ORIGINAL ARTICLE

SLEEVE GASTRECTOMY COMPARED TO GASTRIC BANDING IN MANAGEMENT OF MORBIDLY OBESE PATIENTS

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Abstract

Aim: The objective of this randomized, prospective study is to provide a critical appraisal comparing laparoscopic gastric banding versus laparoscopic sleeve gastrectomy in the treatment of morbidly obese patients.

Methods: The study involved 100 patients, in the period between May 2005 and November 2007. They were randomly assigned to: Group 1: 52 patients subjected to laparoscopic adjustable gastric band or Group 2: 48 patients subjected to laparoscopic sleeve gastrectomy.

Results: After 1 year of follow-up, there was a statistically significant difference between the two groups regarding the percentage of excess weight loss (%EWL) and the rate of complications ($p<0.05$). The %EWL was 63.6±5.4 in group 1 and 68.4±6.2 in group 2. Staple line leakage was reported in 2 cases (4.2%) and band erosion in 2 cases (3.8%).
After 3 years of follow-up, there was no significant difference between the two groups regarding the rate of complication, but there was a statistically significant difference between the 2 groups regarding the %EWL; being 71.3±7.3 for patients in group 1 and 78.5±5.2 in group 2. Four patients (8.3%) in group 2 acquired pouch dilatation. Port site hernia developed in one patient (2.1%) in group 2. Insufficient weight loss noticed in 2 patients (3.8%) in group 1 and in 2 patients (4.2%) in group 2, which was not statistically significant.

Conclusion: Sleeve gastrectomy is significantly more effective than gastric banding in terms of late complications, late reoperations, and long-term results on weight loss.

Keywords: Bariatric surgery, Lap band, longitudinal gastrectomy.

INTRODUCTION

The prevalence of obesity as well as its associated morbidity and mortality are rising at an alarming rate.[1-3] This has a major public health impact as morbid obesity is associated with diabetes, arterial hypertension, hypercholesterolemia, sleep apnea syndrome, arthritis, and decreased life expectancy. Unfortunately, attempts to lose weight with dieting, behavioral modifications, and exercise are unsuccessful in the vast majority of morbidly obese patients.[2] Therefore, different bariatric surgery procedures have been developed. The introduction of laparoscopic surgery has created a revolution in the field of bariatric surgery.[4-6] Laparoscopic procedures have progressively replaced traditional open bariatric procedures in both Europe and North America. Gastric bypass, duodenal switch, and gastric banding are the most commonly performed laparoscopic procedure in USA and Canada[4] while in Europe; laparoscopic gastric restrictive procedures still represent the majority of bariatric procedures.[5] Laparoscopic adjustable silicone gastric banding (LASGB) was first reported by USA in 1994.[7] Introduction of gastric banding into clinical

practice was an immediate success. It caused the rapid growth of bariatric programs in surgical departments throughout European countries, where these procedures were limited to a few centers in the past with Vertical banded gastroplasty was the most popular gastric restrictive procedure during the pre-laparoscopic era. Gastric banding and sleeve procedure do not differ significantly in many ways as both are exclusively restrictive procedures. Furthermore, the laparoscopic placement of a gastric band is technically much less challenging and does not have the risk of suture line leak.[7] Conversely, the laparoscopic sleeve gastrectomy has the risk of suture line leak, and is usually performed by surgeons with advanced laparoscopic or specifically laparoscopic-bariatric surgery training.[8] The use of laparoscopic gastric banding may seem appealing at first as the rate of early post-operative complications is low and the hospital stay is short.[9] However, there have been numerous reports on long-term complications that may require band removal.[8]

The objective of this randomized, prospective study is to compare laparoscopic gastric banding versus laparoscopic sleeve gastrectomy for patients with morbid obesity.

PATIENTS AND METHODS

The study was done in Bugshan hospital, King Abdulaziz University hospital and Prince Abd El Aziz Bin Mosaed hospital in Saudi Arabia, where 100 patients (82 females and 18 males) were operated upon between May 2005 and November 2007. Their ages ranged between 25 and 46 years. They were randomly assigned into 2 groups:

- ***Group 1:*** 52 patients (40 females and 12 males) were assigned to laparoscopic adjustable gastric band.
- ***Group 2:*** 48 patients (42 females and 6 males) were assigned to laparoscopic sleeve gastrectomy.

Patients were considered candidates for either operation when their BMI were > 40 kg/m^2 with no previous upper GIT surgery, had failed at previous restrictive diet measures to lose weight, nonsweet eaters with no endocrinal cause for their obesity. All patients had an informed consent of the procedure's risk and the chances for conversion to open surgery. Routine laboratory investigations, ECG, chest radiograph and abdominal ultrasonography were done to all patients. If there was an associated gall bladder stones, a cholecystectomy was routinely performed at the time of surgery. Prophylactic antibiotic, H_2 blockers and subcutaneous heparin were employed routinely in all patients.

- ***Laparoscopic sleeve gastrectomy***

Under GA, the abdomen was insufflated with CO_2 by Veress needle and ports were inserted as follows: optical port (10mm) is inserted hand-breadth from xyphoid process, 5mm port for liver retraction at xyphoid process area, two 12mm ports in the midclavicular lines on both sides, 5mm port in the left subcostal area and 5mm port in midclaviculr line lateral to the umbilicus on the left side. The gastrocolic ligament was opened at about 5 cm from the pylorus and divided along the whole greater curvature up to the gastro-esophageal junction freeing the whole gastric greater curvature (Fig. 1). A 34-Fr gastric tube was then inserted inside the stomach up to the pylorus. The stomach was then divided with multiple linear staplers parallel, and adjacent to, the intra-gastric tube along the lesser curvature (Fig. 2), using the 60mm, blue cartridge EndoGIA linear stapler (USS EndoGIA® –Tyco® Ethicon Endosurgery). The division line was reinforced with running sutures of ethibond 2/0 and a methylene blue test was performed to detect any suture line leak (Fig. 3). The resected part of the stomach was then extracted out from the peritoneal cavity and the wounds were closed without intra-peritoneal drain.

- ***Laparoscopic gastric banding***

The patient was positioned in the same position as in sleeve gastrectomy. The phrenogastric ligament at the angle of His was dissected and opened (Fig. 4). The pars flaccida was then, opened, the right crus was dissected and dissection was progressed bluntly and carefully behind the posterior wall of the gastroesophageal junction up to the angle of His. The band was introduced into the abdomen, grasped and pulled gently in the retroesophagogastric space (Fig. 5). A gastric tube was inflated up to 15ml and kept against the cardia to create a 15 ml-sized gastric pouch. The band was then encircled around the pouch. In all cases, we used the Swedish Adjustable Gastric Band (SAGB) (Obtech, St. Anton, Switzerland). Two ethibond 2/0 seromascular sutures were placed on the ventral side below and above the band overlapping the anterior gastric wall in front of the band to ensure its stable anterior position (Fig. 6). The reservoir was then fixed deep at the left hypochondrial port site. The wounds were closed without intra-peritoneal drain. The patients started the first band insufflation session one month later which was repeated monthly for the next 5 to 8 months.

In all cases of the study, heparin was stopped when the patients were able to leave the bed and H_2 – blockers were given orally for 1 month. The patients were allowed for oral fluid diet in the first 2 post-operative weeks followed by semisolid oral food in the next 2 weeks.

Statistical Analysis: All data were analyzed using the Statistical Package of Social Sciences version 11, (SPSS INC Chicago, III) for data processing and analysis.

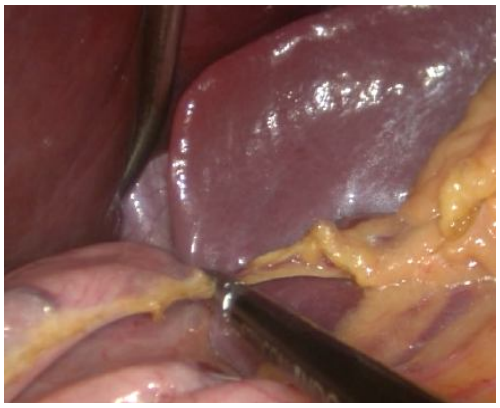

Fig 1. Freeing of the greater curvature.

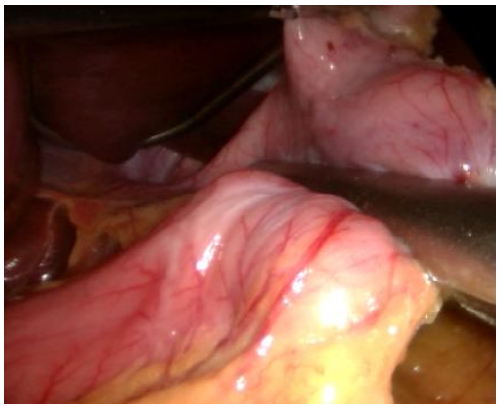

Fig 2. Stomach divided adjacent to the gastric tube.

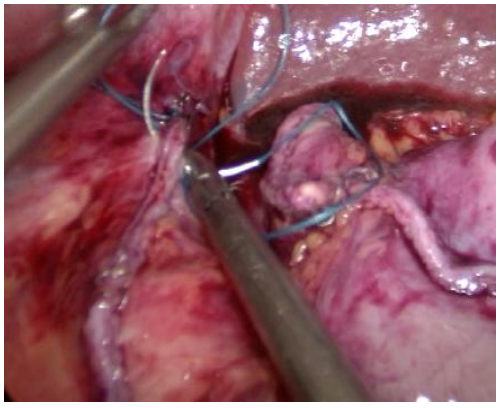

Fig 3. Re-enforcement of division line.

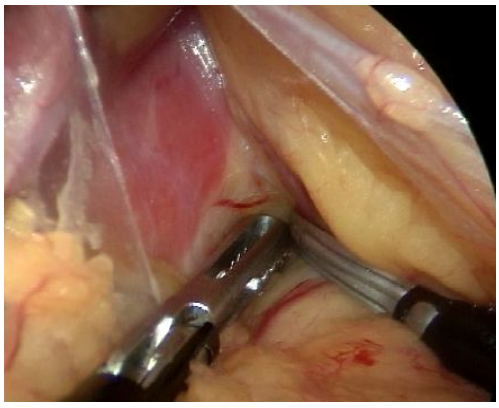

Fig 4. Dissection behind gastro-esophageal junction.

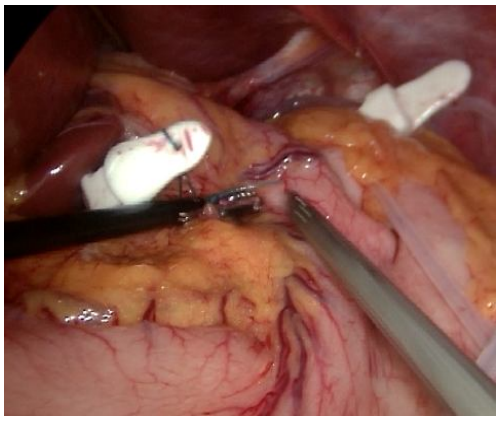

Fig 5. Band in place at retroesophago-gastric space.

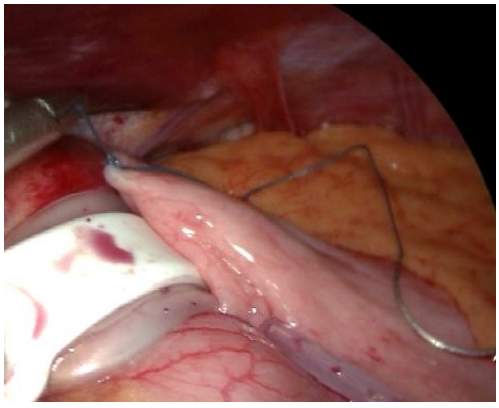

Fig 6. Anterior gastric wall overlapped in front of the band.

RESULTS

All cases were operated upon between May 2005 and November 2007 when, 100 patients (82 females and 18 males) with their ages ranging between 25 and 46 years were randomly assigned into 2 groups for either laparoscopic adjustable gastric banding (group 1) or laparoscopic sleeve gastrectomy (group 2). There were no significant differences between both groups regarding age, sex, mean weight and BMI, and pre-operative routine assessment ($p>0.05$). Cholecystectomy was done in 5 patients in group 1 and in 4 patients in group 2 due to associated gall bladder stones. There was no mortality in both groups. All procedures were completed by laparoscopy without laparotomy conversion. There was a significant differences between the 2 groups regarding the mean operative time and mean hospital stay ($p<0.05$). The patient's demographic data and operative results are summarized in Table 1 and Table 2.

Follow up Data:

- All patients attended the surgical and diet program follow-up.
- The overall complications rate between the two groups was statistically significant during the first year of follow-up Table 3.
- After 1 year of follow up, there was a statistically significant difference between the two groups regarding the percentage of excess weight loss (%EWL) ($p<0.05$). The %EWL was 63.6±5.4 in group 1 and 68.4±6.2 in group 2 by the end of the 1st year and the complications rate was 28.8±6.1 % in group 1 compared to 18.7±5.8 % in group 2. Three patients (5.7%) in group 1 developed GERD symptoms compared to 2 patients (4.2%) in group 2 which was not statistically significant ($p>0.05$). These symptoms were successfully controlled with proton pump inhibitors although temporary band deflation was required in one patient. There was no significant difference between both groups ($p=0.41$) regarding pouch dilatation; where 4 patients (7.6%) in group 1 and one patient (2.1%) in group 2 developed pouch dilatation. In these patients, re-operation was done where band replacement was done in 2 patients; conversion into sleeve gastrectomy was done in one patient, while in the 4th patient a clinical improvement was reported after band deflation. The other patient with pouch dilatation in group 2 refused any surgical management. No port site herniation was reported in both groups during the 1st year follow up period. Infection at port site developed in 1 patient (2.1%) in group 2 which was treated conservatively. Stable line leak was reported in 2 cases (4.2%) that were treated surgically. Band erosion was reported in 2 cases (3.8%) where re-operation and band removal was done for both of them.
- After 3 years follow up, there was a statistically significant difference between the 2 groups regarding the %EWL ($p<0.05$), being 71.3±7.3 for patients in group 1 and 78.5±5.2 in group 2. There was no significant difference between the two groups regarding the rate of complications ($p>0.05$). Six patients (12.5%) in group 2 developed GERD where the medical treatment was effective in 4 of them. In the remaining 2 patients, re-operation and conversion to Roux-en-Y gastric bypass was done due to persistence of GERD symptoms despite the medical treatment. Four patients (8.3%) in group 2 acquired pouch dilatation. Re-operation and conversion to Roux-en-Y gastric bypass was done to 2 of them and the other remaining 2 patients refused any surgical correction. Band erosion occurred in one more patient that required surgical removal. Herniation at the right hypochondrial port site developed in one patient (2.1%) in group 2 that required surgical repair. Insufficient weight loss was present in 2 patients (3.8%) in group 1 and in 2 patients (4.2%) in group 2 which was not statistically significant ($p>0.05$). The post-operative results and complications after 1 and 3 years are summarized in Table 3.

Table 1. Patients demographic data.

Group	No.	Age (years)	Sex	Wt. (Kg)	BMI (kg/m^2)
Group 1	52	36.1± 8	40 F 12 M	124.5 ± 27	44.7 ± 4.5
Group 2	48	38.8 ± 7	42 F 6 M	128.7 ± 32	44.2 ± 5.3
p value		0.08 (NS)	0.26 (NS)	0.49 (NS)	0.61(NS)

BMI: Body Mass Index, Wt: weight, NS: not significant, S: significant.

Table 2. Patients operative results.

Group	No.	Associated Procedure	Mean Operative Time (minutes)	Mean Hospital Stay (days)
Group 1	52	5	87.8 ± 20.2	2.7 ± 1.2
Group 2	48	4	110.2 ± 36.3	6.2 ± 2.6
p value		0.89 (NS)	<0.0002 (S)	<0.0001 (S)

NS: not significant, S: significant.

Table 3. Post-operative results and complications.

Long Term Results and Complications	1 year			3 years		
	Group 1	Group 2	*p value*	Group 1	Group 2	*p value*
%EWL	63.6 ± 5.4	68.4 ± 6.2	0.0001 (S)	71.3 ± 7.2	78.5 ± 5.2	<0.0001 (S)
Rate of complications %	28.8± 6.1	18.7± 5.8	<0.0001 (S)	36.5±7.3	39.6±6.6	0.03 (S)
Mortality	-	-	-	-	-	-
GERD	3 (5.7%)	2 (4.2%)	0.93 (NS)	4 (7.6%)	6 (12.5%)	0.64 (NS)
Staple Line Leak	-	2 (4.2%)	0.46 (NS)	-	2 (4.2%)	0.46 (NS)
Pouch Dilatation	4 (7.6%)	1 (2.1%)	0.41 (NS)	4 (7.6%)	4 (8.3%)	0.80 (NS)
Band Erosion	2 (3.8%)	-	0.51 (NS)	3 (5.7%)	-	0.27 (NS)
Port Site Infection	-	1 (2.1%)	0.97 (NS)	-	1 (2.1%)	0.97 (NS)
Port Site Herniation	-	-	-	-	1 (2.1%)	0.97 (NS)
Food Intolerance	2 (3.8%)	2 (4.2%)	0.67 (NS)	4 (7.6%)	3 (6.3%)	0.91 (NS)
Non-Compliance	2 (3.8%)	-	0.51 (NS)	2 (3.8%)	-	0.51 (NS)
Inadequate Wt. Loss	2 (3.8%)	1 (2.1%)	0.94 (NS)	2 (3.8%)	2 (4.2%)	0.67 (NS)
Re-Operation	5 (9.6%)	2 (4.2%)	0.50 (NS)	6 (11.5%)	5 (10.4%)	0.88 (NS)

NS: not significant, S: significant, EWL: Excess weight loss, GERD: Gastroesophageal Reflux Disease.

DISCUSSION

In recent years, the minimally invasive approach has become the preferred technique for bariatric surgery. All bariatric procedures are now routinely performed laparoscopically. Explanations for this trend include several advantages related to less postoperative discomfort and reduced surgical risk for obese patients.[9,10] Beginning with gastric banding and vertical band gastroplasty, followed by gastric bypass, gastric sleeve, duodenal switch, biliopancreatic diversion, the laparoscopic approach has gradually replaced the corresponding traditional open operations.[11] In Europe, the tumultuous development of gastric banding was based on the simplicity and feasibility of the technique with an excellent immediate postoperative course.[12] However, there was a limited availability of midterm and long-term results.[12,13] Recently, some concern has arisen regarding the efficacy of restrictive gastric procedures as therapy for morbid obesity,[12,14] although only a few studies on sleeve gastrectomy for morbid obesity have been published so far.[15] Despite the prevalent use of bariatric surgery during the past years, there is no controlled trial comparing laparoscopic

banding versus laparoscopic sleeve gastrectomy could be found. In the present study, we compared laparoscopic adjustable gastric banding with the sleeve gastrectomy. Both procedures were safe without mortality. The mean operative time and hospital stay were significantly shorter with gastric banding. Shorter operative time and a smoother postoperative course led to shorter mean length of hospitalization in the band group which correlates with other studies.[14,15] There was statistically significant difference between both groups regarding the early reoperation rate being higher in band group during the 1st year either due to complications or failure to get the required weight loss. This correlates with some studies where major re-operations were required in 21.7% of all patients with gastric banding[16] and does not correlates with others where the need for early reoperation rate was attributed to few cases.[17,18] Pouch dilatation was reported in both groups. Although it was higher in band group after one year follow up and became equal after three years, it did not attain statistical significance. Pouch dilatation as well as other complications including band erosions and band slippage were reported in one study done over 100 patients with gastric banding where one third (33.1%) of their patients developed late complications such as band erosion, pouch dilation, band slippage, and catheter and port related problems.[16,18] Band erosion was a great problem in 3 patients (5.7%) of our study; a complication reported by several authors at a rate of 1% and 3%[19] although some other studies did not experience band erosion.[20] Staple line leak reported in 4.2% of our patients, a complication reported by other studies that needed surgical correction[21-23] The rate of complications was significantly higher in band group during the 1st year of follow up . After 3 years, there was no significant difference between complications rate in both groups. The vast majority of scientific reports on laparoscopic gastric banding have a short follow-up, which limits their usefulness and scientific value as long-term complication and re-operation rates are of utmost importance. However, there have been several publications on laparoscopic gastric bands that report a long-term follow up. Suter and colleagues summarized their prospectively collected results on 317 patients undergoing laparoscopic banding. Long-term follow up was excellent (88.2% at 5 years). One third (33.1%) of their patients developed late complications such as band erosion, pouch dilation, band slippage, and port related problems. Major re-operations were required in 21.7% of all patients and the failure rate consistently increased from 23.8% at 3 years to 31.5% at 5 years, up to 36.9% at 7 years. The 7-year success rate (defined as excessive weight loss of more than 50%) was extremely low (43%). Based on these concerning and disappointing results, the authors concluded that "laparoscopic banding should no longer be considered as the procedure of choice for obesity".[24] In terms of weight loss, the resulting %EWL was significantly higher in sleeve group with satisfactory weight loss in most of the patients at the 1 and 3 year intervals. Different weight loss outcomes following laparoscopic gastric band and sleeve gastrectomy are reported in the literature. Several authors report results nearly similar to our study[25-27] with a resulting BMI at 3 years of 33 to 36 kg/m^2. On the other hand, some series report better outcomes[28,29] with a resulting BMI around 30 kg/m^2. The main difference of these studies seems to be the selection of the patients, in the fact that restrictive gastric surgery is found to be more efficient in the mildly obese rather than the superobese patient population.[29] In studies with the best results, the preoperative average BMI was 42 to 43 kg/m^2. In studies with the poorest results, initial BMI was 44 to 46 kg/m^2.[30-32] There are numerous other investigations that report rates of gastric band removal up to 60%.[33-36] The scientific evidence on the high rates of re-operation after laparoscopic gastric banding is alarming. An increasing number of reports describe the conversion from gastric banding to other bariatric procedures including laparoscopic vertical banded gastroplasty, sleeve resection, and duodenal switch.[37,38] Proponents of the laparoscopic gastric band argue that improvements in the surgical technique (e.g. pars flaccida technique) and the quality and design of bands have considerably reduced the number of complications. While this is true for band slippage,[39] the rate of long-term complications, including band removals, remains high.[40,41]

In conclusion the data from our trial showed that in carefully selected patients of nonsweet eaters with an initial BMI limited to 40 to 49 kg/m^2, restrictive surgery can give good results. Sleeve gastrectomy is significantly more effective than gastric banding in terms of late complications, late reoperations, and long-term results on weight loss.

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