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Cohort Study

Analysis of hepatic markers and lipid profile of patients submitted to gastric by-pass after 2 years – Cohort retrospective

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ABSTRACT

Objetive: To assess the impact of %PEP on liver indicators and lipid profile two years after BS.
Background: The prevalence of weight gain in the adult population continues to increase, 57.8% of the world's adult population will be overweight or obese by 2030.
Methods: This is a retrospective cohort and descriptive study, performed by consulting the database of an Obesity and Digestive Surgery Clinic in the city of Santa Maria – (Rio Grande do Sul, Brazil). The study included 351 patients (284 women, 67 men), aged at least 18 years, who underwent bariatric surgery from March 2014 to March 2016. The following data were obtained from the patients' medical records: Weight, height, age, sex, associated morbidities, biochemical parameters. The data were described by mean and standard deviation, median and interquartile range, count, and percentages.
Results: The results showed a significant reduction in excess loss, triglycerides (TG) and low-density lipoprotein (LDLc) cholesterol variables in the prospective period, while high-density lipoprotein (HDLc) cholesterol levels increased, thus minimizing the hepatic changes. There was a reduction in LDLc and an increase in HDLc at 24 months in both groups 1 and 2. Between 6 and 12 months, total cholesterol (TC) increased in group 2, however, in the period between 12 and 18 months, only G1 had triglycerides reduced. In the period of 18 and 24 months, there was a significant reduction in blood glucose in group 1. The variables AST and ALT were within the normal range, without significance. However, 84.3% of patients had grade I hepatic steatosis.
Conclusion: Bariatric surgery is effective in reducing the %EWL, modifying the lipid profile and liver markers up to 24 months after the bypass, reducing associated comorbidities. More research is needed to clarify the impact of %PEP on liver indicators and lipid profile two years after SB.

1. Introduction

The prevalence of weight gain in the adult population continues to increase, 57.8% of the world's adult population (3.3 billion people) will be overweight or obese by 2030 [1]. Although invasive, BC presents initial results of 50% excess weight loss (EWL), calculated by dividing the difference between the initial BMI and the final BMI, by the difference between the initial BMI and the "normal" target BMI." [2]. Changes in excess weight, liver parameters and changes in lipid profile in adults two years after the procedure would be of great importance for the implementation of control measures related to the health history of patients. The aim of this study was to evaluate the impact of %EWL on liver indicators and lipid profile two years after BS.

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2. Methods

This is a retrospective and descriptive cohort study, with a quantitative approach, carried out in an Obesity and Digestive System Surgery Clinic in the city of Santa Maria – (Rio Grande do Sul, Brazil). Data collection was performed in the clinic's database from March 2018 to March 2019. All patients with gastric bypass surgery from March to Roux-Y (RYGB) from 2014 to March 2016. The sample consisted of 351 adults of both sexes, at least 18 years of age, who have had BS for at least 2 years. The following data were collected from the patients' charts: a) Weight and height; b) age, sex; c) presence of morbidity d) biochemical parameters (TG, glucose, glycated hemoglobin, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, total cholesterol, ALT and AST). Ultrasonography indicates the degree of hepatic steatosis as follows (Grade 1 or mild: small accumulation of fat; Grade 2: moderate fat; Grade 3: Large accumulation of fat in the liver). All mentioned data were collected at patient visits according to clinical protocols (pre-surgery, 6, 12, 18, and 24 months after GB. At 24 months, %PEP was categorized into G1_ (<70%) and G2 _ (≥70%). The study is in full compliance with STROCSS [13] 2021 www.strocssguideline.com. The study was approved by the ethics committee of the Franciscan University (UFN) - nº 3.093.324 and CAAE: 04253218.0.0000.5306. Research Registry UIN: 7827 e.g.from https://www.researchregistry.com/browse-the-registry#home/registrationdetails/6261b775aaf33d001fae58c3/

2.1. Statistical analysis

The analyzes of quantitative data were described by mean and standard deviation. Median and interquartile ranges were used to break down distributive assumptions. Categorical data were described by counts and percentages. The analysis of the longitudinal variability of the quantitative medians (Glycated Hemoglobin, Glucose, ALT, AST, BMI and percentage of excess weight loss (%EWL), was evaluated by Generalized Estimating Equations, having as factors the interaction model between the two factors (<70% and ≥70%).

3. Results

For women, the mean age was 42.5 ± 11.3 years, the mean pre-surgical weight was 110.4 ± 17.2 kg and the mean BMI was 41.8 ± 6.4 kg/m2. Male, mean age of 40.4 ± 11.8 years, mean preoperative weight of 128.4 ± 22.8 kg and mean BMI of 42.0 ± 7.1 kg/m2. Pre-surgical age was one of the comorbidities presented by the patients, being higher among women with hepatic steatosis (40.4%) (Table 1). Of the 351 patients, 151 (43.0%) lost less than 70% of their excess weight, while 200 (57.0%) lost 70% or more. Of the 151 patients who lost less than 70% of their excess weight and 104 (68.9%) had steatosis, and of the 200 who lost 70% or more, 134 (67.0%) had steatosis. When comparing the degrees of steatosis between groups 1 and 2 (Table 2) there was no statistical difference. After analyzing the variables TG, HDLc, LDLc, AST and ALT, it was possible to observe that all post-operative patients had a reduction in weight, TG, total cholesterol and LDLc, while HDLc levels increased. In the TG analysis (Graph 1), it was observed that in the preoperative period (T1), all patients were overweight and had normal TG (125–135 mg/dL). After the procedure (six months), there was a reduction in weight and TG in both groups, with a statistically significant difference (p = 0.000). However, at T4 (18 months), only G1 that lost less weight (<70% PEP) showed a reduction in TG (p = 0.007). In the analysis (Graph 2), it was observed that all patients were overweight and had normal CT (≥190 g/dL) in the pre-operative period (T1). After the procedure (6 months), there was a reduction in weight and TC in both groups, with a significant difference (p = 0.000). At T3 (12 months), only the group that lost more weight (G2) showed a reduction in total cholesterol (TC) levels (p = 0.040). Graph 3 (HDLc) shows that all patients had HDLc levels above the

Table 1
Characteristics of demographic, anthropometric, and comorbidity data of patients selected for BC.

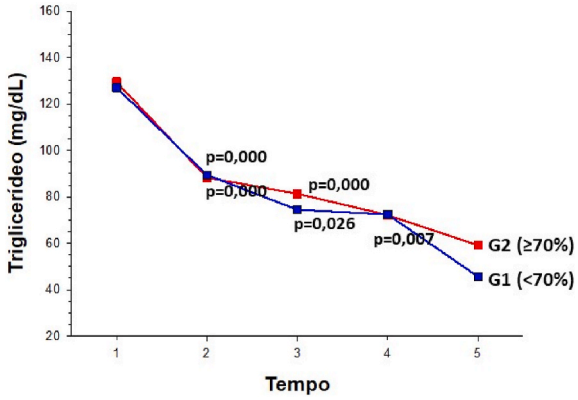
Characteristics	n = 351	
	Female	Male
Age (years) – mean ± SD	42,5 ± 11,3	40,4 ± 11,8
Gender – n (%)	284 (80,9)	67(19,1)
Esteatose hepática - mean ± SD	1,0 ± 0,5 (40,4%)	1,0 ± 0,4 (9,5%)
Weight (kg)		
Preoperative – mean ± SD	110,4 ± 17,2	128,4 ± 22,8
(24 months) – mean ± SD	69,4 ± 11,7	82,8 ± 14,0
BMI (kg/m^2)		
Preoperative – mean ± SD	41,8 ± 6,3	42,9 ± 7,1
(24 months) – mean ± SD	26,7 ± 4,5	27,0 ± 4,6
% EWL – mean ± SD	72,4 ± 15,9	74,1 ± 19,4

Mean ± SD – Standard Deviatin; BMI (body mass index); %PEP (percentage of excess weight loss).

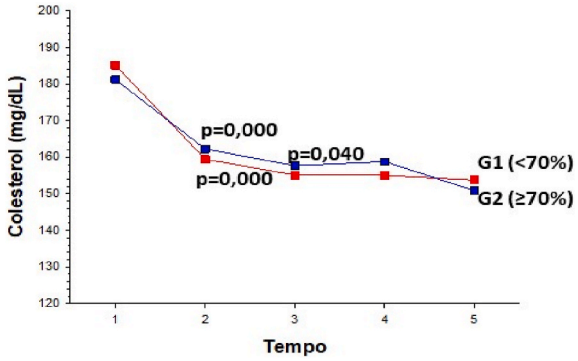
Table 2
Degrees of hepatic steatosis by excess weight loss group.

% EWL	<70% n = 104	≥70% n = 134
Degrees steatosis		
Degree I – n%	85 (81,7)	113 (84,3)
Degree II – n%	5 (4,8)	7 (5,2)
Degree III – n%	14 (13,5)	14 (10,4)

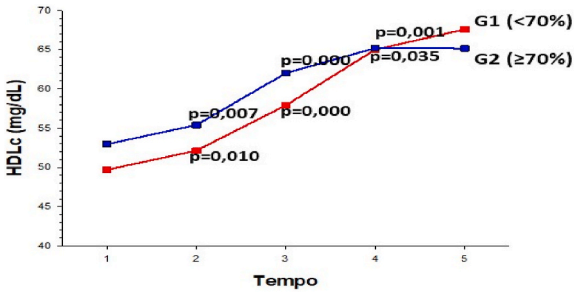
%PEP (percentage of excess weight loss), Degrees hepatic steatosis (Grade I – level of steatosis; Grade II – moderate steatosis; Grade III - chemical steatosis); Group 1 (<70%) e Group 2 (≥70%); n(%).



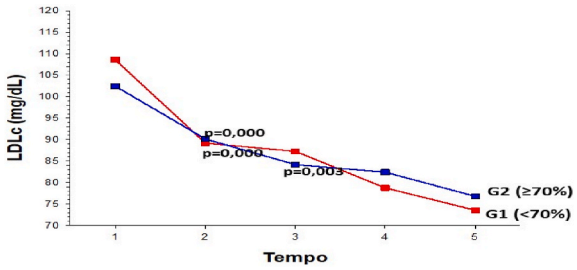
Graph 1. Relationship between triglycerides, time of surgery, and percentage of weight loss (%) TG/ Time/ %EWL.



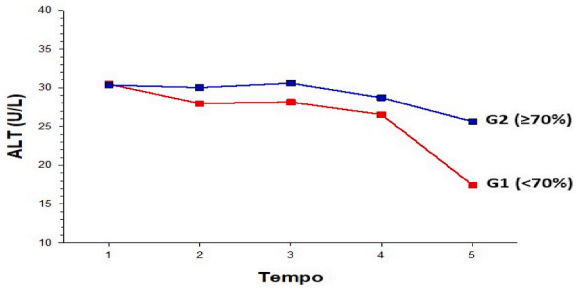
Graph 2. Relationship between total cholesterol, time of surgery and percentage weight loss (%) TC/ Time/ %EWL.



Graph 3. Relationship between HDLc, time of surgery and percentage weight loss (%) HDLc/ Time/ %EWL.

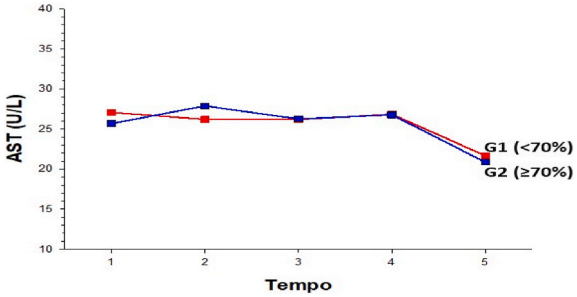


Graph 4. Relationship between LDLc, time of surgery and percentage weight loss (%) LDLc/ Time/ %EWL.



Graph 5. Relationship between AST, time of surgery and percentage weight loss (%) AST/ Time/ %EWL.

reference values (49–53 mg/dL) and were overweight in the preoperative period (T1). Six months after bypass, there was weight reduction and HDLc increase ($p = 0.010$ and 0.007) observed in both groups. In the period T3 (12 months) ($p = 0.000$) and T4 ($p = 0.001$ and 0.035), both groups presented increased HDLc, with similar results for both groups evaluated. The group that lost less weight (G1) increased HDLc up to 24 months. The group that lost the most (G2) also significantly increased HDLc up to 18 months, with a significant and stable relationship between groups 1 and 2. In the analysis of LDLc (Graph 4), it was observed



Graph 6. Relationship between ALT, time of surgery and percentage weight loss (%) ALT/ Time/ %EWL.

that in the preoperative period (T1), all patients were overweight and had LDLc. After six months, there was weight reduction and LDLc reduction ($p = 0.000$) observed for both groups. At T3 (12 months), G2 showed a decrease in LDLc levels ($p = 0.003$), maintaining a similar behavior between groups 1 and 2. In Graphs 5 and 6, which analyze the values of the hepatic parameters AST and ALT, we can see it was observed that all patients had normal levels of AST (5–40U/L) and ALT (7–56U/L) in the preoperative period, but there was a reduction in enzymatic levels, with no significant difference between G1 and G2, regardless of the % PEP.

4. Discussion

When analyzing the relationship between CB and the impact on excess weight loss in the present study, as well as in several previous studies, it is clearly effective [3,4]. Similar data were reported by other authors such as Kral et al. [3], who observed a satisfactory %PEP (>50%) in 94.7% of the patients investigated. The most prevalent pre-surgical comorbidity was HE (40.4%) among women. These data are also corroborated in the literature, as there is an inverse relationship between socioeconomic status and the prevalence of obesity in females [5,6]. In this study, it was observed that the reduction of %PEP with SB has beneficial effects on the lipid profile, further reducing liver markers. Liver markers were within normal levels. During the present study, there was a significant reduction in PEP (>70%) in the patients during the 24-month research period, with a reduction in hepatic and lipid factors. Marchesini et al. [7] studied the metabolic components in 304 individuals with liver disorders and found that more than 90% of patients with some degree of steatosis have at least one liver disorder. In our study, the lipid profile showed a reduction in TG, LDLc and TC, an increase in HDLc and a reduction in %EWL in the postoperative period, in both groups evaluated (G1 and G2), in the 24-month study period. According to Ângulo [8] and Soler et al. [9], the increase in triglycerides occurs during the development process of HE. According to Couillard et al. [10], the reduction of excess weight provides an improvement in HDL-c levels, which is accompanied by a decrease in the concentration of triglycerides, which is in agreement with the data of the present study, in which we observed that in the six months after the surgery, there is a significant reduction in TG. In the period from six to 24 months after surgery, patients who lost less weight (G1) had a greater reduction in TG associated with the control of abdominal obesity and IR, important factors for the reduction of HE. Data from this study corroborate the findings of Adams et al. [11] in which they state that the main treatment related to hepatic alterations is the loss of excess weight and the control of metabolic risk factors, a significant impact after BS in these two cases. CT levels in the first 6 months were reduced for G1 and G2, while at 12 months only G2 showed a reduction in CT. The significant improvement in the lipid profile observed in the present study, through the reduction of TC, LDL-c and TG, was also observed in other studies. Nassif et al. [12] found a reduction in TC, LDL-c and TG after 12 months of surgery. For HDLc, it was observed that 6 months and 12 months after the procedure, there was an increase in HDLc in both groups, with similar results in both G1 and G2. Both groups that lost less weight (G1) and more weight (G2) increased HDLc up to 24 months. Asztalos et al. [4] reported that an increase can occur after the third month of surgery. In the analysis of LDLc, it was observed that at six months there was weight reduction and LDLc reduction in both groups, while at 12 months.

When analyzing the relationship between bariatric surgery and its impact on weight loss, it can be seen that in the present research, as in several studies, this procedure has been shown to be quite effective. Understanding these motivational differences between men and women is of paramount importance, as they can be addressed, both preoperatively and postoperatively, in an attempt to bring patients' expectations closer to the real possible results to be achieved with bariatric surgery, including positive aspects (weight loss, improvement/remission of comorbidities) as well as negative aspects (need to adhere to a new

lifestyle and possible complications). However, the limitations of the study are mainly the non-attendance to follow-up appointments after surgery, as it makes searching in the database difficult. It is suggested that further studies are needed to clarify the impact of %EWL on liver indicators and lipid profile two years after SB.

5. Conclusion

In the present study, BC by the Roux-in-Y method is an important factor in weight loss, with a reduction around (±70%) of the %PEP, reducing liver markers (ALT and AST), lipids (CT, TG, LDLc and HDLc) and in the reduction of associated morbidities, improving the quality of life and health conditions related to obesity, in the 24 months after the surgical intervention. However, a possible limitation of the study is the sample size, it is a database with a small quantitative number of patients. This fact confirms the need to establish well-designed and long-term clinical trials, with an extensive database for a better understanding of the benefits of bariatric surgery in the control of hepatic steatosis. More research is needed to clarify the impact of %PEP on liver indicators and lipid profile two years after SB.

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There are no external sources of funding to support this study.

Author contribution

FFP and CMBM designed the study. . Data collection was carried out through the analysis of a database of patients from the Obesity and Digestive System Surgery Clinic, located in the city of Santa Maria - RS, from March 2018 to March 2019, who were informed to CB from March 2014 to March 2016, with the consent of the physician responsible for the clinic. Data analysis was performed by FFP and CMBM. Data interpretation was performed by FFP and CMBM. The first version of the manuscript was written by FFP, CMBM, DSM, AC, GCA, LDP and ACAM. All authors interpreted the results and collaborated with the interpretation/writing of the findings. All authors contributed and approved the final manuscript.

Ethical approval

The study was developed by the ethical precepts and approved by the Research Ethics Committee of Universidade Franciscana (UFN) under registration no. 3.093.324 and CAAE: 04253218.0.0000.5306.

Registration of research studies

1. Name of the registry: Flaviana Pedron
2. Unique Identifying number or registration ID: researchregistry7827
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): https://www.researchregistry.com/browse-the-registry#home/registrationdetails/6261b775aaf33d001fae58c3/

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Consent

Not applicable.

Provenance and peer review

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Declaration of competing interest

The authors declare no conflicts of interest.

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STROCSS 2021 guidelines apply to cohort studies as well as other observational studies (e.g. cross-sectional, case-control etc.)

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