BASIC OBESITY MANAGEMENT ACCREDITATION 4
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Unit No. 6

INTENSIFYING TREATMENT: BARIATRIC SURGERY

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ABSTRACT

Obesity is a chronic disease that is increasing at epidemic rates worldwide. Diet and lifestyle intervention form the basis of healthy weight management but are not effective in promoting substantial weight loss in morbidly obese individuals. Bariatric surgery can provide not only profound and sustainable weight loss but also excellent control of attendant comorbidities, particularly type 2 diabetes mellitus. Despite the high quality of evidence from numerous prospective randomised trials and cohort studies, fears and concerns regarding the safety and aggressiveness of surgery is limiting the acceptance of bariatric surgery as a viable treatment option. Newer, less invasive procedures hold promise in filling the gap between conservative and surgical therapies for weight loss.

Keywords: Obesity, Weight loss, Bariatric surgery, Metabolic surgery, Gastric bypass, Gastric band, Gastric sleeve, Gastric balloon, Endoscopic sleeve gastroplasty

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INTRODUCTION

Bariatric surgery traditionally refers to surgical procedures carried out on the gastro-intestinal tract to reduce the amount of food consumed and/or nutrients absorbed by the body. This has given rise to the concept that bariatric surgery induces "restriction" and "malabsorption". The principal indication for bariatric surgery is to enable significant and sustained weight loss in morbidly obese individuals. The resulting benefit to obesity-related medical and physical comorbidities is not insignificant.[1] As published in a recent Cochrane review, "surgery results in greater improvement in weight loss outcomes and weight-associated comorbidities compared with non-surgical interventions, regardless of the type of procedures used."[2]

Despite its effectiveness, the uptake of bariatric surgery remains low. The reasons for this may lie with incomplete understanding of the underlying physiology of obesity and limited awareness of treatment options, including risks and outcomes. This article looks at how bariatric procedures have evolved over the past 50 years to minimise risk by reducing invasiveness and morbidity, thereby promoting acceptance.

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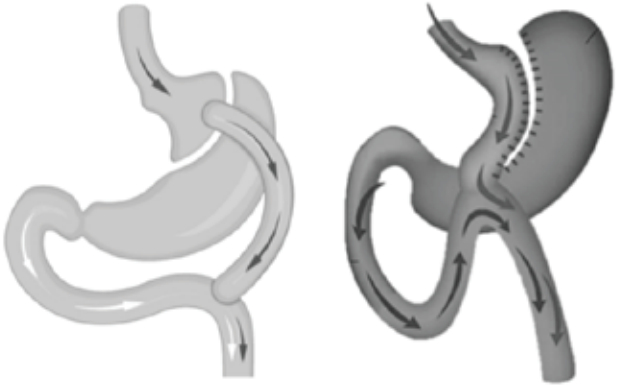
TYPES OF PROCEDURES

Gastric Bypass

The first safe and effective weight loss surgery to be performed on a large scale was the gastric bypass introduced in the 1960s, which involved stapling the stomach to create a small gastric "pouch" and creating a gastro-jejunostomy in order to divert nutrient passage further down the alimentary tract into the mid-jejunum, bypassing the duodenum and proximal jejunum. The advent of laparoscopy led to a dramatic rise in gastric bypass surgery in the USA and worldwide. Today, two types of gastric bypass are typically performed: the Roux-en-Y, and the one-anastomosis gastric bypass (refer to **Figure 1**).[3,4] Notwithstanding the different types of gastro-intestinal anastomoses, weight loss results and improvement in co-morbidities (especially diabetes) following the two procedures are largely similar.

Early morbidity of gastric bypass is approximately 4 percent and usually related to bleeding, perforation, and leakage.[5] Late complications include intestinal obstruction, marginal ulceration, and anastomotic stenosis. Vitamin and mineral supplementation for life is mandatory after all types of gastric bypass surgery. More aggressive procedures include the "distal gastric bypass", "bilio-pancreatic diversion", and "duodenal switch". These make up less than 5 percent of bariatric procedures as they are associated with higher surgical and nutritional morbidity in the long term.

Figure 1. Roux-en-Y gastric bypass (left) and one-anastomosis gastric bypass (right)



Gastric Band

Adjustable gastric banding was introduced in 1993 and saw a dramatic uptake worldwide.[6] The gastric band is deemed adjustable due to an expandable bladder on the inside. The bladder is connected by a tubing to a port, which is implanted subcutaneously. Fluid is added or removed from the band by cannulation of this port in the doctor's office every 4-6 weeks.

The "reversibility" and "no-cutting or stapling" appeal of the procedure was soon supplanted by complications relating to the placement of a silicone ring constricting the upper part of the stomach (refer to **Figure 2**). Despite sutures placed to fix the band at the level of the gastric cardia, slippage remained a troublesome complication. Rapid swallowing invariably led to choking, retching, and vomiting. Inadequately masticated pieces of meat and other firm chunks of food might get stuck above the band and require a late-night visit to the emergency room. Most patients had their bands removed within 10 years of placement as they could not tolerate the mantra of "small bites" and "chew slowly".

In the past decade, gastric band insertions have plummeted worldwide. In Singapore, the lap band™ is not currently available, although there remains a sizeable minority of patients who have successfully lost weight and return to the clinic for band adjustments from time to time. The vast majority of gastric bands have been removed, with some patients electing to convert to a different bariatric procedure such as gastric bypass or sleeve to improve or maintain their weight loss.[7]

Figure 2. Gastric Band

Gastric Sleeve

The procedure that emerged to take the place of the band was the laparoscopic vertical sleeve gastrectomy, or simply, the "gastric sleeve".[8] During this procedure, a bougie or calibration tube is placed along the lesser curvature and about 70-80 percent of the stomach is removed (refer to **Figure 3**). This changes the stomach into a tubular shape. Most of the body and fundus along with the greater curvature of the stomach is resected using a stapler, providing a smooth and haemostatic cut line.

Gastric sleeve numbers have overtaken all other procedures as the most popular bariatric surgery worldwide.[9] The main reason for this lies with the simplicity and efficacy of the sleeve: reduction of meal portions without requiring any foreign body placement or diversion of food passage. The main problem with this procedure is the potential for narrowing or twisting of the gastric tube, obstructing food passage, and causing pain, reflux, and vomiting. Bleeding and leakage from the staple line have also been reported. Post-operative management following the sleeve procedure is simpler than after gastric bypass as there is no intestinal component to the surgery.

Figure 3. Gastric Sleeve

Gastric Balloon

First approved by the FDA in 1985, there are several types of gastric balloons available in Singapore today. The aim of the gastric balloon is to fill up the stomach and reduce hunger and cravings (refer to **Figure 4**). Gastric balloons are typically placed and removed by endoscopy and can be kept in the stomach for up to a year. The Spatz balloon is adjustable, so that an initial smaller volume can be placed to avoid nausea and cramps. Once the stomach is adapted to the balloon, it can be inflated further to occupy more space with the expectation of driving weight loss. Expected weight loss is in the range from 10-15 percent.[10]

Figure 4. Gastric Balloon

NEWER PROCEDURES

Over the past decade, there has been a clear trend of developing less invasive weight loss interventions that provide better weight loss than diet, lifestyle, and pharmacotherapy, but lower risk for adverse events when compared to bariatric surgery. Two new products are disrupting the bariatric landscape in Singapore.

Gastric Pill Balloon

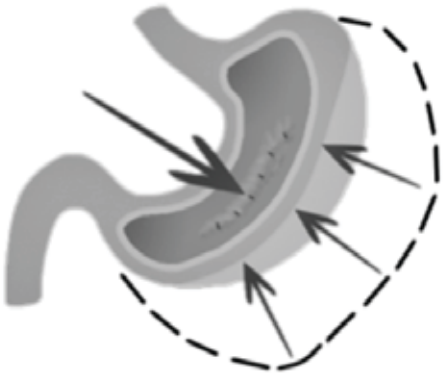
The first is the Elipse pill balloon. The balloon is tightly packed into a capsule that can be swallowed in the clinic. No anaesthesia or endoscopy is required. An x-ray is done to check that the capsule has entered the stomach prior to inflation. The entire placement can be completed in 20 minutes with the patient actively participating.

Balloon removal is even more efficient. The Elipse has a biodegradable control valve that opens and empties after 16 weeks, and the fully deflated balloon passes out naturally with stool. Weight loss after Elipse is comparable to that of other intra-gastric balloons despite remaining in the body for only four months.[11]

Endoscopic Sleeve Gastroplasty

The other product that received full HSA licensing in 2021 is the Overstitch device, a remarkable convergence of concept and technology. It does exactly what its name suggests. The Overstitch is a suturing tool that is mounted on an endoscope. It can be used to place sutures during endoscopy, for example, to close defects after removal of polyps, suture bleeding ulcers, etc. For obese patients, the Overstitch can be used to perform a stomach plication procedure, restricting gastric capacity and distensibility. The stomach is sutured from within during a gastroscopy, reducing its volume by 70 percent, similar to that achieved by a gastric sleeve surgery (refer to **Figure 5**). This new procedure is called an endoscopic sleeve gastroplasty (ESG) or "endo-sleeve".[12,13] A recent multi-centre RCT demonstrated 13.6 percent total body weight loss after one year for individuals with class 1 and 2 obesity following ESG.[14]

Figure 5. Endoscopic Sleeve Gastroplasty



WEIGHT LOSS AND METABOLIC IMPROVEMENT

Bariatric surgical interventions produce 10-30 percent weight loss, maintained for at least 20 years.[1] Glycaemic control is dramatically improved in up to 90 percent of patients, so much so that bariatric surgery has been renamed "metabolic" surgery and added to the treatment algorithm for diabetes management in most countries.[15] The name is indeed apt because of its powerful impact on hypertension, dyslipidaemia, fatty liver, and polycystic ovarian syndrome. The physical effects of weight loss leading to improvement in obstructive sleep apnoea, musculoskeletal pains, chronic leg swelling, and overall quality of life cannot be overstated.[16-18]

HOW BARIATRIC SURGERY WORKS

The goal of bariatric surgery is to enable individuals to feel satisfied with smaller meal portions. Limiting gastric capacity directly impacts the size of a meal one can consume. This effect alone is responsible for most of the weight loss one experiences after bariatric surgery. Furthermore, diversion of nutrient flow distally into the gut will reduce the total amount of food that can be digested and absorbed. In the early days of bariatric surgery, extensive intestinal bypasses were commonly performed. They were overly effective in reducing nutrient absorption, to the point of inducing diarrhoea, malnutrition, and potentially liver failure. That is why many of those procedures are obsolete and gastric bypass procedures carried out today generally retain an adequate length of small intestine (referred to as the common channel) for nutrient absorption.[19]

GUT-BRAIN FEEDBACK

The sense of satiety and regulation of appetite is complex, with recent evidence pointing to fundamental roles for genetic, homeostatic, and hedonic mechanisms.[20] "Restriction" of food intake and "malabsorption" of nutrients were long believed to be the fundamental effects of bariatric surgery. However, critical analysis of eating behaviour and gut-brain signalling after bariatric surgery suggests a far more complex relationship between digestive and metabolic processes in the body. It is likely that alteration of nutrient passage through the stomach and intestine influences appetite control centres in the brain via a variety of neuro-biological feedback pathways.[22] Several candidates identified to contribute to weight loss after gastro-intestinal manipulation include altered secretion of the incretin hormones ghrelin, PYY, oxyntomodulin and GLP-1, gut microbes, and bile acids.[23]

The ultimate control of what and how much we consume appears to rest not in the stomach or adipose tissue but in the brain. To simply "eat less and move more" as is often advocated by many self-styled diet gurus and obesity experts fails to recognise the ongoing struggle between nutrient sensors, endocrine factors, and neural and emotional signals.[21]

PROCEDURE CHOICE AND INFORMED CONSENT

It is ultimately the patient who must live with the procedure, hence it is imperative that an informed choice is made. Most of the fears and concerns that patients express are related to the surgery itself. In modern bariatric surgery, all procedures are done by laparoscopy or keyhole technique with a typical hospital stay of 1-2 days. Adverse event rates in experienced centres are below 5 percent.[24] Pain and general side effects of surgery are similar to that of other GI procedures such as appendectomy and cholecystectomy. Newer alternatives such as the Elipse balloon and endoscopic sleeve gastroplasty are appealing because they are even less invasive, are reversible, and can be done on an outpatient basis.

Pure gastric restrictive procedures rarely bear any long-term nutritional risk, although women may be at risk of iron deficiency. It is different for gastric bypass procedures where vitamin and mineral supplementation must continue throughout the patient's life.[25] This is usually acceptable to a patient who has been on treatment for diabetes, hypertension, etc because they will be swapping out their medications for supplements.

In Singapore, bariatric surgery is regarded as a medical treatment for obesity if the body mass index is >32.5 kg/m^2 and if related medical and physical comorbidities are present.[26] Medisave may be used for reimbursement and many of the integrated shield plans have permitted the inclusion of these conditions, with type 2 diabetes mellitus, fatty liver, polycystic ovarian syndrome, metabolic syndrome, and obstructive sleep apnoea in particular among their approved indications for bariatric surgery.

FOLLOW-UP

Adapting to new dietary and lifestyle habits can often be a challenge. Many patients do not realise at the outset that despite having bariatric surgery, these daily habits are the key to shed weight and keep it off. That is why close clinical follow-up is important and positively correlated with greater weight loss, regardless of procedure type.[27] Visits should be scheduled with not just doctors but also the dietitian and exercise therapist. Some patients may benefit from psychological supervision during the early adjustment period.

During follow-up, it is important for clinicians to identify any problems or complications early. For example, vomiting may sometimes occur if a patient eats too quickly or drinks fluids at mealtimes. However, if pain or vomiting persist, it may be a symptom of an underlying stenosis or ulcer, which may require investigation and treatment. On the other hand, it is rare for a patient to regret their decision to undergo bariatric surgery.[28] When questioned, most patients say that they wish they had surgery earlier.

CONCLUSION

With proper planning, consideration, and procedure selection, bariatric surgery can be a powerful tool to tackle obesity and its related comorbidities. Successful weight loss after intervention requires close monitoring and follow-up by a multidisciplinary team. In 2022, a wide variety of bariatric procedures are available in Singapore, from office-based treatments to outpatient endoscopic therapy and finally laparoscopic surgery.

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LEARNING POINTS

- **Obesity is a chronic neuro-biological disorder that is an important risk factor for cardio-metabolic disorders and cancer.**
- **Bariatric surgery is an effective treatment for obesity and its comorbidities.**
- **Bariatric procedures alter the amount and timing of nutrient passage through the digestive system.**
- **Gastro-intestinal alterations after bariatric surgery lead to changes in gut hormones and feedback signalling to appetite control centres in the brain.**
- **Close multi-disciplinary follow-up is essential to promote successful weight loss and avoid nutritional complications in the long term.**