, central nervous system imaging, or assessment of cerebrospinal fluid pressure with lumbar puncture.^{66,67}

In the presence of advanced stages of the above-mentioned comorbidities, subspecialty referral to cardiology, endocrinology, pulmonology, hepatology, ophthalmology, or neurology may be required. In select cases, preoperative management may include prescribing of medications for management of obesity; however, currently, orlistat is the only FDA-approved drug for treating obesity in children and adolescents.⁶⁸

The physician should also rule out the possibility of *H. pylori* infection, which is positive in about 25% of adult MBS patients.⁶⁹ Inflammation and ulcers may contribute to complications following MBS, so identification and treatment with antibiotics and proton pump inhibitors prior to surgery is optimal. In fertile patients, the physician should, also, caution that fertility often increases following MBS as a result of weight loss and patients should avoid pregnancy in the 18 months following surgery.

Surgeon

Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) guidelines for adolescent bariatric surgery require that a children's hospital which conducts fewer than 25 stapling cases each year have an MBSAQIP-verified bariatric surgeon as a co-surgeon with the pediatric surgeon on each case. The surgeon should first evaluate the patient's anatomical and surgical risk. For example, if MBS candidates with GERD have previously undergone fundoplication, operative difficulty substantially increases.⁴ More thorough anatomical imaging can include upper endoscopy, which is always indicated in patients with clinically significant gastrointestinal symptoms.⁵⁴ The surgeon should, also, participate in both obtaining informed consent/assent from the patient's guardian/patient and assessing the patient's compliance with diet, medication, and lifestyle modifications.

When determining the type of operation to perform, the surgeon should collaborate with other members of the patient's care team. Due to its decreased rate of complications, LSG is currently the preferred method of MBS in both adults and adolescents.⁷⁰ Use of the LSG has some benefits specific to pediatrics including decreased risk of Alcohol addiction, vitamin deficiencies and reoperation when compared to LRYGB. However, if the patient also has severe GERD, LRYGB is the sometimes preferred.⁷¹ Adjustable gastric band is not often recommended for most patients because it is often unsuccessful and frequently requires re-operation.

Optional additional team members

An exercise physiologist can assess the patient's physical activity and prescribe an appropriate activity/exercise plan. The exercise plan should emphasize safe escalation of activity to avoid injuries, aim to decrease sedentary time to <2 h per day and gradually

increase active time.⁷² Post-surgery, the patient should exercise 30–60 min per day, which can be divided into a few shorter increments (e.g. 3 × 10-minute walks).⁷³ However, due to the patient's severe obesity, even lower impact exercises such as cycling and swimming may serve better to reduce load on bones and joints. Occupational therapists can assess the patient's need for assist devices to accomplish activities of daily living. High weight capacity wheelchairs and commodes can help the patient achieve a safer, more independent lifestyle. Social services may assist the psychologist in the family assessment. To evaluate family support, the Family Assessment Device can evaluate perceived family functioning from both the adolescent's and the parent/caregiver's perspectives.⁷⁴ Social Services may also help the patient navigate insurance, transport, prescription costs, and psychologic needs. In addition, Child Life Specialists can assist with the child's well being during clinic and hospital stays.

Special populations

When evaluating a child preoperatively, there are many special subpopulations to consider. From genetic and hypothalamic causes of obesity to differing developmental needs and food insecurity, patients with such diverse backgrounds and needs may experience outcomes which may be inconsistent with those of other MBS patients.

Genetics

Genetic studies, including genome-wide association studies (GWAS) offer attractive headlines as researchers strive to further personalize medicine and therapeutic interventions for patients. It is important to consider a child's genetic background when determining treatment for obesity.⁷⁵ Obesity is multifactorial with prior studies calling attention to both mono- and polygenic causes. Monogenic obesity research strives to identify a single gene with a strong effect on phenotype. The leptin-melanocortin pathway, crucial for energy balance and food intake, is well-established as a potential monogenic contributor to obesity. Conversely, polygenic studies screen a patient's genome to identify single nucleotide polymorphisms that are associated with adiposity and weight loss after MBS.⁷⁶ With this approach, researchers are developing screening and polygenetic risk scores to be used in the presurgical evaluation.^{77,78}

Lastly, although most patients with obesity demonstrate the more typical Mendelian inheritance patterns, some patients suffer from a less common type called syndromic obesity. Patients with syndromic obesity generally experience weight gain as part of a constellation of specific developmental abnormalities including dysmorphic features and learning disabilities. Prader–Willi syndrome, Bardet–Biedl syndrome, and Alstrom syndrome are some of the most common syndromic obesity disorders of childhood. Given the rarity of these disorders in the general population, the risk-benefit ratio of different types of MBS in this specific population is still not completely understood. Earlier analyses of a Prader–Willi cohort found that these patients experienced less average weight loss and higher numbers of complications following MBS.⁷⁹ However, this study compared techniques not currently recommended or utilized in the pediatric population, including biliopancreatic diversion, placement of an intragastric balloon, jejunioileal bypass, and vertical banded gastroplasty. Newer studies using LSG in patients with Prader–Willi syndrome reveal that it is a safe and

effective weight loss therapy associated with a reduction in ghrelin, an orexogenic hormone which stimulates appetite. Ghrelin levels are 4 times higher in patients with Prader–Willi syndrome than in controls with obesity.⁸⁰ A study published by Alqahtani and colleagues found that, of syndromic patients undergoing LSG (16 with Prader–Willi syndrome, one with Bardet–Biedl syndrome and one with Alstrom syndrome), all patients resolved significant comorbidities and lost weight.⁸¹ At the four year postoperative follow-up, they experienced average excess BMI loss of 60% compared to 61% in the non-syndromic group.

Post-craniopharyngioma resection

Affecting the hypothalamic sellar and parasellar stalk of the central nervous system, craniopharyngiomas are slow-growing tumors that begin in childhood. Treatment includes microsurgical resection, with 30 to 70% of patients developing hypothalamic obesity, a form of “endogenous” weight gain, postoperatively. The cause of weight gain, although poorly understood, is thought to be due to damage in the appetite and/or satiety centers of the brain, and insulin regulation. These complications make weight control with lifestyle modifications challenging.⁸² Although no current guidelines for bariatric procedures and hypothalamic obesity exist, studies reporting results of RYGB found weight loss in this population matched that of patients with common obesity phenotypes.⁸³

Autism spectrum disorder and other comorbidities

Adolescents diagnosed with autism spectrum disorder (ASD) may be overlooked for weight-loss interventions with MBS. However, the prevalence of severe obesity in this population is higher than in the general population. Given the nature of the disorder, managing weight loss in a child with ASD using lifestyle modifications is especially challenging for patients, families, and providers. Children with ASD are generally less physically active and experience both poor sleep quantity and quality and aversions to specific textures, colors, smells.⁸⁴

It is suspected that one obstacle to the availability of outcomes data in this cohort stems from the original guidelines for referral to MBS. The original referral guidelines often precluded the consideration of patients with ASD. The major concern has been that lower executive functioning skills—including both cognitive and mood difficulties—might negatively impact adherence to pre- and post-surgical recommendations. However, findings in a 2018 study in *Pediatrics*, which examine weight loss outcomes in adolescents with common psychiatric diagnoses pursuing LSG, contradict these assumptions.⁸⁵ The sample of patients enrolled in the study had high rates of formally diagnosed anxiety, depression, attention deficit hyperactivity disorder, and eating disorders, with smaller numbers of patients suffering from oppositional defiant disorder, bipolar disorder, ASD, substance use, and schizophrenia. They found that there was no recognizable association between psychiatric diagnoses and weight loss trajectory postoperatively; however, other outcomes other than weight alone still may be impacted by concomitant psychiatric disease or cognitive disability. Additionally, in 2019, the same group showed that children with cognitive impairment or developmental delay, who had undergone MBS, displayed no difference in complications or weight loss following LSG when compared to individuals without such impairments.⁸⁶ More data are being

gathered regarding the use of LSG in patients with ASD. Regardless, in all cases in which assent may not be possible, we recommend pursuing ethics consultation.

Underserved populations

On a broader scale, studies show that social determinants of health impact access to surgical interventions. For example, children with severe obesity living in a rural setting are less likely to undergo evaluation for MBS. Access issues primarily affect individuals living in urban, underprivileged and rural communities. A movement emphasizing socially responsible surgery aims to encourage surgeons and healthcare providers to advocate for surgical access amongst underserved populations.⁸⁷

Adequate access to surgical care is especially important given that long-term foster care centers located in urban, underprivileged areas care for a youth population with nearly 40% overweight and 23% obesity. Further, adolescents ages 12-19 remain at higher risk for obesity than children ages 2-5.⁸⁸ These demographics correlate strongly with prior observations demonstrating that the most effective childhood obesity intervention is the empowerment of parents as the primary agents of change. Children in the foster care system, generally, lack a strong parental influence, and, thus, adolescents demonstrate greater control over lifestyle factors leading to exogenous weight gain.⁸⁹

Economically disadvantaged populations face increased risk of food insecurity and obesity. This association has been termed the food insecurity-obesity paradox.⁹⁰ Several hypotheses exist behind the paradoxical relationship; one such suggestion asserts that hunger in the presence of high-calorie, energy dense, but nutrient poor foods leads to weight gain.⁹¹ In terms of screening for MBS candidates, the surgeon must consider the stability of a person's living situation, which often determines access to food preparation and ability to select healthier meals.

MBS and solid organ transplantation

Finally, obesity management in populations also pursuing transplant operations warrants consideration because obesity often corresponds to poorer transplant outcomes, suggesting obesity is relative contraindication to transplantation.⁹² MBS, namely LSG, was superior to LRYGB in reducing comorbidities amongst patients prior to kidney transplant. It appears to be safe and effective in providing weight loss as a bridge to kidney transplantation. However, liver transplant patients fared better if LRYGB or LSG was performed after transplantation.⁹³

Though limited in application, a recent case report included the status of two patients, whose outcome was satisfactory after undergoing MBS prior to orthotopic heart transplantation. Despite the numerous risk factors, post-transplantation patients should certainly be considered for MBS given their increased tendency toward excess weight gain, due to the effects of immunosuppression medications, and reduced physical activity.⁹⁴

Summary

Obesity, particularly childhood obesity, is a serious disease, the progressive nature of which leads to severe, life-threatening comorbidities and debilitation. Given these facts, early surgical intervention in children with severe obesity may reduce their risk of developing even higher BMI values and severe, irreversible comorbidities, and will likely improve QOL. As described above, preoperative evaluation should be thorough. Patients should demonstrate the ability to comply with the various lifestyle changes required for success after surgery.

Contraindications are mostly modifiable; those who face non-modifiable contraindications should be referred to a center that can treat their obesity aggressively and effectively with alternative therapies including medications, physical therapy, diet and possibly devices. Patients with modifiable contraindications like poor compliance, anxiety, depression, and untreated OSA receive counselling and treatment before proceeding with MBS. When a patient's ability to assent is in question, then an ethics committee review is appropriate to assess the appropriateness of proceeding with MBS.

MBS is an appropriate approach to treat severe obesity in childhood and should generally be considered as an **early** option for a safe and effective treatment for severe childhood onset obesity.

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