Surgery for Morbid Obesity: A Continuing Challenge

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Morbid obesity is often defined as a body weight twice the ideal weight as determined from insurance tables or 50 kg (110 lb) or greater above the ideal for individuals taller than 152 cm (62 in) (1-3). Morbid obesity is associated with a variety of health problems including hypertension, diabetes mellitus, degenerative joint disease, and respiratory insufficiency (4-10). In addition to the morbidity implied by obesity-related disease, Drenick et al (11) documented that an age-specific increased mortality is associated with obesity. The underlying etiology of obesity is not clear and has been variously ascribed to sociologic, environmental, psychologic, genetic, and biochemical factors. Regardless of cause, obesity is a disease that is not easily managed. Medical management through diet has been successful in less than 5% of morbidly obese patients (3,12-15).

Recognition of the health implications of morbid obesity and of the inadequacy of dietary management has prompted trials of various surgical approaches to weight control (Table 1) (1,16-34). The multiplicity of surgical procedures suggests that no single procedure completely fulfills the following criteria for satisfactory surgically induced weight loss and control; 1) early and consistent weight loss, 2) sustained long-term weight control, 3) minimal operative morbidity and mortality, 4) minimal long-term adverse sequelae, 5) minimally subject to patient manipulation, and 6) an operation which is easily dismantled (1,16).

Three procedures, jejunoileal bypass, gastric bypass, and gastroplasty, have been widely used. Each of these procedures has significant associated problems which are illustrated in the following case examples.

**Jejunoileal Bypass**

**Case 1**

This 23-year-old white female was admitted for elective conversion of jejunoileal bypass to Roux-en-y gastric bypass. She had undergone jejunoileal bypass at age 15 when she was 162.5 cm (64 in) tall and weighed 103.5 kg (230 lb). Approximately one year following the jejunoileal bypass, she had her first episode of nephrolithiasis. She had maintained a weight of 64.4 to 71.1 kg (143 to 158 lb) for several years. In the 18 months prior to the current admission she had two episodes of nephrolithiasis and had experienced increasing difficulty with crampy abdominal pain, nausea, diarrhea, and fatigue. She began to gain weight recently and was admitted weighing 87.3 kg (194 lb).

On admission she appeared to be a healthy young woman. Her vital signs were normal, and physical examination was remarkable only for moderate obesity and a well-healed midline abdominal incision. Chest x-ray and routine admission laboratory studies including a liver profile were normal.

On the day following admission she underwent take-down of her jejunoileal bypass with conversion to a Roux-en-y gastric bypass (35). Postoperatively she did well and was able to take liquids on the fifth day and solids on the sixth day.

In clinic follow-up six months later, she had lost 12.2 kg (27 lb), weighing 75.1 kg (167 lb). She reported no recurrence of her abdominal cramping, nausea, and diarrhea. She had no recurrence of nephrolithiasis. She also noted less fatigue and claimed an increased sense of well-being.

**Comment**

Although this young woman initially did well following her jejunoileal bypass, eight years postoperatively she exhibited recurrent nephrolithiasis, abdominal pain, nausea, diarrhea, and fatigue. These adverse sequelae of small bowel bypass became apparent years after the original procedure. Other patients have had liver failure more than 15 years postoperatively.

**Table 1**

<table>
<thead>
<tr>
<th>Rationale</th>
<th>Surgical Technique</th>
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<tbody>
<tr>
<td>Reduction of appetite</td>
<td>Hypothalamic lesion (25,26)</td>
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<td></td>
<td>Ileal transposition (1)</td>
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<td>Reduction of oral intake</td>
<td>Dental occlusion (27)</td>
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<td>Reduction of gastric volume</td>
<td>Gastric bypass (18,21)</td>
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<td>Gastroplasty (22-24)</td>
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<td>Gastric wrap (16,28)</td>
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<td>Intragastric balloon (29-31)</td>
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<td>Reduction of absorption</td>
<td>Jejunoileal bypass (17,19,32)</td>
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<td>Bilointestinal bypass (20)</td>
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<td>Bilipancreatic bypass (33)</td>
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<td>Increased transit time</td>
<td>Truncal vagotomy (34)</td>
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*Modified from Griffen and Bell, 1983 (1).
years after jejunooileal bypass. Such cases emphasize that patients who have undergone jejunooileal bypass are at lifelong risk for metabolic sequelae (1,17,36). In this case, conversion to Roux-en-y gastric bypass after take-down of the jejunooileal bypass provided further moderate weight loss and control (35).

**Gastric Bypass**

**Case 2**

This morbidly obese 52-year-old white female was admitted for elective Roux-en-y gastric bypass (Fig 1). She had a long history of obesity and unsuccessful attempts at dietary management. Admission weight and height were 133.2 kg (296 lb) and 157.5 cm (62 in). Her obesity was complicated by hypertension, coronary artery disease, diabetes, and asthma. Her medications at admission included hydrochlorothiazide, chlorpropamide, aminophylline, propranolol, dipyridamole, and papaverine.

On admission she was morbidly obese but in no acute distress. Her vital signs were normal including a blood pressure of 122/74 mm Hg (on medication). Her physical examination was unremarkable except for her obvious obesity.

On the day following admission she underwent Roux-en-y gastric bypass. Her postoperative course was complicated on the third day by tachycardia (> 120 beats/min), fever (39.5°C [103.1°F]), and left shoulder pain. An upper gastrointestinal series with water-soluble contrast demonstrated an anastomotic leak at the gastrojejunostomy communicating with the left subphrenic space. She was reoperated on for closure of the leak, drainage of the subphrenic abscess, and placement of a feeding gastrostomy in the distal excluded gastric pouch. The abdominal wound was packed open. Immediately following this reoperative procedure she exhibited signs of sepsis and required six days of respirator support. As her sepsis cleared she was able to be weaned from the respirator but required ongoing wound care and nutritional support. By the 50th postoperative day, the repaired leak was demonstrated to be sealed by upper gastrointestinal series obtained on an outpatient basis demonstrating disruption of the vertical staple line of her gastroplasty.

On admission she was morbidly obese but in no acute distress. Her vital signs were normal including a blood pressure of 144/100 mm Hg. Her physical examination was remarkable only for her obesity and the presence of a well-healed midline abdominal incision. All routine preoperative test results were normal.

On the day following admission she underwent conversion of her vertical-banded gastroplasty to a Roux-en-y gastric bypass. She did well postoperatively and began taking oral liquids on the fifth day and solids on the sixth day. She was discharged on the seventh postoperative day.

On clinic follow-up one year later, she had lost 47.3 kg (105 lb), weighing 90 kg (200 lb). Her blood pressure was normal without medication. She reported increased energy and increased activity level.

**Comment**

This patient's clinical course illustrates the principal complication of the gastroplasty procedures: the failure of weight control (39,40). In this case the cause of weight loss failure was disruption of the gastroplasty staple line. In other patients the cause of weight loss failure has been dilatation of the gastric pouch itself or of the outlet of the gastric pouch. Regardless of cause, failure of weight control has been reported in up to 40% of patients three years postgastroplasty (39,40).
In 1954, Kremen et al (41) suggested jejunocolostomy as a means of shortening the small bowel to create a situation of controlled malabsorption. An unacceptably high incidence of complications with jejunocolostomy led Sherman et al (42) in 1965 to recommend that the proximal jejenum be anastomosed to the distal ileum above the ileocecal valve. In 1973, Payne et al (19) published their results with small bowel bypass where the proximal jejenum had been transected 35 cm below the ligament of Treitz and the proximal transected end anastomosed to the side of the ileum 10 cm proximal to the ileocecal valve. Failure of some patients to lose weight with this procedure was attributed to reflux of nutrients into the bypassed segment of the small bowel. In 1977, Scott and colleagues (32) proposed transection of the jejenum 30 cm distal to the ligament of Treitz and transection of the ileum 15 cm proximal to the ileocecal valve. The proximal end of the transected jejenum and distal end of the transected ileum were then anastomosed. The distal end of the transected jejenum and the bypassed bowel was oversewn and the distal portion was anastomosed to the colon, providing drainage of the bypassed segment. With various modifications, usually in the amount of ileum preserved, this procedure became the standard jejunoileal bypass.

Jejunoileal bypass, in its many modifications, attempted to achieve weight loss and control by creating a condition of controlled malabsorption. Late metabolic complications resulting from malabsorption, such as intractable diarrhea, severe hepatic dysfunction, cholelithiasis, and nephrolithiasis, pose the principal risks of jejunoileal bypass (Table 2) (1,17,36,43). These and other sequelae have led to a virtual abandonment of this procedure as a means of weight control. Yet, as case 1 illustrates, the problem of patients who have already undergone jejunoileal bypass persists. These patients are at lifelong risk for complications of their jejunoileal bypass unless their bypass is reversed (17,36). Since simple take-down of the jejunoileal bypass is commonly associated with rapid and dramatic weight gain, synchronous conversion to a gastric restrictive procedure is advised for maintenance of weight control, if the patient’s condition will tolerate reoperation (35).

Discouraged by the complications of jejunoileal bypass, Mason (21) devised in 1969 a procedure to reduce the size of the stomach as a means of limiting food intake. In this procedure the stomach was transected, leaving a proximal pouch approximately 10% of the capacity of the normal stomach. This proximal pouch was anastomosed to a loop of jejenum, creating an opening of no greater than 1.2 cm to impede gastric emptying. Mason’s procedure has undergone a series of modifications to where the standard gastric bypass now consists of stapling the stomach without transection to create a 30 to 45 cc proximal pouch and Roux-en-y gastrojejunostomy of 1 cm in diameter (2,18,44-46). Using this technique, gastric bypass can achieve a sustained weight loss equivalent to that of jejunoileal bypass (47,48).

Roux-en-y gastric bypass has evolved to become the “gold standard” for gastric restrictive procedures (18,44-46). The principal problem with the gastric bypass is a leak at the gastrojejunal anastomosis (as in case 2) (18,44,45). Such leaks may result from poor blood supply to the proximal pouch. Tachycardia (pulse > 120 beats/min), fever, and increasing leukocyte count occurring within two to five days postoperatively suggest the presence of an anastomotic leak. Water-soluble contrast studies of the upper gastrointestinal tract can verify the presence of the leak and determine whether this leak is contained adjacent to the anastomosis or communicates with the subphrenic space (2,49). Subphrenic abscess resulting from an anastomotic leak is a devastating complication in the morbidly obese and may necessitate weeks or months of hospitalization for its resolution. Over time approximately 15% of patients are able to distend the gastric pouch or dilate the gastrojejunal Anastomosis sufficiently to allow weight gain, although this weight gain rarely reaches preoperative levels. The principal long-term complication of gastric bypass is anemia (37,44,45,50,51). A theoretical concern is that metaplasia of the excluded stomach could predispose the patient to gastric cancer, but this has not been observed clinically.

The technical difficulty in performing gastric bypass and the concern about the excluded stomach have spawned a series of procedures designed to create a restrictive pouch with gastric continuity maintained. These procedures include horizontal gastroplasty (Pace-Carey or Gomez) (22,23), vertical-banded gastroplasty (Mason) (24), and a multitude of variations. The vertical-banded gastroplasty is considered the standard gastroplasty (24).

All of these gastroplasty procedures fail to control weight over time. Failure of weight control with the vertical-banded gastroplasty (as in case 3) has been reported in up to 40% of patients three years postoperatively (39,46,52).

Currently, some preliminary conclusions about the surgical approach to morbid obesity can be made:

1. Jejunoileal bypass is rarely indicated solely for weight control (17,36,46,47), even though some authors have suggested that jejunoileal bypass may have a role as an intermediate procedure for the “massively” morbidly obese (> 270 kg [600 lb]) (17,47). In this rare circumstance, jejunoileal bypass would be performed to achieve sufficient weight loss to allow a safe conversion to a gastric restrictive procedure.

### Table 2

<table>
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<tr>
<th>Complications Associated with Jejunoileal Bypass*</th>
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<td>Fluid and electrolyte imbalance</td>
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<td>Hepatic dysfunction</td>
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<td>Intrinsic renal disease</td>
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<td>Polyarthralgias</td>
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<td>Specific absorptive defects</td>
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<td>Excess flatulence</td>
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<td>Easy fatigue</td>
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<td>Cholelithiasis</td>
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<td>Intussusception</td>
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<td>Bypass enteritis</td>
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<td>Colonic pseudoobstruction</td>
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<td>Vitamin deficiencies</td>
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<td>Immunosuppression</td>
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<td>Carcinogenic potential</td>
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<td>Abdominal pain</td>
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<td>Diarrhea</td>
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<td>Bone disease</td>
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*See References 1, 17, and 43.
2. The current preferred approach to the operative control of obesity is a gastric restrictive procedure (either gastric bypass or gastroplasty). The Roux-en-y gastric bypass appears more effective in maintaining weight loss than the gastroduodenoplasties (40,46,53). However, Sugarman et al (54) suggested recently that the morbidly obese can be classified preoperatively into sweet versus nonsweet eaters and that the latter group may be treated satisfactorily by gastroplasty. Choice of the appropriate gastric procedure resides with the operating surgeon.

3. All other procedures for weight control should be considered experimental until sufficient experience with their use and outcome can be evaluated. Operative procedures for weight loss and control have been widely adopted before adequate evaluation of the potential for adverse sequelae was complete. For example, thousands of patients underwent jejunoileal bypass before evaluation proved that only approximately 30% of patients would have a satisfactory long-term outcome, that another 30% would have symptoms requiring medication, and that the remainder would have life-threatening complications virtually mandating reversal of the procedure (1,17,36,52). This experience should prompt caution in adopting innovative approaches to surgical control of obesity without clear, supporting data.

4. Given the potential for problems with operations for obesity, the decision to operate should not be undertaken lightly. Although the primary criterion for patients undergoing a surgical procedure for weight control is the state of morbid obesity, the patient should have no evidence of an endocrine cause of obesity. In addition, the patient should have a long-term history of obesity marked by weight loss and subsequent weight gain over a period of years. Patients with concomitant diseases such as diabetes, hypertension, or respiratory insufficiency who are likely to benefit substantially from weight reduction are highly suitable candidates.

Absolute contraindications to performance of an operation for morbid obesity are illnesses such as cancer, symptomatic coronary artery disease, and end-stage renal disease which greatly reduce life expectancy and are not expected to be improved by weight reduction. Psychiatric illness is not necessarily a contraindication. Patients who are incapacitated by their obesity with respiratory failure (the Pickwickian syndrome) or immobilized due to their bulk are extremely high-risk candidates for operation compared to the active, healthy morbidly obese (1,2,18). In these patients the decision to operate must be based on a careful examination of the operative and postoperative risks compared to the potential benefits (4,8).

The ideal surgical approach to weight control has not yet been identified, and the procedures currently available are not without risk. Balanced against the risks of operation are those risks of morbid obesity and the potential benefits of weight reduction and control. For patients with morbid obesity and its attendant complications, the risks of operation may be justified. Such patients should be chosen carefully, informed fully, operated on expertly, and followed up for their lifetime.

References