Decreasing complication rates for one-stage conversion band to laparoscopic sleeve gastrectomy: A retrospective cohort study

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Abstract

Background: Laparoscopic adjustable gastric banding (LAGB) revision surgery is often necessary because of its high failure rate. The objective of this study was to demonstrate that better patient selection, when converting a failed LAGB to a laparoscopic sleeve gastrectomy (LSG) as a one-stage revision procedure, is safe, feasible and improves the complication rate.

Patients and Methods: A retrospective chart review was performed on patients who underwent a one-stage conversion of failed gastric banding to a LSG. Collected data included age, sex, body mass index (BMI), intraoperative complications, length of stay and post-operative complications. The results were compared to a previous study of 90 cases of LSG as a revision procedure for failed LAGB.

Results: There were 75 patients in the current study, 61 women and 14 men, aged 25–67 (average: 46), with a mean BMI of 45 kg/m² (32–66). Seventy patients (93.3%) were operated for insufficient weight loss and 5 patients (6.7%) for intolerance to the band. In our previous study, 35 patients (39%) were operated for slippage, erosion or obstruction and 14 (15.6%) had post-operative complications as opposed to only 4 patients (5.3%) in this series ($P = 0.0359$). Gastric leak also improved to 1.3% compared to 5.5% previously. Average hospitalisation time was 2.5 days (1–40).

Conclusions: Rigorous patient selection, without band complications such as slippage, erosion or obstruction, allows for a significantly lower rate of operative complications for a one-stage conversion of failed gastric banding to a LSG.

Keywords: Laparoscopic adjustable gastric banding, laparoscopic sleeve gastrectomy, morbid obesity, revisional surgery

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INTRODUCTION

In the past, laparoscopic adjustable gastric banding (LAGB) was one of the most commonly performed surgeries for morbid obesity.\cite{5} LAGB is a restrictive procedure that was once thought to be a good option for the management of morbid obesity. There are shorter surgical learning curve and lower early complication rate, which probably contributed to the popularity of the procedure.\cite{2}

Unfortunately, time has revealed the high rate of complications and of weight loss failure associated with this procedure.\cite{3} Consequently, an era of revision surgeries for a patient affected by those issues is now underway. Extended follow-up showed high failure (20%–56%) and removal (10%–50%) rates resulting from weight loss failure or complications.\cite{3,5} Our previous study showed an increasing demand for revision surgery post-LAGB and that a revision to sleeve gastrectomy in a single-step procedure was associated with a 5.5% rate leak.\cite{6} The sleeve gastrectomy technique and its effect at the metabolic level have already been described in the literature.\cite{7-9} The same can be said for its safety as a revision procedure for failed adjustable gastric banding but with a high number of complications.\cite{10-12} However, whether gastric band removal surgery should be a one-stage or two-stage procedure is still under debate.\cite{13} The hypothesis for this retrospective study is that better patient selection would decrease the complication rate for a one-stage revision bariatric surgery.

PATIENTS AND METHODS

Between January 2012 and December 2015, more than 1000 patients underwent laparoscopic sleeve gastrectomy (LSG) at a university bariatric centre, amongst which 75 had revision surgery for failed LAGB. A retrospective review of a prospectively collected database was performed, according to requirements of the Quebec College of Physicians and the hospital to evaluate the improvement in the quality of the act, in accordance with their guidelines and approval from hospital management. Data were collected through routine follow-up. Demographics, complications and percentage of excess weight loss (%EWL) were determined. Based on barium swallow or gastroscopy, patients with slippage, erosion or obstruction were excluded from the study.

All patients followed a 2–4-week Ideal Fast® diet before revision surgery, to achieve a significant reduction in liver size and liver fat content, improving operability and access to the gastro-oesophageal junction.

The surgery was performed under general anaesthesia in a supine position with the table in reverse Trendelenburg. Intermittent pneumatic calf compressors were applied with prophylactic intravenous cephalosporin administered prior to incision and without the insertion of a urethral catheter. An orogastric tube was used and the stomach was decompressed. A Veress needle was inserted in the left upper quadrant with insufflation of the abdominal cavity to a pressure of 15 mmHg. Six laparoscopic ports were inserted. The band was then transected and removed; fundal adhesions to the left diaphragm were excised to completely mobilise the stomach and prevent leaving a large gastric pouch at the level of the gastro-oesophageal junction. The fibrous tissue caused by the band was carefully removed anteriorly, leaving a posterior segment to avoid further damage to the stomach. The short gastric vessels were taken down along the greater curvature of the stomach with a Harmonic® scalpel (Ethicon Endo-Surgery Inc.) or a Ligasure Atlas® (Covidien Inc.). Dissection started 4–5 cm proximal to the pylorus, extending cephalic and taking the adhesions down around the fundus of the stomach. Any dimpling of the hiatus was explored and hiatal hernia was repaired if present. Once freed, a bougie was inserted by the anaesthesiologist, following the lesser curvature. The bougie size, 36–40 Fr, was chosen according to surgeon’s preference. Once the bougie tube was positioned, sequential firings of the stapler (Tri-Staple, Covidien Inc.), without reinforcement, were used to transect the lateral stomach, creating a vertical gastrectomy.

A computed tomography (CT) scan with Gastrografenin® swallow was completed on post-operative day (POD)-1 to rule out any early gastric leak before the advancement of diet. Diet started with clear liquids on POD-1. On POD-3, liquid protein began, which continued for 3 weeks, followed by a soft protein diet, and eventually a solid protein diet at 4 weeks, as tolerated. Multivitamins, Vitamin B12, calcium, iron, Vitamin D and thiamine were given depending on blood tests (Vitamin B12, calcium, iron, Vitamin D and thiamine) taken every 6 months. The primary outcome was repeatedly assessed by means of the amount of weight loss, complications and re-operations. Operative morbidity and mortality were defined as any significant complication or death within 30 days following surgery. Follow-up appointments with complete laboratory assessments were done routinely at 6, 12 and 24 months post-operation.

Continuous values are expressed as mean and standard deviation. Continuous values were compared by Student’s t-test and categorical data by Chi-square and Fisher’s exact tests. P < 0.05 was used to denote statistical significance.
Statistical analysis was performed using IBM SPSS statistics (IBM, Armonk, New York, USA).

**RESULTS**

Between January 2012 and December 2015, 75 patients underwent LSG with adjustable gastric band removal. The study group consisted of 61 women and 14 men with a mean age of 46 years (range: 25–67) and a mean pre-operative weight of 124 kg (range: 77–200) and a mean body mass index of 45 kg/m² (range: 31–71). The following comorbidities were found in 60 patients (80%) before revisional surgery: diabetes mellitus in 21 patients (28%), hypertension in 27 patients (36%), hyperlipidaemia in 12 patients (16%) and obstructive sleep apnoea in 33 patients (44%). Six patients (8%) had four obesity-related comorbidities, 7 (9.3%) had three, 14 (18.6%) had two and those remaining had one or none. When compared to our previous study, the two groups are similar except that, in the new cohort, there are twice as many patients suffering from diabetes or sleep apnoea ($P = 0.019$ and $P = 0.0002$, respectively) [Figure 1].

All the bands had been inserted using the pars flaccida approach and fixed by three to four non-absorbable seromuscular anterior gastrogastric stitches, which completely covered the anterior part of the band. The mean time between band placement and sleeve gastrectomy with band removal was 40 months (range: 6–80). Seventy patients (93.3%) were operated for insufficient weight loss and 5 patients (6.7%) for intolerance to the band. In our previous study, 35 patients (39%) were operated for slippage, erosion/infection or obstruction [Figure 2a and b].

Revisions were completed in one stage in 75 patients, without conversion to open surgery (there were two conversions in the previous study, on two patients with band erosion). No hiatal hernia was discovered during revision surgery. The bougie size was 40 Fr in 59 patients (79%) and the staple line was not reinforced. The mean operative time was 100 min (range: 58–168), with no intraoperative complications. Only four patients (5.3%) suffered a post-operative complication (2 – gastric hematoma, 1 – severe dysphagia and 1 – gastric leak) as opposed to 14 in the previous study ($P = 0.0359$). Gastric leakage rate was 1.3% in our series (5.5% in the previous study) [Figure 3a and b].

A CT scan with Gastrografin® swallow was performed for 57 patients (63.3%) on POD-1 to rule out leakage and hematoma before the advancement of diet. No deep vein thrombosis and/or pulmonary embolism were noted. Average hospitalisation time was 2.5 days (1–40). A total of 60/75 patients had a follow-up time of at least 1 year (80%), 46/75 at 2 years (61%) and 9/75 at 3 years (12%). The mean post-operative %EWL was 54%, 53% and 38% at 1, 2 and 3 years, respectively.

**DISCUSSION**

Bariatric surgery has now been present for several decades, generating more and more demand for revision surgery for previous, failed surgery.[14] About 10%–25% of patients undergoing bariatric surgery require a revision, either for insufficient weight loss or for complications.[10,15] Revision procedures are generally associated with a higher risk of post-operative complications compared to primary procedures, and the perioperative morbidity rate is reportedly higher from 19% to 50%.[16] Our goal was to stress the importance of selection criteria, in order to

![Figure 1: Comorbidities for both studies](image1)

| Comorbidities | Actual study (75 patients) | Previous study (90 patients) | P value |
|---------------|---------------------------|-------------------------------|---------|
| Sex | 81% women | 86% women | ns |
| Age | 46 (25-67) | 41 (22-67) | ns |
| Weight (Kg) | 124 (77-200) | 117 (70-166) | ns |
| BMI | 45 (31-71) | 42 (26-58) | ns |
| Diabetes | 21/75 (28%) | 12/90 (13%) | 0.019 |
| HBP | 27/75 (36%) | 30/90 (33%) | ns |
| Sleep apnea | 33/75 (44%) | 16/90 (18%) | 0.0002 |

![Figure 2: (a) Patient selection comparison between both series of patients. (b) Statistical difference between the two studies for patient selection](image2)
Garneau, et al.: Patient selection and band revision

perform the sleeve gastrectomy as a single-stage procedure along with the removal of the band and have a safe outcome. Few studies have focused exclusively on gastric band removal combined with the sleeve gastrectomy as a single procedure, whereas many articles compare the results of laparoscopic Roux-en-Y gastric bypass (RYGB) and LSG after band removal.\[17\]

The study by Park and Kim reported a high complication rate (22.2% of gastric leak and 11.1% of gastric stenosis),[10] and our first study also found that one-stage conversion of failed gastric banding to LSG was associated with a high complication rate: 5.5% leaks, 4.4% haemorrhage or gastric hematoma and 2.4% parietal hematoma, with 6.6% conversions to open surgery. Most of these patients had significant pre-operative gastric band complications such as erosion, slippage or occlusion.[6]

Consequently, we decided to use one-step surgery only on those patients without gastric band complications, believing that by selecting our patients properly, we could decrease our complication rate. In our new study, we performed single-stage surgery on patients who did not have any complications such as band erosion, perforation, slippage or occlusion. Instead, we selected patients with weight loss failure and intolerance to the band. In this way, we were able to lower our complication rate to 1.3% leaks, 2.7% gastric hematoma, 1.3% dysphagia and 0% conversion to open surgery. Although when each complication is taken individually there is no statistical difference because of the small number of studied patients, the total number of complications (4 vs. 14) does represent a statistically significant difference ($P = 0.0359$). Obviously, experience also played a role in this reduction and allowed us to eliminate technical complications such as colonic perforation or spleen laceration [Figure 3a and b].

Other articles also studied gastric band removal and sleeve gastrectomy as a one-stage procedure, but the series were smaller. In the series by Acholonu et al., there were 15 cases of band removal with sleeve gastrectomy, and only 13/15 were done in a single-stage operation, with 1 case of gastric leak.[11] Berende et al. had a group of 28 patients in which 15 cases underwent one-stage surgery, with complication rates of 20% bleeding and 33% leakage.[18] In the Carandina et al. series, there were 34 cases of revision after band removal into a sleeve gastrectomy with a 2.9% gastric leak rate. However, all those procedures were done as a two-stage surgery, and some of their gastric bands were not removed at the same institution where the patients had their sleeve gastrectomy.[19] In our series, all surgeries were done as a single-stage procedure in the same institution.

In Dang et al., a systematic review and meta-analysis on one- and two-stage revision surgeries, 11 studies were included with 1370 patients. The meta-analysis found comparable rates of complications, morbidity and mortality between one- and two-stage revisions for both the RYGB and sleeve gastrectomy groups. This suggests that immediate or delayed revisional bariatric surgeries are both safe options for LAGB revision. These results support our conclusion, especially considering that we were able to define our surgical indications for a single-stage operation, with a low rate of complications.[13]

The rationale behind the conversion of a failed gastric banding into LSG stems from the fact that the latter works not only as a restrictive procedure but also on other hormonal mechanisms. Indeed, a change in the plasma levels of ghrelin, the hormone that regulates the feeling of hunger, seems to be involved as well.[12]

We agree that follow-up is a major concern in our series, as in most studies in bariatric surgery. Unfortunately, many patients are lost to follow-up because they believe that there is no need to have a medical follow-up unless they have a major problem. This could explain why we have found a %EWL at 3 years of 38%. Only 12% of patients attended their 3-year follow-up, probably due to unsatisfactory weight loss. In our previous study, the %EWL at 3 years was 55% for 22% of patients.
We believe that more studies on this subject are needed for a tailored approach to each patient with a previous gastric adjustable band surgery. This surgery is still offered in many centres around the world and will lead to even more revision surgery post-LAGB.

The experience acquired by the surgeons might present a potential bias which could have improved results, but the change in indication is clearly the major factor. Conversion of a band to a sleeve using a one- or two-stage procedure remains a topic of discussion. Indeed, the high complication rates reported in some studies discouraged the one-stage approach. Our study shows that better patient selection lowers that complication rate for a one-stage conversion. The LSG is an effective procedure for failed LAGB, and the number of complications can be decreased by improving selection criteria, when compared to our previous series which had a higher rate of serious complications (gastric leak).

CONCLUSION

With the increasing demand for revision surgery, we should be aware that the problems associated with complications do not result from the type of revision surgery but rather from patient selection. Our results showed that one-stage conversion of failed gastric banding to a LSG is a safe procedure. We believe that patients with poor weight loss and discomfort related to their gastric band are good candidates for a single-stage surgery, yielding a safe outcome and a low complication rate.

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Conflicts of interest

There are no conflicts of interest.

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