

# 45 *Bariatric Surgery—Importance in Obesity Management*

*Pradeep K Chowbey*

## INTRODUCTION

Obesity is the worst pandemic of the 21st century. Physicians have struggled to treat and control this disease by dietary, physical and pharmacological tools, but have met with limited success. As the disease grows in volume and weight the importance of bariatric or obesity surgery has just begun to be realized. Obesity is a disease of excess fat storage, which causes significant harm to the sufferer (Table 45.1). The disease has an unknown etiology. However the sudden rise in its prevalence is due to a multitude of complex genetic and environmental factors. Management of morbid obesity, therefore, requires a multipronged multidisciplinary approach. Bariatric surgery plays a pivotal role in this approach and is recognized and accepted today as the only method by which significant weight loss can be obtained and sustained over a long period of time.

A Bariatric Surgery unit must have a bariatric surgeon, nutritionist, endocrinologist, physician and a well-trained, empathetic staff.

## Indications for Bariatric Surgery

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Non-surgical means of losing weight are effective in achieving 5-15% body weight loss.<sup>1</sup>

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In patients of lower Body Mass Index (BMI), i.e. < 35 kg/m<sup>2</sup>, this small percentage of weight loss helps to achieve significant improvement in obesity related comorbid conditions such as diabetes and hypertension. However, patients with BMI > 35 kg/m<sup>2</sup> with comorbidities and BMI > 40 kg/m<sup>2</sup> do not do well with non-surgical means of weight loss. Despite losing weight, they still fall in the obese category and stay at a high risk due to obesity.

It is necessary to treat obesity in such patients like a chronic disease showing only a partial or unsatisfactory response to conservative treatment. Thus arises the need to search for a surgical solution for weight reduction. No intervention other than surgery has proven effective in treating severe obesity and its associated medical conditions. In fact, National Institute of Health (NIH) guidelines in 1996 recommended surgery as the most effective treatment available for selected patients of morbid obesity.<sup>2</sup>

**Table 45.1:** Morbidity of obesity

<i>Medical</i>	<i>Psychological</i>	<i>Economic</i>	<i>Social</i>
<ul style="list-style-type: none"> <li>• CHD—Prevalence 6 times higher</li> <li>• NIDDM—Prevalence twice as high</li> <li>• Dyslipidemias</li> <li>• HT</li> </ul>	<ul style="list-style-type: none"> <li>• Depression</li> <li>• Insomnia</li> <li>• Suicide</li> <li>• Neurotic disorders</li> <li>• Self hate and feeling of guilt</li> </ul>	<ul style="list-style-type: none"> <li>• Cost of futile weight loss treatment</li> <li>• Cost of treating various medical conditions</li> <li>• Inability to obtain insurance coverage or increased</li> </ul>	<ul style="list-style-type: none"> <li>• Social isolation</li> <li>• Daily prejudice</li> <li>• Verbal abuse</li> <li>• Physical abuse</li> <li>• Sexual abuse</li> <li>• Limitations in performing</li> </ul>

- Gallstones
  - Osteoarthritis
  - Sleep apnea
  - Malignancy, etc.
- premium
  - Cost of special clothing
  - Difficulty obtaining good jobs or promotions
- daily activities
  - Difficulty with hygiene
  - Clothing limitations
  - Limited mobility
  - Limited access to seats, passageways, etc.

Patients qualifying for bariatric surgery according to NIH consensus conference 1996 are:

1. BMI  $\geq$  40
2. BMI  $\geq$  35 with two associated comorbidities

However, for Asians, studies have shown that obesity-related comorbidities occur at lower BMI levels. It has, therefore, been suggested that the BMI limit be lowered as mentioned in the box below:

Recommended BMI values for Bariatric surgery in Asians

1. BMI  $\geq$  37.5
2. BMI  $\geq$  32.5 with two associated comorbidities

Formulae to calculate BMI

$$\text{BMI} = \frac{\text{Weight (in kgs)}}{\text{Height}^2 (\text{m}^2)}$$

## BARIATRIC PROCEDURES

Bariatric surgery is a field, which benefited phenomenally by the development of minimal access technology. Until the 1990s obesity surgery was being practiced by few dedicated surgeons who were often an object of ridicule (for their chosen branch) by their colleagues. Awareness of an alarming rise in incidence of obesity, coupled with introduction of this patient-friendly technology, has catapulted bariatric surgery into the forefront of surgical sciences. Perhaps, the most important development was recognition of obesity as a disease.

The two basic principles underlying bariatric surgery are restriction and malabsorption. These are at two extremes of a spectrum with a combination principle lying in between. Classification of bariatric procedures based on restriction and malabsorption is given in Flow Chart 45.1.

A worldwide survey in 2002-2003 showed that the gastric bypass is the most commonly performed weight loss procedure (65.1%).<sup>3</sup> Of these, a little over half were performed laparoscopically. The laparoscopic gastric band came second at 24%. The vertical banded gastroplasty and biliopancreatic diversion comprised 5.4% and 4.9% respectively.

### Restrictive Procedures

The procedure involves decreasing the capacity of the stomach to a volume of 15-30 cc and narrowing its outlet into the distal stomach. The patient achieves early satiety once the stomach pouch is full and remains satiated till the pouch does not empty completely. Thus the amount of food consumed is less and time interval between meals prolonged. By modifying the diet with a high protein and low calorie content, the patient begins to lose weight.

The vertical banded gastroplasty and adjustable gastric band are pure restrictive procedures. The adjustable gastric band in addition can be adjusted to allow tailoring of the stoma outlet which controls the rate of emptying the pouch and meal capacity.

### *Laparoscopic Adjustable Gastric Banding (LAGB)*

The procedure was first performed by Cadiere in 1992 but was made popular by Belachew and Legrand in 1993.<sup>4</sup> Laparoscopic adjustable gastric banding is one of the commonly performed bariatric procedures and with its rapidly increasing popularity it may soon become the commonest.

**Surgical technique.** The patient lies supine with legs abducted and surgeon standing between the legs. Five to six ports are made in the upper part of the abdomen (as shown in the Fig. 45.1). The left lobe of the liver is lifted and a tunnel is made behind the esophagus using a perigastric or a pars flaccida technique. The former has the disadvantage of a higher incidence of band erosion.

The band is placed around the stomach just below the esophagogastric junction through this tunnel and tightened below an intragastric calibration balloon filled to 15 cc with saline (Fig. 45.2).

The band is fixed anteriorly with 3-4 gastro-gastric sutures, the first suture being placed near the greater curvature. These sutures are important as they ensure the band placement on the stomach (and not esophagus), which is important for the feeling of early satiety. The sutures also prevent band slippage.

The access port is placed on the anterior rectus sheath where it should be accessible for palpation for future band adjustments. The adjustment is performed using a special access port needle (Huber needle) for piercing the port diaphragm to prevent fluid leakage. The adjustments are made with normal saline.

The greatest advantage of laparoscopic gastric banding is its high safety level and easy reversibility. It is the safest bariatric surgical procedure being performed today, being nearly 7 to 10 times safer than RYGBP. The overall perioperative complication rate is 1-2% and mortality rate is 0.02-0.4%.<sup>5</sup>

### **Complications**

Complications include gastric perforation, gastric prolapse, band erosion (much less after pars flaccida technique), esophageal dilatation, gastric necrosis, Tubing/access port problems.<sup>6-13</sup>

Results in terms of weight loss are expressed as percentage of excess weight lost, decrease in BMI or actual weight lost in kilograms. Patients lose weight gradually. However weight loss continues till upto 3-4 years following surgery till a steady state is achieved. Long-term results have shown patients maintaining 50% of EWL at > 5years follow-up.<sup>14-24</sup>

### *Vertical Banded Gastroplasty*

The Vertical Banded Gastroplasty (VBG) was first performed in 1980 by Dr E Mason.<sup>25</sup> The procedure involves making a circular window in the stomach approximately 3 cm from the lesser curve through the anterior and posterior gastric wall using an EEA Stapler and then firing four layers of staples vertically up to the angle of His shaping the stomach pouch in alignment with the esophagus. The length of this vertical suture line approximates between 5 and 9 cm. A Goretex or Marlex mesh or an adjustable band reinforces the stoma.

**Surgical technique.** The procedure can be performed by open or laparoscopic approach. The latter takes a longer time to perform and has not found much favor. The recovery, hospitalization and postoperative pain following laparoscopic VBG is much less. Procedure-related complications and weight loss are similar with either approach. Mason had reported 80% patients achieving > 25% Excess Weight Loss (EWL) up to 5 years following surgery when success of a bariatric procedure was proven on achieving weight loss of > 25% Excess Body

Weight (EBW).<sup>26,27</sup> Although the most extensively evaluated bariatric procedure, the vertical banded gastroplasty lost its popularity following introduction of laparoscopic adjustable gastric banding. This was perhaps due to weight gain reported 2-3 years following VBG surgery and poor results against revised expectations of > 50% EWL as a marker for surgical success.

<i>Laparoscopic adjustable Gastric banding</i>	<i>Vertical banded gastroplasty</i>
<ul style="list-style-type: none"> <li>• Reversible</li> <li>• Adjustable</li> <li>• Simpler to perform laparoscopically</li> <li>• Sustained weight loss of &gt; 50% EBW &gt; 5 years following surgery</li> <li>• Complications include gastric prolapse, band erosion, rarely gastric perforation and access port complications</li> </ul>	<ul style="list-style-type: none"> <li>• Irreversible</li> <li>• Non adjustable</li> <li>• Technically difficult by laparoscopy</li> <li>• Weight loss of 25-50% EBW and Weight gain after 2-3 years</li> <li>• Complications include suture line disruption, gastric leak, weight gain</li> </ul>

### **Combined Procedures**

#### *Roux en Y gastric bypass (RYGBP)*

These procedures rely on preventing nutrient absorption from bypassed gut segment to assist weight loss. Roux-en-Y-Gastric Bypass (RYGBP) is the most popular procedure in this group and till about 2-3 years back was the dominant bariatric procedure being performed (Fig. 45.3). Today although it is still the commonest procedure being performed, the gentler and safer laparoscopic adjustable gastric banding (LAGB) appears to be rapidly gaining in popularity. The procedure generates weight loss by limiting gastric capacity, causing mild malabsorption and inducing hormonal changes.

**Surgical technique.** The RYGBP can be performed by open or laparoscopic approach. The latter is technically difficult but associated with a quicker recovery surgical technique.

What is described is the procedure as it is performed laparoscopically. The open technique differs only in the large vertical midline incision made for access.

The patient is placed in a steep anti-Trendelenburg position. The two monitors are placed towards the head end at level of patient shoulder. The ports are positioned as shown in the Figure 45.4. A 30 cc stomach pouch is fashioned using endolinear staplers starting from the lesser curvature and stapling up to the angle of His. The patient is now repositioned in the Trendelenburg tilt and omentum retracted cephalad. The duodenojejunal junction is identified by the ligament of Trilin and the jejunum traced up to 100 cm distally where it is divided using an endostapler. The distal loop is lifted to the gastric pouch for the gastro-jejunostomy. The omentum needs to be divided up to the transverse colon to aid the jejunal loop reach the gastric pouch easily and avoid excessive tension on the gastrojejunostomy by the omental weight. Alternatively, a window in the transverse mesocolon can be made to lift the jejunal loop retrocolic up to the gastric pouch. Various methods have been described for making the gastrojejunostomy. These are:

- The transoral technique where the circular anvil of the CEEA stapler is passed transorally with the help of a Ryles tube.
- The linear stapled technique using an endolinear stapler.
- Hand sewn technique.
- Transgastric anvil placement where the anvil of the CEEA stapler is placed in the gastric pouch laparoscopically.

The diameter of the anastomosis functions best at 12-14 mm. The stapler line may be reinforced by 2-4 lebert sutures placed circumferentially.

The jejunojunostomy is made at a distance of 150 cm on the jejunum from the gastro-jejunosomy site. The proximal jejunal end is usually found to lie just left to the distal jejunal loop at this distance. An enterotomy is made in both loops and jejunojunostomy created using an endostapler. The common enterotomy is hand sutured using 2 'O' silk. It is safe to drain the sites of anastomosis as leaks are known to occur and associated with significant morbidity.

### **Complications**

The RYGBP is associated with a 5 to 10% incidence of morbidity and 1% mortality complications are early and late. Early complications include apneic arrests, GI bleed, atelectasis, rhabdomyolysis, pulmonary embolism, intestinal leaks and acute gastric dilatation. All are associated with significant morbidity and mortality.<sup>28-32</sup>

Late complications include: Anastomotic strictures, marginal ulcers, incisional hernias, Wernicke's type polyneuropathy, cholelithiasis, nutritional complications, weight gain and GI bleed. The patient requires lifelong supplementation with iron, calcium, vitamin B<sub>12</sub> and zinc. Weight loss following RYGBP is rapid with patients experiencing > 70% EWL by 1 year. However, by the end of 3 years, 80% of patients achieve and maintain 55-65% EWL. Effect on comorbid conditions relates well with weight loss and is discussed later.<sup>33-39</sup>

### **Malabsorptive Procedures**

#### *Biliopancreatic Diversion (BPD)*

This procedure was first described in 1979 by Nicola Scopinaro.<sup>40,41</sup> It is the only procedure which results in > 75% EWL up to 20 years after surgery.<sup>42</sup>

### **Surgical Technique**

The procedure is complicated and includes a 200-500 cc gastric pouch, an ileal alimentary limb of 200 cm and a common channel of about 50 cm. The rest of the small bowel is included in the biliopancreatic limb. It forms an extreme in the spectrum of bariatric surgical procedures inducing weight loss at the cost of severe malabsorption. The procedure creates a need for lifelong supervised physician care due to its attendant morbidities. The post cibal syndrome, which occurs due to the extreme shortened gut, induces the patient to eat a healthy diet, i.e. high protein, low carbohydrates. The original procedure recommended elimination of the gastric pylorus with rapid gastric emptying to facilitate weight loss. However, recent advances of a sleeve gastrectomy with pylorus preservation (BPD-DS), as described by Hess in 1988, has shown equally good results with a decrease in the incidence of marginal ulcers and dumping syndrome<sup>43-46</sup> (Fig. 45.5).

### **Complications**

Complications of biliopancreatic diversion are multiple. As this surgery is recommended in patients of super obesity, i.e. BMI>50 kg/m<sup>2</sup>, the anesthesia risk is also higher. The complications are divided into perioperative (< 1 month post surgery), early postoperative (1-6 months) and late complications (> 6 months).<sup>47-53</sup>

Perioperative complications include cardiopulmonary disasters like atelectasis, DVT, Pulmonary embolism, hypoventilation, respiratory arrest, myocardial infarction, arrhythmia, pneumonia, pneumo-/hemothorax. Surgical complications like intraabdominal abscess, bleeding, internal hernia, leak, trocar site infection, wound infection.

Early postoperative in addition to above mentioned complications include cholelithiasis with cholecystitis, dehydration, dyselectrolytemia, marginal ulcers and gastritis.

Late postoperative complications are predominantly concerning malnutrition, especially protein malnutrition, anemia, nephrolithiasis, liver abnormalities, metabolic bone disease and vitamin and mineral deficiencies.

Management of these patients requires a multidisciplinary approach. With an alert, dedicated, empathetic staff, long-term follow-up is a necessity and supplementation with up to 150 gm / day of proteins, 2 gm / day of calcium, Vitamin D, iron, daily multivitamins and trace elements such as zinc and minerals mandatory. Patient also needs regular evaluation for liver disease, renal disease and Osteoporosis<sup>54,55</sup>. Despite an aggressive follow-up regimen, up to 7% patients postoperatively develop protein malnutrition and osteoporotic bone disease<sup>56-59</sup>. A setup that cannot provide these facilities would best avoid performing this bypass procedure as the concomitant morbidity may be crippling for the patient.

**Follow-up**

Patient having undergone obesity surgery should be seen 3 to 8 times, during the first post-operative year, 1 to 4 times during the second year and once or twice a year thereafter. Outcome assessment after surgery should include weight loss and maintenance, nutritional status, comorbidities and quality of life.

Bariatric surgical procedures on the super obese are more likely to incur morbidity and mortality. Not only are surgical complications more common, they are also more severe. It is therefore essential to have a cautious approach in managing these patients. Instead of a primary BPD/BPD-DS it is safer to split the treatment into a two-stage procedure. An initial approach may be only a sleeve gastrectomy followed few months later by a more definitive diversion procedure once the patient has lost some weight and has an improved anesthesia risk.

**Improvement in Comorbidities**

Following weight loss surgery, significant improvement has been observed in obesity related comorbidities. 64-100% of patients with Type II DM show resolution or improvement of this ailment. Similar observations are noted in patients with hypertension, where 25-100% of patients experience resolution or improvement of disease. Dyslipidemia is shown to improve or resolve in 60-100% of patients with this disorder. Patients of sleep apnea preoperatively also show substantial improvement. Improvement is also documented in patients with cardiac dysfunction, gastroesophageal reflux, pseudotumor cerebri, polycystic ovarian disease, degenerative joint disease, stress urinary incontinence severe venous stasis, non-alcoholic hepatic steatosis and overall life<sup>38,60-63</sup> quality of

**Benefits of weight loss surgery**

Diabetes mellitus	77% show improvement	
Hypertension	62% recover completely	
High cholesterol	70% showed decreased	blood levels
Arthritis	Majority improve	
Sleep apnea	Gets cured	
Fertility	Improves	
Lowered risk of cancer		

**CONCLUSION**

The last decade has seen surgical treatment for morbid obesity emerge from being the interest of only a few surgeons to a well-recognized surgical specialty. This has been consequent to a rapid increase in the incidence of obesity over the past two decades catching the attention of the

medical and media community, as well as emergence of minimal access surgery as a technological advance in surgical sciences.

In 1996, the NIH consensus conference stated that bariatric surgery is the most effective therapy to treat obesity and type 2 diabetes, whereas conservative treatment strategies failed in the long-term.

However, it is necessary to understand the surgical morbidity involved. It may be best to educate the patient to the balance between amount of weight loss and surgical morbidity of various bariatric procedures. In this context, although weight loss following restrictive procedures is less compared to the more complex, bypass procedures, the benefit derived is greater in terms of minimal procedure-related morbidity.

To optimize the outcome of the procedure, bariatric surgery should be performed on carefully selected patients, in bariatric centers, specially equipped to care for the obese, within a broadly based, multidisciplinary setting that provides life long postoperative care.

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