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ORIGINAL ARTICLE

Three Ports versus Conventional Five Ports Laparoscopic Sleeve Gastrectomy for Treatment of Morbid Obesity; a Retrospective Study.

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ABSTRACT

Background: This study aimed to assess and compare the feasibility and efficacy of three-port laparoscopic sleeve gastrectomy (3P LSG) and conventional 5 ports laparoscopic sleeve gastrectomy (5P LSG).
Methods: A prospective comparative randomized clinical trial to compare patients who underwent 3P LSG versus conventional 5P LSG, each group contain 120 patients.
Results: The follow-up was 12 months for both groups. Mean operative time was longer in 3P LSG (65.5 ± 10.24 min) vs. (55.9± 5. 2 min) in 5P LSG, (P < 0.000). There were 2 cases of intraoperative bleeding in each group. One case of leak in each group. Wound infection at port site was observed in 1 and 2 trocar sites in 3P LSG and 5P LSG (P = 1.000), respectively. At mean 12 months follow-up, with no lost, excess weight loss percentage (%EWL) was 40.44 ±6.34 in 3P LSG and 41.62±5.74 in 5P LSG (P= 0.127).
Conclusion: Three-port laparoscopic sleeve gastrectomy (3P LSG) is a feasible technique without affecting (%EWL) rates, with acceptable complication rate, but with longer operative time.

Keywords: Morbid obesity; Sleeve gastrectomy; Reduced port; Laparoscopy; Bariatric surgery

INTRODUCTION

The pandemic of our generation is, undoubtedly, the rise and prevalence of obesity [1]. Medical therapy for severe obesity has limited short-term success and almost nonexistent long-term success [2].

There are multiple prospective, randomized clinical trials that compare bariatric surgery with medical therapy, and they all conclude that bariatric surgery is a significantly more effective treatment for weight loss, diabetes treatment and resolution of comorbidities than medical therapy [3].

Different surgical procedures have been described in order to obtain excess weight loss (EWL) [4]. One of them is sleeve gastrectomy (SG), which is creation of gastric tube along the lesser curvature after longitudinal gastrectomy [5]. Ganger's group described LSG as a first-stage procedure in the super-obese patients to reduce high morbidity before definitive surgery as biliopancreatic diversion with duodenal switch (BPD-DS) [6].

Nowadays, LSG is performed as first line treatment of morbidly obese patients and a suitable alternative of laparoscopic gastric bypass with promising short-term results [7].

Currently, the most widely practiced multiport technique for LSG uses 4 to 6 ports usually 5 ports, but a technique for performing LSG with 3 ports has been described [8].

The aim of this study is to assess and compare the feasibility and efficacy of three-port laparoscopic sleeve gastrectomy (3P LSG) and conventional 5 ports laparoscopic sleeve gastrectomy (5P LSG). with primary outcome is achievement of weight loss and secondary outcome is other measures as operative time and intra and post-operative complications.

METHODS

Study design:

This prospective comparative randomized clinical trial was conducted to compare patients who underwent LSG via 3 ports versus 5 ports between January 2016 to December 2019. Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association

(Declaration of Helsinki) for studies involving humans. The method of randomization was closed envelope method. The following data were collected prospectively: age, sex, height, weight, BMI. Also, we recorded intra-operative parameters which included operation time (OT), intraoperative events, and complications. We obtained postoperative data from routine follow-up. Postoperative outcomes mainly postoperative complications, weight, BMI at 3months, 6 months and 12 months, and presence of complications at follow-up. Percentage of Excess weight loss (%EWL) was calculated from obtained data. We defined the % EWL as the operative weight minus the follow up weight, divided by the excess weight, and multiplied by 100. We defined excess weight as the operative weight minus ideal body weight based on a BMI of 25 kg/m2.

Patients operated by other bariatric procedures were excluded from the study. Patients undergo LSG without 12 months follow up period also excluded from the study.

Patients were allocated into two groups first group for patients operated by three ports (3P LSG), second group for patients operated by conventional five ports (5P LSG) then we compare between the two groups according to the previous data.

Our operative technique of three ports LSG:

The patients were positioned in French position. General anesthesia was given to all patients. Abduction of the patients' arms at 90 degrees. A foot board is placed to allow positioning in steep anti-Trendelenburg and the patient is strapped at the waist. To avoid deep venous thrombosis (DVT) the legs were wrapped by elastic stocking. The position of the surgeon was between the patient's leg and the position of the assistant is the patient's right side. On the left side of the patient head the monitor and laparoscopic setup were placed.

A12-mm port for the camera is placed at one third of the distance between the xiphoid process and the umbilicus, once pneumoperitoneum is established. Two additional ports are placed each is 12-mm, right and left para-rectal at midclavicular line two finger breadth below costal margin (Figure 1)

In the left side port (surgeons' right hand) an ultrasonic dissector (HARMONIC® Scalpel, ETHICON) was inserted used to free the greater curvature of the stomach starting from the middle of the stomach

In the right-side port, a non-traumatic grasper is used for traction of the stomach and bushing the liver laterally at the same time during dissection upper part of the stomach (Figure 2). The approach of the lesser sac at this level is easier. A particularity of the 3-port technique is represented by the complete posterior dissection of the upper part of the stomach. The reduced port in the complete posterior approach is explained as follows the standard fourth trocar for the liver retractor is replaced by the left hand of the surgeon. The surgeon uses the posterior part of the stomach to lift up the left lobe of the liver.

After complete dissection of the attachments of the posterior part of the fundus, the left crus is identified and represents the main landmark of the dissection. From posterior to anterior, a tunnel is created at the level of angle of His.

A 37 F rigid calibration tube is inserted by the anesthesiologist and directed through the pylorus, after completing the stomach dissection. The stomach is then transected, respecting 2 principles. First, particular attention must be paid to the incisura angularis to avoid a stricture at this point. The left-hand stapling offers the correct direction "to respect the incisura angularis." By the left-hand stapling, the device will be parallel with the lesser curvature and not perpendicular, which is the case when performing a right-hand stapling. Second, to perform an efficient procedure, it is important to remove the whole gastric fundus. In this technique, the following occurs: With the right hand, the surgeon grasps the posterior aspect of the gastric fundus and brings it up anteriorly. With the left hand, the stapler is placed close to the endoluminal tube and partially closed. The stapler is then gently opened, while the right hand of the surgeon pulls the anterior stomach laterally. When the anterior part is completely aligned with the posterior part previously pulled up, the stapler is finally closed and then fired (figure 3). This maneuver is repeated for the last 2 firings to keep the staple line straight, avoiding an oblique sectioning of the gastric fundus. The operative specimen was extracted and the ports were closed (figure 4).

STATISTICAL ANALYSIS

The collected data were analyzed by computer using Statistical Package of Social Services version 24 (SPSS), Data were represented in tables, Continuous Quantitative variables e.g. age were expressed as the mean ± SD & median (range), and categorical qualitative variables were expressed as absolute frequencies (number) & relative frequencies (percentage).

Suitable statistical tests of significance were used after checked for normality. The results were considered statistically significant when the significant probability was less than 0.05 ($P < 0.05$). P-value < 0.001 was considered highly statistically significant (HS), and P-value ≥ 0.05 was considered statistically insignificant (NS).

RESULTS

This is study included 240 patients undergo LSG, 120 patients with 3 ports technique and 120 patients with 5 ports technique.

The age of the studied 3 ports LSG group ranging from 24-49 years old with mean 38.42 ± 7.0 years old and one quarter (25%) of them are males, while in the 5 ports LSG group, their age ranging from 22-51 years old with mean 38.46 ± 7.9 and about fifth of them are males (20.8%), with no statistical difference between both groups **(Table 1)**.

The mean operative time in 3P LSG was 65.5 ± 10.24 min while in 5P LSG it was 55.9± 5.2 min, with P value (0.001) which is highly significant. The median of operation time in 3P LSG was higher (67 min) ranged from 52 – 75 min, while in 5P LSG group operation time ranged from 45-65 min with 53 min as a median **(Table 2)**.

According to post-operative weight loss there is no statistically significant difference between 3P LSG and 5P LSG as shown in **(Table 3)**.

The mean of pre-operative BMI among 3P LSG studied group is 48.46± 6.26 (kg/ht2), with a range from (39-65). While in 5P LSG mean of pre-operative BMI is 49.21± 5.53 (kg/ht2), with a range from (42-62), with no statistical difference.

The BMI of the studied groups decreased gradually till reaching (28.96 ±5.49) in 3P LSG, while in 5P LSG it reached (27.29±4.42) at 12 months postoperative, with p value (0.357) which is not significant.

Table (4) shows the percentage of EWL after 3, 6 and 12 months. At 12 months follow up period the mean of %EWL was 40.44 ±6.34 in 3P LSG while in 5P LSG the mean was 41.62±5.74, with P value 0.127 which is not significant.

As regarding the peri-operative complications, there is no statistically significant difference between 3P LSG and 5P LSG patients regarding occurrence of post-operative complications as intraoperative bleeding, thromboembolism, fever, vomiting or leak **(table 5)**.

Only in three cases (2.5%) of 3P LSG, a fourth trocar needed to be inserted own to the very heavy weight of liver which obscured the field and made a technical difficulty in completing the operation in one case. The other 2 cases showed intra-operative bleeding owing to splenic lacerations which needed a fourth trocar to control the bleeding

Table (1): Sociodemographic characteristics of the studied groups

Item	Three ports Lap sleeve (N=120)		Five ports Lap sleeve (N=120)		Test	P-value
	No.	%	No.	%		
Age (years)						
Mean ± SD	38.42 ± 7.0		38.46 ± 7.9		287.00*	0.984 (NS)
Median (Range)	39.5 (24 – 49)		39 (22 – 51)			
Sex						
Male	30	25.0%	25	20.8%	Fisher exact	1.000 (NS)
Female	90	75.0%	95	79.2%		

* Mann Whitney U test, P < 0.05 is significant, NS: Not significant

Table (2): operative time in the studied groups

Time of operation (min)	Three ports Lap sleeve (N=120)	Five ports Lap sleeve (N=120)	MWT	P-value
Mean ± SD	115.5 ± 10.24	91.92± 15.12	#69.500	0.000* (HS)
Median (Range)	116(92 – 135)	93 (70-125)		

#Mann Whitney U test, P < 0.05 is significant, HS: highly significant

Table (3): Body mass index (BMI) of the studied cases in 3P LSG and 5P LSG groups.

BMI (kg/ht^2)	3 ports Lap sleeve (3P LSG) (N=120)	5 ports Lap seleeve (5P LSG) (N=120)	P- value
Pre-operative			
Mean ± SD	48.46± 6.26	49.21± 5.53	0.634 (NS)
Median (Range)	47.5(39-65)	48(42-62)	
1-month post-operative			
Mean ± SD	44.25 ± 6.23	44.13±4.6	0.852 (NS)
Median (Range)	42.5(35-61)	44(37-52)	

BMI (kg/ht^2)	3 ports Lap sleeve (3P LSG) (N=120)	5 ports Lap seleeve (5P LSG) (N=120)	P- value
3 months post-operative			
Mean ± SD	38.75±6.34	38.54±4.43	0.885 (NS)
Median (Range)	37.5(29-55)	38.5(31-45)	
6 months post-operative			
Mean ± SD	32.88 ± 5.63	32.88±4.34	0.748 (NS)
Median (Range)	32(24-48)	32(25-40)	
12 months post-operative			
Mean ± SD	28.96 ±5.49	27.29±4.42	0.357 (NS)
Median (Range)	27(20- 41)	28(21-35)	

Mann Whitney U test, P < 0.05 is significant, NS: Non-significant

Table (4): Mean of percent of decrease in Body mass index (BMI) among the studied cases in LSG and LMGB groups.

Percentage excess weight loss (EWL %)	3 ports Lap sleeve (3P LSG) (N=120)	5 ports Lap seleeve (5P LSG) (N=120)	P- value
After 1-month post-operative			
Mean ± SD	8.76 ± 2.7	10.16±4.3	0.152 (NS)
Median (mix-min)	8.69(18.37-4.35)	9.09(27.4-4.65)	
After 3 months post-operative			
Mean ± SD	20.27±64	21.61±3.99	0.274 (NS)
Median (Range)	20.4(32.6-12.96)	21.2(33.87-15.7)	
After 6 months post-operative			
Mean ± SD	32.4 ± 4.13	33.19±4.69	0.692 (NS)
Median (Range)	32.6(39.1-24.07)	32.9(43.55-25)	
After 12 months post-operative			
Mean ± SD	40.44 ±6.34	41.62±5.74	0.127 (NS)
Median (Range)	42.2(48.7- 29.41)	43.5(50.32-32.6)	

Mann Whitney U test, P < 0.05 is significant, N S: not significant

Table (5): peri-operative complications in the studied groups.

Item	3 ports Lap sleeve (3P LSG) (N=120)		5 ports Lap sleeve (5P LSG) (N=120)		Test	P-value
	No.	%	No.	%		
Intraoperative Bleeding						
• No	118	98.31	118	98.31	Fisher exact	1.000 (NS)
• Yes	2	1.69	2	1.69		
thromboembolism						
• No	119	99.17	120	100	Fisher exact	1.000 (NS)
• Yes	1	0.83	0	0		
Post-operative leak						
• Negative	119	99.17	119	99.17	Fisher exact	1.000 (NS)
• Positive	1	0.83	1	0.83		
Post-operative vomiting						
• No	120	100	118	98.31	Fisher exact	0.4979 (NS)
• Yes	0	0	2	1.69		
Post-operative fever after 2 days						
• No	117	97.44	118	98.31	Fisher exact	1.000 (NS)
• Yes	3	2.56	2	1.69		
Port site infection						
• No	119	99.17	118	98.31	Fisher exact	1.000 (NS)
• Yes	1	0.83	2	1.69		
Port site hernia						

• No	120	100	120	100	Fisher exact	---

Fisher's exact test, P < 0.05 is significant, NS: Non-significant

Figure (1): Ports insertion in three port laparoscopic sleeve gastrectomy.

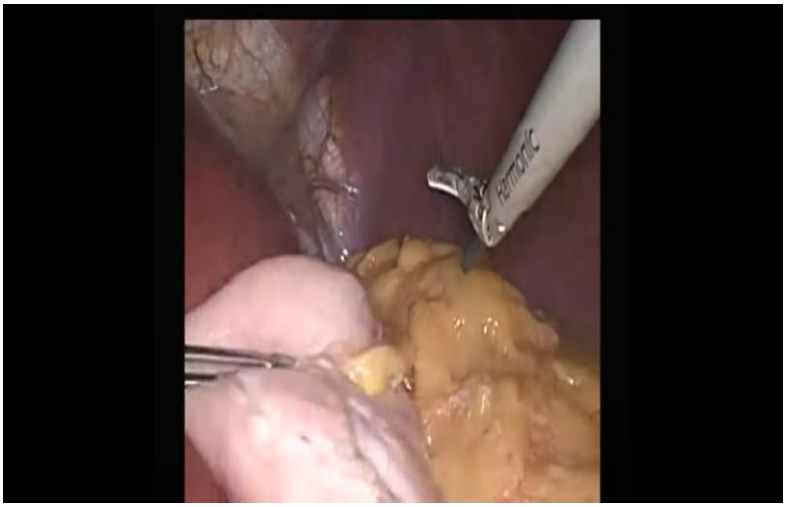

Figure (2): left hand grasper pulls the stomach and push the liver laterally to facilitate dissection of the greater curvature

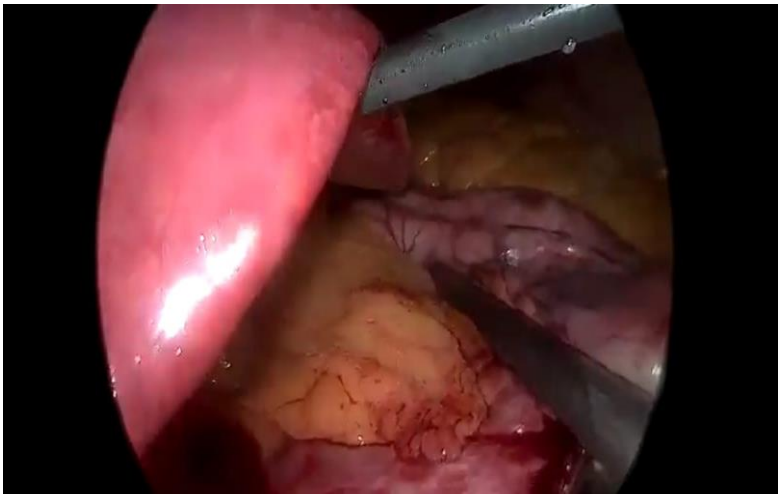

Figure (3): Stapling using left hand while right hand instrument elevate the liver

Figure (4): Final appereance and closure**.**

DISCUSSION

Laparoscopic surgery has many advantages over open surgery, like less postoperative pain, less wound-related complications postoperatively, fast recovery, and better cosmesis [12].

Laparoscopic surgery with reduced ports number has been developed in different surgical fields for example Kim et al. (2015) study showed the effectiveness and feasibility of laparoscopy with ports number reduction in early gastric cancer. Thirty patients undergo distal gastrectomy with Three-port technique with acceptable oncologic (number of lymph nodes harvested) and perioperative results [13].

Earlier to Kim et al study [13], Arru et al. (2013) study was the first report of 3P LSG which showed its safety and feasibility. Herein we compare between the results of 3P LSG versus conventional 5P LSG [11].

The corner stone in bariatric surgery outcome is achievement of weight loss. 3P LSG showed an excellent efficacy in is outcome comparable with conventional 5P LSG in this current study as there is no difference between the two groups in % EWL at 3, 6 & 12 months. This is the same results in Arru et al. [11], Consalvo et al. [9] and Corcelles et al. [12] studies.

While the benefits of weight loss among individuals with severe obesity, particularly those with comorbid conditions, are unquestioned, these benefits must be considered in the context of surgical complications [14].

Consalvo et al. [9] reported a randomized controlled trial comparing 3PL SG and conventional LSG. Their results showed that there was no difference between groups in respect to major (leak, bleeding, stenosis, and peritonitis) or minor (dysphagia, hernia, and wound infection) complications at 1-month follow-up.

In this study the 3P LSG also, showed comparable complications rate with conventional 5P LSG. Unfortunately, one patient (0.83%) in our study did experience postoperative leak in each group which presented by postoperative tachycardia and fever and were diagnosed by contrast CT scan. The management was insertion of stent and sonar guided drainage.

One of the bothersome complications in minimal invasive surgery (MIS) is port site infection (PSI), which undermine the benefits of MIS. Not only does it add to the morbidity of the patient but also spoils the reputation of the surgeon [15]. Corcelles et al. [12] reported (4 %) incidence of PSI in 3P LSG while Kırkıl et al. [16] study showed high rate of wound infection which was near.9% .In this study port site infection was recorded in 1 case (0.83%) in 3P LSG and 2 cases (1.69%) 5P LSG which occurred at the port site of specimen extraction , This is possibly occurred owing to not using a retrieval bag for specimen extraction.

In LSG to improve cosmetic outcome there is many trials to decrease the ports number, like single port LSG (SILS-SG) which showed comparable outcomes with conventional LSG with better cosmesis and less pain [17], but there is still a question about the incidence of incisional hernias on long term which is high in SILS in general. [18] also there is several technical difficulties arise when utilizing the single incision approach. [17] in this study no clinically detected port site hernia in 3P LSG group although we did not routinely close the port site. This seems to be an advantage of 3P LSG over SILS-SG but needs more research and investigations.

Longer operative time seems to be the main drawback of 3P LSG, in this study the mean OT of the 3PSG group was significantly higher than for the other group, but it was still comparable with the available conventional LSG data. Consalvo et al. [19] study showed that the mean operative time was inferior in the five-trocar technique (43.1 ± 8.5 min with a range of 30–66 min) compared to the three-trocar technique (51.5 ± 10.53 min with a range of 35–71 min), with P value of (0.0004) . Kırkıl et al. [16] study Mean operation time (min) 47.2 – 8.9 40.7 – 7.5 P value of <0.001.

Arru et al. study [11] showed only one conversion to a four-port procedure in a small prospective study, including 25 patients, while Corcelles et al. [12] study showed 8 cases (17%) of conversion to a four-port procedure, 2 cases due to intraoperative bleeding . In this study the 3 cases (2.5%) were converted to four-port procedure owing to bleeding from splenic laceration in 2 cases, and failure of dissection due to huge liver in another case.

Reduced number of persons needed to complete the operation is major advantages of 3P LSG over 5P LSG, only needed persons in the operating table is three, surgeon, cameraman and nurse while in conventional 5 P LSG additional one or two assistants were needed.

CONCLUSION AND RECOMMENDATION

Three-port laparoscopic sleeve gastrectomy (3P LSG) is a feasible technique without affecting (%EWL) rates, with acceptable complication rate, but with longer operative time.

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