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## **BARIATRIC SURGERY IN NEW ZEALAND**

**What are the options and how might one choose between them?**

**Viewpoint article**

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### **Abstract:**

Surgery for severe obesity, referred to as bariatric surgery, is becoming better accepted and more widely applied in New Zealand. A number of different operations are currently being performed, yet information for patients and their doctors regarding the major differences between the operations and what can be expected following surgery is not readily available or widely known. This paper seeks to remedy this void.

### **Introduction**

At last New Zealand is waking up! All at once the politicians, the Ministry of Health, health professionals and the public of New Zealand are beginning to recognize and accept that surgery has an important role to play in the management of severe obesity. While this realization was reached by many other countries some years ago – the economic implications of such a realization has always been and remains a

challenge. For many the cost to the public purse of embracing surgery has seemed huge .... but the cost of not doing so is overwhelming!

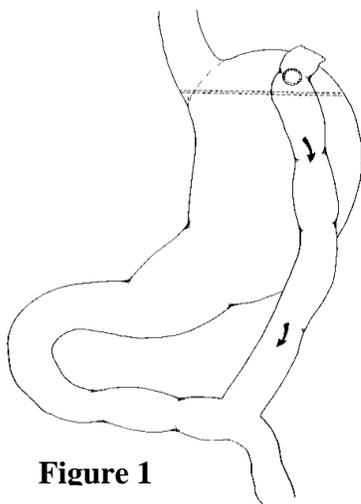
Severe obesity is a disease, and must be treated as such. The close and seemingly inevitable association between severe obesity and emotional, mental, social, metabolic and physical distress and illness is well known and accepted. The disease is both crippling and life shortening.... and ultimately defies almost all personal efforts made to remedy it. One day there may be another answer or at least some options, but for the present there is only one reliable and durably successful option – surgery. However, there are a number of different surgical options available and being performed around the country and there is no agreement here or indeed around the World about which is best. But one fact remains – they are different! The ease of surgery for both the surgeon and patient is different, the costs are different, the hospitalization and recovery times are different, the magnitude, reliability and durability of the weight loss is different, the complications and risks are different, eating patterns and life after the surgery are different, and the likelihood of further surgery being required for weight regain or late complications is different. They are so very, very different! So how might one decide which operation to have? Information is the only possible answer. This article is designed to provide that information, in as far as it is available, in order to assist health professionals to give informed advice and to allow health consumers to make an informed choice.

This article deliberately sets out to discuss only those procedures being commonly offered in this country. They include laparoscopic adjustable gastric banding (Lap-Band), laparoscopic gastric bypass (LGBP), Fobi pouch gastric bypass (FOBI pouch) and laparoscopic sleeve gastrectomy (LSG). Each will be briefly described and then a discussion regarding key attributes of the procedures will follow.

## The Surgical Procedures

Bariatric operations have commonly been classified as “restrictive” or “mal-absorptive”. The former lead to restriction of the amount and type of food which can be consumed, and the latter classically do not interfere with the amount and type of food to be eaten, but substantially reduce the absorption of the food eaten, thus leading to marked malabsorption. This category of operation includes the jejunal-ileal bypass procedures which were developed in the late 1950s but are no longer performed because of serious metabolic problems that followed, biliopancreatic diversion (BPD) procedures as described by Scopinaro<sup>1</sup>, and the duodenal switch variant of the BPD, described by Marceau.<sup>2</sup> These latter two types of surgery are thoroughly effective at achieving major weight loss, but are attended by a significant incidence of metabolic and nutritional problems, which make them problematic. They are not currently offered to patients in this country. The procedures offered in this country and described in this article are best regarded as examples of restrictive procedures.

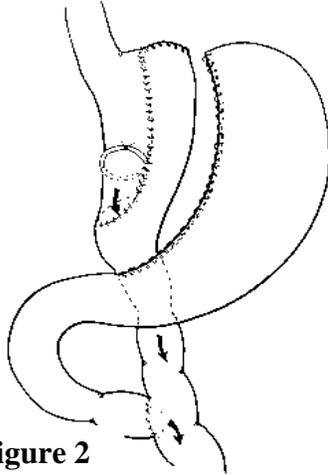
### A. The Fobi Pouch gastric bypass



**Figure 1**

The early forms of the gastric bypass are schematically represented in Figure 1 and became widely accepted as the “Gold-standard” for bariatric surgery. However, these operations, which were available in this country until around 1990, were often associated with late weight regain because of (a) gastric pouch enlargement, (b) gastric outlet (stoma) enlargement or (c) staple line disruption.

The Fobi Pouch variant of the operation was first performed by Dr Fobi, a surgeon from Los Angeles, in the early 1990s and was designed to circumvent these possible causes of late failure, and largely does so.<sup>3</sup> The Fobi Pouch gastric bypass is shown

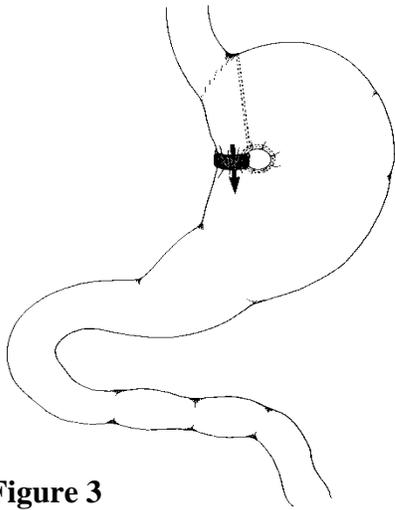


**Figure 2**

schematically in Figure 2. This is the preferred operation of the Wakefield Group, and is the only procedure still routinely performed by open surgery. Efforts to perform this procedure laparoscopically have generally required some compromise on key points in the operation. The key features of this variant are (a) the size and shape of the pouch – the long narrow shape makes subsequent enlargement by dilatation very unlikely, (b) the silastic ring around the gastric pouch defines the size of the outlet permanently, which is then not subject to possible enlargement, (c) the division of the stomach overcomes the possibility of staple-line disruption and (d) the jejunal interposition provides strengthening of the gastric pouch staple-line and prevents adherence of both sides of the staple-line with subsequent internal fistulation (so called gastro-gastric fistula), which would have the same effect as staple-line disruption. The gastric pouch has a volume of approximately 5-10ml, and the silastic ring has a circumference of 6.5cm, giving an outlet diameter of approximately 19mm.

## **B. Laparoscopic adjustable gastric banding (Lap-Band)**

Adjustable gastric banding evolved from an operation developed in the mid 1970s, and popularized throughout the World in the 1980s, known as vertical banded gastroplasty (VBG). This operation or a variant of it was performed in quite large numbers in Dunedin, Christchurch, Hamilton and Auckland in the 1980s and early



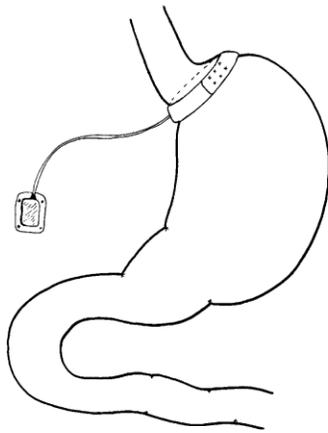
**Figure 3**

1990s, but ultimately proved to be unsatisfactory for around 50% of those who underwent the surgery. The operation is schematically shown in Figure 3. The concept was to produce a small gastric pouch, based on the lesser curve of the stomach, and to create a fixed size outlet from this pouch to the rest of the stomach. In this way the intake of food was radically curtailed and the gastric pouch emptied

slowly, thus creating prolonged satiety. Providing the outlet size was small enough (generally 10mm), weight loss followed. However, three problems were commonly seen, which led to late weight regain, or a very unsatisfactory eating pattern. These were, (a) unacceptable regurgitation / reflux of food, due to too small an outlet, (b) staple-line disruption leading to loss of intake restriction and (c) gastric pouch dilatation, leading to a greater intake of food. Excessive reflux and regurgitation was often difficult to understand, because the way through seemed fine by contrast study or gastroscopy. It was the result of inadequate motility above the band to achieve satisfactory emptying. The consequence was usually that individuals developed a clear preference for high calorie - low fibre foods (eg ice-cream, milkshakes, chocolate, cheese, biscuits), and as a result the weight lost, returned, but their eating pattern was terrible.

The idea of an adjustable band being placed around the top of the stomach seemed perfect. It overcame the shortcomings of the outlet being too small or too large, as it was adjustable, and it overcame the possibility of staple-line disruption, as no staples were required. In the early 1990s a number of inflatable, silicone rubber devices were developed commercially for placement laparoscopically. The best marketed of these was the Lap-Band® system, but a number of others have been

developed and are being used. This operation is shown schematically in Figure 4.



**Figure 4**

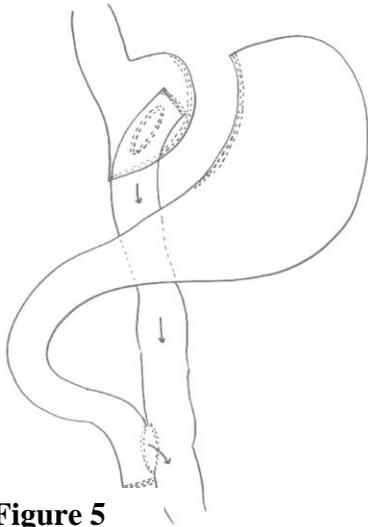
This operation was taken up enthusiastically, particularly in Australia and Europe, and remains popular because of its relative simplicity. For a number of years after its introduction there were many technical problems associated with its placement. These included a high incidence (20-30%) of so called band-slippage, prolapse or erosion, requiring re-operation, often in urgent situations. This high incidence of major problems

has been much reduced in recent years, principally by placement of the band via a so-called "pars-flaccida" approach, rather than the former "peri-gastric" approach which is no longer used.<sup>4</sup> Band adjustments are made by way of injecting saline into a subcutaneously placed port, usually positioned on the rectus sheath.

### **C. Laparoscopic Gastric Bypass (LGBP)**

With the rapidly growing application of laparoscopic surgery to general surgery it was inevitable that attempts would be made to perform the gastric bypass operation, laparoscopically. This was first successfully done and reported by Wittgrove and Clark in 1994.<sup>5</sup> Their report together with the development and widespread uptake of the Lap-Band<sup>®</sup> system outside of the USA, led to a tremendous impetus in the USA for the further development, refinement and adoption of LGBP in that country. At that time, and to this day, North America has firmly favoured gastric bypass surgery over Lap-Band, for reasons which will be outlined in the next section of this article. LGBP is a very challenging undertaking, made the more difficult by the severe obesity of the subject undergoing the surgery. Many techniques, modifications and short-cuts have been

proposed in order to make the procedure simpler. There is no uniformity concerning such things as the size and shape of the pouch, the manner and style of connecting the gastric



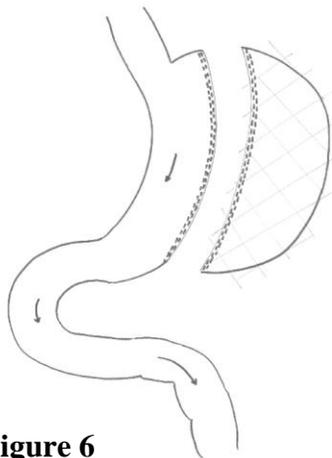
**Figure 5**

pouch to the small intestine and the closure of the so-called mesenteric defects created by the formation of the gastro-jejunosomy. Nevertheless the procedure is being performed in huge numbers, worldwide, and has gained popularity in both Auckland and Hamilton in this country. A schematic representation of this operation is shown in Figure 5. It is however, important to recognize the results to be expected from LGBP will

vary according to the specifics of the procedure performed. The results are certainly to be expected to differ from those of the Fobi Pouch gastric bypass, as shown in the next section of this article.

#### **D. Laparoscopic Sleeve Gastrectomy (LSG)**

This is a relatively recently conceived operation, which has gained some popularity



**Figure 6**

even before medium-term results are available for adequate assessment. It involves performing a partial gastrectomy in such a way as to simply reduce the stomach to a tube or "sleeve". The operation is shown schematically in Figure 6. While this was initially done by open surgery, and was planned as an first stage in performing a duodenal switch, malabsorptive procedure, in very heavy individuals, it readily lent itself to being performed laparoscopically,

and has been taken up by many surgeons as a definitive procedure, in the hope the weight loss achieved by restricting food intake, would be durable. The results are very dependent on the diameter of the gastric "sleeve" but there remains no uniform agreement around the diameter this should be made.

### **Results of the surgical procedures**

The results or outcomes of the various procedures are best considered under a number of headings. (a) reliability and expected weight loss, (b) complications, (c) failure and revision rates (d) effect on co-morbidities and (e) miscellaneous features (eg cost, hospital stay, recovery time, follow-up requirements)

#### ***(a) Reliability and expected weight loss***

Weight loss is generally expressed as percentage of excess weight lost (%EWL). This assessment requires that there be an estimate of ideal body weight (IBW), which is usually derived from New York Metropolitan Life Insurance Company figures. The stated %EWL will vary according to the ideal body weight assumed. The expected weight loss will vary according to the time interval elapsed since surgery. Most procedures have similar average weight loss figures at 12 months, but they vary considerably from that point on. Reliability is reflected in the range or spread of the outcomes, and unfortunately is seldom quoted in published series. This, together with long-term weight loss, is clearly of importance, when considering the different options.

**Table 1.** Median percentage of excess weight loss at various time points for the different operations. These figures are derived from a wide range of published accounts, most of which were included in a systematic review published by O'Brien et al in 2006.<sup>6, 7</sup>

<b>Interval since surgery</b>	<b>FOBI</b>	<b>LGBP</b>	<b>Lap-Band</b>	<b>LSG</b>
1 year	70-80	65-70%	35-50	45-65
5 years	65-75	50-70%	50-60	unknown
10 years	60-70	45-65	40-50	unknown

The reliability of weight loss is highest for Fobi Pouch followed by the LGBP. Both the Lap-Band and the LSG are quite variable in their weight loss outcomes, ranging from little or no weight loss through to very good weight loss.<sup>8</sup> Although it is commonly said that those, who having had a Lap-Band, lose disappointing amounts of weight, are poorly compliant with instructions, there is no way of reliably predicting who will be “non-compliant” prior to surgery. Those undergoing LSG must understand this procedure may well simply be stage one of a two stage operation because medium and long-term weight loss from LSG alone may be disappointing.

***(b) Complications***

Given the generally high complication rates associated with other forms of surgery in the obese it is surprising that the reported mortality and complication rates for bariatric surgery are as low as they are. This is a reflection of the expertise developed by those teams regularly performing this type of surgery, and speaks to the importance of the surgery being performed only by those who have trained in the field and who undertake bariatric surgery on a regular basis. The complications which do occur clearly fall into two categories, those that may occur after any major surgery and those that are procedure specific.<sup>9-14</sup> These are tabulated in Table 2 below. Perhaps the most feared technical complication after gastric bypass is an anastomotic leak. Most published data shows a highly significant difference in leak rates favoring the open technique of gastric bypass.<sup>10</sup>

**Table 2:** Complication rates after the various operations (%).

<b>Complication</b>	<b>Fobi Pouch</b>	<b>LGBP</b>	<b>Lap-Band</b>	<b>LSG</b>
mortality (%)	0.2 - 1	0.2 - 1	0 - 0.6	0.3 - 1.4
chest infection (%)	2 - 5	0.1 - 0.5	0.2 - 0.5	0.2 - 0.5
DVT / PE (%)	0.5 - 1	0.2 - 0.5	0 - 0.6	0.5 - 1
leaks / perforation (%)	0.5 - 1	2 - 5	0.2 - 1.5	2 - 7
stomal stenosis (%)	1 - 2	2 - 5	n/a	0.5 - 1
bowel obstruction (%)	0.5 - 1	3 - 7	n/a	n/a
wound infection (%)	8 - 12	2 - 5	1 - 2	0.5 - 1
incisional hernia (%)	7 - 15	0.2 - 0.5	0 - 0.3	0.2 - 0.5
band or ring problem (%)	2 - 5	n/a	10 - 20	n/a

***(c) Revision / reversal / re-operation***

Revision surgery and even reversal of the operation at some point in the future may be required for a variety of reasons. Broadly speaking this may be to correct a technical problem or complication of the surgery or it may be because weight loss has been disappointing or weight has been regained. Revision surgery to address poor weight loss is not always possible, and is always more difficult for the surgeon and more hazardous for the patient. Results are generally less predictable than for the initial operation.<sup>15</sup>

Revision surgery after Fobi Pouch gastric bypass is most unusual, but is occasionally required for removal of the silastic ring.<sup>16</sup> This is performed because the eating restriction proves too great and there is an unacceptable frequency of regurgitation, and/or quality of eating. Revision surgery after Lap-Band is much more frequent, and indeed may be required on numerous occasions at any time following the original surgery, even many years later. The principal and most serious complication for which revision surgery may be urgently required after Lap-Band is so-called "band-slippage". When this occurs, the position of the band on the stomach changes usually

as a result of some of the stomach beyond the band prolapsing back through the band. This causes a degree of gastric wall congestion/strangulation and even oesophageal obstruction. Pain and vomiting are the result. Urgent band deflation and even laparoscopic removal is required, to prevent ischaemic necrosis of gastric wall. In other circumstances the band may erode into the stomach, necessitating its removal or breaks/leaks in the port or its tubing may occur leading to unexpected deflation of the band. Removal of the band and/or revision surgery is also sought by many patients because of inadequate weight loss or unacceptable regurgitation or reflux and difficulty eating. In this circumstance one may convert to gastric bypass or other operation, although many surgeons will merely replace the band with another, hoping weight loss will be better.<sup>11-13</sup> Revision surgery is seldom required after laparoscopic gastric bypass but may be sought because of poor weight loss or weight regain. In this circumstance the original gastric pouch may have been created too big and be able to be reduced in size. Alternatively, the pouch may be so small that food passes too quickly from the oesophagus through the pouch and into the jejunum. In this case, revision is not possible. Occasionally revision surgery may be required because of the formation of a gastro-gastric fistula, across the staple lines, which have become adherent to one another through inflammation.<sup>17</sup> Figures for revision surgery after LSG are not currently available in the published literature but oral presentations by some who have performed this procedure for more than five years suggest it will be required in 40-60% of patients (see table below). Revision is sought because of disappointing weight loss as a result of rapid gastric emptying or weight regain resulting from dilatation of the gastric tube with a consequent ability to eat more. Trimming of the gastric tube may not be technically possible. An alternative would be to convert to a gastric bypass or to a duodenal switch variant of the BPD procedure. The former may lead to unpredictable results and the latter puts the individual at long-term risk of serious protein-calorie malnutrition and other

micronutrient deficiency, which makes it less than an ideal conversion. The likelihood of need for revision of the various procedures and the most common reasons for having to do so are shown in Table 3 below.<sup>18</sup>

**Table 3:** Reason for and rates of reoperation (%)

<b>Reason for revision / reoperation</b>	<b>Fobi Pouch</b>	<b>LGBP</b>	<b>Lap-Band</b>	<b>LSG</b>
band / port / ring problems (%)	2 - 5	n/a	10 - 30	n/a
gastro-gastric fistula (%)	< 1	1 - 2	n/a	n/a
poor weight loss or weight regain (%)	<1	1 - 5	10 - 20	40 - 60*
bowel obstruction (%)	<1	3 - 5	n/a	n/a
incisional hernia (%)	7-15	0.2 - 0.5	0.2 - 0.5	0.2- 0.5

\* Oral communication at XIII World Congress of International Federation for the Surgery of Obesity, September 2008, Buenos Aires, Argentina. Discussion Panel Aniceto Baltasar(Spain), John Melissas (Greece), Rudolf Weiner (Germany) and Philip Schauer (USA).

Late re-operation for reasons other than revision of the original operation may also be required and occurs with different frequency. Re-operation after open Fobi Pouch is largely related to incisional hernia and may be expected in 7-15% of patients.<sup>14</sup> Bowel obstruction is very seldom seen, because the mesenteric defects created in forming the Roux loop of jejunum are readily and securely closed at open surgery. Re-operation for unrelated reasons is seldom required after Lap-Band, but most commonly relates to a small incisional hernia at one or more of the port sites. Re-operation for unrelated reasons after LGBP is most likely to relate to internal herniation through mesenteric defects which have not been securely closed, causing small bowel obstruction with or without strangulation and the development of ischemia.<sup>10, 19, 20</sup> Such an occurrence requires urgent surgical correction. Small bowel obstruction occurring in pregnancy following LGBP has been reported to be a significant and dangerous problem.<sup>21</sup> Delay in recognition is liable to occur and can be dangerous, leading to either maternal or foetal death or even both.<sup>21</sup> Open surgery is usually required for its correction, because of the space taken up within

the abdomen by the enlarged uterus. As for Lap-Band unrelated re-operation following LSG is unusual, and would most likely be for port site incisional hernia.

***(d) Effect on co-morbidities***

It has been recognized for a long time that weight loss is accompanied by improvement or even resolution of most if not all weight related co-morbidities.<sup>22</sup> Given the very dramatic and sustained weight loss that is usually accomplished by bariatric surgery, it is not surprising that benefits are evident in conditions such as type 2 diabetes, hypertension, dyslipidaemia, obstructive sleep apnoea, obesity hyperventilation syndrome, depression, and back and weight bearing joint problems. These benefits have now been well documented.<sup>22-25</sup> and a number of studies have now shown enhanced survival for those who have undergone bariatric surgery.<sup>26-30</sup> What was not anticipated and is only now becoming better recognized and accepted is that a number of metabolic benefits may be seen well ahead of major weight loss particularly after gastric bypass.<sup>14</sup> Thus Type 2 diabetes, hypertension, dyslipidaemia, and polycystic ovary disease are now known to generally resolve within one week of gastric bypass, presumably because of the immediate loss of insulin resistance which follows this surgery.<sup>31</sup> While improvements in these co-morbidities are seen after Lap-Band and LSG, these are not so dramatic and tend to occur in tandem with weight loss.<sup>23, 24</sup> There is reason to believe this difference relates to the bypass of the duodenum, by gastric bypass, which may be switching off a duodenal derived gut hormone which causes insulin resistance in susceptible individuals.<sup>32</sup>

The relative effects of the various operations on the most important co-morbidities is shown in Table 4 below.<sup>24, 33-36</sup>

**Table 4:** Effect of surgery on co morbidities (%)

<b>Co-morbidity</b>	<b>Fobi Pouch</b>	<b>LGBP</b>	<b>Lap-Band</b>	<b>LSG</b>
Type 2 diabetes –resolution	80-90	80-90	50-60	80
Hypertension -resolution	70-90	60-70	40-60	60-65
Dyslipidaemia				
Resolution/improvement	75-80	75-95	40-60	unknown
GORD- resolution	80-95*	80-95	60 - 75	unknown
OSAS - resolution	80-90	70-80	40-50	unknown

\* Stubbs RS unpublished

(GORD – Gastro-esophageal reflux disease; OSAS - Obstructive sleep apnoea syndrome)

***(e) miscellaneous features (eg cost, hospital stay, recovery time, follow-up requirements)***

Hospital stay is somewhat shorter for the simpler laparoscopic procedures and averages around 2 days for Lap-Band, 3-4 days for LGB and LSG and 7 days for Fobi pouch. These times assume no complications and are determined principally by the time it takes for fluid intake to be restored to acceptable levels. Theatre times vary from around 60-90 minutes for Lap-Band, through 90-120 minutes for LSG, 120-180 minutes for Fobi Pouch and 120-240 minutes for LGB. Hospital and operation costs in the private NZ environment vary from around \$16-18000 for Lap-Band, and \$20-25000 for the other procedures. Return to work and full recovery is faster after the laparoscopic procedures, averaging around 3 and 6 weeks respectively, whereas for Fobi pouch these figures are around 4-6 and 12 weeks respectively. The most onerous follow-up requirements in terms of time are for Lap-Band because the best results are obtained in those who are seen regularly for adjustments and dietary guidance and motivation. This requirement persists so long as the band remains in place. It is important that all patients who have undergone bariatric surgery be maintained on a multivitamin tablet daily for life, because of the reduced food intake. In addition those who have undergone gastric bypass or LSG are advised to have

annual life-long surveillance for vitamin B12, folic acid and iron levels and where indicated institution of appropriate supplements. Other micronutrient deficiencies may need to be screened for in particular circumstances. Failure to observe this requirement can occasionally lead to serious sequelae.

## **Discussion**

It is now irrefutable that each of the procedures discussed above, that are being performed in New Zealand at the present time, can achieve major weight loss in severely obese individuals.<sup>24</sup> The fact that there is a range of options points to the fact that this is an evolving area of surgical endeavour. It is also equally clear that there are differences between the options in terms of difficulty for both the patient and the surgeon, efficacy and reliability of the procedure, and cost and durability. It is likely that with time there may develop greater agreement between surgeons regarding which procedure is best. At the present time most surgeons have a declared preference for one of the procedures and offer this over the others. Until such time as this changes, the task rests with the prospective patient and/or their medical advisor (eg General Practitioner) to make a choice, most particularly regarding which surgeon they will consult, for this will likely determine which procedure is performed. The issues to be considered are cost, time off work, reliability, durability, benefit for comorbidities, and need for ongoing supervision and or revision. While medical people tend to place great store by health benefits, and are often not so concerned about the precise weight loss, one should not forget that the individuals who present for this surgery are generally more concerned with the weight loss they achieve and sustain, for the sake of self esteem and quality of life, and take the relief of comorbidities as a welcome additional benefit, rather than the primary goal! In this respect all the operations look rather similar in the first year or so, but the differences emerge over time. Prospective patients should be made

aware of this. This surgery has become the commonest form of major surgery performed in the USA in recent years, and has the potential to become so in this country also. In this context the reliability and durability is probably paramount. We can ill afford to operate on everyone once ..... let alone twice!

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