

Bariatric surgery repercussions on the quality of life, biochemical profile, and blood pressure of patients with morbid obesity

Repercussões da cirurgia bariátrica na qualidade de vida, no perfil bioquímico e na pressão arterial de pacientes com obesidade mórbida

Repercusiones de la cirugía bariátrica en la cualidad de vida, en el perfil bioquímico y en la presión arterial de pacientes con obesidad mórbida

Lucas Silva Franco de Oliveira¹, Mauro Lúcio Mazini Filho^{1,2}, Juliana Brandão Pinto de Castro³, Henrique Menezes Touguinha⁴, Patrick Costa Ribeiro Silva⁵, Maria Elisa Caputo Ferreira^{1,2}

ABSTRACT | The indication of bariatric surgery (BS) for weight loss and reduction of obesity-related comorbidities is increasing. The objective of this study was to analyze the repercussions of BS on quality of life (QOL), biochemical profile, and blood pressure (BP) of morbidly obese individuals at three different moments: one month before, three months after and six months after BS. The sample consisted of 42 morbidly obese individuals from the BS program of a hospital in the city of Juiz de Fora – MG, Brazil. They were randomly divided into intervention group (IG, n = 21) and control group (CG, n = 21). The IG underwent surgical intervention and the CG was instructed to maintain the usual daily tasks throughout the study period, besides receiving nutritional monitoring. The QOL, biochemical profile, and BP were evaluated through the SF-36 instrument, laboratory blood tests obtained in the patients' medical records, and with the sphygmomanometer and stethoscope, respectively. The results showed a reduction in the biochemical variables HDL, LDL, VLDL, cholesterol, triglycerides, glycated hemoglobin, glucose, systolic blood pressure, and diastolic blood pressure in the IG 6 months after surgery. There was a significant improvement in the variables related to QOL, except in the emotional aspects. It can be concluded that

BS can positively affect most QOL domains, improve the biochemical profile and BP of morbidly obese patients 3 and 6 months after BS.

Keywords | Obesity; Obesity, Morbid; Bariatric Surgery; Quality of Life; Weight Loss.

RESUMO | A indicação da cirurgia bariátrica (CB) para perda de peso e redução de comorbidades associadas à obesidade é crescente. O objetivo do presente estudo foi analisar as repercussões da CB na qualidade de vida (QV), no perfil bioquímico e na pressão arterial (PA) de indivíduos obesos mórbidos em três momentos distintos: um mês antes, três meses depois e seis meses após a CB. Participaram da pesquisa 42 indivíduos com obesidade mórbida do programa de CB de um hospital da cidade de Juiz de Fora – MG, os quais foram aleatoriamente divididos em grupo intervenção (GI, n=21) e grupo controle (GC, n=21). O GI sofreu intervenção cirúrgica e o GC foi orientado a manter os afazeres diários usuais durante todo período do estudo, além de receberem acompanhamento nutricional. Foram avaliados a QV, o perfil bioquímico e a PA através do instrumento SF-36, do exame laboratorial de sangue obtido no prontuário

Study developed in the Laboratory of Studies of the Body (LABESC) of Faculdade de Educação Física e Desportos (FAEFID) of the Universidade Federal de Juiz de Fora (UFJF) – Juiz de Fora (MG), Brazil.

¹Laboratory of Studies of the Body (LABESC), Faculdade de Educação Física e Desportos (FAEFID), Universidade Federal de Juiz de Fora (UFJF) – Juiz de Fora (MG), Brazil.

²Graduate Program in Physical Education, Universidade Federal de Juiz de Fora (UFJF) – Juiz de Fora (MG), Brazil.

³Graduate Program in Exercise and Sport Sciences, Universidade Estadual Rio de Janeiro (UERJ) – Rio de Janeiro (RJ), Brazil.

⁴Department of Biomedical Engineering, Universidade Anhembi Morumbi – São Paulo (SP), Brazil.

⁵Faculdade de Educação Física, Faculdade de São Lourenço – São Lourenço (MG), Brazil.

Corresponding address: Lucas Silva Franco de Oliveira – Rua Ministro Amâncio Lopes Salgado, 89/501 District: Cascatinha – Zip-code: 36033-290 – Juiz de Fora (MG), Brazil – Email: lucasfranco06@yahoo.com.br – Finance source: This study did not receive any financial support of any nature for its conduction – Conflict of interest: Nothing to declare – Presentation: Oct. 3rd, 2017 – Accepted for publication: May 2nd, 2018 – Approved by Ethics Committee for Research in Human Beings from Faculdade de Ciências Médicas e da Saúde de Juiz de Fora – MG, Brazil, under opinion 728.087 e CAAE 30529514.1.0000.5103.

dos pacientes e do esfigmomanômetro e estetoscópio, respectivamente. Os resultados demonstraram redução nas variáveis bioquímicas *High-density lipoproteins* (HDL), *Low-density lipoproteins* (LDL), *Very Low-Density Lipoprotein* (VLDL), colesterol, triglicéridos, hemoglobina glicada, glicose, pressão arterial sistólica e pressão arterial diastólica no GI, após 6 meses de cirurgia. Houve melhora significativa nas variáveis relacionadas à QV, exceto nos aspectos emocionais. Conclui-se que a CB pode repercutir positivamente na maioria dos domínios da QV, na melhora do perfil bioquímico e na PA de pacientes obesos mórbidos após 3 e 6 meses de CB.

Descritores | Obesidade; Obesidade Mórbida; Cirurgia Bariátrica; Qualidade de Vida; Perda de Peso.

RESUMEN | La indicación de la cirugía bariátrica (CB) para pérdida de peso y reducción de comorbidades asociadas a la obesidad es creciente. El objetivo del presente estudio ha sido analizar las repercusiones de la CB en la calidad de vida (CV), en el perfil bioquímico y en la presión arterial (PA) de individuos obesos mórbidos en tres momentos distintos: un mes antes, tres meses después y seis meses después de la CB. Han participado de la investigación 42 individuos con obesidad mórbida del programa

de CB de un hospital de la ciudad de Juiz de Fora – MG, los cuales han sido aleatoriamente divididos en grupo intervención (GI, n=21) y grupo control (GC, n=21). El GI ha tenido intervención quirúrgica y el GC ha sido orientado a mantener los quehaceres diarios usuales durante todo el período del estudio, además de recibir acompañamiento nutricional. Han sido evaluados la CV, el perfil bioquímico y la PA a través del instrumento SF-36, del examen de laboratorio de sangre que ha sido obtenido en el historial médico de los pacientes y del esfigmomanómetro y estetoscópio, respectivamente. Los resultados han demostrado la reducción en las variables bioquímicas *High-density lipoproteins* (HDL), *Low-density lipoproteins* (LDL), *Very Low-Density Lipoprotein* (VLDL), el colesterol, los triglicéridos, la hemoglobina glicosilada, la glucosa, la presión arterial sistólica y la presión arterial diastólica en el GI, después de 6 meses de cirugía. Ha habido mejora significativa en las variables que han sido relacionadas a la CV, excepto en los aspectos emocionales. Se concluye que la CB puede repercutir positivamente en la mayoría de los dominios de la CV, en la mejora del perfil bioquímico y en la PA de pacientes obesos mórbidos después de 3 y 6 meses de CB.

Palabras clave | Obesidad; Obesidad Mórbida; Calidad de Vida; Pérdida de Peso.

INTRODUCTION

According to the World Health Organization (WHO), obesity is defined as abnormal or excessive accumulation of body fat in the form of adipose tissue, and may bring health risks. The worldwide prevalence of obesity more than doubled from 1980 to 2014. In 2014, more than 1.9 billion adults were overweight and 41 million children under 5 years of age had weight above that regarded as ideal¹.

Obesity is classified according to the Body Mass Index (BMI) calculation (body weight/height)². Therefore, grades I, II, and III obesity correspond to BMI values of 30.0 to 34.9, 35.0 to 39.9, and ≥ 40.0 kg/m², respectively, the latter being considered morbid obesity². Obesity is considered a disease with a complex and multifactorial etiology, including genetic, behavioral, metabolic, and environmental factors. In addition, it is directly associated with the risk of developing severe chronic diseases, such as diabetes *mellitus* (DM), cardiovascular diseases, dyslipidemias, obstructive sleep apnea, osteoarthritis, and certain types of neoplasia¹.

As this is a multifactorial phenomenon, a multidisciplinary and meticulous approach to it is required. Initially, the recommended approach is nutritional monitoring, indication of scheduled physical activities, and the use of specific drugs. However, such conventional treatment still has unsatisfactory results for grade III obesity, with 95% of the patients recovering the initial weight in up to two years³. Thus, the indication of bariatric surgery (BS) is becoming increasingly more common for the treatment of morbid obesity^{4,5}.

Surgical techniques differ according to the action mechanism, and can be restrictive of mixed, predominantly absorbing or restrictive⁶. The Fobi-Capella mixed technique is regarded as the gold standard, being the most used among all surgical procedures^{7,8}, providing low morbimortality and a proper resolution of comorbidities, without major nutritional compromises or gastrointestinal symptoms⁹. The BS arises as a form of treatment with potential for healing several comorbidities associated with obesity by standardizing glycemic and pressure levels and some blood variables, such as HDL, LDL, and triglycerides, with possible improvement in the quality of life (QOL) of the obese person¹⁰.

QOL can be defined as the individuals' perception regarding their position in life, in the cultural context and system of values in which they live, and in relation to their objectives, standards, and concerns¹¹. Medical theories of QOL, historically, are based on the cure and survival of people. However, many medical interventions cause unpleasant side effects in the postoperative period. In this sense, it is important to consider QOL during the treatment of morbid obesity¹².

Difficulties faced by obese individuals to buy clothes, use means of transportation, and even to maintain affective relationships, can influence the QOL, being one of the main reasons to search for BS. Given this context, investigating the weight loss with BS and the improved QOL of these individuals becomes very important. Some studies that conducted long-term monitoring (2 years) of patients post-bariatric surgery concluded the BS brings benefits to QOL; in the short term, however, little is known about possible modification in QOL and their repercussions¹³⁻¹⁶.

In Juiz de Fora – MG, the Hospital and Maternity Therezinha de Jesus (HMTJ), in a project of the Federal Government and the State of Minas Gerais, has been performing bariatric surgeries through the Brazilian Unified Health System (SUS) since 2009. Currently, the team consists of professionals from various files of health, performing evaluations and pre- and post-surgical monitoring. Due to the increasing number of surgeries performed in the HMTJ, knowing the entire postoperative picture became of paramount importance for the whole team involved, allowing the identification of needs presented by these patients.

Therefore, this study aimed at analyzing the repercussions of BS on the QOL, biochemical profile, and blood pressure (BP) of obese individuals a month before and three and six months after the BS.

METHODOLOGY

This is a descriptive, longitudinal, and prospective study, approved by the Committee of Ethics in Research with Human Beings of the School of Medical and Health Sciences of Juiz de Fora – MG, under opinion no. 782,087 and CAAE 30529514.1.0000.5103. All participants were invited to take part in the study and signed the Informed Consent Form, in accordance with the provisions of Resolution 466/12 of the National Health Council.

Participants

The participants of the research were morbidly obese patients of the bariatric surgery program of the HMTJ of the School of Medical and Health Sciences of Juiz de Fora – SUPREMA, located in the city of Juiz de Fora – MG. Individuals were evaluated in that hospital from October 2015 to October 2016.

Individuals (53) who met the following inclusion criteria were invited to participate in the study: both genders, aged from 18 to 65 years old, presenting grade III obesity with some associated comorbidity, and being literate. However, of these 53, 4 subjects who did not participate in some stage of data collection, 2 who reported incomplete data, 3 who died in some stage of research, and 2 who were not located during the postoperative monitoring were excluded from the research.

Thus, considering the inclusion and exclusion criteria, the sample consisted of 42 individuals (8 male and 34 female) randomly divided into an intervention group (IG, n=21) and a control group (CG, n=21). The IG was submitted to BS through the Fobi-Capella technique, and the CG was instructed to maintain the usual daily activities throughout the study period and to follow a diet with nutritional monitoring until the endocrinological assessment.

Tools

In this study, socio-demographic data were collected through a self-administered questionnaire, with direct and objective questions, to access personal data. For the anthropometric characterization of the sample, body mass measures were collected through a mechanical scale (Filizola®, Brazil), and height as assessed by a portable stadiometer (Seca®, Baystate Scale & Systems, EUA), in the physical therapy outpatient clinic of the hospital.

To evaluate the participants' QOL, the questionnaire Medical Outcomes Study 36 Item Short-Form Health Survey (SF-36) was used, validated and translated into Portuguese¹⁷. This is a generic QOL assessment instrument with 36 items, subdivided into eight domains: functional capacity; physical aspects; pain; overall health status; vitality; social aspects; emotional aspects, and mental health. It also includes an item that evaluates health changes occurred within a 1-year period. This tool is scored in a Likert-type scale; Each

SF-36 domain is calculated through the formula: [(value obtained - lowest value) x 100/score variation]. Data are analyzed by turning the answers to each domain into a score from zero to 100, resulting in a worse or better overall health status^{17,18}.

Biochemical data collection was carried out by the laboratory examination of blood obtained from the patients' medical records during the three moments of interest of the research, and in the pre-operative period this collection was conducted a month before the surgery. Results of total cholesterol, HDL, LDL, VLDL, triglycerides, vitamin B12, glycosylated hemoglobin, and glucose were recorded, in addition to the presence or absence of comorbidities and their types, through the diagnoses within the patients' medical records.

To assess BP, the participants remained seated for 10 minutes in a chair with back and arms support, with no crossed legs, and the first evaluation was computed by two trained technicians. The equipment used was a table BD manometer of mercury. A Tycos stethoscope was used, with mercury sphygmomanometer. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded. The right arm and wrist were used for this measurement. Each participant's BP was measured twice, with a minute of difference between each measurement. Thus, venous congestion was avoided and the BP variability remained to the minimum.

Procedures

Initially, patients who wished to perform the surgery in the HMTJ through SUS were referred to the Basic Health Unit (BHU) of their residence district and held a consultation with a general clinician. Then, the patient was referred to the HMTJ endocrinologist. In this consultation, the patient was submitted to an assessment on the real desire to perform the surgery and if there was indication for the procedure. After the indication for surgery was checked, the patient was referred to pre-surgical exams and multi-professional evaluation.

Upon arriving at the Department of Physical Therapy, a face-to-face meeting was scheduled with the obese subjects to clarify the study objectives and methods. Then, individuals who agreed to voluntarily participate in the study responded the questionnaires and underwent anthropometric evaluations. The SF-36 application, anthropometric evaluation, and BP

measurement were carried out with these same individuals a month before surgery and in the 3rd and 6th months after surgery, in the Physical Therapy outpatient clinic. Biochemical data were provided through electronic medical records.

Statistical analysis

A descriptive analysis was performed, calculating intra-group mean values and standard deviation of each of the measures related to biochemical and QOL variables (SF-36). Normality and homoscedasticity were observed (by Shapiro-Wilk and Levene tests, respectively) only in the biochemical and QOL variables of the SF-36, only in the analysis between times (1, 2, and 3). Thus, for the analysis of variance between times (1,2, and 3) in the biochemical, BP, and QOL variables of the SF-36, the one-way Anova test was used with the Tukey test as post hoc to identify any differences. Regarding intergroup analysis (time 3 of IG and CG) involving biochemical and BP variables, the Student's t-test was used. On the other hand, as normality was not detected in QOL variables of the SF-36 in the intergroup analysis (time 3 of IG and CG), the non-parametric analysis was adopted through Mann-Whitney U test.

For the parametric analysis, the effect size was determined by Cohen's *d* value for the Student's t-test and by the value of eta square (η^2) in the analysis of variance (one-way Anova). Regarding the non-parametric analysis, the effect size was determined by the *r* value proposed by Rosenthal and Rosnow¹⁹ and calculated by the following formula:

$$r = \frac{Z \text{ (value of the Mann-Whitney "U" test)}}{\sqrt{N} \text{ (squared root of the number of observations)}}$$

For both analysis, the significance level adopted was $p < 0.05$. All analyses were conducted using the statistical package *IBM SPSS Statistics* version 21.0.

RESULTS

Table 1 presents the general characterization of the sample. Most were female, aged from 31 to 45 years old (age: 38.2 ± 9.1 years), married, with children, and education level up to high school.

When analyzing the biochemical and hemodynamic variables six months after BS, an improvement in the levels of cholesterol, HDL, LDL, VLDL, triglycerides, glycated hemoglobin, glucose, SBP, and DBP was observed in IG, except in the vitamin B12 variable, as presented in Table 2.

Table 3 presents the anthropometric characterization and the biochemical variables of IG at the three different times of the study. A reduction in body mass, BMI, and in the levels of cholesterol, HDL, LDL, triglycerides, glycated hemoglobin, glucose, SBP, and DBP was observed over time. However, vitamin B12 levels showed no improvement.

Table 4 presents the QOL scores of the SF-36 six months after intervention. A significant improvement was observed in QOL-related variables, except in emotional aspects.

Table 5 presents the quality of life scores of the SF-36 for IG in the three different times of the study. A significant improvement was observed in QOL-related variables, except in emotional aspects.

Table 1. General characteristics of the sample (n=42)

Characteristic	GI	GC
Gender		
Female	15	19
Male	6	2
Age		
≤ 30 years old	3	3
31 to 45 years old	13	10
> 45 years old	5	8
Marital status		
Single	9	9
Married	10	10
Divorced	2	2
Number of children		
None	12	9
1 to 2	8	12
3 to 4	1	0
Education level		
≤ Elementary school	7	7
High School	9	14
Higher Education	5	0

IG: Intervention Group; CG: Control Group

Table 2. Biochemical and hemodynamic variables related to IG and CG six months after the bariatric surgery

Variables	Mean ± SD IG	Mean ± SD CG	t value	p	d
Total cholesterol	162.47 ± 22.37	184.38 ± 20.25	-3.326	0.001	1.02
HDL	52.90 ± 7.62	52.19 ± 9.26	0.272	0.786	0.083
LDL	87.38 ± 22.87	109.19 ± 18.71	-3.381	0.001	1.04
VLDL	22.19 ± 5.95	23.00 ± 11.19	-0.292	0.771	0.090
Triglycerides	98.61 ± 23.09	112.90 ± 23.22	-1.999	0.052	0.61
Vitamin B12	352.71 ± 106.05	348.80 ± 74.11	0.138	0.890	0.042
Glycated Hemoglobin	5.16 ± 0.25	5.90 ± 0.44	-6.572	0.000	2.06
Glucose	68.04 ± 2.85	84.28 ± 14.51	-5.028	0.000	1.55
SBP	125.23 ± 6.01	132.85 ± 10.55	-2.873	0.006	0.88
DBP	76.66 ± 10.16	89.52 ± 8.04	-4.544	0.000	1.40

IG: Intervention Group; CG: Control Group; HDL: High-density lipoproteins; LDL: Low-density lipoproteins; VLDL: very low-density lipoprotein; SBP: systolic blood pressure; DBP: diastolic blood pressure; d: effect size

Table 3. Mean ± standard-deviation of the BMI and biochemical and hemodynamic variables of the IG at the times 1, 2, and 3

Variables	Time 1	Time 2	Time 3	p	η ²
Body mass	120.0 ± 11.9	98.1 ± 10.3 ^a	80.9 ± 5.3 ^{a,b}	<0.001*	0.73
BMI	44.0 ± 5.4	36.0 ± 4.0 ^a	29.9 ± 3.0 ^{a,b}	<0.001*	0.67
Cholesterol	198.2 ± 38.9	169.6 ± 26.7 ^a	162.4 ± 22.3 ^{a,b}	0.001*	0.21
HDL	56.6 ± 10.1	49.2 ± 6.4 ^a	52.9 ± 7.6 ^b	0.019*	0.12
LDL	115.0 ± 32.6	97.2 ± 22.1 ^a	87.3 ± 22.8 ^{a,b}	0.004*	0.16
VLDL	27.2 ± 14.6	23.2 ± 8.1 ^a	22.1 ± 5.9 ^a	0.251	0.04
Triglycerides	108.1 ± 28.2	89.5 ± 24.8 ^a	98.6 ± 23.0 ^a	0.070	0.08

(continues)

Table 3. Continuation

Variables	Time 1	Time 2	Time 3	p	η^2
Vitamin B12	338.0 ± 47.6	356.2 ± 101.1	352.7 ± 106.0	0.782	0.008
Glycated Hemoglobin	5.92 ± 0.77	5.53 ± 0.68	5.16 ± 0.25 ^{a,b}	<0.001*	0.28
Glucose	91.71 ± 14.07	71.04 ± 5.42	68.04 ± 2.85 ^{a,b}	<0.001*	0.58
SBP	131.42 ± 13.52	125.23 ± 9.80	125.23 ± 6.01	0.126	0.013
DBP	81.90 ± 10.30	75.23 ± 9.80	76.66 ± 10.16	0.171	0.086

BMI – Body Mass Index; SBP: systolic blood pressure; DBP: diastolic blood pressure; HDL – *High-Density Lipoproteins*; LDL – *Low-Density Lipoproteins*; VLDL – *Very Low-Density Lipoprotein*; p: One-way Anova; *statistically significant difference, p < 0.05; a: p < 0.05 vs. pre-test; b: p < 0.05 vs. 3 months.

Table 4. Quality of life score of the SF-36 related to IG and CG

Domains	Rank Sum IG	Rank Sum CG	U	Z	p	R
Functional capacity	434.00	469.00	203.00	-0.427	0.668	-0.07
Physical aspects	569.50	333.50	102.50	2.955	0.003	0.46
Pain	479.00	424.00	193.00	0.679	0.497	0.10
Overall Health Status	405.00	498.00	174.00	-1.157	0.247	-0.18
Vitality	437.00	466.00	206.00	-0.352	0.724	-0.05
Social Aspects	504.50	398.50	167.50	1.320	0.186	0.20
Emotional aspects	507.50	395.50	164.50	1.396	0.162	0.22
Mental health	409.00	494.00	178.00	-1.056	0.290	-0.16

U: Mann-Whitney Test; Z: Standardized Score; p: Probability of significance; A: effect size

Table 5. Mean ± standard deviation of quality of life scores of the SF-36 of IG at times 1, 2, and 3

Domains	Time 1	Time 2	Time 3	p	η^2
Functional capacity	50.0 ± 23.5	66.0 ± 18.2 ^a	72.0 ± 16.4 ^{a,b}	< 0.001*	0.19
Physical aspects	70.0 ± 29.0	95.0 ± 13.1 ^a	95.0 ± 10.1 ^{a,b}	< 0.001*	0.19
Pain	53.0 ± 19.9	66.0 ± 19.8 ^a	76.0 ± 22.0 ^{a,b}	< 0.001*	0.17
Overall Health Status	46.0 ± 15.3	62.0 ± 14.4 ^a	71.0 ± 11.6 ^{a,b}	< 0.001*	0.38
Vitality	51.0 ± 17.5	53.0 ± 14.5 ^a	68.0 ± 14.8 ^a	< 0.001*	0.20
Social Aspects	62.7 ± 15.4	77.0 ± 15.5 ^a	92.9 ± 9.3 ^{a,b}	< 0.001*	0.44
Emotional aspects	73.0 ± 29.1	63.0 ± 23.9	71.0 ± 30.4	0.308	0.03
Mental Health	61.0 ± 20.7	62.0 ± 18.1 ^a	74.0 ± 21.6 ^b	0.018*	0.09

p: One-way Anova; *statistically significant difference, p < 0.05; a: p < 0.05 vs. Pre-test; b: p < 0.05 vs. 3 months.

DISCUSSION

This study verified a predominance of females searching for surgical intervention. The tendency of women to the accumulation of body fat may be related to the higher prevalence of obesity in females²⁰, as reported by the national²¹ and international¹ literature. Similar results have identified a greater search for surgical treatment by women^{6,22-25}, which may be related to the social pressure imposed on obesity²⁶.

In the biochemical profile, a reduction of glucose was verified in the IG. According to Silva-Neto et al.²⁷, anatomical and hormonal changes from the gastrojejunal

derivation technique assist the weight loss and the improvement or even resolution of type 2 DM (DM2). In the study of Carvalho et al.²⁸, individuals were evaluated in BS pre- and post-operative moments, being 15 with DM2 diagnosis and 5 with altered fasting blood glucose. At the postoperative moment the 20 patients had normal levels of fasting glucose and glycated hemoglobin, without the use of medication. This result can be explained by the reduction of the path between the stomach and the intestine, anticipating the food contact with the final part of the intestine and resulting in a increased production of incretins – substances that stimulate the production of insulin –, contributing to regulate the glucose

metabolism. In this study, the same surgical technique was used, which may justify the result found.

Regarding systemic arterial hypertension (SAH), the study of Carvalho et al.²⁸, which evaluated 47 patients between the pre- and post-operative moments, pointed a reduction of 28.7 mmHg in SBP and 20.8 mmHg in DBP, corresponding to 19.0% and 20.8%, respectively. A similar result was verified in another study²⁹ with 41 patients monitored for up to 1 year of BS postoperative period. In the preoperative period, 56% of the individuals had SAH and, after the surgical procedure, this number was reduced to 31.7%, and the use of hypertensive medication was suspended by more than 50% of the patients. These findings are in accordance with those of this study, showing that BS can be an instrument for combating SAH and DM in bariatric individuals.

In the sample study, an improved lipid profile was observed three months after BS. Vieira et al.³⁰ have found similar results when assessing the lipid profile of 30 patients submitted to BS in the preoperative period and three months after surgery. Also, they observed reduced levels of cholesterol, LDL, and triglycerides, suggesting that BS is important in reducing cardiovascular risks in obese individuals. In line with these results, Moreira et al.³¹ observed a significant decrease in total cholesterol and triglycerides levels 3 months after BS, corroborating the findings of this study.

According to Bordalo et al.³², the BS through the Bypass technique in Roux Y, by presenting a disabsorptive component, may cause shortage of some nutrients such as B12. For the authors, the deficiency of this water-soluble vitamin can occur six months after BS. However, it most often occurs after a year or more, which is in discordance with the findings of this study, in which the vitamin B12 levels were already low 3 months after surgery. On the other hand, Carvalho et al.³³ observed that, after six months, 76.9% of the patients with normal levels of vitamin B12 in the preoperative period had a reduction of the values regarded as normal, in accordance with this study.

Regarding the QOL scores found in the Functional Capacity domain, there was improvement over the three times, corroborating the study of Julian et al.³⁴, who observed improvement between the preoperative period and the 3rd and 6th month post-operation. Satisfactory results were also found in the study of Grans et al.³⁵, in which this domain improved 42 months after BS. According to other study³⁶, the BS provided significant increase in the ability to carry out activities of daily

living (ADLS), in addition to increase of comorbidities associated with obesity.

In this study, the domain Physical Aspects has shown improvements in the 3rd and 6th months after BS. Julia et al.³⁴ also registered an increase in values over the moments: preoperative (60.6), 3rd month of postoperative (74.3), and 6th month of postoperative period (81.5). Similar results were found in the study of Grans et al.³⁵, which revealed the value of 27.9 in the preoperative period and of 84.6 after 42 months of post-surgery. This results show that, over time, there was a reduction of limitations related both to work as to ADLS.

In the domain Pain, a reduction in its levels was observed throughout the period investigated. Duarte et al.¹⁸ evaluated 57 patients classified into three groups: DS, with 17 patients who underwent surgery with the Duodenal Switch technique; BGYR, with 20 patients submitted to the Gastric Bypass technique in Y of Roux; and group C, consisting of 20 patients candidates to BS. After the SF-36 questionnaire was applied, they observed that groups DS and BGYR obtained values 86.35 and 71.95, respectively, which were higher than groups C (24.90), corroborating the results of this study. Satisfactory results were also found in the study of Grans et al.³⁵, in which this domain presented values of 45.3 in the preoperative period and 77.1 after 42 months. Results found in this study show that the interference cause by pain when performing ADLS was reduced over time.

In this study, the mean scores found in Overall Health Status increased over the three moments. However, the result was smaller in comparison to other domains, which is consistent with other study³⁷ in which, despite of recording improvements, this domains presented the smallest results between the preoperative (39.30) and postoperative periods, between 4 and 36 months (56.09). In the study of Julia et al.³⁴, there has also been improvement between the preoperative and the 3rd and 6th month of postoperative period (48.1, 67.8, and 72.1, respectively), corroborating this study. Such result shows an improvement in the general perception of health.

Values found in the Vitality domain over the three times represent an increase of energy and reduction of fatigue. Overall, this increase in the willing to carry out activities was found in other studies^{34,37}, which observed similar results.

In line with other research^{34,35}, there was improvement in the domain Social Aspects over the period studied. Results observed in this study show an increased integration of these individuals in the social environment,

which can favor employment and social interaction. It is possible that the weight loss provided by the surgery make the individual recover the enthusiasm for performing activities that were previously hampered by the excess weight, in addition to stimulating the participation in groups tasks.

There was no statistically significant improvement in the domain Emotional Aspects, suggesting that BS did not change the emotional component, which is in line with the results pointed by other study³⁴. Therefore, emotional disorders can be found in obese subjects and also can manifest themselves before the obesity is installed, being considered a causative of the disease³⁸. A similar result was found in the study of Marcelino and Patrício³⁹, in which it was evidence that some of the individuals operated developed other types of compulsion (depression, anxiety, alcohol and other drugs dependency, for example), as forms to compensate the limited intake of food. The surgery causes the subject to be unable to eat as before; however, the compulsive behavior may continue, causing them to develop other disorders and seek new outlets. Another factor that may explain the result found is the insecurity and fear about the effects of the procedure, causing individuals to create expectations that, in some cases, are not achieved. Thus, the screening and monitoring of all aspects involving these individuals' health by the professional team is of paramount importance, especially in the emotional area³⁹.

As pointed by other studies^{34,40}, the domain Mental Health showed statistically significant improvement, similar to this study. Despite the reduction of mental health-related changes, such as anxiety and depression, this result cannot be only related to the weight loss provided by the BS, as the mental changes of these individuals may be a result of several causes. According to Oliveira et al.⁴¹, the rapid changes occurring in the body of the individual operated require a reflection about the emotional state, considering that a psychological work at this moment becomes extremely important and can help the patient to deal with the new body.

This study presented some limitations. Because this is a prospective study, losses may occur in the course of the research. However, the fact the researcher is inserted in the place of research, as well as the possibility of monitoring the three moments of interest, contributed to minimize sampling losses. Throughout the research, some difficulties were encountered, as the patient's attendance to the hospital in the evaluation steps as, since many of them did not reside in Juiz de Fora, it was necessary to request

support vehicles for transporting the individual to the Physical Therapy outpatient clinic. Another important point to be highlighted is the relevance of maintaining constant contact with patients in the postoperative period because the tendency is the distancing due to the monitoring period, and the patient ends up showing lack of interest in participating in the study.

CONCLUSION

Interventions with BS can have positive repercussions in the QOL, biochemical profile, and BP of morbidly obese patients, when the periods prior and after surgery are analyzed. It is expected these results have an impact on the lifestyle of each individuals and within their social and family groups, and not only on the biological aspect. However, the periodic monitoring of individuals operated is necessary to identify possible changes, both in aspects that integrate the QOL as in biochemical variables, making the intervention of the multi-professional team effective. Further studies to extend the time period covered by this study and to monitor the evolution of the variables analyzed for 12 months or more are suggested, aimed at identifying and evaluating preventive and therapeutic measures that contribute to the improvement of QOL and biochemical profile. Although the findings of this study are in line with research focused on the benefits of BS, it is important to highlight that the BS is a tool for weight loss, not a definitive solution.

ACKNOWLEDGEMENTS

We thank the instrumental support of the Laboratory of Studies of the Body (LABESC), of the Universidade Federal de Juiz de Fora (UFJF), Minas Gerais, Brazil.

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