



## Bariatric Surgery in Adolescents

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In this electronic age, we have become increasingly sedentary, while food, much of it prepackaged and of high nutrient density, is available in abundance. That overweight and obesity rates have

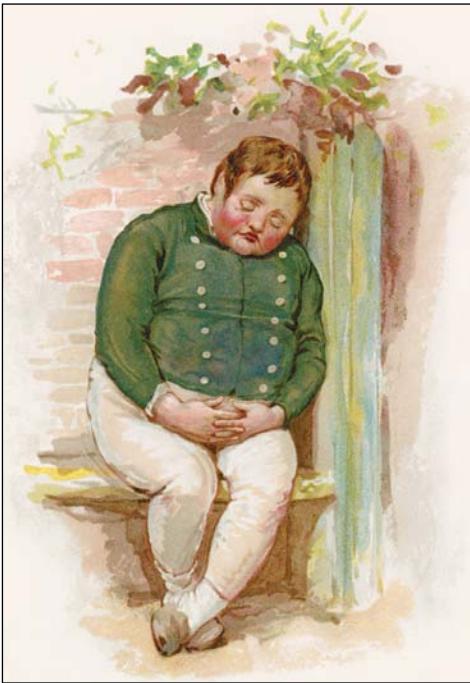
reached epidemic proportions among children and adolescents in industrialized society is no longer news, nor are the signs and symptoms of present and future risks and complications of massive obesity. As increasing numbers of children and adolescents become obese (an estimated 17% of youngsters 2 to 19 years of age in the United States, according to the Centers for Disease Control and Prevention), the risk of medical conditions to which overweight and obesity contribute rises. If you were the health care provider or close relative of a morbidly obese child or adolescent, would the possibility that a surgical procedure, particularly if minimally invasive, might cure a child's obesity and the concomi-

tant and future complications, seem an appealing solution? Or does a surgical approach to a complex problem that often affects more than one member of a family, not just the child, constitute a misguided application of technology to a societal overeating disorder?

The conditions associated with obesity in childhood<sup>1,2</sup> include concomitant or emerging hyperinsulinemia, impaired glucose tolerance, dyslipidemia, hypertension, acanthosis nigricans or full-blown metabolic syndrome, frank type 2 diabetes, nonalcoholic fatty liver disease, sleep apnea, gastroesophageal reflux disease, and polycystic ovary syndrome. Many morbidly obese children find physical activity difficult, and

some develop conditions caused by extra avoirdupois on the skeleton — slipped capital femoral epiphyses, Blount's disease, and joint damage. Pseudotumor cerebri has also been associated with extreme obesity. Moreover, the long-term outlook for affected children is widely considered guarded, at best, with high risks of premature cardiovascular, central nervous system, and peripheral vascular disease, as well as higher risks of certain cancers, such as colon cancer. And these medical issues may be less painful than the stigma of obesity and the frequent experience of isolation, bullying, and discrimination.

Morbid obesity seems nearly impossible to treat, once it occurs, and parents, caregivers, and young patients themselves increasingly seek more effective solutions than diet, exercise, and trials of medication. Many experts advocate early intervention



**The Fat Boy, *The Pickwick Papers*, by Charles Dickens.**

“And on the box sat a fat and red-faced boy, in a state of somnolency, whom no speculative observer could have regarded for an instant without setting down as the official dispenser of the contents of the before-mentioned hamper, when the proper time for their consumption should arrive. . . . ‘Pray, come up,’ said the stout gentleman. ‘Joe!—damn that boy, he’s gone to sleep again.’”

for preventing overweight, obesity, and resulting conditions, and massive federally funded studies are proliferating in the United States, Europe, and Australasia. Some experts have gone so far as to recommend protective custody for obese children and adolescents.<sup>3</sup>

A recent meta-analysis<sup>4</sup> has bolstered the sense that bariatric surgery is a good solution for morbid obesity in adolescents, since patients seem to keep weight off and concomitant metabolic conditions resolve. By the late 1990s, only a few young people had undergone bariatric surgery, but its use has grown rapidly. Although no one data source tracks all such procedures, it appears that somewhere between just under 1000 and several thousand

adolescents undergo bariatric procedures each year.

Current guidelines<sup>1,2</sup> — soon to be updated — suggest (and most centers insist) that to qualify for bariatric surgery, a patient must be morbidly obese, as defined by a body-mass index (BMI, the weight in kilograms divided by the square of the height in meters) of at least 40 with coexisting medical conditions or at least 50 otherwise; have reached physical maturity (Tanner stage 4 or 5); have evidence of emotional and cognitive maturity; and have been unable to achieve weight loss with all other methods. Furthermore, the presence of a supportive family is considered key. Guidelines state that prepubertal children, patients with Prader-Willi syndrome, and patients with untreated psychiatric disorders or eating disorders should not receive bariatric surgery. Guidelines are also adamant that new databases and studies will be essential if we are to gain further insight and that bariatric surgery centers should be the only places where such procedures are performed.

A recent review<sup>5</sup> enumerated 10 necessary components for such centers: institutional commitment, adequate training for the surgeons, a medical home for patients, sufficient volume of operations, adequate staffing (a surgical and medical director, as well as committed and present staff including a social worker, psychologist, dietitian, exercise specialist, and referral specialty services), multidisciplinary review in place, specialized equipment to handle morbidly obese patients, standardized inpatient and follow-up care, support groups, and transition care. Most U.S. children’s hospitals now have obesity programs, the majority of which include bariatric surgery; thus,

oversight and standardization are essential.

There are several types of bariatric surgery procedures. Roux-en-Y gastric bypass is associated with the most weight loss and is the most commonly performed bariatric surgery for morbidly obese teens in most U.S. centers. A gastric sleeve operation is becoming more prevalent but still accounts for a minority. Gastric banding is associated with less rapid and less profound weight loss but is considered far more effective than lifestyle-based treatment. Other alternatives, such as an intragastric balloon, which is inflated and left in place for up to 6 months, or a gastric stimulator, in which electrodes are implanted and stimulated to lead to a sense of satiety, have been recommended, but data in children and teenagers are minimal.

A number of Web sites contain information for adolescents and families interested in weight-loss surgery, but these sites may have the effect of promoting the procedure merely by providing easier access to it (e.g., through advertisements from bariatric surgeons). (See, for instance, [www.yourbariatricsurgeryguide.com/obesity-teens/](http://www.yourbariatricsurgeryguide.com/obesity-teens/).)

Observers concerned about balance and trends, however, ask whether surgery converts a societal problem into a medical disease. Naysayers’ comments are found primarily in the lay press or in blogs. Fewer concerns appear in the medical literature, though the relevant issues are not trivial. Critics point out that most reports on bariatric surgery in adolescents are anecdotal or based on limited case series with little hard information. In some scholarly articles, the reported cases do not appear to include all cases in a given institution, which

raises concerns about selection bias and “cherry picking.”

Some experts have raised ethical concerns. Should bariatric surgery be compared head to head with other approaches — and which approaches? How can clinicians ensure that an adolescent continues to adhere to the necessary dietary changes, supplemental medications, and life-long monitoring?

Several prospective studies of bariatric surgery are in progress. In the United States, the Teen Longitudinal Assessment of Bariatric Surgery (Teen-LABS), which has nearly completed enrollment, is obtaining extensive data on adolescents who have undergone any bariatric procedure. The researchers initially planned to obtain data on gastric bypass but have increased enrollment to include patients who have undergone sleeve gastrectomy or gastric banding. Teen-LABS is not a randomized study, but rather involves patients prospectively enrolled from nine centers (ClinicalTrials.gov number, NCT00474318). A study in Israel is comparing an inpatient in-

tervention with bariatric surgery, though all participants start with an inpatient stay (NCT01254266). That study, too, is amassing substantial quality-of-life and endocrinologic data. And researchers in the Netherlands are initiating a prospective, randomized interventional study (NCT01172899) comparing laparoscopic adjustable gastric-band surgery with behavioral therapy. Results of such studies will not be forthcoming for several years.

Will bariatric surgery in the young prove more effective over time than other less-invasive approaches? Given the health effects of massive obesity, many practitioners believe that weight-loss surgery is a better alternative than watching a morbidly obese youngster develop myriad complications. All adolescents must navigate the journey into adult life, and those who have undergone bariatric surgery will need to adhere to a stringent diet and medication and exercise regimens for the rest of their lives. There may be as-yet-unknown adverse effects of the surgery — for ex-

ample, effects on bone density over decades. We also have much to learn about why bariatric surgery leads to a recalibration of the weight set point. It appears that bariatric surgery for adolescents has caught on, whether “right” or “wrong.” But the current strict requirements for having a bariatric procedure should not be relaxed until we know more.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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## The Coming Explosion in Genetic Testing — Is There a Duty to Recontact?

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The question of whether a duty exists to recontact patients about new genetic information has been debated for several decades without consensus, but the emergence of new technologies compels us to reconsider this complex matter. Ordering a “genetic test,” such as a chromosome analysis or a search for a mutation, is different from ordering a complete blood count. Before ob-

taining a specimen, counseling of the patient is required in order to discuss confidentiality, potential anxiety, stigma or discrimination, the interpretation and implications of possible results, and relevant follow-up options. Ideally, both pre- and post-test counseling would be conducted by genetic counselors, but there aren’t enough such professionals to meet the current demands.

Uncertainty in the results of many genetic tests, such as gene sequencing and cytogenomic arrays, presents a conundrum. A result may be abnormal and clearly pathologic, reflecting a disease that is present, a disease that will appear later, or a susceptibility to a common disease. Conversely, depending on the thoroughness of the analysis, a “negative” result may not mean that the pa-