SURGERY FOR OBESITY AND RELATED DISEASES

Surgery for Obesity and Related Diseases ▮ (2017) 00–00

Original article

Improvement in cardiovascular risk in women after bariatric surgery as measured by carotid intima-media thickness: comparison of sleeve gastrectomy versus gastric bypass

Jesús M. Gómez-Martin, M.D.[a], Enrique Aracil, M.D.[b], Julio Galindo, M.D., Ph.D.[c], Héctor F. Escobar-Morreale, M.D., Ph.D.[a,d], José A. Balsa, M.D., Ph.D.[e,f], José I. Botella-Carretero, M.D., Ph.D., M.B.A.[a,f,*]

[a]*Department of Endocrinology and Nutrition, Hospital Universitario Ramón y Cajal and Instituto Ramón y Cajal de Investigación Sanitaria, Madrid, Spain*
[b]*Department of Vascular Surgery, Hospital Universitario Ramón y Cajal and Instituto Ramón y Cajal de Investigación Sanitaria, Madrid, Spain*
[c]*Department of General and Gastrointestinal Surgery, Hospital Universitario Ramón y Cajal and Instituto Ramón y Cajal de Investigación Sanitaria, Madrid, Spain*
[d]*Centro de Investigación Biomédica en Red Diabetes y Enfermedades Metabólicas Asociadas (CIBERdem), Madrid, Spain*
[e]*Department of Endocrinology and Nutrition, Hospital Infanta Sofía, Madrid, Spain*
[f]*Centro de Investigación Biomédica en Red Fisiopatología de la Obesidad y Nutrición (CIBERobn), Madrid, Spain*

Received October 27, 2016; accepted January 27, 2017

Abstract

Background: Bariatric surgery may diminish cardiovascular risk (CVR) and its associated mortality. However, studies that compare these effects with different techniques are scarce.
Objective: To evaluate the changes in CVR as estimated by carotid intima-media thickness (IMT) after obesity surgery in women with high CVR as defined by the presence of metabolic syndrome.
Setting: Academic hospital.
Methods: We studied 40 severely obese women, of whom 20 received laparoscopic Roux en Y gastric bypass (RYGB) and 20 received sleeve gastrectomy (SG). Twenty control women matched for age and cardiovascular risk were also included. Patients and controls were evaluated at baseline and 1 year after surgery or conventional treatment with diet and exercise, respectively. Only 18 of the 20 women in the control group were available for analysis after 1 year. None of the women who had bariatric surgery was lost to follow-up.
Results: Mean carotid IMT decreased 1 year after surgery irrespective of the surgical technique used, whereas no changes were observed in the control women who had conventional therapy (Wilks´ $\lambda = .802$, $P = .002$ for the interaction, $P = .011$ for RYGB versus controls, $P = .002$ for SG versus controls, $P = .349$ for RYGB versus SG).
Conclusion: Both RYGB and SG decrease CVR as measured by carotid IMT in obese women. (Surg Obes Relat Dis 2017;▮:00–00.)

Keywords: Carotid intima-media thickness; Cardiovascular risk; Gastric bypass; Obesity surgery; Sleeve gastrectomy; Subclinical atherosclerosis

Introduction

Obesity is a major public health problem with rising worldwide prevalence [1]. It is associated with an increase in all-cause mortality and with significant medical co-morbidities, [2] including cardiovascular risk factors such

Supported by grant FIBioHRyC EM03/2010. CIBERdem and CIBERobn are also initiatives of Instituto de Salud Carlos III.

*Correspondence: José I. Botella-Carretero, Department of Endocrinology and Nutrition, IRYCIS, CIBERobn, Hospital Universitario Ramón y Cajal, Carretera de Colmenar Km. 9.1, 28034 Madrid, Spain.
E-mail: joseignacio.botella@salud.madrid.org

http://dx.doi.org/10.1016/j.soard.2017.01.040
1550-7289/

as type 2 diabetes, hypertension, hypercholesterolemia, prothrombotic states, and sleep apnea, among others [3,4].

In past years, use of bariatric surgical procedures for the treatment of severe obesity has increased steadily as a result of their more successful weight loss and long-term weight maintenance compared with weight loss strategies based on diet and lifestyle changes [5]. This tendency has also been driven by the relatively low mortality and complication rate of modern bariatric surgical procedures that, although not free from long-term nutritional and metabolic issues [6–9], clearly compensate for the high risks associated with severe obesity.

Long-term outcomes after bariatric surgery include the resolution of many metabolic complications associated with obesity [10,11] as well as other endocrine disorders, such as polycystic ovary syndrome in women and hypogonadotropic hypogonadism in men [12–14]. Furthermore, a beneficial impact of obesity surgery on the incidence of cardiovascular events and reduction in cardiovascular deaths has been consistently demonstrated compared with standard obesity treatment [15,16].

Among the many cardiovascular risk markers commonly employed, an increase in the common carotid intima-media thickness (IMT) has been associated with unfavorable classical cardiovascular risk factors and systemic atherosclerosis [17,18]. Therefore, noninvasive assessment of IMT of the carotid arteries by high-resolution B-mode ultrasonography is widely used as predictor of future stroke and myocardial infarction [19], and it can be considered a surrogate clinical endpoint [20].

Obesity surgery has been shown to diminish carotid IMT in some previous studies, as reported by a recent meta-analysis [21]. However, data from direct comparisons of different bariatric techniques are scarce [22,23], and previous studies included heterogeneous groups of patients with different baseline cardiovascular risk, some lacking an adequate nonsurgical control group for comparison. Furthermore, sex dimorphism in cardiovascular risk has been previously shown [24] but has not always been taken into account in previous studies.

The aim of the present study was to evaluate the changes in IMT after obesity surgery in a homogeneous group of women with high baseline cardiovascular risk, as defined by the presence of metabolic syndrome, comparing the most frequently used bariatric techniques today: Roux en Y gastric bypass (RYGB) and sleeve gastrectomy (SG).

Methods

Patients and study design

Forty female candidates for obesity surgery presenting with high cardiovascular risk, defined by the presence of metabolic syndrome, were included in the study. Of them, 20 received laparoscopic RYGB and 20 received SG. The indication for each surgical technique was made according to international guidelines for obesity surgery and our hospital's protocol, precluding randomization of the surgical technique for this reason. Our protocol allocates patients with body mass index (BMI) >45 preferentially to RYGB. The main characteristics of the RYGB procedure include a 20- to 40-mL gastric pouch, a biliopancreatic limb measuring 80–100 cm from the Treitz ligament, and a 120- to 200-cm-long alimentary limb. SG was performed with a laparoscopic linear stapler calibrated with a 32 F orogastric tube. Twenty control women matched for age and cardiovascular risk were also recruited, and were treated with diet and lifestyle modification.

A diagnosis of metabolic syndrome, according to the American Heart Association and the National Heart, Lung, and Blood Institute [25], requires the presence of 3 or more of the following criteria: central obesity with a waist circumference (WC) ≥ 88 cm, triglycerides ≥ 150 mg/dL, blood pressure $\geq 130/85$ mm Hg, fasting glucose ≥ 100 mg/dL, high-density lipoprotein cholesterol ≤ 50 mg/dL, previous diagnosis of type 2 diabetes or treatment for hypertension, or lipid disorders. The Systematic Coronary Risk Evaluation (SCORE), a validated and recommended method for estimating cardiovascular risk in the Spanish population [26], was also calculated for each patient and control at baseline.

Exclusion criteria included mental impairment, uncontrolled psychiatric condition or active substance abuse, active neoplastic disease, pregnancy, unstable or incurable serious preexisting co-morbidities, and treatment with thiazolidinediones. Both patients and controls were evaluated at baseline and 1 year after surgery or after starting conventional treatment with diet and lifestyle modification, respectively. Written informed consent was obtained from every participant, and the study was approved by the Institutional Review Board of our institution.

The primary endpoint of the study was the change in carotid IMT on both sides, and the secondary endpoints were changes in cardiovascular risk factors including BMI, WC, blood pressure, lipid profiles, fasting glucose, insulin resistance, and C-reactive protein (CRP).

Between 8:00 a.m. and 9:00 a.m. after a 12 h overnight fast, an indwelling intravenous line was placed in a forearm vein, and after 15–30 minutes, basal blood samples were obtained from each patient. Office blood pressure and anthropometric parameters were also recorded and BMI was calculated. WC was measured as the smallest perimeter between the costal border and the anterior suprailiac spines. Excess body weight (EBW) was calculated as the difference between baseline weight and ideal weight. Ideal weight was calculated as the weight corresponding to a BMI of 25 kg/m^2, given a previous lack of consensus for the precise definition of EBW [27,28]. EWL was calculated as the percentage of weight loss attained from baseline EBW.