Research Article

Prospective comparison between antral resection laparoscopic sleeve gastrectomy and antral preservation laparoscopic sleeve gastrectomy

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Abstract

Background: Obesity is one of the leading preventable causes of death worldwide it is considered one of the most serious public health problem of the 21st century. Severe obesity by definition is having a body mass index (BMI) greater than 35 kg/m2. Obesity could be treated with either non-surgical treatment or surgical treatment. Non-surgical treatment includes diet therapy, physical activity, behavior modification and pharmacotherapy. However it showed noncompliance of the obese patients, non-satisfactory weight loss or regaining the weight shortly after losing weight. Sleeve gastrectomy is a restrictive intervention consisting of a vertical gastrectomy including the entire greater curvature of the stomach. Many studies have compared antral resection sleeve gastrectomy to traditional antral preservation sleeve gastrectomy. **Objective:** to compare between antral resection laparoscopic sleeve gastrectomy and antral preservation laparoscopic sleeve gastrectomy regarding short & long term weight loss and complications. **Patients and Methods:** prospective randomized control study, conducted in Ain Shams University Surgery Hospital between November 2015 till December 2016. Sample size was 40 patients divided into two groups each of them contained 20 patients. Inclusion criteria: age between 18 and 60 years, with body mass index exceeding 30, fit for surgery. Exclusion criteria was patients with contraindication to laparoscopy, thyroid problems, mental and psychological illness. Pre-operative history and investigation and post-operative follow up was done. **Results:** Our study showed mild better weight loss and BMI reduction after 6 and 12 months in the antral resection group but with no statistical significant. Operation time was shorter in the antral resection group than in the antral preservation group (P-value 0.027). No statistically difference in post-operative complication was observed. **Conclusion**: Our study showed mild increase in weight loss and BMI reduction after 6 and 12 months in the antral resection group more than the antral preservation group. Antral resection was associated with shorter operation time

Keywords: sleeve gastrectomy, laparoscopic sleeve gastrectomy, SG, LSG antral resection laparoscopic sleeve gastrectomy, antral preservation laparoscopic sleeve gastrectomy.

Introduction

Obesity is one of the leading preventable causes of death worldwide and with rates of adult and childhood obesity increasing, authorities views it as one of the most serious public health problem of the 21st century (Barness et al., 2007). Severe obesity by definition is having a body mass index (BMI) greater than 35 kg/m2, while the morbid obesity is having a body mass index greater than 40 kg/m2 or a BMI greater than 35 kg/m2 with concomitant obesity-related morbidity (Brunicardi et al., 2001). Obesity could be treated with either non-surgical treatment or surgical treatment. Non-surgical treatment includes diet therapy, physical activity, behavior modification and pharmacotherapy. However it showed noncompliance of the obese patients, non-satisfactory weight loss or regaining the weight shortly after losing weight (Noakes et al., 2005).

Sleeve gastrectomy is a restrictive intervention consisting of a vertical gastrectomy including the entire greater curvature of the stomach while leaving in place an approximately 100-ml gastric tube along the lesser curvature (Mognol & Marmuse., 2007).

Sleeve Gastrectomy (SG) was first used in 1988, it was associated with reduction in dumping symptoms and marginal ulcers. In addition, gastrectomy was more restrictive,

permitting malabsorptive component and nutritional secondary effects. Initially, this technique was performed openly, it was performed laparoscopically for the first time in the late 1990's. SG has gradually gained in popularity, becoming established as the second most used bariatric procedure. Thus, according to the International Federation for the Surgery of Obesity and Metabolic Diseases 27.9% of all procedures while RYGB 46.6 % (Buchwald et al., 2011).

The surgical technique of sleeve gastrectomy has not been fully standardized, Resection of the antrum is considered to be a point of disagreement between surgeons. Some studies have shown that more aggressive antrum cut was associated with faster gastric emptying. Thus more surgeons are preferring antral resection over the traditional antral preserving technique. On the other hand, studies evaluating the weight loss after SG correlated failure to operation failure or failure of weight regained with the dilation or not adequate resection of fundus and antrum.

Many studies have compared antral resection sleeve gastrectomy to traditional antral presservation sleeve gastrectomy. Some studies showed more prominent results associated with antral resection technique (Parikh et al., 2008, Obeidat et al., 2015). However, other studies found that there is no statistically significant differences in %EWL between the two techniques (Yuval et al., 2013). Other studies associated the antral resection technique with less compilations and hospitalization time (Mognol et al., 2005; Baltasar et al., 2005).

Aim of the Study

In our study we will try to compare between two techniques regarding sleeve gastrectomy, first group 20 patients will undergo antral resection while the other group 20 patients will undergo classical sleeve gastrectomy. The comparison will discuss short & long term weight loss and complications between both antral resection laparoscopic sleeve gastrectomy and antral preservation laparoscopic sleeve gastrectomy.

Patients and Methods

This prospective randomized control study was conducted in Ain Shams University Surgery Hospital in Cairo from November 2015 till December 2016. The targeted group was patients with BMI exceeding 30. After applying the inclusion\ exclusion criteria, the final sample size was 40 patients. Twenty patients underwent antral resection in laparoscopic sleeve gastrectomy, and the other twenty patients underwent antral preservation laparoscopic sleeve gastrectomy. Inclusion criteria was for the patients to be aged between 18 and 60 years, have a body mass index exceeding 30, it for surgery. Motivated patients were excluded of the study. We excluded patients with contraindication to laparoscopy as previous abdominal operation and patients with hypothyroid state & on replacement therapy, Patient who refused the treatment, mentally retarded patients, and patients with psychiatric illness.

Pre-operative preparation of the patients included history taking focusing on age, sex, weight, BMI, Dietary habits, history of previous operations. All the patients underwent full general examination, full abdominal examination checking for scars of previous operations or abdominal wall hernias.

General pre-operative laboratory investigations for all the patients included full blood count, prothrombin and thromboplastin time, liver function tests, albumin, liver AST, ALT, serum urea, serum creatinine, sodium and potassium, free T3, T4, TSH, Fasting blood sugar and HBA1C.

Pre-operative investigations were ECG, CXR. Patients with cardiovascular troubles had ECHO. Patients with respiratory troubles as sleep apnea underwent respiratory function test and arterial blood gases. A pre-operative pelvi-abdominal ultrasound was done to all patients to see any intra-abdominal and pelvic organs pathology

Intraoperative, we followed the standard laparoscopic five puncture technique focusing on operative time, anatomy and operative findings. In antral resection group; we started resection at a point about 2 cm from the pyloric ring. In antral preservation group; we started resection at a point about 6 cm from the pyloric ring.

Post-operative follow up was done to record any difference between the two groups

regarding the operative time, early Post-operative complications, postoperative hospital stay, any long term complications (stenosis, GERD, ulceration) and long term weight loss (6 and 12 months postoperative).

Statistical analysis

Statistical analysis were performed using SPSS 23.0. The continuous variables were presented as mean ±SD, and the categorical variables were presented as ratio or number of cases. Comparison between the variables was done using the one sample test. P value was considered statistically significant if its value was less than 0.05.

Results

40 patients were included in our randomized study (34 female patients and 6 male patients), and were divided to 2 groups; antral presser-vation group (16 female and 4 males with mean Age 33.9) and antral resection group (18 female patients and 2 male patients with mean Age 33).

Table (1): Showing significant demographic differences no between both groups as regard Age and Sex.

		Antral preservation	Antral resection	Test value	P-value	Sig.
		No. = 20	No. = 20			
Age	**Mean±SD**	33.90 ± 7.68	33.00 ± 10.04	0.319•	0.752	NS
	Range	22 - 46	20 - 54			
Gender	**Female**	16 (80.0%)	18(90.0%)	0.784*	0.376	NS
	Male	4 (20.0%)	2 (10.0%)			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value 0.01: Highly significant; NA: Not applicable *: Chi-square test; •: Independent t-test

No significant variations between both group as regard preoperative weight, height and BMI with mean preoperative weight 127.5 kg in antral preservation group and 122 kg in antral resection group, mean preoperative BMI 47.13% in antral preservation group and 47.7% in antral resection group.

Table (2): Showing variations between both group as preoperative weight, height and BMI.

		Antral preservation	Antral resection	Test value•	P-value	Sig.
		No. = 20	No. = 20			
Weight (kg)	**Mean±SD**	127.53 ± 22.99	122.00 ± 19.82	0.814	0.421	NS
	Range	92-165	88-166			
Height (cm)	**Mean±SD**	163.80 ± 8.41	160.40 ± 11.93	1.042	0.304	NS
	Range	151-185	130-193			
BMI (%)	**Mean±SD**	47.13 ± 6.74	47.70 8.80	-0.230	0.819	NS
	Range	38-59	32-69			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value 0.01: Highly significant; NA: Not applicable

Patients with comorbidities as DM and HTN were not included in our study for the aim of justifying both groups result without underlying diseases. There was no early post -operative complications such as Bleeding and leakage reported in our 2 groups.

Table (3): Showing that no patients with comorbidities (DM and HTN were included in our study and the incidence of early postoperative complications in both groups

		Antral preservation		Antral resection		Test value•	P-value	Sig.
		No.	%	No.	%			
DM	**Negative**	20	100%	20	100%	NA	NA	NA
	Positive	0	0%	0	0%			
HTN	**Negative**	20	100%	20	100%	NA	NA	NA
	Positive	0	0%	0	0%			
Bleeding	**Negative**	20	100%	20	100%	NA	NA	NA
	Positive	0	0%	0	0%			
Leakage	**Negative**	20	100%	20	100%	NA	NA	NA
	Positive	0	0%	0	0%			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value 0.01: Highly significant; NA: Not applicable

Our study showed mild increase in weight loss and BMI reduction after 6 months in the antral resection group more than the antral preservation group with mean weight loss 92.5kg in antral resection group compared to 98.05kg in antral preservation group and mean BMI 36.2 %in antral resection group compared to 36.43% in antral preservation group, but still doesn't rise to be statistically significant value.

Table (4): Shows the variations in weight loss and BMI reduction after 6 months between both groups

		Antral preservation	Antral resection	Test value•	P-value	Sig.
		No. = 20	No. = 20			
Weight after 6 months (kg)	**Mean±SD**	98.05 ± 19.68	92.5 ± 15.13	1.000	0.324	NS
	Range	65-127	68-130			
BMI after 6 months (%)	**Mean±SD**	36.43 ± 6.31	36.22 ± 6.37	0.102	0.919	NS
	Range	24.46-47.	25.28-50.3			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value 0.01: Highly significant; NA: Not applicable

Our study showed also mild increase in weight loss and BMI reduction after 12 months in the antral resection group more than the antral preservation group with mean weight loss 70.5kg in antral resection group compared to 75.05kg in antral preservation group and mean BMI 27.7 %in antral resection group compared to 27.9% in antral preservation group, but again still doesn't rise to be statistically significant value.

Table (5): Shows the variations in weight loss and BMI reduction after 12 months between both groups.

		Antral preservation	Antral resection	Test value•	P-value	Sig.
		No. = 20	No. = 20			
Weight after 12 months (kg)	**Mean±SD**	75.15 ± 15.55	70.55 ± 10.35	1.101	0.278	NS
	Range	52-98	57-86			
BMI after 12 months (%)	**Mean±SD**	27.9 ± 4.76	27.72 ± 5.19	0.113	0.910	NS
	Range	19.57-36.44	21.19 - 38.22			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value 0.01: Highly significant; NA: Not applicable

Operation time was shorter in the antral resection group than in the antral preservation group in our study with no apparent clue. Although our study showed Non-significant variations between both groups as regard incidence of GERD and developing Gastric ulcers and vomiting, one patient developed GERD and 4 patients developed vomiting in the antral resection group compared to 2 patients developed vomiting and no one complained of GERD in the antral preservation group. Hospital stay was 1 day for all patients in both groups and No conversion to open sleeve gastrectomy was done in any patient in both groups.

Table (6): Shows the variations in operation time, late postoperative complication (GERD, Ulceration and vomiting), hospital stay and Conversion to open surgery between both groups.

		Antral preservation	Antral resection	Test value•	P-value	Sig.
		No. = 20	No. = 20			
Operation time (min)	**Mean±SD**	27.75 ± 4.72	24.70± 3.57	2.304•	0.027	S
	Range	20 - 37	20 - 32			
GERD)	**Negative**	20 (100.0%)	19 (95.0%)	1.026	0.311	NS
	Positive	0 (0.0%)	1 (5.0%)			
Ulceration and vomiting	**Negative**	18 (90.0%)	16 (80.0%)	0.784*	0.376	NS
	Positive	2 (10.0%)	4 (20.0%)			
Hospital stay (days)	**Mean±SD**	1 ± 0	1 ± 0	NA	NA	NA
	Range	1-1	1-1			
Conversion to open	**Negative**	20 (100.0%)	20 (100.0%)	NA	NA	NA
	Positive	0 (0.0%)	0 (0.0%)			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value 0.01: Highly significant; NA: Not applicable *: Chi-square test; •: Independent t-test

Discussion

There are several factors affecting the success of LSG in achieving proper weight reduction which include a combination of gastric restriction, hormonal factors, and changes in gastric emptying and eating habits are involved Sleeve gastrectomy is primarily a restrictive type of bariatric surgery, where surgical technique plays a major role in the resulting and maintained weight loss. The idea for restriction is to create a narrow gastric tube without a large enter antral pouch. Multiple technical factors are considered of great concern in the restrictive effect of laparoscopic sleeve gastrectomy. The size of the bougie used for calibration varies among authors, and there is controversy surrounding proximal gastric resection and the use of reinforcement materials (Burgos et al., 2013). The degree of antral resection is one of the most sophisticated controversial issues in LSG. (Givon-Madhala et al., and Silecchia et al.,) believed in antral preservation and started GRAP their resections 6 cm or more from the pylorus. Their belief that doing so preserves gastric contractile function, promoting better gastric emptying and thus reducing intraluminal pressure and potentially decreasing leakage (Dogan et al., 2016) On the other side, (Baltasar et al., 2005) start dividing the stomach approximately 2 cm from the pylorus; their argument that hence LSG is a restrictive procedure in nature, thus the restriction should be more aggressive for achieving better results.

The most frequent controversy against radical pyloric antrum resection is that it may alter the gastric evacuation process. LSG is anticipated to have an impact motility patterns because it affects both the proximal and distal stomach in many significant ways. General speaking, LSG may affect stomach emptying via several mechanisms: removal of the fundus with its capacitation and propulsive abilities, altered compliance and contractility of the resulting distensible sleeve thus elevating the intragastric pressure, and on gastric narrow and non-removal of the gastric pacemaker area in the body of the stomach. However, studies adderssing the topic of gastric emptying following LSG have yielded conflicting results. Our study did not address the impact of antral resection on motility and evacuation, which is considered one of its gastric limitations (Elli et al., 2015).

Other limitations to our study are; the small groups of patients, short follow up periods, compliance of patient in modifying their food habits and exercises and the wide variations in hormonal alteration post LSG Studies addressing the effect of pyloric antral resection on weight loss have shown conflicting results. (Jacobs et al.,) showed no statistically significant difference in the %EWL following creation of a 4- versus 7-cm antral pouch. In contrast analysis of data from the Spanish national registry revealed that resection closer to the pylorus resulted in better weight loss during the first and second postoperative years. Our study showed that a more radical antral resection resulted in better weight loss in the first postoperative year, yet it doesn't rise to be a significant result due to our study's limitations (Rahman et al., 2017). enter The success of LSG as a solo bariatric procedure may be limited by weight regain or insufficient weight loss, which occurs in 1.3-15 % of cases.

Failure is usually multifactorial, involving compliance lifestyle modifications, procedural failure, and operator errors. Potential explanations for LSG failure include eventual dilation of the residual gastric tube with consequent increases in gastric poor prescribed to (capacity, incomplete removal of the gastric fundus, and creation of a large gastric tube calibrated over a large bougie. The probability that the gastric tube may undergo dilation over time has been a point of debate and controversy. (Bragetto et al., 2009) found that gastric volume increased over a 2-year period, but he did not report any weight regain. Our study didn't address whether the creation of a narrower tube with consequent higher pressure and less distensibility may prevent gastric dilatation and weight regain and it requires further study (Diamantis et al., 2014)

Conclusion

Our study showed mild increase in weight loss and BMI reduction after 6 and 12 months in the antral resection group more than the antral preservation group with mean weight loss 92.5kg after 6 months and 70.5kg after 12 months in antral resection group compared to 98.05kg after 6 months and75.05 in antral preservation group and mean BMI 36.2 after 6 months and 27.7 % after 12 months in antral resection group compared to 36.43% after 6 months and27.9% after 12 months in antral

preservation group, but still do not rise to statistically significant values. There are several factors affecting the success of LSG in achieving proper weight reduction which include a combination of gastric restriction, hormonal factors, and changes in gastric emptying and eating habits are involved. Failure is usually multifactorial, involving poor compliance to prescribed lifestyle modifycations, procedural failure, and operator errors. Potential explanations for LSG failure include eventual dilation of the residual gastric tube with consequent increases in gastric capacity, incomplete removal of the gastric fundus, and creation of a large gastric tube calibrated over a large bougie. Other limitations to our study are; the small groups of patients, short follow up periods, compliance of patient in modifying their food habits and exercises and the wide variations in hormonal alteration post LSG Finally, we do believe that Radical antral resection in LSG safely potentiates the restrictive effect achieved and may result in greater and better maintained weight loss.

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