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Relationship between changes in hemoglobin glycosilated and improvement of body composition in patients with morbid obesity after tubular laparoscopic gastrectomy☆

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ABSTRACT

Background and objective: The objective of our study is to analyze the possible relationship between changes in glycemic profile and body composition parameters in morbid obesity patients after tubular laparoscopic gastrectomy.
Material and methods: A prospective observational cohort study with 69 patients was performed. The variables analyzed were body weight, blood glucose, haemoglobin, glycosylated, high density lipoprotein, low density lipoprotein, triglycerides, and waist and hip circumference. An analysis of variance of repeated measurements (ANOVA) and a correlation analysis through the Pearson test were carried out.
Results: A significant reduction in weight ($p < 0.001$ after surgery) and in glycosylated haemoglobin ($p < 0.036$) and waist hip ($p < 0.001$) were found at 6 months after surgery. There was no significant difference in the rest of the variables studied. In correlation analysis, a significant positive correlation was found between the change in concentration of haemoglobin glycosylated and hip circumference ($p = 0.047$; $r = 0.237$), the smaller the hip circumference, the lower the concentration of glycosylated haemoglobin.
Conclusions: Tubular laparoscopic gastrectomy is an effective technique for the treatment of morbidly obese patients with type 2 diabetes mellitus. The reduction in the perimeter of hip is related to glycosylated haemoglobin reduction 6 months after intervention.

Relación entre cambios en hemoglobina glucosilada y mejora de la composición corporal en pacientes con obesidad mórbida tras gastrectomía tubular laparoscópica

Palabras clave:
Diabetes mellitus
Gastrectomía tubular laparoscópica
Obesidad mórbida

RESUMEN

Introducción y objetivo: El objetivo de nuestro estudio es analizar la posible relación entre los cambios en el perfil glucémico y los parámetros de composición corporal en pacientes con obesidad mórbida tras gastrectomía tubular laparoscópica.
Material y métodos: Se realiza un estudio observacional prospectivo de cohortes donde el tamaño muestral es de 69 pacientes. Las variables analizadas son peso corporal, glucemia, hemoglobina glucosilada, *lipoprotein high density*, *lipoprotein low density*, triglicéridos y circunferencia cintura y cadera. Para llevar a cabo el objetivo de este estudio se ha utilizado un análisis de la variancia de medidas repetidas (ANOVA) y un posterior análisis de correlación a través del test de Pearson.

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Resultados: Tras el análisis estadístico se han encontrado una reducción significativa del peso tras la cirugía p < 0,001, una reducción significativa de la hemoglobina glucosilada entre los valores preintervención y a los 6 meses de la cirugía (p< 0,036) y un descenso significativo de los perímetros de cintura y cadera (p< 0,001). No existieron diferencias significativas en el resto de variables estudiadas. En el análisis de correlación, se encontró una correlación positiva significativa entre el cambio en concentración de hemoglobina glucosilada y perímetro de cadera (p = 0,047; r = 0,237), a menor diámetro de cadera, menor concentración de hemoglobina glucosilada.
Conclusiones: La gastrectomía tubular laparoscópica se muestra como una técnica efectiva para el tratamiento de pacientes obesos mórbidos con diabetes mellitus tipo 2. La reducción en el perímetro de cadera está relacionada con la reducción de hemoglobina glucosilada a los 6 meses de la intervención.

Introduction

Morbid obesity is a chronic and multifactorial disease characterized by an excess of body fat that causes a pathological weight gain (body mass index [BMI]) > 40 kg/m^2, or patients whose weight exceeds the ideal weight by 75 kg.[1]

Spain has experienced an increase of more than 200% in recent decades.[2] Most patients with morbid obesity have diabetes mellitus type 2 (DM2), the basis of its pathogenesis is the occurrence of insulin resistance linked to abdominal obesity, being the main risk factor for this condition.[3] DM2, arterial hypertension and dyslipidaemia are conditions that share insulin resistance and are part of the metabolic syndrome, which is a predictor of cardiovascular disease.[4] Non-invasive treatments for morbid obesity, diet, drugs, exercise, produce discrete results with a low long-term maintenance rate.[5] This fact is especially significant in the control of DM2 and the decrease in glycosylated haemoglobin (HbA1c). Decreasing blood pressure, improving the lipid profile and reducing glycosylated haemoglobin in morbidly obese patients is very difficult without surgery.[6] Bariatric surgery is extremely useful for morbidly obese patients with DM2, not only in terms of decreasing body weight, but also improving glycaemic control.[7] We do not currently have data that directly relate changes in biologic markers of glucose control with changes induced by bariatric surgery in the body composition of patients.

Patients undergoing bariatric surgery improve the lipid profile, blood pressure and obstructive sleep apnoea syndrome, among other complications associated with obesity.[8] One of the main bariatric surgery techniques is laparoscopic sleeve gastrectomy (LSG). This surgical technique, according to some studies, allows a weight loss of 57.6% per year and 70.1% after 3 years of its completion,[9] in addition to its simplicity as a surgical procedure, the maintenance of gastrointestinal continuity does not affect the quality of life of the patient, as occurs with other malabsorptive techniques. It is a procedure with few postoperative complications; that produces an improvement of cardiovascular risk factors: DM2, dyslipidaemia, high blood pressure, obstructive sleep apnoea syndrome.[10] The weight loss caused by surgery is associated with an improvement in DM2, which may or may not be related to the magnitude of weight loss.[9] Currently there are two mechanisms that could be involved in the improvement of hyperglycaemia from LSG: the hormonal response to meals and the improvement of fasting glycaemic control.[11] Morbid obesity is associated with the insulin resistance syndrome frequently observed with excess fat tissue, especially when there is an abdominothoracic or visceral distribution.[12] At present, there are no studies that evaluate at what point of the early follow-up there is an improvement in glycosylated haemoglobin and if this improvement coincides with the hip fat weight loss.

Morbid obesity is associated with hypertriglyceridemia, with a slight increase in total cholesterol, but with a significant decrease in HDL cholesterol (and therefore an increase in the total cholesterol/HDL cholesterol ratio).[13,14] On the other hand, something similar occurs with LDL, which receive triglycerides, these are partially metabolized by hepatic lipase and transformed into small and dense LDL, with a greater atherogenic potential.[15] Bariatric surgery improves hypercholesterolemia by 70% in malabsorptive techniques and by 45% in non-malabsorptive techniques.[16] Information currently available on the changes triggered during hypertriglyceridemia in early follow-up is reduced.

The aim of this study was to analyze the improvement in DM2 based on the decrease in HbA1c in patients with morbid obesity undergoing laparoscopic sleeve gastrectomy, and the possible relationship between changes in the glycaemic profile and the parameters of body composition occurred 6 months after the intervention.

Methodology

We used a prospective observational cohort study design with a 6-month follow-up period. To this end, 69 patients previously diagnosed with morbid obesity were invited to participate and underwent laparoscopic sleeve gastrectomy in the General Surgery and Gastroenterology Department of the San Cecilio Hospital in Granada, Spain. The study was carried out between the month of March 2011 and the month of June 2015. The inclusion criteria to participate in the study were the following: (1) patients >18 years of age, with severe obesity that met the criteria for surgical indication (BMI >35 with comorbidities or BMI >40 mg/kg^2). (2) Having signed the informed consent. Exclusion criteria: (1) general anaesthesia contraindication, (2) pregnancy, (3) previous abdominal surgery, (4) non-controllable medical conditions incompatible with the study's objective, (5) uncontrollable psychiatric conditions, (6) presence of ventral or hiatal hernia, (7) age ≥65 years. All patients who met the criteria accepted inclusion. Once informed, they signed the informed consent in accordance with the regulations of the Declaration of Helsinki. The data of the patients related to their demographic and clinical characteristics were obtained through a questionnaire prepared for this purpose, as well as through the patients' clinical history. The study was approved by the Clinical Research Ethics Committee of the Province of Granada. Participants were admitted to hospital 24 h before surgery. Two hours after hospital admission, the baseline parameters of the study were determined: questionnaires, laboratory and physical parameters. Surgery was always performed by the same surgical team using general anaesthesia, laparoscopy and 5 trocars (4 of 5 mm and 1 of 12 mm). Subsequently, two more determinations of all the parameters were analyzed 1-month and 6-months after surgery.