Revisonal Bariatric/Metabolic Surgery: What Dictates Its Indications?

Pearl Ma1 · Subhash Reddy1 · Kelvin D. Higa1

Abstract Bariatric/metabolic surgery is currently the only effective long-term treatment for morbid obesity- and obesity-related diseases such as diabetes, heart disease, hypertension, obstructive sleep apnea, and dyslipidemia. In addition, bariatric/metabolic surgery has been shown to significantly reduce the incidence of diabetes and cancer and prolong life when compared to non-surgical therapies. However, as obesity is a chronic disease, recidivism of weight and comorbid conditions can occur. In addition, the surgical construct can lead to long-term consequences such as marginal ulceration, bowel obstruction, reflux, and nutritional deficiencies. Despite these drawbacks, prospective randomized controlled studies and long-term longitudinal population-based comparative studies greatly favor surgical intervention as opposed to traditional lifestyle, diet, and exercise programs. Revisional surgery can be quite complex and technically challenging and may offer the patient a wide variety of solutions for treatment of weight recidivism and complications after primary operations. Given the paucity of high quality published data, we have endeavored to provide indications for revisions after bariatric surgery.

Keywords Bariatric surgery · Reoperative · Weight regain · Complications · Morbid obesity · Gastric bypass

Introduction

In 2014, the World Health Organization estimated 39 % of adults were overweight and 13 % were obese [1]. However in the USA, the prevalence of obesity is much higher and estimated at 34 % of adults and 16.9 % of children [2]. Research has demonstrated the relationship with obesity and several chronic diseases including type 2 diabetes, heart disease, stroke, dyslipidemia, sleep apnea, and cancer [3, 4]. Whitlock et al. in their prospective review found mortality increases with rising body mass index (BMI). At a BMI range >40, they found overall survival was reduced by 8 to 10 years which is comparable to the effects caused by smoking [4].

Bariatric surgery has proven to be an effective tool not just only in weight loss but also in reversing and prevention of the obesity-related comorbidities [5]. Buchwald’s meta-analysis demonstrated 61 % excess weight loss (EWL) for all bariatric patients [6]. Even 5 years after surgery, approximately 50 % of patients after bariatric surgery maintain greater than 50 % EWL [7]. 76.8 % of patients had resolution of diabetes, where 86 % had improvement in hemoglobin A1c levels. 78.5 % of patients who underwent bariatric surgery had improvement in hypertension where 61.7 % of patients had complete reversal. In addition, obstructive sleep apnea was resolved and was improved in >80 % of patients [6]. Multiple prospective, randomized studies have demonstrated superiority of bariatric surgery over medical therapy in resolving and improving type 2 diabetes mellitus [8–10]. A recent meta-analysis found overall remission rate of type 2 diabetes mellitus was 63.5 % of bariatric patients compared to 15.6 % of patients treated with conventional therapy [11]. A 5-year follow-up on randomized control study by Rubino et al. continues to demonstrate surgical therapy superior to medical therapy in long-term treatment of diabetes [12••]. Surgery for diabetes is also effective for non-morbidly obese individuals (BMI <35 kg/m²) [13].

1 UCSF-Fresno Medical Education Program, Fresno, CA, USA
A recent systematic review also describes association with bariatric surgery and improvement of heart disease. Postoperative echocardiogram and magnetic resonance cardiac indices show remodeling with decrease in left ventricular mass and increased left ventricular ejection fraction [14].

Primary cancer risk was also reduced in post-bariatric patients, including the incidence of breast and colon cancers [15–17].

One study found that after 7 years, bariatric surgery decreased risk of premature death by 40 % [7]. Significant cost savings to health care occur as seen after 5 years of treatment, bariatric surgery decreased significant health care costs related to obesity-related diseases by 29 % [18].

Throughout the years, a multitude of procedures have been abandoned, such as the jejuno-ileal bypass or the vertical-banded gastroplasty for complications or ineffectiveness or modified, such as the biliopancreatic diversion, now primarily performed with a sleeve gastrectomy and known as the duodenal switch. In addition, almost all procedures are performed laparoscopically.

Despite excellent safety, primary bariatric procedures vary in their individual outcomes. In general, the adjustable gastric band, vertical sleeve gastrectomy, Roux-en-Y gastric bypass, and duodenal switch, the most common operations performed today, are listed in their order of increasing complexity and performance as well as complication rates [19••]. Individual outcomes may be related more to genetic factors than choice of operation. Unfortunately, most patients are given a great degree of autonomy in choosing their procedure, rather than listening to the recommendations of the health care team. This may lead to higher numbers of failures in terms of weight and comorbid condition control.

Majority of bariatric patients achieve >50 % excess weight loss; however, approximately 15–20 % of patients fail to achieve or sustain this goal.

These individuals are difficult to predict preoperatively. Studies suggest poor response to bariatric surgery is likely multifactorial and are generally speculative at this time [20]. In the past, such patients were thought of as “non-compliant,” but there is little evidence that measure of compliance correlate with performance after surgery. As one might expect patients with significant weight loss in the first postoperative year are more likely to have sustained long-term weight loss [21••]. Initial responders to surgery can have late weight regain, often associated with return of comorbid conditions. Sometimes, this is due to failure of the procedure itself, such as breakdown of a gastric staple line or band erosion but is often related to a change in environment or psychosocial stress.

Revisional bariatric/metabolic surgery encompasses a wide variety of solutions for an even wider variety of primary operations and for reasons that can occur over the lifetime of an individual patient. The complexity of this topic is increased because there exists little in the way of standardization of a particular operation. Gastric pouch and limb lengths vary not only among different surgeons but also often are modified by the individual surgeon depending on his/her interpretation of the needs of a particular patient. To this end, this review cannot be complete or devoid of personal opinion influenced by the experience of the authors. However, given the paucity of high quality published data, we have endeavored to provide rationale where evidence is lacking. These operations can be quite complex and technically challenging. It should be emphasized that only the most experienced and bariatric surgeons should attempt these procedures.

Although unclear, the exact percentage of individuals who could benefit from revisional bariatric/metabolic surgery, the incidence will continue to rise as the solutions continue to be refined and made available to those who most need this service.

**Indications for Reoperative Bariatric/Metabolic Surgery**

In a systematic review, the American Society for Metabolic and Bariatric Surgery (ASMBS) categorizes reoperative surgery as conversion, corrective, or reversal [22]. Conversions are sometimes necessary for both complications and inadequate response, such as a conversion from an adjustable gastric band to a gastric bypass. Corrective procedures indicate a poorly constructed initial operation or a complication of an operation such as operating on a gastric bypass for marginal ulceration as a consequence of a large gastric pouch. Reversal, when applicable, is necessary for intolerance to the consequences brought on by the procedure such as nutritional deficiencies or psychological issues.

Inadequate control of weight and/or comorbidities may be the most common indication for reoperation. The threshold for reoperation is still somewhat arbitrary and requires a thorough understanding of the potential risks as well as the benefits to the individual patient. Insurance carriers sometimes apply the 1991 NIH guidelines, based on BMI > 35, or modified Reinhold criteria (<50 % excessive weight loss) without evidence or expert opinion to validate these criteria. Compliance as measured by performance is also sometimes instituted to deny coverage. Interestingly, this rationale does not exist in other specialties such as orthopedics, oncology, or even general surgery. Therefore, the only plausible explanation for denial of coverage would be based on ignorance and prejudice against individuals of size.

Weight recidivism may lead to recurrent metabolic disease. These patients may be candidates for revisional surgery to improve metabolic response. Brethauer et al. showed improvement in HgA1c levels, lowered low density lipoprotein cholesterol levels and triglyceride
levels, and improved hypertension after revisional surgery for inadequate weight loss or weight recidivism [23]. However, further research is needed to examine those with adequate weight loss from primary bariatric procedures and still refractory metabolic disease.

In addition, patients with weight regain do not always necessarily translate into recurrent metabolic disease. One study found no reversal of insulin sensitivity after early weight regain after gastric bypass surgery [24]. Long-term studies are limited in examining long-term effects however.

As with most complex operations, complications can and do occur. However, with the increased longevity afforded patients undergoing bariatric/metabolic surgery, complications are not relegated to 30 postoperative days as it is in most surgical literature. Bariatric/metabolic surgeons’ success/failure is measured in terms of decades and so are their complications. Most long-term complications are nutritional and avoidable with proper education and follow-up. Others, such as the aforementioned marginal ulcers after gastric bypass can be treated with medications or cessation of smoking but sometimes require correction, conversion, or reversal individual to the patient [19-21, 25, 26, 27]. Significant nutritional deficiencies such as protein-calorie malnutrition can be dealt with modification of the limb lengths of the original operation or reversal of the procedure.

Currently, there are no set criteria as to what constitutes success or failure after bariatric/metabolic surgery; therefore, indications for reoperative surgery must be individualized to each patient. Ultimately, the indications should be in line with the objectives of the original procedure—to improve the quality and longevity of each individual life. Arbitrary indications based on BMI or weight should not be used.

Restorative or Corrective Surgery

The strategy of restorative/corrective surgery is to optimize and repair the current anatomy in order to correct the problem that failed non-operative management.

Restorative surgery would serve to return the anatomy to the intended primary state. For example, patients may present with dilated gastric pouch and cause food trapping in the neo-fundus and marginal ulcers thus require a revision of the pouch to a “normal” size. Surgery aimed at revising the gastric pouch solely for weight recidivism has been shown to be effective in the short term [28, 29]. Endoscopic procedures such as transoral gastric plication also have short-term effectiveness [29]. Reducing or optimizing the size of a gastric sleeve has been shown effective to augment weight loss. Restorative surgery assumes the initial operation was done optimally, and that there was a good initial response to the procedure; otherwise, conversion to a different operation would be indicated.

Corrective surgery may be performed to address complications of the primary bariatric surgery after failing non-operative treatment. Chronic marginal ulcers may develop on the Roux limb of the gastrojejunostomy and cause discomfort. Clearly if marginal ulcers can be treated with medications such as protein pump inhibitors and cytoprotective agents, surgery would not be indicated. However, recalcitrant ulcers may require revision.

Patients can also develop chronic stenosis at the gastrojejunostomy due to chronic marginal ulcers and fail endoscopic balloon dilation. In addition, gastro-gastric fistulas can develop between gastric pouch and gastric remnant causing weight regain and recurrent ulcer disease and require a revision of gastric pouch and division of the gastric remnant [30].

Endoluminal obesity therapy can be utilized in revisional bariatrics as a part of minimal invasive treatment options. Endoluminal options to reduce pouch size, stoma size, closure of gastro-gastric fistula are associated with minimal morbidity with good outcomes to certain group of patients and do not affect future revisions.

Augmentation

Augmentation may be performed to enhance gastric bypass intended effects. Although this is considered a conversion by the ASMBS, having its own category helps to simplify the nomenclature [22]. Augmentation of an existing procedure is performed for inadequate weight loss, weight recidivism, or improving medical comorbidities. An example of this includes limb lengthening or the addition of an adjustable gastric band after gastric bypass.

Distalization procedure serves to shorten the length of the common channel of a gastric bypass so that the amount of small intestine that comes in contact with food is decreased, therefore reducing the absorption of calories and nutrients. The malabsorptive nature of the distal bypass can potentially correct persistent or recurrent diabetes or hyperlipidemia.

By altering the common channel length to a shorter length, one study found a significant improvement at 6-month postoperative hemoglobin A1c compared to those with greater than 600 cm common channel [31]. However, there is no universal consensus regarding the optimal bowel limb lengths for effective weight loss or reversal of comorbidities [32].

While elongating the biliopancreatic limb can lead to weight loss and remission of diabetes and hyperlipidemia, close follow-up is required to prevent complications of protein malnutrition and malabsorption. Long-term results are still being investigated [27].
Conversion

Bariatric patients may require conversion to another procedure for complications from the primary surgery or ineffective weight loss.

Most commonly, conversion from lap adjustable gastric band to Roux-en-Y gastric bypass or sleeve gastrectomy is performed. Complications from gastric band include slippage and pouch dilation, erosions, dysphagia, and port complications leading to approximately 10–50 % removal rate and 40–50 % failure rate of long-term weight loss [27, 32, 33, 34••, 35].

Patients with previously placed adjustable gastric band, conversion both safe and effective and may be performed as single stage or in two stages [29]. Those that had minimal response to weight loss from the band had superior percentage of excess weight loss with conversion to the gastric bypass than from the sleeve gastrectomy [33]. Band revisions were found to have the lowest complication rate compared to other type of revisions [36].

Approximately 10–41 % of patients with vertical-banded gastroplasty may require revision due to complications or weight regain. One institution describes 15 cases of successful revision to gastric bypass [37•].

More recently, revision to a single anastomosis gastric bypass has been described. In France, 5 year data found a 66 % excess BMI loss for revision patients. However, patients had lower quality of life scores and more reflux and dysphagia symptoms compared to primary single anastomosis bypass procedures [21••]. Conversions from single anastomosis gastric bypass to gastric bypass for chronic bile reflux are now being reported [38]. In Taiwan, Lee et al. reports 42 cases of revision of single anastomosis gastric bypass to sleeve gastrectomy with success of maintaining BMI with resolution of preoperative malnutrition, ulceration, and bile reflux symptoms with a leak rate of 6.1 % [39].

Reversal

Reversal of gastric bypass may be indicated for patients with long-term complications from gastric bypass such as reactive hypoglycemia refractory to medication and diet changes, drug and alcohol addiction, and chronic marginal ulcers [40•, 41]. Other indications included intractable nausea and recalcitrant hypocalcemia [41, 42].

A small percentage of patients may become underweight with malabsorption issues resulting in severe protein-calorie malnutrition. These patients become dependent on total parenteral nutrition and require a reversal of gastric bypass to improve small bowel absorption [43].

After reversal, majority of patients have resolution of their symptoms [44].

Himpens et al. describes reversal of gastric bypass into sleeve gastrectomy as potential procedure for patients with anticipated undesirable weight gain. Ten patients underwent a single stage operation with conversion to sleeve like gastrectomy with plication of the antrum with resolution of preoperative symptoms. Leak rate was reported at 30 % [45, Fig. 1].

Personal Experience

Revisional surgery can be a technically challenging undertaking depending on patient needs. Patients with weight recidivism or inadequate weight loss can be the most challenging to our practice as results can be variable and difficult to predict. The success of converting a patient from adjustable gastric band or vertically banded gastroplasty to another primary bariatric procedure is much higher. However, those that undergo gastric bypass and sleeve gastrectomy, revisional surgeries are less dramatic in results and inconsistent. In one study, only 50 % of patients were noted to be good on a satisfaction index [28].

Failure of patient to achieve weight loss is not a marker of patient noncompliance. Medical therapies including appetite suppressants for return of hunger can be useful adjuncts. Patients being considered for revisional surgery must be optimized nutritionally and overall assessment of patient compliance and readiness. This must involve a multidisciplinary approach with adequate support from nutrition and psychologists.

Conclusion

Bariatric surgery is a powerful tool in the treatment of obesity and obesity-related diseases. However, as obesity is a chronic disease, bariatric surgery must continue to evolve as our understanding of the pathophysiology continues to grow. As more primary procedures are being performed, there will continue to be a rise in revisional surgeries. Surgeons must have a
thorough preoperative workup to delineate anatomy and patient symptoms before undertaking reoperative surgery. Revisional surgeries are higher risk operations and should be performed by experienced and technically competent bariatric surgeons with multidisciplinary resources available.

Compliance with Ethical Standards

Conflict of Interest  Pearl Ma, Subhash Reddy, and Kelvin D. Higa declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent  This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:

Of importance

Of major importance

Summarizes outcomes between primary versus revisional versus conversion bariatric surgeries.


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