Evaluation of Sleeve Gastrectomy As Revisional Surgery for Failed Laroscopic Adjustable Gastric Band and Vertical Banded Gastroplasty for Treatment of Morbid Obesity

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Abstract: Objective: to evaluate sleeve gastrectomy (SG) as a revisional operation for failed LBG and VBG. **Introduction:** The World Health Organization (WHO) defines obesity as a condition of excessive fat accumulation in the body to the extent that health and well-being are adversely affected. Obesity is an extremely significant and increasing public health challenge in both economically developed and developing regions of the world. All bariatric surgical procedures have an associated failure rate and none has proved to be a single definitive cure for obesity and its associated comorbidities. Bariatric surgeons must be aware of the reasons for failure of each operation, how to evaluate patients who fail, and the options for managing them. These can be surgical, nonsurgical, or a combined approach, but each patient needs an individualized management plan. Failure of any bariatric surgical procedure can be defined as insufficient weight loss or weight regain with or without the recurrence of comorbidities. Weight loss after laparoscopic adjustable gastric banding (LAGB) progresses over a 2- or even 3-year period and then stabilizes, and long-term (4- to 12-year follow-up) outcomes have been reported by individual series showing a great variation in weight loss results from 25 to 70 % of excess weight. This procedure carries a3 % 30-day morbidity and a delayed complication (gastric prolapse, erosion, port/tubing disconnection) rate of 12 %. The incidence of complications is inversely related to experience with the procedure in vertical banded gastroplasty (VBG) Because of the non-divided nature of the gastric tube, the major reason for weight regain is the recanalization of the vertical staple line resulting in gastro-gastric fistula. The other indication for reoperation is related to the development of dysphagia and esophageal reflux symptoms secondary to gastric outlet obstruction. The obstruction is commonly caused by the different degree of erosion of the foreign body (silastic band or mesh) at the distal part of the gastric tube. **Patients and Methods**: This study takes place at AL AZHAR university hospitals in the period from November 2012 to November 2015, 40 patients were subjected to this study, out of them 26 female and 14 male, History and physical examination including details of previous procedure and operative record if available. If the patient has a LAGB implanted, important details include the type of band, type of port, and location. In VBG The presence of foreign bodies in the form of rings and meshes. **Results**: 40 patients, who underwent adjustable gastric band and vertical banded gastroplasty by different surgeons). and 26 female (65%)14 male(35%), with a mean age at revisional LSG of 38.5 ± 15.5 years (23 - 54),BMI = 42 kgm² ranges from (34- 50) kg/m². The preoperative data reveals out of them 23 patients had VBG (20 male and 3 female BMI = 42 kgm²),17 patient had LAGB (13 female and 4 male BMI=43 kgm²).BMI before previous bariatric surgery 55kg/m² (45-65) and before revision bariatric procedure 42kg/m² (34- 50) surgery, categorized as Obese ≥ 40= 19 patients, Morbid obesity (40-50)=13 patients, Supper obesity (50-60)=7patients, Triple obesity > 60=1 patients. The mean interval from the primary procedure to LSG was 7.5 ±3.5 years (Range 4- 11 years). Additional previous surgery Cholicystectomy =4, Incional hernia=3, dermolipectomy= 7, abdominal exploration= 1. Indications for revision surgery Insufficient weight loss =26 patients, Outlet stenosis =1 patient, Band slippage=1 patient, Weight regain =12 patients. Operative data of the revision procedure were done laparoscopically in 21 patients and open surgery 4 patients and conversion from lap to open15 patients. The procedure was completed in all patients in one sitting. Intra-operative bleeding happen in 5 cases all were stable line bleeding controlled by sutures, injures to the liver managed conservatively, splenectomy done for tow case due to severe spleenic injury. Operative time =150 minutes (120 – 180 minutes). Post operative morbidities in the form of Leaks= 2, Fistula= 1, Peritonitis=1, DVT= 1, Wound problem (Seroma, infection, small haematoma) = 6. And mortalities two patients (5%) one patient dies due to multiple organ failure and septic shock after exploration for peritonitis secondary to leaks, another one died due to heart attack. Weight loss after surgery BMI decreased on follow up at 3months, 6m, 9m, and 12 months = 37 Kg/m². And the percentage of excess weight loss increased 78%, and reduction of co-morbidity. **Conclusion**: Sleeve gastrectomy is effective as revisional surgery for failed laparoscopic adjustable gastric banding and vertical banded gastroplasty, proper evaluation of the patients and lack of operative records in Egyptian patients and surgeon experience play roles in operation outcomes.

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1. Introduction:

The World Health Organization (WHO) defines obesity as a condition of excessive fat accumulation in the body to the extent that health and well-being are adversely affected. Obesity is an extremely significant and increasing public health challenge in both economically developed and developing regions of the world [1]. Weight loss after gastric banding progresses over a 2- or even 3-year period and then stabilizes, and long-term (4 to 12-year follow-up) outcomes have been reported by individual series showing a great variation in weight loss results from 25 to 70 % of excess weight [2]. This procedure carries 3 % 30-day morbidity [3] and a delayed complication (gastric prolapse, erosion, port/tubing disconnection) rate of 12 % [4]. The incidence of complications is inversely related to experience with the procedure. All bariatric surgical procedures have an associated failure rate and none has proved to be a single definitive cure for obesity and its associated comorbidities. Bariatric surgeons must be aware of the reasons for failure of each operation, how to evaluate patients who fail, and the options for managing them. These can be surgical, nonsurgical, or a combined approach, but each patient needs an individualized management plan [5].

Failure of any bariatric surgical procedure can be defined as insufficient weight loss or weight regain with or without the recurrence of comorbidities. In VBG Because of the no divided nature of the gastric tube, the major reason for weight regain is the recanalization of the vertical staple line resulting in gastro-gastric fistula. The other indication for reoperation is related to the development of dysphagia and esophageal reflux symptoms secondary to gastric outlet obstruction. The obstruction is commonly caused by the different degree of erosion of the foreign body (silastic band or mesh) at the distal part of the gastric tube [6].

The number of revisional bariatric procedures has progressively increased as well. Currently, the overall incidence of reoperations after any bariatric procedure is estimated to be between 5 and 54 %.The wide range depends on the different types of primary operations. Restrictive operations such as adjustable gastric banding (AGB) and vertical banded gastroplasty (VBG) have the highest rates of reoperation in the literature (up to 60 %) [7, 8].

Indications for reoperations in bariatric surgery are either related to failure of weight loss and weight regain or complications. The latter can be acute, early, late, and chronic. Based on the increase in demand of reoperative bariatric surgery and the overall increase in both the morbidity and mortality of such procedures, it is necessary for bariatric surgeons and bariatricians to familiarize themselves with the different surgical scenarios [9].

In order to formulate a successful reoperative plan, it is paramount to understand the reasons why an additional procedure is needed. The main reasons for reoperation can be categorized as failures and complications [9]. Laparoscopic sleeve gastrectomy is a comparatively recent bariatric procedure that developed as the first stage of a two stage duodenal switch operation. The attraction of sleeve gastrectomy as a weight loss operation includes being technically less demanding than gastric bypass, with less malabsorption, less risk of renal calculi, and no risk of internal hernia or anastomotic ulcer formation [9].

The increased popularity and abundance of studies demonstrating safety and effectiveness of LSG as a primary procedure has led to its implementation as a second-line procedure as well. The conversion from laparoscopic adjustable gastric band (LAGB) to another restrictive procedure is not considered the normal, but several series have proven feasibility, at least short term [10].

Among its advantages are decreased chances of malnutrition, marginal ulcers, reactive hypoglycemia, and dumping syndrome. Disadvantages are higher leak rate and long-term GERD [11]. The mechanisms for postoperative leaks are related to ischemia and fibrotic tissue, especially at the gastroesophageal junction. Also, inadvertent transaction of a non-adequately unwrapped portion of the funds can result in postoperative leaks. Potential indications for conversion to LSG include adolescents, very high-risk patients, patients on chronic anticoagulation, low BMI with minimal comorbidities, or no metabolic syndrome; patients requiring additional surgeries (transplantation, incisional hernia repair, joint replacements); and patients with small bowel disease or contraindication to malabsorptive procedures [12].The reported weight loss after revisional LSG is up to 57 % at 12 months, similar to a primary LSG [13].

Failure can be defined as inadequate weight loss or weight regain. Unfortunately, there is no consensus regarding the definition of failure after bariatric surgery. In general, “success” after bariatric surgery is defined as the durable control of weight loss with resolution or improvement of comorbid conditions and good quality of life. Several authors have utilized different parameters to assess success. The Adelaide study group proposed using an excess weight loss (EWL) >50 %, as previously described by Reinhold, whereas **Fobi et al**. utilize the term “failure” for EWL <40 % [14,15].

Where failure is defined as <25 % EWL at 2 years [16]. It is clear, then, how failure of weight loss should

be based on the expected average results of a particular operation, and not on a unified parameter. Although inadequate weight loss might be a reflection of "failure" it is certainly important to consider resolution or recurrence of comorbidities when evaluating patients for candidacy to reoperative surgery. Among bariatric procedures, the operation with the lower rate of redo surgery is biliopancreatic diversion (5 %), with increasing rate of revision in gastric bypass (10–20 %); vertical banded gastroplasty (25–55 %); and gastric banding (40–50 %). The existence of a group of nonresponders to bariatric surgery should be also considered: patients showing poor weight loss or weight regain [17]. Despite maximal efforts by the surgeon and the multidisciplinary team. Several studies demonstrated that weight loss after redo surgery is in general lower than observed after primary bariatric procedures. Randomized trials suggesting validated algorithms for clinical decision in redo surgery are not available, and therefore the clinical decision is largely based on the surgeon's experience and the global evaluation by the multidisciplinary team. Redo bariatric surgery has a rate of intraoperative major complications definitely higher than primary bariatric surgery. Therefore, redo surgery should be performed in highly specialized bariatric centers [18 – 19].

2. Patients and Methods:

This study takes place at Al-Azhar university hospitals-Cairo-Egypt.in the period from November 2012 to November 2015, 40 patients were subjected to this study, out of them 26 female and 14 male. History and physical examination including details of previous procedure and operative record if available. If the patient has a LAGB implanted, important details include the type of band, type of port, and location. In VBG The presence of foreign bodies, in the form of rings and meshes. Dietary and behavioral habits, Counseling psychological assessment. Patient body mass index (BMI),Pulmonary function test, duplex both lower limbs, blood test cbc, liver and kidney profiles, albumen, serum calcium phosphorous, Upper gastrointestinal endoscopy.

All data well be recorded including. The mean interval from the primary procedure to LSG duration of operation, length of hospital stay, and indications for rovisional surgery, morbidity and mortality rates and weight reduction at follow-up visits.

The informed consent process (including realistic expectations and complications).

Study Design, Statistical Analysis:

Prospective interventional study. It was descriptive study using means of proportions by ration or present age.

Surgical Technique:

Thromboembolism prophylaxis (low molecular weight heparin) preoperative. Additionally, stockings (Elastic Stockings) were used during and post the intervention.A second-generation cephalosporin (cephazoline 2.0 g IV) was applied perioperative. The patient was positioned in French position (supine with legs apart and arms abducted) with the surgeon standing between the legs.

The abdomen was insufflated after Hasson technique point to a pressure of 18 mmHg. Five tracers technique was used. The first 12-mm was placed 20 cm distal to the xiphoid process for the 30° optical system. One 5-mm trocar was placed just below the xiphoid process on the left side and the other two trocars were placed in the mid-clavicular line right and left side 5 cm distal to the costal margin (right 15-mm and left 12-mm trocar).

The liver was retracted with a 5-mm liver retractor. If the procedure was post-

LAGB, the band was freed of adhesions and the total circumference was exposed by sectioning the gastrogastric tunnel covering the band. Then the band is removed. thin LSG is done, the greater curvature of the stomach was freed from the greater omentum, starting opposite the crow's foot.

With the Harmonic scalpel dissecting proximally until the left crus and angle of His were reached and distally towards the pylorus sparing 6 cm of theproximal antrum. The stomach was transected with 6 – 7 green (average) (Covidien stipplers), under guidance of a 38-F or gastric tube pressed along the lesser curvature. If the procedure was post-VBG, the transaction was up to the former staplers. Band was removed if possible, split if impossible. methylene blue dye was used to test for leaks. A drain and nasogastric tube was left in place at the end of the procedure in all the patients. Metheline blue via a calibration tube and air leak via orogastric tube. If a positive leak test is obtained, the anastomosis should be repaired or redone, and external drainage must be considered. A gastrostomy tube should be an additional safety measure. The excised stomach was extracted from the abdomen through the somewhat enlarged 15-mm trocar site. The gastric tube was removed, CO2 released, and trocars removed. Skin was closed intracutaneously. Allpatients underwent an upper gastrointestinal series with water-soluble contrast medium within 3 days. If no leak or stenosis was found and good transit throughout the duodenum was shown, the nasogastric tube and drain were removed; patients were discharged at the third postoperative day with liquid diet advised for 3 weeks.

3. Results:

40 patients, who underwent adjustable gastric band and vertical banded gastroplasty by different

surgeons). and 26 female (65%), 14 male (35%), with a mean age at revisional LSG of 38.5 ± 15.5 years (23 - 54), BMI = 42 kgm² ranges from (34- 50) kg/m². Table [1].

Table [1[: Patient demographic

N0	**40**
Sex male Female Ratio	14 (65%) 26(35%) 3.5: 6.5
Age (years) Range	38.5±15.5 23-54
BMI (kg/m²) Average(range)	34-50 42kg/m²

The preoperative data out of them 23 patients had VBG (20 male and 3 female BMI = 42 kgm²), 17 patient had LAGB (13 female and 4 male BMI=43 kgm²). BMI before previous bariatric surgery 55kg/m² (45-65) and before revision bariatric 42kg/m² (34- 50) surgery, categorized as Obese ≥ 40= 19 patients, Morbid obesity (40-50)=13 patients, Supper obesity (50-60)=7patients, Triple obesity >60=1 patients. The mean interval from the primary procedure to LSG was 7.5 ±3.5 years (Range 4- 11 years). Additional previous surgery Cholicystectomy =4, Incional hernia=3, dermolipectomy= 7, abdominal exploration= 1. Indications for revision surgery Insufficient weight loss =26 patients, Outlet stenosis =1 patient, Band slippage=1 patient, Wt. gain =12 patients.

Table [2]: Preoperative data of the patients.

Total no VBG LAGB	40 23 (57.5%) (20 M 50% - 3 F 7.5%) 17 (42.5%) (4 m10% - 13F 32.5%)
BMI(kg/m²)*before previous bariatric surgery*	55 (45-65)
BMI (kg/m²)*before revision bariatric surgery*	42 (34- 50)
BMI categorization *Obese ≥ 40* *Morbid obesity (40-50)* *Supper obesity (50-60)* *Triple obesity > 60*	 *19 (47.5%)* *13 (32.5%)* *7 (17.5%)* *1 (2.5%)*
Additional previous surgery *Cholicystectomy* *Incional hernia* *dermolipectomy* *abdominal exploration*	 4 (10%) 3 (7.5%) 7 (17.5%) 1 (2.5%)
Interval between previous and revision	7.5±3.5 years (4-11 years)
Indications for revision surgery *Insufficient weight loss* *Outlet stenosis* *Band slippage* *Wt. gain*	 26 (65%) 1 (2.5%) 1 (2.5%) 12 (30%)
Associated co-morbidities Hypertension Sleep apnea Hypercholestrelemia Daibeties type 2 Osteoarthritis	29 patients (72.5%) 8 (20%) 2 (5%) 6 (15%) 6 (15%) 7 (17.5%)

Operative data and postoperative data of the revision procedure were done laparoscopically in 21 patients and open surgery 4 patients and conversion from lap to open15 patients. The procedure were completed in all patients in one sitting. intraoperative bleeding happen in 5 cases all were stable line bleeding controlled by sutures, injures to the liver managed conservativlly, splenectomy done for one case due to severe spleenic injury. Operative time =150 minutes (120 – 180 minutes). Post operative morbidities in the form of Leaks= 2, Fistula= 1, Peritonitis=1, DVT= 1, Wound problem (seroma, infection, small haematoma)= 6. And mortalities one patients dies due to multiple organ failure and septic shock after exploration for peritonitis secondary to leaks. Table[3].

Table [3]: Operative and Postoperative data.

Procedure		
Lap.	21	52.5 %
Open	4	10%
Conversion lap. To open	15	37.5%
Intraoperative complication		
Bleeding	5	12.5%
Injuries	3	7.5%
splenectomy	1	2.5%
Operative time	150 minutes (120-180)	
Hospital stay	4 ±4 days (4-16 days)	
Post operative morbidities		
Leaks	2	5%
Fistula	1	2.5%
Peritonitis	1	2.5%
DVT	1	2.5%
Wound problem	6	15%
Mortality	2	5%

Weight loss after surgery BMI decreased on follow up at 3months, 6m, 9m, and 12 months = 37 Kg/m². And the percentage of excess weight loss increased (EPWL) 78%, and reduction of co-morbiditymorbidities.

Table [4]:Post operative wt. loss.

Period of fllow up	1st month	3rd month	6th month	9th month	12th month	%/NO.
BMI Kg/m²	42	40	49	38	37	37%
EPWL %	41	56	66	76	78	78%
Patients NO.	40	39	39	39	38	38

Obesity related co-morbidity are disappears or improved in the form of disappearance of hypertension 25%, improvement 50%, stable 25% also diabetes disappear 50%, improvement 33.3%, stable 16.7%,: Table {5].

Table [5]: Improvement of co-morbidities.

	Disappear	improved	stable	No 29
hypertension	2 (25%)	4 (50%)	2 (25%)	8
hyperlipediemia	3 (50%)	2 (33.3%)	1 (16.7%)	6
Sleep apnea	1 (50%)	1 (50%)		2
Diabetes type 2	3 (50%)	2 (33.3%)	1 (16.7 %)	6
osteoarthritis	5 (71.4 %)	1 (14.3 %)	1 (14.3%)	7

4. Discussion:

Morbid obesity is a chronic disease that requires lifetime treatment. While bariatric surgery is highly effective and durable therapy, as with many other chronic diseases requiring medical or surgical therapy, there will be patients who respond well to an initial therapy and others with only a partial response. There will also be a subset of patients who are no responders or have recurrent or persistent disease or complications of therapy; these patients may require escalation of therapy, a new treatment modality, or correction of complications [20].

Failure is usually multifactorial and can be attributed to the surgeon (technical issues such as a large pouch, to the patient (behavioral, dietary), and to the disease process itself (bariatric surgery "resistance"). Reoperative bariatric surgery is more challenging than primary procedures and is associated with a higher rate of 30-dayadverseevents [21]. However, when reoperative surgery is performed by experienced surgeons who perform a variety of revisional procedures, risk and complication rates are acceptable [22&23].

Although no direct analysis has been published on reoperative surgery in Egypt, we could apply similar concepts for the even more complex reoperations and Lack of previous operative details records that explain the previous operations. Conversion of LAGB to SG is

most commonly per- formed for inadequate weight loss] [24-29]. Acceptable morbidity rates and short-term (up to 2yr) weight loss improvement after conversion to SG has been demonstrated in published studies [29].

In our study the target patients were ether failed to lose weight (65%) and some of them develop complications related to the procedure (5%) or weight regain (12%).But some series report higher leak rates than primary SG. This is postulated to be a result of the scar tissue at the angle of His that occurs after banding. Recent systematic review of 8 studies (286 patients) evaluating conversion of LAGB to SG reported an overall complication rate (major and minor) of 12.2 % with staple line leak rate of 5.6%. Three leaks required reoperation. For studies that reported follow-up periods after revision (6–36 mo), the excess weight loss (EWL) ranged from 31–60% [29].In our study the post operative reported leaks (5%), fistula (2.5%).Removal of a LAGB with conversion to SG can be performed in a single- stage procedure or in 2 states with band removal and interval conversion to SG.There is some evidence that the staged approach results in fewer leaks at the time of SG but the data are limited [30]. In our study revisional surgery completed laparoscopically (52%), open surgery from the start (10%) due to huge incisional hernia and previous abdominal exploration. Most studies report higher perioperative morbidity (10–50%) and mortality (2.7–8.3 %) following reoperative procedures compared to primary ones [31]. Furthermore, when an additional procedure is necessary, the morbidity and mortality are even higher [32]. Sleeve for failed gastric band and vertical banded gastroplasty is a good and effective revisional procedure with 60% EWL at 26 months follow up [33]. SG has gradually gained in popularity, becoming established as the second most used bariatric procedure worldwide, closer to RYGB, the considered gold standard. Thus, according to the International Federation for the Surgery of Obesity and Metabolic Diseases, between 2008 and 2013, SG use increased from 5.3% to 27.9% of all procedures while RYGB, albeit remaining the most widely-used technique, has fallen from 49.0%.

In our study the overall postoperative morbidities (27.5%) in the form of leaks at the fund stomach remnant, one case diagnosed after 12 day post operative open surgery done peritoneal toilet and external drainage and juejonostomy feeding tube after 6 weeks complete fistula closure were done, and another leaks diagnosed on the day 3 post operative managed laparoscopically by peritoneal toilet and juijnostomtytube and endoscopically by (Mega stent) for three weeks. One case died that case diagnosed 18 days post operative open surgery done twice and died due to unreversable septic shock another died case due to nonrelated surgical cause (cardiac arrest) 9 months postoperativelly. Mortalities (2.5) are acceptable and lower than expected in comparison to other study. And the revision sleeve considered as the simple revisional popular procedure and it effectiveness (59.5 %) EWL at 12 months. In our study acceptable improvement of associated comorbedites added more interest to the sleeve gastrectomy as a revisional surgery.

Conclusion:

Sleeve gastrectomy is effective as revisional surgery for failed laparoscopic adjustable gastric banding and vertical banded gastroplasty, proper evaluation of the patients and lack of operative records in Egyptian patients and surgeon experience play roles in operation outcomes.

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