

## Evaluation of Weight Loss and Quality of Life in Morbidly Obese Patients Undergoing Y De Roux Gastric Bypass Surgery with Reduction Ring and Without Ring, After The First Year of Follow-Up

Fabiana Tornincasa Franca<sup>1</sup>, João Kleber de Almeida Gentile<sup>2</sup>, Renato Migliore<sup>2</sup>, Pedro Marcos Santinho Bueno de Souza<sup>1</sup> and José César Assef<sup>3</sup>

<sup>1</sup>Assistant at the Department of Digestive Surgery at Hospital do Servidor Público Municipal (HSPM-SP). (HSPM-SP).

<sup>2</sup>Resident Physician at the Department of General Surgery at the Hospital do Servidor Público Municipal (HSPM-SP).

<sup>3</sup>Chief of the Department of Digestive Surgery at the Hospital do Servidor Público Municipal (HSPM-SP).

### \*Correspondence:

Rua Castro Alves, 60 - Liberdade, São Paulo – SP, CEP: 01532-000, Seção Técnica de Cirurgia do Aparelho Digestivo, 6º andar, Tel: (11) 3726-8591.

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### ABSTRACT

*Obesity is an epidemic disease in the modern world. The clinical therapies, when isolated, are not effective to weight loss and control in morbidly obese patients (BMI > 40 Kg/m<sup>2</sup>) in long term. Surgery is the only method proven effective to achieve these goals.*

*The Gastric Bypass Roux-Y (RYGB) is the most commonly performed bariatric surgery in the world including Brazil and is considered the gold standard of bariatric procedures because of its effectiveness in losing and maintaining long term weight loss associated with lower complication rates.*

*There is a discussion about the need of using the sylastic ring at the end of gastric pouch, when the RYGB surgery is done, surgery known as the Fobi-Capella, because the high incidence of complications related to the ring and the difficulty in the intake of solids. Today, many surgical teams perform Capella's surgery without placement the ring, with the argument that weight loss is similar without the limitations and complications related to the ring.*

*The proposal of this study is analyzing the need to use the ring in morbidly obese patients comparing the weight loss after one year and nutrition quality. Thus, we compared two groups of patients, first group submitted in 2009 to gastric bypass (RYGB with ring or Capella's surgery) and the second group operated in 2010 (RYGB without ring), analyzing the results for weight loss and quality of life after 1 year elapsed from surgery through established questionnaires as BAROS and specific questionnaires on nutrition quality. Of the total 21 patients, 12 patients were submitted to RYGB with ring and the other 9 patients were submitted RYGB without placement of the ring. The surgery is aimed at weight loss and resolution of comorbidities associated with obesity. It is considered an effective surgical technique when weight loss is greater than 50% of the overweight in 75% of patients. The study showed that both types of surgery, with or without the ring, reach the objective.*

*The study noted that patients submitted to RYGB with ring have an important restriction on the intake of meat, while the group submitted to RYGB surgery without the ring eat better foods rich in protein and has no postprandial vomiting, with a better-quality food.*

*Regarding quality of life, we observe significant improvement in all variables in both groups without statistical difference.*

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## Keywords

Bypass, Gastric; Bypass, Roux-en-Y Gastric, Obesity, Quality of Life.

## Introduction

Obesity is defined as an excessive accumulation of fat in the body's adipose tissue resulting from an imbalance between caloric gain and expenditure [1].

Morbid obesity is the high excess of body fat that induces the appearance of associated diseases, physically and socially debilitating the individual and leading to an increased risk of morbidity and mortality in relation to the eutrophic population [2].

There are several methods of determination and qualitative and quantitative classification of obesity that guide therapeutic approaches. Due to its ease of application, the body mass index, even subject to criticism, became universally used. It is also known by the index name of Quetelet [3].

The body mass index (BMI) is calculated by dividing the patient's weight, in kilograms, by the patient's squared height, in meters. According to the BMI, the population is stratified into thinness indices when the BMI is less than 18.5 kg/m<sup>2</sup>, normality, when the BMI is between 18.5 and 24.9 kg/m<sup>2</sup>, overweight, BMI between 25 to 29.9 Kg/m<sup>2</sup> and obesity when BMI is greater than 30Kg/m<sup>2</sup>. Obesity is classified as mild or grade I with BMI values of 30 to 34.9 kg/m<sup>2</sup>, moderate when the BMI is between 35 to 39.9 kg/m<sup>2</sup>, and high or severe with a BMI above 40 kg/m<sup>2</sup>. BMI above 50 kg/m<sup>2</sup> is called super or hyperobesity. Morbid obesity is defined when the BMI is above 40 kg/m<sup>2</sup> [3].

The objective of surgery is to cause substantial weight loss and, in this way, reduce obesity-associated morbidity and mortality, improving the patient's metabolic function and living conditions. Several studies prove that bariatric surgery is effective in reducing obesity-related comorbidities, in addition to additional benefits such as reducing the cost of monthly medication spent by the patient, reducing the number of days away due to illness and improving quality of life. A significant reduction in specific causes of mortality has also been clearly demonstrated [4,5].

The indications for the surgical treatment of obesity were outlined by the National Institutes of Health (NIH) in the Consensus Development Panel in 1991. The indication criteria must include three conditions: 1- BMI greater than or equal to 40 kg/m<sup>2</sup> or BMI greater than or equal to 35 Kg/m<sup>2</sup> associated with severe comorbidities such as diabetes, systemic arterial hypertension, sleep apnea and osteoarticular degenerative diseases; 2- failure to lose weight with clinical treatment for at least two years; 3- understanding the surgery and the process of dietary change by the patient [6].

Contraindications to bariatric surgery include patients with untreated major depression or psychosis, current drugs or alcohol

abuse, severe heart disease, prohibitive anesthetic risk, severe coagulopathy, and the patient's inability to comply with nutritional requirements, including replacement vitamin for life. Bariatric surgery with an advanced age (65 years) or very young (less than 18 years) is controversial, but it is considered when the BMI is very high or the comorbidities are very severe [7].

The types of bariatric surgeries are divided into three categories: restrictive, malabsorptive, and mixed, according to the predominance of changes in digestive physiology caused by the surgery.

Restrictive surgical procedures correspond to surgeries that only reduce food intake by decreasing the volume of the gastric chamber. They include vertical banded gastroplasty (GVB), laparoscopic adjustable gastric banding (BGAL) and vertical gastrectomy (GV). The RYGB surgical technique is the most common bariatric surgery performed in the world and in Brazil and is considered the gold standard among bariatric procedures due to its multiple mechanisms of action and maintenance of long-term weight loss [8].

Excessive weight loss after gastric bypass is permanent and adequate. On average, 62 to 68% of excess weight loss is reported after the first year. Initially, weight loss is usually rapid, but it reaches a plateau after 1 year with an average loss of 50 to 75% excess weight loss. Sustainable weight loss is seen in follow-up for up to 16 years, which makes this procedure an excellent tool for permanent surgical weight loss. The criterion for analyzing the good result of a surgical technique was an excess weight loss response of at least 50% in at least 75% of the patients [9,10].

Bariatric surgery is associated with high morbidity and low mortality. Overall mortality in the first thirty days after surgery is between 1 and 3%. Several factors have been associated with an increased risk of mortality such as: older age (over 65 years), male gender, chronic diseases and super obesity (BMI>50). The most common causes of early mortality are pulmonary embolism and complications related to fistulas [11,12].

Fobi et al advocate the use of a sylvastic ring in association with Roux-en-Y Gastric Bypass to decrease the gastric pouch emptying speed and prevent anastomosis widening over time [13].

Some evidence indicates that there is better long-term maintenance of weight loss in patients in whom the ring has been used. However, other studies demonstrate similar weight loss without the ring in the first year and, in the long term, weight maintenance [14].

There are studies comparing results, in terms of weight loss and quality of life, of patients undergoing RYGB with rings of different sizes. Larger rings are associated with similar weight loss and better food quality, while smaller rings have a greater need for removal due to greater food restriction [1,6].

In view of the above data, the surgical technique of RYGB without using a ring has been proposed by most groups. Observing the

works by Fobi et al, in order to improve quality of life and reduce complications such as vomiting, esophagitis, malnutrition, late hospital discharge, we decided to retrospectively reassess our patients in the last 2 years treated by the surgical technique of RYGB with and without a ring.

The performance of RYGB surgery at HSPM with a ring began in 2001, and since then 250 surgeries have been performed. From 2010 onwards, the RYGB surgery began without placing the ring.

The purpose of this study is to analyze the need to use the ring in patients undergoing gastric bypass between 2009 (Capella surgery) and patients operated in 2010 (without ring), comparing results regarding weight loss and quality of life after the first year of surgery through established questionnaires such as BAROS and specific food quality questionnaires.

## Objectives

In morbidly obese patients undergoing bariatric surgery using the Roux-en-Y Gastric Bypass (RYGB) technique with or without placement of the sylastic ring in the distal portion of the neocamera, assess for adequate loss of excess weight and the quality of life of both groups of patients through the questionnaire known as BAROS and by the specific questionnaire to assess food quality, after the first year of postoperative follow-up.

## Methods

The study was carried out retrospectively, in the gastrosurgery outpatient clinic of the Hospital do Civil Servant Municipal, from May to August 2011, through the review of medical records and the application of questionnaires to patients.

Patients' data regarding age, race and gender were analyzed, in addition to anthropometric measurements, such as weight, preoperative BMI and comorbidities present before surgery and 1 year after surgery, through the patients' medical records. Data on length of stay in the postoperative period and complications in the immediate postoperative period (30 days after surgery) such as vomiting, fistulas, reoperations and pulmonary thromboembolism were also analyzed.

Anthropometric data 1 year after surgery were obtained from information from medical records (absolute weight loss, percentage of weight loss, percentage of excess weight lost).

To calculate the ideal weight, a specific formula was used for morbidly obese patients undergoing obesity surgery, according to Monaco et al.

Men:  $PI = 61.2328 + [(A - 1.6002) \times 53.5433]$

Women:  $PI = 53.975 + [(A - 1.524) \times 53.5433]$ , where: PI=Ideal weight and H=Height.

Excess weight (EP) was calculated using the following formula:

$EP = PA - PI$ , where PA= current weight and PI= ideal weight.

The percentage of excess weight loss (% PEP) was established according to the formula:  $\% PEP = 100 \times PP$  (PP = weight loss)

Twenty-one patients who underwent bariatric surgery using the ROUX-en-Y Gastric Bypass (BGYR) technique described by Capella from March 2009 to August 2010 were evaluated. Patients operated on in 2009 underwent RYGB bariatric surgery with placement of a 6.5 cm long sylastic ring, with the gastrojejunal passage having a 1.2 cm diameter. Patients operated on in 2010 underwent bariatric RYGB surgery without the placement of a sylastic ring.

The surgical technique used in the patients was the technique known as RYGB by laparotomy, which consists of performing a gastric pouch of 20 ml in volume and 6 cm in length from the gastric esophagus transition, through the small gastric curvature. The pouch is made using a 60 mm linear stapler that cuts the stomach and at the same time staples (mechanical suture) the double wall. Next, the angle of Treitz is identified and the jejunal loop is measured 60 cm distally from it, sectioning it at this level. This segment corresponds to the so-called biliary loop into which gastric secretion from the excluded stomach, bile and pancreatic juice pass. Immediately after the section, 100 cm distally is measured and the biliary loop anastomosis is performed at this level. This 100 cm jejunum loop corresponds to the food loop that will be anastomosed to the gastric neocamera.

The surgical procedure was always performed by the same surgeon. The only difference between the two studied groups, regarding the surgical technique, was the placement or not of the sylastic ring around the gastric pouch. The gastro-jejunal anastomosis was performed manually and calibrated with a #34 Fouchet probe in both surgeries. The ring consists of a sylastic tube (6.5 cm long), which is an anergic synthetic plastic material. Inside this tube a thread of prolene is placed. The wire loops are tied and in this way the ring surrounds the distal portion of the neocamera creating a passage of 1.2 cm in diameter. This ring causes a restriction of the emptying of the neocamera.

Patients are followed up at the outpatient clinic of this service with appointments every 3 months in the first year of surgery, with weight loss, laboratory tests related to nutritional aspects, food quality, improvement of obesity-related comorbidities, reduced use checked. of medications and late complications.

As for the assessment of the patients' quality of life, two questionnaires were applied: A) Food quality questionnaire with objective questions about the acceptance of foods such as meat, vegetables and fruits, in addition to the variety and frequency consumed. The existence of food vomiting and Dumping syndrome was also analyzed [13,15,16].

Data were processed in Excel, version 6.0 and Statistical Analysis System (SAS), version 8.02, and a descriptive analysis was performed, characterizing the studied group and verifying the relationship between the variables age, sex, weight, BMI, %WBS and quality of life and the follow-up time in the period of 12 months.

The measures of central tendency (mean and median) and variability (maximal, minimum and standard deviation) were used to describe the numerical variables and frequency distribution for the categories.

To calculate the percentage of excess weight loss, the formula used in the study carried out by Monaco et al..

To verify the association between numerical variables in relation to the study group (with and without ring) the Student t test was applied and in the case of non-verification of normality, the Mann-Whitney U test was adopted. The Shapiro-Francia test was applied to verify the normality of the data.

Fisher's exact test was used to compare categorical variables and the study group with a significance level of 5% was considered in all statistical tests, and the computer program Stata version 7.0 (StataCorp) was used to perform the analyzes Statistics.

## Results

Of a total of 21 patients, RYGB surgery with ring placement was performed in 12 patients from May to December 2009 and the other 9 patients underwent RYGB surgery without ring placement from January to August 2010. groups are comparable in terms of gender, race and preoperative BMI, but the mean age was statistically higher in the ring group

In the ring group, of the 12 patients, 10 patients (83.3%) are female and 2 patients (16.7%) are male. The group without a ring is composed of 9 patients, 6 (66.7%) female and 3 (33.3%) male.

Regarding the patients' race, in the ring group, 7 patients (58.3%) were white and 5 patients (41.7%) were black. In the group without a ring, 7 patients (77.8%) are white and 2 patients (22.2%) are black.

The mean age of patients in the ring group is 47.8 years, with the youngest patient being 40 years old and the oldest being 61 years old. In the group without a ring, patients have a mean age of 40.8 years with a minimum age of 34 and a maximum age of 49 years. It is observed that the mean age of patients wearing a ring (47.8 years) was higher than those without a ring (40.8 years) and this difference is statistically significant ( $p=0.025$ ).

The average preoperative weight in the group with a ring was 119.5 kg with an average BMI of 46 kg/m<sup>2</sup>. Patients without a ring had a mean preoperative weight of 119.8 kg with a mean BMI of 43.5 kg/m<sup>2</sup>, with no statistical difference.

Of the 12 patients with a ring, 2 patients (16.7%) had no comorbidities, 5 patients (41.7%) had hypertension, 1 patient (8.3%) had diabetes, 3 patients (25%) had hypertension and diabetes and 1 patient (8.3%) had hypertension and dyslipidemia. Of the 9 patients without ring placement, 1 patient had no comorbidities (11.1%), 5 patients (55.6%) had hypertension, 1 patient (11.1%) had hypertension and diabetes, 1 patient (11.1%)

had hypertension and dyslipidemia and 1 patient (11.1%) had hypertension, dyslipidemia and diabetes. The measurement of weight after 1 year of surgery in the group with a ring was an average of 73.7 kg and the average BMI was 28.3 kg/m<sup>2</sup>. In the group without a ring, the average postoperative weight was 81.8 kg and an average postoperative BMI of 29.6 kg/m<sup>2</sup>. Weight loss 1 year after surgery in the group with a ring was 45.8 kg, ranging from 37-67.5 kg, and in the group without a ring, 37.9 kg, ranging from 29.3-44.9 kg.

The percentage of weight loss in the group with a ring was 38.2% and in the group without a ring it was 31.9%. The percentage of weight loss shows that the mean of the group with a ring was higher than the group without placing a ring and this difference was statistically significant ( $p = 0.018$ ), but when analyzing the mean of the percentage of excess weight loss, in the group with a ring it was 76.8% and in the group without a ring it was 67.8%, with no statistical difference. The variation in the percentage of excess weight loss showed that all patients lost more than 50% excess weight, with a variation of 52.6-89.1% in the group with a ring and a variation of 51.4-95.5% in the group without ring.

Regarding the length of hospital stay after bariatric surgery, the average length of stay was 9 days, with a range from 4 to 27 days for patients who had a ring inserted, while patients who did not have a ring were hospitalized for an average of 5, 7 days with a variation of 4 to 13 days. The median length of hospital stay for the group with a ring was greater (6.5 days) than the median for the group without a ring (5 days). This difference is statistically significant ( $p=0.036$ ).

Postoperative vomiting was observed in 3 patients (25%) in the ring group, while in the non-ring group only 1 patient (11.1%) had this symptom in the immediate postoperative period.

Among the early complications, a fistula in the gastric pouch of a patient (8.3%) in the ring group was identified, undergoing clinical treatment without the need for surgery. In the group without a ring, there was also a fistula in one patient (11.1%) with formation of a subphrenic abscess and need for surgical drainage on the tenth postoperative day.

In the ring group, 3 (25%) patients needed to remove the ring in the postoperative follow-up due to extrusion, food intolerance or megaesophagus. Late complications were not found in the group without ring placement.

Among the patients with comorbidities, which corresponded to 18 patients (SAH, DM and/or dyslipidemia), 10 patients in the ring group and 8 patients in the non-ring group. In the group with a ring, eight (80%) of the 10 patients progressed with resolution of comorbidities, while in the group without a ring, of the 8 patients with comorbidities, all (100%) had resolution of the same after 1 year of surgery, no longer requiring the use of medications such as antihypertensives or hypoglycemic agents. Only 2 patients did not evolve with resolution of postoperative comorbidities and

belonged to the ring group. Although there was no resolution, these comorbidities improved, reducing the use of medications (20% of patients in the group without ring).

Regarding food quality, frequent meat consumption is normal in only 6 patients (50%) in the ring group and in all patients (100%) in the non-ring group. Half of the patients in the ring group (50%) are never able to consume meat, or do so infrequently, and this association was statistically significant ( $p=0.019$ ).

As for the frequency of postprandial vomiting, in the 1-year follow-up of surgery, it was observed that 7 patients (63.6%) of the group that placed the ring reported vomiting after eating, while only 1 patient (11.1%) reports vomiting in the group without a ring, and this difference is statistically significant ( $p=0.028$ ).

Also in relation to food quality, both groups reported good acceptance of vegetables, fruits and bread, in addition to good food variety. Regular vegetable consumption was seen in 10 patients (83.3%) in the ring group and in 7 patients (77.8%) in the non-ring group. A good variety in eating fruit was observed in 11 patients (91.7%) in the group with a ring and in 8 patients (88.9%) in the group without a ring. Bread intake was observed in 11 patients (91.7%) in the ring group and in all patients (100%) in the non-ring group. The food variety was not restricted in either group, and all patients (100%), with or without a ring, showed food variety close to normal.

Regarding the dumping symptom, 9 patients (75%) in the ring group presented dumping and 4 patients (44.4%) who did not put on the ring reported this symptom frequently.

When analyzing the results of the application of the BAROS questionnaire, it is observed that both groups have improved quality of life, translated by improvement in self-esteem, physical fitness, involvement in social activities, ability to work and sexual interest, not observing statistically significant differences between the variables.

## Discussion

Surgery is the only proven effective method to achieve the treatment goals of the morbidly obese. Currently, with the refinement of surgical techniques, anesthetics and improved intensive care, surgery for morbid obesity has become more feasible, considerably reducing operative time, surgical morbidity and mortality, and consequently, mortality (1 to 3%).<sup>20,24</sup> The indication for surgery follows well-established criteria dictated by the regulations of the Brazilian Society of Bariatric and Metabolic Surgery and by the Federal Council of Medicine itself.

At the Hospital do Civil Servant Municipal (HSPM), bariatric surgery has been performed since 2001, with more than 250 operated cases. The surgery performed is the Roux-en-Y Gastric Bypass (RYGB) with ring placement, the most common technique in Brazil and in the world, performed in our service by the same bariatric surgeon.

It is important to emphasize that bariatric surgeries at the HSPM are always performed by the same assistant, so the surgical technique performed is strictly the same proposal and standardized by Fobi-Capella. From 2010 onwards, it was decided to perform bariatric surgery using the RYGB technique without placing the ring. In order to analyze the results of the techniques employed in the bariatric surgery service at the HSPM, we propose to compare the results of the groups operated by the RYGB technique with and without a ring, regarding weight loss and quality of life analyzed by the BAROS questionnaire and evaluation of food quality after 1 year of surgery follow-up.

Fobi-Capella surgery is considered the first choice in bariatric surgery services and achieves an average weight loss of 40% of the initial weight with relapse rates below 5% [17]. The placement or not of the ring in the Roux-en-Y gastric bypass are surgical procedures described in the literature and can be used because they cause considerable weight loss.

Recently, several studies analyze not only the weight loss of bariatric surgery, but also the change in the quality of life and food variety of patients 1 year after surgery [18,19]. This more current concern led to changes in surgical techniques in search of effective results in weight loss and resolution of comorbidities, as well as preserving good food quality.

Crampton et al demonstrated that patients undergoing Roux-en-Y gastric bypass have better food quality after placement of a 6 cm extension ring than after placement of a 5.5 cm ring. Weight loss is comparable and can be maintained by the improved tolerance for fiber, low-energy foods, and a slightly greater propensity for dumping and milk intolerance seen in patients with larger rings. This demonstrates that food quality can vary drastically with the size of ring used, that is, rings with greater length and therefore larger diameter of the gastric neocamera outlet, cause less intolerance to solid foods. The removal of the ring was not a measure taken to improve weight loss but to have quality food in the long term [16].

We observed, over time, that several authors needed to progressively increase the diameter of the ring, mainly due to great food restriction. However, the effectiveness of the surgery in losing weight and resolving comorbidities remained the same.

Some of the patients who underwent RYGB surgery with a ring in the bariatric surgery service of the HSPM had the same complications as the sylastic ring, requiring removal of the ring by endoscopy or surgery.

Due to these aspects, we started to perform the RYBG surgery without placing the ring as recommended by authors such as Balsiger, Sears D, Adams TD [5,14,18] from the year 2010 to the present day.

It is well established that total weight loss peaks 12 months after the operation, averaging 100-120 pounds (45-54 kg). 71,72

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Patients treated with Roux-en-Y Gastric Bypass lose most of their weight in the first year, 40% of their initial weight.

On average, a RYGB patient will achieve about 65% excess weight loss or 35% of initial weight in two years. This average is reached 1 year after surgery noting that 12 months after surgery is the appropriate period to assess the effectiveness of weight loss resulting from the surgical treatment.

Based on these data, the study analyzed the two groups of patients regarding weight loss, 1 year after surgery. We also assessed pre- and post-operative BMI.

The 2 groups studied had demographic variables such as gender, race, weight and preoperative BMI, which were statistically similar and comparable.

Only in relation to age, the groups show statistically different differences. The group with a ring has a higher mean age (47.8 years) than the group without a ring (40.8 years) (Graph 1). There is a tendency for weight gain to be progressive with increasing age. In addition, just as there is greater weight gain with increasing age, there would also be greater difficulty in losing weight in a group of older patients. seniors. This would imply that the weight loss in the group with a ring should be smaller with surgery, and this was not observed, since the percentage of weight loss in the group of patients with a ring was statistically higher than in the group without a ring.

The variation in BMI after one year of surgery showed that in the 2 groups all patients were no longer morbidly obese (BMI > 40 kg/m<sup>2</sup>), with a variation in their BMI between 23.1 to 35.8 kg/m<sup>2</sup>, after 1 year of surgery.

The definition of the effectiveness of bariatric surgery is the loss of 50% excess weight in 75% of operated patients. In the study, it is observed that all patients (100%), both in the ring and non-ring groups, lost more than 50% excess weight, demonstrating an adequate result of the surgery with the surgical technique used.

The group of patients with a ring has a statistically higher percentage of weight loss than the group without a ring, but when the mean percentage of excess weight loss is assessed, the two groups do not show any statistical difference.

Many studies of gastric bypass report 65-75% loss of excess weight [20]. The average loss of excess weight was 66% for Shen R et al, similar to Schauer et al who was also 68% at 1 year after surgery. The study obtained an average percentage of excess weight loss of 76.8% (group with ring) and 67.8% (group without ring), results comparable to the literature.

The association between the average weight of a certain population group and the prevalence of diabetes, cardiovascular diseases, respiratory diseases, dyslipidemia, hypertension, cancer and psychiatric disorders have been repeatedly observed [4,14,18,20].

Data from the "Framingham" study and from several other studies that followed the clinical evolution of patients after weight reduction, observed a considerable decrease in the morbidity and mortality rates of these patients, further encouraging the development of effective therapies against obesity [9,10].

Weight loss considerably contributes to the regression of comorbidities present in the preoperative phase, allowing the suspension of anti-hypertensive, anti-diabetic, analgesic and anti-inflammatory medications in most cases [18].

The improvement in comorbidities after bariatric surgery is very well documented [18-20]. The improvements and even resolution seen in comorbidities such as hypertension, diabetes and dyslipidemia are particularly important and are associated with improved life expectancy.

The study also analyzed these three obesity-related comorbidities, as they are the most frequent and have the highest morbidity and mortality. In the 2 groups, the vast majority (83.3% of patients in the ring group and 88.9% of patients in the non-ring group) had at least one of these three comorbidities. A resolution of comorbidities was observed in 80% in patients with ring placement and 100% resolution in the group without a ring, demonstrating a high rate of resolution of these diseases after one year of surgery. The small percentage of patients without complete resolution of their comorbidities improved as the number and dose of medications decreased.

Surgery aims at weight loss (50% excess weight) and resolution of comorbidities associated with obesity [18-20]. Therefore, our study demonstrated this in both studied groups, reaching the goal of surgery. Both surgical techniques, with or without a ring, fulfill the proposed objectives and, therefore, both are effective.

The introduction of the diet after bariatric surgery is divided into phases based on the texture and nutritional needs of patients. Thus, it starts with the ingestion of liquids in the first 2 weeks after surgery, then starts with a pasty diet for another 2 weeks and finally introduces solid food. When performing RYGB bariatric surgery without placing the ring, there is better tolerance in the progression between phases with greater ease and without complications such as vomiting, pain and regurgitation. Patients undergoing RYGB should have good planning when progressing on the diet, with the objective of ensuring adequate healing from the surgery as well as to develop healthy eating habits throughout life.

The immediate post-operative diet recommends the administration of only liquids with a view to hydration and minimum calories supply, avoiding food impaction or fistula formation. Thus, patients are offered a liquid diet on the first postoperative day. The diet is started in small volumes (20 ml) and every 20 minutes every 20 minutes throughout the day. The evolution of the diet occurs according to the patient's acceptance and absence of vomiting, that is, on the second day after surgery, the volume administered is the same but with a shorter interval. The patient is discharged from the

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hospital in the postoperative period when he is ingesting 20 ml of liquid every 5 minutes.

The gastrojejunostomy is made with a narrow caliber precisely in order to reduce the time for gastric emptying. When the ring is placed in the distal portion of the neocamera, this restriction increases, predisposing to frequent vomiting even in postoperative fasting due to local edema.<sup>70</sup> Postoperative vomiting in patients undergoing RYGB ring surgery is common, it may occur in 20% of patients.

The study observed a longer hospital stay in the group with a ring (9 days), compared to the group without a ring (5-7 days), translating a better acceptance of patients operated without ring placement. Postoperative vomiting was more frequent in the group without a ring, however, it was less intense than in the group with a ring and stopped in a shorter time. This statistically significant difference in length of stay demonstrates that patients without a ring more quickly begin to ingest fluids properly, that is, a better acceptance of the diet to the point that they spend less time in the hospital.

The most frequent early complications of RYGB surgery include pulmonary embolism, bleeding, fistula, atelectasis and pneumonia. Fistulas occur in 1.5 to 6% of patients and when not diagnosed in a timely manner, mortality can reach 15% [21].

As for early complications (first 30 days after surgery), a similar complication rate was observed and among the complications the most common was fistula. The patient in the ring group did not require reoperation and had a good response to clinical treatment. The patient in the group without a ring needed to undergo surgical treatment due to the formation of a subphrenic abscess, evolving well postoperatively. No mortality was observed in the 2 groups analyzed.

Regarding late complications, removal of the ring due to food intolerance, malnutrition and megaesophagus occurred in 25% of patients in the group with ring placement. The group without a ring did not present any late complications during the 1-year follow-up. Bariatric surgery is performed with the objective of reducing body weight, treating comorbidities and improving the quality of life of morbidly obese patients [18-20].

All gastric restrictive procedures, by definition, restrict food intake, however, this should be based on the amount of food and not on the variety of food consumed, allowing for an intake of solid and protein-rich foods, such as meat, for the purpose preventing the evolution to protein malnutrition [15].

The protein requirement of a normal adult is 0.6 to 0.8 g of body weight/kg/day. It is estimated that 65-70% of protein intake comes from sources of high biological value, typically animal products, which contain a full set of essential amino acids. Most alternative plant sources (eg vegetables, grains, nuts, seeds and vegetables) do not contain a full set of essential amino acids and therefore more

diet planning is needed when the individual opts for a meatless diet. Animal products (meat and dairy products) provide the only source of vitamin B12 (cobalamin) for humans.

The study observed that patients with a ring have great food restriction in terms of meat intake, while all patients in the group without a ring eat meat frequently. Half of the patients in the ring group cannot eat meat, in agreement with the studies by Stubbs [13], while all patients in the group without ring are able to eat, with a statistically significant difference. In addition to the poorer food quality, due to the limitation of diet and variety, the group of patients with ring presents a higher risk of nutritional deficiencies such as protein malnutrition and anemia due to vitamin B12 deficiency.

Importantly, plant-based foods are often incomplete, being deficient in one or more of the essential amino acids.

In the follow-up of the patients, episodes of postprandial vomiting were observed as the complaint that most worsened food quality in the late postoperative period. Stubbs et al found a significantly greater difference in the frequency of vomiting episodes between patients wearing a 5.5 cm and 6.5 cm ring length (29% vs 14%,  $p<0.05$ ) [13]. Postprandial vomiting episodes were observed more frequently in the group with a ring (63.6% reported vomiting 1 year after surgery), with a statistically significant difference compared to the group without a ring (11.1% had vomiting in the follow-up 1 year of surgery) in our service. These results are worse than those by Stubbs, as in the group with a 6.5 cm ring we observed 63.6% of vomiting episodes, while Stubbs reports only 14%, perhaps this is due to the socioeconomic level of our patients, since dental problems and consequently good chewing are not uncommon.

In our study, the group without a ring ingests better proteins (100% of patients) and does not present postprandial vomiting, demonstrating a better food quality and therefore a lower risk of nutritional deficiencies after 1 year.

Dumping syndrome is characterized by symptoms of nausea, tremors, sweating, diarrhea, dizziness, flushing, tachycardia and syncope, right after eating foods rich in refined sugars and their rapid passage to the intestinal loop. One of the recognized benefits of gastric bypass is the great restriction on the consumption of sugars and fats, due to the dumping syndrome [15].

Dumping syndrome occurs in approximately 50% of patients after RYGB. 71 Campton et al demonstrated a dumping frequency of 59% in the group that used a 5.5 cm diameter ring and 71% in the group with a 6.0 cm diameter ring [15]. Therefore, the greater the caliber of the gastroenteric passage, the greater the frequency of dumping. In the study, dumping occurred in 75% of patients with a ring and only in 44.4% in the group without a ring, differently from the literature. This difference between the two groups is not statistically significant. This fact can be explained by the better food quality, that is, in patients without a ring, although a higher frequency of dumping was expected, patients more frequently

ingest meat, fruits and vegetables, that is, less caloric foods that cause less dumping. On the other hand, patients with a ring ingest more liquid and creamy foods, foods that are rich in calories and with a faster emptying time of the neocamera than solid food, even with the presence of the ring when compared to the group without a ring. Patients with dumping syndrome should be advised to avoid foods that trigger symptoms. It is considered by some to have a positive effect after RYGB, especially in candy eaters, as it results in an aversion to consuming such foods. Dumping syndrome is rarely severe enough to cause significant nutritional deficiency problems.

In order to evaluate the results obtained by the surgery, the following must be taken into account: A) weight reduction; B) reduction of associated comorbidities; C) the benefits from a psychological point of view. The assessment of improvement in mood, self-esteem, self-confidence, and daily activities is substantial in this final analysis.

Currently, quality of life issues and the impact on surgical outcomes have gained importance. Many quality of life scales such as SF-36, IWQOL, B.A.R.O.S have been developed.

The B.A.R.O.S protocol was proposed by Oria and Moorhead in 1997. The objective is to evaluate the clinical, familial and psychosocial evolution of the obese patient in the late postoperative period [48].

A study published by Favretti et al, applied the BAROS in 180 morbidly obese patients submitted to adjustable gastric banding by videolaparoscopy, proving to be an easy to apply, low cost and useful method in the analysis of the medium and long term results of the treatment surgical treatment of obesity. Other studies have also demonstrated that using the B.A.R.O.S it was possible to adequately compare the results of different procedures, surgeries, techniques and groups of patients and different cultures.

We used the BAROS questionnaire because it is a standardized and universally accepted questionnaire with the aim of evaluating quality of life after 1 year of surgery. We observed an important improvement in all studied variables, similarly in our 2 groups.

Even in the group with a ring, although they present greater food restriction and a greater number of vomiting episodes in the postoperative period, patients report an important improvement in self-esteem and health. Thus, the fact that they present a great loss of weight leads to an improvement in life in general, as assessed by the BAROS questionnaire (social evaluation, work, self-esteem). This general improvement in quality of life resulting from significant weight loss may explain why these patients undergoing RYGB surgery with a ring report a good food intake and a good variety of foods, even though they have important limitations, that is, patients transmit greater importance life improvement than food quality, at least in the first year after surgery. This observation is essential to understand that the patient can report a general well-being when in fact he is with food restriction to the

point of developing malnutrition. The specialists involved in your postoperative follow-up need to be aware of a good dietary history and diagnose nutritional errors early.

## Conclusion

In the study of morbidly obese patients 1 year after bariatric surgery, using the Roux-en-Y Gastric Bypass (RYGB) technique with or without silyastic ring, we concluded that both techniques are effective in weight loss, with no statistical difference in weight loss. overweight between the two types of surgery.

Patients undergoing RYGB without ring placement have a better quality of life with easier feeding, translated by a better meat intake and a low incidence of postprandial vomiting, and the quality of life according to the BAROS questionnaire is the same in both studied groups.

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