Review Article

Laparoscopic Roux en Y gastric bypass in the super obese

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Abstract: Bariatric surgery in super obese patients presents technical, metabolic and risk related challenges. Moreover, there is concern that weight loss and health outcomes of surgery, including gastric bypass, may be lesser than in non super obese (morbidly obese) patients. This may drive clinicians toward more aggressive forms of surgery at the risk of greater morbidity. This review examines outcomes pertaining to laparoscopic Roux en Y gastric bypass (LRYGB) in the super obese and determines the role of such surgery in the current day. Whilst a minor increase in morbidity and mortality risk exists, weight loss outcomes when measured as percentage total body weight loss are equivalent to non super obese patients. Final BMI is not an appropriate indicator of benefit in such patients and may lead to escalation surgery inappropriately. Surgeons employing the use of LRYGB in the super obese should have adequate training and expertise in the technique and operating upon super obese patients should be avoided during the learning curve phase to minimise morbidity risk.

Keywords: Super obese; gastric bypass; outcomes

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Introduction

Laparoscopic Roux en Y gastric bypass (LRYGB) is a well-established procedure for the treatment of morbid obesity. RYGB has been used since the 1970's and continues to this day attesting to its durability and efficacy (1). For this reason, RYGB is often held up as the gold standard bariatric procedure to which other operations are compared.

Laparoscopic approaches were developed in the 1990's (2) and emerged in common use in the mid 2000's. Since then, operative morbidity has continued to fall (3).

However, controversy remains regarding the utility of LRYGB in the Super Obese (SO, BMI >50) and Super Super Obese (SSO, BMI >60). These patients pose several challenges. Firstly, they are more likely to have obesity related comorbidity. Secondly, their size, particularly in the presence of central obesity, makes surgery technically challenging. These two features potentially confer greater surgical risk than lesser obese (morbidly obese BMI <50) patients (4). Finally, there is concern that patients with super obesity are more resistant to treatment with weight loss and metabolic outcomes lesser than morbidly obese patients (5,6).

These concerns raise questions as to the most optimal treatment of the super obese. Is LRYGB sufficiently safe and effective? Should a simpler less morbid procedure be a first choice—for example sleeve gastrectomy? Perhaps surgery with a greater metabolic mechanism would achieve better results?

This paper will examine the safety, outcomes and place of LRYGB in the super obese.

The challenges of the super obese

Surgery in patients with super obesity has traditionally been associated with greater morbidity than those with morbid obesity.

Patients with super obesity are likely to have greater

pre-operative morbidity of both metabolic disease as well as reduced mobility and ability to exercise (3,4). Conditions such as diabetes, obstructive sleep apnoea and hypoventilation syndrome and cardiac risk factors increase operative risk. These patients are often relatively sarcopaenic and have reduced capacity to manage the stress of surgery (5,7).

Surgical complications are likely to have greater morbidity impact. Surgical wound complications tend to be more severe, respiratory complications more difficult to recover from and sepsis more difficult to reverse (7). Assessment and treatment of complications may also be more difficult due to body habitus leading to late diagnosis and treatment. Further, recovery and rehabilitation from complication is more difficult.

Surgery is technically more challenging in the super obese. Somatic (body wall) obesity may create difficulty establishing access due to torque on laparoscopic ports (5,7). The heavier abdominal wall may require greater pressure pneumoperitoneum and this may compromise ventilation. Intrabdominal obesity makes operative exposure demanding and frequent obscuration of the visual field may occur. Higher risk of visceral injury particularly the small bowel with the heavy omentum creating traction and thick foreshortened mesentery putting the bowel at risk during manipulation.

Several technical tips may help. Preoperative weight loss using very low energy diet (VLED) to reduce hepatomegaly (8), stay sutures for retraction of the omentum, use of additional ports may all overcome some if the difficulties encountered. Careful patient positioning and consideration of operative technique to reduce traction on tissues may avoid inadvertent injury.

What constitutes a RYGB?

Whilst the essential structure and form of the RYGB has been standardised for several decades now, evolution and variations in detail exist (1,9). This is important to keep in mind when examining the literature, especially when considering outcomes.

What is generally agreed is that the gastric pouch should exclude the fundus to prevent latter dilation. Pouch shape has evolved from the classical short square pouch to the now longer thin pouch. This is believed to have less risk of dilation but the longer the pouch the greater the incidence of stomal ulceration appears to be (9). This may be mitigated by the use of PPI medication though routine use is not common practice.

The other variation is in limb lengths – alimentary, biliopancreatic and consequentially total limb length. The length of the common channel is less of a concern in classical RYGB since the total limb lengths used in the Roux construction rarely exceeds 250 cm. In this sense, classical RYGB is not a malabsorptive procedure; it does not rely on malabsorption as its mechanism of action (9,10). The alimentary limb needs to be long enough to limit bile reflux (at least 60 cm) whilst BP limbs have varied from as little as 30 cm to as long as 200 cm (4,11,12). There is robust data to suggest that the metabolic "power" and thus weight loss, durability and effect on metabolic disease is influenced most significantly by the length of the biliopancreatic limb (12). Biliopancreatic limb lengths greater than 200 cm are likely however to pose significant risk of malabsorption and nutrient deficiency (12). The authors routinely use a biliopancreatic limb length of 100cm and extend this to 150–180 cm where greater effect is felt clinically indicated—for example in revision of sleeve to bypass for poor weight loss or in the super obese with heavy metabolic disease.

Outcomes in the super obese—safety

As noted, surgery in the super obese population potentially carries greater risk than in the morbidly obese.

In large "real world" health databases in the USA, this is reflected for LRYGB as with other surgery.

The MBSAQIP database reveals higher risk of perioperative complications and 30 day mortality for Super Obese (SO) and Super-Super Obese (SSO) compared to Morbidly Obese (MO) patients having either LRYGB but the absolute overall mortality is low and not clinically significant (7). The absolute mortality was 0.33% in the MBSAQIP database for LRYGB in the SO groups and 0.10% in the MO group. Moreover despite higher peri-operative risks of complications in SO and SSO, the absolute risks remain low and acceptable in this as well as other large series (4,5,7,11,13).

Nonetheless, it is clear that LRYGB in super obese can be achieved with safety comparable to that in morbidly obese patients in experienced and expert hands. Moon *et al.* (5) describes a vast experience (>2,000 cases) in LRYGB. They divided patients into MO, SO, and SSO obese groups as previously defined and performed a retrospective (unmatched) analysis. There was no significant difference in complication rate, readmission rate or return to theatre rate between the 3 groups. Mortality rates were 0.1%, 0.2% and

0.4% respectively which although suggesting a trend, was not statistically significant.

Outcomes in the super obese—weight loss & metabolic improvement

There is concern that standard bariatric procedures such as sleeve gastrectomy and classical RYGB produce either insufficient weight loss or inferior weight loss in the super obese compared to the morbidly obese (4,11).

Claims of insufficient weight loss often centre on the fact that most super obese patients are not rendered non obese by their bariatric surgery. Such claims set an expectation that patients after surgery should achieve a BMI <30.

Such expectations are misguided, unrealistic and potentially dangerous. Firstly, the benefit of surgery lies in the weight lost, not on the final BMI (14). Whilst benefit in terms of metabolic restoration may correlate to degree of weight loss, there is a diminishing return beyond 15% total body weight (TBW) (15). Secondly, studies examining long term weight loss have consistently demonstrated that the average weight loss with RYGB is around 25–30% TBW (or 50–60% EWL) (16). This does not usually render the patient non obese (i.e., BMI <30) but it is a realistic expectation of outcome and it is associated with significant health and wellbeing benefits (3). Suggesting this is insufficient potentially encourages unnecessary revisional surgery or the use of more aggressive malabsorptive procedures (e.g., BPD) as primary surgery carrying the risk of malnutrition, sarcopaenia and osteoporosis.

The question remains however, are the results in the super obese inferior to the morbidly obese?

Arapis *et al.* (4) in a retrospective series of 90 SSO patients undergoing LRYGB demonstrated 65% excess weight loss (EWL) (TBWL 33%) out to 5 years. These results compare well with expected outcomes in the treatment of morbid obesity with LRYGB, however this was not a direct comparative study. Similar weight loss outcomes have been described from the BOLD database by Celio *et al.* (17) in over 42,000 LRYGB in the super obese.

In studies directly comparing weight loss outcomes between MO and SO or SSO for LRYGB, the trend appears to be for less weight loss in the SO/SSO groups, at least when measured as a function of excess weight. Moon *et al.* (5) describes a large comparative series of MO *vs.* SO *vs.* SSO and reports percentage excessive body mass index loss (%EBMIL) of approximately 85%, 72% and 63% respectively at 2 years. In a small unmatched study, Gould *et al.* (6) describes %EWL in MO *vs.* SSO of 60% and 70% respectively at 2 years.

These, and similar studies however hove reported weight loss with reference to excess weight. It is well documented that measures such as %EWL are influenced significantly by initial BMI and may lead to erroneous conclusions regarding weight loss efficacy (18). Measures of %Total body weight loss (%TBW) may be more reflective of true effect.

In this regard, Thereaux *et al.* (13) compared 30 SSO patients with 60 matched MO patients undergoing LRYGB. In this study, 5 year %EWL was 45% in the SSO group and 65% in the morbid obesity group and was statistically significant. However, when comparing %TBWL there was no significant difference—27% *vs.* 29%. Moreover, there was no difference in weight regain rates between the two groups.

Only one other study reports outcomes in %TBW. The study of Aftab *et al.* (19) actually reports greater weight loss in the SO group (30% *vs.* 26% TBWL, 0.008) while %EWL was not significantly different.

Despite the perception of lesser weight loss at least when reported as %EWL, these studies all report relatively equally significant restoration of metabolic comorbidities and quality of life (QOL) in all groups (5,6,13). Thereaux (13) does note a significantly lesser response of joint pain however.

Lengthening the biliopancreatic limb (up to 200 cm with care not to exceed total limb lengths beyond 300 cm) in the super obese group of patients appears to provide greater weight loss as well and lesser weight regain as well as greater resolution of comorbidities in the longer term (12).

Comparison to other procedures

Whilst long term weight loss with malabsorptive procedures such as biliopancreatic diversion/duodenal switch have been consistently shown to be greater than classical RYGB, they do come at a greater cost of nutritional risk (20). Moreover, they are not commonly performed procedures from an international perspective. Laparoscopic vertical sleeve gastrectomy and bypass procedures remain the most popular choices worldwide. As such, it is most prudent to compare results of LRYGB with sleeve gastrectomy in the super obese.

Weight loss appears to be significantly better for LRYGB compared to LVSG for the SO and SSO group particularly in the first four years of follow up (4,11,17,21). Wang *et al.* performed a metanalysis of LRYGB and LVSG in the super obese examining 12 comparative studies finding that all except one reported significantly greater weight loss in

the LRYGB groups compared to LVSG groups at 12 and 24 months (21). Studies examining longer term weight loss comparisons are lacking but the study of Arapis *et al.* reports outcomes at 6 years suggesting no major difference in the weight loss between the LVSG and classic LRYGB (4). However, it should be noted that in this study, the biliopancreatic limb was relatively short—only 60 cm—and longer biliopancreatic limb lengths are likely to provide more sustainable weight loss (12).

With respect to safety, studies consistently report higher morbidity and mortality for LRYGB compared to LVSG in the super obese. Nasser *et al.* used the large MBSAQIP database to examine 30 day mortality in SO and SSO groups for both LVSG and LRYGB. In the SO group it was .08% and 0.17% respectively whilst for the SSO group it was 0.18% and 0.33% respectively (7). Morbidity rates were 3.3% and 4.5% in LVSG for the SO and SSO whilst for LRYGB the morbidity was higher at 6.6% and 8.7% respectively. Wang *et al.* in the recent meta-analysis suggested greater overall complications, leak rate and mortality in 9 of 12 studies but the differences were not statistically significant (21).

Conclusions

LRYGB remains an effective and safe procedure for the treatment of the super obese. The super obese may have more resistant obesity than the morbidly obese as reflected in weight loss outcomes when using %EWL as a measure although %TBW appears comparable. Attention should be paid to the length of the biliopancreatic limb and consideration given to making this longer in the super obese, keeping the total limb lengths to less than 300 cm. The safety and long term results compare favourably with other non-malabsorptive procedures making LRYGB an excellent option. However, appropriate training, skill acquisition and experience is required for optimal outcome. Surgeons should avoid performing LRYGB in the super obese during their learning curve and ideally develop these skills in an experienced high volume unit.

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Footnote

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