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SHORT COMMUNICATION

Preoperative factors correlated with post-bariatric surgery weight loss☆

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Abstract Whether preoperative parameters can predict weight loss following bariatric surgery is a matter of debate. We conducted a longitudinal and prospective pilot study on 35 patients that underwent bariatric surgery, with a 12-month follow-up. In the preoperative period, a high HOMA-beta index, lower fasting blood glucose, and lower HbA1c were correlated with a lower BMI at 12 months. Traditional preoperative factors, such as weight and BMI, were correlated with the postoperative BMI values. The presence of well-controlled diabetes may influence weight loss after surgery.

PALABRAS CLAVE
Cirugía bariátrica;
HbA1c;
Índice HOMA;
Pérdida de peso

Factores preoperatorios correlacionados con la pérdida de peso post-cirugía bariátrica

Resumen Existe un debate sobre si los parámetros preoperatorios pueden predecir la pérdida de peso después de la cirugía bariátrica. Realizamos un estudio piloto, longitudinal y prospectivo con 35 pacientes sometidos a cirugía bariátrica con un seguimiento de 12 meses. En el período preoperatorio, un índice HOMA beta alto, una glucosa en ayunas más baja y una HbA1c más baja se correlacionaron con un índice de masa corporal (IMC) de 12 meses más bajo. Los factores preoperatorios tradicionales, incluidos el peso y el IMC, también se correlacionaron con el IMC posoperatorio. La presencia de una diabetes bien controlada puede influir en la pérdida de peso después de la cirugía.

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Introduction

Bariatric surgery is one of the most effective therapies for obesity, in terms of weight loss, quality of life, and remission of comorbidities. Diabetes and insulin resistance are also common in that population. Their importance as predictors of weight loss following surgery has yet to be established.[1]

The preoperative characteristics that are truly connected with the success of bariatric surgery remain a source of debate. Weight loss is thought to be influenced by a variety of aspects, including the care team, the patient's capacity to maintain behavioral measures against regain, and the evolving environment.[1] A systematic review published in 2012 demonstrated that preoperative body mass index (BMI), super obesity, and personal disorders (binge eating) were negatively associated with weight loss.[2]

The present study aimed to evaluate the preoperative factors that were correlated with BMI evolution, 12 months after bariatric surgery.

Methods

A longitudinal, prospective pilot study was conducted on 35 patients that underwent bariatric surgery at a private clinic in Southern Brazil, with a 12-month follow-up. The inclusion criteria were patients $\geq$ 18 years of age that had a BMI $\geq$ 35 kg/m^2 and comorbidities. Laboratory tests were conducted on the patients for their preoperative evaluation. The homeostasis model assessment (HOMA) for assessing β-cell function (HOMA-beta) and insulin resistance (HOMA-IR) was carried out for predicting insulin resistance, and the early-phase insulin secretion index and insulin area under the curve (AUC) were calculated using the following equations[3]:

i. HOMA-beta = (20 $\times$ fasting insulin)/(fasting blood glucose -3.5)
ii. HOMA-IR = (fasting blood glucose $\times$ fasting insulin)/22.5
iii. Insulin index = (30-min insulin – fasting insulin)/(30-min blood glucose – fasting blood glucose).
iv. Insulin AUC 0-180 min = 0.5 $\times$ (fasting insulin + 30-min insulin) $\times$ (30 + 0.5) $\times$ (30-min insulin + 120-min insulin) $\times$ (90 + 0.5) $\times$ (120-min insulin – 180-min insulin) $\times$ 60

All of the above equations utilized mU/L for insulin and mmol/L for glucose. There are numerous measures for assessing weight loss success following surgery,[4] but we chose the BMI because it is associated with insulin resistance.[5]

Statistical analysis

The Kolmogorov-Smirnov test was used to ensure that the data were normally distributed. The categorical values were expressed as percentages, whereas the continuous values were expressed as mean $\pm$ standard deviation. The Spearman correlation was used for the correlation of the BMI with the preoperative variables at 12 months.

Table 1 Correlation between preoperative variables and postoperative BMI values at 12 months.

Preoperative variables	Spearman correlation	p
Fasting glucose (mg/dL)	0.484	0.004
Fasting insulin (mU/L)	0.122	0.521
HbA1c (%)	0.521	0.039
HOMA-IR	0.346	0.061
HOMA-beta	−0.362	0.049
Insulin index	0.009	0.967
Insulin AUC (0-180 min)	−0.139	0.500
Weight (kg)	0.600	<0.001
BMI (kg/m^2)	0.796	<0.001

Ethical considerations

The study was approved by the Ethics Committee of the Ponta Grossa State University, and all subjects provided their written informed consent. No data or images that could identify any of the patients were included, preserving patient anonymity at all times.

Results

Sleeve gastrectomy was the technique performed on all patients. Five (14.3%) of the patients were men and 30 (85.7%) were women. The mean patient age was 37.5 years (SD 8.7). Comorbidities included dyslipidemia (12 [34.2%]), type 2 diabetes (8 [22.8%]), hypertension (14 [40%]), and depression (8 [22.8%]). The mean baseline BMI was 41.8 kg/m^2 (SD 4.4) and the mean weight was 111.3 kg (SD 17). The preoperative blood glucose profile demonstrated a mean fasting blood glucose of 105.7 mg/dL (SD 35.5), mean fasting insulin of 21 mU/L (SD 11.3), and mean HbA1c of 6% (SD 1.5). For the preoperative beta cell dysfunction profile, the mean HOMA-IR was 5.2 (SD 3.3), mean HOMA-beta was 229.8 (SD 105), mean insulin index was 2.5 (SD 2.9), and mean insulin AUC (0-180 min) was 13,988 (SD 9,549.6).

The mean BMI at 12 months was 29.5 kg/m^2 (SD 4.2), the mean weight was 78.8 kg (SD 14), and the percentage of excess weight loss was 65.6% (SD 15.5).

The BMI 12 months after surgery demonstrated a significant positive correlation with preoperative HbA1c, fasting blood glucose, weight, and BMI, as well as a significant negative correlation with preoperative HOMA-beta (Table 1).

Discussion

A recent study by Samuel et al. on 1,419 patients indicated that perioperative results were similar in patients with uncontrolled diabetes prior to surgery. However, there was also less weight loss in the group with HbA1c levels > 8.5%.[6] Poor preoperative glycemic control has been associated with worse postoperative blood glucose level control, fewer diabetic remissions, and less weight loss.[7]

In a larger trial on 1,561 patients, HOMA-beta was negatively correlated with the percentage of total body weight loss, implying that beta cell function could be a useful indicator of weight loss after surgery in clinical practice.[1]

Disparities in insulin resistance/beta cell function and high HbA1c outcomes can be explained. HOMA-beta does not have a linear correlation with HbA1c; in fact, it decreases by approximately 28% when HbA1c is between 8-9%,[8] probably due to fasting hyperglycemia and the progression of diabetes to insulinopenia. Our study showed that fasting hyperglycemia was correlated with a higher postoperative BMI.

These results are important and are consistent with those reported in the literature. Since beta cell dysfunction may be an early sign of pre-diabetes or diabetes development, those patients may benefit from early bariatric surgery. The delay in performing the procedure can lead to uncontrolled diabetes, with high HbA1c levels and less weight loss following the surgery.

The present study has certain limitations. We had a small sample size and only a 12-month follow-up period. Moreover, the euglycemic clamp is the most reliable method for assessing beta cell responsivity to hyperglycemia, but it is not used in clinical practice.

Conclusion

Our study highlighted the fact that patients with a high HOMA-beta index could lose weight during the postoperative period. In addition, high preoperative values for HbA1c, fasting blood glucose, BMI, and weight were correlated with a higher postoperative BMI.

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Conflict of interest

The authors declare that there is no conflict of interest.

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