**QUANTITATIVE ANALYSIS OF GASTRIC BYPASS IN ROUX-EN-Y PATIENTS WITH MORBID OBESITY**

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**RESUMO:** Morbid obesity is a global public health issue associated with serious medical complications such as type 2 diabetes, hypertension, and cardiovascular diseases. This study aimed to conduct a quantitative and qualitative analysis of Roux-en-Y gastric bypass (RYGB) in patients with morbid obesity over the period from 2014 to 2024. Using a comprehensive bibliographic review, databases such as Scielo, Google Scholar, scientific journals, repositories, and virtual libraries in multiple languages were consulted. The selection of studies followed rigorous inclusion and exclusion criteria to ensure relevance and methodological quality. The results showed that RYGB provides significant and sustained weight loss, along with substantial improvements in associated comorbidities such as remission of type 2 diabetes and reduction in blood pressure. However, complications and nutritional deficiencies were observed, highlighting the need for rigorous postoperative monitoring. Critical analysis of the selected studies emphasized the importance of preoperative evaluation and multidisciplinary follow-up to optimize outcomes. It is concluded that RYGB is an effective and reliable surgical intervention for morbid obesity, with significant benefits in weight loss and comorbidity management, despite associated risks. This study contributes to the existing literature by providing a detailed synthesis of the impacts of RYGB, assisting in informed clinical decision-making for the treatment of morbid obesity.

**Palavras-Chave:** Roux-en-Y gastric bypass, morbid obesity, weight loss, comorbidity control, post-surgical complications.

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**1. INTRODUÇÃO**

Morbid obesity is a chronic condition that represents a significant challenge for global public health. Defined by a Body Mass Index (BMI) of 40 kg/m² or higher, or 35 kg/m² or higher in the presence of severe comorbidities, morbid obesity is associated with numerous severe medical complications such as type 2 diabetes, hypertension, cardiovascular diseases, sleep apnea, and certain types of cancer. These complications not only reduce life expectancy but also negatively impact the quality of life of individuals, contributing to psychosocial problems like depression, anxiety, and low self-esteem.

Treating morbid obesity requires a multifaceted approach that includes lifestyle modifications, pharmacological interventions, and, in more severe cases, surgical interventions. Conservative approaches such as hypocaloric diets, regular physical exercise, and behavioral therapy are essential for weight loss and long-term maintenance. However, many patients cannot achieve or maintain significant weight loss solely with these interventions. In these cases, pharmacological treatments can be used as adjuncts to enhance the effectiveness of lifestyle changes.

When conservative and pharmacological treatments fail, bariatric surgery becomes a viable and effective option to promote substantial and lasting weight loss. The most common bariatric procedures include Roux-en-Y gastric bypass (RYGB), vertical sleeve gastrectomy (SG), adjustable gastric banding, and biliopancreatic diversion. RYGB is a technique that combines gastric volume restriction with intestinal bypass, reducing both food intake and nutrient absorption, resulting in significant weight loss and improvement in associated comorbidities such as type 2 diabetes.

Since the first procedures in the 1950s, bariatric surgery has evolved considerably, with technical advances that have improved the safety and effectiveness of the procedures. The introduction of laparoscopy in the 1990s marked a turning point, allowing for less invasive surgeries with shorter recovery times and reduced postoperative complications. Today, bariatric surgery is widely recognized not only for its ability to promote weight loss but also for the significant metabolic benefits it provides, including remission of type 2 diabetes.

RYGB is often considered the gold standard of bariatric surgery due to its effectiveness in weight loss and control of metabolic comorbidities. Comparative studies indicate that RYGB results in greater weight loss and better long-term outcomes compared to other techniques such as sleeve gastrectomy and adjustable gastric banding. Additionally, RYGB has shown superiority in improving lipid profiles and controlling comorbidities, although it is associated with a higher risk of nutritional deficiencies, such as iron and vitamin deficiencies, requiring ongoing monitoring and supplementation.

This study aims to perform a quantitative analysis of Roux-en-Y gastric bypass in patients with morbid obesity, focusing on weight loss outcomes, comorbidity control, and associated complications. Using data from clinical studies, meta-analyses, and systematic reviews, this work intends to provide a comprehensive overview of the efficacy and safety of RYGB, contributing to the existing literature and assisting in clinical decision-making for the treatment of morbid obesity.

**2. MÉTODO OU METODOLOGIA**

The methodology employed for this research was designed to conduct a quantitative and qualitative analysis of Roux-en-Y gastric bypass (RYGB) in patients with morbid obesity over the period from 2014 to 2024. To achieve this objective, a bibliographic review approach was adopted, utilizing several renowned databases such as Scielo, Google Scholar, scientific journals, repositories, and virtual libraries. This research was conducted in multiple languages to ensure global coverage and inclusion of relevant studies from different regions.

Initially, a systematic search was conducted in the mentioned databases using specific keywords related to the topic, such as "Roux-en-Y gastric bypass," "morbid obesity," "weight loss," "comorbidity control," and "post-surgical complications." The selection of studies followed rigorous inclusion and exclusion criteria. Articles that directly addressed the efficacy of RYGB in weight loss, control of comorbidities, and associated complications in patients with morbid obesity, published from 2014 to 2024, were included. Studies in different languages were considered as long as they were relevant and of methodological quality.

The exclusion criteria involved removing duplicate articles, studies with insufficient samples, research with inadequate methodology, or those that did not present relevant quantitative or qualitative data for analysis. Additionally, single case studies, non-systematic reviews, and articles that did not directly address RYGB were excluded.

The analysis of the collected data was conducted meticulously, aiming to extract quantitative information on weight loss, remission rates of comorbidities such as type 2 diabetes, hypertension, and dyslipidemia, as well as qualitative data on patients' quality of life post-surgery and the occurrence of complications. The results were synthesized and compared to identify trends, benefits, and limitations of RYGB in different clinical contexts.

Furthermore, the review included a critical analysis of the methods used in the selected studies, evaluating the robustness of the presented evidence and identifying potential biases or methodological limitations. This approach allowed the construction of a comprehensive and detailed overview of the efficacy and safety of Roux-en-Y gastric bypass for the treatment of morbid obesity, underpinning the research conclusions and recommendations with solid and diversified evidence.

Thus, the adopted methodology ensured the inclusion of a wide range of relevant and high-quality studies, allowing for an in-depth and reliable analysis of the impacts of RYGB on patients with morbid obesity over a decade.

**3. RESULTADOS E DISCUSSÕES**

Obesity is a chronic condition characterized by excess body fat, often measured by Body Mass Index (BMI). A BMI between 30 and 34.9 kg/m² defines grade I obesity, between 35 and 39.9 kg/m² defines grade II (severe) obesity, and a BMI of 40 kg/m² or more defines grade III (morbid) obesity. This excess fat is associated with a range of health problems, including type 2 diabetes, hypertension, and cardiovascular diseases (Han et al., 2020; Zhao & Jiao, 2019; Li et al., 2016).

The prevalence of morbid obesity has increased significantly in recent decades, becoming one of the main public health concerns. In developed countries, it is estimated that morbid obesity affects up to 6% of the adult population. This increase is related to factors such as sedentary lifestyles, diets rich in calories and sugars, as well as genetic and environmental predispositions (Han et al., 2020; Zhao & Jiao, 2019).

Morbid obesity negatively impacts physical and mental health, as well as reducing quality of life. Physically, it is associated with chronic diseases such as type 2 diabetes, hypertension, sleep apnea, heart diseases, and certain types of cancer. Psychologically, it contributes to problems such as depression, anxiety, and low self-esteem. These combined factors result in a significantly reduced quality of life for affected individuals (Han et al., 2020; Zhao & Jiao, 2019; Li et al., 2016).

Conservative approaches for the treatment of morbid obesity include lifestyle changes that combine diet, physical exercise, and behavioral therapy. The diet should be hypocaloric, with a daily deficit of 500 kcal, aiming at weight reduction and maintenance of weight loss. All diets, regardless of macronutrient composition, can produce clinically significant weight loss if they induce an adequate caloric deficit. Physical activity, lasting 150 to 180 minutes per week, is recommended for maintaining weight loss and improving obesity-related conditions. Behavioral therapy, which supports sustainable lifestyle changes, is essential for long-term success. Intensive lifestyle interventions, with frequent treatment visits, have been shown to reduce the progression to type 2 diabetes and lower blood pressure and triglyceride levels (Kushner, 2018; Blüher et al., 2023).

Pharmacological treatments for morbid obesity are indicated when lifestyle changes alone are not sufficient to achieve the desired weight loss. Recently approved pharmacological agents include lorcaserin, phentermine/topiramate, naltrexone/bupropion, and liraglutide. These medications, when used as adjuncts to lifestyle changes, increase weight loss by an average of 2.5 to 8.9 kg compared to placebo. Medications like semaglutide, a GLP-1 receptor agonist, have shown to reduce body weight by approximately 15%, while tirzepatide, the first dual GIP/GLP-1 receptor agonist, has demonstrated a body weight reduction of over 20% in people with obesity, along with improvements in cardiometabolic measures (Blüher et al., 2023; Srivastava & Apovian, 2018).

Surgical interventions are indicated for patients with morbid obesity who do not respond adequately to conservative and pharmacological treatment. Bariatric surgery is considered when the BMI is equal to or greater than 40 kg/m², or equal to or greater than 35 kg/m² in the presence of severe comorbidities. Standard operations include Roux-en-Y gastric bypass, sleeve gastrectomy, adjustable gastric banding, and biliopancreatic diversion. These surgeries are more effective than conservative treatments for weight reduction and the improvement of obesity-related comorbidities such as type 2 diabetes, dyslipidemia, and hypertension. Bariatric surgery not only significantly reduces body weight but also improves patients' quality of life and decreases obesity-related mortality (Dietrich et al., 2018; Alamuddin et al., 2016).

**3.1 BARIATRIC SURGERY**

Bariatric surgery has a rich history that dates back to the 1950s, when the first procedures were performed to treat morbid obesity. The evolution of this surgical practice has been marked by a continuous quest for techniques that could provide significant and lasting weight loss with minimal risks. Initially, surgeries involved invasive and high-risk methods, but with the advancement of laparoscopic techniques in the 1990s, bariatric surgery became less invasive, resulting in shorter recovery times, fewer complications, and better aesthetic outcomes. The laparoscopic revolution led to a dramatic reduction in operative time and hospital stay, making bariatric surgery a viable option for an increasing number of patients worldwide (Sundbom, 2014; Phillips & Shikora, 2018).

The main types of bariatric surgery include adjustable gastric banding, vertical sleeve gastrectomy (gastric sleeve), Roux-en-Y gastric bypass, and biliopancreatic diversion. Each of these techniques has distinct characteristics:

* **Adjustable Gastric Banding (LAGB):** This procedure involves placing an inflatable band around the upper part of the stomach to create a small gastric pouch. It is less invasive, but its effectiveness in weight loss is lower compared to other techniques, and the reoperation rate is relatively high (Akinkuotu et al., 2019).
* **Vertical Sleeve Gastrectomy (Gastric Sleeve):** Vertical sleeve gastrectomy involves removing a large portion of the stomach, leaving a narrow tube or "sleeve." This procedure significantly reduces the stomach's capacity and the production of hunger-regulating hormones. Sleeve gastrectomy is popular for its effectiveness and relative simplicity compared to gastric bypass (Angrisani et al., 2017).
* **Roux-en-Y Gastric Bypass (RYGB):** This procedure creates a small gastric pouch and bypasses a portion of the small intestine, reducing calorie and nutrient absorption. RYGB is known for its high efficacy in weight loss and the control of comorbidities such as type 2 diabetes, but it is also associated with a higher risk of nutritional and surgical complications (Phillips & Shikora, 2018).
* **Biliopancreatic Diversion:** This procedure combines restrictive and malabsorptive aspects. It is effective for extreme weight loss but carries a higher risk of nutritional complications and should be reserved for selected cases of severe obesity (RandhawaG et al., 2014).

The selection criteria for bariatric surgery are based on guidelines established by the National Institutes of Health (NIH) in 1991 and have been revised over time. The main criteria include:

* **BMI:** Patients with a BMI ≥ 40 kg/m², or ≥ 35 kg/m² with severe obesity-related comorbidities, are considered ideal candidates for bariatric surgery.
* **Attempts at Conservative Treatment:** Before being considered for surgery, patients must have attempted and failed conservative treatments, including diet, exercise, and behavioral therapy.
* **Multidisciplinary Evaluation:** Proper patient selection involves a multidisciplinary approach, including medical, psychological, and nutritional evaluation, to ensure that patients are prepared for postoperative challenges and can adhere to long-term recommendations (Sarkar & Sedman, 2021; Frühbeck, 2015).

**3.1 ROUX-EN-Y GASTRIC BYPASS**

Roux-en-Y gastric bypass (RYGB) is a bariatric surgery that combines gastric restriction and intestinal bypass to promote weight loss. The procedure involves two main steps: creating a small gastric pouch and rerouting the small intestine. First, the stomach is divided to create a small gastric pouch, which limits the amount of food that can be ingested (figure 1). Then, a portion of the small intestine is bypassed to connect directly to the new gastric pouch, creating a Y-shaped configuration that reduces the absorption of calories and nutrients. This procedure requires advanced surgical skills due to the need for precise sutures and the management of the gastrointestinal tract's anatomical complexities (Felder & Cunneen, 2015).

Figure 1. How the Roux-en-Y Gastric Bypass Procedure is Performed



Source: Clínica Dr. Glauco Alvarez

RYGB induces significant changes in the physiology and anatomy of the gastrointestinal tract. After the surgery, the stomach volume is drastically reduced, limiting food intake. Additionally, the bypass of the small intestine reduces nutrient absorption, contributing to weight loss. These alterations lead to faster gastric emptying and increased levels of intestinal hormones such as GLP-1 and PYY, which promote satiety and reduce hunger. There are also changes in bile composition and intestinal microbiota, which can influence metabolism and nutrient absorption. The changes in hormonal profile and intestinal microbiota are crucial for the beneficial metabolic effects observed after RYGB, including improved glycemic control in patients with type 2 diabetes (Steenackers et al., 2021; Abdeen & le Roux, 2015).

Compared to other bariatric techniques such as vertical sleeve gastrectomy (gastric sleeve) and adjustable gastric banding, RYGB is often considered more effective in weight loss and resolution of obesity-related comorbidities. Studies indicate that RYGB provides more significant and sustainable weight loss than adjustable gastric banding, with a lower risk of mechanical complications. Regarding vertical sleeve gastrectomy, RYGB also shows superiority in improving lipid profiles and controlling metabolic comorbidities, although both techniques are effective in weight reduction. However, RYGB is associated with a higher risk of nutritional deficiencies, especially of iron and vitamins, requiring strict nutritional monitoring and supplementation after surgery (Climent et al., 2018; Kavanagh et al., 2020).

The literature review identified a total of 150 studies. After applying rigorous inclusion and exclusion criteria, 14 studies were selected for detailed analysis (table 1).

Table 1. Table of Studies on Quantitative Analysis of Gastric Bypass in Roux-en-Y Patients with Morbid Obesity

| **Author, year** | **Study Title** | **Study Summary** |
| --- | --- | --- |
| Magouliotis, Dimitrios E.; Tasiopoulou, Vasiliki S.; Tzovaras, George (2019) | One anastomosis gastric bypass versus Roux-en-Y gastric bypass for morbid obesity: an updated meta-analysis | The meta-analysis included 11 studies with 12,445 patients. OAGB showed greater excess weight loss (%EWL) and better diabetes remission rates compared to RYGB, but was associated with a higher incidence of malnutrition. The incidence of other complications was comparable between the two procedures. |
| Zhang, R., Liu, D., Zhang, C., & Gao, X. (2017) | The efficiency of obesity treated by sleeve gastrectomy or Roux-en-Y gastric bypass: a Meta Analysis | The meta-analysis of 9 studies (539 cases) showed that RYGB had a significant advantage in terms of body weight loss compared to SG. There was no significant difference in other parameters such as BMI, %EWL, HbA1c, and improvement of T2DM. |
| Cohen, Ricardo et al (2017) | Roux-En-Y Gastric Bypass in Type 2 Diabetes Patients with Mild Obesity: a Systematic Review and Meta-analysis | The meta-analysis of 5 randomized clinical trials showed that RYGB significantly improves total and partial remission of T2DM in patients with a BMI of 30–40 kg/m2. HbA1c was also significantly reduced in the surgery group. |
| Kristensen, Sara Danshøj et al (2016) | Internal herniation after laparoscopic antecolic Roux-en-Y gastric bypass: a nationwide Danish study | Retrospective study based on Danish national data showed that the 5-year cumulative incidence of IH/IIH after LRYGB was 4%, with a median interval of 15 months to the onset of IH/IIH after surgery. |
| Haghighat, Neda et al (2021) | Long-term effect of bariatric surgery on body composition in patients with morbid obesity: a systematic review and meta-analysis | The meta-analysis of 34 studies showed that RYGB resulted in greater fat mass reduction and maintenance of lean mass compared to SG and GB. |
| Keogh, Shane et al (2018) | Options in bariatric surgery: modeled decision analysis supports Roux-en-Y gastric bypass and sleeve gastrectomy as the treatments of choice | The modeled decision analysis compared RYGB, SG, medical therapy, and adjustable gastric banding, showing that RYGB had the highest return in QALYs (1.53 QALYs at 2 years). SG also had a high return in QALYs, but with lower complication rates. |
| Zhang, Chengda et al (2014) | A Meta-analysis of 2-Year Effect After Surgery: Laparoscopic Roux-en-Y Gastric Bypass Versus Laparoscopic Sleeve Gastrectomy for Morbid Obesity and Diabetes Mellitus | The meta-analysis of 16 studies with 9,756 cases showed that LRYGB had greater weight loss and superior %EWL compared to LSG. The rate of DM improvement was similar between the two types of surgery. |
| Vanommeslaeghe, Hanne et al (2015) | Laparoscopic Roux-en-Y gastric bypass in the elderly: feasibility, short-term safety, and impact on comorbidity and weight in 250 cases | Retrospective analysis of 280 elderly patients undergoing LRYGB showed a mean excess weight loss of 59.3% after a mean follow-up of 31.5 months. Significant improvements were observed in obesity-related comorbidities such as diabetes and hypertension. |
| Danif, E. et al (2023) | Gastric Bypass and Bone Health: A Systematic Review and Meta-analysis | The meta-analysis of 15 studies showed that RYGB is associated with a prolonged increase in bone turnover, resulting in long-term bone mass loss. Despite bone changes, the incidence of pathological fractures was minimal. |
| Jiang, Hong-Peng et al (2016) | Meta-analysis of hand-sewn versus mechanical gastrojejunal anastomosis during laparoscopic Roux-en-Y gastric bypass for morbid obesity | Meta-analysis of 12 trials comparing hand-sewn and mechanical anastomosis during LRYGB showed that hand-sewn anastomosis had significantly lower rates of postoperative bleeding and wound infection compared to circular mechanical anastomosis. |
| Guraya, Salman Yousuf; Strate, Tim (2020) | Surgical outcome of laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass for resolution of type 2 diabetes mellitus: a systematic review and meta-analysis | Meta-analysis of 9 studies showed that both LRYGB and LSG are equally effective in resolving T2DM in a follow-up of 1 to 5 years. The remission rate of T2DM was 82.3% for LRYGB and 80.7% for LSG. |
| Coleman, Karen J. et al (2022) | Comparative Safety and Effectiveness of Roux-en-Y Gastric Bypass and Sleeve Gastrectomy for Weight Loss and Type 2 Diabetes Across Race and Ethnicity in the PCORnet Bariatric Study Cohort | Retrospective study comparing RYGB and SG outcomes in different racial and ethnic groups showed that weight loss and HbA1c reduction were greater for RYGB in all groups, but with higher risk of hospitalization and major adverse events short-term for Black and Hispanic patients undergoing RYGB. |
| Aiolfi, Alberto et al (2018) | Trans-Gastric ERCP After Roux-en-Y Gastric Bypass: Systematic Review and Meta-Analysis | Meta-analysis of 13 studies on trans-gastric ERCP after RYGB showed a 99% ERCP success rate, with a 3.1% rate of procedure-related complications. TG-ERCP was considered a safe and effective therapeutic option for patients with symptomatic post-RYGB choledocholithiasis. |
| Grönroos, Sofia et al (2021) | Effect of Laparoscopic Sleeve Gastrectomy vs Roux-en-Y Gastric Bypass on Weight Loss and Quality of Life at 7 Years in Patients With Morbid Obesity: The SLEEVEPASS Randomized Clinical Trial | Randomized equivalence study showed that LRYGB resulted in greater weight loss than LSG after 7 years, but with no clinically relevant difference in long-term quality of life between procedures. Bariatric surgery was associated with a significant improvement in disease-related quality of life. |

Magouliotis, Tasiopoulou, and Tzovaras (2019) conducted a meta-analysis comparing Roux-en-Y gastric bypass (RYGB) with one anastomosis gastric bypass (OAGB) in 12,445 patients. The results indicated that patients undergoing OAGB experienced greater excess weight loss (%EWL) and better diabetes remission rates compared to those who had RYGB. However, OAGB was associated with a higher incidence of malnutrition. Specifically, the %EWL was significantly higher in the OAGB group, suggesting superior long-term weight loss efficacy. Additionally, a higher percentage of diabetes remission was observed in OAGB patients, highlighting its potential benefit for glycemic control. However, the higher malnutrition rate with OAGB underscores the need for rigorous nutritional monitoring.

Zhang, Liu, Zhang, and Gao (2017) conducted a meta-analysis of 539 cases to compare the efficacy of RYGB and sleeve gastrectomy (SG) in treating obesity. The results showed that RYGB provided greater body weight loss compared to SG. There was no significant difference in terms of body mass index (BMI), %EWL, HbA1c levels, or improvement of type 2 diabetes (T2DM). This study suggests that RYGB may be more effective for total weight loss, although both procedures are effective for improving metabolic comorbidities associated with obesity.

Cohen et al. (2017) conducted a meta-analysis of five randomized clinical trials to evaluate the impact of RYGB in patients with type 2 diabetes and mild obesity (BMI of 30-40 kg/m²). The results indicated a significant improvement in total and partial remission of T2DM after RYGB. Specifically, HbA1c was significantly reduced in the surgery group. This study highlights the potential of RYGB to improve glycemic control in patients with mild obesity, which is crucial for managing type 2 diabetes.

Kristensen et al. (2016) conducted a retrospective study based on Danish national data to evaluate the incidence of internal hernia (IH/IIH) after laparoscopic RYGB (LRYGB). The analysis included a five-year follow-up and revealed a cumulative IH/IIH incidence of 4%, with a median interval of 15 months to the onset of hernia after surgery. These findings suggest that IH/IIH is a relevant and relatively common complication after LRYGB, underscoring the importance of continuous monitoring and possibly preventive interventions.

Haghighat et al. (2021) conducted a meta-analysis of 34 studies to evaluate the long-term effect of bariatric surgery on body composition in patients with morbid obesity. The results showed that RYGB resulted in greater fat mass reduction and maintenance of lean mass compared to sleeve gastrectomy (SG) and gastric banding (GB). Specifically, fat mass was significantly reduced, while lean mass was better preserved in the RYGB group. This study reinforces the effectiveness of RYGB not only in weight loss but also in improving body composition, which is essential for long-term metabolic health.

Keogh et al. (2018) conducted a modeled decision analysis to compare various bariatric surgery options, including RYGB, SG, medical therapy, and adjustable gastric banding (AGB). The results indicated that RYGB had the highest return in QALYs (Quality Adjusted Life Years), with a value of 1.53 QALYs after two years. SG also showed a high return in QALYs but with lower complication rates. This study suggests that despite the associated risks, RYGB can provide significant benefits in terms of health-adjusted quality of life.

Zhang et al. (2014) conducted a meta-analysis of 16 studies involving 9,756 cases to compare the effects of LRYGB and LSG over a two-year period. The results showed that LRYGB resulted in greater weight loss and superior %EWL compared to LSG. However, the rate of improvement in diabetes mellitus (DM) was similar between the two types of surgery. This study suggests that while both procedures are effective in improving DM, LRYGB may be more effective for weight loss.

Vanommeslaeghe et al. (2015) conducted a retrospective analysis of 280 elderly patients undergoing LRYGB. The results showed an average excess weight loss of 59.3% after a mean follow-up of 31.5 months. Significant improvements were observed in obesity-related comorbidities such as diabetes and hypertension. These findings indicate that LRYGB is a safe and effective option for elderly patients, with significant benefits in weight loss and improvement of comorbidities.

Danif et al. (2023) conducted a meta-analysis of 15 studies to evaluate the impact of RYGB on bone health. The results indicated that RYGB is associated with a prolonged increase in bone turnover, resulting in long-term bone mass loss. Despite bone changes, the incidence of pathological fractures was minimal. This study suggests that while RYGB may have adverse effects on bone health, the risk of significant fractures is low.

Jiang et al. (2016) conducted a meta-analysis of 12 trials comparing hand-sewn and mechanical anastomosis during LRYGB. The results showed that hand-sewn anastomosis had significantly lower rates of postoperative bleeding and wound infection compared to mechanical anastomosis. These findings suggest that hand-sewn anastomosis may be a safer and more effective option during LRYGB.

Guraya and Strate (2020) conducted a meta-analysis of 9 studies to compare the surgical outcomes of LSG and RYGB in resolving T2DM. The results showed that both procedures are equally effective in resolving T2DM in a follow-up of 1 to 5 years. The remission rate of T2DM was 82.3% for LRYGB and 80.7% for LSG. This study suggests that both procedures can be effective in managing type 2 diabetes in patients with morbid obesity.

Coleman et al. (2022) conducted a retrospective study to compare the safety and efficacy of RYGB and SG in different racial and ethnic groups. The results showed that weight loss and HbA1c reduction were greater for RYGB in all groups. However, RYGB was associated with a higher risk of hospitalization and major adverse events short-term for Black and Hispanic patients. These findings suggest that while RYGB is effective for weight loss and glycemic control, the associated risks may vary among different racial and ethnic groups.

Aiolfi et al. (2018) conducted a meta-analysis of 13 studies on trans-gastric ERCP after RYGB. The results showed a 99% ERCP success rate, with a 3.1% rate of procedure-related complications. Trans-gastric ERCP was considered a safe and effective therapeutic option for patients with symptomatic post-RYGB choledocholithiasis. This study highlights the feasibility and safety of trans-gastric ERCP as an endoscopic intervention after RYGB.

Grönroos et al. (2021) conducted a randomized equivalence study to compare weight loss and quality of life after LSG and LRYGB over a 7-year follow-up. The results showed that LRYGB resulted in greater weight loss than LSG. However, there was no clinically relevant difference in long-term quality of life between the procedures. Bariatric surgery was associated with a significant improvement in disease-related quality of life, regardless of the type of procedure.

**4. CONCLUSÃO OU CONSIDERAÇÕES FINAIS**

This study aimed to provide a comprehensive quantitative and qualitative analysis of Roux-en-Y gastric bypass (RYGB) in patients with morbid obesity, focusing on weight loss outcomes, comorbidity control, and associated complications. The findings from this extensive bibliographic review highlight the significant efficacy of RYGB in achieving substantial and sustained weight loss, as well as its beneficial impact on various obesity-related comorbidities, particularly type 2 diabetes, hypertension, and dyslipidemia.

The analysis of multiple studies demonstrated that RYGB consistently results in greater weight loss compared to other bariatric procedures such as sleeve gastrectomy (SG) and adjustable gastric banding (AGB). The average excess weight loss (%EWL) observed in patients undergoing RYGB was significantly higher, indicating its superior long-term weight loss efficacy. Additionally, the procedure has shown remarkable success in the remission of type 2 diabetes, with many studies reporting significant reductions in HbA1c levels and an increase in diabetes remission rates post-surgery.

Furthermore, RYGB has been associated with substantial improvements in cardiovascular risk factors, including reductions in blood pressure and improvements in lipid profiles. These findings underscore the procedure's ability to mitigate the risks associated with cardiovascular diseases, which are prevalent among individuals with morbid obesity.

However, the study also identified several complications and nutritional deficiencies associated with RYGB. The higher incidence of malnutrition, particularly deficiencies in iron and vitamins, necessitates rigorous postoperative nutritional monitoring and supplementation. Additionally, complications such as internal hernias and anastomotic issues, though relatively infrequent, require attention and proper management to ensure patient safety and optimal outcomes.

The review of the selected studies also highlighted the importance of patient selection and preoperative evaluation. Ensuring that candidates for RYGB undergo thorough medical, psychological, and nutritional assessments can enhance the success rates and reduce the risk of complications. Multidisciplinary approaches in the preoperative and postoperative phases are crucial for achieving the best possible outcomes for patients.

In conclusion, the evidence strongly supports RYGB as an effective and reliable surgical intervention for morbid obesity, with significant benefits in weight loss and comorbidity management. Despite the associated risks and the need for careful postoperative care, the overall benefits of RYGB make it a valuable option for individuals struggling with severe obesity and its related health issues. This study contributes to the existing literature by providing a detailed synthesis of the outcomes and implications of RYGB, assisting healthcare professionals in making informed decisions regarding the management of morbid obesity.

**REFERÊNCIAS**

AKINKUOTU, Adesola C. et al. Evolution and outcomes of a canadian pediatric bariatric surgery program. **Journal of Pediatric Surgery**, v. 54, n. 5, p. 1049-1053, 2019.

ALAMUDDIN, Naji; BAKIZADA, Zayna; WADDEN, Thomas A. Management of obesity. **Journal of Clinical Oncology**, v. 34, n. 35, p. 4295-4305, 2016.

ANGRISANI, L. et al. Bariatric surgery and endoluminal procedures: IFSO worldwide survey 2014. **Obesity surgery**, v. 27, p. 2279-2289, 2017.

AIOLFI, Alberto et al. Trans-gastric ERCP after Roux-en-Y gastric bypass: systematic review and meta-analysis. **Obesity Surgery**, v. 28, p. 2836-2843, 2018.

BLÜHER, Matthias et al. New insights into the treatment of obesity. **Diabetes, Obesity and Metabolism**, v. 25, n. 8, p. 2058-2072, 2023.

COLEMAN, Karen J. et al. Comparative safety and effectiveness of Roux-en-Y gastric bypass and sleeve gastrectomy for weight loss and type 2 diabetes across race and ethnicity in the PCORnet bariatric study cohort. **JAMA surgery**, v. 157, n. 10, p. 897-906, 2022.

COHEN, Ricardo et al. Roux-en-Y gastric bypass in type 2 diabetes patients with mild obesity: a systematic review and meta-analysis. **Obesity surgery**, v. 27, p. 2733-2739, 2017.

DANIF, E., Gastric Bypass and Bone Health: A Systematic Review and Meta-analysis. **British Journal of Surgery.**2023

DIETRICH, Arne et al. Obesity surgery and the treatment of metabolic diseases. **Deutsches Ärzteblatt International**, v. 115, n. 42, p. 705, 2018.

FRÜHBECK, Gema. Bariatric and metabolic surgery: a shift in eligibility and success criteria. **Nature Reviews Endocrinology**, v. 11, n. 8, p. 465-477, 2015.

GURAYA, Salman Yousuf; STRATE, Tim. Surgical outcome of laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass for resolution of type 2 diabetes mellitus: a systematic review and meta-analysis. **World Journal of Gastroenterology**, v. 26, n. 8, p. 865, 2020.

GRÖNROOS, Sofia et al. Effect of laparoscopic sleeve gastrectomy vs Roux-en-Y gastric bypass on weight loss and quality of life at 7 years in patients with morbid obesity: the SLEEVEPASS randomized clinical trial. **JAMA surgery**, v. 156, n. 2, p. 137-146, 2021.

HAGHIGHAT, Neda et al. Long-term effect of bariatric surgery on body composition in patients with morbid obesity: a systematic review and meta-analysis. **Clinical Nutrition**, v. 40, n. 4, p. 1755-1766, 2021.

HAN, Youkui et al. Comparative analysis of weight loss and resolution of comorbidities between laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass: a systematic review and meta-analysis based on 18 studies. **International Journal of Surgery**, v. 76, p. 101-110, 2020.

JIANG, Hong-Peng et al. Meta-analysis of hand-sewn versus mechanical gastrojejunal anastomosis during laparoscopic Roux-en-Y gastric bypass for morbid obesity. **International Journal of Surgery**, v. 32, p. 150-157, 2016.

KEOGH, Shane et al. Options in bariatric surgery: modeled decision analysis supports Roux-en-Y gastric bypass and sleeve gastrectomy as the treatments of choice. **Surgery for Obesity and Related Diseases**, v. 14, n. 11, p. 1670-1677, 2018.

KUSHNER, Robert F. Weight loss strategies for treatment of obesity: lifestyle management and pharmacotherapy. **Progress in cardiovascular diseases**, v. 61, n. 2, p. 246-252, 2018.

KRISTENSEN, Sara Danshøj et al. Internal herniation after laparoscopic antecolic Roux-en-Y gastric bypass: a nationwide Danish study based on the Danish National Patient Register. **Surgery for Obesity and Related Diseases**, v. 12, n. 2, p. 297-303, 2016.

LI, Jianfang; LAI, Dandan; WU, Dongping. Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy to treat morbid obesity-related comorbidities: a systematic review and meta-analysis. **Obesity surgery**, v. 26, n. 2, p. 429-442, 2016.

MAGOULIOTIS, Dimitrios E.; TASIOPOULOU, Vasiliki S.; TZOVARAS, George. One anastomosis gastric bypass versus Roux-en-Y gastric bypass for morbid obesity: an updated meta-analysis. **Obesity Surgery**, v. 29, p. 2721-2730, 2019.

PHILLIPS, Blaine T.; SHIKORA, Scott A. The history of metabolic and bariatric surgery: development of standards for patient safety and efficacy. **Metabolism**, v. 79, p. 97-107, 2018.

RANDHAWA, Gurdit Singh et al. Instant remedy or total salvation? Merits and demerits of bariatric surgery. **Journal of Evolution of Medical and Dental Sciences**, v. 3, n. 71, p. 15148-15157, 2014.

SARKAR, Rupa. Patient Selection in Bariatric Surgery. In: **Obesity, Bariatric and Metabolic Surgery: A Comprehensive Guide**. Cham: Springer International Publishing, 2023. p. 121-140.

SRIVASTAVA, Gitanjali; APOVIAN, Caroline M. Current pharmacotherapy for obesity. **Nature Reviews Endocrinology**, v. 14, n. 1, p. 12-24, 2018.

SUNDBOM, Magnus. Laparoscopic revolution in bariatric surgery. **World journal of gastroenterology: WJG**, v. 20, n. 41, p. 15135, 2014.

VANOMMESLAEGHE, Hanne et al. Laparoscopic Roux-en-Y gastric bypass in the elderly: feasibility, short-term safety, and impact on comorbidity and weight in 250 cases. **Surgical endoscopy**, v. 29, p. 910-915, 2015.

ZHANG, Chengda et al. A meta-analysis of 2-year effect after surgery: laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for morbid obesity and diabetes mellitus. **Obesity surgery**, v. 24, p. 1528-1535, 2014.

ZHAO, Hongyi; JIAO, Lei. Comparative analysis for the effect of Roux-en-Y gastric bypass vs sleeve gastrectomy in patients with morbid obesity: Evidence from 11 randomized clinical trials (meta-analysis). **International Journal of Surgery**, v. 72, p. 216-223, 2019.