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The Impact Of Gastrectomy Sleeve On A Number Of Biochemical Variables And Body Mass Index For Male Obese Patients

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Abstract

This study involved 48 male patients (35 who were subjected to sleeve gastrectomy, and 13 who were not and considered a control group) who were obese and had body mass indexes of 40 kg/m^2 and more and their ages ranged between (20-50) years, all from the city of Mosul. The patients periodically visited the National Center for Obesity Treatment, and their conditions were previously confirmed by specialist doctors through conducting a set of tests, including calculating their body mass index. All patients included in the study met the criteria to be eligible for surgical treatment of obesity, after which all patients underwent the sleeve gastrectomy operation in Al-Zahrawi Private Hospital - Nineveh using laparoscopic surgery by doctors specialized in obesity surgery, and all patients were followed up for (6) months after the operation.

Laparoscopic sleeve gastrectomy led to positive effects on the studied chemical characteristics of blood serum compared with the control group, represented by a significant decrease in the concentration of total cholesterol, triglycerides, low density lipoproteins cholesterol, and very low density lipoprotein cholesterol, with a significant increase in high-density lipoprotein cholesterol in male obese patients compared with the control group throughout the follow-up period.

The results of the present study showed a significant decrease in body mass index throughout the follow-up period compared to the control group.

Keywords: sleeve gastrectomy, obesity, biochemical variables, body mass index.

Introduction:

In the past, obesity was a sign of good health, but this misconception quickly changed with the development of science, and this problem became widespread, and it cannot be considered a problem for some individuals, but rather a pandemic that threatens all the categories of society, both sexes and all ages, whether in developed or developing countries [1,2], obesity is a chronic disease that currently affects more than 300 million people worldwide [3]. Obesity can be diagnosed by body mass index; it ranges from 30-34.9, 35-39.9 and 40 kg/m^2 or more [4]. Obesety is classified as class I, Class II and severely

obese, respectively. Morbid obesity is the fastest growing and it affects about 2-6% of individuals in Canada and the USA [5,6].

Since the studies at hand have shown that the most effective way to achieve continuous weight loss in obese patients is bariatric surgery, it has become the preferred treatment in many centers for obese patients [7]. The most common operation performed worldwide is gastric bypass, at a rate 39%, and sleeve gastrectomy at a rate of 5% [8]. Sleeve gastrectomy surgery is technically easier, faster to perform, and potentially safer compared to gastric bypass surgery [9]. Laparoscopic gastric sleeve surgeries have increased significantly in Asia, accounting for 1% of all bariatric procedures performed in 2005 and it reached 25% in 2009 [10]. This increase continued and laparoscopic sleeve gastrectomy accounted for 60% of all surgeries compared to Laparoscopic gastric bypass, which accounted for about 13.8% in 2014 [11]. Laparoscopic sleeve gastrectomy is considered one of the most effective interventions for continuous weight loss and metabolic improvement [12].

Aim of the study:

This study aimed to evaluate the impact of gastric sleeve on a number of biochemical variables and on body mass index in obese male patients.

Materials and Methods:

Study Place and Time:

The study was conducted in the National Center for Obesity Treatment and Al-Sabah Laboratory of Al- Zahrawy Private Hospital- Nineveh.

Human Samples under Study

Groups of sleeve gastrectomy patients

Thirty-five men suffering obesity with a body mass index of 40 kg / m^2 and above participated in the study, their ages ranged between (20-50) years all from the city of Mosul. The patients were regular visitors to the National Center for Obesity Treatment. All the patients underwent sleeve gastrectomy in the operation room / Al-Zahrawi private Hospital – Nineveh, using laparoscopic surgery by doctors specialized in obesity surgery. Patients were prevented from eating for 24 hours before the surgery [13], all patients were followed up for (6) months after the operation.

The Control Group

Consisted of 13 patients from the same original group, with the same ages, suffer from obesity and have body mass indexes of 40 kg/m^2 or more, but they did not undergo the sleeve gastrectomy surgery.

Body Mass Index (BMI) Calculation

After measuring the weight and height for the groups of sleeve gastrectomy patients before and after the operation and for the time periods that included (one month, three and six months) after the surgery, and the same applies for the control group, the body mass index was calculated by applying the following equation [14]:

$$\text{BMI } (\text{kg/m}^2) = \frac{\text{Weight(kg)}}{(\text{Height})^2(\text{m}^2)}$$

Biochemical Tests

1- Estimation of Total Cholesterol Concentration in Blood Serum

Total cholesterol concentration in the blood sera of all the groups of (sleeve gastrectomy and control) males were estimated using the measuring tapes of the Reflotron device manufactured by the German company Roche.

2- **Estimation of the Concentration of Triglycerides in the Blood Serum**

The concentration of triglycerides in the blood sera of males of all groups (sleeve gastrectomy and control) of patients was estimated using the measuring tapes of the Reflotron device manufactured by the German company Roche.

3- Estimation of the Concentration of High-Density Lipoproteins cholesterol (HDL-c) in the Blood Serum

The concentration of high-density lipoproteins cholesterol in the sera of males of all groups of patients was estimated using the measuring tapes of the Reflotron device manufactured by the German company Roche.

4- Calculation of the Low-density Lipoproteins cholesterol (LDL-c) Concentration in the Blood Serum

The concentration of low-density lipoproteins cholesterol in the sera of males of all groups was calculated by applying the equation developed by [15,16]:

LDL-c (mg/100ml) = Total cholesterol in serum - HDL-c - TG/5

5- Calculation of the Very Low-Density Lipoproteins cholesterol (VLDL-c) Concentration in the Blood Serum

The concentration of very low-density lipoproteins cholesterol in the sera of males of all groups was calculated using the equation contained in [16]:

VLDL-c (mg/100ml) = Triglycerides/5

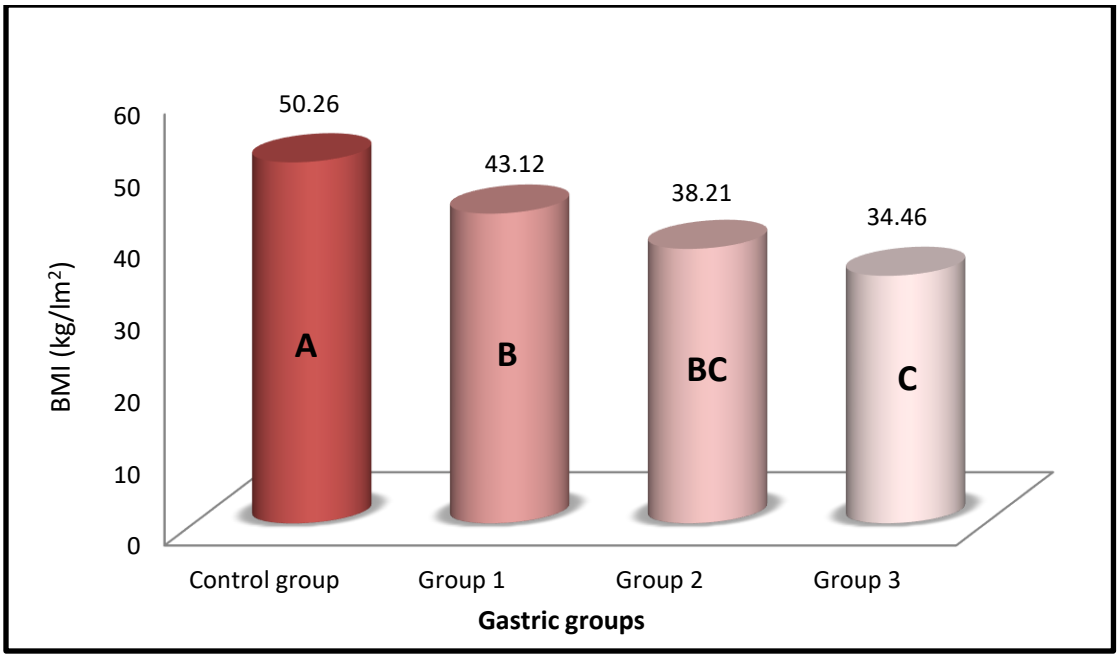
Statistical Analysis

The results were statistically analyzed according to the simple experimental system in a completely randomized design, and Duncan's multiple range test was used to test the differences between the groups and the results were significant at the probability level ($P \leq 0.05$), using the SAS statistical program [17].

Results and Discussion

Figure (1) shows a significant decrease at the level of probability ($P \leq 0.05$) in body mass index in all groups of sleeve gastrectomy male patients in different time periods compared with the control group, and the decrease was more significant in the two groups of obese patients who underwent the sleeve gastrectomy operation and who had undergone the operation before three months for the second group and six months for the third group, as there is no significant difference between these two groups, and the arithmetic mean for them reached 38.21 ±5.92 kg/m^2 and 34.46 ±5.39 kg/m^2 respectively, also there is no significant difference between the two groups with gastric sleeves after one month for the first group

and three months for the second group after the operation, the average for the first group was 43.12 ± 6.40 kg/m^2. Note that the mean of the control group is 50.26 ± 6.34 kg/m^2.



Values are expressed as mean ± standard deviation and the number of patients/group = 12.

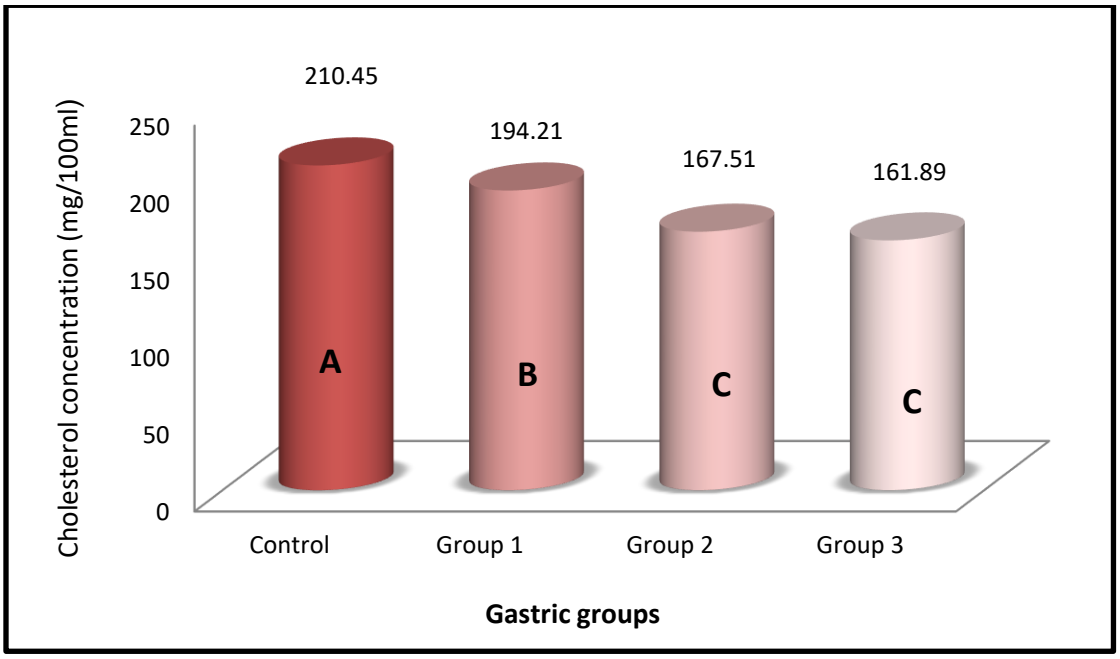
Shapes paired with different letters indicate a significant difference at the probability level (P≤0.05).

Figure (1): Shows the impact of gastrectomy sleeve on body mass index (kg/m^2) for Obese Males Patients.

The results of the present study showed a significant decrease in the weights of all males of the sleeve gastrectomy groups compared to the control group, and the weight loss after the sleeve gastrectomy was represented by the reduced body mass index throughout all the follow-up period; a direct relationship between weight and body mass index was noted (i.e. lower weight means lower body mass index and vice versa), and weight loss is achieved after laparoscopic sleeve gastrectomy because of the hormonal restriction and modification mechanisms, and the presented results of laparoscopic sleeve gastrectomy are similar to the published results of other bariatric centers around the world, as we proved through our study that lower body mass index persisted throughout the follow-up period of (6) months, and the results of the present study agree with the findings of [18,19].

What makes the rate of weight loss (body mass index reduction) high after the sleeve gastrectomy, is that the sleeve gastrectomy sergury reduces the size of the stomach by (75-80)% and thus limits the amount of food consumed in one meal, and after eating very small quantities, the gastric sleeve patient feels full quickly for several hours. In addition, the gastric sleeve surgery also reduces appetite because of the low concentration of ghrelin (the appetite hormone) that is secreted by the stomach, and this contributes to weight loss after the sleeve gastrectomy surgery [20,21,22], as sleeve gastrectomy has been shown to play a significant role in weight loss up to 5 years after the urgey [23,24], prompting surgeons to search for basic weight loss mechanisms.

The results shown in (Fig.2) indicated a significant decrease in the concentration of total cholesterol in blood sera of the obese males who underwent sleeve gastrectomy at probability level (P≤0.05) in all the specified time periods compared with the control group. The decrease was more significant in the gastric sleeve group after six months (third group) from the operation compared with the control group; the arithmetic mean was 161.89 ± 7.55 mg/100 ml. and this group did not show a significant difference from the other gastric sleeve group which was checked after 3 months (the second group) at the same level of probability and its arithmetic mean was 167.51 ±6.53 mg/100 ml. The arithmetic mean of the control group was 210.45 ±7.05 mg/100 ml, and finally the group of patients who underwent sleeve gastrectomy and checked after one month (the first group) showed a mean of 194.21 ± 8.49 mg/100 ml.

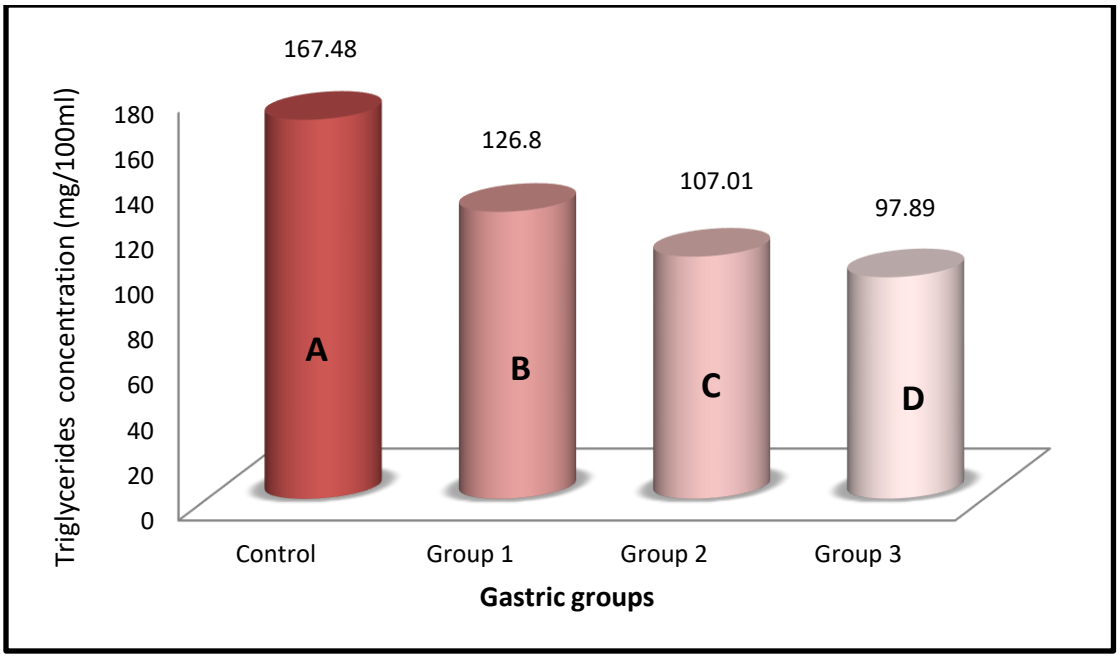


Values are expressed as mean ± standard deviation and the number of patients/group = 12.

Shapes paired with different letters indicate a significant difference at the probability level (P≤0.05).

Figure (2): Shows the impact of gastrectomy sleeve on total cholesterol concentration (mg/100ml) in the blood sera of obese males patients.

The Groups of patients underwent sleeve gastrectomy surgery, for all the time periods specified in the study, showed a significant decrease in the concentration of triglycerides in their blood sera at the level of probability (P≤0.05) as shown in Figure (3). The sleeve gastrectomy group checked after six months from their surgery (the third group) had the lowest arithmetic mean of 97.89 ±8.25 mg/100 ml, followed by the group that had passed three months (the second group) after the surgery with an arithmetic mean of 107.01 ±7.57 mg/100 ml, then the sleeve gastrectomy group that were checked after one month (the first group) from the date of the surgery showed a mean of 126.80 ± 7.74 mg/100 ml. The mean of the control group was 167.48 ± 7.67 mg/100 ml.

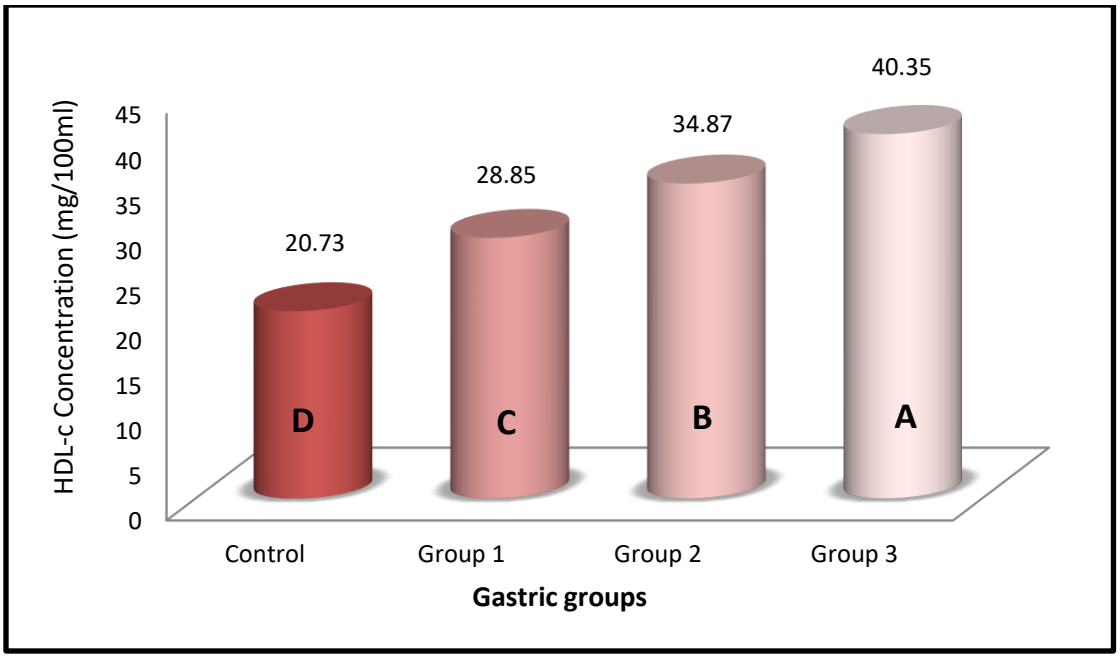


Values are expressed as mean ± standard deviation and the number of patients/group = 12.

Shapes paired with different letters indicate a significant difference at the probability level (P≤0.05).

Figure (3): Shows the effect of gastrectomy sleeve on the concentration of triglycerides (mg/100ml) in the blood sera of obese males.

The results in Figure (4) also showed that there was a significant increase in the concentration of High-Density Lipoproteins cholesterol (HDL-c) in the blood sera of obese males at the probability level (P≤0.05) in all groups subjected to the sleeve gastrectomy and for all time periods specified in the study compared with the control group; there is a significant difference between the two sleeve gastrectomy groups for a period of one month (the first group) and three months (the second group), as their arithmetic means were 28.85 ± 3.97 mg/100 ml and 34.87 ± 2.26 mg/100 ml, respectively. The group checked after six months (the third group) significantly increased than the rest of the groups and at the same level of probability, as its mean was 40.35 ± 2.85 mg/100 ml. Note that the mean of the control group is 20.73 ± 4.15 mg/100 ml.

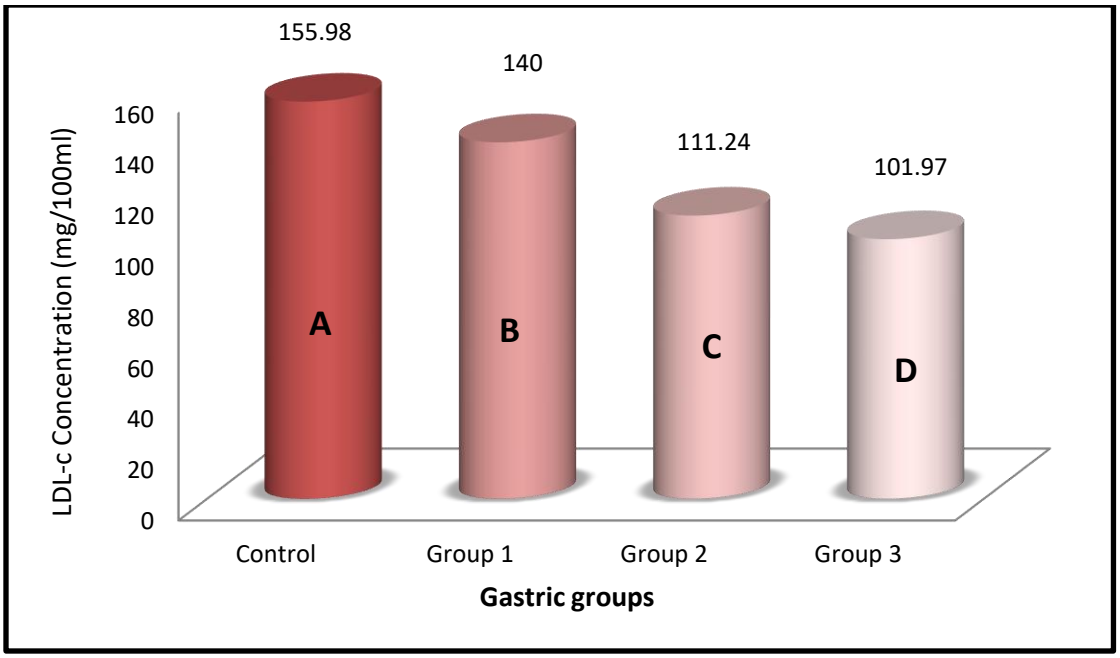


Values are expressed as mean ± standard deviation and the number of patients/group = 12.

Shapes paired with different letters indicate a significant difference at the probability level (P≤0.05).

Figure (4): Shows the impact of gastrectomy sleeve on the concentration of high-density lipoprotein cholesterol (mg/100ml) in the sera of obese males.

The results in Figure (5) showed that there was a significant decrease in the concentration of Low-Density Lipoproteins cholesterol (LDL-c) in the blood sera of obese males at the probability level (P≤0.05) in all groups subjected to the gastrectomy at different time periods compared with the control group. The decrease was more significant in the two groups of three months (the second group) and six months (the third group) after surgery; their arithmetic means were 111.24 ± 2.94 mg/100 ml and 101.97 ± 3.22 mg/100 ml, respectively, while the control group showed an arithmetic mean 155.98 ±1.73 mg/100 ml. Finally, the mean of the sleeve gastrectomy group after one month (the first group) was 140.00 ±3.11 mg/100 ml.

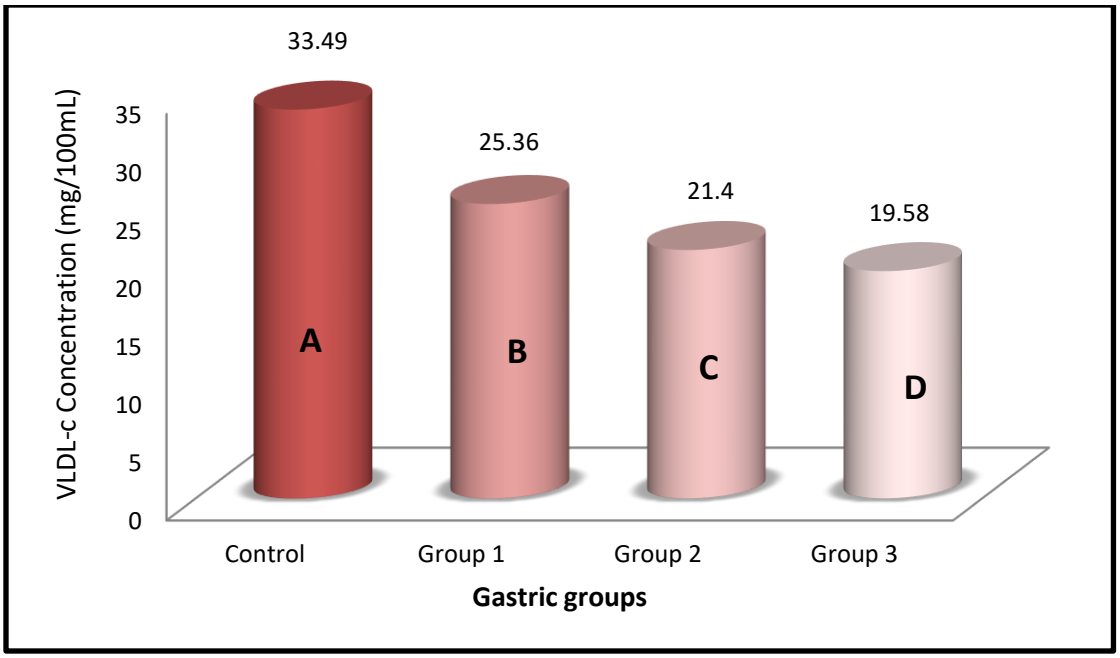


Values are expressed as mean ± standard deviation and the number of patients/group = 12.

Shapes paired with different letters indicate a significant difference at the probability level (P≤0.05).

Figure (5): Shows the impact of gastrectomy sleeve on the concentration of low-density lipoprotein cholesterol (mg/100ml) in the blood sera of obese males.

The results shown in Figure (6) also showed that there was a significant decrease in the concentration of Very Low Density Lipoproteins cholesterol (VLDL-c) in the blood sera of male obese patients who underwent sleeve gastrectomy for all time periods at the probability level (P≤0.05) compared with the control group, and the decrease was more significant in the group that was checked after six months from the surgery (the third group) compared with the rest of the groups and the control group, as its mean was 19.58 ±1.65 mg/100 ml, whereas the arithmetic mean of the sleeve gastrectomy group checked after three months (the second group) was 21.40 ±1.51, and the one-month ago sleeve gastrectomy group (the first group) gave a mean of 25.36 ± 1.54 mg/100 ml. Note that the mean of the control group is 33.49 ± 1.53 mg/100 ml.



Values are expressed as mean ± standard deviation and the number of patients/group = 12.

Shapes paired with different letters indicate a significant difference at the probability level (P≤0.05).

Figure (6): Shows the effect of gastrectomy sleeve on the concentration of very low density lipoproteins cholesterol (mg/100ml) in the blood sera of obese males.

Obesity is one of the main problems in the Arab countries and is linked to many comorbidities, and the most important factors that lead to it are the irrational eating habits [25], and we often find low concentrations of HDL-c, increased cholesterol concentrations, triglycerides, LDL-c and VLDL-c in obese patients [26]. Moreover, dyslipidemia is a cardiovascular risk factor and may explain the excessive mortalities among obese patients [27].

The reason for a significant increase in the concentration of HDL-c and a significant decrease in the concentration of total cholesterol, triglycerides, LDL-c and VLDL-c in the people with gastric sleeve may be that after the sleeve gastrectomy, the body begins to lose a lot of weight, especially in the first three months, while avoiding eating starches and reducing carbohydrates, the body obtains energy by burning fats, and therefore the body gets rid of the accumulated fats and with exercise, muscle mass is gradually built, which raises the rate of burning, or because people with gastric sleeve eat foods that contain a high percentage of proteins, which are characterized by their effect of lipid-lowering and raising the level of HDL-c [28], in addition to that following a healthy diet (by the patients which underwent the sleeve gastrectomy) rich in minerals such as copper and magnesium, which are characterized by their ability to reduce LDL-c and raise the concentration of HDL-c [29]. In this study we noticed an improvement in the concentration of lipids in the blood of people with gastric sleeve after six months of follow up. The results of our study agree with the findings of several studies that showed a decrease in the concentration of lipids in the blood after LSG and that 76% of dyslipidemia cases recovered after the surgery [30]. According to studies, bariatric surgery showed a positive effect on the profile of lipids, and thus their cardio-protective effect [31,32].

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