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The Effect of Single Anastomosis Gastric bypass and Sleeve Gastrectomy on Morbidly Obese Patients' Lipid Profile. A Comparative Study

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Abstract

Background: The Being one of the most pressing health issues of our century, the prevalence of obesity and overweight is on the rise. Diet, exercise, and behavioral changes are the cornerstones of a healthy lifestyle when it comes to treating obesity. When it comes to treating obesity and its complications, bariatric surgery has shown to be an effective alternative that leads to long-term weight reduction and improvements in these areas. In recent years, SAGB (Single Anastomosis Gastric Bypass) surgery has exploded in popularity across the world. In the last ten years, laparoscopic sleeve gastroscopy (LSG) has become more common, making it one of the most sought-after bariatric procedures globally. Hypertension, dyslipidaemia, sleep apnea, and joint discomfort are just a few of the obesity-related comorbidities that may be alleviated or eliminated altogether after bariatric surgery. Obesity is associated with several health problems. Obesity is associated with a host of health problems, including type 2 diabetes, high blood pressure, heart disease, asthma, obstructive sleep apnea, non-alcoholic fatty liver disease, osteoarthritis, and polycystic ovary syndrome. There is also mounting evidence that losing weight helps with these conditions. Despite the strong correlation between obesity and some cancers, additional research is needed to definitively establish the role of obesity in cancer due to the limitations of epidemiological studies in determining causation and the absence of intervention studies.

Keywords: Single Anastomosis Gastric Bypass, Sleeve Gastrectomy, Morbid obesity, dyslipidemia.

1.Introduction

The People who are "overweight" or "obese" have an abnormally high amount of fat stored in their bodies, which may have negative effects on their health. In order to determine an individual's weight status, the World Health Organization (WHO) recommends using body mass index (BMI). When the body mass index (BMI) is 25 or more kg/m2 or above, it is considered overweight; when it is 30 or higher, it is considered obese. (2) The differential between total caloric intake and expenditure is the most influential component in the pathophysiology of overweight and obesity, but inheritance, environmental and psychological variables, hormone imbalances, insufficiency in physical activity, and genetics all play a role. Three, obesity is third globally and smoking ranks first when it comes to unnecessary deaths. (4) Obesity-related changes in lipid profile characteristics include lower levels of high-density lipoprotein (HDL) cholesterol in blood, along with increases in total cholesterol, LDL cholesterol, VLDL cholesterol, triglycerides, and proprotein B. Although lipid problems are found in the majority of obese individuals, only 20% of this group does not exhibit characteristic metabolic lipid alterations. It is well-known that hyperlipidemia is a major co-morbidity in people with extreme obesity. Lipid profiles are therefore becoming more important in the quest to perhaps lessen cardiovascular-related illness, which should come as no surprise. People who are overweight or obese are also more likely to have so-called "atherogenic dyslipidemia," which is defined as hypertriglyceridemia together with high levels of bad cholesterol and low levels of good cholesterol (HDL). Individuals who do not have any additional risk factors for coronary heart disease are advised in the third NCEP report to keep their serum levels of LDL-cholesterol, total cholesterol, and triglycerides below 130mg/dl, 200mg/dl, and 150mg/dl, respectively, in order to reduce the likelihood of atherosclerotic disease symptoms. The ideal level of blood HDL cholesterol for women is above 50 mg/dl while for males it is over 40 mg/dl. (8) A 0.05 mmol/L drop in blood total cholesterol and a 0.02 mmol/L drop in LDL cholesterol are associated with a 1 kg weight loss, whereas a 0.009 mmol/L rise in HDL cholesterol is reported.(9). Diet planning, exercise, behavioral treatment (e.g., addressing the underlying psychological facilitators of eating disorders), medication, and surgical intervention are the current gold standards for the care of obesity. 10. Since then, bariatric surgery has progressed to four main treatments: bilio-pancreatic diversion (BPD), roux-en-Y gastric bypass (RYGBP), adjustable gastric banding, and sleeve gastrectomy. These operations range from severely restrictive to mostly malabsorptive. They are considered the gold standard treatments for obesity. (11), despite bariatric surgery's stated goal of promoting and maintaining a significant reduction in body weight, several studies have shown that it actually improves complications associated with obesity. 12-Calorie restriction, weight loss (9), endocrine alterations, and malabsorption are potential pathways that might influence components of the lipid profile in bariatric surgery. There is an increase in cholesterol production and a drop in LDL cholesterol levels due to reduced sterol absorption, which occurs simultaneously with increased cholesterol catabolism.(14) It is also possible that a decrease in the production of gastric lipase and cholecystokinin, which are digestive enzyme secretion regulators, could lead to a decrease in the hydrolysis of triglycerides and a decrease in the absorption of free fatty acids. This would be another mechanism to be considered. (14) Reducing body fat by surgery does enhance blood lipid levels significantly. 6 The impact of various surgical procedures on alterations to lipid profiles has not been extensively studied. (7) Patient features and co-morbidities make it difficult to choose the best successful surgical approach among the many available options. (15) One relatively recent surgery is the Single Anastomosis Gastric Bypass (SAGB), which limits the absorption of nutrients. It has several names, including micro gastric bypass and omega gastric bypass. Safety, ease of use, and good results have propelled SAGB to the forefront of treatment popularity worldwide. (16) A global leader in reducing nutrition absorption, sleeve gastrectomy (SG) is a highly sought-after surgical treatment. Although gastric bypass surgery (SG) is less complicated technically and has a quick learning curve and efficient weight reduction, it has two major drawbacks: a high risk of weight return and gastroesophageal reflux syndrome. (GERD). [17]

2.Aim of the work

This study is a prospective randomized study carried out on morbidly obese patients. The aim of this study is to evaluate the effect of two types of bariatric surgeries; single anastomosis gastric bypass and sleeve gastrectomy, on lipid profile of morbidly obese patients and compare the results of both groups.

3. Patients and Methods

3.1 Patients Selection

This is A prospective, randomized research was carried out on sixty patients with severe obesity and dyslipidemia who had bariatric surgery at the General Surgery Department of Benha University Hospitals in Benha, Egypt. The outpatient clinic was used for the patient selection process. The research period for this project spanned from 2022 to 2024. Thirty patients from the first group received gastric bypass surgery with a single anastomosis; the other forty patients served as controls. Thirty patients who had sleeve gastrectomy procedures made up Group II.

All participants gave their written informed permission after the research got the OK from Benha University's Ethics Board.

3.2 Criteria for selection

Individuals who are critically obese are defined as having a body mass index (BMI) of 40 kg/m² or more, or a BMI of 35 kg/m² or lower, together with other health conditions related to obesity. had bariatric surgery performed by the general surgeons of Benha University Hospitals. Both sexes were represented, and their ages ranged from eighteen to sixty. Never abused booze or drugs.

3.3 Restrictions

Diabetes, hypothyroidism, and Cushing syndrome are endocrine disorders. Surgery involving the upper abdomen. Below the age of 18 or above the age of 60. Individuals who are not suitable candidates for insufflation or general anesthesia due to their severe restrictive respiratory condition or severe cardiovascular disease. Quite a substantial abdominal ventral hernia in this patient. Someone who has struggled with drug or alcohol misuse in the past. Expectant mothers

3.4 Evaluation before surgery:

3.4.1 Background Information The clinical history collecting process included gathering individuals' personal details, such as their age, work, and other health-related behaviors that may be relevant. A history of almost two years of trying to become in shape. Comprehensive food record. Associated comorbidities. Evaluations of weight reduction. A thorough evaluation of the patient's current health status, including an examination of any symptoms (such as chest pain, constipation, or prostatism), as well as a review of any history of medical conditions, drug allergies, blood transfusions, surgeries (particularly those involving the digestive system), or obesity in the family should be conducted.

3.4.2 Review

Checking vitals include blood pressure, heart rate, neurological function, mental health, and breathing. Evaluation of the height in centimeters (cm), weight in kilograms (kg), and body mass index (BMI): the formula is the product of the square of the height in meters and the weight in kilograms. Hypothyroidism is characterized by a receding hairline around the outer third of the eye brow and swollen lower eyelids. A truncal obesity associated with Cushing syndrome, characterized by a buffalo hump.

3.4.3 Research

Whenever necessary, patients were asked to undergo investigations such as complete blood counts, coagulation profiles, liver function tests, renal function tests, fasting blood sugar, and hepatitis viral indicators (HCV Ab, HBVsAg). The thyroid function test includes measuring free thyroid hormone (TSH) and three other parameters.Serum cortisol morning and evening. Comprehensive lipid panel (LDL, HDL, triglycerides, total cholesterol). Hepatomegaly and gall bladder stones may be seen using an abdominal ultrasonography.electrocardiogram and echocardiography. Pulmonary function tests and chest X-ray for the purpose of evaluating the respiratory system.Upper GIT endoscopy.

3.5. Postoperative Follow-up DimensionsOutpatient care was used throughout the follow-up period: After the first month after release from the hospital, patients are seen weekly for another month. After six weeks, they are followed up at3,6,9, and 12 months, and then annually by measuring body mass index and lipid profiles.

3.6 Statistical Analysis

The data were input, coded, and processed using SPSS [version 25.0] on computers. Tabular and diagrammatic representations of the findings were then used for interpretation. As for descriptive statistics, we used the mean, standard deviation, range, frequency, and percentage values. This examination was carried out: The association factors for categorical data were tested using Chi-SquaretestX³. When comparing two population means in an independent sample research, the statistical significance of the difference was evaluated using Student's t-test. A p-value less than or equal to 0.05 was deemed statistically significant. Significant.

4.Results

Table 1 shows that there was no statistically significant variation in the distribution of sexes between the two groups. Both groups did not vary significantly from one another in terms of baseline anthropometric measurements taken before surgery (Table 2). Total cholesterol, HDL cholesterol, LDL cholesterol, and triglyceride levels were not significantly different between the two groups at baseline before surgery. (Appendix 3).

After both surgeries, patients' body mass indexes dropped considerably; however, when comparing the two groups three and six months after surgery, there was no statistically significant difference in BMI. Nonetheless, compared to Group II (SG), Group I (SAGB) had a significantly lower 12-month postoperative body mass index (BMI). Group I (SAGB) lost a greater percentage of their body mass index (BMI) than Group II (SG) due to a statistically significant rise. (Viewed in Table 4).

A comparison of the lipid profiles of the two groups taken 3, 6, and 12 months after surgery reveals a considerable improvement over the preoperative profiles. At 3 and 6 months after surgery, the total cholesterol levels of Group I (SAGB) and Group II (SG) were not significantly different from one another. Group I (SAGB) had a significantly lower total cholesterol level 12 months after surgery compared to Group II (SG).(Referring to Table 5).

The HDL levels of Group II (SG) increased at a more significant rate than those of Group I (SAGB) three months after surgery. Group I (SAGB) and Group II (SG) did not vary significantly in terms of HDL level 6 and 12 months after surgery. Group I (SAGB) had a higher rise in HDL level 12 months after surgery compared to Group II (SG) (Table 6).

Group II (SG) showed a greater amount of change in LDL than Group I (SAGB) at3,6, and 12 months postoperatively, and this difference was highly statistically significant (Table 7).

In terms of TG levels three and six months after surgery, there was no statistically significant difference between SAGB and SG groups. But compared to Group II (SG), Group I (SAGB) had a significantly lower level of triglycerides (TG) 12 months after surgery.Figure 8.

Table (1) Baseline pre-operative demographic data in both groups.

		Group					
		Single anastomosis gastric bypass (N=30)		**Sleeve gastrectomy (N=30)**			
		Mean	**SD**	**Mean**	**SD**	**t***	**P value**
Age (years)		33.67	11.02	39.47	11.13	2.03	0.05 S
		N	%	N	%	X^2 ■	P value
Sex	**Male**	6	20.0%	5	16.7%		
	Female	24	80.0%	25	83.3%	0.11	0.74 NS

*Student t test

Table (2) Baseline pre-operative anthropometric measures in both groups.

	Group					
	Single anastomosis gastric bypass (N=30)		Sleeve gastrectomy (N=30)			
	Mean	SD	Mean	SD	t*	P value
Weight (kg)	129.80	17.46	131.65	16.35	0.42	0.67 NS
Height (cm)	159.40	8.08	161.40	8.60	0.93	0.36 NS
BMI (kg/m2)	51.09	5.69	50.61	5.77	0.33	0.74 NS

*Student t test

Table (3) Baseline pre-operative lipid profile measures in both groups.

(mg/dl)	Group					
	Single anastomosis gastric bypass (N=30)		Sleeve gastrectomy (N=30)			
	Mean	SD	Mean	SD	t*	P value
Total cholesterol	268.43	52.06	274.83	41.77	0.53	0.60 NS
HDL	34.03	7.60	32.51	5.64	0.88	0.38 NS
LDL	167.86	31.66	179.33	28.98	2.74	0.25 NS
Triglycerides	222.50	56.44	210.59	18.92	2.93	0.41 NS

*Student t test

Table (4) Comparison between Group I (SAGB) and Group II (SG) regarding pre-operative, 3,6 and 12 months post operative BMI.

BMI (kg/m2)	**Single anastomosis gastric bypass (N=30) Mean ± SD**	**Sleeve gastrectomy (N=30) Mean ± SD**	**t***	**P. value**
Pre-operative BMI	51.09 ± 5.69	50.61 ± 5.77	0.42	0.67 NS
BMI after 3 months	48.68 ± 8.89	46.95 ± 9.14	-0.744	0.46 NS
BMI after 6 months	43.32 ± 7.73	42.34 ± 8.45	-0.470	0.64 NS
BMI after 12 months	33.33 ± 10.25	38.72 ± 8.42	2.224	<0.001 HS
Total BMI loss	19.98 ± 4.14	12.89 ± 7.92	4.346	<0.001 HS

*Student t test

Table (5) Comparison between Group I (SAGB) and Group II (SG) regarding pre-operative, 3,6 and 12 months post operative total cholesterol (TC) level.

Total cholesterol (TC) Normal range <200 mg/dl	Single anastomosis gastric bypass (N=30) Mean ± SD	Sleeve gastrectomy (N=30) Mean ± SD	t*	P. value
Pre-operative	268.43 ± 52.06	274.83 ± 41.78	0.53	0.60 NS
After 3 months	226.87 ± 43.21	235.81 ± 35.79	15.33	0.49 NS
After 6 months	221.23 ± 43.15	230.82 ± 35.25	11.05	0.23 NS
After 12 months	185.60 ± 9.61	199.3 ± 36.40	5.08	<0.001 HS

Table (6) Comparison between Group I (SAGB) and Group II (SG) regarding pre-operative, 3,6 and 12 months post operative HDL level.

HDL Normal range 40-60 mg/dl	Single anastomosis gastric bypass (N=30) Mean ± SD	Sleeve gastrectomy (N=30) Mean ± SD	t*	P. value
Pre-operative	34.03 ± 7.60	32.51 ± 5.64	0.88	0.38 NS
After 3 months	37.76 ± 8.83	40.43 ± 6.53	4.32	<0.001 HS
After 6 months	45.76 ± 5.83	44.16 ± 3.83	10.05	0.32 NS
After 12 months	55.20 ± 4.50	49.50 ± 5.2	3.08	0.12 NS

*Student t test

Table (7) Comparison between Group I (SAGB) and Group II (SG) regarding pre-operative, 3,6 and 12 months post operative LDL level.

LDL Normal range <130 mg/dL	Single anastomosis gastric bypass (N=30) Mean ± SD	Sleeve gastrectomy (N=30) Mean ± SD	t*	P. value
Pre-operative	167.86 ± 31.66	179.33 ± 28.98	2.74	0.25 NS
After 3 months	133.43 ± 25.73	149.51 ± 22.32	6.32	<0.001 HS
After 6 months	125.40 ± 5.22	131.51 ± 22.32	9.05	<0.001 HS
After 12 months	95.40 ±19.61	110.7 ± 30.8	3.08	<0.001 HS

*Student t test

Table (8) Comparison between Group I (SAGB) and Group II (SG) regarding pre-operative, 3,6 and 12 months post operative Triglycerides (TG) level.

Triglycerides (TG) Normal range <150 mg/dl	Single anastomosis gastric bypass (N=30) Mean ± SD	Sleeve gastrectomy (N=30) Mean ± SD	t*	P. value
Pre-operative	222.50 ± 56.44	210.59 ± 28.92	2.93	0.41 NS
After 3 months	169.66 ± 41.14	146.38 ± 22.96	6.32	0.11 NS
After 6 months	145.92±23.67	139.51 ± 22.32	9.05	0.31 NS
After 12 months	103.40±13.61	125.3 ± 58.4	3.08	<0.001 HS

*Student t test

5.Discussion

The terms “When a person's body fat percentage is abnormally high and causes health problems, the terms "overweight" and "obesity" are used. The World Health Organization states that the most popular way to determine a person's weight is by looking at their body mass index (BMI). Obesity is defined as a body mass index (BMI) of 30 or higher, whereas overweight is defined as a BMI of 25 or higher. (2) The current gold standard for treating obesity and overweight includes a mix of the following: dietary changes, aerobic exercise, behavioral therapy (to address the mental factors that contribute to eating disorders), medication, and, finally, surgery. Patients with severe obesity (BMI = 35 - 40 kg/m2) and co-morbid diseases including diabetes, dyslipidemia, or hypertension are candidates for bariatric surgery. Morbid obesity is defined as a BMI greater than 40 kg/m2. Patients in the SG group were much older than those in the SAGB group, according to the current study's demographic data analysis (17). In terms of gender distribution, there was no discernible variation between the two sets of data. The random assignment of participants to each group, without regard to age or gender, means that this still meets our selection criterion. Additionally, the patient and treating physician decided on the kind of procedure.

There was no statistically significant difference between the two groups on baseline preoperative anthropometric parameters (weight, height, and BMI) in the present investigation. Both groups were comparable in terms of weight and average BMI, according to Bettini et al., (2021), Afifi et al., (2020), and Benaiges et al., (2012) (18), (19), (13) which is in accordance with our findings.

Low HDL, hypertriglyceridemia, and elevated LDL were the results of the pre-operative lipid profile assessments in our research. Total cholesterol, HDL cholesterol, LDL cholesterol, and triglyceride levels were not significantly different between the two groups. Both Bettini et al. (2021) and Garay et al. (2021) demonstrated that. [18], [20]

Both surgical procedures resulted in a large reduction in body mass index (BMI) in this research. However, when comparing the two groups three and six months following surgery, no statistically significant difference was found. Nonetheless, compared to Group II (SG), Group I (SAGB) had a significantly lower 12-month postoperative body mass index (BMI). Group I (SAGB) lost a greater percentage of their body mass index (BMI) than Group II (SG) due to a statistically significant rise.

According to Garay et al. (2021) (20), both surgical techniques resulted in a significant decrease in body mass index (BMI) within the first month after surgery. However, there was no statistically significant difference between Group I (SAGB) and Group II (SG) at 3 and 6 months, and SAGB showed a greater and statistically significant decrease starting at 12 months. Additionally, Benaiges et al. (2012) (13) observed no variations in body mass index (BMI) or excess weight loss percentage (EWL%) between the two groups three months after the operation. In addition, Hutter et al. (2011) (21) found that SAGB had a much higher EWL% one year out. Compared to SG, SAGB resulted in more weight reduction at 1 year for super-obese patients, according to Plamper et al., (2017) (22).

Milone et al. (2015) found that SAGB patients had smaller changes in BMI compared to SG patients during the 3-month post-operative follow-up, which contradicts our findings.

A statistically significant difference was seen between the two groups' pre- and post-operative outcomes when comparing the amount of change in lipid profile. Both Bettini et al. (2021) and Garay et al. (2021) demonstrated that the lipid profiles of the patients after surgery were significantly improved compared to their pre-operative ones at 3, 6, and 12 months post-operatively. While both groups' total cholesterol levels dropped significantly after surgery, there was no discernible difference between Group I (SAGB) and Group II (SG) at three or six months after surgery (18, 20). Nevertheless, as shown by Garay et al. (2021) and Benaiges et al. (2012), Group I (SAGB) had a significantly lower total cholesterol level twelve months after surgery compared to Group II (SG). In both groups, HDL levels increased significantly after surgery (13, 20). There was a statistically significant difference between the two groups when comparing the amount of change in HDL three postoperatively; specifically, the rise in HDL was more pronounced after SG than SAGB. According to Kehagias et al. (2023), SG differs from previous restrictive procedures because it involves excision of the gastric fundus, which leads to a decrease in ghrelin. (23) In light of the fact that some single nucleotide polymorphisms in ghrelin may influence HDL concentrations, there is some data that suggests a connection between ghrelin and HDL metabolism (Magno et al., (2021) and Yadegari et al., (2022)). The difference between the two groups was not statistically significant, although SAGB resulted in larger increases in HDL levels than SG (18), as reported by Bettini et al. (2021) (24).

Group I (SAGB) and Group II (SG) did not vary significantly in terms of HDL level 6 and 12 months after surgery. Group I (SAGB) had a higher rise in HDL level twelve months after surgery compared to Group II (SG), as shown by Garay et al. (2021). (20) Both groups saw a significant reduction in postoperative LDL levels. When looking at the LDL change3,6, and 12 months following surgery, there was a statistically significant difference between the two groups. SAGB resulted in a greater drop in LDL than SG. Previous studies by Milone et al. (2015) and Garay et al. (2021) corroborate this result. Both groups saw a significant reduction in postoperative triglycerides (TG) (7), (20). There was no statistically significant difference between the two groups when comparing the quantity of 3, 6 postoperative change in triglycerides. Nevertheless, when looking at the triglyceride levels 12 months after surgery, it reveals a statistically significant difference between the two groups, with the former seeing a greater reduction in SAGB. Previous studies by Pihlajamäki et al. (2010) and Garay et al. (2021) corroborate this result. in (26), When a person's body fat percentage is abnormally high and causes health problems, the terms "overweight" and "obesity" are used. The World Health Organization states that the most popular way to determine a person's weight is by looking at their body mass index (BMI). Obesity is defined as a body mass index (BMI) of 30 or higher, whereas overweight is defined as a BMI of 25 or higher. (2) The current gold standard for treating obesity and overweight includes a mix of the following: dietary changes, aerobic exercise, behavioral therapy (to address the mental factors that contribute to eating disorders), medication, and, finally, surgery. Patients with severe obesity (BMI = 35 - 40 kg/m2) and co-morbid diseases including diabetes, dyslipidemia, or hypertension are candidates for bariatric surgery. Morbid obesity is defined as a BMI greater than 40 kg/m2. Patients in the SG group were much older than those in the SAGB group, according to the current study's demographic data analysis (17). In terms of gender distribution, there was no discernible variation between the two sets of data. The random assignment of participants to each group, without regard to age or gender, means that this still meets our selection criterion. Additionally, the patient and treating physician decided on the kind of procedure.

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Nevertheless, when looking at the triglyceride levels 12 months after surgery, it reveals a statistically significant difference between the two groups, with the former seeing a greater reduction in SAGB. Previous studies by Pihlajamäki et al. (2010) and Garay et al. (2021) corroborate this result. in (26), (20)

6.Conclusion

Both research on laparoscopic procedures found that SG and SAGB were both safe and effective in improving lipid profiles in individuals suffering from dyslipidemia due to severe obesity. Based on the short-term outcomes, SG may be the best option for those suffering from dyslipidemia. Reason being, three months after surgery, there was a larger rise in HDL cholesterol, even if the reduction of LDL cholesterol and triglycerides was comparable to SAGB. On the other hand, SAGB outperformed SG in the medium-to long-term outcomes of weight reduction, hypercholesterolemia resolution, and reduced TG levels. Patients who are overweight and have dyslipidemia before surgery may benefit more from SAGB.

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