Bariatric Surgery: Indian Perspective

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Abstract

Obesity is associated with weight-related mortality and morbidity. Bariatric surgery is defined as the operative manipulation of a normal organ or organ system to achieve weight loss and biological result for a potential health gain. Bariatric surgery numbers have seen a sharp rise in India in the last decade. There are various different bariatric procedures which are being done in India, with sleeve gastrectomy, Roux-en-Y gastric bypass and one anastamosis gastric bypass being the commonest amongst all. The choice of one bariatric procedure over another is generally influenced by a number of factors in our country. The impact of Bariatric surgery on weight loss and morbidity resolution has been significant and has led to it being the treatment of choice for obesity and obesity related morbidity in India. In this article we discuss the current scenario of Bariatric surgery in India.

Keywords: Bariatric surgery; Metabolic Surgery and RYGB

1. Introduction

Obesity is a spreading like an epidemic in India and is associated with weight-related mortality and morbidity. It is a chronic disease characterized by excess body fat, which causes injury to the individual. It has grown all over the world, both in developed and underdeveloped countries. The global burden of obesity is around 10% with more incidence in female population worldwide. This rapidly increasing problem is projected to affect 1.12 billion individuals worldwide by 2030. Bariatric surgery is the most effective intervention to reduce body weight and obesity associated diseases among obese patients and has become a widely accepted approach to treating these disorders [2]. American Society for Metabolic and Bariatric Surgery (ASMBS) advice that bariatric surgery should be considered for patients whose BMI is over 40 regardless of comorbidities, for patients with BMI of 35-40 in the presence of a severe obesity-related comorbidity such as diabetes. In Asian population the guidelines suggest lowering the BMI thresholds by 2.5 points. Bariatric surgery numbers have seen a sharp rise in India in the last decade. India is one of the 10 most obese nations of the world besides being second only to China in the number of type 2 diabetics [3].

Selection criteria in Indian population:
The guidelines laid by Obesity surgical society of India has stated the following criteria for Indian patients with morbid obesity to undergo bariatric procedure [4].

- BMI >37.5 without presence of any obesity related co-morbidities
- BMI > 32.5 with the presence of type 2 Diabetes / any obesity related co-morbidities
- Patients motivated to lose weight and commitment to long term follow up
- Patient should have attempted conservative methods of weight loss and failed
- Bariatric Surgery to be considered only between ages of 18 - 65 years
- Bariatric surgery may be considered in patients more than 65 years in the presence of severe obesity related co-morbidities / disability
- Bariatric Surgery may be considered in patients < 18 years in special situations after pediatrician / endocrinology certification, but after attainment of puberty or completion of skeletal maturity

2. Improvement with Bariatric Surgery
Bariatric surgery induces rapid and durable weight loss among obese patients, and reduces the burden of multiple obesity-associated comorbidities including diabetes, hypertension, stroke, coronary artery disease, and heart failure. Excess weight loss and diabetes control are associated with reduced risk of multiple primary malignancy. Bariatric surgery is also effective in improving OSA [5-7]. In the Swedish Obese Subjects study, involving 4047 obese patients, a total of 2010 patients who underwent bariatric surgery were prospectively matched to a control group of 2037 patients who underwent standard medical therapy, the risk-adjusted hazard ratio for mortality was 0.71 after a mean follow up of 10.9 years. The most common causes of death were myocardial infarction and cancer [8]. A retrospective cohort study that matched 2500 bariatric surgery patients which included 74% gastric bypass, 15% sleeve gastrectomy, 10% adjustable gastric banding, and 1% other procedures to 7462 matched controls in the United States Veterans Affairs system found that surgical patients had significantly decreased mortality after one year of follow up, with a hazard ratio of 0.47 after five years [9].

3. Types of Bariatric Procedures and Complications
The failure of medical therapy for severe obesity and the success of bariatric surgery over the last six decades has led to introduction of series of new techniques and procedures for the treatment of obesity and its comorbidities. Bariatric operations have traditionally been divided into three groups based on their mechanism of weight loss production. Malabsorptive procedures induce weight loss totally by interference with digestion and absorption. Restrictive procedures produce weight loss solely by limiting intake. Mixed malabsorptive and restrictive procedures limit intake and produce malabsorption [10].

The choice of one bariatric procedure over another is generally influenced by a number of factors such as literature results, specific local conditions, and the experience of the surgeon and surgical staff in our country. The commonly performed procedures for weight loss are the sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB), which together account for the vast majority of initial bariatric surgical procedures worldwide and in India. One anastamosis gastric bypass (OAGB) is a procedure which is on the rise in India. We discuss these three procedures below. Less commonly utilized procedures in India are enumerated and briefly discussed as well [11].
1. Roux-en-Y Gastric Bypass
RYGB was traditionally regarded as the standard of care and is one of the most popular bariatric operation. RYGB involves dividing the stomach to create a small pouch composed of cardia and fundus known as the “gastric pouch.” The jejunum is divided around 75-100 cms distal to the ligament of Treitz. The distal “roux limb” is anastomosed to the gastric pouch such that food bypasses the proximal “biliopancreatic limb,” composed of the remnant stomach, duodenum, and associated pancreaticobiliary structures. Meanwhile, the biliopancreatic limb is anastomosed to the roux limb at about 100-150 cms along its length such that the two limbs converge and empty into a “common channel” [12]. Weight Loss RYGB induces loss of about 60% of excess body weight. There is maximum weight reduction in the initial 2 years after surgery, followed by a period of stagnant weight [13] (FIG. 1).

![RYGB Diagram](image.png)

FIG. 1. RYGB.

2. Complications
During the initial stages, overall 30-day morbidity rate for RYGB is about 3.4% for serious complications and 8.3% for any complication. The most important perioperative complications are bleeding, gastrointestinal leak, wound complications, and bowel obstruction, each with an incidence on the order of 1-2%. A recent large database analysis places contemporary venous thromboembolism (VTE) risk at 0.04% in an era when most bariatric centers use routine VTE chemo prophylaxis [14-15]. Patients with diabetes have a higher risk of developing wound complications secondary to glycosylated white blood cells and microangiopathy. Risk factors for short-term morbidity include patient age, male sex, and low institutional case volume. The overall mortality rate is very low [15]. RYGB patients can complain of abdominal pain that may be acute or chronic in nature. Nearly half of these patients require CT imaging to evaluate the pain. Causes of abdominal pain are variable and workup should exclude problems related specifically to RYGB such as marginal ulcers, dumping syndrome, internal hernias, gastric remnant distension, bowel obstruction, and cholecystitis. Often, the etiology is not identified [16].

Marginal Ulcer is seen in around 0.6-7.6% of patients. The etiology of a marginal ulcer is unclear, but possible factors include large pouch size, smoking, NSAID use, anastomotic tension, corticosteroid use, foreign suture material used at anastomosis, and anticoagulation. They are confirmed endoscopically. The symptoms can usually be treated medically with proton pump inhibitors plus or minus sucralfate and avoidance of risk factors such as smoking or NSAIDs. Less frequently, marginal ulcer can present with gastrointestinal bleeding, perforation, or fistula, occasionally prompting reoperation [17].
RYGB patients are at risk for herniation of small bowel through mesenteric defects. The incidence in the Indian population has been reported to be approximately 1%-4% [18]. Internal hernias can present any time after RYGB, but are commonly seen 2-3 years post-operatively in patients who have lost significant amounts of weight. The presentation can frequently be atypical and demands a high index of suspicion with immediate Computed tomography [CT]. CT can be useful in identifying internal hernias especially if mesenteric swirling is visualized, but is often non-revealing. If clinical suspicion for internal hernia is high based on symptoms, an operative exploration is warranted in form of re-laparoscopy or laparotomy depending upon surgical expertise, given the high risk of progression to bowel necrosis [18,19]. Important among nutritional deficiencies are B12 deficiency, iron deficiency, anemia, and hypovitaminosis D, as these are readily deficient in Indian population due to more vegetable based diet in our dietary habits [20].

Bone mineral density decreases following surgery, placing patients at increased risk for fractures. Other micronutrient deficiencies such as folate, zinc, copper and selenium have been reported in literature. Patients who undergo RYGB should have periodic surveillance of important micro and macro-nutrient levels [21,22]. Early dumping manifests due rapid emptying of gastric contents into small intestine within 30 minutes of food ingestion leading to symptoms due to osmotic fluid shifts and hormonal responses to food occurring in around 20% of Indian patients; late dumping describes a reactive hypoglycemia that occurs hours postprandially due to insulin over secretion, 10% of RYGB patients in India develop symptoms of late dumping syndrome.

The dumping phenomenon is thought to be high in indian population due to high carbohydrate quantity in Indian diet. Although dumping symptoms have been associated with decreased quality of life, but they may influence eating behaviors that contribute to post-operative weight loss [23,24].

3. Sleeve Gastrectomy

SG involves resection of the greater curvature of the stomach, leaving a tubular remnant with markedly restricted capacity. Initially used to bridge high risk patients to biliopancreatic diversion, SG was ultimately accepted as a standalone alternative. SG functions by reducing approximately 80% of the stomach with remaining pouch resembling a tube leading to decreased appetite in patients post operatively. Additionally, due to resection of gastric fundus, LSG is associated with decreased ghrelin levels. Major advantages of LSG are laparoscopic feasibility, short-hospital stay, volume restriction with preservation of pylorus and gastric function.

SG is the most common Bariatric surgery procedure at present in India [25].Randomized controlled trials comparing RYGB and SG, including the recent SLEEVEPASS and SM-BOSS trials, demonstrate the procedures are comparable in terms of excess weight reduction [26,27]. Maximum loss in weight was seen within six months of surgery and which followed a slow and steady decrease in weight in most of the patients.

The initial loss in weight is also dependent on the preoperative excess weight. However, some data from large, long-term cohort studies suggest RYGB is probably more effective than SG in reducing excess weight beyond five years. The drawbacks associated with LSG being a non-reversible procedure and higher early risk of stapling complications and tendency for long-term vitamin deficiencies [28,29] (FIG. 2).
Early complication (within 2 weeks) includes gastric leakage, hemorrhage, abscess, port site hernia, pancreatic fistula and rarely acute pancreatitis. Delayed complication (after 2 weeks) includes nutritional deficiency, GERD, stricture formation and port site hernia. The incidence of staple line bleed and gastrointestinal leak, each occurring in less than two percent of Indian patients. The incidence of gastrointestinal leak is lower among SG as compared to RYGB patients. Many of these complications can be treated endoscopically, but there is always a diagnostic dilemma in SG patients and there any many reports of delayed leaks in SG patients. Surgeons continue to debate the relative importance of surgical technique versus patient factors in the risk of leak [25,30]. Anemia, iron, folate, vitamin B12, and vitamin D deficiencies are seen and require frequent surveillance and adherence to daily multivitamins, B12 and calcium supplementation as in RYGB patients. The rate of early dumping symptoms after SG is similar to that following RYGB, but SG patients seem to experience less late dumping [31].

4. One Anastamosis Gastric Bypass (OAGB)
OAGB has become a popular bariatric surgery procedure. In India OAGB is the 2nd most common procedure following the sleeve Gastrectomy [32]. The operation is based on general surgical principles combining Collis Gastroplasty, with a Billroth II ante-colic Loop gastro-jejunostomy. The Gastric tube should as be wide as the esophagus and not tight as in SG, and similarly the gastro-jejunostomy should be large and non-obstructive. The length of the pouch is an important factor. The jejunum is divided around 150-250 cms distal to the ligament of Treitz. A 45 or 60 mm stapler cartridge is used for the gastrojejunostomy between the posterior wall of the gastric pouch and the anti-mesenteric border of the jejunum. The mechanism of weight loss and diabetes control in OAGB is similar to RYGB. While the ASMBS does not recognize yet the MGB/OAGB in the official guidelines, it is a standard bariatric procedure in India. Starting from Rutledge’s first report in 2001, many bariatric surgeons have expressed serious concern regarding the use of OAGB worldwide and in India [33,34]. Literature reports less than 1 % intra-operative complications in patients undergoing OAGB and around 3% complication in Early Post-operative period, which is comparable to RYGB and SG.

There is around 10% complication rate in long term in patients who underwent OAGB , which may require a revisional bariatric procedure .Leaks following OAGB are dangerous and difficult to manage due to the presence of both acidic and alkaline fluids . However the rate of internal hernia is less as compared to RYGB. Protein energy malnutrition is higher as compared to RYGB, while the other macro and micro-nutrient deficiencies are similar to RYGB [35] (FIG. 3).
5. **Laparoscopic Adjustable Gastric Banding (LAGB)**

LAGB uses an inflatable band around the gastric fundus and cardia to restrict food intake and stomach compliance. However, it is associated with a high rate of reoperation at an unacceptable cost to patients, with the fact that only few handful of surgeons are now doing this procedure in India. Although some authors advocate for its continued utility in selected patients. At various high volume bariatric centers in India, procedures to remove gastric bands now outnumber placements. Weight loss among LAGB patients appears to be inferior to that of SG and RYGB [36]. Although the 30-day morbidity rate is about 1% and lower than that of RYGB, GB patients are much more likely to suffer major adverse events or reoperation in the years following surgery. In a large database analysis that included over 25,000 patients who underwent GB with mean follow up of 4.5 years, about 20% of patients underwent an average of nearly four reoperations [37,38].

6. **Biliopancreatic Diversion (BPD)**

BPD consists of a partial gastrectomy in combination with a Roux-en-Y gastro-ileostomy. A variant of this procedure is duodenal switch, which includes sleeve gastrectomy. This procedures are highly efficacious in weight loss induction with an effect size larger than that of RYGB and a better diabetes control. However due to highly vegetarian diet in Indian Population the numbers In India are very low [39].

7. **Intragastric Balloon (IGB)**

IGB are intended for short term use, are not an alternative to bariatric surgery. A recent review of intragastric balloons meta-analyzed four controlled trials and found the devices led to mean total body weight loss of 9.7%, which is significant but small in relation to standard bariatric procedures. There have been multiple reports of gastric rupture and hemorrhage following intragastric balloon placement, the outcomes of which remain undetermined. Also few patients also report a constant feeling of retching after IGB placement, which has limited its use in India [40,41].

8. **Mechanism of Action of Weight Loss and Metabolic Surgery**

The exact mechanism by which bariatric procedure cause weight loss not fully understood till now. There is an ongoing debate regarding the underlying physiology of weight loss and blood glucose homeostasis following bariatric surgery. It
appears to be multifactorial and mediated by interrelated changes in enteroendocrine function, bile acid circulation, behavior and appetite, and intestinal microflora. Following surgery, patients experience significant changes in food preferences and eating behaviors, with decreased caloric intake lasting for years following intervention. Foregut hypothesis and Hindgut hypothesis has been advocated for the results. Bariatric procedure increase PYY and GLP-1, intestinal peptide hormones secreted by L cells in the distal gut that are normally increased following meals. PYY likely acts centrally and increases satiety; GLP-1 also acts centrally to increase satiety and potentiates insulin responsiveness; and its analogues are common and effective diabetes medications. Bariatric surgery also increases bile acids, which have various metabolic functions including regulation of metabolically important hormones such as GLP-1 and FGF-19. There are intestinal luminal morphologic and functional changes following the procedure. Malabsorption of macronutrient content appears to play a partial but relatively minor role in weight loss after surgery [42].

9. Impact of Surgery on Comorbidities
RCT have shown that in patients with obesity associated with diabetes, Bariatric surgery is the best and highly effective in controlling hyperglycemia. The Diabetes Surgery Study randomized 120 adults with obesity and diabetes to intensive medical management alone or in combination with RYGB. After a year, 49% of surgical patients achieved a composite endpoint combining control of blood sugar, blood pressure, and cholesterol levels as compared to 19% of the non-surgical arm, and they required significantly fewer medications. After three years, 28% of RYGB patients as compared to 9% of controls met criteria for the primary endpoint, demonstrating the durability of surgical intervention [43]. In various studies done on efficacy of Bariatric procedures diabetes resolution has been reported to be around 90% in RYGB patients and 80% in SG patients. In Indian studies Resolution of Hypertension has been reported to be 60%-80 % patients, sleep apnea resolution in range of 91%-100% patients, improvement in GERD is reported to be around 60%-73 % patients and improvement in joint pain in around 60% patients [44]. Bariatric procedures are hypothesized to slow or reverse non-alcoholic fatty liver disease (NAFLD) by improving lipid metabolism and insulin sensitivity and by reducing the chronic inflammation of obesity. A prospective study confirmed the dramatic effect of WLS on NAFLD using serial MR imaging. Resolution of NASH following WLS is seen among patients with improved insulin sensitivity and increased weight loss [45].

10. Conclusion
Bariatric surgery is the most effective treatment for obesity. Its effects go beyond weight loss, in a high percentage of cases achieving remission of comorbidities associated with obesity and reducing mortality. Bariatric surgery comprises a number of procedures and interventions that have proved durably efficacious in treating a number of obesity-related diseases. Bariatric surgeries have an acceptable safety profile and continue to improve and evolve over time. It is gaining popularity in India and more Bariatric centers are coming up in the country. The choice of one bariatric procedure over another is generally influenced by a number of factors such as specific local conditions, and the experience of the surgeon and surgical staff in our country.

REFERENCES


