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A Literature Review: Effects of Bariatric Surgery on Adolescents and Young Adults

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Abstract

Introduction and Purpose: The global rise in adolescent obesity presents a critical public health challenge. Bariatric surgery has emerged as a treatment option for adolescents with severe obesity, especially when conservative interventions fail. This section outlines the rationale for evaluating bariatric surgery outcomes in young patients.

A Brief Description of the State of Knowledge: Studies show that bariatric surgery in adolescents leads to significant and sustained weight loss, resolution of comorbidities such as type 2 diabetes and hypertension, and improvements in quality of life. However, concerns remain about nutritional deficiencies, bone health, and psychological outcomes, highlighting the importance of careful patient selection and multidisciplinary follow-up.

Conclusions: Bariatric surgery can be an effective intervention for adolescents with severe obesity, providing numerous health benefits when other treatments are unsuccessful. Long-term monitoring and ethical considerations are essential for optimizing outcomes and ensuring safety in this vulnerable population.

Keywords: Bariatric surgery, Obesity, Adolescent obesity treatment

Introduction and Purpose

The global prevalence of obesity is increasing, representing a significant public health issue. Obesity at a young age is particularly concerning because it increases the risk of early development of noncommunicable disorders such as type 2 diabetes, hypertension, other cardiovascular diseases, and depression, compromising quality of life and mortality risk. Severe cases of childhood and adolescent obesity are especially worrisome. Obesity-related health risks do not persist if an adolescent becomes nonobese again, while adults living with obesity have worse medical outcomes if they were already obese during adolescence.

Bariatric surgery (BS), also referred to as metabolic and bariatric surgery (MBS), is a well-established treatment for obesity and many of its related comorbidities in adults. Recent data support the use of bariatric surgery in adolescents with severe obesity following unsuccessful non-surgical treatments. However, despite its efficacy and support from high-quality data in this population, MBS remains underutilized in pediatric patients. There has been an increasing adoption of bariatric procedures for adolescents with severe obesity, and the evidence for its effectiveness in adolescents is growing.

The purpose of this review is to synthesize the findings from recent studies and reviews provided in the sources to characterize the effects of bariatric surgery in adolescents and young adults, specifically focusing on weight loss outcomes, resolution of comorbidities, changes in body composition, nutritional risks, gastrointestinal symptoms, psychosocial outcomes, and safety, drawing on the information within the provided texts.

Description of the State of Knowledge

Bariatric surgery is considered a valuable treatment option for adolescents with severe obesity. Studies have demonstrated significant outcomes following surgical intervention in this population.

•**Weight Loss Outcomes:** Bariatric surgery is effective in promoting higher and faster body weight and fat mass losses in children and adolescents. It leads to significant and lasting reductions in body weight and BMI. A systematic review of medium- and long-term outcomes (minimum three-year follow-up) of bariatric surgery including 9 adolescents aged twelve to nineteen years showed an average decrease in BMI of 1.3 kg/m². The Adolescent Morbid Obesity Surgery (AMOS) study reported a mean BMI reduction of 1.1 kg/m² over 5 years among adolescents who received Roux-en-Y gastric bypass (RYGB), similar to results in adults. Notably, the control group of adolescents in the AMOS study, who attended multimodal lifestyle intervention programs, experienced a mean increase in BMI of 3.3 kg/m² across the five-year period. The Teenage Longitudinal Assessment of Bariatric Surgery (Teen-LABS) study showed a mean three-year BMI reduction of 1 kg/m² after RYGB and 1 kg/m² after sleeve gastrectomy (SG). A randomized controlled trial comparing laparoscopic adjustable gastric banding (LAGB) combined with multidisciplinary lifestyle intervention (MLI) to MLI alone in adolescents with severe obesity who did not achieve sufficient weight loss with MLI alone found a mean weight loss of 1.2 ± 7.8% after 1 months in the surgery group, compared to a weight gain of 1.7 ± 8.1% in the control group. The sources suggest that while both SG and RYGB are common procedures., RYGB may favor higher body weight, BMI, and fat mass losses compared to SG. A comparison of one-year outcomes between adolescents and young adults undergoing bariatric surgery found similar mean loss of BMI (−1.4 ± 3.6 vs. −1.8 ± 4.6 kg/m²) and 1-month percentage of excess weight loss (8.4 ± 2.1% vs. 8.2 ± 2.1%)1. Some previous studies comparing adolescents with middle-aged adults (~4 years) even reported relatively better weight loss outcomes in adolescents. Body composition changes, including body weight and BMI reduction, were observed only in the first 1 months after surgery. [2,3,4,5,6,8]

•**Resolution of Comorbidities:** Bariatric surgery is effective in reducing obesity-related comorbidities in adolescents. Resolution rates for common comorbidities in adolescents aged twelve to nineteen years with severe obesity have been reported: Type 2 Diabetes (TD)/insulin resistance in 6.9%, hypertension in 6.6%, and dyslipidemia in 5.1%1. In the AMOS study, adolescents receiving RYGB showed high resolution rates for comorbidities over 5 years: hypertension in 1%, dyslipidemia in 8.7%, and complete resolution of TD and disturbed glucose homeostasis in 1% (n=3) and 8.7%, respectively. The Teen-LABS study also observed significant improvements in cardio-metabolic health after bariatric surgery, including 9% remission of TD, 8% remission of abnormal kidney function, 7% remission of elevated blood pressure, and 6% remission of dyslipidemia. The randomized controlled trial involving LAGB showed significant improvements in fasting insulin, insulin resistance score, and lipid profile in the surgery group after 1 months. A study comparing adolescents and young adults found that both groups showed parallel reductions in cardiovascular risk factors, and the remission of hypertension, diabetes mellitus, and dyslipidemia was similar between the groups at 1 year.

The Teen-LABS group published 5-year outcomes after RYGB comparing adolescents and adults, which confirmed similar weight loss but a more favorable TD and hypertension outcome in adolescents, supporting the case for early intervention. [1,3,4,7,8,22]

•**Body Composition Changes:** While effective for weight and fat mass reduction, bariatric surgery also leads to substantial changes in other body composition components. Significant reductions in lean mass and fat-free mass are observed after surgery. These losses raise concerns, particularly in adolescents undergoing growth and development. Changes in body composition are more pronounced during the first 1 months after surgery, with a trend for losses attenuation thereafter. Bone mass seems not to be impaired in the summary of one source, but other sources highlight concerns regarding bone health. Lean, fat-free, and bone mass losses are special concerns in adolescents due to the ongoing musculoskeletal developmental phase. Studies have reported increased bone turnover and decreased bone mass after gastric bypass surgery in adults. There are also concerns about possible negative effects of performing bariatric surgery, especially SG, on bone structure and strength estimates in adolescents. Longitudinal studies have identified bone loss in adolescents after bariatric surgery. More longitudinal studies, including control groups, are needed to adequately address the question regarding the possible negative long-term effect of BS, especially on bone development. [2,9,15,16,17,21]

•**Nutritional Risks:** Bariatric surgery procedures, particularly those that alter nutrient absorption, are associated with risks of micronutrient deficiencies. The Teen-LABS study suggested that risks associated with the procedures may be more prevalent after RYGB and included specific micronutrient deficiencies. Nutritional risks exist in adolescents after bariatric surgery. Studies indicate the importance of adherence to vitamin supplementation following adolescent bariatric surgery. A comparison between adolescents and young adults found that copper deficiency was greater in young adults, whereas ferritin deficiency was greater in adolescents at 1 year post-surgery. Additional studies are needed to ensure adequate calcium and 2 OHD levels pre- and post-operatively and to examine the long-term trend of bone turnover markers after SG. [2,9,16,17,21]

•**Gastrointestinal Symptoms:** Postoperative gastrointestinal symptoms (GIS) are a concern after MBS in adolescents. A prospective, multicenter, observational cohort study followed adolescents for 8 years after RYGB or SG. Adolescents undergoing either VSG or RYGB demonstrated significant increases in abdominal pain (1% vs. 1% baseline vs. 8 years), bloating (8% vs. 2%), and constipation (3% vs. 9%) between baseline and 8 years ($p < 0.0$)2. Following RYGB, the prevalence of gastroesophageal reflux symptoms (GERS) was not statistically significantly different between baseline (1%) and 8 years (1%) ($p > 0.0$)2. However, following VSG, GERS increased from 9% pre-operatively to 2% at 8 years ($p < 0.0$)1. In adjusted analyses, VSG was associated with higher odds of GERS at 8 years (adjusted odds ratio 2.6 [1.5–4.5, 9%CI]) 2. GERS represents a considerable concern pre- and post-MBS in adolescents, especially after VSG. Appropriate patient selection, counseling, and objective monitoring for pathologic consequences of gastroesophageal reflux after MBS are warranted. [7]

•**Psychosocial Outcomes:** Bariatric surgery has shown positive impacts on weight-related quality of life in adolescents. Studies indicate improvements in physical function and quality of life after bariatric surgery. Over 5 years post-surgery, younger (13–15 years) and older (16–19 years) adolescents showed similar improvement in quality of life. Bariatric surgery can help improve body image. However, psychological outcomes can be varied.
While significant weight loss was associated with higher self-perceptions of maturity in one study, research is needed to understand whether youth who underwent bariatric surgery meet developmental outcomes during the transition to adulthood. Concerns exist about psychological disorders like depression, anxiety, and binge eating, and whether they remain after surgery. Studies also highlight potential negative outcomes, such as increased suicidal thoughts and behaviors in adolescents who underwent bariatric surgery. Mental health factors are associated with progression to adolescent metabolic and bariatric surgery.[5,6,10,20,22]

•**Safety and Complications:** The rate of reoperation in adolescents with severe obesity after bariatric surgery was reported as 9.6%, mostly because of postoperative complications and suboptimal weight loss. Perioperative outcomes have been studied in adolescent bariatric surgery, such as in the Teen-LABS study. A comparison study found that surgical complications and adverse outcomes were comparable between adolescents and young adults 1 year after surgery. Laparoscopic adjustable gastric banding was chosen as a surgical procedure in one trial because of its acceptable perioperative complication rate and negligible risk of malabsorption, as it does not structurally affect anatomy. Potential issues observed in surgical patients' muscle-skeletal system raise a major concern when performing this intervention during growth. The Teen-LABS study suggested that risks associated with the procedures may be more prevalent after RYGB, including the need for additional abdominal procedures. [1,4,7,8,15,14,18]

•**Comparison Across Age Groups:** Comparing outcomes between different adolescent age groups and between adolescents and young adults is an area of research. A study comparing younger (13–15 years) and older (16–19 years) adolescents after bariatric surgery found that both groups had similar weight loss, resolution of hypertension and dyslipidemia, nutritional deficiencies, and improvement in quality of life over 5 years. The conclusion was that age alone should not dissuade providers and patients from pursuing surgery when medically indicated. Another study comparing adolescents (11–18 years) and young adults (19–29 years) undergoing bariatric surgery found that weight loss, improvement of cardiovascular risk factors, and resolution of obesity-related comorbidities were comparable between the two age groups at 1 year post-surgery. Surgical complications and adverse outcomes were also comparable. This study highlighted the value of comparing adolescents to young adults who have not been exposed to long-term adiposity, which can lead to irreversible changes that might negatively affect outcomes in older adults. [1,4,11,19]

•**Ethical Considerations:** Ethical concerns, considerations, and controversies exist regarding pediatric MBS. Decision making involves considering patient assent, parent/guardian consent, and balancing current and future risk. Case studies illustrate ethical issues, such as a teenager with severe obesity and an unsupportive parent making derogatory remarks about the surgery and the child, or a teenager with morbid obesity and developmental delay. Providers caring for patients should utilize "obesity-friendly" language to lessen stigma. [4,12,13,20]

Conclusions

Bariatric surgery is recognized as an effective intervention for adolescents and young adults with severe obesity, particularly when non-surgical treatments have been unsuccessful. The provided sources demonstrate that MBS leads to significant weight loss and substantial improvements in obesity-related comorbidities such as type 2 diabetes, hypertension, and dyslipidemia, with resolution rates often comparable or even more favorable than in adults in some studies. Both Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) are commonly performed, with some evidence suggesting RYGB might result in slightly greater weight loss, although direct comparative studies in adolescents are limited. [2,3,4,5,6,8]

Significant changes in body composition, including reductions in fat mass, lean mass, and fat-free mass, occur after surgery, primarily within the first 1 months. While one source suggests bone mass is not impaired, others raise concerns about bone loss and density changes, particularly after RYGB and SG, highlighting the need for further long-term research in this developing population. [2,9,15,16,17,21] Nutritional deficiencies are a known risk requiring ongoing monitoring and supplementation. [2,9,16,17,21]

Gastrointestinal symptoms, such as abdominal pain, bloating, and constipation, may increase after both RYGB and SG over the long term. Importantly, gastroesophageal reflux symptoms (GERS) are a significant concern that appears to increase specifically after SG but not RYGB over 8 years.[7] Psychosocial outcomes generally show improvement, including quality of life and body image. However, mental health challenges, including depression, anxiety, binge eating, and potentially suicidal thoughts/behaviors, can persist or emerge, emphasizing the importance of comprehensive psychological evaluation and support. [5,6,10,20,22]

Comparisons between younger and older adolescents show similar outcomes in weight loss, comorbidity resolution, nutritional status, and quality of life. Similarly, short-term outcomes (1 year) regarding weight loss, comorbidity resolution, and surgical complications appear comparable between adolescents and young adults. Surgical complications and reoperation rates are noted, underscoring the inherent risks of the procedures. Ethical considerations are crucial in decision-making, involving patient assent, parental consent, and the balance of risks and benefits, especially in diverse family and developmental contexts. [1,4,11,19]

Overall, bariatric surgery is an effective treatment option for severe obesity in adolescents and young adults, offering significant health benefits and improved quality of life, but requires careful patient selection, consideration of potential complications, and comprehensive long-term multidisciplinary follow-up focusing on nutritional, bone health, GI, and psychosocial aspects. In light of the current evidence, it becomes increasingly clear that bariatric surgery can serve as a crucial tool in managing severe obesity and its associated comorbidities among younger populations. The early intervention not only leads to physical health improvements but also contributes to better psychological outcomes and quality of life.

However, to optimize the long-term benefits and mitigate potential risks, a multidisciplinary approach is essential. This includes close monitoring by healthcare professionals, psychological support, consistent nutritional counseling, and regular follow-up to ensure adherence to supplementation and lifestyle changes. Future research should focus on longitudinal effects beyond ten years, evaluating both physical and mental health trajectories in patients undergoing MBS in adolescence and young adulthood. Ethical deliberations should also be continuously re-evaluated as practices evolve, particularly in ensuring informed consent and equitable access to this treatment option.

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