

# Effect of laparoscopic gastric sleeve vs. laparoscopic gastric bypass in Roux-Y on long-term weight loss in obese mexican population

*Efecto de la manga gástrica laparoscópica vs. el bypass gástrico laparoscópico en Y de Roux sobre la pérdida ponderal a largo plazo en población mexicana con obesidad*

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## Abstract

**Objective:** Compare the weight loss results between long-term procedures up to 5 years, after undergoing MGL and RYGB in Mexican patients with obesity and associated comorbidity. The most common bariatric surgical procedures worldwide are, laparoscopic gastric sleeve (MGL) and laparoscopic Roux-en-Y gastric bypass (RYGB), as a treatment for weight loss and remission of comorbidity associated with obesity; however, they are the long-term weight loss results in the Mexican population are unknown. **Method:** Retrospective, observational cohort of patients with obesity undergoing MGL or RYGB in a private hospital Medica Sur, in Mexico City, in the period from 2013 to 2021. Instrumental variables analysis and standardized mean differences were used to calculate outcomes up to 5 years at 5 follow-up visits (S1-S5), at 7 days, 2 months, 6 months, 10 months and 2-5 years after surgery, to compare results of the groups. **Results:** 104 patients were included in two groups: 31 (30.09%) with MG and 73 (70.87%) with RYGB. The last follow-up (S5), the MG group recorded a mean EW 9.61 kg, EW% 12.72% and EWL% 73.50%, and the RYGB group EW 10.1 kg, EW% 14.72% and EWL% 70.41%. **Conclusions:** No significant difference was found between groups for long-term EW loss ( $p = 0.082$ ); however, there is a greater decrease in weight loss in RYGB at 6-12 months compared to MGL.

**Keywords:** Bariatric surgery. Metabolic surgery. Obesity. Sleeve gastrectomy. Roux-en-Y gastric bypass.

## Resumen

**Objetivo:** Comparar los resultados de pérdida de peso con los procedimientos MGL y BGYRL a largo plazo (hasta 5 años) en pacientes mexicanos con obesidad y comorbilidad asociada. Son dos los procedimientos quirúrgicos bariátricos más frecuentes en todo el mundo: la manga gástrica lapa-ros-cópica (MGL) y el bypass gástrico en Y de Roux laparoscópico (BGYRL); ambos como tratamiento para pérdida ponderal y remisión de la comorbilidad asociadas a la obesidad. Sin embargo, se desconocen los resultados de pérdida de peso a largo plazo en la población mexicana. **Método:** Cohorte retrospectiva, observacional, de pacientes con obesidad sometidos a MGL o BGYRL en el hospital privado Médica Sur, de Ciudad de México, en el período de 2013 a 2021. Se utilizó el análisis de variables instrumentales y diferencias de medias estandarizadas para calcular los desenlaces hasta 5 años posquirúrgicos en cinco consultas de seguimiento (S1-S5) a los 7 días, 2 meses, 6 meses, 10 meses y 2-5 años posquirúrgicos, para comparar los resultados de los grupos. **Resultados:** Se incluyeron 104

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*pacientes en dos grupos: 31 (30.09%) con MG y 73 (70.87%) con BGYR. En el último seguimiento (S5), el grupo de MG registró media de EW 9.61 kg, EW% 12.72% y EWL% 73.50%, y el grupo BGYR tuvo EW 10.1 kg, EW% 14.72% y EWL% 70.41%. Conclusiones: No se encontró diferencia significativa entre grupos para pérdida de EW a largo plazo ( $p = 0.082$ ); sin embargo, hay una mayor disminución de pérdida ponderal en los pacientes con BGYR a los 6-12 meses en comparación con los tratados con MGL.*

**Palabras clave:** Cirugía bariátrica. Cirugía metabólica. Obesidad. Gastrectomía en manga. Bypass gástrico en Y de Roux.

## Introduction

For decades, obesity has become a public health issue, and its global incidence and prevalence continue to rise, along with the costs of its treatment and chronic repercussions. The excessive accumulation of body fat (typically 20% above the ideal weight) will eventually affect health and lead to damage that may not be reversible, potentially resulting in multiple associated comorbidities<sup>1</sup>, as well as a significant deterioration in quality of life<sup>2</sup>. It is estimated that by 2030, 57.8% of the global population (3.3 billion people) will have overweight or obesity<sup>3</sup>. Significant improvements in health-related quality of life have been demonstrated in patients who underwent bariatric surgery<sup>4</sup>.

Laparoscopic bariatric surgery is currently the surgical treatment of choice for obesity and its related comorbidities, with gastric sleeve (GS) being the most widely performed procedure today, compared to gastric bypass (GB) as the most widely practiced worldwide<sup>5</sup>.

In postoperative follow-up, it is crucial to report data under a standardized outcomes reporting system, such as the one provided by the American Society for Metabolic and Bariatric Surgery (ASMBS), which includes long-term follow-up of at least 5 years after the procedure, as well as bariatric variables such as excess weight (EW) and the percentage of excess weight loss (EWL%)<sup>6</sup>.

A meta-analysis comparing laparoscopic gastric sleeve (LGS) and laparoscopic Roux-en-Y gastric bypass (LRYGB) in patients with a body mass index (BMI) > 50 kg/m<sup>2</sup> showed that LRYGB achieved better weight loss after 6 to 12 months and a greater resolution of dyslipidemia 1 year after the intervention<sup>7</sup>.

In the observational follow-up of the SLEEVEPASS trial at 10 years, which was a multicenter randomized clinical trial, LRYGB showed an 8.4% greater EWL% vs GS. A meta-analysis of 18 studies did not find statistical significance between EWL with GS vs. LRYGB<sup>8</sup>. In a 4-year follow-up, GS had fewer reinterventions, hospitalizations, complications, lower general healthcare costs, and less mortality<sup>9</sup> compared to patients

who underwent LRYGB<sup>10</sup>. However, at 2 years, revision surgery was more frequent with GS.

There are different types and degrees of obesity: severe, morbid, or grade III. One of the studies with the longest follow-up, lasting 12 years for 90% of its initial population, showed that patients who underwent LRYGB maintained an average weight loss of 35 kg in follow-up, compared to 0 to 2.9 kg in the non-surgical group<sup>11</sup>. LRYGB is generally more effective than GS, with total remission of obesity-related comorbidities<sup>12</sup>. The short-term morbidity and mortality with both procedures are very low, and if complications arise, they are typically minor within the first 6 months<sup>13</sup>.

The success of bariatric surgery lies in the high rate of complete or partial remission of obesity-associated comorbidities, preventing complications, late effects, and related diseases, as well as improving quality of life<sup>14</sup> by achieving sustained weight loss<sup>15</sup>. Understanding the benefits and long-term outcomes of bariatric procedures is crucial due to their significant impact on morbidity and mortality associated with metabolic syndrome and obesity<sup>16</sup>.

The objective of this study was to compare weight loss up to 5 years across five postoperative follow-ups in Mexican patients who underwent the main bariatric procedures.

## Method

This was a retrospective, observational study of obese patients who underwent laparoscopic bariatric surgery from March 2013 to September 2021 at the third-level hospital Médica Sur in Mexico City. A non-probabilistic convenience sampling was used, selecting consecutive cases during the study period according to inclusion criteria. Clinical records, both physical and electronic, were used, and G\*Power from Heinrich Heine University Düsseldorf was employed for statistical power analysis, with a patient population of 120, who underwent LGS and LRYGB, with a 95% confidence interval and an ideal sample size of 89 patients.

All patients received mechanical thromboprophylaxis prior to surgery and pharmacological thromboprophylaxis until hospital discharge.

The study included patients (Fig. 1) with morbid obesity/grade III (BMI > 40 kg/m<sup>2</sup>) and grade II obesity (BMI > 35 kg/m<sup>2</sup>) with obesity-related comorbidities (systemic hypertension, type 2 diabetes, obstructive sleep apnea syndrome, dyslipidemia), and with pre-operative cardiological assessment without contraindications. Patients who had undergone revision surgery (secondary procedure), had prior intra-abdominal surgery, or had grade II obesity without comorbidity were excluded. Variables considered were age, sex, BMI, and comorbidity, and variables compared included EW, excess weight percentage (EW%), and EWL% between groups.

Patients were followed up through five consultations after the procedure: the first follow-up occurred with a mean of 10 days (n = 104), the second with a mean of 72 days (n = 97), the third with a mean of 235 days (n = 79), the fourth with a mean of 317 days (n = 55), and the fifth with a mean of 669 days (n = 38) for both the GS and LRYGB groups, with comparisons made at each follow-up. All results are presented as means, with standard deviation (SD) and a 95% confidence interval (95%CI). Anthropometric measurements and postoperative bariatric parameters were collected at each follow-up.

For the LRYGB surgical technique, a 20 cm<sup>3</sup> gastric pouch was created with a 100 cm biliary limb and a 150 cm alimentary limb, and a 36-Fr calibration tube was used, along with transoperative endoscopy. For GS, antrectomy was performed up to 1 cm lateral to the His angle, and calibration was done with a 40-Fr tube, with transoperative endoscopy used as well.

To avoid biases in the surgical technique, the procedures were performed by the same surgeon and surgical team.

Statistical analyses were conducted using the SPSS software (Statistical Package for the Social Sciences) version 25.0. Categorical variables are presented as frequencies and percentages, and numerical variables as means and SD as measures of dispersion. The Kolmogorov-Smirnov test was used to verify normal data distribution, and Levene's test was used to confirm homoscedasticity. A paired t-test was used to confirm homoscedasticity. A paired t-test was applied for analysis of numerical variables within the same group over time. A Student's t-test was used to explore differences between groups over time. A two-step transformation method was applied for variables that did not follow a normal distribution. Values with  $p < 0.05$  were considered statistically significant.

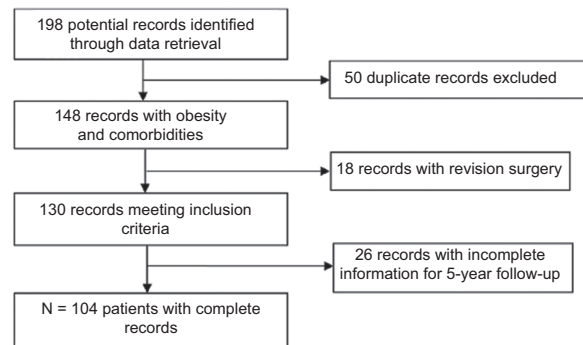


Figure 1. Flowchart of patient inclusion.

## Results

A total of 104 patients were included, divided into the LRYGB group and the LGS group. The demographic data (Table 1) showed a significant difference between the groups in the variables of female sex, presence of dyslipidemia, and gastroesophageal reflux disease ( $p < 0.001$ ). Regarding EW, EW%, and EWL%, no statistically significant differences were found between the groups in the recorded follow-ups (Table 2).

Greater weight loss was observed in the LRYGB group at 6-12 months compared to the LGS group; however, no significant differences were found between the weight, excess weight, or excess weight loss in the follow-ups between the two groups.

With the anthropometric data recorded during follow-up, the means of weight (Fig. 2), EW (Fig. 3), EWL% (Fig. 4), EW% (Fig. 4), and BMI (Fig. 5) were plotted, from the start of the preoperative protocol to the last postoperative follow-up (Fig. 5).

## Discussion

There are numerous treatments vs obesity in response to the growing global incidence, but bariatric surgery remains the most effective method. It is known that, in the long term, up to 10 years post-surgery, LRYGB is the most effective procedure; however, the most widely performed surgery worldwide today is LGS. This highlights the relevance of generating comparative results between both procedures in the long term.

Several studies have identified greater weight loss in patients with LRYGB compared to GS, including controlled clinical trials, systematic reviews, and meta-analyses. A meta-analysis<sup>6</sup> found no difference in weight loss with follow-up > 5 years for both procedures.

**Table 1. Baseline Demographic Characteristics of the Included Population**

| Characteristics                    | LRYGB<br>(n = 73; 70.87%) | LGS<br>(n = 31; 30.09%) | p       |
|------------------------------------|---------------------------|-------------------------|---------|
| Women                              | 52 (71.2%)                | 16 (51.6%)              | < 0.001 |
| Men                                | 21 (28.8%)                | 15 (48.4%)              | 0.472   |
| Age, years, mean (SD)              | 43.6 (14.18)              | 43.25 (15.31)           | 0.914   |
| Weight, kg, mean (SD)              | 115.91 (26.71)            | 111.54 (22.02)          | 0.389   |
| Height, m, mean (SD)               | 1.69 (0.19)               | 1.71 (0.16)             | 0.552   |
| BMI, kg/m <sup>2</sup> , mean (SD) | 43.03 (7.56)              | 39.24 (5.27)            | 0.004   |
| Type II Diabetes Mellitus          | 22 (29.7%)                | 11 (35.5%)              | 0.136   |
| Hypertension                       | 21 (28.5%)                | 11 (35.5%)              | 0.171   |
| Dyslipidemia                       | 25 (33.8%)                | 5 (16.1%)               | < 0.001 |
| OSAS                               | 9 (12.2%)                 | 4 (12.9%)               | 0.072   |
| GERD                               | 3 (4.1%)                  | 0 (0.0%)                | < 0.001 |
| Metabolic Syndrome                 | 49 (66.2%)                | 21 (67.7%)              | 0.057   |

LRYGB: laparoscopic Roux-en-Y gastric bypass; SD: standard deviation;  
GERD: gastroesophageal reflux disease; BMI: body mass index; LGS: laparoscopic  
gastric sleeve; OSAS: obstructive sleep apnea syndrome.

In our study, the number of procedures was higher for the LRYGB group than for the LGS group, contrary to what is described in the literature and current global trends. This discrepancy was due to the earlier years during which patients underwent bariatric surgery, with initially higher volumes, followed by a frequency reversal, making LGS now the most widely performed procedure, with no variations in the previously described surgical techniques. Demographic variables were similar between the two groups, as was comorbidity, with no significant differences. Three complications occurred, including postoperative bleeding from the staple line in the LGS group, all of which were resolved during the same hospitalization.

In our retrospective cohort, numerous anthropometric variables were collected over five follow-up visits, with an average of 669 postoperative days at the last follow-up. Weight loss was similar in both groups, though greater weight loss was observed in the first 6-12 postoperative months in the LRYGB group (6).

At the final follow-up, the LGS group recorded an EW of 9.61 kg, EW% of 12.72%, and EWL% of 73.50%, while the LRYGB group recorded an EW of 10.1 kg, EW% of 14.72%, and EWL% of 70.41%, with no significant difference.

**Table 2. Postoperative Follow-ups (S1-S5)**

|           | S1 (x 10 days) |             |       | S1 (x 72 days) |             |       | S1 (x 235 days) |             |       | S1 (x 317 days) |             |       | S1 (x 669 days) |             |       |
|-----------|----------------|-------------|-------|----------------|-------------|-------|-----------------|-------------|-------|-----------------|-------------|-------|-----------------|-------------|-------|
|           | LRYGB          | LGS         | p     | LRYGB          | LGS         | p     | LRYGB           | LGS         | p     | LRYGB           | LGS         | p     | LRYGB           | LGS         | p     |
| EW (kg)   |                |             |       |                |             |       |                 |             |       |                 |             |       |                 |             |       |
| $\bar{x}$ | 40.44-48.75    | 32.28-40.79 | 0.083 | 31.94-40.43    | 26.09-33.05 | 0.185 | 23.35-32.83     | 16.76-25.98 | 0.417 | 16.98-25.66     | 13.32-17.62 | 0.141 | 10.13-17.03     | 9.61-14.75  | 0.082 |
| SD        | 7.59           | 7.94        |       | 8.22           | 5.9         |       | 7.8             | 7.72        |       | 6.77            | 3.06        |       | 5.56            | 4.09        |       |
| 95%CI     | 6.99-9.06      | 7.43-9.58   |       | 6.06-11.01     | 4.72-9.21   |       | 7.39-11.56      | 6.74-11.68  |       | 6.69-10.66      | 2.45-6.16   |       | 4.85-8.94       | 3.49-7.77   |       |
| EW%       |                |             |       |                |             |       |                 |             |       |                 |             |       |                 |             |       |
| $\bar{x}$ | 59.93-66.16    | 44.92-50.0  | 0.068 | 47.42-66.16    | 36.31-45.9  | 0.138 | 34.92-48.86     | 23.42-36.18 | 0.233 | 24.86-38.08     | 18.26-24.26 | 0.086 | 14.72-25.32     | 12.72-16.98 | 0.061 |
| SD        | 6.85           | 4.02        |       | 16.02          | 7.69        |       | 11.81           | 10.23       |       | 10.85           | 4.4         |       | 8.43            | 3.81        |       |
| 95%CI     | 4.62-7.82      | 3.63-6.58   |       | 8.91-16.67     | 6.66-12.51  |       | 11.04-16.83     | 9.62-15.87  |       | 10.14-16.28     | 3.33-8.66   |       | 7.5-13.69       | 3.69-10.2   |       |
| EWL%      |                |             |       |                |             |       |                 |             |       |                 |             |       |                 |             |       |
| $\bar{x}$ | 9.18-19.86     | 13.57-24.56 | 0.623 | 19.50-38.37    | 23.24-39.90 | 0.401 | 38.66-56.84     | 39.63-65.32 | 0.883 | 53.06-70.89     | 67.75-78.98 | 0.129 | 14.72-70.41     | 12.72-73.50 | 0.161 |
| SD        | 10.6           | 10.86       |       | 16.28          | 12.09       |       | 17.04           | 24.68       |       | 15.03           | 11.21       |       | 47.13           | 39.02       |       |
| 95%CI     | 7.5-13.84      | 6.63-15.34  |       | 15.41-22.32    | 12.07-21.24 |       | 13.65-22.7      | 18.20-33.16 |       | 14.07-21.58     | 10.92-20.14 |       | 42.06-69.30     | 33.93-87.61 |       |

SD: standard deviation; EW: excess weight; EW%: percentage of excess weight; EWL%: percentage of excess weight loss; 95%CI: 95% confidence interval.

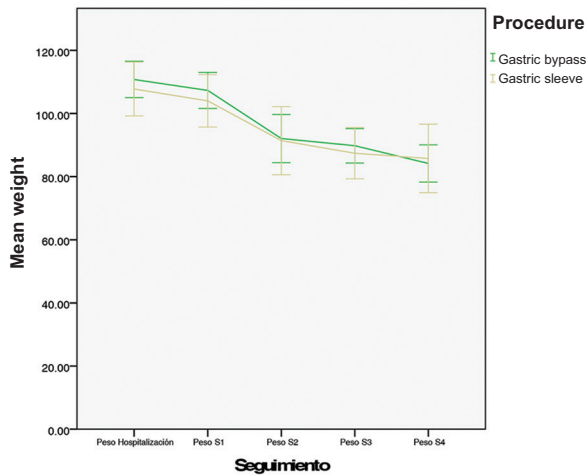


Figure 2. Postoperative follow-up of weight loss (mean weight).

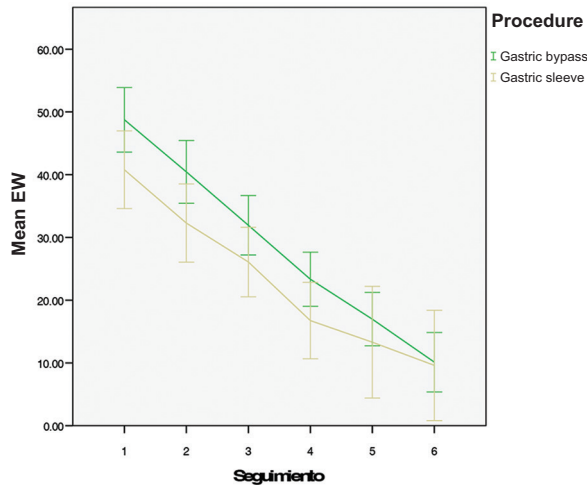


Figure 3. Postoperative follow-up of excess weight.

Analyses between groups across various follow-up records showed no statistically significant difference in weight loss at 20-month follow-up, with a 100% retention rate; however, the number of patients who discontinued follow-up visits later varied, with a tendency to drop out.

A limitation of this retrospective cohort study, given its nature, is the long-term follow-up, with gaps in record-keeping leading to the exclusion of some patients. Additionally, the year of patient selection was not the same, and the cohort was not homogeneous across both groups; however, the five postoperative follow-up visits were consistent. It is essential to

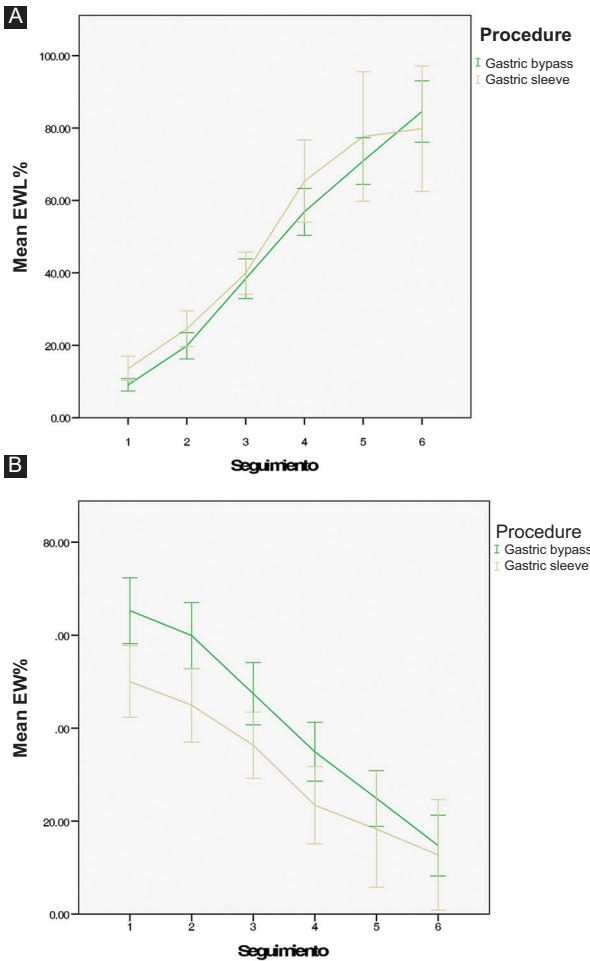


Figure 4. A) Postoperative follow-up of excess weight loss percentage (EWL%). B) Postoperative follow-up of excess weight percentage (EW%).

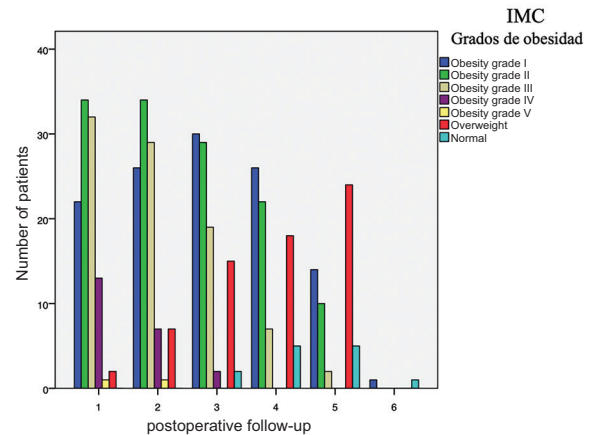


Figure 5. Comparison of body mass index in the postoperative follow-up.

highlight the varying adherence to follow-up visits among the study participants.

## Conclusions

The GS procedure had the same long-term weight loss in the Mexican population as LRYGB, with the latter being more effective in weight loss within the first 6-12 months. No differences were found regarding the resolution of comorbidity between the groups, and there was no significant difference in complications and reinterventions. Currently, there is no effective strategy for long-term postoperative patients, so better measures need to be implemented for the follow-up of obese patients undergoing bariatric surgery to achieve optimal postoperative control and follow-up, ensuring more reliable long-term results, as well as improving weight control and enhancing the quality of life for patients while continuing the complete remission of obesity-related comorbidities.

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None declared.

## Conflicts of interest

None declared.

## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that they have followed the protocols of their work center on the publication of patient data.

**Right to privacy and informed consent.** The authors have obtained approval from the Ethics Committee for analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

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