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Laparoscopic sleeve gastrectomy vs laparoscopic single anastemosis sleeve ileal bypass in control of triglyceridemia in obese patients

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Abstract
Background: An independent risk factor for atherosclerotic heart disease is hypertriglyceridemia (HTG). Acute pancreatitis is also a danger for people with serum triglyceride (TG) levels >1000 mg/dL. The most successful weight loss treatment now available has been proven to be bariatric surgery. The aim of this work was to compare between laparoscopic sleeve gastrectomy (LSG) versus laparoscopic Single anastomosis Sleeve Ileal bypass in control of HTG in obese patients.
Methods: Fifty-two individuals, aged 18 to 65, of both sexes, with a BMI of 30 to 55 kg/m^2, T2D, a history of prior unsuccessful weight loss attempts, and strong surgical motivation were included in this prospective study. Type 1 diabetics, those above the age of 15, people with BMIs under 30, people over 55, those who had previously undergone gastric or obesity surgery, and women who were pregnant were all excluded from the study. The included patients were split into two groups: obese patients in group I (N=26) had LSG, while obese patients in group II (N=26) got laparoscopic gastric bypass.
Results: The mean cholesterol after 3 months was 156.92±14.90 and 163.08±16.31 between bypass and LSG respectively. There was no statistically significant difference between the bypass and LSG. The cholesterol level after 3 months all participants were desirable in bypass, was 96.15% desirable in LSG and 3.85% non-desirable bypass in LSG. The mean triglyceride after 3 months was 129.23±13.47 and 144.62±14.21 between bypass and LSG respectively. There was a statistically significant difference between the bypass and LSG. Triglyceride level after 3 months was desirable in 92.31% bypass and 57.69% LSG and nor desirable in 7.69% bypass and 42.31% LSG between bypass and LSG. There was a statistically significant difference between the bypass and LSG.
Conclusions: Gastric bypass was associated produce more favorable outcomes compared LSG in diabetes obese patients. This is observed in more weight loss after 1-year, better lipid profile after 3 months.

Keywords: Laparoscopic sleeve gastrectomy, SASI, obese, hypertriglyceridemia

Introduction
An independent risk factor for atherosclerotic heart disease is hypertriglyceridemia (HTG). Acute pancreatitis is also a serious danger for people with serum triglyceride (TG) levels >1000 mg/dL [1]. HTG can be treated with diet modification, statins, nicotinic acid, and derivatives of fibric acid. Plasmapheresis has reportedly been successful in treating patients with severe HTG-associated pancreatitis who had previously responded poorly to therapy, especially in expectant women. For patients with severe HTG and recurrent pancreatitis crises, none of these treatments can offer a cure [1].
Hypertension is a side effect of obesity in addition to metabolic diseases including diabetes and lipid disorders. The risk of cardiovascular disease is raised by certain metabolic conditions and hypertension. Additionally, a higher BMI and an increase in BMI over the course of a person's lifetime are linked to an increased risk of cancer [2]. As a result, obesity raises mortality, making it a significant issue on a global scale. With just 5–10% of total body weight (BW) lost after a year and significant rates of rebound weight gain, lifestyle changes alone for the treatment of obesity have had little success [3]. Patients do, in fact, regain more than 30% of the weight they lost within the first year and nearly reach their pre-treatment weight by the second year [4].
The most successful weight loss treatment now available has been proven to be bariatric surgery [5]. The adjusted risk ratio for death after bariatric surgery was 0.71 in the Swedish Obese

Subjects Study as compared to the control group [6]. In that study, whereas the average total weight loss 10 years after gastric bypass surgery was 25%, the average weight change in the control group across the study period was less than a few percentage points. One of the surgical bariatric procedures is laparoscopic sleeve gastrectomy (LSG), which reduces excess weight by 69.7% one year after surgery [7]. With remission rates of 67-91% after LSG, it has been demonstrated that LSG efficiently improves diabetes, hypertension, and dyslipidemia [8]. Therefore, bariatric surgery, including LSG, has remarkable therapeutic effects for both obesity and disorders associated to obesity.

The aim of this work was to compare between LSG versus laparoscopic gastric bypass in control of HTG in obese patients.

Patients and Methods

52 obese patients, aged 18 to 65, of both sexes, with a BMI of 30 to 55 kg/m^2, T2D, a history of prior unsuccessful weight loss attempts, and strong surgical motivation were included in this prospective study. Type 1 diabetics, those above the age of 15, people with BMIs under 30, people over 55, those who had previously undergone gastric or obesity surgery, and women who were pregnant were all excluded from the study. The study was approved by the Institutional Review Board and an informed consent was obtained from each participant.

The included patients were split into two groups: obese patients in group I (N=26) had LSG, while obese patients in group II (N=26) got laparoscopic SASI bypass.

Preoperative assessment

All patients were subjected to detailed history and clinical examination (general, local), obesity-related morbidities, causes of obesity, weight/BMI between bypass and LSG surgery, weight loss history, and exclusions related to surgical risk.

Complete history taking: personal history: as age, sex, marital status, and residence, feeding history and if the patients like sweet much or not, duration of obesity, and history of previous trials of weight loss whether surgical or non-surgical, medical history for comorbidities, complete physical examination: Measurement of weight per Kg, height per meter then calculation of BMI = (weight Kg/height m²), type of obesity (android or peripheral), abdominal examination for (scar for pervious surgery, hernia orifices, organomegaly, right hypochondrial tenderness), cardiac and pulmonary evaluation, medical consultation for proper control of blood sugar (pre and postoperative), and tobacco cessation (must be ≥8 weeks before the procedure), and imaging investigations.

Perioperative management

Preoperative anticoagulant was administered to the patients 12 hours before the procedure, then continued for two weeks after the surgery. Prophylactic antibiotic (cefotaxime 2 gm.) was given immediately before the surgery, then continued for three days after the surgery. Also, analgesics (NSAIDS) were administered according to body weight postoperatively. Intraoperative data including blood loss, mean operative time, and conversion to laparotomy were recorded.

Additional instructions were Patients are advised to refrain from lifting and from heavy work, and they must not drive for 1 weeks following the procedure.

Research outcome measures: Comorbidity changes (Hyperlipidemia) were assessed either resolution or improvement, and weight loss is by calculating the percentage of excess weight loss (% EWL) or the percentage of excess BMI lost.

Postoperative Assessment

The expected hospital stays following a bariatric surgical procedure is between 1 to 2 days. Prior to discharge and after enteral feeding is initiated, patients typically receive a radiographic series of the upper gastrointestinal tract with contrast to determine if there are any leaks. If there are no leaks, patients will continue on the pureed diet for up to 4 weeks. Additional instructions may vary, but patients are often advised to refrain from lifting and from heavy work. They must not drive for 1 week following the procedure and should abstain from sexual intercourse for the first week postoperatively. Follow-up occurs at approximate intervals of 2 weeks, 1 month, 6 weeks, 3 months, 12 months, 18 months, and 2 years, with annual visits thereafter.

Postoperative Maintenance

These long-term complications can be prevented and treated by daily supplementation with vitamins and minerals. For malabsorptive procedures, it is recommended to consume 60g/day of protein. Laboratory testing should be done every 3 months through the first year and at least annually thereafter. Included in the laboratory analysis should be complete blood count, electrolytes, liver function tests (particularly albumin), ferritin and iron studies, and vitamin B 12 and folate determinations.

Statistical analysis

STATA 14.2 (Stata Statistical Software: Release 14.2, College Station, TX: StataCorp LP.) was used to analyze the data. Mean, standard deviation, median, and range were the metrics used to express quantitative data. Student t-tests were used to compare the means of two groups of participants, and ANOVA was used to examine the means of three groups or more. The Chi square test or the fisher exact test was used to compare qualitative data that was given as numbers and percentages. Graphs were created with the STATA or Excel programs. If the P value was less than 0.05, it was deemed significant.

Results

The mean age was 43.69±7.08 and 39.58±7.69 between bypass and LSG respectively. There was a statistically significant difference between bypass and LSG. There were (61.54% and 65.38%) females and (38.46% and 34.62%) males between the bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. There were (88.46% and 65.38%) married and (11.52% and 34.62%) single respectively. There was a statistically significant difference between bypass and LSG. All participants had diabetes mellitus. There were 38.46% and 19.23% had hypertension between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. There were 15.38% and 19.23% had ischemic heart disease between bypass and LSG respectively. There was no statistically significant difference between the bypass and LSG. All participants had failed trails previous exercise between bypass and LSG. There was no statistically significant difference between the bypass and LSG. There were 3.85% and 3.85% previous DVT between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. There were 84.62% and 69.23% had GB stone between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. (Table 1).

Table 1: Comparison between bypass and sleeve gastrectomy surgery as regard personal and past history

Variable	Bypass N=26	Sleeve gastrectomy N=26	P value
Age/year			0.05*
Mean ± SD	43.69±7.08	39.58±7.69	
Median (range)	42 (25-56)	39 (26-53)	
Gender			0.77
Female	16 (61.54%)	17 (65.38%)	
Male	10 (38.46%)	9 (34.62%)	
Marital status			0.048*
Married	23 (88.46%)	17 (65.38%)	
Single	3 (11.52%)	9 (34.62%)	
Diabetes			-----
No	0	0	
Yes	26 (100%)	26 (100%)	
Hypertension			0.13
No	16 (61.54%)	21 (80.77%)	
Yes	10 (38.46%)	5 (19.23%)	
Ischemic heart disease			0.35
No	22 (84.62%)	25 (96.15%)	
Yes	4 (15.38%)	1 (3.85%)	
Previous diet			1.00
No	2 (7.69%)	1 (3.85%)	
Yes	24 (92.31%)	25 (96.15%)	
Previous exercise			1.00
Failed trails	26 (100%)	26 (100%)	
Previous deep vein thrombosis			1.00
No	25 (96.15%)	25 (96.15%)	
		1 (3.85%)	
Yes	1 (3.85%)		
Gall bladder stone			0.19
No	4 (15.38%)	8 (30.77%)	
Yes	22 (84.62%)	18 (69.23%)	

The mean cholesterol level was 224.61±22.41 and 217.77±18.30 between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. The cholesterol level was 3.85% desirable in LSG and all participants were non-desirable in bypass and 96.15% was non-desirable in LSG. There was no statistically significant difference between bypass and LSG. The mean triglyceride level was 191.0±16.94 and 184.19±16.54 between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. Triglyceride level was 3.85% desirable in bypass and 96.15% was non-desirable in bypass and all participants were non-desirable in LSG. There was no statistically significant difference between bypass and LSG. (Table 2)

Table 2: Comparison between bypass and sleeve gastrectomy surgery as regard preoperative blood lipid:

Variable	Bypass N=26	Sleeve gastrectomy N=26	P value
Cholesterol			0.32
Mean ± SD	224.61±22.41	217.77±18.30	
Median (range)	220 (200:270)	210 (190:260)	
Cholesterol level			1.00
Desirable	0	1 (3.85%)	
Non-desirable	26 (100%)	25 (96.15%)	
Triglyceride			0.15
Mean ± SD	191.0±16.94	184.19±16.54	
Median (range)	200 (140:210)	190 (150:205)	
Triglyceride level			1.00
Desirable	1 (3.85%)	0	
Non-desirable	25 (96.15%)	26 (100%)	

The mean time of surgery was 114.69±14.08 and 91.04±12.37 between bypass and LSG respectively. There was a statistically significant difference between bypass and LSG. There were 42.31% and 15.38% drain between bypass and LSG respectively. There was a statistically significant difference between bypass and LSG. There were 15.38% and 3.85% stayed for three days in hospital staying duration. There was a statistically significant difference between the bypass and LSG. There were 7.69% and 3.85% had post-operative bleeding between bypass and LSG respectively. There was no clinically meaningful difference in bypass versus LSG. (Table 3)

Table 3: Comparison between bypass and sleeve gastrectomy surgery as regard operative data

Variable	Bypass N=26	Sleeve gastrectomy N=26	P value
Time of surgery			
Mean ± SD	114.69±14.08	91.04±12.37	<0.001*
Median (range)	115 (78:150)	90 (68:130)	
Drain			
No	15 (57.69%)	22 (84.62%)	0.03*
Yes	11 (42.31%)	4 (15.38%)	
Hospital stay			
One day	6 (23.08%)	17 (65.38%)	0.008*
Two day	16 (61.54%)	8 (30.77%)	
Three day	4 (15.38%)	1 (3.85%)	
Complications			
No	24 (92.31%)	25 (96.15%)	1.00
Bleeding	2 (7.69%)	1 (3.85%)	

The mean weight after 2 weeks was 118.08±17.61 and 116.77±12.95 bleeding between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. The mean weight after 4 weeks was 109.04±16.16 and 110.65±12.71 between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. The mean weight after 1 year was 61.69±5.14 and 72.42±7.71 between bypass and LSG respectively. There was a statistically significant difference between the bypass and LSG. The mean percentage of weight loss after 1 year was 90.77±3.92 and 69.62±12.24 between bypass and LSG respectively. There was a statistically significant difference between the bypass and LSG. (Fig. 1).

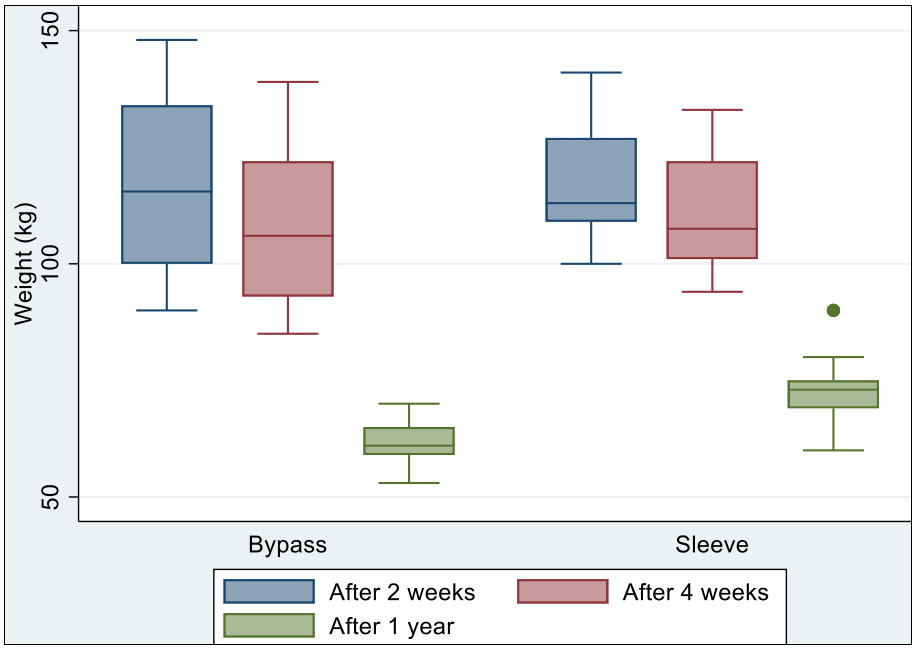

Fig 1: Comparison between bypass and sleeve gastrectomy surgery as regard post-operative weight

The mean cholesterol after 3 months was 156.92±14.90 and 163.08±16.31 between bypass and LSG respectively. There was no statistically significant difference between the bypass and LSG. The cholesterol level after 3 months all participants were desirable in bypass, was 96.15% desirable in LSG and 3.85% non-desirable bypass in LSG. The mean triglyceride after 3 months was 129.23±13.47 and 144.62±14.21 between bypass and LSG respectively. There was a statistically significant difference between the bypass and LSG. Triglyceride level after 3 months was desirable in 92.31% bypass and 57.69% LSG and nor desirable in 7.69% bypass and 42.31% LSG between bypass and LSG. There was a statistically significant difference between the bypass and LSG. (Table 4)

Table 4: Comparison between bypass and sleeve gastrectomy surgery as regard postoperative blood lipid

Variable	Bypass N=26	Sleeve gastrectomy N=26	P value
Cholesterol after 3 months			
Mean ± SD	156.92±14.90	163.08±16.31	0.16
Median (range)	160 (130:190)	160 (140:200)	
Cholesterol level after 3 months			
Desirable	26 (100%)	25 (96.15%)	1.00
Nor desirable	0	1 (3.85%)	
Triglyceride after 3 months			0.0002*

Mean ± SD	129.23±13.47	144.62±14.21	
Median (range)	130 (100:150)	140 (120:175)	
Triglyceride level after 3 months			
Desirable	24 (92.31%)	15 (57.69%)	0.004*
Nor desirable	2 (7.69%)	11 (42.31%)	

Discussion

The mean age was 43.69±7.08 and 39.58±7.69 between bypass and LSG respectively. There was a statistically significant difference between bypass and LSG. There were (61.54% and 65.38%) females and (38.46% and 34.62%) males between the bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. There were (88.46% and 65.38%) married and (11.52% and 34.62%) single respectively. There was a statistically significant difference between bypass and LSG.

In disagreement with the present findings, Abd-Elmonem *et al.* [9] reported that there was no statistically significant difference in age between bypass and LSG. However, they reported similar findings regarding gender as there was no statistically significant difference between both groups.

In the current study, the mean time of surgery was 114.69±14.08 and 91.04±12.37 between bypass and LSG respectively. There was a statistically significant difference between bypass and LSG. There were 42.31% and 15.38% drain between bypass and LSG respectively. There was a statistically significant difference between bypass and LSG. There were 15.38% and 3.85% stayed for three days in hospital staying duration. There was a statistically significant difference between the bypass and LSG. There were 7.69% and 3.85% had post-operative bleeding between bypass and LSG respectively. There was no statistically significant difference between bypass and LSG. Different from the current results, Abd-Elmonem *et al.* [9] reported that there was no statistically significant difference between LSG and bypass regarding operation time. Also, Mohamed *et al.* [10] reported that there was no statistically significant difference between LSG and bypass regarding operation time. Moreover, Lee *et al.* [11] showed that there was no statistically significant difference in operation time between LSG and bypass surgeries. Similar to the present findings, Mohamed *et al.* [10] reported that hospital stay was statistically significant longer in the bypass group compared to the LSG group. Different from the current findings, Elkerkary *et al.* [12] reported that hospital stay was statistically significant longer in the LSG group compared to the bypass group. Different from the present study, Elkerkary *et al.* [12] reported that occurrence of bleeding was statistically significant higher in the bypass group compared to the LSG group.

According to the current study, the mean weight after two weeks was 118.08 ± 17.61 for bypass surgery and 116.77 ± 12.95 for LSG surgery, respectively. Between the bypass and LSG, there was no statistically significant change. The average weight after 4 weeks was 109.04 ± 16.16 for the bypass and 110.65 ± 12.71 for the LSG, respectively. Between the bypass and LSG, there was no statistically significant change. The mean weight between the bypass and LSG groups after a year was 61.69 ± 5.14 and 72.42 ± 7.71, respectively. The bypass and LSG differed in a statistically meaningful way. After one year, the mean percentages of weight loss after bypass and LSG were 90.77 ± 3.92 and 69.62 ± 12.24, respectively. The bypass and LSG differed in a statistically meaningful way.

Elkerkary *et al.* [12] also noted that the mean preoperative BMI for the LSG group was 53 kg/m^2, which decreased to 50.6 kg/m^2 21 months after surgery, 49.6 kg/m^2 after 3 months, 45.5 kg/m^2 after 6 months, 40 kg/m^2 after 9 months, and finally 37 kg/m^2 at the end of follow-up 12 months after surgery. The mean BMI for the bypass group was 52 kg/m^2 before surgery, dropped to 48.1 kg/m^2 after one month, 43.2 kg/m^2 after three months, 40 kg/m^2 after six months, 37.4 kg/m^2 after nine months, and ultimately to 35.1 kg/m^2 at the end of the follow-up period 12 months after surgery. The difference in average BMI changes after surgery between the study groups was statistically significant. The LSG group, however, was linked to greater weight loss at 1 month and 3 months, whereas there was no discernible difference at 9 and 12 months, according to Mohamed *et al.* [10].

The present study showed that the mean cholesterol after 3 months was 156.92±14.90 and 163.08±16.31 between bypass and LSG respectively. There was no statistically significant difference between the bypass and LSG. The cholesterol level after 3 months all participants were desirable in bypass, was 96.15% desirable in LSG and 3.85% non-desirable bypass in LSG. The mean triglyceride after 3 months was 129.23±13.47 and 144.62±14.21 between bypass and LSG respectively. There was a statistically significant difference between the bypass and LSG. Triglyceride level after 3 months was desirable in 92.31% bypass and 57.69% LSG and nor desirable in 7.69% bypass and 42.31% LSG between bypass and LSG. There was a statistically significant difference between the bypass and LSG.

Similarly, Li *et al.* [13] in their meta-analysis reported that bypass group had a significantly lower triglycerides level than the LSG group after surgery (weighted mean difference −0.23, 95% CI −0.35 to −0.11, $p < 0.001$). The bypass group had a significantly lower LDL level than the LSG group (weighted mean difference −0.73, 95% CI −1.25 to −0.22, $p = 0.005$).

Conclusions

Gastric bypass was associated produce better outcomes compared LSG in diabetes obese patients. This is observed in more weight loss after 1-year, better lipid profile after 3 months.

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Conflict of Interest: Nil

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