

# Obesity and metabolic surgery

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This issue of European Journal of Endoscopic Laparoscopic Surgery is devoted to the momentous topic of the emerging field of the surgery for obesity and metabolic surgery. Since the 1950s, obesity has been increasing steadily throughout the developed and developing world, but more rapidly in the past 20 years. There appear to be multiple factors, but the major causes are a sedentary lifestyle (especially with computers and TV) and an increase in the frequent consumption of available high-caloric convenience foods. This has particularly increased in countries where society has become affluent.

There are various definitions of obesity, but one that is frequently used pertains to body mass index kg/m<sup>2</sup> (BMI). A BMI of 25–30 has been designated as overweight, 30–35 as obesity, 35–40 as moderate obesity, and >40 as severe or morbid obesity. Morbid obesity is associated with progressive, serious, debilitating diseases. An arbitrary decision is that BMI  $\geq$ 60 represents super-obesity. However, in Asians, the diseases associated with obesity occur at a lower BMI. Waist circumference has also been used as a measure of obesity, although the degree will depend on patient's height. Obesity is associated with diseases as it increases—particularly the metabolic syndrome with diabetes type 2, atherosclerosis, cardiac disease, dyslipidemias, fatty liver, sleep apnea, urologic and gynecologic problems, and development of certain cancers.

When severe obesity (BMI  $\geq$ 40, or >35 with co-morbidities) has been refractory to conservative treatments (diet and exercise methods), patients are considered for bariatric

surgery. These patients must understand the implications and sequelae of the operation with potential complications, accept this, take the vitamin and mineral supplements and adequate protein following the operation, and agree to lifelong follow-up by the surgeon and the bariatric team.

Anesthesia for the operation must be undertaken by an anesthetist who has a particular expertise and interest in obese patients, who are often challenges. Indeed, the high-risk patients or those with sleep apnea may require intensive care postoperatively.

The operations for severe obesity have undergone development since the 1960s with intestinal bypasses (malabsorptive), followed in the 1970s by gastric bypasses and then gastroplasties (restrictive). The operations have undergone various modifications, and advancements, as more effective and safer procedures have been achieved. Furthermore, all bariatric operations can now be performed by laparoscopy, which requires expertise but allows less trauma and earlier recovery for the patient.

In the 1990s, there was extensive use of the adjustable gastric band, which was the first operation which particularly lent itself to the laparoscopic technique. The hollow band about the very proximal stomach is attached by a tubing to a reservoir (port) which is placed in the subcutaneous tissue on the fascia. The reservoir can be used to inflate or deflate the band as necessary, with sterile saline. Banding has provided successful weight loss, but generally less than the other operations. It has the potential for



band slippage or erosion and there can be problems with the subcutaneous reservoir.

Laparoscopic gastric greater curvature plication has developed in the past 10 years, with inversion of the stomach against a lesser curvature tube for sizing. It is a fairly safe operation, but has some problems of enlargement of the gastric channel after the first few years, with regain of ability for sizeable oral intake.

Laparoscopic sleeve gastrectomy is at the moment the most common bariatric operation internationally. It consists of a lesser curvature sleeve, with resection of the greater curvature portion of the stomach down to the antrum. It has been associated with occasional early proximal leaks and later reflux. It has shown very good weight loss of >50% of excess body weight in expert hands, but some late regain of weight has been observed after 4 years.

The laparoscopic mini-gastric bypass (MGB) or one-anastomosis gastric bypass has been performed starting in 1997 by Dr. Robert Rutledge, but there had been some prejudice against the MGB, apparently unwarranted. It is a simple procedure, with a lesser curvature gastric sleeve to just below the crow's foot, and avoids dissection of the cardia. The sleeve is anastomosed to an antecolic loop of jejunum about 200 cm distal to Treitz' ligament. The remainder of the stomach is left in situ. The anastomosis to the jejunal loop can be moved proximally or distally depending on the need for weight loss. The gastric sleeve gives very slight restriction, and sizeable meals can be taken; however, the weight loss is through loss of fat (and some carbohydrate) through malabsorption. The MGB has now become a mainstream operation in many countries in the world, particularly in India. Fears of bile reflux and also of development of carcinoma in the gastric channel and esophagus have actually not been borne out, and the MGB is rapid and quite safe, with durable weight loss and resolution of type 2 diabetes in >75% of patients. Supplements are necessary, especially iron, calcium, vitamin D, dairy milk, yoghurt, etc.

Laparoscopic Roux-en-Y gastric bypass (RYGB) has been a further development of open RYGB which actually commenced in the 1970s. Many surgeons are experts in this procedure, which avoids gastroesophageal reflux. The RYGB has a degree of restriction and malabsorption, with generally very good long standing weight loss. However, problems of leak, marginal ulcer and internal hernias have been features of laparoscopic RYGB in a minority of cases.

Laparoscopic sleeve gastrectomy with duodeno-jejunal bypass has developed in the past few years, particularly in Spain, and is a modification of sleeve gastrectomy, with malabsorptive weight loss added by the bypass. This operation holds considerable promise, but is still being assessed. It is not a difficult procedure. The duodeno-jejunal bypass originates in the right gutter and is slightly more difficult than the anastomosis under direct vision of the MGB.

Robotics have been introduced by various workers throughout the world into bariatric surgery. It must be performed in excellent experienced hands, and appears to make the operation more accurate and easier, although there is some disagreement on this.

Single-incision laparoscopic surgery (SILS) has been developed by many workers in the field for their bariatric operations. This generally consists of a single incision at the umbilicus, with an apparatus which allows multiple instruments to navigate through the umbilical site to perform the surgery. Reduced laparoscopic port techniques appear to allow a faster recovery, and the cosmetic appearance is obviously superior.

Because of regain of weight, in adequate weight loss, or unacceptable sequelae following bariatric operations, revisional surgery may become necessary. Revisions must be performed by highly experienced surgeons, or by the original surgeon if an expert, and requires particular skill. Leaks after revisional operations are more common than after primary cases. However, in certain cases, a revision can result in the proper weight-loss effect.

Obesity is now a feature in some adolescents throughout the world, particularly in affluent countries. Massively obese adolescents are ridiculed by their same-age acquaintances. They are starting to manifest the major co-morbidities of massive obesity already in their teens-impaired glucose tolerance, hypertension, dyslipidemia, sleep apnea, dyspnea, delayed menstrual periods, and other serious sequelae. Bariatric surgery may thus be necessary in teens who develop major obesity-associated diseases, and again the families and patients must understand the needs and cooperation with the bariatric team post-surgery. In adolescents, the surgery should be done by very qualified bariatric surgeons with expertise in pediatric surgery.

The most important effect of massive obesity is the rapidly increasing type 2 diabetes throughout the world. Weight

loss has become mandatory to thwart the progress to the diseases which follow diabetes. Visceral adipose tissue is associated with impaired glucose tolerance and metabolic and inflammatory factors. After bariatric surgery, besides the weight loss, it has been found that with malabsorptive procedures, the rapid transit of intestinal contents through the ileum leads to the secretion of incretins.

The most important of these ileal intestinal hormones is secretion into the bloodstream of glucagon-like peptide-1 (GLP-1), which has a stimulatory and hyperplastic effect on the beta cells in the pancreas; therefore GLP-1 can cure or alleviate type 2 diabetes.

One tactic to relieve this diabetes is a sleeve gastrectomy with interposition of a segment of ileum proximally in the small bowel, producing GLP-1 on early contact with food.

The bariatric team must follow the patient after bariatric surgery. Patients absolutely must understand that they have to return for these visits, stay under scheduled surveillance, and be cooperative, to prevent long-term sequelae with regain or excess weight loss and malnutrition.

The various complications of the operation must be treated early. They may consist of excess weight loss and vitamin and mineral deficiencies. For example, Wernicke's encephalopathy in those with early vomiting necessitates IV or IM B1 before the neurological defects become permanent. Other nutrients such as vitamin D (which is often low already preoperatively), calcium, iron, B12, and other supplements are necessary. Complications such as leaks, ulcers, obstructions, reflux, and even cancer must be considered.