A comparative Study of 3 cm and 6 cm Pre-pyloric Starting Point for Sleeve Gastrectomy as Regard Post-operative Weight Loss and Vomiting

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ABSTRACT

Laparoscopic sleeve gastrectomy (LSG) is gaining popularity as a primary, staged and revisional operation for its proven safety and simplicity, as well as short-term and mid-term efficacy. Some evidence has shown that sleeve gastrectomy and similar procedures can be complicated by significant post-operative reflux symptoms. With an intact pylorus, severely restricted stomach capacity, and physiologically disrupted motility possibly creating stasis, one would expect that LSG would not be likely to relieve heartburn reflux symptoms, as does LRYGB. ***Methods****: This was a randomly selected prospective study carried out on morbidly obese patients presented to Kasr El-Aini teaching hospital during the period from January 2013 to March 2014, where sixty patients underwent sleeve gastrectomy. These patients grouped into two groups according to the starting point of resection of the stomach; group (A) started 3cm from the pylorus towards the gastro-esophageal junction and group (B) 6cm from the pylorus. The decision to do 3 cm resection or 6 cm resection randomly selected. These patients followed over a period of 6 months for post -operative nausea; vomiting and reflux symptoms and their weight loss.* ***Results****: The overall patients' weight loss percentage ranged from 30 to 86.9 % excess body weight loss with a mean of 60 %. In group A (3 cm), patients' weight loss percentage ranged from 31.2 to 86.9 % excess body weight loss with a mean of 60.9%, however, in group B (6 cm), patients' weight loss percentage ranged from 30 to 83.5 % excess body weight loss with a mean of 61.1%. In this study, (41.7%) of patients lost (40-60%) of their excess body weight within 6 months without significance to any group or by other mean (91.7%) of patients lose > 40% of their body weight at 6 months with no significance to 6 cm or 3 cm groups as seen from P-value 0.610. There was no major complications (e.g.; leakage, bleeding, pulmonary embolism or death). However, minor complications in the form of nausea, vomiting and reflux were more with 3 cm group (96.6%) as compared to 6 cm group (67.9%). There was a strong significant difference between both groups can be seen in the P-value (0.003).* ***Conclusion****: The majority of patients (88.3%) were satisfied from the procedure and its results with no statistically significant difference between both groups in terms of weight loss, decreased appetite or patient satisfaction.*

Key words: Sleeve gastrectomy, Morbid obesity, Bariatric surgery

INTRODUCTION

Sleeve gastrectomy (SG) was initially conceived and first described in 1988 by Hess [(1)] and Marceau [(2)] as a restrictive component of the bilio-pancreatic diversion (BPD) and duodenal switch procedure at times when bariatric surgery was conducted via laparotomy (open surgery). In 1999,10 years after the introduction of minimally invasive surgery, LSG was performed as a first step procedure in high-risk patients, to be followed by a second-step LRYGBP [(3)] or laparoscopic BPD[(4)]. The original idea conceived by Gagner et al. was to allow super-morbidly obese patients to lose weight and decrease their operative risk by allowing some co-morbid conditions to go into remission [(5)]. Laparoscopic sleeve gastrectomy (LSG) is gaining popularity as a primary, staged and revisional operation for its proven safety and simplicity, as well as short-term and mid-term efficacy. Excess weight loss and remission of comorbidities have been reported to take place in a frequency comparable with other well-established procedures[(6)].

The mechanism of weight loss following the LSG is due mainly to a restricted calories intake, which results from the combination of the small capacity, low dispensability of the sleeve and the

resultant immediate high intraluminal pressure. Both might be responsible for the satiety effect of this procedure. The role of the pylorus as another potential mechanism of increased intragastric pressure remains to be determined[7]. Another mechanism of weight loss reported by Langer et al. that found lower ghrelin levels after LSG than after LAGB[8]. Karamanakos et al. reported that the peptide YY (PYY) levels increased similarly after both the LRYGBP and LSG. The markedly reduced ghrelin levels in addition to increased PYY levels after LSG are associated with greater appetite suppression and excess weight loss compared with LRYGBP[9].

Some evidence has shown that sleeve gastrectomy and similar procedures can be complicated by significant post-operative reflux symptoms[10]. It is a reasonably expected side effect, particularly because preoperative reflux symptoms and esophageal dysmotility are associated with morbid obesity[11].With an intact pylorus, severely restricted stomach capacity, and physiologically disrupted motility possibly creating stasis[12], one would expect that LSG would not be likely to relieve heartburn reflux symptoms, as does LRYGB[13]. Laparoscopic sleeve gastrectomy proposed to have an adverse effect on the function of the lower esophageal sphincter due to disruption of the phreno-esophageal membrane and gastric resection at the angle of His predisposing the patient to postoperative reflux symptoms [14].

The exact mechanism of this reflux complication is not clear. Impaired gastric emptying may be a possible explanation. Himpens[15] and Weiner[16] evaluated the incidence of reflux, and found that it increases during the first postoperative year, but disappears thereafter. Does it expose the preexistent subtle dysmotility of the stomach or esophagus or there is some intrinsic effect of the procedure itself? It is mainly unknown how this operation affects gastric emptying, and the only two studies published on this issue reported controversial results. The Melissas's study[12] reported an increase in the gastric clearance times, while Bernstine et al. cited no change in gastric emptying rates at 3 months after the operation[17].

The aim of this study is to find out the results of resecting the stomach 3 cm from the pylorus versus 6 cm regarding BMI change,nausea, vomiting and reflux symptoms.

PATIENTS & METHODS

Study design:

This was a randomly selected prospective study carried out on morbidly obese patients presented to Kasr El-Aini teaching hospitalduringthe period from January 2013 to March 2014, where sixty patients underwent sleeve gastrectomy. These patients grouped into two groups according to the starting point of resection of the stomach; group (A) started 3cm from the pylorus towards the gastro-esophageal junction and group (B) 6cm from the pylorus. The decision to do 3 cm resection or 6 cm resection randomly selected (3 cm was done in the new Kasr El-Aini teaching hospital, while 6 cm was done in the old Kasr El-Aini teaching hospital). These patients followed over a period of 6 months for post-operative nausea; vomiting and reflux symptoms and their weight loss.

Patient inclusion criteria:

These patients should fulfill certain criteria for choice:

1. Patients who have BMIs of 40 kg/m2 or more, or between 35 kg/m2 and 40kg/m2 with other significant obesity related co-morbiditiesthat could be improved if they lost weight.
2. Both sexes (males and females)
3. Patients are generally fit for anesthesia and surgery.
4. Patients commit to the need for follow up.

Patient exclusion criteria:

1. patients with previous abdominal surgeries
2. patients with psychiatric problems
3. severe cardiopulmonary disease or other serious organic disease making the subject a high-risk surgical candidate, uncontrolled hypertension, and portal hypertension
4. pregnancy or lactation at surgery
5. drug or alcohol abuse
6. previous malabsorptive or restrictive procedures performed for the treatment of obesity

Pre-operative preparation:

All patients underwent a standard evaluation preoperatively. Blood tests requested in the form of complete blood picture, Fasting blood sugar, clinical chemistries (serum albumin, ALT, AST, GGT, Urea, and Creatinine) and Prothrombin time and concentration. Abdominal

ultrasonography, chest X-ray, Pulmonary function tests, ECG and Echocardiography performed preoperatively. Patients informed about the nature of the research, and each patient understood and agreed to the procedure.One to two weeks pre-operatively the patients asked to consume very low caloric diet.

Surgical Procedures:

Anesthesia and Positioning:

All surgical procedures took place under general anesthesia. The patient placed in supine position with 30 degrees reverse trendlenberg, legs open, and with elastic stockings to avoid DVT and pulmonary embolism and a prophylactic dose of anticoagulant given subcutaneously.

Insufflation and Trocar sites:

Pneumoperitoneum induced using veress needle introduced through the left subcostal region at midclavicular line; then five ports introduced as follow:

1. 12mm camera port about 15 cm below the xiphisternum
2. 12mm port for liver retraction 2 cm below the xiphisternum
3. two working ports one 15mm port in the right midclavicular line and the other 12mm in the left midclavicular line
4. 5mm assistant port in the left anterior axillary line

Procedure:

Dissection of greater curvature started flush to the greater curvature using Ligasure® (Covidien) or Harmonic scalpel® (Ethicon Endo-Surgery) until the gastro-esophageal junction and releasing the posterior adhesions between the stomach and the pancreas. It was important to continue the dissection up to the left crus of diaphragm, dividing the gastrophrenic ligament and making the gastric fundus completely free. Marking of the distance from the pyloric ring to the starting point of resection done; where a calibrated string used to determine the starting point of resection from the pyloric ring at the greater curvature of the stomach either 3 cm or 6 cm, as shown in figure (1) and (2). The decision to do 3 cm resection or 6 cm resection randomly selected.

In order to excise, then a 36 Fr bougie was inserted till the pylorus then the stapler introduced through the right operator port with a green cartridge then the following blue cartridges introduced through the left operator port. A grasper then used to close the pylorus and methylene blue injected under pressure to test for leakage. Finally, a drain placed and the resected removed through the left 12 mm working port.

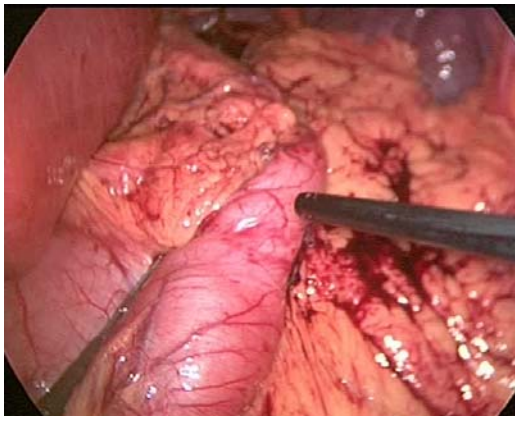

Figure (1): Sleeve gastrectomy with starting point 3 cm pre-pyloric distance.

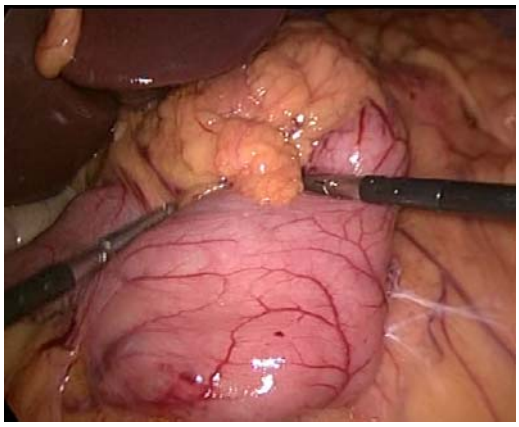

Figure (2): Sleeve gastrectomy with starting point 6 cm pre-pyloric distance.

Post-operative measures:

In day one, gastrograffin study was performed to exclude leakage then the drain was removed and the patient was discharged on liquid diet for three weeks followed by pureed foodsfor another three weeks then soft diet for two weeks, then regular diet afterwards. All patients were discharged on vitamin B12 vial every month for one year, calcium tablets twice dailyfor one year; PPI for the first three months and multi-vitamins for one year.

All patients were examined monthly during the first six months for BMI changes and post-operative complications mainly (nausea, vomiting and reflux) where nausea and vomiting

categorized by a scoring system called PONVimpact scale (18) (post-operative nausea and vomiting scoring system), as shown in table (1).

Table (1): Scoring system of Vomiting

Vomiting Frequency	Score
No	0
Once	1
Twice	2
Three or more times	3

Feeling of nausea (an unsettled feeling in the stomach and slight urge to vomit)? If yes, has your feeling of nausea interfered with activities of daily living, such as being able to get out of bed, being able to move about freely in bed, being able to walk normally, or eating and drinking?, as shown in table (2).

Table (2): Scoring system of Nausea

Nausea Frequency	Score
Not at all	0
Sometimes	1
Often or most of the time	2
All of the time	3

Statistical methods:

The data coded and entered using the statistical package SPSS version 15. The data summarized using number and percentage for qualitative values. Statistical differences between groups tested using Chi Square test for qualitative variables. Logistic regression analysis done to test for significant predictors of postoperative complications. P-values less than or equal to 0.05 were considered statistically significant.

RESULTS

This was a randomly selected prospective study carried out on morbidly obese patients presented to Kasr El-Aini teaching hospitalduring the period from January 2013 to March 2014, where sixty patients underwent sleeve gastrectomy. These patients grouped into two groups according to the starting point of resection of the stomach; group (A) started 3 cm from the pylorus towards the gastro-esophageal junction and group (B) 6 cm from the pylorus.

The patients' ages ranged from 17 to 60 years old with a mean of 34.5 years. The majority of patients in this study were in the age group 21-40 (65%) with five patients (8.3%) below twenty years. The majority of candidates in this study (71.7%) were females. Most of the candidates in our study were married (60%) as compared to single (40%).

Fifty percent of patients in this study had BMI > 50, 25% had BMI 40-45%, and 5% had BMI 35-40% with co-morbidities, as shown in Table (3).The majority of patients in this study were bulky eater (76.7%) versus (23.3%) were sweet eater.

Table (3): Initial BMI of patients

	Group A 3 cm	Group B 6 cm	Total
Initial BMI (Kg/m2)			
35-40	3	0	3
	(9.4%)	(0%)	(5.0%)
40-45	8	7	15
	(25.0%)	(25.0%)	(25.0%)
45-50	8	4	12
	(25.0%)	(14.3%)	(20.0%)
>50	13	17	30
	(40.6%)	(60.7%)	(50.0%)
Total	32	28	60
	(100.0%)	(100.0%)	(100.0%)

Ninety percent of patients in this study were not diabetic versus 10% were diabetic on oral hypoglycemic drugs.Eighty percent of subjects in our study were not hypertensive versus twenty percent were hypertensive and on medication.Eighty seven percent of patients in this study were not complaining from chronic diseases (in the form of chest diseases, liver, cardiac, renal or other medical disorders) versus 13.3% suffered from chronic diseases mostly chest diseases and two patients had poliomyelitis.

The overall patients' weight loss percentage ranged from 30 to 86.9 % excess body weight loss with a mean of 60 %. In group A, patients' weight loss percentage ranged from 31.2 to 86.9 % excess body weight loss with a mean of 60.9%, however, in group B, patients' weight loss percentage ranged from 30 to 83.5 % excess body weight loss with a mean of 61.1%, as shown in Table (4).

Table (4): Range and mean of weight loss at 6 months

	Group A 3 cm	Group B 6 cm	All Patients
Weight loss			
Minimum	31.2 %	30 %	30 %
Maximum	86.9 %	83.5 %	86.9 %
Mean	60.9 %	61.1 %	60 %

In this study, (41.7%) of patients lost (40-60%) of their excess body weight within 6 months without significance to any group or by other mean (91.7%) of patients lose >40% of their body weight at 6 months with no significance to 6 cm or 3 cm groups as seen from P-value 0.610. However, in this study, four patients (12.5%) in group A lost more than 80% of their excess body weight over a period of six months versus one patient (3.6%) in group B lost 80 % of his excess body weight and that 83.4 % lost 40-80 % over the period of 6 months, as shown in Table (5) and figure (3).

Table (5): Percentage of weight loss at 6 months

	Group A 3 cm	Group B 6 cm	Total
Percentage of weight loss at 6 months (%)			
20-40	3	2	5
	(9.4%)	(7.1%)	(8.3%)
41-60	13	12	25
	(40.6%)	(42.9%)	(41.7%)
61-80	12	13	25
	(37.5%)	(46.4%)	(41.7%)
>80	4	1	5
	(12.5%)	(3.6%)	(8.3%)
Total	32	28	60
	(100.0%)	(100.0%)	(100.0%)

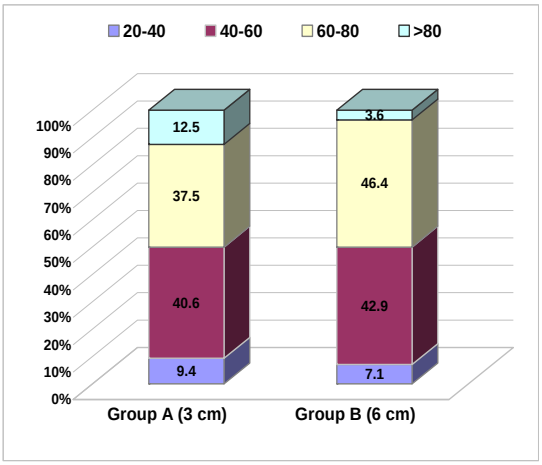

Figure (3): Percentage of weight loss at 6 months

In this study, 66.7% of patients with initial BMI from 35-40 kg/m2 lost >80% of their excess body weight within 6 months, sixty percent of patients with initial BMI from 40-45 kg/m2 lost 60-80 % of their excess body weight within 6 months, whereas 58.3% of patients with initial BMI from 45-50 kg/m2 lost 60-80 % of their excess body weight and finally, patients with BMI more than 50 kg/m2 lost 40-60 % of their excess body weight within 6 months, as shown in Table (6) and figure (4).

Table (6): Correlation between initial BMI and percentage of weight loss at 6 month

	Initial BMI (Kg/m2)				Total
	35-40	40-45	45-50	>50	
Percentage of weight loss at 6 months (%)					
20-40	1	1	0	3	5
	(33.3%)	(6.7%)	(0%)	(10.0%)	(8.3%)
41-60	0	3	5	17	25
	(0%)	20.0%	(41.7%)	(56.7%)	(41.7%)
61-80	0	9	7	9	25
	(0%)	(60.0%)	(58.3%)	(30.0%)	(41.7%)
>80	2	2	0	1	5
	(66.7%)	(13.3%)	(0%)	(3.3%)	(8.3%)
Total	3	15	12	30	60
	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

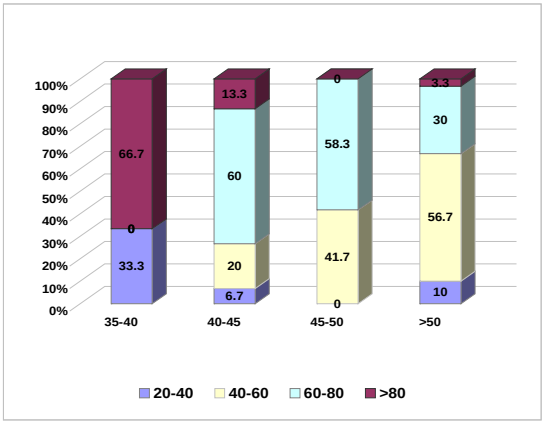

Figure (4): Correlation between initial BMI and percentage of weight loss at 6 month

The majority of our patients (88.3%) satisfied from the procedure and its results without any privileges for any group (3cm or 6cm) and with the presence of minor complications, which had accepted, by most of them.Almost all of patients underwent this operation with either techniques (3cm or 6cm) showed marked reduction in their appetite (95%).

In this study, there was no major complications (e.g.; leakage, bleeding, pulmonary embolism or death). However, minor complications in the form of nausea, vomiting and reflux were more with 3 cm group (96.6%) as compared to 6 cm group (67.9%). There was a strong significant difference between both groups can be seen in the P-value in this table (0.003), as shown in figure (5).

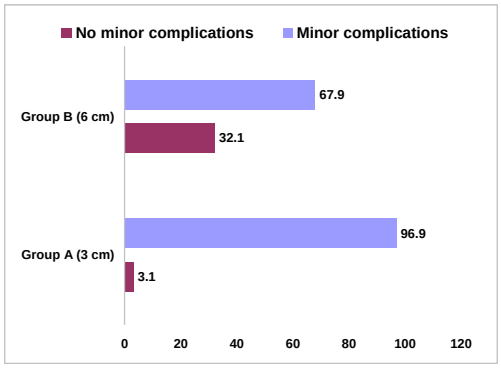

Figure (5): Correlation between two groups and presence of Minor complications (nausea, vomiting and reflux)

Complications in this study were totally minor (nausea, vomiting and reflux) and occurred in (83.3%) of patients with no age significance versus (16.7%) who developed no complications.initial BMI had no influence on post-operative complications and this was evident from the near percent of patients in each BMI group.Diabetes mellitus, hypertension and chronic diseases had no influence on post-operative complications in either group (3cm and 6cm).

There was no statistically significant difference between both groups (6 cm and 3 cm) regarding post-operative reflux, where most of patients (61.7%) did not suffer reflux symptom versus (38.3%) who suffered from reflux where most of them had already pre-operative reflux symptoms. In addition, (43.8%) of patients in 3 cm group suffered from reflux versus (32.1%) in 6 cm group who suffered from reflux taking in consideration that the sample size is sixty patients so higher sample size may confirm this correlation, as shown in figure (6).

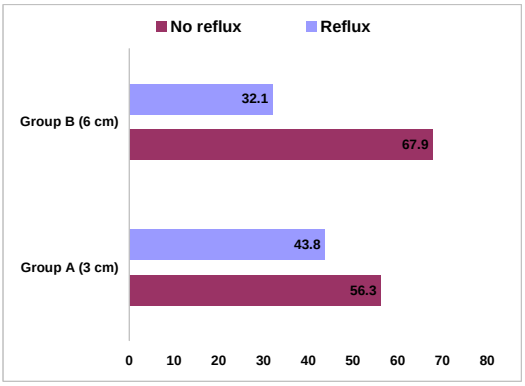

Figure (6): Correlation between two groups and presence of Reflux

Ninety percent (90.6%) from the group 3 cm suffered from repeated vomiting (twice or more daily) within the first six months compared to (60.7%) from 6 cm group, which had a strong significant difference with P-value 0.021. On the other hand we find that (32.1%) of patients in 6 cm group developed no vomiting at six months versus (6.3%) of 3 cm group, as shown in figure (7).

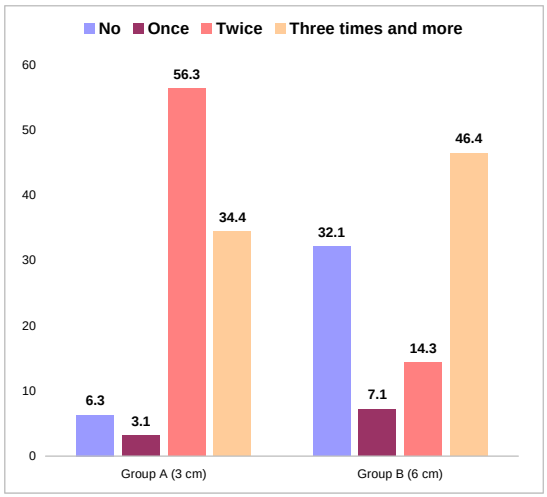

Figure (7): Correlation between two groups and presence of vomiting

Sixty five percent (65%) of patients underwent sleeve in this study did not suffer from postoperative nausea without any significance between both groups (3cm and 6cm) with a p-value of 0.319. In contrast to (23.3%) who suffered from nausea most of the time at six months, as shown in figure (8).

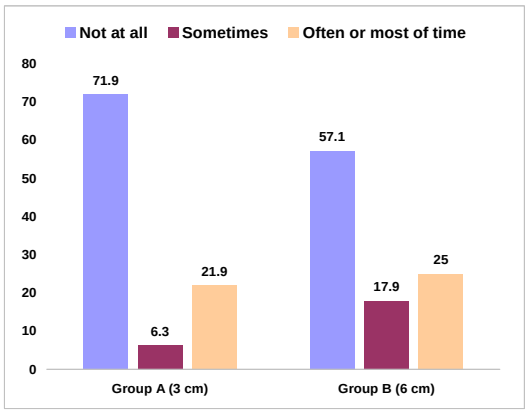

Figure (8): Correlation between two groups and presence of nausea

DISCUSSION

Laparoscopic sleeve gastrectomy (LSG) has become a very popular bariatric procedure because of the several advantages that it carries over other more complex procedure such as the laparoscopic Roux-en-Y gastric bypass (LRYGBP)[19] and, recently, is gaining momentum as a definitive single-stage procedure for morbid obesity [20,21].

Weiner et al.[16] mentioned that, the fundus is the most easily expanded compartment of the reservoir part since it has only two layers of muscle**;** enabling that way the stomach to accommodate larger volumes. Therefore, resecting the fundus during LSG results not only in volume capacity reduction, but also in removal of the most distensible part of the stomach leading to high intraluminal pressure and consequently to early satiety feeling [22].

All restrictive procedures show a tendency to weight gain after several years. This can be caused by adaptation to soft and liquid high-calorie food ingestion and/or loss of restriction[16].

Antonio et al.[19] mentioned that LSG may be followed by insufficient weight loss and or weight regain with or without recurrence of comorbidities. The potential explanation for LSG failure may be eventually identified in the dilation of the gastric tube with consequent increase in the gastric capacity, an incomplete removal of the gastric fundus, in our study only one case experienced insufficient weight loss where she lost 20% of her excess BMI over a period of six months and remain stationary the first year**.**

The majority of patients in this study was in the age group 21-40 (65%) giving an idea about the age group seeking for this operation most were young adults and middle age. The majority of candidates in this study (71.7%) was females, which may be indicator of the main sex looking for this operation. Most of the candidates in our study were married (60%) as compared to single (40%) which indicates that the majority of patients looking for this kind of operation were mostly married females for functional and psychological elements. The majority of subjects in our study (55%) was working denoting which kind of patients look for this operation and the need of this group for the operation to improve their performance. Fifty percent of patients in this study had BMI > 50, 25% had BMI 40-45%, and 5% had BMI 35-40% with co-morbidities denoting that the majority of patients did not look for this operation until they became morbidly obese.

Ninety percent of the patients in this study were not diabetic versus 10% only who are

diabetic on oral hypoglycemic drugs with minimal improvement over the period of six months in the form of reduction of the doses of their oral hypoglycemic drugs. Eighty percent of subjects in our study were not hypertensive versus twenty percent were hypertensive and on medication. They showed minimal improvement over the period of six months in the form of reduction of the doses of anti-hypertensive drugs.

Weiner et al.[16]; mentioned that mean excess BMI loss reached 62% at 1 year, while in this study, the overall patients' weight loss percentage ranged from 30 to 86.9 % excess body weight loss with a mean of 60 % at 6 months. In group A, patients' weight loss percentage ranged from 31.2 to 86.9 % excess body weight loss with a mean of 60.9%, and in group B, patients' weight loss percentage ranged from 30 to 83.5 % excess body weight loss with a mean of 61.1%. In this study, (41.7%) of patients lost (40-60%) of their excess body weight within 6 months without significance to any group or by other mean (91.7%) of patients lose > 40% of their body weight at 6 months with no significance to 6 cm or 3 cm groups as seen from p-value 0.610.

One consider what the difference in the bougie size actually means. Taking under consideration that 1 Fr equals 0.3 mm, a bougie of 36 Fr has 1.2 cm diameter and contains 26 cm3 volume, does not vary significantly from the 40 Fr bougie (1.3 cm diameter and 32 cm3 volume)[22].

Roa et al.[23] mentioned that the size of the bougie used for calibrating the stomach tube might influence success, i.e., weight loss, but this correlation appears to be complex and is definitely not linear[24]. In this study, we used a fixed bougie size 36 Fr while changing the size of antral pouch 6 cm versus 3 cm.

In this study, we proved that the 3 cm antral pouch group have higher rate of vomiting compared to 6 cm group with fixed bougie size 36 Fr and that 3 cm groups were > 6 times at a higher risk to have vomiting > once compared to 6 cm group where these results differed to some extent with ***Jacobs and co-workers***[25] who reported that no statistically significant difference between 4 and 7 cm antral pouch existed and agreed with that no difference between 46-Fr, 40-Fr, and 36-Fr bougie regarding excess body weight loss EBWL**.**But our results agreed with ***Jacobs and co-workers*** regarding excess body weight loss that there was no difference in the results of 6 cm groups and 3 cm antral pouch.

However, these results did not expected as the size of the pouch had increased with the 6 cm group and so more weight loss had expected to be with group A (3 cm). So, more time of follow-up may be needed to prove that small pouch is more effective for weight loss.

In this study, four patients (12.5%) in group A lost more than 80% of their excess body weight over a period of six months versus one patient (3.6%) in group B lost 80 % of his excess body weight and that 83.4 % lost 40-80 % over the period of 6 months. However, this result had no significance and may be of significance if more patients were done. In addition, this study showed that the percentage of weight loss was more with lower basic BMI so the less was the basic BMI the more is the percentage of weight loss at 6 months.

The majority of our patients (88.3%) were satisfied from the procedure and its results without any privileges for any group (3 cm or 6 cm) and with the presence of minor complications which were accepted by most of them. In addition, almost all of patients underwent this operation with either techniques (3 cm or 6 cm) showed marked reduction in their appetite (95%) without any privileges for any group.

Complications were graded according to the Clavien's classification system[26], grade I, a complication inducing any deviation from the normal postoperative course; grade II, complications requiring pharmacologic treatment; grade III, complications requiring operative, endoscopic, or radiologic intervention; grade IV, life-threatening complications requiring intermediate or intensive care unit management; and grade V, death of a patient[27]. In this study, there was no major complications (e.g.; leakage, bleeding, pulmonary embolism or death). Applying this grading in this study, we find that all complications belonged to grade 1 and 2 in the form of nausea, vomiting and reflux symptoms, where all responded to medical treatment and one case only of severe vomiting that was re-admitted to the hospital for IV fluids infusion and discharged after two days. We found that 96.9% (31 patients) in 3 cm group developed minor complications mostly reflux and vomiting and 67.9% (19 patients) in 6 cm group denoting that minor complications as nausea vomiting and

reflux were strongly significant (p-value was (0.003)) to 3 cm group and our results proved that 3 cm groups were >14 times at a higher risk to have these complications compared to 6 cm group.

The study of Yehoshua et al.[7], demonstrating that the LSG creates a high-pressure system when compared with the native stomach, should caution bariatric surgeons to perform LSG in patients with already diagnosed GERD and incompetent lower esophageal sphincter[6,7] and this match with our results that proved that 61.7% (37 patients) of patients in our study didn't develop reflux symptoms compared to 38.3% (23 patients) who developed exaggeration of already presenting reflux symptoms with no significance to 3 cm and 6 cm groups which agree with[16], whosuggested that leaving the antral part behind is crucial for normal function of the retained stomach, but they themselves report reflux with a technique of resection that starts from 5–6 cm proximal to pylorus. However, Andrei et al.[28] suggested that the extent of the resection of the antrum has no implication on the sleeve emptying. In this study, (43.8%) of patients in 3 cm group suffered from reflux versus (32.1%) in 6 cm group who suffered from reflux taking in consideration that the sample size is sixty patients so higher sample size may confirm this correlation.

Development of intense and persistent vomiting can lead to vitamin, mineral and protein deficiencies in a short period of time[29]. Wernicke's syndrome presents as confusion, nystagmus, ophthalmoplegia and ataxia. A confusional state with inattention, apathy, disorientation and memory loss may be present. The lower limbs may be affected with motor and sensory deficit[30]. In our study, ninety percent (90.6%) from the group 3 cm suffered from repeated vomiting (twice or more daily) within the first six months compared to (60.7%) from 6 cm group, which had a strong significant difference with P-value 0.021. On the other hand, we find that nine patients (32.1%) in 6 cm group developed no vomiting at six months versus two patients (6.3%) in 3 cm group.

In our study, sixty five percent (65%) of patients underwent sleeve in this study did not suffer from postoperative nausea without any significance between both groups (3cm and 6cm) with a p-value of 0.319. In contrast, to (23.3%) who suffered from nausea most of the time at six months.

Makarewiczet al.[31] stated that some patients were readmitted for dehydration and renal failure, both of which may possibly be related to the postoperative gastro-esophageal reflux disease; in this study 61.7 % of patients developed no reflux symptoms while 82.7% developed vomiting more than once so vomiting is related to the size of antral pouch where the 3 cm antral pouch group have higher rate of vomiting compared to 6 cm group with fixed bougie size 36 Fr and that 3 cm groups were > 6 times at a higher risk to have vomiting more than once compared to 6 cm group . Even Wernicke–Korsakoff syndrome has been reported after sleeve gastrectomy (SG) due to prolonged vomiting. Most authors report prescribing PPIs for different periods of time to the SG patients; in this study PPI were prescribed routinely for all patients for 3 months at least, where only one case was re-admitted for severe vomiting and dehydration where she received IV fluids for 2 days and discharged after that.

Evangelos et al.[32] mentioned that reinforcement of the stapling line is a negative predictor for subsequent complications, while a high preoperative BMI, previous bariatric operation, and diabetes are positive predictorsthat contradict the results in this study that stated that DM, hypertension and other chronic diseases had no influence on development of any post-operative nausea, vomiting or reflux.

CONCLUSION

The majority of patients (88.3%) were satisfied from the procedure and its results with no statistically significant difference between both groups in terms of weight loss, decreased appetite or patient satisfaction.

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