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SURGERY

The Body Weight, Blood Pressure, and Biochemical Parameters of the Patients After Obesity Surgery

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Abstract

The objective of this study is to observe whether the patients' loss weight is long term after bariatric surgery, as well as evaluating the blood pressure and certain chemical parameters. This retrospective study was carried out based on the files of 70 patients, who underwent laparoscopic sleeve gastrectomy (LSG) operation between January 2013 and December 2017. Paired sample *t* test and Wilcoxon tests were used for comparison of patients' weight, blood pressure, and other parameters related to obesity within at least 6 months after LSG. While the body mass index (BMI) average of patients before bariatric surgery was 45.82 ± 4.73 kg/m^2, it was reduced to 27.33 ± 2.98 kg/m^2 within approximately 3 years after the operation ($p < 0.01$). It was confirmed that there was a significant remission in hypertension, diabetes mellitus, hyperlipidemia, serum insulin, HbA1C, and HOMA-IR parameters of patients after bariatric surgery ($p < 0.05$). Additionally, it was also detected that the antihypertensive and antidiabetic drug usage dosage of patients was either minimized or discontinued after bariatric surgery. In our study, it was detected that the weight loss of patients after LSG was satisfactory and that blood pressure, including certain biochemical parameters related to obesity, was on remission. Therefore, it is thought that LSG in the early period is a reliable operation, which ensures the weight loss, provided that the patients accommodate themselves to the changes in their lifestyles.

Keywords Morbid obesity · Bariatric surgery · Hypertension · Diabetes mellitus

Introduction

Defined as excessive and abnormal fat deposition, which has the potential to cause various health problems, obesity is an important disorder, affecting the lives of individuals from each and every age group. According to the World Health Organization (WHO) 2016 data, more than 1.9 billion individuals aged 18 and over are overweight and at least 650 million are obese [1]. As per the data by the Turkish Statistical Institute (TÜİK) for the year 2016, 15.2% and 23.9% of the male and female individuals, respectively, who are 15 years old and older, are obese [2]. Obesity, which can be seen widely in almost every society, is correlated with a number of diseases like diabetes mellitus (DM), hypertension (HT), coronary artery disease, steatosis hepatic, and sleep apnea syndrome [3–6]. Where the body mass index (BMI) of individuals is over 25 kg/m^2, the risk of vascular disease increases. Individuals who are obese, particularly those who are classified within the morbid obesity group (BMI ≥ 40 kg/m^2), the morbidity and mortality rates increase. Moreover, the lifetime of these individuals reduces by 8 to 10 years [7].

Varying from person to person, the obesity treatment is provided with lifestyle changes in the beginning, including behavioral modification interventions (diet, exercise, cognitive, and behavioral therapies). Where the weight loss is not satisfactory following these changes, pharmacological treatment is started for these individuals. However, if the expected results are not achieved even after the aforementioned treatment methods, surgical therapy becomes an option for treatment [8]. Within the bariatric surgery, laparoscopic sleeve gastrectomy (LSG) is one of the most frequently used methods in today's world. BMI levels of individuals can be reduced to an ideal range thanks to LSG. Additionally, LSG is also suggested for the treatment of HT and DM, accompanied

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by obesity [9]. A reduction is conferred in the systolic and diastolic blood pressures of patients after LSG. Similarly, blood glucose, lipid, and cholesterol levels of patients can be reduced with LSG as well. LSG can improve or fix obesity-induced comorbidities [10]. The rate of morbidity and mortality in patients who underwent LSG detected lower than patients who underwent Roux-en-Y gastric bypass [11]. LSG is an effective and reliable method. However, if patients do not fit in the postoperative, a strict diet and exercise program, they can gain weight again [12]. Therefore, the objective of this study is to observe whether the patients' loss weight is long term after bariatric surgery, as well as evaluating the blood pressure and certain chemical parameters, within an average period of 3 years (1162 days) after the LSG operation.

Methods

This retrospective study was carried out based on the files of 70 patients with a BMI over 40 kg/m^2, who underwent LSG operation, as well as having HT and DM as comorbid to obesity between January 2013 to December 2017 in the Ankara Atatürk Training and Research Hospital. In our hospital, patients who undergo LSG surgery are called for an outpatient checkup at regular intervals (e.g., first 3 months, once a month). Nutrition and diet experts at our polyclinic regularly follow the patients are made. Daily calorie calculation of patients is done. Besides, the exercise program of the patient is determined by the activity of daily living. The patient does exercise at home and at work according to this program. The operations within the surgery, including ultrasonography results for preoperative and postoperative processes, checks and pathology reports were included in the patient files. Besides, systolic and diastolic blood pressures of patients, including the drugs and dosages, were also examined, before and after the surgery through the patient files. Preoperative and postoperative starvation blood glucose, starvation insulin level, HbA1C, HOMA-IR, serum LDL, HDL, total cholesterol, and triglyceride levels of patients were checked as well.

This study was started after obtaining approval from the Yıldırım Beyazıt University Medical Faculty Clinical Research Ethical Evaluation Commission (decision no. 107, 07 May 2018), and write permissions from the Ankara Atatürk Training and Research Hospital (Ankara, Turkey).

The data obtained from the study were evaluated in the SPSS program (version 25.0 SPSS, Chicago, IL, USA). In the evaluation of descriptive statistics, number, percentage, mean, and standard deviation values were used. For the differences between pre- and postoperative continuous outcomes, paired sample t test and Wilcoxon test were used to analyze the differences between normally distributed and non-normally distributed variables, respectively.

Results

In our study, the age average of female patients was 42.94 ± 10.72 (n = 55, min = 22, max = 64), while the age average of male patients was 35.78 ± 10.46 (n = 15, min = 21, max = 57). BMI average of the patient was 45.82 ± 4.73 kg/m^2 for the preoperative process while being reduced to 27.33 ± 2.98 kg/m^2 after the surgery; meaning that the expected weight loss was achieved for the patients ($p < 0.01$). During the check in 3 years (average) after the LSG surgery, it was detected that BMI levels of 4 patients increase about 4–6 kg/m^2 due to not following their diets but consuming high-calorie drinks, despite having no other problem apart from the obesity.

Before the LSG operation, 25 patients had high blood pressure (Table 1). After the LSG operation, the dose of the blood pressure drug was decreased in 15 patients with HT and the use of this drug was completely terminated in 10 patients. Postoperative weight loss led to a significant balance in the serum cholesterol and lipid levels of patients, depending on following their diet and exercise programs (Table 2). Five patients discontinued statin-group anti-hyperlipidemic medication after LSG. The other patients were suggested to reduce the dosage of the medication. In our study, it was detected that 20 patients had high blood glucose level before LSG operation, 6 patients used overdose antidiabetic medication for this reason, while 3 patients received insulin therapy. After the LSG operation, 6 patients received metformin treatment. In order to regulate blood glucose levels of 4 patients who had decreased insulin resistance after LSG operation, a lower dose of oral antidiabetic medication was recommended.

Table 1 The body mass index and blood pressure levels of obese subjects before and after sleeve gastrectomy

Body mass index and blood pressure levels	Before surgery (mean ± SD)	After surgery (mean ± SD)	p value
BMI (kg/m^2)	45.82 ± 4.73	27.33 ± 2.98	$p < 0.01$
Systolic blood pressure (mmHg)	151.20 ± 8.33	144.40 ± 10.44	$p < 0.01$
Diastolic blood pressure (mmHg)	95.01 ± 9.01	93.20 ± 10.69	$p = 0.014$

Wilcoxon test and paired samples t test were used

Table 2 The biochemical parameters of obese subjects before and after sleeve gastrectomy

Biochemical parameters	Before surgery (mean ± SD)	After surgery (mean ± SD)	*p* value
Blood glucose (mg/dL)	157.80 ± 45.23	136.85 ± 41.28	$p < 0.01$
HbA1C	%7.20 ± 1.65	%6.04 ± 1.34	$p < 0.01$
Insulin (μIU/mL)	29.49 ± 6.29	10.15 ± 5.41	$p < 0.01$
HOMA-IR (μIU/mL z mmol/22.5)	12.15 ± 4.87	3.54 ± 2.85	$p < 0.01$
Serum cholesterol (mg/dL)	207.50 ± 36.16	186.80 ± 25.36	$p = 0.013$
Serum triglycerides (mg/dL)	164.55 ± 56.10	121.55 ± 47.07	$p < 0.01$
Serum LDL cholesterol (mg/dL)	129.68 ± 33.34	112.37 ± 18.49	$p = 0.035$
Serum HDL cholesterol (mg/dL)	42.40 ± 10.09	45.90 ± 7.31	$p = 0.049$

Wilcoxon test was used

Discussion

According to the statistic for 2016, circulatory system diseases were in the first place as the cause of death in Turkey (39.84%) [2]. Additionally, 7.6% and 3.84% of men and women in our country, respectively, lose their lives due to coronary artery heart disease (CHD) [13]. It is known that CHD has a positive correlation with obesity, age, HT, DM, LDL, and high triglyceride [14]. Morbid obesity is one of the most critical risk factors for cardiovascular diseases. However, it is also important not to lose muscle mass and power while trying to lose weight. Losing weight accompanied by regular exercise reduces the risk of CHD [15]. Therefore, the patients in our study were suggested to follow a regular exercise program, as well as taking nourishment as per their diet programs. In an experimental study, the blood pressure of patients, who underwent LSG operation, was conferred to be reduced [16]. Similarly, systolic and diastolic blood pressure of patients in our study significantly reduced after LSG ($p < 0.05$). After the LSG operation, the weight loss of patients was relatively faster in the first 6 months, while the weight loss process takes up to 12 months. Additionally, some changes were seen in the lifestyles of patients (doing exercise, following a proper diet program, smoking cessation). Along with losing weight, the blood glucose, lipid level, and blood pressure levels of patients were reduced. Thus, circulatory system disease rates decreased with respect to preoperative values. Moreover, the life expectancy of patients increases after LSG [17]. In our study, the blood pressure levels of patients, who underwent LSG operation, were significantly reduced after losing weight, doing exercise, and following a proper diet program. In our study, the blood pressure in 10 patients (40%) came to normal limits due to their weight loss. For this reason, they left their blood pressure medications. The blood pressure, LDL, and triglyceride levels of morbidly obese patients were conferred to be on a significant remission after LSG [18]. It was detected that LSG has a major influence in the remission of hyperlipidemia and accompanying comorbid diseases [19]. In our study, it was detected the lipid levels of patients were significantly reduced after LSG operation ($p < 0.05$). Additionally, 5 (20%) of patients were not required to continue lipid-lowering medication. It is highlighted that the insulin resistance of morbidly obese patients is correlated with the reduction of cholesterol absorption and an increase in cholesterol synthesis [20]. The postoperative process of LSG leads to a decrease in insulin resistance and cholesterol synthesis. However, cholesterol absorption increases after LSG. Removal of the major part of the stomach during LSG is suggested to decrease the cholecystokinin production and, accordingly, cholesterol absorption [21]. In another study, it was detected that the cholesterol synthesis of patients after LSG is reduced, yet not changing the absorption level [22]. In our study, it was detected that there was a significant reduction in the cholesterol level of patients after the surgery ($p < 0.05$). In addition to LSG surgery, we think that regular exercise and strict diet program are effective in decreasing cholesterol level. LSG is suggested to be as effective as a laparoscopic Roux-en-Y gastric bypass (LRYGB), in terms of stabilizing the insulin resistance. Experiencing a reduction in levels of HOMA-IR in 3 months after LSG operation indicates a recovery in type 2 DM [23]. Similar to the results of this study, HOMA-IR levels in our study decreased after LGS operation ($p < 0.05$). In our study, in accordance with the literature, blood glucose levels of 10 (59%) patients with type 2 DM were determined to be regulated [23, 24].

Conclusion

In conclusion, it was conferred in our study that the weight loss levels of patients, who were classified in the morbid obesity group, were satisfactory after LSG operation. As long as the patients follow their proper diet and exercise programs after LSG, the weight loss is kept for a long term, thus leading to remissions in certain diseases like HT, CHD, and type 2 DM, as comorbid to obesity. Therefore, it is thought that LSG in the early period is a reliable operation for patients, ensuring to achieve the weight loss levels, while leading to remission in comorbid diseases, as well.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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