The Surgical Management of Severe Obesity

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Abstract

The prevalence of obesity in the United States is increasing to epidemic proportions. At present, more than 60% of Americans are overweight. While a variety of medications are available for the treatment of obesity, none results in the long-term loss of more than 10% of body weight. The current standard for the treatment of severe obesity, defined as a body mass index of greater than 35–40 kg/m^2, is surgical. Several surgical procedures are currently available, including gastric bypass, biliopancreatic diversion with duodenal switch, and the adjustable gastric band. These operations may be performed using laparoscopic surgical techniques to minimize perioperative morbidity and postoperative recovery time. To optimize the outcome of this type of procedure, bariatric surgery should be performed on carefully selected patients, in centers specially equipped to care for the obese, within a broadly based, multidisciplinary setting providing lifelong postoperative care.

Key Words: Severe obesity, morbid obesity, obesity, bariatric surgery, gastric bypass, biliopancreatic diversion, adjustable gastric band.

Introduction

The prevalence of obesity in the United States has increased to epidemic proportions over the last decade. Between 1991 and 1998 the percentage of Americans meeting the clinical definition of obesity increased from 12.0% to 17.9% (1). This change has been identified in all 50 states, across all age groups, races, and educational levels. And obesity has been identified as a major risk factor for many diseases, including cardiovascular disease, cancer, and type II diabetes (2). Actuarial data suggest that more than 300,000 deaths per year in the United States may be attributed (to some extent) to obesity (3).

The costs associated with the treatment of obesity are similarly extreme. In the United States, more than $30 billion per year is spent on dietary and behavioral treatments for obesity. A study of Kaiser Permanente patients revealed health care costs to be 44% greater among severely obese patients (4). While the problem of obesity is an international one, the effects are especially acute in the U.S., where the cost of treating obesity and related ailments has been estimated to account for fully 7% of the national health care budget (5).

Unfortunately, the options available for the treatment of this vast public health problem are relatively limited. Dietary and behavioral approaches to obesity have achieved very limited success. While several anti-obesity drugs are available, these rarely result in the loss of more than 10% of total body weight.

At present, the only available therapeutic intervention that provides effective long-term weight loss for the severely obese is bariatric surgery. Recent advances in surgical technique have allowed bariatric procedures to be performed using laparoscopic, minimally invasive techniques, thus reducing hospital stays and minimizing early postoperative morbidity.

Definition of Obesity

The most widely accepted measure of obesity is the body mass index (BMI). This

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number is calculated by dividing a patient's mass in kilograms by the square of his or her height in meters. A normal BMI is considered to range from 18.5 – 24.9 kg/m^2. A BMI between 25.0 and 29.9 is considered overweight. A BMI of 30 or greater is classified as obese; this is further subdivided into Class I, II, or III obesity, as shown in Table 1 (6).

It may be important to consider other factors besides the BMI, such as total muscle mass and waist circumference. An extremely muscular individual may have an elevated BMI without being considered overweight. Waist circumference has been shown to be an excellent indicator of abdominal fat mass (7). A circumference greater than 88 cm (35 in) in women or 102 cm (40 in) in men strongly correlates with an increased risk of obesity-related disease (6).

Prevalence of Obesity and Obesity-Related Morbidity

Obesity, defined as a BMI greater than 30 kg/m^2, has become a worldwide problem. A recent report from the World Health Organization stated that the number of obese adults worldwide had increased to more than 300 million in the year 2000 (8). And the results of the 1999 National Health and Nutrition Examination Survey (NHANES) revealed that 61% of American adults were overweight (BMI $\geq$ 25.0 kg/m^2), and 26% obese (BMI $\geq$ 30.0 kg/m^2) (9). But a 1999 study by the American Cancer Society demonstrated that the relative risk of death for obese men was 2.58 times that of controls (1). Thus, elevated BMI has been identified as an independent predictor of early death.

TABLE 1
Categories of Obesity

	BMI (kg/m^2)	Risk
Underweight	<18.5	Increased
Normal	18.5 – 24.9	Normal
Overweight	25.0 – 29.9	Increased
Obesity Class I	30.0 – 34.9	High
Obesity Class II	35.0 – 39.9	Very high
Obesity Class III	≥40.0	Extremely high

Data taken from National Institutes of Health (NIH); National Heart, Lung and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults — the evidence report. www.nhlbi.hih.gov/guidelines/obesity/ob_gdlns.pdf on p. 16.

Behavioral and Dietary Management

It is widely appreciated that weight loss can be obtained by decreasing caloric intake (dieting) and increasing metabolic activity (exercising). Decreasing caloric intake by 500 – 1000 kcal/day below maintenance level can result in the loss of 0.5 kg of body weight per week (10). However, while 29% of men and 44% of women state that they are trying to lose weight, only 20% of these men and women report that they are actually implementing such behavioral and dietary modifications (11).

Perhaps the explanation for this failure of behavior to follow data lies in the knowledge that weight-reduction programs based on dieting and exercise alone are frequently ineffective. Some 90 – 95% of persons who lose weight go on to regain the weight lost — and gain more (10). Nonetheless, Americans continue to spend $30 billion per year on weight-loss programs and diets (12).

Medical Management

Substantial enthusiasm for the pharmacologic treatment of obesity was generated in 1992, when Weintraub published data on the use of medical therapy used in combination with behavioral management (13). Each medication discussed in that study, fenfluramine and phentermine, serves to reduce appetite. Fenfluramine produced moderate amounts of weight loss on a short-term basis; however, it was removed from the market when evidence emerged that is was associated with valvular heart disease.

Currently, two weight-reduction medications are available for long-term use in the U.S. Sibutramine (Meridia®) (Abbott Laboratories, Abbott Park, IL) is an appetite suppressant that works by inhibiting the reuptake of norepinephrine, serotonin and dopamine. While it appears to be a safe medication, its efficacy is quite limited. One study showed that subjects treated with sibutramine lost only 4 kg more than those treated with placebo (14). In a second study, only 13% of subjects treated with sibutramine lost more than 10% of their body weight, versus 4% of those treated with placebo (15).

The second medication currently available for long-term use is orlistat (Xenical®) (Roche, Nutley, NJ), a synthetic lipase inhibitor. Orlistat binds to lipases in the gut and inhibits the absorption of dietary fat. While it appears to be a fairly safe medication, its efficacy is similarly limited. Only 20–40% of subjects on orlistat lost 10% or more of their initial body weight, versus 10–25% of control patients treated with placebo (16).

Surgical Management

In 1991, the National Institutes of Health (NIH) organized a consensus conference to examine the role of both surgical and nonsurgical interventions in the treatment of severe obesity. The consensus panel ultimately recommended that the most appropriate treatment for a severely obese patient who had failed dieting, exercise, and behavioral management was surgical therapy. The panel recommended (17) that these patients should be "selected carefully after evaluation by a multidisciplinary team with medical, surgical, psychiatric and nutritional expertise" and operated on "by a surgeon substantially experienced with the appropriate procedures and working in a clinical setting with adequate support for all aspects of management and assessment."

Appropriate patient selection was one of the central points contained in the consensus panel's recommendations. Patients with a BMI greater than 40 kg/m^2 were considered to be good candidates for a bariatric procedure because of the substantial negative impact of obesity on their quality of life. Certain patients with BMIs between 35 and 40 were also classified as candidates for surgical therapy if they suffered from one or more comorbidities caused by their obesity, such as sleep apnea, Pickwickian syndrome, or diabetes mellitus.

At the present time, a number of different surgical procedures are available for treatment of the severely obese patient. These procedures generate weight loss from two mechanisms of action: restriction and malabsorption. Because the different operations entail substantially different lifestyle modifications, it is essential that patients are well informed about the specific changes in lifestyle, eating habits, and bowel habits that may accompany the procedure being suggested for them.

Gastric Bypass

The gastric bypass is the most commonly performed weight loss operation in the U.S. and has earned the reputation of being the "gold standard" against which other procedures are compared. First reported in 1967 by Mason, the gastric bypass has undergone numerous modifications (18). Most current techniques involve the use of a surgical stapler to create a small, vertically oriented stomach pouch based on the lesser curvature. The pouch, typically 15–30 cc in capacity, is anastomosed to a segment of small intestine in a Roux-en-Y fashion (Fig. 1). Ingested food passes from the stomach pouch through the gastrojejunostomy into the alimentary limb, typically between 50 and 150 cm long.

The gastric bypass provides a substantial amount of dietary restriction. The restriction is created by the small stomach pouch, which gives the patient a feeling of satiety after eating a small meal. In addition, the gastric bypass provides a small-to-moderate degree of intentional malabsorption due to the separation of food, which passes through the alimentary limb of the Y, from the biliopancreatic secretions, which pass through the biliopancreatic limb of the Y. The degree of malabsorption can be adjusted by modifying the length of the alimentary and biliopancreatic limbs (19).

Some patients may experience the "dumping syndrome" upon ingestion of sweets, after gastric bypass surgery. This is caused by the rapid passage of gastric pouch contents directly into the small bowel, unimpeded by a pyloric valve. The presence of concentrated simple sugars in the Roux limb presents a substantial osmotic load that may result in cramping and abdominal discomfort; additionally, the ensuing rapid release of insulin by the pancreas may cause symptomatic

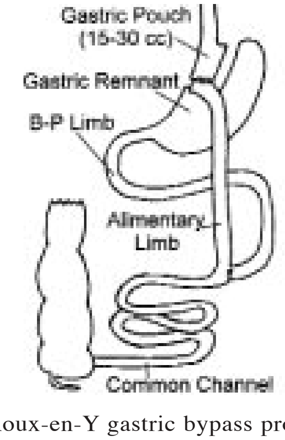

Fig. 1. The Roux-en-Y gastric bypass procedure. B-P limb is biliopancreatic limb. Illustration ©2002 Daniel M. Herron, http://www.surgicallyslim.com/gastric_bypass.htm. Accessed 4/14/03.

hypoglycemia. This unpleasant reaction to sugars is considered to be a desired aftereffect of gastric bypass surgery, and has been referred to by patients as the "postoperative police officer."

Weight loss after gastric bypass has been shown to be greater than that obtained by dietary, medical, behavioral, or combined approaches to weight loss. A recent long-term follow-up study performed by MacLean et al. defined postoperative success as a reduction in weight to a BMI of less than 35 kg/m^2. By this criterion, a successful outcome was achieved in 93% of patients whose initial BMI was less than 50 kg/m^2, and in 57% of those with an initial BMI greater than 50 kg/m^2 (20).

In 1996 a gastric bypass procedure using laparoscopic techniques was first reported (21). In a number of studies since that time, the laparoscopic approach has been shown to combine the efficacy of the open approach with the decreased pain, lower wound morbidity, and shorter convalescence of a minimally invasive procedure (22, 23).

Results of several laparoscopic gastric bypass series have paralleled or improved upon those of open surgery. In Higa's series of 400 laparoscopic procedures, patients lost an average of 69% of their initial excess weight by 12 months after their operations (22). Schauer's group reported even better weight loss; in a group of 275 patients undergoing laparoscopic gastric bypass, there was an average loss of excess weight of 83% at 24 months after surgery (23). In experienced hands, the laparoscopic gastric bypass can routinely be performed in less than 1.5 hours (22). Average hospital stay was quite short in both series: 1.6 days in the former and 3.6 days (median 2) in the latter.

A prospective, randomized trial comparing the results of laparoscopic and open gastric bypass was recently completed (24). Laparoscopic patients were found to have substantially less impairment of pulmonary function after surgery and decreased postoperative pain. In our experience, the convalescence after laparoscopic gastric bypass is substantially reduced relative to open procedures, with some patients returning to work in 2 weeks or less.

The most commonly reported complication of laparoscopic gastric bypass surgery is stenosis of the gastrojejunal anastomosis. This occurs in 5 – 10% or more of patients and is treated by outpatient endoscopic balloon dilatation. Marginal ulcers may occur in approximately 1% of patients due to exposure of the proximal jejunum to hydrochloric acid from the gastric pouch. This is typically managed pharmacologically using proton pump inhibitors. Despite the substantial cardiac, pulmonary and endocrine comorbidities of the typical bariatric patient, perioperative mortality ranged from 0.0 –0.4% (22, 23).

After surgery, patients must remain on a high-protein, low-fat diet, and supplement their diet with multivitamins, iron, and calcium, usually on a twice-a-day basis. Ursodiol (Actigall) may be given to minimize the risk of developing gallstones during the period of acute weight loss (25). Patients must also modify their eating habits by avoiding chewy meats and other foods that may inhibit normal emptying of their stomach pouch. Nutritional and metabolic bloodwork needs to be performed on a frequent basis; in our practice this is performed 3 months, 6 months, and 12 months after surgery, and annually thereafter.

Biliopancreatic Diversion with Duodenal Switch

The first weight loss procedure performed in the U.S. was the jejunoileal bypass (26). This procedure functionally "short-circuited" the small bowel by removing a major portion of small intestine from the alimentary path. The operation allowed the patient to eat normal-sized meals and resulted in excellent weight loss. However, the operation was ultimately abandoned due to excessive long-term nutritional complications, including protein and calorie malnutrition, electrolyte imbalances, renal stone formation and hepatic failure (27).

The desire to create an operation that combined the safety of the gastric bypass with the potentially better lifestyle and weight loss of a malabsorptive operation led Scopinaro to create the biliopancreatic diversion (28). In this procedure an antrectomy is performed, reducing the volume of the stomach to 200 – 500 mL. The remaining stomach is anastomosed to the distal 250 cm of small intestine. The excluded small intestine, containing the bile and pancreatic secretions, is connected to the alimentary channel 50 cm proximal to the terminal ileum.

This procedure was modified by Marceau and Hess to include a "sleeve gastrectomy," in which the greater curvature of the stomach is resected, but the lesser curvature of the stomach and the pylorus remain intact (29, 30). The first portion of the duodenum is divided and connected to the distal 250 cm of the small bowel. The biliopancreatic limb, containing all the bile and pancreatic secretions, is anastomosed 100 cm from the terminal ileum, providing a longer "common channel" and thus more protein and fat absorption than the Scopinaro version of the procedure (Fig. 2). This procedure has been named the "biliopancreatic diversion with duodenal switch" (BPD-DS).

The BPD-DS offers several theoretical benefits over the gastric bypass. Because the volume of the stomach after sleeve gastrectomy is substantially larger than the gastric pouch of the gastric bypass, patients may eat larger portions. Additionally, the dumping syndrome is avoided, since the pylorus remains intact. Almost 60% of patients report that they can "eat whatever they want" after BPD-DS, with 90% "almost never" vomiting (29). However, because of the substantial fat malabsorption obtained with BPD-DS, these patients must consume additional supplements of the fat-soluble vitamins (A, D, E, K) in addition to the supplementation used by the gastric bypass patients.

As with the gastric bypass, laparoscopic techniques have been applied to the BPD-DS. The laparoscopic approach was first utilized in 1999 (31). Early results in this series appeared to be similar to those of open series.

Weight loss after the BPD-DS is excellent. In Marceau's series of 457 patients, patients lost an average of 73% of their initial excess weight. As might be expected, however, patients suffer from substantial side effects of fat and protein malabsorption. Most patients have from 3–4 soft bowel movements per day, and notice a substantial increase in the amount of flatus passed, as well as the strength of its odor. This is reported to be a "major problem" by 30–40% of patients. Abdominal cramping and bloating is also common, reported to occur more than once a week in approximately one-third of patients (29).

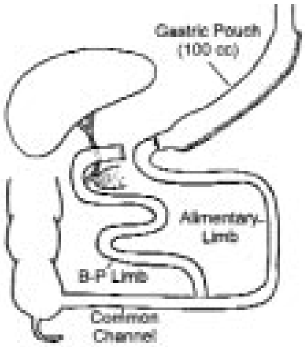

Fig. 2. The biliopancreatic diversion with duodenal switch (BPD-DS). B-P limb is biliopancreatic limb. Illustration ©2002 Daniel M. Herron, http://www.surgicallyslim.com/bpt.ds.htm. Accessed 4/14/03.

Additionally, long-term protein malnutrition occasionally requires readmission to the hospital for supplemental parenteral nutrition or surgical revision. The most commonly performed revision involves lengthening of the "common channel" where the alimentary limb ultimately joins the biliopancreatic limb. The risk of rehospitalization in Marceau's series was approximately 1% per patient per year (29).

Because the BPD-DS involves a partial gastrectomy and a complicated duodenal dissection, it is considered to be a substantially more complex operation than the gastric bypass. This is reflected in its higher mortality rate, from 0.5–2.5%, and an incidence of major morbidity of over 15% (30, 31). Nonetheless, public interest in the procedure continues to rise, based on the perception of a superior quality of life postoperatively.

Restrictive Procedures

Vertical Banded Gastroplasty

Purely restrictive bariatric procedures function solely by reducing the functional capacity of the stomach. The vertical banded gastroplasty (VBG), commonly referred to as a "stomach stapling," is an example of this type of procedure. In the VBG, a surgical stapler is used to create a vertically oriented pouch based on the lesser curvature of the stomach. The outlet of this pouch is restricted by a prosthetic band. Unlike the gastric bypass, the VBG pouch empties into the stomach, and no rerouting of the alimentary path occurs.

The VBG offers several apparent advantages. It is a technically straightforward procedure, whether performed using open or laparoscopic surgical techniques. It leaves the alimentary tract continuous, thus reducing or avoiding the potential malnutrition issues that may accompany malabsorptive operations such as the gastric bypass or the BPD-DS. Because there are no surgical anastomoses, there is no risk of anastomotic leakage.

Unfortunately, these theoretical advantages have not been supported by the available clinical data. Balsiger recently reviewed the long-term outcome of VBG. Of 70 patients who underwent VBG between 1985 and 1989, only 14 (20%) had experienced a durable loss of more than 50% of their excess weight (32). MacLean performed a prospective randomized trial comparing VBG to gastric bypass, with success defined as a postoperative BMI of less than 35 kg/m^2. Gastric bypass (with a completely separated gastric pouch) was successful in 83% of patients, while VBG provided a successful outcome in only 39% (33).

Laparoscopic Adjustable Gastric Band

Recently, interest in purely restrictive procedures has resurfaced, due to the approval by the Food and Drug Administration (FDA) in June 2001 of a laparoscopically placed adjustable gastric band (Fig. 3). The device (Lap Band, Bioenterics Corp., Carpenteria, CA) consists of a hollow silicone rubber band that can easily be wrapped around the superior portion of the stomach, just distal to the gastroesophageal junction. The amount of restriction may be adjusted by injecting or withdrawing saline solution from the hollow core of the band which can be accessed via a subcutaneous port similar to that used for long-term venous access in chemotherapy patients. In theory, this mechanism allows the amount of restriction to be fine-tuned until an appropriate balance of restriction and lifestyle is achieved.

Results of the adjustable gastric band are quite mixed. Excellent results have been reported from Europe and Australia. A recent French study of 400 patients demonstrated a loss of 50% of initial excess body weight at 2 years follow-up (34). Fielding has reported the results of 355 patients undergoing laparoscopic adjustable gastric banding in Australia.

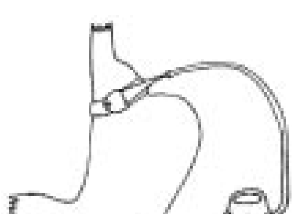

Fig. 3. The laparoscopic adjustable gastric band. Illustration ©2002 Daniel M. Herron.

Complication rates were low, and the 58 patients who were followed for 18 months postoperatively lost an average of 62% of their excess weight (35). Confusingly, these data are in marked conflict with American results. DeMaria reported on 37 patients from one of the 8 American centers evaluating the band for FDA approval. These patients lost only 18% of their initial excess weight at 3–18 months after surgery. More than 40% of the patients in that series had their band removed, most commonly because of inadequate weight loss (36).

It is not clear whether the poor results of the laparoscopic adjustable gastric band in the United States are due to differences in the diet, lifestyle and/or compliance of American patients, or if they are statistical anomalies caused by inadequate sample size. While the adjustable band may hold promise, its use in American patients must be considered with caution.

Surgical Weight Loss: Long-Term Health Benefits

There is little debate that surgery can provide greater and longer-lasting weight loss than dietary, behavioral or medical therapy. However, the risks of surgery, while low, are not negligible (Table 2). Thus, when considering a surgical procedure for an individual patient, it is necessary to consider the long-term benefits of substantial weight loss.

Type II diabetes, also referred to as non-insulin-dependent diabetes mellitus (NIDDM), affects approximately 13 million Americans (37). Of severely obese patients, roughly one-third suffer from type II diabetes, and another third have impaired glucose tolerance (38). In a landmark study, Dr. Pories followed the outcome of 608 severely obese patients who underwent gastric bypass, with higher than 97% follow-up. Of the 146 patients with type II diabetes in his study, 82.9% ultimately became euglycemic. The results were even more impressive for patients with impaired glucose tolerance; of the 152 patients in this category, 98.7% became euglycemic after surgery (37).

In a second study, the same research group compared patients undergoing gastric bypass surgery with a control group that did not undergo surgery, due to insurance denial or personal considerations. Mean follow-up ranged from 6–9 years. In the group

TABLE 2
A Comparison of Weight Loss Operations

	Gastric Bypass	Biliopancreatic Diversion with Duodenal Switch	Gastric Band
Duration of procedure	1 – 4 hours	2 – 5 hours	0.5 – 2 hours
Length of stay	2 – 3 days	2 – 4 days	1 – 2 days
Postoperative supplements	MVI, iron, calcium	MVI, iron, calcium, ADEK	MVI, calcium
Estimated weight loss	50 – 75% EBW	60 – 80% EBW	40 – 60% EBW
Side effects	dumping syndrome	diarrhea, excessive flatus, body odor changes	vomiting
Short-term complications	DVT/PE, anastomotic leakage, pouch leakage, gastrointestinal bleeding	DVT/PE, anastomotic leakage, pouch leakage, gastrointestinal bleeding	DVT/PE, port-site infection, esophageal perforation
Long-term complications	gastrojejunostomy stenosis, iron deficiency anemia, calcium deficiency, B12 deficiency, marginal ulcer, internal hernia	iron deficiency, calcium deficiency, protein malnutrition, need for common channel revision, internal hernia	band slippage, device leakage, erosion into stomach/esophagus, pouch enlargement, device infection
Mortality rate	0 – 1%	0.5 – 2.5%	0 – 1%

EBW=Excess body weight; MVI=multivitamin; ADEK=Fat-soluble vitamin supplement; DVT/PE=Deep vein thrombosis, pulmonary embolism.

undergoing surgery, the percentage of patients requiring insulin or oral hypoglycemic medication dropped from 31.8% preoperatively to 8.6% postoperatively. In contrast, patients who did not undergo surgery saw their need for hypoglycemic therapy increase from 56.4% at initial contact to 87.5% by the end of the follow-up period (39).

Dyslipidemia is another comorbidity present in a large subset of the severely obese population. Dr. Marceau of Laval Hospital in Quebec reported on 717 patients who had undergone duodenal switch. Preoperatively, 23% of patients suffered from elevated cholesterol (> 6 mmol/L). Postoperatively, this was reduced to 0.7% (29). Marceau noted a substantial, but less extreme, decrease in the incidence of hypertension requiring medical therapy. Preoperatively, antihypertensive medication was required by 91 patients; only 38 required it after a mean follow-up period of 4.1 – 8.3 years.

Sleep apnea is another potentially disabling problem with a disturbingly high incidence in the severely obese population. It may be caused by compression of the upper airway by fatty tissue, combined with increased upper-airway collapsibility. Schueller and Weider studied 15 severely obese patients with severe sleep apnea, 8 of whom had already been treated with tracheostomy (40). After they underwent a weight loss procedure, their mean respiratory disturbance index (RDI) decreased from 96.9 events/hr to 11.3 events/hr. Minimum oxygen saturation increased from a mean of 58.7% before surgery to 85.2% after surgery. Of the 8 patients with tracheostomies, all were ultimately able to have their tubes removed.

The Management of Severe Obesity: What Does the Future Hold?

Recent discoveries in human fat metabolism have led to renewed hope that an effective pharmacological treatment for obesity may one day be discovered. The peroxisome proliferator-activated receptor (PPAR)-gamma gene has been identified as the potential master regulator of fat cell formation (41). Thus, pharmacologic manipulation of this gene's expression could theoretically downregulate fat cell formation. Angiogenesis inhibitors such as TNP-470, angiostatin and endostatin have been tested on mice in hopes of slowing or stopping neoplastic tumor growth. An interesting side effect has been that these mice have lost nearly half their body weight. While there have been no human studies using these medications for weight loss purposes, the use of these agents has been patented as a potential cure for obesity (42).

However, despite the promise that this and other research shows, surgical intervention currently remains the only effective treatment for severe obesity. For this reason, gastric bypass has been one of the most rapidly increasing surgical procedures performed in the U.S. (personal communication, Sheila Salter, USSC Corp., Norwalk, CT). In hopes of optimizing the conditions under which bariatric surgery is performed, the American College of Surgeons recently released a series (43) of formal "Recommendations for Facilities Performing Bariatric Surgery." Their recommendations include the following points:

- Bariatric surgery should only be performed by a team of experienced surgeons, anesthesiologists, nurses, and nutritionists. Recovery room and nursing staff should be specially trained in the management of the severely obese.

- Operating rooms should be specially designed and equipped to accommodate the unique needs of the severely obese patient.

- Hospital facilities, including intensive care units, radiology departments, and rehabilitation facilities, must be redesigned with the care of these patients in mind.

These requirements for a high-quality bariatric treatment program are demanding. Moreover, patient selection needs to be performed very carefully, and the choice of procedure needs to be tailored to the individual patient's physiologic needs and desires for postoperative lifestyle. Finally, nutritional and metabolic follow-up must continue for the lifetime of the patient. If these requirements are fulfilled, the obese patient undergoing bariatric surgery may look forward to vastly improved health and quality of life.

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