Revisional Surgery: Sleeve Gastrectomy to Roux-En-Y Gastric Bypass

Meshka Kamal Anderson and Abdelrahman Nimeri

1 Introduction

Laparoscopic Sleeve Gastrectomy's (SG) is the most common weight loss procedure performed in the United States (US), Europe, Asia, Middle East and North Africa [1]. In the US, as of 2018, over 61% of bariatric procedures performed are SG [1]. Despite similar mid-term effectiveness of primary SG and lower rates of complications compared to Roux-en-Y gastric bypass (RYGB), long term outcomes show that many patients may need revisional surgery after SG mainly for weight regain or gastroesophageal reflux disease (GERD) [2, 3]. In this chapter we will review the indications, preoperative workup, operative technique and outcomes of conversion of SG to RYGB.

2 Indications for Conversion of SG to RYGB

There are no randomized controlled trials, systematic reviews or meta analyses comparing conversion of SG to RYGB to other procedures. In addition, most of the series comparing conversion of SG to RYGB are small series (18–77 patients); with the exception of few matched controlled studies or multi center studies.

M. K. Anderson
Surgery Residency Program, Department of Surgery, Carolinas Medical Center, Atrium Health, Charlotte, NC, USA
e-mail: meshka.anderson@atriumhealth.org

A. Nimeri (✉)
Atrium Health Weight Management, Section of Bariatric & Metabolic Surgery, Department of Surgery, Carolinas Medical Center, Atrium Health, Charlotte, NC, USA
e-mail: nimeri@gmail.com

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The most common reason to covert SG to RYGB is due to the development of GERD because RYGB is more effective in treating GERD than biliopancreatic diversion (BPD), BPD-duodenal switch (BPD-DS), single anastomosis duodeno-ileostomy (SADI) or one anastomosis gastric bypass (OAGB) [2, 3]. In contrast, several studies report that conversion of SG to RYGB is not as effective for weight regain as described in a study by Parmar et al. [4]. Similarly, a multi-center study from the Netherlands by Dijkhorst et al. compared conversion of SG to RYGB or SADI [5]. It was able to demonstrate that RYGB was very effective for the resolution of GERD. However, SADI was more effective than RYGB for conversion from SG for weight regain, with a similar complication rate and higher rate of nutritional deficiencies after SADI (34%) compared to RYGB (26%) [5].

The high incidence of GERD and the potential for Barrett's esophagitis was first highlighted by Genco et al. in 2016 [2]. In his landmark paper, Genco reported that 5 years after SG, 68% of 110 patients presented with GERD versus 33% preoperatively and proton pump inhibitor (PPI) intake also increased to 57 from 19% preoperatively while 17.2% of patients developed Barrett's esophagitis[2]. Similarly, Mandeville et al. followed 100 patients after SG over 8.5 years and was able to show that 50% of patients developed severe reflux up from 17% preoperatively [6]. In this series, after conversion of SG to RYGB, 57% of patients converted had complete resolution of GERD symptoms [6]. There are other reasons to convert SG to RYGB. For example, a study by Landreneau et al. reported on patients converted for SG complications (47.2%), planned two-stage approach (40.5%) and weight regain (12.4%) [7]. Similarly, a multi-center study by Boru et al. revealed that 50% of patients converted were due to GERD, 40% IWL/WR and 10% GERD and IWL/WR and GERD resolution was 83% after conversion from SG to RYGB [8].

3 Pre-Operative Work-Up

Prior to converting SG patients to RYGB or other procedures, a thorough evaluation is required to evaluate the anatomy of SG, objective assessment for GERD, assessment of patient's compliance and nutritional status. To assess the anatomy of SG, an upper endoscopy (EGD) is often used to check the presence of a hiatal hernia, size of the SG pouch, presence of strictures or proximal migration of the Z line. In addition, an upper gastrointestinal (UGI) series is often used to estimate the function of the SG as well as the presence of any esophageal dilatation.

To objectively assess for the presence of GERD, one must not depend on symptoms as they are misleading. Objective assessment utilizing esophageal manometry and pH testing is necessary to document the presence or absence of GERD after SG. Finally, all patients considered for conversion of SG to RYGB or other procedures need assessment of their compliance to follow-up, behavioral and dietary recommendation of the dietitians and obesity medicine specialists as well a complete nutritional evaluation to assess for deficiencies can affect a patient's morbidity and quality of life.

4 Operative Technique for Conversion of SG to RYGB

The technical aspects of converting SG patients to RYGB involve important steps including always looking for a hiatal hernia (especially on the left side), using a higher surgical staplers height to compensate for thickness of the SG tissue as well as liberal over-sewing of the staple lines, utilizing the patients current BMI and prior weight loss success in deciding the length of the BP limb (100 cm up to a maximum of 1/3 of the small bowel up to 250–300 cm) [9]. For example, Nergaard et al. evaluated 187 primary RYGB patients randomized to a long BP limb (200 cm) versus a short BP limb (60 cm) over a median follow-up of 70.6 months[10]. Median pre-operation BMI was 44 kg/m^2. At 2-years post-RYGB, the long BP limb group had a higher mean EBMIL% of 88.5% compared to the short BP limb group at a mean EBMIL% of 77.7% [10]. A difference between groups was maintained throughout the study period and at 7 years post-surgery even in the superobese (BMI > 50 kg/m^2) [10]. However, nutritional deficiencies were more common in the long BP limb group (17–67%) compared to the short BP limb group (3.5–52%) [9]. In addition, others have shown that significant nutritional deficiencies (requiring hospital admission) can occur if the BP limb is made too long and studies have suggested that BP length over 200 cm may redispose patients to hospitalization [11].

5 How Common Do SG Patients Need Conversion to RYGB

It is difficult to council SG patients about the true incidence of conversion of SG to RYGB due to the lack of large series with long-term follow up. Nevertheless, Felsenreich et al. followed 96 patients for 10-years after SG and reported that 14% of SG patients were converted to RYGB due to GERD [12]. In addition, 38% of SG patients had symptomatic GERD but did not undergo revisional surgery [12]. The authors updated their study in 2018, and the conversion rate increased from 14 to 33% while the number of symptomatic patients who did not undergo revisional surgery increased from 38 to 57% [12]. Similary, Chang et al. reported on a series of SG patients with a 10-year follow-up. In this series 50% had de novo GERD symptoms and 21.5% needed revision to RYGB [13].

It appears that conversion of SG to RYGB leads to improvement in GERD symptoms, more weight loss and improvement of obesity related medical problems. For example, a Canadian study by Yorke et al. evaluated 273 SG for a mean of 41.8 months and 6.6% needing conversion to RYGB [14]. Reasons for conversion were inadequate weight loss (65.3%) and severe reflux (26.1%) [14]. The mean BMI after conversion was 36.4 kg.m^2, down from a mean BMI of 50.5 kg/m^2 preoperatively [14]. Similarly, Parmar et al. reported that conversion of SG to RYGB over a 3-year period with 16 month follow-up yields benefits for resolving GERD but not for further reducing weight [4]. Reasons for conversion were

GERD in 45.5% (pre-conversion BMI 30.5) and IWL/WR in 50% (pre-conversion BMI 43.3) [4]. All patients converted for GERD noted improvement in their symptoms, with 80% stopping their medications altogether [4]. In the IWL/WR group, the BMI drop was 2.5 point after 2 years similar to the BMI drop in the GERD group (2-point drop) [4].

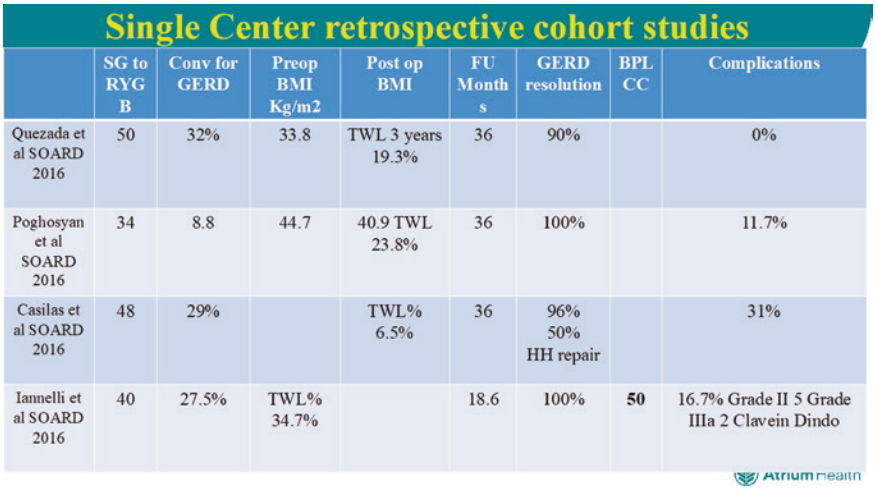
6 Conversion of SG to RYGB Versus Other Procedures

In patients with weight regain post-SG, the BMI at the time of the conversion plays an important role in which procedure is recommended and patients with super obesity (BMI>50 kg/m^2) are not recommended to undergo conversion of SG to RYGB. This is particularly important since weight loss is lower in patients undergoing conversion of SG to RYGB and the rate of complications is higher than primary RYGB. For example, Malinka et al. compared outcomes of revisional RYGB vs primary RYGB [15]. The percent excess weight loss was higher in the primary group (74 ± 23%) versus the revisional group (52 ± 26%) at 3 years. With similar resolution of comorbidities such as diabetes and hypertension[15].

A study by Dijkorst et al. evaluated 140 patients after conversion of SG to RYGB or Single Anastomosis Duodenoileal Bypass (SADI) [5]. At 2 years, SG patients converted to SADI had 20% more total weight loss than those converted to RYGB [5]. The SADI group however also had more nutritional deficiencies than the RYGB group, 34 versus 26% [5]. Similarly, Homan et al. evaluated outcomes of SG patients converted to RYGB versus biliopancreatic diversion with duodenal switch (BPD/DS) [16]. The primary reasons for conversion were inadequate weight loss in 40% and weight regain in 19% [16]. After 34 months, median excess weight loss was 59% in BPD/DS and 23% in RYGB and nutritional deficiencies were more significant in patients converted to BPD/DS [16]. Likewise, Shimon et al. also studied the outcomes of SG patients converted to RYGB or BPD/DS for insufficient weight loss [17]. The mean follow-up was 49 months and conversion to RYGB led to lower BMI reduction of 8.5–31.9 kg/m^2 compared to SG conversion to BPD/DS BMI reduction of 12.8–31.9 kg/m^2 [17].

7 Conclusion

The data suggests that an important component in the decision making of converting SG patients to RYGB vs other procedures should be balancing the amount of weight loss desired with potential side effects such as diarrhea, steatorrhea and nutritional deficiencies that may lead to additional complications. Complications such as osteoporosis due to severe vitamin D deficiency or iron deficiency anemia. It appears that converting a SG patient to RYGB will have less weight loss than conversion of SG to SADI or BPD/DS but SG patients converted to RYGB tend to suffer fewer nutritional deficiencies compared to SG patients converted to BPD/DS.



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