

Surgery in the Management of Obesity

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Introduction

Obesity is becoming an increasing problem in most countries both for affected individuals and for the state. As the severity of obesity increases, individuals experience a deterioration in quality of life related to lowered self-esteem, reduced acceptance by society, impairment of physical capabilities and the development of a variety of potentially serious co-morbidities. These include diabetes, hypertension, dyslipidaemia, asthma, obstructive sleep apnoea, obesity hypoventilation syndrome (Pickwickian syndrome), degenerative disease in weight bearing joints, and depression. Life expectancy is substantially reduced as a result. Society too is affected by the deteriorating health and capabilities of some of its members not to mention the very considerable associated healthcare costs related to the management of co-morbidities.¹

As the problem has grown, so too has an acceptance, albeit reluctant, of our inability to manage it effectively. While the standard approaches of dieting, exercise, behaviour modification, hypnotherapy and medication are undoubtedly all capable of short-term success in some individuals, in the longer-term they remain woefully ineffective, and indeed there is an almost inevitable continuing weight gain noted over time. Surgery was first considered as an option for severe obesity in the late 1950s when the initial small intestinal

bypass operations were performed. Although very effective at achieving substantial weight loss these ***malabsorptive procedures*** were associated with a high rate of serious and even life-threatening metabolic and nutritional complications which meant their use was discontinued. However surgical procedures for severe obesity have continued to evolve over the ensuing 40 years to the point that highly effective and reasonably safe and acceptable options do now exist. Unlike the original jejuno-ileal bypasses which worked by producing malabsorption, the newer operations, generically referred to as ***restrictive procedures***, function by restricting intake. Perhaps as a result of the considerable morbidity and even mortality associated with the early forms of these operations coupled with a prevailing view that weight control should be within the grasp of the individual, surgery has not enjoyed favour with either health professionals or the Public at large. However, with the presently available and practised procedures it is entirely appropriate that this rather negative attitude should be revisited and perhaps modified.

Indications for Surgery

Surgical procedures for the control of obesity were devised for use in those with so called morbid obesity which has usually been taken to indicate a weight of more than double ideal body weight. However, obesity is probably best defined by Body Mass Index (BMI). Overweight is present with BMI over 27, obesity

with BMI over 30 and morbid obesity with BMI over 40. As long ago as 1991 a Consensus statement from The National Institutes of Health in the United States recorded that surgery (even as it was then performed) was an appropriate modality of treatment for those with BMI over 40 or over 35 in the presence of associated significant co-morbidities.² This remains an appropriate statement today and suitably defines those individuals for whom surgery is indicated.

Surgical Options

A variety of surgical procedures are currently performed for severe obesity. In general terms the particular operation offered is dictated by the preference of the surgeon rather than by any agreed set of circumstances which make that procedure preferable. Each has its advantages and disadvantages but each now has a long enough history of use for comparative comments to be made. Four generic procedures are in use today.

Roux en Y Gastric bypass

This operation has been and probably remains the “gold-standard” though because of its technical difficulty, perceived or otherwise, and the morbidity associated with the early forms of the operation many surgeons have sought simpler operations in answer to the same problem. Hence the impetus for the development of the newer operations discussed below. The prototype gastric bypass was developed in the mid 1960s and entailed creation of a small (30ml) gastric pouch based on the fundus of the stomach to which was anastomosed a Roux loop (defunctioned) of jejunum (see Fig 1). This was a difficult operation to perform in the morbidly obese, for reasons related to poor access

to the fundus of the stomach but weight loss was excellent and invariable. However, late weight gain was not uncommon because of enlargement of the pouch or anastomosis or both. Current modifications to the procedure were made in the late 1980s and have made this both an easier operation to perform (and therefore a safer one) and one with a more durable weight loss. This was achieved by constructing the small gastric pouch down the lesser curve of the stomach (which is much less susceptible to enlargement) and the placement of a silastic ring around the pouch to delay its emptying and fix the effective outlet size (see Fig 2). The principal remaining reason for disappointment from this operation relates to a technical failure with partial staple-line disruption which may occur in 10-20% of individuals over time. This may be overcome by performing gastric transection between staple lines, (either at the initial operation or at the time of revision surgery) thus completely isolating the lesser curve pouch from the remainder of the stomach (see Fig 3). These are complex operations to be undertaken laparoscopically, but this has certainly been done and mastered in some (a few) centres.

Vertical Banded Gastroplasty (VBG)

This procedure was first performed in the late 1970s and because of its relative simplicity and therefore lack of operative morbidity it or variants of it have probably become the most popular operation for obesity performed throughout the World. A stapler is used to create a small gastric pouch down the lesser curve of the stomach the outlet of which is reinforced either by a marlex mesh, a silastic ring or simply non-absorbable circumferential sutures (see Fig 4). As for the gastric bypass procedures, partial staple line disruption is a potential source of failure with late weight gain. Gastric transection once again provides the answer. In recent years many centres have been performing these operations laparoscopically.

Laparoscopic Banding procedures (Lap-Band)

The trend of the 1990s toward minimally invasive surgery has seen the inevitable development of laparoscopic approaches to obesity surgery. Some surgeons preferred to perform established operations in this way (vide supra) but others have explored and developed a new operation utilising an adjustable silastic band placed around the upper stomach thereby mimicking the effect of the VBG (Fig 5). Adjustments may be made by injecting fluid into an inflatable ring via a subcutaneously placed injection port. The appeal of this operation to both surgeon and patient alike is undeniable and has ensured the procedure has been widely adopted and practised in the last 5 years.

Bilio-pancreatic Diversion (BPD) procedures

This operation was devised in the late 1970s³ and combines a gastric restrictive component (partial gastrectomy) with a malabsorptive small intestinal bypass component. It is undoubtedly a highly effective operation but there can be moderately serious nutritional problems develop with protein-calorie malnutrition requiring careful monitoring and even periodic intravenous hyperalimentation. This factor has reduced its attractiveness to both surgeon and patient and has meant it has gained only limited appeal.

Comparative Studies

Surgical risk

While the risks of the early forms of obesity surgery were not inconsiderable, the newer operations should all be able to be performed with good levels of

safety. Although procedures such as the Lap-Band and VBG may seem to be inherently safer than the more complex procedures of gastric bypass and BPD, providing the procedures are performed by well trained and appropriately experienced surgical teams, there should be little to choose between them on the grounds of operative risk. Operative mortality should be no more than 1-2% and the risk of major operative complications no more than 5-10%.

Weight loss achieved

While all the above operations produce considerable weight loss in most patients, the reliability, magnitude and durability of this weight loss is greater for the BPD and newer forms of gastric bypass than for the Lap-Band and VBG. The principal explanation for this lies with the mechanism of achieving weight loss. The VBG and Lap-Band rely totally on the restriction of intake achieved by the pouch and outlet size (usually 1cm diameter) whereas the gastric bypass and BPD have the additional advantage of discouraging fat and simple sugar intake by the occurrence of subtle “dumping” brought about by gastro-jejunal anastomosis. The BPD has yet another dimension of malabsorption brought about by diversion of bile and pancreatic juice to a point well down the small intestine. ***All*** patients after gastric bypass and BPD experience substantial weight loss averaging 60-80% of their excess weight.^{3,4} On the other hand, average weight loss after VBG and Lap-Band is of the order of 50-60% of excess weight, but as many as 10-20% of individuals will experience minimal weight loss because of their ability and even encouragement by the operation to consume high-calorie, low-fibre fluids or foods. In the longer-term many of those with a VBG or Lap-Band will regain some of the weight lost because of

an almost inevitable and unhindered recourse to high-calorie, low-fibre foods, which are so much easier to consume after these procedures than low-calorie, high-fibre foods. Gastric bypass, for the opposite reason, achieves a more durable weight loss.⁵

Quality of eating

Initially it is necessary for all patients who have undergone gastric restrictive surgery to take small amounts of a soft, puree diet. Progression from this to more normal food takes a variable period of time but improvements can be expected for up to 12 months after the surgery. Most individuals will be eating small meals of normally prepared food within 3-6 months, providing they eat carefully, chew well and eat slowly (eg small side plate of food over 30-40 minutes).

As indicated above the VBG and Lap-Band rely for their weight loss on the size of the outlet from the small gastric pouch to the remainder of the stomach. With a VBG this is generally 1.0cm diameter. In some individuals this is too small and too restrictive on the intake of high-fibre food (eg cereals, fruit and vegetables) with the consequence that high-calorie, low-fibre foods are favoured and weight regain occurs. In others the outlet is not small enough, with the consequence that eating is not sufficiently restricted to achieve desirable weight loss. Lap-Band overcomes this weakness by allowing

adjustment of the band and therefore outlet size without re-operation. However, for both operations there is to some extent a reciprocal relationship between ability to eat high-fibre, low-calorie foods and weight loss. Such a conflict does not apply to gastric bypass or BPD procedures. Because of the difficulties with eating imposed on many individuals by the restricted outlet (ring) of a VBG most surgeons performing gastric bypass procedures have preferred not to include a ring with that operation. Our own experience is that weight loss is greater when a ring is added to the gastric bypass and for that reason we prefer to include a silastic ring, but use a much larger diameter ring (1.9cm) than is usually employed by those doing VBG. Quality of eating for those with a SRGB with this large ring is very good with most reporting they can eat a wide variety of food if they are careful.⁶

Surgical revision rates

All forms of surgery for obesity at times are associated with a need to perform revision of the procedure. In general terms such surgery (when it follows previous open procedures) is much more difficult than the initial surgery and is associated with somewhat greater risks. For this reason it should only be performed by surgeons with significant experience in the field. The reasons for the revision vary with each procedure.

The most common reason for revision after gastric bypass is for partial staple line disruption which in our experience (using a special purpose-built stapler) occurs in some 10% of patients. When this occurs there is regain of some but not usually all the weight previously lost, and patients may develop an anastomotic ulcer because of acid reflux back from the distal stomach to the gastric pouch and the anastomosis with the small intestine. The problem is overcome by transecting the stomach as shown in Fig 3. This risk of staple line

disruption is virtually eradicated if gastric transection is performed at the time of the initial gastric bypass.

Revision after VBG type procedures occurs for two main reasons. The first is staple line disruption as for gastric bypass and the second is because of undue difficulty eating and vomiting (actually regurgitation) after most foods. Both problems are generally associated with weight gain. In the former instance this occurs because of increased food intake and in the latter because of the inevitably preferred intake of high calorie, low fibre foods or fluids. Revision surgery may ultimately be required in as many as 20-40% of individuals⁷ and in our view should take the form of conversion to a gastric bypass, with or without gastric transection.

Revision surgery after Lap-Band operations may be required because of technical problems associated with band slippage on the stomach, or occasionally band erosion, both of which will result in excessive vomiting. Alternatively, revision may be sought because of disappointing or minimal weight loss. Technical problems were common in the early days of the procedure, but are less common once experience has been gained.⁸ The proportion of patients who seek revision to improve their weight loss is not yet known but based on the experience with VBG may well be not insignificant in the longer-term. Once again revision for the latter reason should probably take the form of conversion to a gastric bypass procedure.

Revision surgery after BPD is seldom required because good weight loss is invariable and the operation has no reliance on a staple line. However, modifications to the small bowel bypass may be required because of the development of unacceptable metabolic/nutritional problems.

Benefits of weight loss

The substantial weight loss achieved by successful bariatric surgery is of huge benefit to the individual and usually represents a turning point in their life. Self-esteem and confidence grows, usually even before weight loss is complete, the social stigma of severe obesity is removed and new opportunities in life develop. Physical capabilities improve as a result of weight loss and reduced demands on weight bearing joints. Striking improvements or even resolution of co-morbidities such as hypertension, dyslipidaemia, asthma and sleep apnoea occur⁹ and as a result life expectancy is almost certainly enhanced. One of the most interesting and important improvements in co-morbidity occurs with Type 2 diabetes.¹⁰ While this would be expected to improve with weight loss and certainly does, after gastric bypass procedures it almost uniformly disappears by the time the patient leaves hospital and therefore even before appreciable weight loss has taken place. While the explanation for this remains unclear it seems likely to be related to the bypass of the distal stomach and duodenum, as it is not so obviously and regularly seen after VBG operations.

Summary

Surgery is currently the only reliable method of achieving substantial and prolonged weight loss in those with severe obesity and can be accomplished with a high level of safety with few immediate or long-term complications. Of the procedures currently being employed the gastric bypass remains the gold standard and achieves average weight loss of 60-80% of excess weight over a 12-18 month period. Significant improvement and even resolution of associated co-morbidities is seen as a result. There is good reason to believe surgery should be more widely performed in severely obese individuals.

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Figure legends

- Figure 1:** Schematic diagram showing the original Roux-en-Y Gastric Bypass procedure.
- Figure 2:** Schematic diagram showing the modification of the Gastric bypass preferred by the authors, termed silastic ring gastric bypass (SRGB).
- Figure 3:** Silastic ring gastric bypass with gastric transection (Fobi Pouch), which overcomes the possibility of staple line disruption. The Roux loop is sutured over the staple line to create a serosal patch.
- Figure 4:** Schematic diagram showing the commonly performed vertical banded gastroplasty (VBG).
- Figure 5:** Schematic diagram of the “Lap-Band” operation in which an adjustable silicone band is placed around the stomach just distal to the oesophago-gastric junction. Adjustments to the diameter of the band are made by injecting fluid into the subcutaneous port.

Figure 6: Weight loss in 185 consecutive patients who underwent SRGB at the Wakefield Gastroenterology Centre demonstrated by median and range of BMI. Upper limit of normal BMI range is shown by the dotted line.