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Food tolerance and nutritional risk after sleeve gastrectomy and Roux-en-Y gastric bypass in elderly patients with severe obesity: a prospective, randomized controlled trial

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ABSTRACT – Background – Bariatric surgery is still controversial in elderly patients with severe obesity. Most publications focus on safety and early clinical outcomes. Food tolerance and nutritional postoperative risk is unknown for this population. **Methods –** Thirty-six elderly patients with severe obesity were recruited for an open-label randomized trial from September 2017 to May 2019 comparing laparoscopic sleeve gastrectomy (LSG) to Roux-en-Y Gastric Bypass (LRYGB). Food tolerance was accessed by Quality of Alimentation (QoA) questionnaire and data on weight loss, body composition, and nutritional risk were collected between 6 and 24 months after surgery. **Results –** Comparing LSG to LRYGB patients, the latter had higher total weight loss (22% vs 31%, *P*=0.01) and excess weight loss (53% vs 68%, *P*=0.01). Food tolerance to eight food groups was similar between groups (14 vs 15 points, *P*=0.270), as Suter score (23 vs 25, *P*=0.238). Daily protein intake was below recommendation in both groups (40 vs 51 g/d, *P*=0.105). Nutritional risk, evaluated through Standardized Phase Angle (-1.48 vs -1.99, *P*=0.027), was worse for LRYGB group. **Conclusion –** Food tolerance and adequacy of food consumption were similar in both groups. LRYGB patients had higher nutritional risk.

Keywords – Bariatric surgery; feeding behavior; elderly nutrition.

INTRODUCTION

Despite the prevalence of 35% of obesity in older adults (aged 65 or older) in the American population, bariatric surgery in this group is still controversial[1]. Besides the greater risk of perioperative morbidity[2], specific nutritional aspects raise concern for these patients during postoperative follow-up: increased risk of sarcopenia with its impact on frailty and worse functionality after accelerated muscle mass decline post age 65 due to several age-related factors, such as neuromuscular degeneration, changes in muscle protein turnover, chronic inflammation, and sedentary lifestyle[3-5]; difficulty in food adaptation, due to functional capacity, hypodontia and dysphagia[6,7]; changes in food tolerance and eating behavior, such as perception of taste and smell[8,9].

Patients undergoing bariatric surgery go through a period of food readjustment that often courses with some degree of intolerance, mostly with regurgitation and vomiting after meals rich in protein[10], especially during the first year after the procedure, thus being more vulnerable to food and nutritional inadequacy and risk[11,12]. In this manner, the importance of investigating the occurrence of these outcomes in the elderly patient stands out, bearing in mind that knowledge about such findings is still incipient in the geriatric population.

The aim of this study was to compare postoperative food tolerance, adequacy of food consumption and the presence of nutritional risk in elderly patients with severe obesity who underwent laparoscopic sleeve gastrectomy (LSG) or Roux-en-Y Gastric Bypass (LRYGB).

METHODS

From September 2017 to May 2019, elderly patients with severe obesity were recruited for an open-label randomized trial, in which the outcomes of LSG were compared with those of LRYGB. Patients were assigned to either group using a computer-based block randomization with sealed envelopes after informed consent was obtained. A parallel design, with allocation 1:1 was adopted, considering inclusion and exclusion criteria as previously published[2]. The study protocol was reviewed and approved by the local Research Ethics Committee and registered at ClinicalTrials.gov (NCT03339791).

All patients assigned to the study were pre-operatively evaluated by a multidisciplinary team, and a geriatric consultation, with a Comprehensive Geriatric Assessment (CGA) consisting of a multidimensional evaluation of physical, mental, functional, social, and environmental aspects, was mandatory before surgery[2,13].

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After completion of preoperative clinical evaluation, eligible patients were admitted for a 2-week weight loss program with very low-calorie diet (VLCD), containing 600 kcal with an average 20% protein, 20% fat, and 60% carbohydrate[14]. Despite controversial in the literature, this weight loss program was intended to reduce perioperative morbidity, as advanced aged and super obesity are risk factors for severe complications[2,15,16].

Study allocation and randomization were performed right after admission, prior to weight loss. Surgery was performed by a single experienced bariatric surgeon, with both LSG and LRYGB according to standardized technique routinely used in our service, as previously published[2].

After surgery, patients had routine multidisciplinary follow-up. Postoperative nutritional plan and micronutrients supplementation were performed according to ASMBS Allied Health Nutritional Guidelines[6]. Besides regular follow-up, all patients had specific consultations between 6 and 24 months with a team of registered dietitian nutritionists focusing on this study data collection as detailed hereafter.

Assessment of weight loss, body composition and nutritional risk

Body weight, height and body mass index (BMI) were measured preoperatively in two moments: after hospital admission (maximum BMI) and before surgery, after the 2-week weight loss program (preoperative BMI); and postoperatively from 6 to 24 months after surgery. The percentage of total weight loss (%TWL) and the percentage of excess weight loss (%EWL) were calculated, considering the ideal weight for the individual, established by the average value of the eutrophic range for the elderly (BMI 25 kg/m^2)[17]. Electrical bioimpedance analysis (BIA) was adopted to assess body composition in the postoperative period, using a multiple frequency bioimpedanciometer (InBody 770®, GE Healthcare, USA).

From the values obtained for the phase angle (PA), the standardized phase angle (SPA) was calculated, from the reference values for the Brazilian population[18], using the following equation: SPA = [(observed PA – mean age and gender PA) / standard deviation for age and gender PA]. As described in other studies, the SPA value of less than -1.65 was adopted as the cutoff point for risk classification, which represents the fifth percentile of the normal population and can be considered as the accepted lower limit for a healthy population[19,20].

To monitor the effects of dietary changes on body composition, and to assess the nutritional risk, BIA tests were performed. The PA is a data derived from BIA, which can be associated with a series of health outcomes and used as a prognostic factor for cirrhotic, cancer, and critically ill patients[21-23]. In bariatric patients it can be considered a dimension of lean body mass[24,25]. Since body composition and, consequently, PA values are influenced by gender and age[26], reference values were established and validated for different populations, making it possible to calculate the SPA, which controls such variables[27]. Regarding the Brazilian population, SPA values below -1.65 are suggestive of the presence of nutritional risk[19,20].

Evaluation of caloric and protein consumption

Patients were instructed to complete three 24-hour food records, relating to 2 days of the week and 1 day of the weekend, describing all meals, detailing which foods were consumed at each meal, as well as their quantities, in measures homemade. Patients were also instructed to inform the consumption of dietary supplements and multivitamins, specifying the name of the product and the amount consumed. The questionnaires were then reviewed during the interview.

From the completed questionnaires, the food and its quantities were tabulated to ascertain the average energy and protein consumption, as well as the percentage of each macronutrient in the total energy value (TEV), from the insertion of data in the DietBox® software, so that the biochemical composition of the food was evaluated according to data from the nutritional composition table[28] and, when not available, from data on food labels.

The American Association for Bariatric and Metabolic Surgery (ASMBS) guidelines were considered as a parameter for protein adequacy[6], which recommend a consumption of 60 to 80 g of protein per day, or 1.1–1.5 g/kg of ideal weight. Despite the lack of evidence for protein intake in elderly patients undergoing bariatric surgery, nutritional orientation was focused on optimization of protein consumption and regular supplementation, with 30 g of albumin or whey protein, according to institutional protocol[29].

Assessment of food tolerance

Food tolerance in postoperative follow-up was assessed using the Questionnaire Quality of Alimentation (QOA), proposed by Suter et al., which consists of four sections of questions that evaluate overall satisfaction regarding quality of alimentation, timing of eating over the day, tolerance to several types of food, and frequency of vomiting/regurgitation. A composite score is derived from the answers, ranging from 1 to 27 points, where higher values correspond to better food tolerance[11]. It was translated and validated into Portuguese by Godoy[30], for rapid assessment of food tolerance in bariatric patients. The questionnaire was applied based on diet recall and self-reported by each patient.

Whenever needed, in order to improve chewing and food tolerance, patients with hypodontia and periodontal disease were evaluated by our institutional odontology referral team.

Statistics

Statistical analysis was made with R® 4.0.2. Wilcoxon-Mann test and X^2 were used for nonparametric variables, while Pearson correlation and student t test were used for parametric variables. A value of $P<0.05$ was considered statistically significant.

RESULTS

All 36 patients who underwent surgery, with equal distribution between groups, completed follow-up for 6 to 24 months, with a mean follow-up of 17 months for LSG and 22 for LRYGB. Regarding outcomes for weight loss, %EWL and %TWL were significantly higher for LRYGB patients, as seen in TABLE 1.

In both groups, the average protein consumption was below the recommendation for the postoperative period (at least 60 grams per day)[6]. In addition, only 16.7% and 22.2% of the patients in the LSG and LRYGB groups, respectively, reported consuming protein supplements regularly. There were no significant differences regarding food tolerance in any of the eight food groups and for the final Suter score (23 vs 25, $P=0.238$). On the other hand, comparison of SPA showed statistically significant worse results for the LRYGB group (-1.48 vs -1.99, $P=0.027$), which impacts on nutritional risk based on body composition evaluation, as seen in TABLE 2.

About food satisfaction, no significant difference was found

for parameters assessed by the QOA questionnaire (satisfaction with food and the occurrence of vomiting and regurgitation), as it can be seen in TABLE 3. However, data from this questionnaire regarding the consumption of protein-rich foods shows in FIGURE 1 that LSG patients had worse rates of good tolerance as compared to LRYGB patients for red meat (38.8% vs 61.1%, *P*=0.298), white meat (72.2% vs 88.8%, *P*=0.348), and fish (83.3% vs 88.8%, *P*=0.833).

TABLE 1. General characteristics of the population, categorized by surgical technique.

	LSG (18)	LRYGB (18)	*P*-value
Female gender, n (%)	18 (100%)	13 (72.2%)	0.045
Age, years ± SD	68.8±2.9	68.7±2.7	0.91
Follow-up, months ± SD	17.2±7.1	22.2±10.5	0.10
Maximum BMI, kg/m² ± SD	48.8±8.1	50.8±5.7	0.54
Preoperative BMI, kg/m² ± SD	43±5.4	46.7±4.8	0.04
Postoperative BMI, kg/m² ± SD	34.8±3.8	33±3.4	0.15
%EWL ± SD	53±19.8	68±13.4	0.01
%TWL ± SD	22±8.8	31±7.9	0.01

LSG: laparoscopic sleeve gastrectomy; LRYGB: laparoscopic Roux-en-Y gastric bypass; BMI: body mass index; SD: standard deviation; EWL: excess weight loss; TWL: total weight loss.

TABLE 2. Protein and energy intake, food tolerance and nutritional risk of elderly patients after surgical treatment for obesity, categorized by surgical technique.

	LSG	LRYGB	*P*-value
Protein intake, g/d ± SD	40±15.5	51±21.9	0.105
Energy intake, kcal/d ± SD	858±206	1070±270	0.118
Daily consumption of protein supplements (%)	16.7	22.2	–
Tolerance to eight food groups, points (min-max)	14 (12–15)	15 (14–16)	0.270
Suter score, points (min-max)	23 (19–25)	25 (21–26)	0.238
SPA ± SD	-1.48±0.71	-1.99±0.59	0.027

LSG: laparoscopic sleeve gastrectomy; LRYGB: laparoscopic Roux-en-Y gastric bypass; BMI: body mass index; SD: standard deviation; SPA: standardized phase angle. Classification of nutritional risk in SPA values below -1.65.

TABLE 3. Worst outcomes prevalence for satisfaction and intolerance symptoms.

	LSG (%)	LRYGB (%)	*P*-value
Satisfaction			
Poor/acceptable	33.3	22.2	0.46
Frequency of vomiting and regurgitation			
Daily/often	27.8	11.1	0.21

LSG: laparoscopic sleeve gastrectomy; LRYGB: laparoscopic Roux-en-Y gastric bypass.

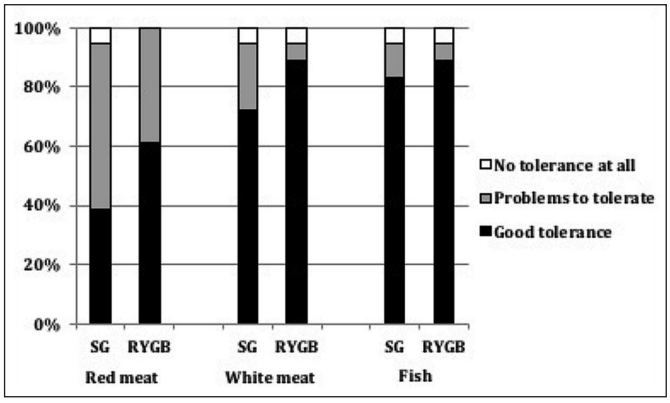

FIGURE 1. Elderly patient tolerance to protein-rich foods.
SG: sleeve gastrectomy; BGYR: Bypass gastrico em Y-de-Roux.

We observed that worse results for food tolerance may be associated with lower protein consumption, as there was a positive, although weak, association of the final score of the questionnaire in relation to the values of protein consumption (expressed in g/d), according to Pearson's correlation test (FIGURE 2). On the other hand, the results for food tolerance do not seem to be correlated with the %EWL, nor with the SPA values, for *P*<0.05.

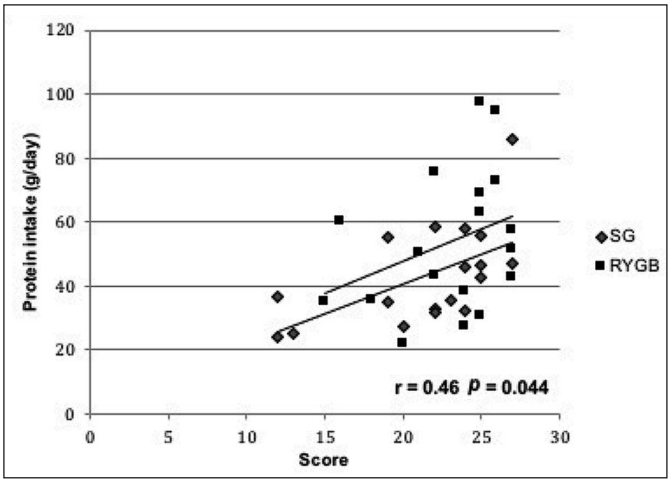

FIGURE 2. Correlation between daily protein intake and Quality of Alimentation questionnaire score.
SG: sleeve gastrectomy; BGYR: Bypass gastrico em Y-de-Roux.

DISCUSSION

The results of this randomized trial showed that elderly patients with severe obesity undergoing bariatric surgery have similar food tolerance and adequacy of food consumption for both LSG and LRYGB. During follow-up, %TWL and %EWL were significantly greater in the RYGB group, corroborating other publications[31,32].

In both groups, such weight loss occurred in parallel with an average protein intake below the minimum recommendations and low adherence to protein supplementation, despite recurrent counseling from the multidisciplinary team on the importance of protein intake. Some participants justified dietary changes to factors related to advancing age, such as hypodontia, poor adaptation to the use of dental prosthesis and demotivation to cook and eat

regularly after changes in family dynamics, whether due to the death of spouses or the departure of children from home.

In this study, the mean SPA values, as an indicator of lean mass and body composition, suggest a significantly higher prevalence of nutritional risk in the LRYGB group. As far as we can see, this is the first study that used SPA in bariatric patients as a means of identifying nutritional risk.

Symptoms of food intolerance, common in the first postoperative year, are associated with worsening quality of life, changes in dietary pattern and negative outcomes on body composition[33-35]. In this study, despite no statistically significant difference for these outcomes between groups, LSG patients had a worse profile of protein intake, consumption of protein supplements, food tolerance and regurgitation or vomiting. This result suggests that the low protein consumption can be explained, at least partially, by the presence of symptoms of food intolerance, evidenced by lower scores in the QOA questionnaire.

Differences in EWL and TWL seen between the two groups, with better weight loss results for LRYGB patients, cannot be explained by protein intake or food tolerance, as there was no statistically significant difference for these outcomes. Freeman et al., also showed no difference in food tolerance, while they presented similar results of EWL between SG and RYGB[36]. We believe that greater EWL for LRYGB can be explained by other mechanisms related to surgical aspects, such as gastrointestinal hormones and gastric emptying. Riccioppo et al., after functional and anatomical study of LRYGB patients, showed that faster gastric emptying was associated with better food tolerance and weight loss maintenance in long-term follow-up[37].

The study has limitations, especially due to lack of preoperative analysis of body composition, as we know that BMI is inaccurate to access nutritional status properly. A study on body composition would allow us to evaluate the trajectory of change in the compartments of fat mass and especially lean mass, but unfortunately the multiple frequency bioimpedanciometer to study BIA was not available at our institution during preoperative evaluation. The classification of nutritional risk based on the use of SPA is still incipient among bariatric patients, and its use requires further analysis to assess agreement with other markers. However, it may be useful as an early marker of malnutrition, signaling to the multidisciplinary team about the possible need for further interventions, in order to preserve or recover the nutritional status of the patients.

An important limitation refers to the lack of routine preoperative dental health evaluation, as we acknowledge its impact on food tolerance, especially in the elderly population. Another important limitation refers to short time of follow-up, characterizing this study as preliminary data. We intend to continue following these patients and address long-term outcomes in future publications.

CONCLUSION

Elderly patients with obesity have similar food tolerance and adequacy of food consumption after both LSG and LRYGB. With worse results in body composition analyzed by phase angle, LRYGB patients can have higher nutritional risk and, thus, should be followed more strictly.

Authors' contribution

Medeiros VG: data collection; statistical analysis; drafting the manuscript. Pajecki D and Dias MCG: conception of the work; manuscript supervision. Dantas ACB: statistical analysis; drafting the manuscript. Cleva R and Santo MA: critical review of the manuscript. We certify that all authors of this manuscript have participated in conceptualizing the research or content of the manuscript, in writing or critically editing the manuscript, and/or in analysis of data presented in the manuscript. Consent to submit has been received from all co-authors.

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Medeiros VG, Pajecki D, Dias MCG, Dantas ACB, Cleva R, Santo MA. Tolerância alimentar e risco nutricional após gastrectomia vertical e bypass gástrico em Y-de-Roux em pacientes idosos com obesidade grave: um estudo clínico prospectivo randomizado. Arq Gastroenterol. 2022;59(3):370-4.

RESUMO – Contexto – A cirurgia bariátrica ainda é controversa em pacientes idosos com obesidade grave. A maioria das publicações tem foco em segurança e desfechos clínicos precoces. A tolerância alimentar e o risco nutricional pós-operatório são desconhecidos para essa população. **Métodos –** Trinta e seis pacientes idosos com obesidade grave foram recrutados para um estudo clínico randomizado de setembro de 2017 a maio de 2019 comparando gastrectomia vertical com Bypass Gástrico em Y-de-Roux (BGYR). A tolerância alimentar foi avaliada pelo questionário de qualidade alimentar e dados sobre perda de peso, composição corporal e risco nutricional foram coletados entre 6 e 24 meses após a cirurgia. **Resultados –** Comparando os pacientes de gastrectomia vertical com BGYR, estes tiveram maior perda de peso total (22% vs 31%, *P*=0,01) e perda do excesso de peso (53% vs 68%, *P*=0,01). A tolerância alimentar para oito grupos foi similar entre grupos 14 vs 15 pontos, *P*=0,270), bem como o escore de Suter (23 vs 25, *P*=0,238). A ingestão diária de proteínas foi abaixo do recomendado para ambos os grupos (40 vs 51 g/d, *P*=0,105). O risco nutricional, avaliado através do ângulo de fase padronizado (-1,48 vs -1,99, *P*=0,027), foi pior para o grupo do BGYR. **Conclusão –** A tolerância alimentar e adequação do consumo alimentar foi similar entre os grupos. Pacientes submetidos a BGYR tiveram maior risco nutricional.

Palavras-chave – Cirurgia bariátrica; comportamento alimentar; nutrição do idoso.

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