Impact of laparoscopic banded gastric bypass on weight loss surgery outcomes: five years' results

Abdelrahman Mohammed Galal [1,2,4], Evert-Jan Boerma [1,2], Sofie Fransen [1,2], Berry Meesters [1,2], Steven Olde-Damink [3], Magdy Khalil Abdelmageed[4], Alaa Abass Sabry[5], Alaaeldin Hassan M. Elsuity[4] and Jan Willem Greve [1,2]

1. Surgery department, Zuyderland Medical cnter, Heerlen, the Netherlands.

2. Dutch obesity clinic south, Heerlen, the Netherlands

3. Maastricht Universiy, Maastricht, the Netherlands.

4. General Surgery department, Sohag University hospital , Sohag University, Egypt

5. General surgery department, bariatric and metabolic surgery unit, Ainshams University hospital, Cairo, Egypt.

Abstract

Objective:

Evaluate 5 years outcomes of banded gastric bypass (BRYGB) as a primary and revisional bariatric procedure.

Methods:

A retrospective review of all BRYGB between January 2011- March 2013. Outcomes included % Excess Weight loss(%EWL), weight loss maintenance and band related complications.

Results

142 patients underwent BRYGB; 106 primary and 36 conversions. Indication for conversion to BRYGB were complications of the primary procedure (n= 19), insufficient weight loss (n=5) and weight regain (n=12). In the primary group, mean preoperative BMI was 44.8 kg/m2 (±6.9 kg/m2). After 1, 2, 3, 4 and 5 years, %EWL was 81.9% (n=95), 81.1 (n=82), 80.6% (n=70), 79.4 (n=62), 75.4% (n=75) respectively. Mean %TWL compared to pre-revision weight was 33.9% (n=95), 34.1%(n=82), 34.0% (n=70), 33.9% (62), 31.8% (n=75) after 1, 2, 3, 4 and 5 years respectively. In conversions for insufficient WL and or weight regain; mean preoperative BMI was 40.8 kg/m2 (±6.01 kg/m2). One patient gained weight

and 16 patients had mean %EWL 69.7%(n=13), 76%(n=11), 71.6%(n=8), 62.7%(n=8) and 52.4%(n=11) after one, two, three, four and five years respectively. Compared to pre-revision weight, % TWL was 25.7% (n=13), 28% (n=11), 23.9 (n=8), 18.3(n=8) and 18.2 (n=11) respectively.

In conversions secondary to complications of the primary procedure (n=19), mean preoperative BMI was 28.4 kg/m2 (±3.5 kg/m2); after 1,2,3,4 and 5 years mean BMI was 28.1 kg/m2(n=15), 29 kg/m2(n=10), 29.8 kg/m2(n=9), 30.6 kg/m2(n=10) and 30.9 kg/m2(n=12) respectively.

Band related complications after five years of follow up: erosion (n=3, one with concomitant gastro-gastric fistula), persistent dysphagia (band diameter 6.5cm (n=5). One band was repositioned as it was around the gastrojejunostomy. Perioperative surgical complications (30 days); bleeding(n=2), leakage and band removal(n=1), port site hernia(n=1), food impaction(n=1), wound problems(n=2).

Conclusion

Banded gastric bypass has good results in terms of weight loss and weight loss maintenance in both primary and revisional bariatric procedures with acceptable incidence of band related complications.

Introduction

Bariatric surgery is the most effective and sustained treatment of morbid obesity and its associated comorbidities compared to non-surgical methods [1]. More than 500,000 bariatric procedures are performed yearly, consequently the revision procedures is expected to increase [2]. Although laparoscopic gastric bypass is the second most common bariatric procedure performed all over the world after sleeve gastrectomy, 39.6% and 45.9% respectively, it is still considered the gold standard procedure to obtain long term sustained significant weight loss and resolution of obesity-associated comorbidities, in particular diabetes mellitus type 2 [2, 3]. After 18- 24 months, Kothari et al have reported mean Excess weight loss (EWL) 79% and 56% after 10 years [4]. Although standard gastric bypass has good results in weight loss, weight regain has been reported in many studies. Magro et al. reported significant weight regain after 48 months [5]. Christo also reported in gastric bypass patients with minimum follow up 10 years a failure rate 20% in morbid obese and about 35% of the superobese patients [6].

Weight regain after gastric bypass surgery could be attributed to many factors such as adaptive anatomical changes(lost restrictive component), patient non-compliance to follow up protocols and physiological changes that occurs after all bariatric procedures not only in bypass [6, 7]. In a study published by Yimcharoen et al., gastrojejunostomy dilatation was the most common cause of weight regain (59%), followed by pouch dilatation (29%) and both in 12% [8]. Dilatation of pouch or outlet lead to subsequent dilatation of the roux limb and increase the functional capacity of the pouch.

For these reasons, banded gastric bypass has been proposed to guard against weight regain. Banded bypass was introduced as a revision surgery for failed vertical banded gastroplasty (VBG). After good initial results with conversion of VBG to RYGB leaving the band in place, the use of banded gastric bypass as a primary bariatric procedure was suggested [9, 10]. Multiple bands have been used such as silicone bands, synthetic meshes, the GaBP™-Ring and even adjustable gastric band in combination with the gastric bypass [11, 12]. In a systematic review, Mahawar et al concluded that banded gastric bypass has a significant superiority over non-banded bypass when it comes to long-term weight loss, especially in patient at BMI more than 50, resolution of comorbidities and improvement of quality of life [7]. However, banded gastric bypass has some specific band complications such as postoperative food intolerance, band migration and erosion, these problems could be avoided

by proper selection of the band type as well as adequate knowledge about the technique of band positioning and using the proper size [13]. The present study reviewed the short and five years outcomes of non-adjustable banded bypass as a primary and revision bariatric procedure in a tertiary bariatric center regarding weight loss, comorbidity resolution and band related complications.

Material and methods

I. Study design and population

A retrospective study with prospective collected data included all consecutive bariatric patients who underwent non-adjustable banded gastric bypass in Zuyderland Medical Center between the 1st of January 2011 and the 31st of March 2013. The analysis included data of all the patients who underwent primary and revision surgery. All patients were approved as candidates for bariatric surgery by a multidisciplinary screening team, between 18 and 65 years of age and a BMI more than 40 kg/m2 or BMI of more than 35 combined with comorbidities. Patients who had adjustable banded gastric bypass were excluded from the study population.

II. Intervention:

Laparoscopic non-adjustable banded Roux en Y gastric bypass (BRYGB) is a standard bariatric procedure in Zuyderland Medical Center since 2011. All procedures were done laparoscopically except one converted to open because of massive adhesions after mason. A vertical gastric pouch of 5–7 cm was calibrated by 40 Fr gastric tube. Gastrojejunostomy (GJ) and jejenujejunostomy (JJ) was performed using linear stapler and hand sewen closure of the remaining opening. Alimentary limb was 120 cm and biliary limb 60 cm in all patients. Type of band used in all patients was silicon tubing. It was placed around the pouch, 1–2 cm proximal to the gastroenterostomy. Band circumference after closure 6 and 6.5 cm were initially used in all patients. Later, 6.5 cm was used for females and 7.0 cm for males and revisions. For tube placement, atraumatic goldfinger instrument was used to bring the tube through the lesser omentum. At the moment of closure, gastric tube should be inside the pouch. Closure of ring was done by non-absorbable suture.

III. Data collection

Prospectively collected data included age, sex, BMI. Examined comorbidities were diabetes mellitus (DM), hypertension(HT), obstructive sleep apnea (OSAS), hypercholestraemia (HC). The surgical details were type of procedure (primary or revision), operative time, band

diameter and intraoperative complications. Follow up data included five years excess weight loss (EWL%), percent total weight loss (TWL%), comorbidity resolution and early (post-operative 30 days) and late complications.

All the required data have been collected from the patients' files at Zuyderland Medical Center and their follow-up files at Dutch Obesity Clinic South. To update follow up data for missing patients, a postal questionnaire was sent to all patients to retrieve the latest outcome. Patients who did not respond received a phone call and email if applicable. The postal questionnaire contained questions about:

a) Current and lowest weight after surgery.

b) Current comorbidities and medication.

c) Possible complaints / complications.

d) Any surgical intervention related to the banded gastric bypass.

In case of non-response, the data of the last visit either in hospital or Dutch obesity clinic were used as a final outcome.

IV. Outcomes

A. Weight and BMI: Patient weight and BMI were recorded prior to the operation and during each follow up visit at 3 months, 6 months and 1, 2, 3, 4, 5 years. Weight loss (in kg) and weight change were reported as the percentage of excess weight loss (%EWL). The following formulae used to calculate:

1. The Excess Weight = preoperative weight − Ideal Weight.
2. Patient weight at BMI 25 was considered the ideal weight.
3. Weight loss = preoperative weight- current weight
4. %EWL = Weight loss × 100 / Excess Weight.
5. %BMI loss = preoperative BMI - %BMI loss at each time point.

B. Obesity related comorbidities

The included comorbidities in this study were defined as the following:

- Diabetes mellitus (DM): is a fasting plasma glucose of ≥126 mg/dl or a 2-hour plasma glucose ≥200 mg/dl or the use of antidiabetic drug and or insulin therapy.

- Hypertension (HT): is defined as systolic blood pressure ≥140 and/or diastolic blood pressure ≥ 90 mmHg or the use of antihypertensive medications.
- Obstructive Sleep Apnea Syndrome (OSAS): is repeated episodes of upper-airway obstruction during sleep with or without day time sleepiness, or use of nasal continuous positive airway pressure (CPAP) during sleep.
- Hypercholesteremia: is a fasting lipid profile of HDL <40 mg/dl for men and <50 mg/dl for women, and/or triglyceride >150, and/or LDL >100 mg/dl, or use of lipid lowering medications.

Comorbidity resolution was stratified as shown in table 9.

Comorbidity status	Definition
Remission	Stop all medication
Improvement	- Decreased amount of medication - Stop using CPAP (in cases of (OSAS)
Unchanged	The same situation as before surgery
Worsened	Increase amount of medication or developed complication
Recurrent / Relapse	Recurrent after complete stop of medication
New comorbidity	After surgery

C. Complications:

All procedure related complication either general or band related complications were reviewed regarding early complications (30 days post-operative) and late complications.

D. Statistical analysis

Data had been managed and analysed using SPSS version 22, for Windows (SPSS Inc., Chicago, IL, USA). Categorical data expressed as percentages and continuous data were presented as means ± standard deviation. This study had been approved by medical ethical committee of Zuyderland medical center and medical director of Dutch obesity clinic south.

E. Results

Patients characteristics:

A total of 142 bariatric patients who underwent Non-adjustable Banded Gastric Bypass between January 2011 and March 2013 in tertiary bariatric center. Of these, 106 patients were

primary (group I) and 36 patients revision bariatric procedures. Indications for revision were complications of the primary procedures in 19 patients (group II) and weight loss failure in 17 patients (group III). The main indication of conversion in group II was persistent dysphagia and vomiting from the primary procedures, therefore, the first target to resolve the complication then maintains the weight loss state. In group II; six patients had BMI ≤25 kg/m2, seven patients had BMI 26-30 kg/m2 and six patients had BMI between 31-33 kg/m2. Group III included 5 cases of insufficient weight loss and 12 cases of weight regain after primary procedures. Type of procedures and indications are shown in (table 1). Numbers and percentages of follow up are shown in (table 2). Preoperative patient characteristics including demographic data and comorbidities are summarized in (Table 3).

Weight loss outcomes

In the study population; ninety-nine patients completed 5 years follow up (75 patients primary and 24 revision); 9 patients responded to phone call, 31 responded to questionnaire and the remaining collected by patients' files in the hospital and outpatient clinic and Dutch obesity clinic south. All patients in group I and III achieved weight loss except one patient in the latter group who did not lose weight but gained more than preoperative. The mean %TWL and %EWL at 5 years (compared with baseline weight prior to surgery) was 31.7 ±10.4% and 75.4± 23.25 %, respectively in the primary group compared to 18.2± 15.2% and 52.6± 41.5%, respectively in group III. Both groups attained mean %EWL more than 50 % after 5 years follow up. In the primary group 89.2% of the patients who completed 5 years follow up had more than 50%, whereas 50% in group III (figure 1). One patient in group III gained weight from BMI 40kg/m2 preoperative to BMI 48 kg/ m2 at 5 years or more. Table 4 and 5 show the weight loss, % EWL in the group I and III with the number of patients at each follow up point.

Weight loss maintenance

Five years Mean BMI at all groups were around BMI 30 (figure 2). Group I was divided to morbid obese (BMI <50) and superobese (BMI ≥50). Mean five years BMI in morbid obese was 28.9 kg/m2 whereas superobese mean BMI was 33.7 kg/m2. In group II who were converted to banded bypass because of complication from the primary procedures, base line mean BMI was 28.4 kg/m2 and reached to the lowest measure after one year. Five years mean BMI in group II was 30.5 kg/m2. Group 3 who operated for failure of their primary procedures, they maintained at mean BMI 32.8 kg/m2 (table 6).

Complications

I. **<u>30- days complications:</u> a**ll procedures were done laparoscopically except one case converted to open laparotomy because of dense adhesions. In the perioperative and early post-operative period there were non-specific complications (6 patients, 4.2%) in the form of

- Hypokalaemia
- Impaired renal function due to low intake and repeated Vomiting.
- Urinary tract infection.
- Wound problems:
  - Wound infection: one patient.
  - Bleeding and haematoma: two patients; one of them was liver cirrhosis and decompensated (thrombocytopenia and ascites)

Seven patients (4.9%) needed intervention either by laparoscopy or endoscopy.

A. **Primary group: two patients (1.9%):**
   - Gastrojejunostomy leak: Re-laparoscopy and endoscopic stenting were done then complicated by pelvic abscess. (Band removed)
   - Food impaction: endoscopic removal.

B. **Revision group:** five patients (13.9%) needed re-laparoscopy because of:
   - Bleeding
   - JJ kinking (converted to laparotomy)
   - Cicatricial hernia repair at 6th days postoperatively
   - Two cases of negative re- laparoscopy.

II. **<u>Late complications (after 30 days postoperatively)</u>:**

At least one long term complication was observed in 34 (23.9%) patients, of whom 30 patients (21.1%) required reoperation.

- Three patients had persistent iron deficiency anaemia needed recurrent iron infusions.
- One patients complained of dumping syndrome secondary to hyperinsulinemia. managed by medication and diet control.
- 30 patients needed reoperation. (Table 7) shows banded bypass procedures during the 5 years, taking in consider some patients had multiple pathology in their procedures.

Band related complications

In the present study, One band was replaced and eight had been removed. Table 8 shows the causes of removal and size of the removed bands. Band erosion occurred in 3 patients 2.1%; one revision (2.8%, 8 cm) and two after primary procedures (1.8%, 6.5 cm). Bands were removed endoscopically in two patients and third case removed by laparoscopy because it was associated with gastro-gastric fistula after primary BRYGB.

Comorbidity resolution table 10 and figure 3 and 4 shows the numbers of comorbidities between the populations and status of remission. In the primary group, the best remission rate was in diabetes (74.5%) followed by hypercholestraemia (59.4%) then OSAS (50%) and hypertension (40.8%). American Diabetes Association defined remission as complete if HbA1C < 6.0% and partial if < 6.5, off all diabetes medications and maintenance of these levels for at least one year [14]. All diabetic patients who achieved remission fulfilled these criteria except 4 patients who was using one tablet metformin daily which is recommended by Diabetes surgery summit II (DSS II) which stated that complementary pharmaceutical therapies such as metformin should not be discontinued to meet the definition of remission because it should be maintained as needed to sustain glycaemic control and prevent diabetes complications [15]. The small numbers of follow up in revision group were too small to get any conclusion.

Discussion

Gastric bypass is the gold standard bariatric procedure as a primary and as a revision procedure for failed other bariatric procedures especially the restrictive procedures [16-19]. Its mechanism of action depends on combination between gastric restriction mainly and some degree of malabsorption through bypassing proximal jejunum [20]. With the time, lost restrictive component may be the main cause of weight regain after bypass surgery. Banded gastric bypass emerged to prevent pouch dilatation and add more restriction. In literature, banding pouch also have been used as a salvage procedure for failed gastric bypass [21-23].

This study confirmed that banded bypass is an effective procedure for rapid and maintained weight loss in primary and revision bariatric patients. Short term outcomes in primary group revealed %EWL of 81.9% and 81.1% after one year and 2 years postoperatively which is higher than reported in a systematic review by Mahawar et al. for primary silastic ring banded

bypass (%EWL after 1 and 2 years were 68.5 and 69.2% respectively) [7]. Heneghan et al. reported average % EWL 58.6% in banded bypass patients after 24 months post-operatively [24]. In literature, it is obvious that weight loss outcome of banded bypass was clear in studies with long-term follow up 3 years or more. Bessler et al and lemmens et al reported EWL 73.4% and 85% after three years and four years respectively [12, 25]. White et al reported 75% EWL 10 years after banded bypass with a silicone ring [26]. Five years EWL was 83% and 69.6% by Salina et al and valezi et al. respectively [27, 28]. In this study, EWL was 75% in 74 patients with mean follow up 5.57 years (range 4.8-7 years) which was comparable to the reported by Buchwald in systematic review (72.5%)[29].

Five years after primary BRYGB, morbid obese patients lost 29 ± 10.5% of their initial weight (total weight loss %), with a mean BMI of 28.9 ± 4.8kg/m2. On the other hand, superobese patients lost 37.9 ± 7.9% of their initial weight reaching to a mean BMI of 33.7 ± 4.7 kg/m2. Regarding success rate of the procedure, 75.7% of the primary patients achieved a BMI <35 (Reinhold criteria)[30] modified by Christou [6]; Sixty percent of the remaining patients (BMI >35) were super obese before surgery These results were nearly matched to what reported in 10 years follow up results by magro et al [31]. According to Brolin, success of surgery in terms of weight loss was defined as %EWL≥50% [32], patients who had 5 years EWL <50% were 10.8% and half of them were more than 40%. This percent was slightly higher than reported by Lemmens et al who reported only 7% of banded bypass did not achieve 50% EWL after minimum 5 years [33].

Regarding revision group, patients were classified to two groups weight loss failure and complicated primary procedures. During 5 years after surgery, BRYGB provided significant weight loss in the weight loss failure group reached the maximum after 2 years (EWL 76%) which was nearly similar to that reported in revision BRYGB by Drew et al (76.3%) and cabella et al (70.8%) [34, 35]. The patients lost 18.2 ±15.2% of their initial weight, corresponding to a mean of 7.1 ± 6.2 body mass index (BMI) units. Then, most patients regained some weight and mean EWL decreased to 52.3% in 11 patients completed mean follow up 5.6 years (4.9 – 7 years). Five years EWL was comparable to that reported by Bessler et al. (47%) in study adding adjustable band for failed gastric bypass [36] but lower than reported by Drew et al and cabella et al.;73% and 65% respectively [34, 35]. Of note among this group, 75% of the patients achieved a BMI <35 and 63.6% of 5 years follow up patients had EWL% ≥ 50.

In patients who were complicated from the first procedure, they had initial low mean BMI pre-revision (mean pre-operative BMI 28.8 kg/m2) because of persistent vomiting and sever dysphagia. The primary procedures in all were vertical banded gastroplasty except one sleeve complicated by sever stenosis. After banded bypass, all obstructive symptoms relieved and the patients start to lose weight reaching maximum at one year but then gained some weight and maintained around mean BMI 30 kg/m2 (range 23.9-34.6) after 5 years. (figure2)

Weight loss maintenance was clear in all groups within the study population. Figure 1 shows the changes in mean BMI through the five years follow up. In the primary group mean BMI started to decrease rapidly up to the one year then maintained at same range between 25 and 30 through the 2-5 years follow up. In revision group who had failed primary procedures, BMI was decreasing over first three years then maintained the same range of the primary group. In group 2, banded bypass added some weight loss to the primary procedure but stabilised after three years.

The primary group revealed maintenance in diabetes remission for five years after surgery in 74% of the patients which was comparable with the results reported white et al and bessler et al. [26, 36]. For comorbidity resolution, weight loss is the most critical factor in comorbidity resolution. In general, 10 % TWL was considered a threshold that significantly improving obesity-related comorbidities [37, 38]. In the primary group, only one patient had %TWL <10% after 5 years in primary group. Maintenance of weight loss is also so important for maintaining the resolution of comorbidities. Neto et al stated that comorbidity status is directly related to the percent of weight loss for all comorbidities except infertility [39]. However, few patients revealed recurrence of comorbidities on long term follow up and still having on low BMI. This might be explained by the fact of comorbidity resolution is not dependent only on the weight loss. Other factors may play role such as hormonal changes by weight loss or anatomical changes by the procedure, life style changes and irreversible degenerative changes that could affect organ function. Fobi et al. reported long term diabetes remission associated with maintenance rate of >50.0 %EWL in 90% of BRYGB patients through 7–10 years. He suggested that banded bypass may be a double effective operation for bariatric surgery candidates suffering from diabetes or at risk of its development [10].

Many bariatric surgeons do not use banded gastric bypass as a standard procedure because they worry about adding foreign body with possible complications such as infection, erosion, migration or stenosis. Compared to standard RYGB, adding band did not increase the major

early complication rate such as leakage (one case, 0.7%) or bleeding (two cases, 1.4%). Compared to the observed long term complications in this trial (23.9%), Duvoisin et al reported nearly similar long term complication rate (21.3%) between primary and revision non-banded RYGB[16]. Band-related reoperation rate was 6.3% (9/142) which were comparable to numbers reported by reviewing 8,707 banded gastric bypass patients by Buchwald (non-band related; 15.2 % and band-related; 4.1 %) [29].

Band-related complication rate depends mainly on band diameter, material, position and procedure type primary or revision. Band erosion rate was 1.8% in the primary and 2.8% in revision groups which was comparable to that reported by Fobi et al. (1.9% in primary and 5.9% in revision) who has carried out the biggest series of banded RYGB [10]. The more the band was tight and near to the gastrojejunostomy, the higher complication incidence was. Fobi et al recommended band placement more proximal at least 2 cm to minimize the incidence of erosion [40]. Heneghan et al reported very low incidence of erosion 1.5% by placing the band silicone ring 1–2 cm distal to the gastroesophageal junction and at least 2 cm above the gastrojejunostomy [24].

Band migration to gastrojejunostomy causing stenosis in one patient in this series (0.7%, band diameter 7 cm). This patient needed revision of the gastrojejunostomy and replacement of the band. Good band position and material are critical factors to avoid the migration and stenosis or erosion through the gastro-jejunal junction. The low slippage rate of the silicone band can be explained by formation of fibrous capsule which limit its movement. Schwartz et al. reported 3.2% stenosis rate after fascia-lata graft banded bypass, endoscopical dilation was used but resulted in perforations in 25% of the patients (8/32) [41].

Food intolerance is a common reported symptom in many studies with banded gastric bypass. Some researchers see that food intolerance is a desirable symptom because it happens mostly if the patients eat big bites or rapid eating without good chewing and the surgeons always try learning patients to avoid these bad eating habits. Awad et al. [42] found that the higher rate of food intolerance in the banded group did not have any bad impact on the quality of life of this group compared to non-banded bypass. At the present study, five patients suffered from severe food intolerance (band 6.5cm) and band removal was required. All cases were not associated with strictures and improved by band removal. Patients with tight bands may suffer from vomiting, dysphagia as well as regurgitation if the patient has lower esophageal sphincter hypotonia [43]. Arasaki et al found that using silicone ring 62 mm had chronic

regurgitation 23% and 77 mm bands had 8%. The former had 4.5 times greater regurgitation risk than latter group [43].

Limitation and conclusion

Despite of limitations in this study; such as retrospective nature and small number of revision group and relatively lower follow up rate after the procedure; it gives good indicator for safety and efficacy of banded gastric bypass. It may help a great number of bariatric candidates either primary or revisions. Multicentre comparative study with highly extensive follow up or prospective studies are needed to give better overview on superiority of banded bypass surgery. Banded gastric bypass has good short and long-term results in terms of weight loss. The advantage of banded bypass is clear in long term maintenance of weight loss and comorbidity resolution in both primary and revisional bariatric procedures. Beside weight maintenance in the group who had complicated primary procedure, more than 86% of primary and 75% of weight loss failure group maintained their BMI below 35 kg/m2 after 5 years follow up. Banded bypass is also safe procedure with acceptable incidence of band related complications.

References

1. Picot, J., et al., *The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation.* Health Technol Assess, 2009. **13**(41): p. 1-190, 215-357, iii-iv.
2. Angrisani, L., et al., *Bariatric Surgery and Endoluminal Procedures: IFSO Worldwide Survey 2014.* Obes Surg, 2017.
3. Milone, M., et al., *Bariatric surgery and diabetes remission: sleeve gastrectomy or mini-gastric bypass?* World J Gastroenterol, 2013. **19**(39): p. 6590-7.
4. Kothari, S.N., et al., *Long-term (>10-year) outcomes after laparoscopic Roux-en-Y gastric bypass.* Surg Obes Relat Dis, 2017. **13**(6): p. 972-978.
5. Magro, D.O., et al., *Long-term weight regain after gastric bypass: a -year prospective study.* Obes Surg, 2008. **18**(6): p. 648-51.
6. Christou, N.V., D. Look, and L.D. Maclean, *Weight gain after short- and long-limb gastric bypass in patients followed for longer than 10 years.* Ann Surg, 2006. **244**(5): p. 734-40.
7. Mahawar, K.K., et al., *Primary banded Roux-en-Y gastric bypass: a systematic review.* Obes Surg, 2014. **24**(10): p. 1771-92.
8. Yimcharoen, P., et al., *Endoscopic findings and outcomes of revisional procedures for patients with weight recidivism after gastric bypass.* Surg Endosc, 2011. **25**(10): p. 3345-52.
9. Capella, J.F. and R.F. Capella, *An assessment of vertical banded gastroplasty-Roux-en-Y gastric bypass for the treatment of morbid obesity.* Am J Surg, 2002. **183**(2): p. 117-23.

10. Fobi, M. and A.B.S.C. Conference, *Banded gastric bypass: combining two principles.* Surg Obes Relat Dis, 2005. **1**(3): p. 304-9.
11. Dillemans, B., et al., *Laparoscopic adjustable banded roux-en-y gastric bypass as a primary procedure for the super-super-obese (body mass index > 60 kg/m(2)).* BMC Surg, 2010. **10**: p. 33.
12. Lemmens, L., et al., *Banded gastric bypass - four years follow up in a prospective multicenter analysis.* BMC Surg, 2014. **14**: p. 88.
13. Bhandari, M., et al., *Comparison Between Banded and Nonbanded Roux-En-Y Gastric Bypass with 2-Year Follow-Up: a Preliminary Retrospective Analysis.* Obes Surg, 2016. **26**(1): p. 213-8.
14. Buse, J.B., et al., *How do we define cure of diabetes?* Diabetes Care, 2009. **32**(11): p. 2133-5.
15. Rubino, F., et al., *Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes: a Joint Statement by International Diabetes Organizations.* Obes Surg, 2017. **27**(1): p. 2-21.
16. Duvoisin, C., et al., *Roux-en-Y Gastric Bypass: Ten-year Results in a Cohort of 658 Patie* Ann Surg, 2017.
17. Hunter Mehaffey, J., et al., *Roux-en-Y gastric bypass 10-year follow-up: the found population.* Surg Obes Relat Dis, 2016. **12**(4): p. 778-782.
18. Schouten, R., et al., *Conversion of vertical banded gastroplasty to Roux-en-Y gastric bypass results in restoration of the positive effect on weight loss and co-morbidities: evaluation of 101 patient* Obes Surg, 2007. **17**(5): p. 622-30.
19. van Wezenbeek, M.R., et al., *Conversion to Gastric Bypass After Either Failed Gastric Band or Failed Sleeve Gastrectomy.* Obes Surg, 2017. **27**(1): p. 83-89.
20. Colquitt, J.L., et al., *Surgery for weight loss in adults.* Cochrane Database Syst Rev, 2014(8): p. CD003641.
21. Aminian, A., et al., *Critical appraisal of salvage banding for weight loss failure after gastric bypass.* Surg Obes Relat Dis, 2015. **11**(3): p. 607-11.
22. Irani, K., et al., *Midterm results for gastric banding as salvage procedure for patients with weight loss failure after Roux-en-Y gastric bypass.* Surg Obes Relat Dis, 2011. **7**(2): p. 219-24.
23. Vijgen, G.H., et al., *Salvage banding for failed Roux-en-Y gastric bypass.* Surg Obes Relat Dis, 2012. **8**(6): p. 803-8.
24. Heneghan, H.M., et al., *Incidence and management of bleeding complications after gastric bypass surgery in the morbidly obese.* Surg Obes Relat Dis, 2012. **8**(6): p. 729-35.
25. Bessler, M., et al., *Adjustable gastric banding as a revisional bariatric procedure after failed gastric bypass.* Obes Surg, 2005. **15**(10): p. 1443-8.
26. White, S., et al., *Long-term outcomes after gastric bypass.* Obes Surg, 2005. **15**(2): p. 155-63.
27. Salinas, A., et al., *Silastic ring vertical gastric bypass: evolution of an open surgical technique, and review of 1,588 cases.* Obes Surg, 2005. **15**(10): p. 1403-7.
28. Valezi, A.C., et al., *Weight loss outcome after silastic ring Roux-en-Y gastric bypass: 8 years of follow-up.* Obes Surg, 2010. **20**(11): p. 1491-5.
29. Buchwald, H., J.N. Buchwald, and T.W. McGlennon, *Systematic review and meta-analysis of medium-term outcomes after banded Roux-en-Y gastric bypass.* Obes Surg, 2014. **24**(9): p. 1536-51.
30. Reinhold, R.B., *Critical analysis of long term weight loss following gastric bypass.* Surg Gynecol Obstet, 1982. **155**(3): p. 385-94.
31. Magro, D.O., et al., *Long-term weight loss outcomes after banded Roux-en-Y gastric bypass: a prospective 1 -year follow-up study.* Surg Obes Relat Dis, 2018.
32. Brolin, R.E., et al., *The dilemma of outcome assessment after operations for morbid obesity.* Surgery, 1989. **105**(3): p. 337-46.
33. Lemmens, L., *Banded Gastric Bypass: Better Long-Term Results? A Cohort Study with Minimum 5-Year Follow-Up.* Obes Surg, 2017. **27**(4): p. 864-872.

34. Capella, R.F. and J.F. Capella, *Converting vertical banded gastroplasty to a lesser curvature gastric bypass: technical considerations.* Obes Surg, 1998. **8**(2): p. 218-24.
35. Drew, R.L. and J.H. Linner, *Revisional Surgery for Severe Obesity with Fascia Banded Stoma Roux-en-Y Gastric Bypass.* Obes Surg, 1992. **2**(4): p. 349-354.
36. Bessler, M., et al., *Prospective randomized trial of banded versus nonbanded gastric bypass for the super obese: early results.* Surg Obes Relat Dis, 2007. **3**(4): p. 480-4; discussion 484-5.
37. Lambert, E.A., et al., *Sympathetic activity and markers of cardiovascular risk in nondiabetic severely obese patients: the effect of the initial 10% weig.* Am J Hypertens, 2014. **27**(10): p. 1308-15.
38. McQuigg, M., et al., *The Counterweight programme: Prevalence of CVD risk factors by body mass index and the impact of 10% weight change.* Obes Res Clin Pract, 2008. **2**(1): p. I-II.
39. Laurino Neto, R.M., et al., *Comorbidities remission after Roux-en-Y Gastric Bypass for morbid obesity is sustained in a long-term follow-up and correlates with weight regain.* Obes Surg, 2012. **22**(10): p. 1580-5.
40. Fobi, M., et al., *Band erosion: incidence, etiology, management and outcome after banded vertical gastric bypass.* Obes Surg, 2001. **11**(6): p. 699-707.
41. Schwartz, M.L., et al., *Stenosis of the gastroenterostomy after laparoscopic gastric bypass.* Obes Surg, 2004. **14**(4): p. 484-91.
42. Awad, W., A. Garay, and C. Martinez, *Ten years experience of banded gastric bypass: does it make a difference?* Obes Surg, 2012. **22**(2): p. 271-8.
43. Arasaki, C.H., et al., *Incidence of regurgitation after the banded gastric bypass.* Obes Surg, 2005. **15**(10): p. 1408-17.