



Caso clínico

Bariatric surgery in type 1 diabetes mellitus; long-term experience in two cases

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Abstract

In patients with obesity and type 2 diabetes, recommendations for bariatric surgery are well established. However, no consensus exists regarding its role for the management of patients with type 1 diabetes and morbid obesity.

We present the long-term follow-up of two women with type 1 diabetes, morbid obesity and associated comorbidities, who underwent malabsorptive bariatric surgery. More than four years after the procedure, both have a body mass index (BMI) within the normal range and HbA1c levels below 7%. Also, they have been able to reduce their insulin requirements in more than 50%, their associated comorbidities have disappeared, and their overall quality of life has significantly improved.

We compare our results with other recently published ones, emphasizing potential indications of bariatric surgery for patients with type 1 diabetes.

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Key words: *Bariatric surgery. Type-1 diabetes mellitus.*

CIRUGÍA BARIÁTRICA EN DIABETES MELLITUS TIPO 1; EXPERIENCIA A LARGO PLAZO EN DOS CASOS

Resumen

Las indicaciones de la cirugía bariátrica en los pacientes con diabetes tipo 2 y obesidad están bien establecidas, pero no existe consenso que contemple esta posibilidad de tratamiento en los pacientes con diabetes tipo 1 que presentan obesidad severa.

Presentamos la evolución a largo plazo de dos mujeres diagnosticadas de diabetes tipo 1 (DM1) y que presentaban obesidad mórbida y comorbilidades asociadas que fueron intervenidas mediante la realización de una cirugía bariátrica malabsortiva. Tras seguimiento de más de 4 años, ambas pacientes mantienen un BMI dentro de la normalidad, concentraciones de hemoglobina glicada < 7%, reducción de sus necesidades de insulina en más del 50 %, remisión de las comorbilidades y clara mejoría de su calidad de vida. Se analizan estos resultados en comparación a otros publicados previamente con la finalidad de señalar las potenciales indicaciones de la cirugía bariátrica en pacientes con DM 1.

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Palabras clave: *Cirugía bariátrica. Diabetes mellitus tipo 1.*

Introduction

Bariatric surgery has proved to be an effective treatment for obesity and type 2 diabetes (T2D), with sustained remission rates ranging between 57% and 95%, depending on the surgical technique performed.¹ Even though we could also presume its role for the management of patients with type 1 diabetes (T1D) and

morbid obesity, evidence is limited to small case series. Consequently, recommendations for bariatric surgery are not addressed in either bariatric surgery consensus, or guidelines for the treatment of T1D.

We report the long-term follow-up of two patients with T1D and morbid obesity, who successfully underwent bariatric surgery. This provides a further source of evidence regarding the role of bariatric surgery in this clinical setting.

Case 1

A 33-year old woman, who was diagnosed with T1D at the age of 3.5 years, developed progressive weight gain since puberty, and reached 109 kg (BMI 46.6

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kg/m²) before she was scheduled for bariatric surgery. She followed an intensive basal-bolus insulin regime with four injections a day (total dose of 132 IU of insulin per day-1.21 IU/kg/day) and 1,700 mg of metformin. Average HbA1c level was 7.6%, her C-peptide levels were undetectable, and a mild retinopathy was the only specific microvascular complication she had. Obesity-associated comorbidities included high total cholesterol levels, gastro-esophageal reflux and polycystic ovary syndrome with irregular menses. The patient accepted to undergo bariatric surgery with the aim of reducing her overweight and she signed a written informed consent in which it was specified that clinical and analytical data could be potentially used for research and publication. A single-anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) was performed. This procedure is based on a biliopancreatic diversion with duodenal switch in which, after the sleeve gastrectomy, the proximal duodenal stump is anastomosed to the ileum in a Billroth-II fashion.² This technique has proved to be highly effective for weight control and T2D remission.³

Twelve months after bariatric surgery, body weight was 53 kg (BMI 22.64 kg/m², % weight loss [%WL] 56 %, % excess weight loss [%EWL] 95.3%) and, furthermore, insulin requirements decreased by 90%, which meant a daily dose of only 13 IU (0.25 IU/kg/day), and she was able to maintain HbA1c levels below 6.5% with no clinically relevant episodes of hypoglycemia. Five years later, her BMI is 24.5 kg/m², her total insulin dose is 58 IU/day (0.98 IU/kg/day), which means a 56% reduction of her preoperative dose, and HbA1c levels remain stable around 6.2%. Evaluation of her quality of life with Impact of Weight on Quality of Life (IWQoL-Lite) and EuroQoL questionnaires, revealed significant improvement (fig. 1 and table I, respectively). Additionally, her c-LDL levels are kept under 100 mg/dL without treatment, and she has experienced recovery of regular menses.

Case 2

A 32-year old woman, who was diagnosed with T1D nine years earlier, had an obesity history that began

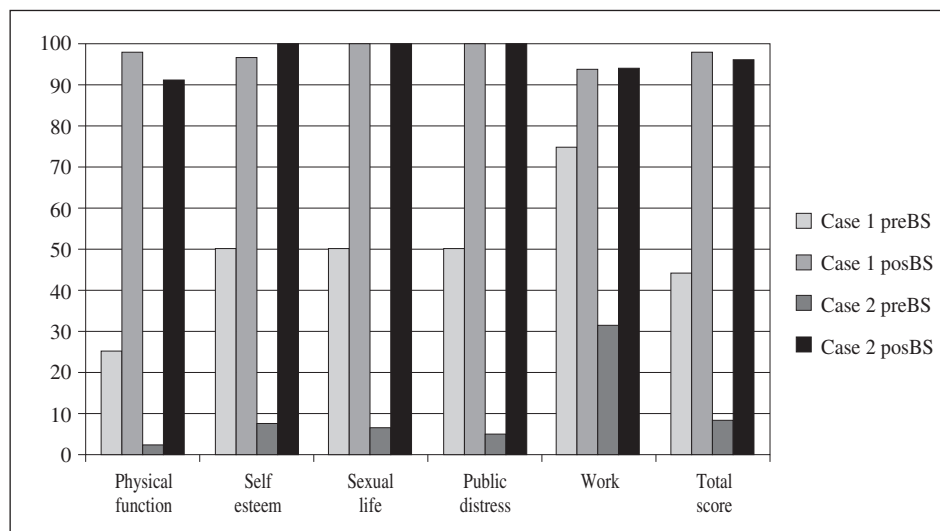


Fig. 1.—IWQoL-Lite transformed score (0 = worst, 100 = best). Results are presented by dimension and by case, before and 5 years (case 1) or 4 years (case 2) after bariatric surgery. PreBS = pre bariatric surgery. PostBS = post bariatric surgery.

Table I

Health profile using the EuroQoL instrument. Results are presented by dimension and by case, before and after surgery

EuroQoL dimension	Case 1		Case 2	
	Before surgery	After surgery (5 years)	Before surgery	After surgery (4 years)
Mobility ¹	2	1	2	1
Self-care ¹	1	1	2	1
Usual activities ¹	2	1	2	1
Pain/discomfort ¹	2	2	2	2
Anxiety/depression ¹	1	1	2	2
Self-rated health ²	50	80	50	80

¹Level 1 = No problems; Level 2 = Some problems; Level 3 = Extreme problems.

²Visual score from 0 to 100 (0 = worst imaginable health state, 100 = best imaginable health state).

following the initiation of intensive insulin regime and pregnancy, with a total weight gain of 40 kg. Prior to scheduled surgery, she weighed 125 kg (BMI 47.1 kg/m²), she was on 92 IU of insulin per day (0.74 IU/kg/day), her HbA1c level was 7.5%, C-peptide levels were undetectable, and she did not suffer from any diabetes-associated macro or microvascular complications. She did, however, have the following obesity-related comorbidities: medically controlled high blood pressure, high cholesterol levels which required atorvastatin 20 mg QD, and primary autoimmune hypothyroidism, which was controlled on 125 ug levothyroxine QD.

Similarly to case 1, SADI-S was the offered technique, and the patient also signed written informed consent. One year after the bariatric procedure, she weighed 69 kg (BMI 25.97 kg/m², %WL 44.8%, %EWL 85.9%) and her total insulin dose was 14 IU/day (0.22 IU/kg/day). During the first postoperative months, she experienced several episodes of moderate hypoglycemia due to insufficient intake of carbohydrates, which was not followed by subsequent titration of insulin dosage. These episodes progressively disappeared as treatment adjustments were accomplished. HbA1c levels remained stable around 7.0-7.2% during the next two years.

Four years have elapsed since she underwent bariatric surgery; her present body weight is 62 kg (BMI 23.3 kg/m²), HbA1c level is 6.9%, and total insulin dose is 28 IU (0.45 IU/kg/day) divided in three injections, which means a 70% reduction from preoperative dosage. In the same way as in case 1, this patient does not currently experience any food intolerance or bowel habit shifts, and she has significantly improved her quality of life (fig. 1 and table I). Blood pressure is now normal and cholesterol levels do not require treatment in order to be kept under target recommendations (< 100 mg/dL).

Discussion

In the two cases here presented, bariatric surgery was not only an effective treatment for obesity, but also helpful for glycemic control, weight-associated comorbidities and quality of life, as it could be inferred from the specific questionnaires performed. In fact, the main reason why surgery was offered in the first place was the latter; reduction of total insulin dosage, recovery of functional capacity, and amelioration of associated comorbidities were the main initial targets aimed, in order to achieve a significant overall improvement of quality of life.

T1D arises following a destructive autoimmune process of pancreatic beta-cells at an early age. However, the possibility of developing insulin resistance later on is still feasible, as it may occur in non-diabetics. This setting is usually associated to T2D family history, high BMI, elevated daily insulin requirements and poor metabolic control.⁴ Evidence

exists to support the existence of hepatic and peripheral insulin resistance in T1D in a similar way to what has been described in T2D.⁵ In the two patients that we present, weight loss and reduction of insulin requirements reveal an amelioration of insulin resistance, which entailed an improvement of obesity-related comorbidities. Furthermore, restoration of insulin sensitivity should imply prevention of diabetes-associated cardiovascular complications.

Glycemic control in T1D may be problematic during the first postoperative months after bariatric surgery due to different reasons. Firstly, a rapid decrease in insulin requirements challenges insulin titration, increases glycemic variability, and conveys the risk of clinically relevant episodes of hypoglycemia, as it occurred in case 2. Moreover, poor progression of diet, food intolerances and vomiting may jeopardize an adequate long-term control, and could even lead to the development of ketoacidosis in extreme cases, although this was not seen in neither of our patients. Prudence is, therefore, essential when recommending restrictive procedures in this clinical setting, in order to avoid the aforementioned complications.

In our two patients, we chose a procedure mainly based on malabsorption because, in our experience, this technique has proved to be effective in reducing insulin resistance and improving associated comorbidities in the mid-term follow-up.³ Patients experience good quality of life without major nutrient and vitamin deficiencies, and are able to maintain BMI within the normal range. Nevertheless, other approaches such as Roux-en-Y gastric bypass (RYGB) may be equally effective in the long-term in patients with T1D and morbid obesity.⁶⁻¹⁰

The majority of the twelve cases previously reported in the literature describe the follow-up of patients for up to one year, but long-term outcomes have been seldom reported. However, its knowledge deems necessary, since weight recovery would surely determine a return to deterioration of metabolic control. Only two patients reported in the case-series by Raab H et al⁹ remain with a BMI below 30 kg/m² after at least three years of follow-up. In another publication by Czupryniak L et al.,⁸ who described the long-term monitoring of three patients, two of them presented a BMI of 30.5 kg/m² 5 years after surgery, whilst the third one, after achieving a BMI of 30.1 kg/m² at 12-months' follow-up, she regained 24 kg and reached a BMI of 39.7 kg/m² after 6 years, with an accompanying worsening of metabolic control. Both of our patients here portrayed maintain a normal BMI in the long-term follow-up. The type of bariatric technique performed may have contributed to this outcome, and it may probably guarantee that both patients remain within an optimal body weight, and, consequently, with an adequate and long-lasting metabolic control and low cardiovascular risk.

In conclusion, even though data is still scarce, bariatric surgery appears to emerge as an attractive

approach for the management of patients with T1D and severe obesity who have insulin resistance and suffer from major associated comorbidities, such as high blood pressure, atherogenic dyslipidemia and obstructive sleep apnea, all of which entail an increased cardiovascular risk. Intensive lifestyle interventions and drug therapy may be insufficient for adequate control, thus allowing bariatric surgery to work its way in treatment algorithms. Yet the decision should be agreed amongst a multidisciplinary team and be approved by the corresponding ethics committee, and a complete informed consent should be provided by the patient. Beyond this clinical setting, bariatric surgery may entail risks that would outweigh its benefits, and thus, it may not be universally applicable yet.

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