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Quality of life assessment before and after laparoscopic sleeve gastrectomy: a prospective study

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Abstract. – OBJECTIVE: Obesity has a negative effect on the quality of life (QoL), and therefore, the goal of bariatric surgery is not only to decrease excess weight but also to improve QoL and obesity-related comorbidities. Laparoscopic sleeve gastrectomy (LSG) has become the most commonly applied bariatric procedure worldwide, although there is a lack of prospective data on QoL in patients undergoing this procedure. Therefore, this prospective study aimed to compare QoL of obese patients before, and one year after LSG, and also to analyze the weight loss process and resolution of obesity-related comorbidities.

PATIENTS AND METHODS: Patients undergoing LSG between January 2019 and December 2019 were included. They completed the Bariatric Quality of Life index (BQL) before surgery and one year after. Anthropometric data and obesity-related comorbidities were recorded.

RESULTS: Thirty-eight patients were included in the study. The mean age was 37.9 ± 11.2 years, and the majority were women (68.4%). One year after the surgery, the mean body mass index (BMI) decreased from 45.5 ± 8.2 kg/m^2 to 29.3 ± 6.1 kg/m^2 (p<0.0001), and the mean percentage excess weight loss (%EWL) was 85.1 ± 22.3%. The preoperative total score of BQL was 46.05 ± 7.01 points and postoperatively it increased to 66.52 ± 5.53 points (p<0.0001). BQL total score and %EWL was positively and significantly correlated (r=0.479, p=0.002). Postoperatively, all obesity-related comorbidities were improved, although de novo gastroesophageal reflux disease (GERD) appeared in 7.8% of the cases.

CONCLUSIONS: LSG improves QoL and allows resolution of obesity-related comorbidities, but a small proportion of patients may develop troublesome GERD postoperatively.

Key Words:

Laparoscopic sleeve gastrectomy, Quality of life, Bariatric quality of life index, Obesity.

Introduction

The prevalence of obesity has increased in the past years, becoming a major public health problem not only in the Western countries but also in Eastern Europe. Due to the epidemic proportions, a significant decrease in life expectancy has been observed and is defined as disproportionate body weight for height with an excessive accumulation of adipose tissue that is accompanied by systemic inflammation[1]. Obesity also can lead to the development of diseases, such as insulin resistance and type 2 diabetes mellitus, gastroesophageal reflux disease (GERD), cardiovascular diseases, including arterial hypertension, joint disease, and others[2].

Despite the existence of various conservative treatments, sustainable weight loss often fails in the long term. Therefore, bariatric surgery is currently considered the most effective treatment for substantial and sustained weight loss. Also, many obesity-related comorbidities are consecutively improved and/or resolved, and therefore, the surgery influences not only weight as per se, but the patient's metabolic profile as a whole[3].

Laparoscopic sleeve gastrectomy (LSG), was initially described as a component of biliopancreatic diversion. Nowadays is a stand-alone bariatric procedure with the largest global use, and with effective outcomes both for weight loss and for resolving the main obesity-related comorbidities[4]. It is performed, in almost all cases, through a laparoscopic approach. It involves the creation of a narrow tubular duct along the lesser curvature after the removal of a portion from the fundus, corpus, and antrum of the stomach. The volume is reduced to approximatively 25% of the original. Several advantages linked to this procedure are responsible for its widespread use in the

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"bariatric world". These include: the lack of anatomical rearrangement or surgical anastomoses and a shorter operative time[5].

The quality of life (QoL) concept refers to how the well-being state of a person may be impacted over time by a disease. It can be defined as a multidimensional construct of physical, psychological, and social dimensions of health[6].

Obesity is associated with reduced QoL, and therefore, the success of bariatric surgery is not only based on how much weight the patient loses but also on improvements in QoL. As a consequence, a complete LSG outcomes assessment should include an analysis of changes in QoL, besides evaluation of weight loss process, comorbidities improvement, and incidence of complications. This action is known under the name of "bariatric triple assessment"[6,7].

Objective assessment of QoL is performed with validated questionnaires designated for this purpose. Medical Outcomes Study Short Form 36-item Health Survey which is a generic questionnaire[8] could be an example, or it can be used a more disease-specific questionnaire like Bariatric Quality of Life index (BQL). This questionnaire measures the patient's QoL before and after a bariatric procedure and consists of two parts[9,10]. More details about the BQL questionnaire will be discussed in this study.

Therefore, this study aimed to compare QoL of obese patients before, and one year after LSG, using BQL as an instrument for measurement and, also to analyze the weight loss process and resolution of obesity-related comorbidities.

Patients and Methods

Study Design

This is a prospective study in which obese patients submitted to LSG were included. The study took place between January 2019 and December 2019 in a university surgical department from Târgu Mureş, Romania. Patients were eligible for participation if they had morbid obesity (body mass index (BMI) ≥40 kg/m^2) or were severely obese (BMI ≥35 kg/m^2) with at least one related comorbidity, had age greater than 18 years old, and had no previous bariatric surgery.

Data were collected before LSG and one year after the surgery. Preoperative data involved the collection of the anthropometric measurements, obesity-related comorbidities, and a preoperative quality of life questionnaire. One year after the date of the surgery, during which the patients were contacted by telephone, e-mail, or social media, the same information was collected postoperatively. Only patients who accepted to participate and completed the questionnaire before, and within one year after surgery were included in this study. The obtained results were analyzed statistically.

The study was approved by the Ethics Committee of the "George Emil Palade" University of Medicine, Pharmacy, Science and Technology of Târgu Mureş, and was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all patients included in the study.

Study Outcomes

The primary endpoint of the study was the evaluation of QoL changes after LSG by using the BQL questionnaire[8,9]. The BQL was developed in 2005 and updated in 2009 and is a validated instrument that assessed patients' QoL before and after bariatric procedures. It consists of 30 questions divided into two parts. The first part consisting of 16 items assesses obesity-related comorbidities, gastrointestinal symptoms, and medication intake. The second part consisting of 14 items assesses QoL factors with a five-point Likert scale ranging from 0 to 5 points. The final score is calculated by adding all the item scores from both parts and ranges from 0 to 78 with a higher score representing better QoL. All patients received a questionnaire in English and an oral explanation for cases with difficulty understanding English.

Secondary endpoints were the evaluation of the weight loss process and postoperative resolution of comorbidities. The weight loss process was analyzed by the changes in body weight and BMI values and also by the percentages of excess weight loss (%EWL). The %EWL was calculated according to the formula: [100 x (baseline weight – weight at one year after surgery)/excess weight]. The excess weight was calculated by extracting the ideal weight (based on a BMI of 25 kg/m^2) from the baseline weight. Satisfactory weight loss after surgery was defined by %EWL greater than 50%. The presence and resolution of comorbidities were quantified according to the use and discontinuation of medication for arterial hypertension and diabetes in the postoperative period. The presence of GERD was defined when the typical symptoms (heartburn and regurgitation) were present. GERD was considered as *de novo* when symptoms appeared after LSG.

Table I. Weight loss process.

Evaluated parameter	Baseline mean ± SD (range)	After 1 year mean ± SD (range)	*p*
Body weight (kg)	129.4 ± 29.2 (88-95)	83.5 ± 20.8 (57-142)	< 0.0001
BMI (kg/m^2)	45.5 ± 8.2 (35.1-72.1)	29.3 ± 6.1 (20.1-47.9)	< 0.0001
Weight loss (kg)		45.8 ± 13.1 (24-80)	
% EWL (%)		85.1 ± 22.3 (39.7-143.3)	

BMI: body mass index; %EWL: percentages of excess weight loss; SD: standard deviation.

Surgical Technique

Our standard surgical technique was used in all cases, with the surgeon standing between the patient's legs. The pneumoperitoneum was performed with a Veress needle and five trocars were used. The greater curvature of the stomach was dissected starting 2 to 4 cm from the pylorus and extending up to the gastroesophageal junction. The stapling line began at 4 cm from the pylorus up to the angle of His, using a calibration bougie of 36 Fr. The staple line integrity was checked by the methylene blue instillation through a nasogastric tube and any bleeding at this level was controlled using metal clips. The resected stomach was extracted through the left port (12 mm trocar place) and a drainage tube was left in place for the next 48 hours. All surgical procedures were performed by the same surgeon.

Statistical Analysis

The results are presented as mean ± standard deviation (SD) or percentage. The Kolmogorov-Smirnov test was used to evaluate the assumption of normality in the data. Paired *t*-test and Wilcoxon test were conducted to analyze continuous variables, in accordance with data distribution. Fisher test was conducted to analyze categorical variables. The correlation between %EWL and BQL were assessed by using Pearson's *r* coefficient. The *p*-value less than 0.05 was considered statistically significant. All statistical analysis was performed with GraphPad Prism Software (version 9, San Diego, CA, USA).

Results

A total of 38 patients accepted to participate and were included in the study. Of these, 26 (68.4%) were women and 12 (31.5%) were men. The mean age of the group was 37.9 ± 11.2 years (range 19-64) and the mean preoperative weight was 129.4 ± 29.2 kg, with an average BMI of 45.5 ± 8.2 kg/m^2. Eleven (28.9%) patients had a preoperative BMI of above 50 kg/m^2. The follow-up rate was 100%.

A significant loss in weight was observed one year after surgery. The mean postoperative weight was 83.5 ± 20.8 kg and the mean %EWL was 85.1 ± 22.3%. Table I exposes more detailed weight loss data. The overall success rate, defined when %EWL is greater than 50, was encountered in 94.7% of the patients after one year.

Based on the responses of patients to the BQL questionnaire, the total preoperative score was 46.05 ± 7.01 points. After one year, there was a significant improvement in the total score with a value of 66.52 ± 5.53 (p<0.0001). Tables II and III show a more detailed analysis of the different BQL parameters, exposing a significant improvement in all aspects of QoL.

Table II. Total score and subscales scores of BQL questionnaire.

	Number of items	Baseline (mean ± SD)	After 1 year (mean ± SD)	*p*
BQL	30	46.05 ± 7.01	66.52 ± 5.53	< 0.0001*
QoL subscale	14	39.31 ± 6.99	58.28 ± 5.63	< 0.0001*
Non-QoL subscale	16	5.22 ± 1.66	7.08 ± 0.95	< 0.0001**

BQL: Bariatric Quality of Life index; QoL: quality of life; SD: standard deviation; *Paired *t*-test; **Wilcoxon test.

Table III. Items of QoL subscale of BQL (five-point Likert scale.

	Baseline	After 1 year	p
1) "I like my weight."	1.263	4.105	< 0.0001
2) "I can accept my weight."	1.736	4.342	< 0.0001
3) "How is your actual quality of life?"	2.684	4.236	< 0.0001
4) "I exercise regularly."	1.736	2.684	< 0.0001
5) "I am participating in social activities (theatre, etc.)."	2.526	3.473	< 0.0001
6) "I often meet friends or family."	4.026	4.447	0.0068
7) "I feel excluded from social life."	4.131	4.578	0.0008
8) "I feel under pressure because of my weight."	2.315	4.263	< 0.0001
9) "Sometimes, I feel depressed."	2.736	4.184	< 0.0001
10) "All in all, I feel satisfied in my life."	3.421	4.368	< 0.0001
11) "I feel restricted because of my weight."			
a) at home	3.105	4.421	< 0.0001
b) at work	3.210	4.394	< 0.0001
c) privately	3	4.315	< 0.0001
12) "I feel self-confident."	3.421	4.421	< 0.0001

We observed that BQL total score and %EWL was positively and significant correlated (r=0.479, p=0.002). In addition, QoL subscale was found to be significantly and positively correlated with %EWL (r=0.421, p=0.008).

Comorbidities were deemed present when the patients were under medication. Of the patients, 20 (52.6%) were hypertensive and 8 (21%) were diabetic. GERD was found in 11 (28.9%) cases, defined by the presence of symptoms reported by the patients, such as heartburn and regurgitation. Twenty-eight (73.6%) patients had chronic arthralgia. After surgery, a decrease in comorbidities was observed (Table IV). Arterial hypertension resolved in 14 patients out of 20 (70%) and diabetes in 4 patients out of 8 (50%). Of the initial 11 patients, 5 continued to suffer from GERD, and also 3 (7.8%) patients developed *de novo* GERD. A significant decrease in arthralgia was also observed.

All procedures were performed laparoscopically with no conversion to an open approach. Concomitant procedures were performed in 3 (7.8%) patients, all of them being cholecystectomies. Also, in the postoperative period, 2 (5.2%) patients developed cholelithiasis and were submitted to laparoscopic cholecystectomy.

Five (13.1%) patients suffered from postoperative complications. Two of them had gastric stenosis and were submitted to endoscopically balloon dilation, with good outcomes. Another two suffered from dehydration and were readmitted for symptomatic treatment with hydro-electrolytes. One patient developed acute pancreatitis and was treated with antibiotics, painkillers, and anti-inflammatory drugs, having a good evolution with remission of pancreatic inflammation. There were no leaks or bleeding, and no mortality in this series.

Discussion

Obesity is a disease not only through the risk of developing associated comorbidities, but it is also leading to a decrease in aspects of QoL. Bariatric surgery in addition to improving the QoL offers the patient a social, emotional, and psychological reintegration, along with weight loss and remission of obesity-related comorbidities. Among bariatric options, LSG gained wide acceptance as a stand-alone procedure with the largest global use[11,12].

Table IV. Obesity-related comorbidities before and after surgery.

Comorbidities	Before surgery n (%)	After surgery n (%)	p
Arterial hypertension	20 (52.6)	6 (15.7)	0.0014
Diabetes	8 (21.0)	4 (10.5)	0.3459
GERD	11 (28.9)	8 (21.0)	0.5970
Arthralgia	28 (73.6)	9 (23.6)	< 0.0001

GERD: gastroesophageal reflux disease.

This study reports a one-year follow-up of 38 obese patients who underwent LSG and who accepted to participate. Most of the participants were women (68.4%), and the mean age of the group was 37.9 years ranging from 19 to 64 years old.

There is a paucity of prospective studies which analyze QoL in patients who underwent LSG, before and after the procedure[7]. Therefore, this study aimed to explore this aspect using a validated questionnaire. Besides that, we also reported the weight loss process, resolution of obesity-related comorbidities, and finally the incidence of postoperative complications.

We used the BQL as an instrument for measurement, and we observed a significant improvement in QoL after LSG in our study. The BQL is divided into two subscales. The first one consisting of 16 non-QoL items, assesses obesity-related comorbidities, gastrointestinal symptoms, and medication intake. The second one consisting of 14 items, assesses QoL factors. The final score, adding all the item scores from both parts, range from 0 to 78 points with a higher score representing a better QoL[9,10].

Overall mean BQL score underwent an improvement from 46.05 ± 7.01 points preoperatively to 66.52 ± 5.53 points after one year (p<0.0001). The QoL subscale score also underwent an improvement (p<0.0001). These results are in line with other studies that also reported an improvement in QoL, using BQL as an instrument for measurement. Robertson et al[13] showed after one year, an improvement from 46.6 ± 7.8 to 49.6 ± 2.46 points in BQL total score, and from 39.5 ± 7.6 to 45.2 ± 10.3 points in the QoL subscale. In a study[14] presenting long-term data on QoL after LSG, the postoperative score of BQL was 48.2 ± 9.8 after ten years. The authors conclude that the BQL proved to be appropriate to evaluate the long-term effects of LSG on patient's QoL, therefore they recommend the usage of this questionnaire.

Preoperatively, in the QoL subscale, the worst scores were in item "I like my weight" (1.263) followed by "I can accept my weight" (1.736). After LSG both scores were improved significantly (4.105 and 4.342, respectively; p<0.0001). This shows that the main reason why patients appealed to LSG was a lower body image. It is known that obese patients have a lower body image compared with the general population[15]. In a study[16] that used a scale from 1 (very poor) to 5 (excellent) to scoring the body image, after one year of follow-up, they founded a score of 4.4 ± 0.8, similar to our results. Nickel et al[17] in a prospective study concluded that regarding age, gender, or type of bariatric procedure, QoL and body image improved significantly within six months after surgery and stayed stable within two years after surgery. Published studies[17,18] demonstrate that in patients seeking treatment for morbid obesity, the physical health domain is impacted more than the mental health domain.

Overall, every item of the BQL is improved in the present study, with a positive variation of the scores one year after surgery. Two previously published studies[11,19] that also used specific questionnaires to quantify the QoL before and after LSG, each of them using a different questionnaire, reported significant improvement of QoL after surgery. Therefore, using a specific tool seems to be more sensitive to detect amelioration of QoL.

Besides the QoL assessment, we evaluated the weight loss process also. The success weight loss rate, defined when %EWL is greater than 50, was encountered in 94.7% of the patients after one year, and was significantly correlated with overall BQL score (r=0.479, p=0.002), and with the QoL subscale (r=0.421, p=0.008) also. Like in our case, Noun et al[16] found that 50% EWL achieved at one year in 96.8% of the patients. In our study, the mean %EWL value was 85.1 ± 22.3%. This was in accordance with other published studies, for instance, Kirkil et al[20] found a mean %EWL of 89.9 ± 18.2% in a group of patients who were followed up nine to twelve months. In another prospective study[21] at one year after LSG, the mean %EWL was 82.0 ± 18.8%, and overall success rate (%EWL >50) was encountered in 96.1% of the patients. The conclusion was that LSG proved to be safe and highly effective in terms of weight loss, particularly in patients with a preoperative BMI lower than 40 kg/m^2.

Resolution of arterial hypertension was achieved in 14 patients (70%) and resolution of diabetes in 4 patients (50%). These results are in accordance with previously published studies[7,19]. A significant decrease (p<0.0001) was observed in patients with arthralgia also, where from the initial 28 patients who suffered, only 9 continued to have articular pain. Thus, we can state that weight loss facilitates movement by decreasing the impediment caused by excess weight.

One drawback of LSG is represented by the incidence of GERD, which can potentially influence the patients' QoL[22,23]. In our study, 11 patients had symptomatic GERD preoperatively.

After surgery, 5 patients continued to suffer from GERD, and 3 (7.8%) developed *de novo* GERD. This postoperative incidence is difficult to interpret as no specific investigation was made to objectify GERD. All patients who continued to suffer, reported daily proton-pump inhibitors (PPIs) usage. The precise prevalence of *de novo* or worsening GERD secondary to LSG is controversial. Yeung et al[24] in a recent meta-analysis included 46 studies totaling 10,718 patients who underwent LSG. Results indicated a 19% increase in GERD symptoms after LSG and a 23% incidence in symptoms for *de novo* GERD. Other postoperative outcomes included esophagitis in 30% of the cases, Barrett's esophagus (BE) in 6%, hiatal hernia in 41%, and use of PPIs in 38%, respectively. Also, the conversion rate to Roux-en-Y gastric bypass was found in 4% of the cases, due to severe reflux. The conclusion was that the postoperative prevalence of GERD, esophagitis, and BE following LSG was significant. There is no consensus in the published literature, regarding the investigation of GERD. Studies used a variety of methods to define and investigate GERD[24]. This varies from clinical notes to validated questionnaires, to objective investigations, or a combination of the above.

Strengths of this study include the prospective manner and the usage of a validated obesity-specific questionnaire. Another strength is represented by the QoL collected data both pre- and postoperatively. Also, all the procedures were made in the same manner by the same surgeon.

This study also has some limitations. The small number of patients enrolled, could be considered a limitation, although in literature there are published studies[25,26] which indicated that the number of included cases may be statistically sufficient to draw conclusions.

Some postoperative data collected from patients' interviews could be over or under-reported.

The follow-up period of one year in 38 obese patients who underwent LSG is short to be able to say that the procedure has been successful, but it still provides data and insights for future research.

Conclusions

To our knowledge, this is the first prospective study in our country, who uses BQL as an instrument for measuring the QoL of obese patients before, and one year after LSG.

At first glance QoL improves after one year, but a small proportion of patients may develop troublesome GERD postoperatively.

Larger studies and a longer postoperative follow-up period are required, in order to understand if there are significant differences in the QoL after LSG.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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Authors' Contribution

Conception and design: Marius Coroș, Flavius Mocian. Acquisition of data: Flavius Mocian. Analysis and interpretation of data: Flavius Mocian. Drafting the article: Marius Coroș, Flavius Mocian. Revising article critically: Marius Coroș. Final approval of article: Marius Coroș, Flavius Mocian.

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