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Original Article

Comparison of spirometric functions in patients with asthma who underwent laparoscopic gastric bypass versus laparoscopic sleeve gastrectomy: A retrospective study

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Abstract

Aim: Morbid obesity has become a global problem in our day, and different surgical methods are used in its solution. We aimed to compare the spirometric function results of asthmatic morbid obese who underwent laparoscopic sleeve gastrectomy (LSG) versus laparoscopic roux n y gastric bypass (LGB).

Materials and Methods: We have retrospectively reviewed seventy two asthmatic patients who underwent LSG and LGB for morbid obesity between march 2016 and january 2020 in pulmonology department. Demographic findings, spirometrıc outcomes, and hospital stay were assessed. Statistically significant results were accepted as p <0.001.

Results: The mean age of the participants in the study was 34.13±5.28 (mean age range 25-37), mean BMI 47.3 ± 3.4 kg / m2 (range 43-55). All of the operations were terminated laparoscopically Multivariate logistic regression analysis identified the independent prognostic factors for lung symptoms as age, gender and BMI. Age p:0.064, (OR(95%CI):2.036 [0.955, 4.341]), BMI,p:0.0791. (OR(95%CI): 895 [0.948, 3.789]), gender p:0.110(OR(95%CI):,0.978 [0.951, 1.005]) detected as shown.

Conclusion: Although the laparoscopic gastric bypass procedure has a higher morbidity rate than laparoscopic sleeve gastrectomy, we have concluded that the healing effect in spirometric function tests and improvement in pulmonary outcomes are better.

Keywords: Gastric bypass; sleeve gastrectomy; spirometry

INTRODUCTION

Asthma is a heterogeneous disease characterized by chronic respiratory inflammation with expiratory airflow limitation, often accompanied by symptoms such as respiratory distress, cough, wheezing. Asthma is thought to affect about 300 million people worldwide. Asthma is a common disease in different countries ranging from 1-18% of the population (1,2).

One of the most important comorbidities that accompany asthma is obesity. Asthma is more common in obese patients and it is more difficult to control it. Obese asthma patients were found to have worse lung function and more comorbidity than normal-weight asthma patients. Late-onset asthma phenotype is observed in morbid obese asthmatics compared to non-obese asthmatic patients (3-7).

Morbid obesity is a common problem in all developing and developed countries, and the definitive solution is primarily the only option for patients who have not benefited from medical treatment. While LSG, which has become almost conventional in bariatric surgery, has a primary role, today LGB is applied in patients who have not received more specific and first-line treatment. Although patients lose weight after bariatric surgery, the daily activities can perform more effectively, and decreases the intraabdominal pressure on the lung cavity. In present study, we aimed to compare spirometric functions in patients with asthma who have undergone LGB versus LSG (8-10).

MATERIALS and METHODS

The spirometric values of 72 patients who underwent bariatric surgery in tertiary pulmonology clinic and also underwent LSG and LGB procedures according to BMI results were evaluated retrospectively. Selcuk University Local Ethics Committee has been approved this retrospective research (2020 / 08 – decision number 173).

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The necessary consultations (endocrine, psychiatry, chest, and dietician) were made for the patients who applied before the operation, the necessary information was given for the operation. The BMI values of all patients were> 40 kg / m2 and also upper system endoscopies and abdominal ultrasonographies were performed. Bariatric procedures performed by an experienced bariatric surgeon team.

Study protocol

Patients participated in the study in accordance with the Declaration of Helsinki. First of all, spirometry was performed to obtain FVC, FEV1 and FEV1 / FVC ratio and values. The obtained values are reported as vital capacity (VC), functional residual capacity (FRC), total lung capacity (TLC), residual volume (RV) and expiratory reserve volume (ERV) in percent. The questionnaires were repeated in the preoperative and postoperative 12 months. Patients were advised to take the drugs they use in this process (11).

Inclusion criteria

Patients 25 and 37 years of age, no history of bariatric surgery previously, no history of respiratory or cardiac comorbidities and body mass index(BMI) > 40 kg/m2 are described as inclusion criteria

Exclusion criteria

Psychiatric diseases, previous tumoral conditions, frequent exacerbations and not giving consent were determined as criteria. Demographic findings, operation times, complication rates, hospital treatment times of the operated patients were evaluated.

Bariatric procedure

Pre-operative information was given from the patients, and both operations were explained and their consent was obtained. Patients were fed a liquid diet for up to two days before the operation, hospitalized 12 hours before the preoperative period, and prophylaxis was performed with low molecular weight heparin before the operation. Antibiotic prophylaxis was applied to patients with 2 gr cefazolin as soon as they were intubated. LSG process was applied to the pylorus at a distance of 4 cm. In the LGB procedure, resection was applied until the stomach remained in a volume of 30cc, and anostomosis was made with a stomach lobe at a certain distance from the treizt ligament. Operations were completed in a controlled manner by laparoscopic method.

RESULTS

Asthmatic patients without exacerbation for last three months were included in the study. All of the patients agreed to perform spirometric methods. 46 of the patients were female (67.7%), 26 were male (33.3%), mean BMI was 47.3 ± 3.4 kg / m2 (range 42–54), mean age was 34.13±5.28 (mean age range 25-37) (Table 1).

Table 1. Patients demographic and clinical outcomes

	LSG(n:40)	LGB(n:32)	P
Patient number	40	32	
Age	34.4(30-37)	33.6(25-37)	0.687
Gender,(M/F)	22/18	17/15	0.734
BMI, kg/m²	45.3(40-52)	48.2(44-57)	0.813
Hypertension	36	25	0.629
Diabetus mellitus	14	17	0.904
Dislipidemia	18	22	0.893
Medical drugs			0.754
PPİ	21	27	
NSAID	32	24	
Bad habits			0.561
Tobacco	11	8	

No additional complications were observed in patients. The symptoms of the patients were evaluated before the operation and at the end of 1 year. Spirometric risk factors affecting lung reserves were evaluated in multivariate regression analysis. FEV1/FVC LSG: preop; p:0.210,postop, p:<0.001, LGB: preop p: 0.020, postop p: <0.001, FRC; LSG, preop (-16.24 (3.14) 0.426) postop (-8.79 (2.54) <0.001) LGB, preop:(19.76 (3.03) 0.040) postop: -4.66 (2.23) <0.001), ERV LSG: preop (-38.61(5.09) 0.148) postop:-27.4 (4.12) <0.001), LGB, preop: -43.66 (4.91) 0.074, postop:-14.09 (3.62) <0.001), LGB was found to be more meaningful in post-operative results (Table 2).

Table 2. Multiple linear regression analysis of PFT findings of the groups after 12 months

Variables	Preop	p value	12.m	p value	Preop	p value	12.m	p value
VC%	-4.44 (2.18)	0.059	1.95 (1.76)	0.246	-0.53 (2.09)	0.837	1.09 (1.54)	0.480
TLC%	-3.55 (2.43)	0.113	2.30 (1.97)	0.261	-1.55 (2.34)	0.617	1.20 (1.73)	0.490
FEV1/FVC	1.36 (1.09)	0.210	1.99(0.88)	<0.001	2.46 (1.05)	0.231	0.15 (0.77)	<0.001
FRC	-16.24 (3.14)	0.426	-8.79 (2.54)	<0.001	19.76 (3.03)	0.040	-4.66(2.23)	<0.001
ERV	-38.61(5.09)	0.148	-27.4 (4.12)	<0.001	-43.66 (4.91)	0.074	-14.09 (3.62)	<0.001

VC: Vital Capacity, TLC:Total Lung Capacity, FRC: Functional Resıdue Volume, ERV: end resıdual volüme, M:Months

When the spirometric values of the patients were examined, the factors affecting the lung reserves of the patients were evaluated by univariate logistic regression analysis. Age, p: 0.064 (OR (95% CI) 2.036 [0.955, 4.341]), BMI p: 0.079 (OR (95% CI) 1.895 [0.948, 3.789]), Gender, p: 0.110 (OR (95% CI) 0.978 [0.951, 1.005]), these factors were not effective (Table 3). When the postop regression analyzes of FRC and ERV were applied, the relationship between BMI decrease and FRC and ERV was found to be significant in the postoperative improvements (Figure 1).

Table 3. Univariant regression analysis of independent predictive values of lung reserve

Prediktive factor	P value	Odds ratio(95%CI)
Age	0.064	2.036 (0.955, 4.341)
BMI	0.079	1.895 (0.948, 3.789)
Gender	0.110	0.978 (0.951, 1.005)

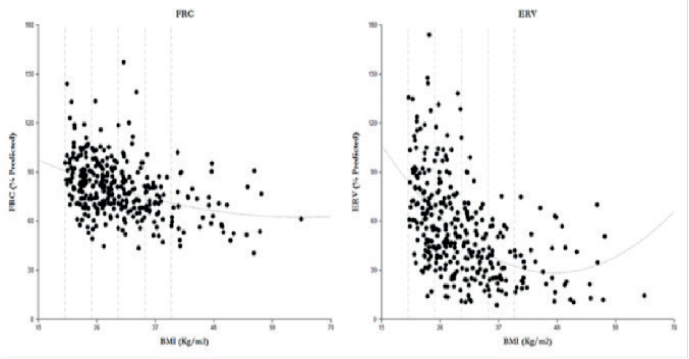

Figure 1. Regression analysis of FRC and ERV in the postoperative period

Statistical methods

The normal distribution of quantitative data was evaluated with Paired t test. Fischer's exact test and Mann – Whitney U test were used to compare categorical data. All data in the study were analyzed with SPSS version 20.0 data package. Quantitative data are given as mean ± standard deviation (Sd), in percent. The patients in our study group were considered randomized because of the similarity in BMI, age, gender and number. Lung functions analyzed by multivariate logistic regression methods and also demographic findings were evaluated by univariate regression analyzis. Statistically significant results were accepted as p <0.001.

DISCUSSION

Asthma it is still one of the obstructive respiratory diseases that have not yet been cured, lung compliance load increase with morbid obesity and also it affects their quality of life negatively. Surgery is one of the most effective methods used for morbid obesity. Bariatric surgery is a light of hope for these patients, it has been shown in studies that it has a positive improvement in patients and reduces the number of attacks. Recently, LSG is a method that is frequently applied. In the postoperative period, there is a significant improvement in functions due to both weight loss and decreased pressure on the lung (12).

Jones et al. investigated lung functions in morbid obese patients. They found that a negative correlation between BMI and lung capacity, and also revealed the opposite relationships between obesity and FRC and ERV. Furthermore Merghani et al. demonstrated that FEV1 could be more sensitive for detecting the airway obstruction within the airways of the lungs. Similarly, while our study revealed that lung functions were associated with morbid obesity (13-15).

Various studies have shown that asthma tends to be more common in morbid obese individuals; symptoms are more intense in patients with morbid obese asthma. Asthma control is difficult and quality of life is deteriorated. In a review evaluating the relationship between asthma and obesity, it was stated that losing weight was associated with improvement in asthma. In a pilot study investigating the long-term effects of weight loss by Maniscalco et al. showed that there was a significant improvement in the first and fifth year spirometry values of asthmatic patients undergoing laparoscopic bariatric surgery. When the spirometry test results are examined; morbid obese asthmatics with underwent LSG process outcomes were lower than those with LGB, but the difference was not significant (16,17). On the other hand LGB process lead to weight loss easy and more than LSG process and this contributes to patients spirometric functions by increasing the lung capacity by means of decreasing the pressure on lungs. Besides that de Souza et al. revealed that decline in BMI correlates with improvement in respiratory, static and dynamic lung volumes (18).

In the study conducted by Zapatero et al. found that there was an increase in the mortality rates and exacerbation numbers of patients, along with weight gain, and this was a negative process. In another retrospective study, Lainscak et al. investigated this over a longer period of time and reached similar conclusions as a correlation (19,20).

On the other hand, Zewari et al concluded that morbid obesity triggers the exacerbation and lead to decrease pulmonary functions, increases inflammatory response. This research is coherent with our study. (21).

In the LSG procedure of asthma, although not in the early period, weight gain in the middle and advanced period results, while regression in lung function is observed. On the other hand, the fact that LSG is a first-line procedure, lead to rapid weight loss in the early period, easy conversion to other surgical methods in the future, lead less morbidity and mortality are its positive effects. Studies have found that asthma control is more difficult in morbid obese than non-obese asthmatic patients. Lavoie et al. found that asthmatic patients have hard to control as the BMI increased, regardless of the severity of asthma. In the study of Saint-Pierre et al. 406 persistent asthmatic patients were followed for several years.

Despite pharmacological treatment, overweight patients were found to have insufficient asthma control. To date, the only study which evaluated the relationship between obesity and asthma severity; this study suggests that higher BMIs are associated with clinically relevant asthma morbidity, and that excess body fat may complicate both asthma control and quality of life independently of factors typically related to age and asthma severity. As a result of multivariate analysis, it was observed that morbid obesity lead to asthma control significantly difficult, and those who underwent LGB surgery had a faster and permanent recovery of lung functions and also had a significant difference compared to LSG group (22-24).

In addition, after LSG process, there is still no consensus on which exactly perform bariatric procedure to follow. In present study, more effective and successful results were achieved in LGB process in the postoperative follow-up period of lung functions. Regression analysis of the patients was evaluated as preoperative BMI, age and gender independent risk factor in 1 year results (Table 2).

LIMITATIONS

The limitations in present study, which were primarily a retrospective observational study, a smaller number of patient populations, and not a long-term study. As a result, we concluded that the patients who underwent LGB surgery had a significant improvement in lung capacity compared to LSG surgery in the 12-month follow-up period (Table 3).

CONCLUSION

LGB procedure more effective procedure in the improvement of lung functions. Spirometric outcomes was improved or even resolved in LGB performed patients with acquiring significance but also without progression. Long-term surveillance data is necessary to define the certain evolution of pulmonary functions after LGB process.

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Ethical approval: Selcuk University Local Ethics Committee approval has taken (2020 / 08 – decision number 173).

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