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The Effect of Laparoscopic Sleeve Gastrectomy on Serum Lipids

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ABSTRACT

Context: morbid obesity is a growing health problem in the modern world and affects almost 20% of the population. Obesity associates with increased morbidity and mortality, one of which is dyslipidemia. Bariatric surgery is the only known method to induce significant weight loss and prevent its regain in morbidly obese patients.

Objective: the aim of this work was to evaluate the effect of laparoscopic sleeve gastrectomy on serum lipids (Cholesterol - TG - LDL - HDL) and analysis of these data and compare with other results from different centers, institutes all over the world.

Patients and Methods: our study was a prospective study on 20 patients hospitalized in General Surgery department of Al-zhraa University hospital who underwent laparoscopic sleeve gastrectomy in order to treat morbid obesity from August 2018 to February 2019.

Results: In our study 3 month after LSG we observed significant changes in lipid profile parameters including significant decrease in total cholesterol, TG, LDL and significant increase in HDL.

Conclusion: our retrospective study shows that LSG is very good bariatric procedure with excellent results on short term follow up regarding body weight reduction, BMI. Three months after operation improve metabolism and lipid profile was accompanied by decrease in Total Cholesterol, Triglyceride and LDL cholesterol and increase in HDL cholesterol change in significant way.

Keywords: Laparoscopic Sleeve, LDL, HDL, SG, RYGB

INTRODUCTION

Obesity is a growing health problem in the modern world and affects almost 20% of the population. Obesity associates with increased morbidity and mortality, and the reason for such association appears to be the clustering of cardiovascular risk factors in obese individuals, one of which is dyslipidemia. High levels of triglycerides (TG) and low-density lipoprotein (LDL) cholesterol and low levels of high-density lipoprotein (HDL) cholesterol are frequently encountered in obese patients[(1)].

Bariatric surgery is the only known method to induce significant weight loss and prevent its regain in morbidly obese patients. Its benefits appear to go beyond weight loss; Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) improve carbohydrate metabolism even before any noticeable weight loss has occurred, this is probably due to their effect on the gastrointestinal hormonal milieu[(2)].

Surgical techniques for obesity management continue to gain broader implementation possibilities. Nowadays, gastric sleeve resection is performed mainly laparoscopically. Despite late introduction as a treatment modality, it is gaining popularity not only as the first step in the staged treatment of super morbid obesity or in patients from high-risk groups but mainly as an isolated, definitive bariatric procedure[(3)].

Sleeve gastrectomy (SG) was first described in 1988 as a part of the duodenal switch procedure and in 1993 as an independent one-stage procedure. The number of laparoscopic sleeve gastrectomies continues to increase both in Europe and North America. There was an increase from 0% to 4% in the USA and Canada and a 7% increase in Europe during the period of 2003-2008. Laparoscopic sleeve gastrectomy (LSG) started to be performed in Poland in 2005, and one can observe a constant increase in the number of procedures from year to year [(4)].

Bariatric surgery is also effective in improving the lipid profile in obese patients, but the type and magnitude of this improvement differs according to the procedure. The three most common techniques—Roux-en-y gastric bypass (RYGB), sleeve gastrectomy (SG) and adjustable gastric banding (AGB)—increase HDL and decrease TG levels, but only RYGB, a mixed malabsorptive and restrictive technique, appears to be capable of reducing total cholesterol (TC) and LDL cholesterol. A still unanswered question is whether this improvement in the lipid profile is merely weight-dependent or otherwise, also results from specificities inherent to the bariatric procedure itself. Current evidence points towards the importance of weight loss [(5)].

AIM OF THE WORK

The aim of this work is to evaluate the effect of laparoscopic sleeve gastrectomy on serum lipids (Cholesterol - TG - LDL - HDL) and analysis of these data and compare with other results from different centers, institutes all over the world.

PATIENTS AND METHODS

Our study was a prospective study on 20 patients hospitalized in General Surgery department of Al-zhraa University hospital who underwent laparoscopic sleeve gastrectomy in order to treat morbid obesity from August 2018 to February 2019.

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The inclusion criteria for surgery in our study included BMI >40 with or without co-morbidities such as diabetes mellitus hypertension, and hyperlipidemia, BMI from 35 to 40 with comorbidities such as diabetes mellitus, hypertension and hyperlipidemia.

The exclusion criteria for surgery in our study included patients who were unfit for surgery as extremely high operative risk, active substance abuse, major psychological or endocrinal conditions. Patients that cannot comprehend the nature of the surgical intervention and compliance with the lifelong diet, exercise and behavior modification.

The study was approved by the Academic and Ethical Committee at Al-Azhar University. Written approval was also obtained from patients. All the patients involved in the study were subjected to the following:

- **Clinical history:** Detailed history was obtained including: age, sex: marital status, occupation, residence, special habits of medical importance: not found, history of D.M or HTN, history of any medical problems and history of pervious operations.
- **Clinical examination:** General and local examinations.
- **Investigations:** Laboratory investigations:
- **Serum lipids:** Cholesterol, triglyceride (TG), high-density lipoprotein (HDL), low density lipoprotein (LDL).
- **Thyroid profile:** Free T3, Free T4, TSH were within normal values.
- **Serum cortisol:** Serum cortisol; Am, Pm were within normal values.
- **Pulmonary function test:** Was show normal spirometry in 16 patients, mild restriction in 2 patients and severe restriction in 2 patients.
- **Arterial blood gases:** Was within normal in all patients
- **Chest x-ray:** Was normal in all patients.
- **Consultations:**
  1- **Cardiological assessment:** By resting electrocardiogram if the patient age above 40 years old and echocardiography if needed.
  2- **Respiratory assessment:** By chest x-ray, pulmonary funcation test and arterial blood gases.
  3- **Other assessments:** According to the need of patient condition.

Preoperative management:

Preparation of the patient through checking the file , investigations, consultations done to the patient and doing recommendations of this consultations if present, giving clexan ampoule to the patient subcutaneous at the night prior to the day of operation, taking the signature of the patient on detailed operative consent include detailed explanation of the procedure, its outcome, complications, expected improvement after explanation of this items to the patient and good psychic support of the patient.

Intraoperative management:

All patients were subjected to laparoscopic sleeve gastrectomy.

The operating room prepared by checking the presence of all required instruments, drugs for both anesthesia and surgery as shown in figure (1).

Figure (1): Preparationand checking of instruments in operating room.

All patients were given general anathsia, they were supine in reverse trendlenberg position, with sterilization and toweling of all abdomen as shown in figure (2).

Figure (2): Showing that all patients were take general anathsia, they were supine in reverse trendlenberg position, with sterilization and toweling of all abdomen.

Surgical technique:

1- **Insufflation of abdomen by CO2** as shown in figure(3):

Figure (3): Showing insufflation of abdomen by CO2.

2- **Insertion of trocars:** one is inserted 2 hand breadth from the xiphisternum immediately to the left from the mid line, two working ports are inserted in right and left midclavicular lines above the first port, the forth port (liver retractor) inserted in the epigastrium as shown in figure (4).

Figure (4): Show sites if inseration of ports.

3- **Visualization of the operative filed and identification of the greater omntum and its dissection** above to the esophagus and below near to the pylorus as shown in figure (5).

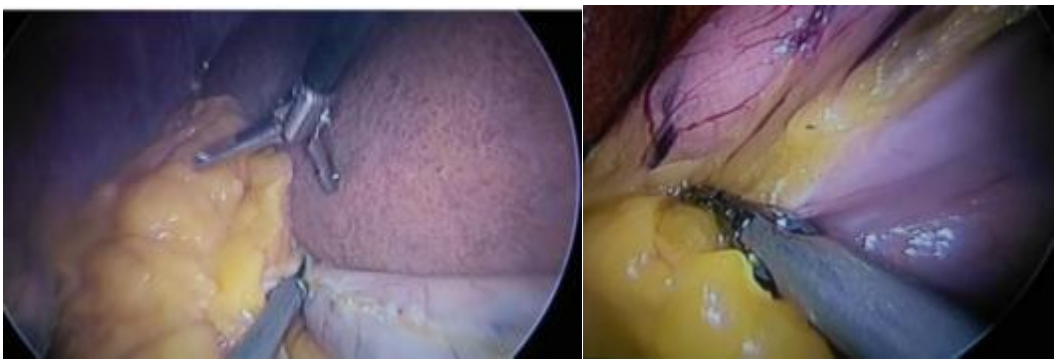

Figure (5): This figure show visualization of the operative filed and identification of the greater omntum and its dissection above to the esophagus and below near to the pylorus.

4- **Insertion of bougi** in order to creation of gastric tube as shown in figure (6)

Figure (6): This figure show insertion of bougi in order to creation of gastric tube.

5- Stomach resection started 4 to 6 cm from the pylorus using stapler to create a sleeved part from the stomach ranged from 60 to 100 ml as shown in figure (7).

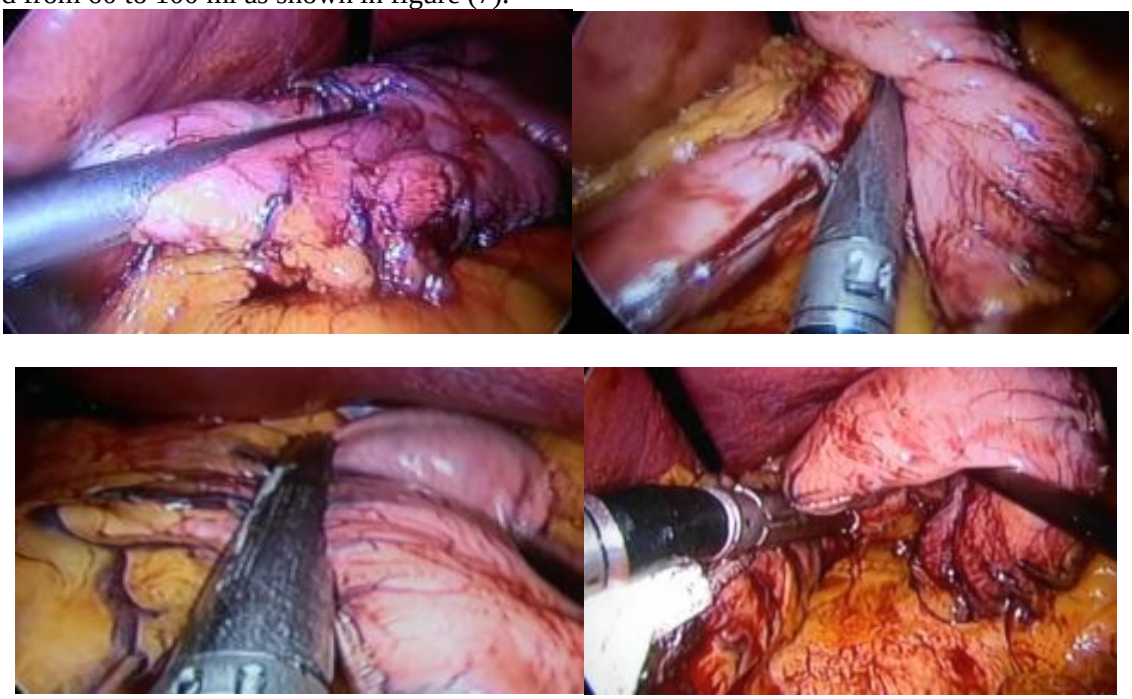

Figure (7): Show stomach resection started 4 to 6 cm from the pylorus using stapler to create a sleeved part from the stomach ranged from 60 to 100 ml.

6- Good hemostasis done after complete stapling of the stomach and creation of sleeved part to insure safety of stapling line and identify any source of bleeding or oozing in order to control it if present as shown in figure (8).

Figure (8): Show good hemostasis done after complete stapling of the stomach.

7- Specimen extraction after insuring good hemostasis and insuring intact staple line from any leak as shown in figure (9).

Figure (9): Show specimen extraction.

Postoperative follow up:

Including giving recommended medications to the patients which include parentral fluids (normal saline, ringer, glucose 5%), antibiotics, antipyretics, proton pump inhibtors, antiemetics, antispasmodics, and anticoagulant as clexan which given 12 hour postoperative.

Follow up of general condition of the patient through checking conscious level, vital data and abdomen of the patient.

Follow up of amount, color, nature of secretions in the drain of the patient.

Encourage early ambulation of the patient postoperative as early as possible.

Patients were discharged home on the 2nd or 3rd postoperative day after stabilization of general condition and removal of the drain.

Follow up:

All patients were followed up by serum lipids (cholesterol, TG, HDL, LDL) 3 months postoperative.

Item to study:

Study the different preoperative and 3 months postoperative variables in serum lipids including (cholesterol, TG, HDL, LDL).

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
- Probability (P-value)
  - P-value <0.05 was considered significant.
  - P-value <0.001 was considered as highly significant.
  - P-value >0.05 was considered insignificant.

RESULTS

This prospective study was conducted on 20 morbid obese patients presenting for sleeve gastrectomy in Al-Zahraa University hospital. All of them underwent laparoscopic sleeve gastrectomy. Overall, the patients were 17 women (85%) and 3 men (15%). The average weight of patients preoperative was (128). The average age of patients included in our study was (32.65). The average BMI was (48.13). The average body weight after 3 months was (100) and the average BMI after 3 month was (38.35). Demographic characteristics of the study population are shown in **(Table 1, 2).**

Table (1): Showing age data among this study, the average age of the included patients in the study is (32.65), the youngest patient is 23 years old, the oldest patient is 50 years old.

	Age
Minimum	23
Maximum	50
Mean	32.65
Range	26 -29

Table (2): Showing sex data among this study, the study include 20 patients, 3 of them are males (15 %), 17 of them are females (85%).

	Sex	
	N	**%**
Male	3	15%
Female	17	85%
Total	20	100%

Table (3): Comparison between weight preoperative and weight postoperative, the average body weight preoperative was 128, the average body weight postoperative was 100, p value less than 0.05 (0.000) indicating significant weight reduction 3 months postoperative.

	Weight		**P. Value**	
	Mean	**SD**	**T**	**P**
Weight preoperative (kg)	128	17.62	17	0.000
Weight postoperative (kg)	100	16.12		

P < 0.05: Significant , P > 0.05: not Significant

Table (4): Comparison between BMI preoperative and BMI postoperative, the average BMI pre-operative was 48.13, the average BMI 3 months post-operative was 38.35, p value less than 0.05(0.001) indicating significant decrease in BMI 3 months post-operative.

	BMI		**P. Value**	
	Mean	**SD**	**t**	**P**
BMI preoperative (kg/m^2)	48.13	4.62	15	0.001
BMI postoperative (kg/m^2)	38.35	4.88		

P < 0.05: Significant , P > 0.05: not Significant

After the analysis of anthropometric parameter in 20 patients of LSG all components of lipid profile was observed at 3 months postoperative.

For total cholesterol: For total cholesterol we observed a statistically significant decrease of its level 3 months postoperative, average total cholesterol preoperative was 186.71, average total cholesterol postoperative was 149.65, p value less than .05(0.002) indicating significant decrease postoperative as shown in **(Table 5)**.

Table (5): Comparison between total cholesterol preoperative and total cholesterol postoperative

	Total cholesterol		P. Value	
	Mean	**SD**	**t**	**P**
Total cholesterol preoperative	186.71	29.24	12	0.002
Total cholesterol postoperative	149.65	34.92		

P < 0.05: Significant , P > 0.05: not Significant

For Triglycerides: During the examination of TG concentration, we stated a statistically significant decrease of its value after 3 months in comparison to preoperative value, average triglycerides preoperative was 127.71, average triglycerides postoperative was 101.15, p value less than .05 (0.004) showing significant decrease as shown in **(Table 6)**.

Table (6): Comparison between triglycerides preoperative and triglycerides postoperative

	Triglycerides		P. Value	
	Mean	**SD**	**t**	**P**
Triglycerides preoperative	127.71	29.24	9	0.004
Triglycerides postoperative	*101.15*	*21.43*		

P < 0.05: Significant , P > 0.05: not Significant

For LDL: During the examination of LDL level pre and postoperative, we stated a statistically significant decrease of its value after 3 months in comparison to preoperative value, average LDL preoperative was 116.12, average LDL postoperative was 101.21, p value less than .05 (0.026) showing significant decrease postoperative as shown in **(Table 7)**.

Table (7): Comparison between LDL preoperative and LDL postoperative.

	LDL		P. Value	
	Mean	**SD**	**t**	**P**
LDL preoperative	116.12	25.97	3	0.026
LDL postoperative	101.21	20.47		

P < 0.05: Significant , P > 0.05: not Significant

For HDL cholesterol: Significant increase was observed after three months after the surgery in comparison to preoperative value, average HDL preoperative was 45.15, average HDL postoperative was 56.12, p value less than .05 (0.014) showing significant increase postoperative as shown in **(Table 8)**.

Table (8): Comparison between HDL preoperative and HDL postoperative.

	HDL		P. Value	
	Mean	**SD**	**t**	**P**
HDL preoperative	45.15	6.14	3	0.014
HDL postoperative	56.12	7.86		

P < 0.05: Significant , P > 0.05: not Significant

DISCUSSION

Obesity is very serious issue in world now days as it has become the global epidemic and major problem in the 21st century which influences many aspects of health. The World Health Organization (WHO) has declared obesity as the largest global chronic health problem in adults which is increasingly turning into a more serious problem than malnutrition [(6)].

Obesity is a risk factor for several of the leading causes of preventable death, including cancer, cardiovascular disease, diabetes mellitus, dyslipidemia and many types of cancer. Thus, successful treatment and control of obesity should be major imperatives. However, multiple studies have shown that detection and counseling rates among physicians remain low. Thus, a gap exists between the need to provide obesity care and the actual provision of care [(7)].

Due to its greater efficiency and low complication rate LSG has become more widely accepted as a definitive treatment for morbidly obese patients. In LSG stomach is divided vertically, while removing most of the fundus of the stomach and preserving the continuity of digestive tract [(7)].

Eighty percentages of patient with obesity present with lipid abnormality and 15-20% patient do not show classic metabolic lipid changes. Hyperlipidemia is widely recognized as major co-morbidity in obese patients. So now a day's bariatric surgeries are increasingly focused on lipid profile in the drive to potentially reduce cardiovascular related disease. The aim of our study is to monitor the changes of lipid profile in selected parameters to 3 month's postoperatively.

Dyslipidemia are a major risk factor for cardiovascular disease, the main cause of mortality

worldwide. Obesity is frequently associated with dyslipidemia and bariatric surgery is most effective treatment for obesity with high rate of prevention and remission of comorbid condition after surgery including dyslipidemia. Three months after surgery (LSG), there were significant average weight reduction in the study group.

The main purpose of this study was to investigate further the effect of LSG on hyperlipidemia. Our study shows that LSG resolved or improved lipid profile in a majority of patients. 3 months after surgery significant change in lipid profile include increase serum HDL cholesterol level with decreased level of TG and LDL level.

Similar results were obtained by team of **Strain *et al.*[8]** as in our study. **Feng *et al.*[9]** also indicated that low level of HDL cholesterol and high TG, LDL are the main risk factor for cardiovascular disease in obese patient. Regarding the cardiovascular risk, the observed increased HDL and decrease TG, LDL level are fairly positive prognostic factor **[8, 9].**

Similar results were obtained by **Vidal *et al.*[10]** with a significant improvement of lipid profile parameters including significant increase in HDL and significant decrease in TG, LDL levels following LSG.

In our study 3 month after LSG we observed significant changes in lipid profile parameters including significant decrease in total cholesterol, TG, LDL and significant increase in HDL.

Despite considerable and growing progress in the understanding of the presented issues, the mechanism responsible for improvement of dyslipidemia remains unknown and may be due to increased insulin sensitivity that is usually associated with total weight loss and fat tissue reduction. On the other hand, certain authors emphasize the fact that an improvement of dyslipidemia and obesity related comorbidities is less dependent on weight loss, being rather attributable to hormonal changes after LSG **[11].**

CONCLUSION

Our retrospective study shows that LSG is very good bariatric procedure with excellent results on short term follow up regarding body weight reduction, BMI. Three months after operation improve metabolism and lipid profile was accompanied by decrease in Total Cholesterol, Triglyceride and LDL cholesterol and increase in HDL cholesterol change in significant way.

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