

The Impact Of Gastrectomy Sleeve On A Number Of Hormonal Variables Of Females Obese Patients

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Abstract

This study involved 48 female patients (35 who underwent sleeve gastrectomy and 13 who did not undergo the surgery and constituted the control group) who were obese and had body mass index of 40 kg/m² and more, and their ages ranged between (20-45) years and from Mosul and Duhok cities. The patients were periodic visitors to the National Center for Obesity Treatment, and their conditions were previously confirmed by specialist doctors after conducting a set of tests, including calculating their body mass index. All the patients who were included in the study met the criteria to be eligible for surgical treatment of obesity. Later, Patients were subjected to sleeve gastrectomy at Al-Zahrawi Private Hospital - Nineveh using laparoscopic surgery by doctors specialized in obesity surgery. The patients were followed up for six months on three intervals; after one month, three months and six months. Laparoscopic sleeve gastrectomy resulted in a significant decrease in the concentration of the ghrelin hormone in the serum of female sleeve gastrectomy patients compared to the control group. The results also showed a significant increase in the concentration of the adiponectin hormone in the serum of females of all groups of gastric sleeve patients during the follow-up period compared with the control group.

Keywords: sleeve gastrectomy, obesity, hormonal variables.

Introduction:

Obesity is becoming increasingly prevalent worldwide and has become the most common disease related to metabolism (Ng et al,2014). In 2005 there were 1,600 million overweight persons and 400 million obese persons (Wyleżoł et al,2009), while in 2014, nearly 2 billion people were overweight, and more than 600 million of those were suffering obesity (WHO ;2016).). The prevalence of obesity in adults was 38% (Flegal et al,2016), its prevalence in the United States reached more than 33% from 2011 to 2014 (Ogden et al,2016) and the epidemic is increasing among adolescents (Desart et al,2015), New studies indicate high rates of obesity in developing countries and even in countries that were considered economically underdeveloped until now and this is also evident in Poland, 1% of its population has a body mass index of more than 40 kg / m², which represents more than 300,000 people (Iannelli et al,2008).

Bariatric surgeries continue to gain wider implementation possibilities at present, one of these surgeries is the laparoscopic sleeve gastrectomy which is performed on obese patients with a BMI greater than 40 kg/m² (Desart et al 2015). Despite the late introduction as a treatment method, it is very popular all over the world, and is mainly used as a separate and definitive procedure for the treatment of severe obesity (Iannelli et al,2008 ; Anhô et al,2017). The surgery is performed by removing a large part of the stomach along the curvature of the fundus and body of the stomach in a vertical manner. Surgeons remove

about 75% of the stomach, leaving a long tube and tubule (Regan et al,2003), leading to a tubal gastric sleeve. Weight loss after surgery is promoted through the benefit of the sleeve and the surgical resection of the fundus cells producing ghrelin, and with the decreased secretion of ghrelin (the appetite hormone) and subsequently decreased appetite (Emile et al,2017).

Aim of the Study:

This study aimed to evaluate the impact of gastric sleeve on a number of hormonal variables in obese female patients.

Materials and Methods:

Place and Time of the Study:

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

Human Samples under Study

Groups of Sleeve Gastrectomy Patients

This study involved (35) females suffering obesity and their body mass indexes were 40 kg/m² and more, with ages ranged between (20- 45) years, from the cities of Mosul and Duhok. The patients were periodic visitors to the National Center for Obesity Treatment. All patients underwent sleeve gastrectomy surgery in the operation room/ Al-Zahrawi Private Hospital – Nineveh, using laparoscopic surgery performed by doctors specialized in obesity surgery and the patients were prevented from eating for 24 hours before the surgery (Ayoub and Al-Badrany, ,2012)). The patients were followed up for (6) months after the surgery.

The Control Group

From the same groups of patients of the same ages, and they suffer from obesity and have a body mass index of 40 kg/m² or more, but they did not undergo the sleeve gastrectomy surgery, and they were (13) patients.

Calculating the Percentage of Excess Weight Loss

The percentage of excess weight loss for females in the sleeve gastrectomy groups was calculated by the following equation (Deitel, and Greenstein, 2003.):

$$(\text{Pre-operative weight} - \text{Current weight}) / (\text{pre-operative weight}) \times 100 = \% \text{ body weight change.}$$

Hormone Tests

The concentrations of the following hormones were estimated in blood sera of the groups who undergone sleeve gastrectomy as well as the control group.

1- Estimating the Concentration of Ghrelin hormone in the Blood Sera

The concentration of the ghrelin hormone in the serum was estimated, using a ready-made assay kit from the American company Sunlong, using ELISA technology. This assay relied on an enzyme system linked to a Biotin double antibody sandwich, to measure the concentration of the ghrelin, as the serum containing this hormone is added to the reaction pit pre-containing ghrelin hormone monoclonal antibody. After incubation the biotin-labeled ghrelin antibodies were added to bind with Streptavidin-HRP, to produce an

immune complex. The unbound hormone is removed by washing, then Chromagen A,B is added so that the solution turns blue and then yellow; the intensity of color is directly proportional to the concentration of the hormone. Absorbency was measured at the wavelength 450 nm, within ten minutes of the formation of the yellow color using a Semi-Automated ELISA shaker-reader, manufactured by Rayto from Germany, and by reference to the standard curve the concentration of ghrelin was determined in (pg/ml).

2- Determination of the Concentration of Adiponectin hormone in the Blood Serum

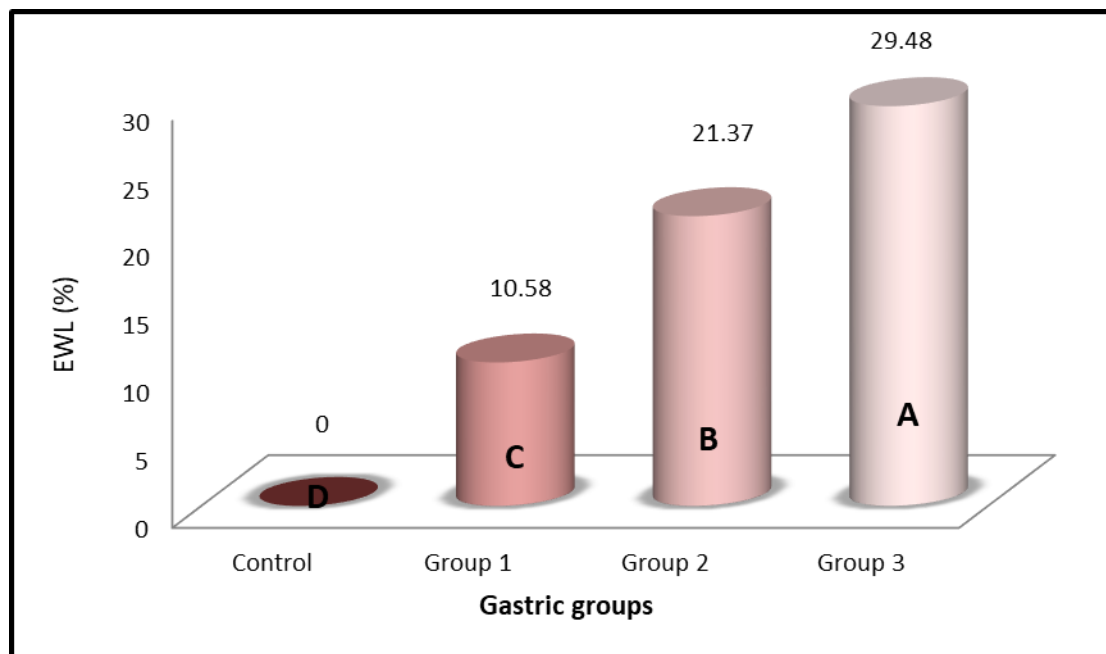
The concentration of the adiponectin hormone in the serum was estimated using ready-made analyses kit from the American Sunlong company using ELISA technology. This assay relied on an enzyme system related to Biotin double antibody sandwich to measure the concentration of adiponectin; the serum containing this hormone is added to the reaction pit that has ADPN monoclonal antibody. After incubation, adiponectin antibodies labeled with biotin are added to bind with Streptavidin-HRP, to produce an immune complex. The unbound hormone is removed by washing, and then Chromagen A,B is added and the solution changes to blue then to yellow color. Color intensity is proportional to the concentration of interest adiponectin, the absorbency was measured at wavelength 450 nm, during ten minutes of yellow color formation, using Semi-Automated ELISA shaker-reader manufactured by Rayto from Germany. By reference to the standard curve, concentration of adiponectin hormone was determined in (ng/ml)

Statistical Analysis

Statistical analysis of the results was carried out using a one-way complete random design, and the differences between the groups of sleeve gastrectomy patients and the control group were determined using Duncan's multiple range test for all the variables dealt with in the study. The level of probability was ($P \leq 0.05$), which was considered a significant difference, and by using the statistical program (SAS,2001) ready to find the mean and standard error (Hinton, 2014).).

Results and Discussion

Figure (1) shows that there is a significant increase at the probability level ($P \leq 0.05$) in the percentage of Excess Weight Loss (EWL) in all the sleeve gastrectomy groups with their different time periods. The highest arithmetic mean was $29.48 \pm 5.34\%$ of the sleeve gastrectomy group checked after (6) months (the third group), followed by the sleeve gastrectomy group that was checked after three months (the second group) with an arithmetic mean of $21.37 \pm 3.99\%$, while the sleeve gastrectomy group checked after one month (the first group) showed a significant difference and gave an arithmetic mean of $10.58 \pm 2.46\%$. Note that the arithmetic mean of the control group is 0.00 ± 0.00 because they did not undergo any attempt to lose weight.



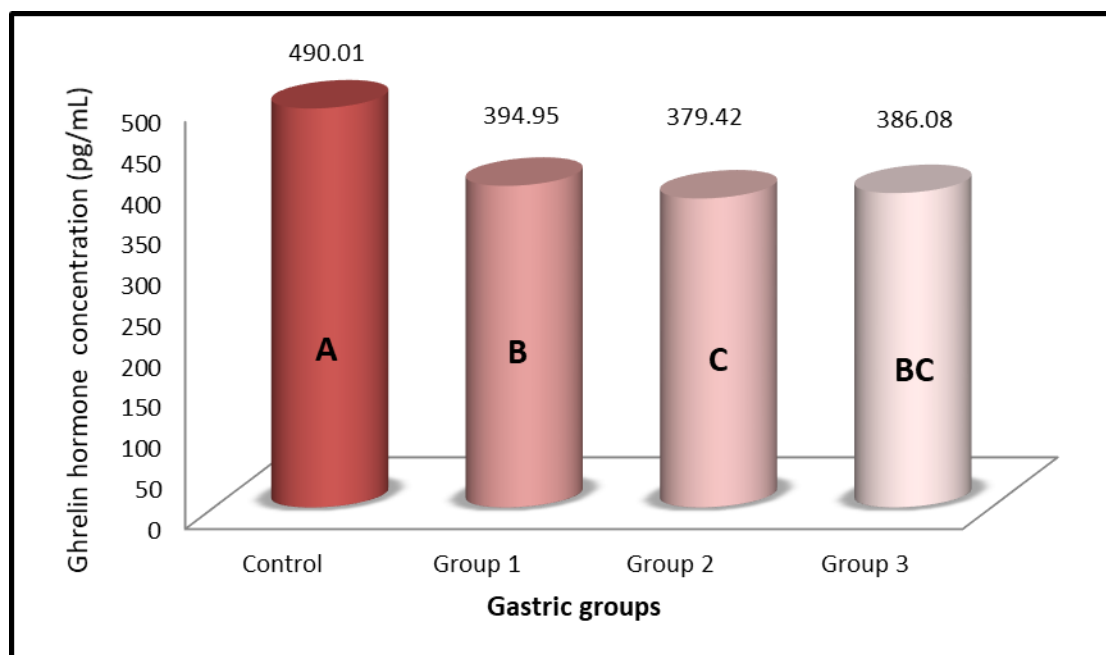
Values are expressed as arithmetic mean (\pm) standard deviation, and number of patients/group = 12. Figures paired with different letters indicate a significant difference at the probability level ($P \leq 0.05$).

Figure (1): Shows the impact of gastrectomy sleeve on the percentage of excess weight loss (%) for females obese patients.

The sleeve gastrectomy surgery led to a significant increase in the percentage of excess weight loss, and there is a study which shows that sleeve gastrectomy surgery showed great effectiveness with regard to the percentage of excess weight loss compared to other surgeries such as gastric bypass, especially in patients with body mass index less than $50 \text{ kg} / \text{m}^2$ (16), and in recent years, the preferred method of expressing weight loss after bariatric surgery is weight loss as a percentage compared to the original body weight, the rate of weight loss after sleeve gastrectomy ranges between 60-70% of the excess weight; most people reach their lowest weight within 12-24 months after the sleeve gastrectomy (Kehagias et al,2011), and this study is consistent with our current findings. After the gastric sleeve surgery, the body begins to lose a lot of weight in the first three months, as it loses approximately 20 to 25% of excess weight, and after 6 months, the weight loss is approximately 32% of excess weight during our follow-up period. These results are consistent with many previously published researches (Brethauer et al,2015 , Kehagias et al,2011; Zhang et al,2014 ; Schauer et al,2017). The effectiveness of bariatric procedures must be evaluated based on long-term outcome information, because obesity is a chronic disease, as well as its associated diseases, however, the results of bariatric surgery are still uncertain due to the lack of studies of bariatric surgery with long-term results along with adequate follow-up of the patient (Puzziferri et al,2014).

The results shown in Figure (2) also showed a significant decrease at the probability level ($P \leq 0.05$) in the concentration of the ghrelin hormone in the blood sera of females of the gastric sleeved groups compared to the control group, except that the sleeve gastrectomy group who had undergone the operation six months ago (the third group) showed a significant increase (yet its arithmetic mean did not reach the level of the control group and at the same level of probability) compared with the two other gastric sleeved groups who underwent the surgery and checked after one month (the first group), and three months (the second group). There were no significant differences between the three groups, as the

average reached arithmetic mean for them were 386.08 ± 13.06 pg/ml, 394.95 ± 9.18 pg/ml, and 379.42 ± 11.11 pg/ml, respectively, having in mind that the mean of the control group was 490.01 ± 10.79 (pg/ml.)



Values are expressed as arithmetic mean (\pm) standard deviation, and number of patients/group = 12.

Figures paired with different letters indicate a significant difference at the probability level ($P \leq 0.05$).

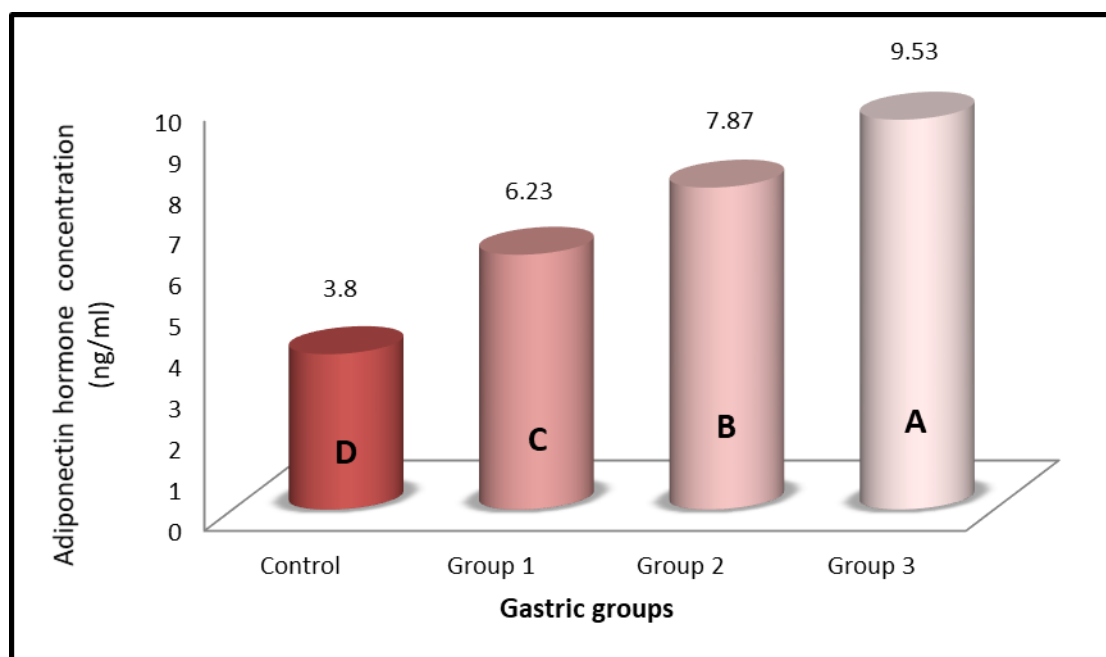
Figure (2): Shows the impact of gastrectomy sleeve on ghrelin hormone concentration (pg/mL) in the blood sera of females obese patients.

The effects of bariatric procedures on ghrelin hormone concentration are varied, as laparoscopic sleeve gastrectomy significantly reduces ghrelin production in 90% of patients (Gagner et al,2009 ; Puzziferri et al,2014), and this was proven in our current study; a significant decrease was observed in the concentration of the ghrelin hormone during the follow-up period after the sleeve gastrectomy surgery, and the concentration of the hormone continued to decrease after the first and third months after the surgery. This may be due to the fact that in the laparoscopic sleeve gastrectomy, a large part of the larger curvature of the fundus and body of the stomach is removed, which leads to a tubular gastric sleeve. Resection of the fundus in turn leads to the removal of fundus cells producing ghrelin, which would reduce the production of ghrelin and subsequently decrease appetite (Bohdjalian et al,2010 , Miguel et al,2009).In a research study through which the distribution of cells responsible for secretion of ghrelin throughout the stomach was determined, it was noted that it is highly localized in the fundus of the stomach, emphasizing the importance of accurate fundus resection during sleeve gastrectomy for maximum removal of ghrelin-producing basal cells (Goitein et al,2012).

Our study achieved a significant decrease in the concentration of ghrelin after the end of the first and third months after the surgery, and at the end of the follow-up and after six months of the sleeve gastrectomy surgery, we noticed a slight increase in the average concentration of ghrelin, but it did not reach the level that was seen at the end of the first month after the surgery, in addition to the control group, the reason for the slight increase in the concentration of ghrelin at the end of the follow-up period (6 months) may be due to the fact that this hormone is secreted from places other than the stomach such as the small intestine, and a small amount of it is secreted in the pancreas and brain (Castaneda et al, 2010), and our results for a one-month follow-up period agrees with what was found by (Tsoli et al, 2013), as they recorded a significant decrease in the concentration of ghrelin in the blood in one month after LSG, but our results contradict what was found by (Hanusch-Enserer et al,2003),as they observed that the

concentration of ghrelin decreased at 6 months but increased at 12 months after LSG, and this also highlights the need for more long-term data on ghrelin after one year, and the studies are very few and due to the short follow-up period, further study is needed.

The results in Figure (3) showed a significant increase in the concentration of the adiponectin hormone in the blood sera of female sleeve gastrectomy groups at the probability level ($P \leq 0.05$) compared with the control group, and the group of patients who had undergone the sleeve surgery and checked after six months (the third group) was distinguished by having the highest arithmetic mean of adiponectin hormone concentration of 9.53 ± 1.17 ng/ml, followed by the sleeve gastrectomy group, which was checked after three months (the second group) from their surgery with a mean of 7.87 ± 1.03 ng/ml, and then the group that was checked after one month after surgery (The first group) with a mean of 6.23 ± 1.04 ng/ml compared to the mean of 3.80 ± 0.93 ng/ml for the control group.



Values are expressed as arithmetic mean (\pm) standard deviation, and number of patients/group = 12.

Figures paired with different letters indicate a significant difference at the probability level ($P \leq 0.05$).

Figure (3): Shows the impact of gastrectomy sleeve on the concentration of adiponectin hormone (ng/ml) in the blood sera of females obese patients.

The sleeve gastrectomy achieved a significant increase in the concentration of the hormone adiponectin in females; the reason for this may be due to the weight loss resulting from the sleeve gastrectomy and the decrease in body mass index. The current study is similar to what was found by (Holdstock et al,2003), who showed that the concentration of adiponectin increases after a healthy diet or weight loss resulting from bariatric surgery, also Tabák et al(2012) stated that adiponectin concentrations increase in conjunction with weight loss. It is thought that the reason for its high concentration in the serum of the gastric sleeve groups is due to the low levels of lipids in the blood serum, so the adiponectin hormone plays an important role in the prevention of hyperlipidemia and consequently atherosclerosis and its complications (Al-Tu et al,2011),and there is a direct relationship between Adiponectin and HDL-c concentrations which is consistent with what was found by the researchers (Takahashi et al,2011 ; Mankowska et al,2009; Rasul et al,2011).The reason may be that adiponectin is one of the hormones that metabolize carbohydrates and fats and increases fatty acid oxidation and energy consumption leading to a decrease in the content of triglycerides in the liver, heart and skeletal muscle, which indicates the

importance of the adiponectin hormone in metabolic processes within the body (Trujillo et al,2005). Due to the importance of the adiponectin hormone and the absence of previous studies about it in Iraq, in addition to the lack of information explaining the relationship between adiponectin hormone and the gastric sleeve surgery, and because this is the first study, there is a need for more studies to clarify this relationship.

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