



Revision of sleeve gastrectomy to Roux-en-Y Gastric Bypass: A Canadian experience



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ABSTRACT

Introduction: Sleeve gastrectomy (SG) can be associated with inadequate weight loss, insufficient resolution of co-morbidities and severe reflux. Conversion to Roux-en-Y Gastric Bypass (RYGB) is a potential solution. The aim of this study was to determine the common indications for conversion from SG to RYGB at our centre, and evaluate patient outcomes with respect to weight loss and co-morbidity resolution.

Methods: A retrospective review of patients who underwent conversion from SG to RYGB between 2008 and 2015.

Results: 273 SGs were performed of which 6.6% (n = 18) were converted to RYGB most commonly due to inadequate weight loss (65.3%) and severe reflux (26.1%). Two patients were converted as a planned two-stage approach to RYGB. Patients went from a mean preoperative BMI of 50.5 to a mean BMI of 40.5 post-SG on average by 20.9 months. The mean time to conversion was 41.8 months. There was a positive correlation between pre-SG BMI and time to conversion (p = 0.040). The mean BMI after conversion was 36.4, but this additional weight loss was not significant (p = 0.057). After conversion, four of the five diabetic patients are now medication free and 75% of patients no longer have reflux symptoms. All patients had complete resolution of their hypertension and obstructive sleep apnea. Revision perioperative complication rates were comparable to primary RYGB. Two patients developed new onset iron deficiency anemia.

Conclusion: Revision to RYGB is a safe option for SG failure and resulted in significant benefits from co-morbidity resolution.

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1. Introduction

Bariatric surgery is an established treatment modality for severe obesity with long-term efficacy in sustainable weight loss and comorbidity resolution.¹ Laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) are currently the two most commonly performed bariatric procedures in Canada. LRYGB achieves a slightly greater weight loss and comorbidity resolution when compared to the LSG long term.² However, LSG is gaining popularity because it is technically less demanding,

requires less operative time, and may be associated with fewer complications and metabolic deficiencies than the LRYGB.³ An added advantage of LSG is that the remnant stomach and duodenum are easily accessible for upper gastrointestinal (GI) endoscopy.

However, the LSG has disadvantages, including the potential for persistent symptomatic reflux, and the challenges associated with managing leaks, which typically occur close to gastroesophageal junction.⁴ Increasing experience with LSG shows that some patients will have inadequate weight loss, failure of comorbidity resolution, or develop reflux symptoms that are refractory to medical treatment.^{5,6} Some of these patients will require another surgical intervention such as re-SG, RYGB or the duodenal switch (DS).

The aim of this study was to determine the indications for

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conversion from SG to RYGB at our centre, and evaluate our patient outcomes not only with respect to weight loss, but particularly in regard to the additional co-morbidity resolution that is achieved after conversion.

2. Methods and surgical technique

A retrospective review of patients that underwent sleeve gastrectomy (SG) and subsequent revision to RYGB at the Royal Alexandra Hospital in Edmonton, Canada from January 2008 to December 2015 was completed. The indications for conversion were severe reflux refractory to medical management, inadequate weight loss (IWL) and a planned two-stage approach for RYGB. There is no consensus on the definition of IWL. At our centre, IWL was considered when a patient's weight was stable for more than 6 months with less than 50% excess weight loss, or when a patient experienced weight regain. Reflux was diagnosed based on symptoms of heartburn and regurgitation as per the Montreal Criteria,⁷ and all patients with reflux had a trial of medical management. Resolution of co-morbidities was defined as cessation of medications. Prior to conversion, all patients underwent a gastroscopy and upper GI contrast as part of the preoperative work up. The patients were also reassessed by a multidisciplinary team. Institutional Review Board approval for data collection was obtained.

The surgical technique was standardized across surgeons. LSG procedures were calibrated around a 50 French bougie. The surgical technique used in the revision LRYGB was similar to the primary LRYGB technique used at our centre. The gastric sleeve was horizontally transected approximately 7–8 centimetres (cm) below the gastroesophageal junction. If the sleeve was dilated, another staple cartridge was applied vertically. Further stomach resection was not performed. The biliopancreatic limb was approximately 30–50 cm in length. The Roux limb was brought up in an antecolic manner and a stapled end-to-side gastrojejunostomy was performed using a circular stapled technique. The length of the alimentary limb was between 100 cm and 110 cm. A stapled side-to-side jejunojejunostomy was performed. At the end of the procedure, an intraoperative gastroscopy and methylene blue dye test was performed to assess for anastomotic leak. This operative approach to the RYGB is the same technique that is used for primary RYGB at our centre.

Quantitative data was expressed as means $\pm$ standard deviation. Categorical variables were summarized as number of cases (n) and percentages. The two-sample *t*-test or two proportions procedure was used to determine if differences were significant. A *p*-value of <0.05 was considered statistically significant. The analysis was calculated using Statistix 10 Analytical Software (1985–2013).

3. Results

Of the 273 SGs that were performed from May 2013 to December 2015, a total of 18 of these patients underwent conversion to Roux-en-Y Gastric bypass (RYGB). All of these conversion surgeries were performed at our institution. The decision for SG was based on the patient's choice after discussion at the preoperative consultation (83.3%), a planned two-stage approach to RYGB for high-BMI patients (5.6%), or intraoperative choice because of challenges faced attempting to perform a RYGB at the initial operation (11.1%). Technical challenges which typically affected the decision to proceed with a RYGB were: extensive intra-abdominal adhesions, increased abdominal wall thickness, severe hepatomegaly, significant visceral fat and profound mesenteric thickening. In these instances, a SG was performed and later converted to a RYGB if needed. All patients were appropriately consented for this possibility.

Mean patient age was 41.7 ± 10.6 years and 77.8% were female.

Mean preoperative BMI was 50.5 ± 12.0 kg/m². Indications for laparoscopic conversion to RYGB were inadequate weight loss in nine patients (50%), intractable reflux in three patients (16.7%) and a combination of severe reflux and inadequate weight loss in four patients (22.2%). Two patients (11.1%) were converted as a planned two-stage approach to RYGB.

The average duration to achieving maximal weight loss after SG was 20.9 ± 7.8 months. The mean BMI after SG was 40.5 ± 10.5 kg/m². The average time between SG and revision RYGB was 41.8 ± 12.5 months. There was a significant relationship between pre-SG BMI and time to conversion to RYGB ($p = 0.040$), i.e. the higher a patient's initial BMI, the longer it took before their SG was converted to a RYGB. The mean BMI after conversion was 36.4 ± 9.0 kg/m². The mean additional weight loss after conversion was 23.0 ± 18.2 kg which was not statistically significant ($p = 0.057$). Weight loss trends are summarized in Table 1.

Two patients underwent open sleeve gastrectomies due to previous operations that resulted in significant intra-abdominal adhesions. These same patients required a laparotomy when they were converted to RYGB. The remainder (88.9%) underwent laparoscopic procedures. The mean operative time for conversion to RYGB was 120 ± 28 min. The mean operative time for primary LRYGB at our centre is 96 ± 8.5 min. Thus, re-operative surgery was on average 24 min longer ($p = 0.002$). The mean postoperative hospital stay was 2.5 ± 0.8 days. The mean follow-up duration after RYGB was 21.1 ± 11.3 months. The follow-up rate was 100%.

One patient had a post-operative bleed that required transfusion. There were three post-operative wound infections: two in the patients that underwent laparotomies, and the third was at the introduction site of the circular stapler of a revisional LRYGB patient. There were no anastomotic leaks. There were no perioperative deaths. Two patients (11.1%) developed marginal ulcers. These patients presented with epigastric pain, were diagnosed with endoscopy, and were successfully treated with medical management.

After conversion, four of the five diabetic patients (80%) are now medication free and three of the four (75%) of patients no longer have reflux symptoms. All patients had complete resolution of their hypertension and obstructive sleep apnea (OSA). Two patients developed new onset iron deficiency anemia. Co-morbidity resolution trends and complication rates are summarized in Tables 2–6.

4. Discussion

SG is a well-established bariatric procedure with excellent clinical outcomes. However, revision of SG is becoming increasingly common; and is done for inadequate weight loss and complications such as development of gastroesophageal reflux disease (GERD), stricture, pouch dilatation or leaks.⁶ Approximately 5–10% of SG patients will have limited weight loss and require a revision procedure.^{5,6} Possible reasons for these poor weight loss outcomes are inability to maintain lifestyle changes, technical factors at the initial operation leading to a relatively large sleeve, or a sleeve that has dilated over time. Reported perioperative complication rates for revisional laparoscopic bariatric surgery are approximately 14.3%–46.3% with conversion to laparotomy rates of 3.0%–27.8%.⁸ Our results showed a 22.2% perioperative complication rate which is comparable to the 23.6% perioperative complication rate in our primary LRYGB (Table 4). 2 patients (11.1%) were converted to open surgeries.

With SG failures, revisional surgery options include re-SG, RYGB (46%) and DS (24%).⁶ The disadvantage of a re-SG is significantly higher leak rates of up to 1 in 7⁹ with less weight loss.¹⁰ In conversion surgery for weight regain, Homan et al.¹¹ found a statistically better % excess weight loss after DS compared to RYGB (59% versus 23%). The disadvantage of DS is inadequate oral intake and

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