Laparoscopic Roux-en-Y bariatric gastric bypass in an adolescent

An obese teenager's gastric bypass results not only in weight loss and a healthier lifestyle but also in resolution of her type 2 diabetes and other comorbidities.

Cristina Hochwalt, PA-C, MPAS;
Rita Anderson, MD, PhD

CASE

A 16-year-old white female with morbid obesity presented to the bariatric surgery center for an informational discussion about bariatric surgery and consultation about the laparoscopic Roux-en-Y procedure specifically. Standing 5 ft 8 in tall and weighing 280.3 lb, the patient had a body mass index (BMI) of 43 kg/m^2, which put her in the category of being morbidly obese. She had become obese at a young age. At age 8 years, she developed hypothyroidism, and by age 10 years, she had started gaining weight. At 15 years, she developed polycystic ovary syndrome and continued to gain weight. Her primary care provider recorded weight gains of more than 150 lb in 5 years and more than 75 lb in 1 year.

The patient had tried dieting, Weight Watchers, protein drinks, hypnosis, medicines, and exercising to no avail. Her most successful weight loss had been a meager 10 lb, which she maintained for only 2 months. Discouraged, she began binge eating. The resultant weight gain produced respiratory problems and excessive sleepiness during the day. All these effects led to personality changes. Behavioral and psychological components reflected her feelings of social isolation and depression. She also felt shame and rejection, which served to increase and reinforce the comfort she experienced from eating. In addition to her previously noted comorbidities, she had asthma, type 2 diabetes mellitus (T2DM), and arthralgias. An upper GI double-contrast barium series revealed mild duodenitis involving the second portion of the duodenum. Her medications included esomeprazole, levothyroxine, drospirenone/ethinyl estradiol, aripiprazole, citalopram, iron supplements, albuterol in an inhaler, and metformin. She had no history of alcohol use or smoking. Family history was significant for diabetes and morbid obesity. Tonsillectomy as an infant was her only prior surgery.

After careful consideration, the patient chose Roux-en-Y surgery and underwent a preoperative evaluation, including a physical examination. One month before her surgery, a lipid panel showed elevated levels of LDL cholesterol (150 mg/dL) and triglycerides (198 mg/dL). She participated in several education classes and underwent psychological, nutritional, and exercise evaluation. When she had completed all the assessments, she took a quiz to demonstrate her consent for surgery. She also understood the surgical complications. Her mother signed a similar consent.

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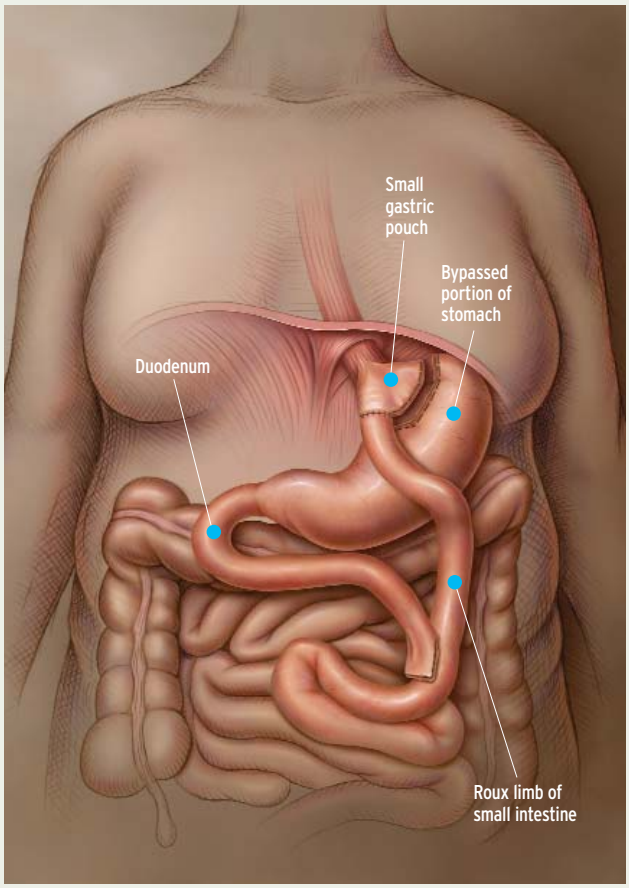

In a Roux-en-Y procedure, the stomach is reduced to a small pouch that is connected directly to the jejunum.

TABLE 1. Adult BMI categories

Overweight	25-29.9 kg/m^2
Obese (class I obesity)	30-34.9 kg/m^2
Moderately obese (class II obesity)	35-39.9 kg/m^2
Morbidly obese (class III obesity)	40-49.9 kg/m^2
Supermorbidly obese (class IV obesity)	≥50 kg/m^2

TABLE 2. Obesity comorbidities

- Arthritis
- Asthma
- Cancers of the breast, colon, uterus, and prostate
- Cholelithiasis
- Coronary heart disease
- Degenerative joint disease
- Diabetes mellitus type 2
- Depression
- Gastroesophageal reflux disease
- Hypercholesterolemia
- Hypertension
- Infertility
- Obstructive sleep apnea
- Osteoporosis
- Pickwickian syndrome
- Pulmonary hypertension
- Stroke

Specific to adolescents

- Pseudotumor cerebri
- Steatohepatitis
- Slipped capital femoral epiphysis
- Blount's disease
- Polycystic ovary syndrome

Data from Inge TH et al,[2] Rendon SE and Pories WJ,[3] and Wadden TA et al.[4]

DISCUSSION

BMI is used to determine whether a person is overweight or underweight[1] (see Table 1). Recent studies estimate that 50 million Americans are overweight and 12 million are severely obese. The economic costs of obesity, which encompass hospitalizations and other complications, job losses, and decreased productivity, amount to approximately $65 billion.[1] This is of particular concern because the impact on both our nation's overall health and the financial burden are expected to rise given the increase of obesity and related comorbid diseases in adolescents and children since the late 1970s[2-4] (see Table 2). Additionally, children and adolescents who are obese tend to remain obese as adults.[2] This, in turn, leads to an increase in comorbidities.[2] The average cost for bariatric surgery ranges from $25,000 to $35,000, but the up-front cost is made up for later by savings in reduced hospitalizations, physician visits, and pharmaceutical use.[1,5]

Morbid obesity This is defined as having a BMI of 40 kg/m^2 or higher or as weighing approximately 100 lb, or about 60%, more than desirable.[1] Obesity is a complex, multifactorial, chronic disease involving environmental (social and cultural), genetic, physiologic, metabolic, behavioral, and psychological components.[6]

Surgical treatment of obesity Bariatric surgery is considered when all other approaches to weight loss (ie, dietary therapy, exercise, behavioral therapy, and pharmacotherapy used either alone or in combination) have been tried without success. Previous studies clearly show that gastric bypass procedures in adults produce complete resolution or improvement in their comorbid conditions and result in an average loss of 56.7% to 66.5% of excess weight.[7] The result is fewer MIs and deaths due to cardiac disease.[7]

There are several bariatric procedures, including the biliopancreatic diversion with duodenal switch, the lap band, and the Roux-en-Y gastric bypass. The biliopancreatic diversion involves removal of about 75% of the stomach and diversion of the bile and pancreatic digestive juices to a point farther along in the duodenum than usual. The result is a shorter gut, where a fraction of calories and nutrients are digested and absorbed.

A lap band is a small, inflatable silicone band, which constricts to form a small pouch. Use of a lap band limits the amount of food ingested and slows the emptying of food into the stomach.

In the laparoscopic Roux-en-Y gastric bypass with pain pump placement procedure, a small pouch is created from the upper part of the stomach. A 40-inch Roux limb of small intestine is then created and connected to the small gastric pouch. Food bypasses the duodenum and upper jejunum. The effect of the small pouch is to restrict caloric intake. Supplements are necessary to replace nutrients normally ab-

TEACHING POINTS

- Bariatric surgery is considered when all other approaches to weight loss (ie, dietary therapy, exercise, behavioral therapy, and pharmacotherapy used alone or in combination) have been tried without success. Previous studies clearly show that gastric bypass procedures in adults produce improvement or complete resolution of their comorbid conditions, particularly type 2 diabetes.
- Adult patients are candidates for bariatric surgery if they have a BMI of 40 kg/m^2 or higher and no comorbidities or if they have a BMI of 35 kg/m^2 or higher with one or more comorbid diseases. Additional inclusion criteria specific to adolescents include attainment or near-attainment of physiologic maturity, avoidance of pregnancy for at least 1 year postoperatively, and a supportive family environment.
- The ideal preoperative program encompasses a minimum of five components: medical, nutritional, and psychological workups; exercise assessment; and evaluation of the patient's understanding of the surgery.
- Because patients with obesity enter puberty and reach skeletal maturity earlier in life, bariatric surgery can be considered in younger adolescents than might otherwise be possible. Adolescents contemplating surgery need a good support system, but ultimately they need to be mature enough to manage their own postoperative course.

sorbed by the duodenum and to prevent osteoporosis. The Roux-en-Y is the most commonly performed bariatric procedure in the United States and is the gold standard procedure to which all other surgeries are compared. Studies have shown that patients with T2DM benefit significantly from gastric bypass surgery, such as the Roux-en-Y.[7]

Bariatric surgery in adolescents Results similar to those seen in adults are expected with bariatric surgery in adolescents. Young children have unique considerations and require specific guidelines to avoid inappropriate use and/or overuse of weight loss surgery. Inge and colleagues note that neuroendocrine, skeletal, and psychosocial maturation are accelerated during adolescence. How these processes are affected by restrictive or malabsorptive surgical procedures that lead to rapid weight loss is not yet known.[2] Nutrition is vitally important after surgery to ensure that weight loss in children and adolescents does not impair linear bone growth and normal development.[8] Because patients with obesity enter puberty and reach skeletal maturity earlier in life, bariatric surgery can be considered in younger adolescents than might otherwise be possible.[2] Adolescents contemplating surgery need a good support system, but ultimately they need to be mature enough to manage their own postoperative course.

"Comorbid conditions should be managed by clinicians prior to the operation. Modest weight loss should also be encouraged."

Candidates for surgery Adult patients are candidates for bariatric surgery if they have a BMI of 40 kg/m^2 or higher and no comorbidities or if they have a BMI of 35 kg/m^2 or higher with one or more comorbid diseases.[7] Additional inclusion criteria specific to adolescents include attainment or near-attainment of physiologic maturity, avoidance of pregnancy for at least 1 year postoperatively, and a supportive family environment[2,5,8-11] (see Table 3). Our patient had a BMI of 43 kg/m^2 and a number of comorbidities—T2DM, polycystic ovary syndrome, duodenitis, depression, hypothyroidism, asthma, and arthralgias. She wanted a new healthy life and was extremely motivated to make the necessary changes before, during, and after surgery. We educated her about all the future permanent lifestyle changes and possible complications of the procedure. She met all of the criteria for surgery.

Preoperative evaluation The ideal preoperative program encompasses a minimum of five components: medical, nutritional, and psychological workups, exercise assessment, and evaluation of the patient's understanding of the surgery.[12] Comorbid conditions should be managed by medical personnel prior to the operation. Modest weight loss is encouraged. A thorough physical examination and disease-specific testing are also recommended (eg, electrocardiography, CBC, liver

TABLE 3. Inclusion criteria for bariatric surgery candidates

Adults
BMI ≥40 kg/m^2 without comorbidities OR BMI ≥35 kg/m^2 with one or more comorbidities
Absence of psychological issues on psychological evaluation
No drug or alcohol abuse
Compliance in general: subscribing to nutritional/diet plan, regular exercise as advised by physician, behavior counseling/therapy.
Motivation—before and after the procedure—to maintain a healthy lifestyle
Lifetime commitment to follow-up care
Letter from primary care doctor requesting gastric bypass and containing documentation of comorbid conditions, an annual weight check for the past 5 y, and weight-loss methods the patient has tried
Nutritional evaluation
Adolescents
Failed ≥6 months of organized attempts at weight management, determined by primary care provider
Physically or nearly physically mature
BMI ≥40 kg/m^2 (morbidly obese) with one or more serious obesity-related comorbidities or BMI ≥50 kg/m^2 with one or more less severe comorbidities
Comprehensive medical and psychologic evaluations before and after surgery
Commitment to avoid pregnancy for at least 1 y postoperatively
Capability and willingness to adhere to nutritional guidelines postoperatively
Informed consent to surgical treatment
Demonstration of decisional capacity
Supportive family environment

Data from Inge TH et al,[2] Powers KA et al,[5] Kim RJ et al,[8] Colquitt J et al,[9] Mun EC and Tavakkolizadeh A,[10] and Markel TA and Mattar SG.[11]

TABLE 4. Postoperative progress

Date	Weight (lb)	Time since surgery	Weight loss (lb)	BMI (kg/m^2)
3/1/07	263.2	2 weeks	17.1	40
4/5/07	244.9	1 month	35.4	37.2
6/12/07	211.6	4 months	68.7	32.2
7/10/07	196.8	5 months	83.5	29.9
11/29/07	166.9	9 months	113.4	25.4

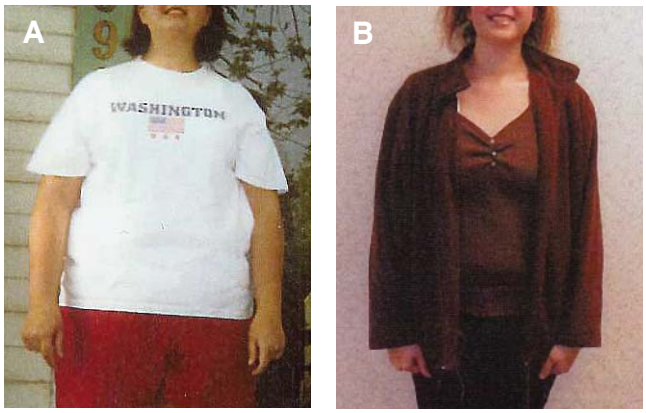

FIGURE 1. The patient before surgery (A) and after surgery (B)

function tests, liver biopsy, polysomnography, and a pregnancy test for female patients).

Outcome Our patient was age 17 years at the time of her procedure. After being overweight for 8 years, she is now content with her life. Table 4 (page 29) illustrates her success. Before the surgery, she weighed 280.3 lb, and now she weighs 166.9 lb. She lost 113.4 lb within 9 months and continues to lose weight. Her BMI, which was 43 kg/m^2 prior to surgery, is now 25.4 kg/m^2. She smiles from ear to ear and is thrilled about her progress (see Figure 1). She engages in a healthy lifestyle that includes eating nutritious small meals and snacks; exercising for 30 minutes five times a week; and participating in after-school activities, such as cheerleading and other functions. Her back and joint pain have resolved.

Overall, the patient is grateful for her weight loss results, which led to resolution of her T2DM, depression, and arthralgias. Bariatric surgery should be considered for resolution of T2DM in the morbidly obese.[13] As she looks forward to a life she never thought possible, the patient has become an advocate for bariatric surgery in adolescents. Pediatric weight management is a relatively new field of medicine, and there are few long-term studies on the effects of bariatric surgery on adolescents. Studies in the pediatric population are still in progress, and more studies are needed to determine if operating at a younger age can prevent the comorbidities commonly seen in overweight patients. We believe bariatric surgery in adolescents is safe and effective. It is increasingly becoming an option for young adults to become healthy adults. JAAPA

Cristina Hochwalt is a recent graduate of the Marietta College Physician Assistant Program, Marietta, Ohio, and practices at Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio. **Rita Anderson** is a bariatric surgeon at Kettering Medical Center, Kettering, Ohio. The authors have indicated no relationships to disclose relating to the content of this article.

DRUGS MENTIONED

Albuterol inhaler
Aripiprazole (Abilify)
Citalopram (Celexa)
Drospirenone/ethinyl estradiol (Yaz)
Esomeprazole (Nexium)
Iron supplements
Levothyroxine
Metformin

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