Long-Term Results of Gastric Bypass Surgery in Morbidly Obese Type 1 Diabetes Patients

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Abstract

Background Long-term effects of bariatric surgery in morbidly obese type 1 patients are unknown. Five to eight-year experience in the case series of type 1 diabetes subjects is presented.

Methods Three poorly controlled type 1 diabetes patients, aged 19, 23, and 28 underwent Roux-en-Y gastric bypass surgery.

Results Their maximum body weight reduction noted during the follow-up was between 27% and 31% of baseline body weight, insulin requirement decreased from 0.6–0.95 to 0.3–0.83 IU/kg, and absolute reduction in HbA1c was 3–4%. Significant improvement in blood pressure, plasma lipid profile, and microalbuminuria was noted.

Conclusions RYGB surgery in morbidly obese type 1 diabetes patients leads to a significant and maintained weight loss and results in remarkable improvement in blood glucose control and concomitant disorders. Bariatric surgery should be recommended to significantly obese type 1 diabetes patients as a means of reduction of vascular complications risk.

Keywords Type 1 diabetes · Vascular complications · Prevention · Morbid obesity · Gastric bypass

Introduction

Bariatric surgery is an effective method of treating morbid obesity [1], and weight loss achieved in type 2 diabetes subjects leads to resolution or significant improvement of the clinical manifestation of the disease [2]. However, the experience of bariatric surgery in morbidly obese patients with type 1 diabetes is limited, partly because majority of patients with type 1 diabetes (caused by autoimmune destruction of pancreatic beta cells, which leads to absolute insulin deficiency) are not obese or even overweight either before developing the disease or in the course of it. Yet, in those obese subjects who become to suffer from type 1 diabetes, the role of bariatric surgery is not established. We report the long-term results of Roux-en-Y (RYGB) surgery in case series of type 1 diabetes patients.

Methods and Results

The first patient was a 23-year-old woman with autoimmune type 1 diabetes (plasma islet cell autoantibodies (ICA) titer assessed in the third year of the disease was 160 JDF units [normal range 0 JDF units]) since the age of 15 years, which was poorly controlled (HbA1c 9.5%) and treated with a basal bolus insulin regimen (daily insulin dose 68 IU). Her body weight was 113.5 kg, (body mass index (BMI) 38.8 kg/m²). She was microalbuminuric, mildly hypertensive, and had hypercholesterolemia treated...
with a low cholesterol diet. The patient underwent RYGB surgery as described before [3] in August 2000. Six months after the surgery, her body weight was 84.3 kg (BMI 28.8 kg/m²; 25.7% reduction). After 1 year, it decreased to 77.7 kg (BMI 26.6 kg/m²; 31.5% reduction). Two years after the surgery, her weight increased to 85.0 kg (BMI 29.1 kg/m²). At present, over 8 years after the operation, her weight is 89.0 kg (BMI 30.5 kg/m²) with daily insulin dose reduced to 43 IU. Her blood pressure, plasma lipids, and urinary albumin returned to normal soon after the surgery. Since the time of the bariatric surgery, she has presented with no signs of late diabetic complications or episodes of significant hypoglycemia; her most recent HbA1c value is 6.9%.

The second patient was a 28-year-old woman who was diagnosed with type 1 diabetes at the age of five. No immunological studies were performed in this subject; however, she was found to be C-peptide negative at the age of nine, which indicates presence of autoimmune type 1 diabetes. She had been obese since childhood, and her body weight had been steadily increasing since the diabetes diagnosis. At the time of the surgery, her weight was 126 kg (BMI 46.3 kg/m²). She had also been diagnosed with hypertension, hypertriglyceridemia, and Sjogren’s syndrome. She was treated with intensive insulin therapy (120 IU/day); however, her blood glucose control for the last 10 years had been extremely poor (HbA1c 10.4%). Her plasma ICA titer at the diagnosis was 39.7 kg/m²). Recently, she had been diagnosed with non-proliferative retinopathy. Her other medications included enalapril, bisoprolol, and fenofibrate. She had RYGB surgery performed in November 2002. Ten months after the operation, her weight was 84 kg (BMI 30.1 kg/m²; 33% reduction), and similar to the previous patient, increased slightly 18 months after the surgery to 89.5 kg (BMI 32.9 kg/m²; 29% reduction). Her metabolic control improved at that time substantially (HbA1c 7.3%), and her daily insulin dose was 70 IU. She no longer required any treatment for hypertension or lipid disorders. She had suffered occasional hypoglycemia bouts which could have been responsible for her recent body weight increase. Over 6 years after the surgery, her weight is 108 kg (BMI 39.7 kg/m²), and daily insulin dose increased to 84 IU, HbA1c 7.5%. Her retinopathy remains stable.

The third patient was a 19-year-old man with type 1 diabetes diagnosed at the age of 15 and poor glycemic control (HbA1c 10.5%). His plasma ICA titer at the diagnosis was 320 Juvenile Diabetes Foundation (JDF) units and anti-glutamic acid decarboxylase (GAD) antibodies 368 U/ml (normal range<9.1 U/ml). His body weight was 136 kg, height 181 cm, and BMI 41.5 kg/m²; he was treated with basal bolus insulin therapy (daily dose 96 IU). He underwent RYGB surgery in March 2004. Five years after the operation, his body weight is 99.5 kg (BMI 30.4 kg/m²; 26.8% weight reduction) and daily insulin dose decreased to 30 IU, with HbA1c 6.8%. He has not developed any vascular complications of diabetes so far.

Discussion

Our report is, to the best of our knowledge, the first one describing long-term effects of obesity surgery in type 1 diabetes patients. As in type 2 diabetes of morbidly obese patients, RYGB performed in type 1 diabetes subjects leads to sustained weight reduction and significant improvement in blood glucose control [4]. Moreover, it apparently may help prevent development and progression of late complications as seen in our patients.

With gastric bypass gaining acceptance worldwide as the effective surgical method of treating obesity and growing number of the operations [5], obese type 1 diabetes patients may be offered new treatment options. Other centers have also recently started to operate type 1 patients (personal communication from Prof. Eduardo Bastos, Brasil). Long-term effects of bariatric surgery, although well described in obese subjects, are poorly known in patients with type 1 diabetes. Our experience, though limited, show unequivocally that benefits of gastric bypass outweigh risks of the surgery in type 1 diabetes patients. The operations not only resulted in sustained weight reduction, but also “cure” hypertension and hyperlipidemia, and thus contributed to the prevention of vascular complications [6].

It is worth noting that surgery-induced weight loss was also associated with a significant decrease in insulin requirement per kilogram of body weight (from 0.60 to 0.53 IU/kg in the first, 0.95 to 0.83 IU/kg in the second, and 0.7 to 0.3 IU/kg in the third patient). This observation confirms the presence of clinically significant insulin resistance in severely obese type 1 diabetic subjects [7], which was effectively reduced with weight loss. This improvement in insulin sensitivity might also play an important role in the prevention of complications [8]. One may argue that insulin treatment regimen in the patients was on some occasions not in agreement with standard care typical of type 1 diabetes patients; however, all of these patients were far from being a standard example of subjects with type 1 diabetes as morbid obesity is rarely seen in that population of patients. In short, in all described subjects the most effective and safe insulin therapy model was used.

The patients lost 50–60% of their excessive body weight during the follow-up period, which is also the rate reported in non-diabetes subjects [9]. More importantly, as the surgery was performed in young adults, it is likely to prevent long-term obesity-related complications from developing in their future preferably long lives. Moderate
increase in body weight several years after the surgery is not unusual and has been reported in several follow-up studies of bariatric surgery efficacy [10].

In view of the obesity epidemic, it is interesting to note that at present, more often than not, physicians have increasing difficulties with diagnosing types of diabetes. Autoimmune ketosis-prone type 1 diabetes might occur in an obese subject who also presents with decreased insulin sensitivity. This issue is of particular importance in pediatric and adolescent population when type 2 diabetes has been until recently an unexpected finding. With increasing prevalence of obesity in young individuals, the number of cases of type 2 diabetes rise concomitantly [11]. On the other hand, as many as 15–25% of newly diagnosed type 1 diabetes subjects may be overweight or obese [12], which in selected cases, might lead to diagnosing of so-called “type 2 diabetes in type 1 diabetes” or “double diabetes” [13]. In addition, in up to 36% of children and adolescents diagnosed with type 2 diabetes, some markers of autoimmune reaction towards pancreatic beta cells are detected [14].

In general, it may be assumed that the need for bariatric surgery in patients with autoimmune diabetes will certainly increase in the near future, and our report shows that it might be a safe and effective therapeutic option. The problems with differentiating between both main types of diabetes in younger population have been described in details in the recently published clinical practice guidelines issued by the International Society for the Pediatric and Adolescent Diabetes [15]. However, in the three cases presented in this brief report, the diagnosis of autoimmune type 1 diabetes was confirmed with either immunological or biochemical studies.

In conclusion, RYGB surgery not only leads to a significant and maintained weight loss in type 1 diabetes patients but also results in remarkable improvement in metabolic control (absolute HbA1c reduction 3–4%) and concomitant disorders. Following surgery, no progress of vascular complications was noted, and its regression (from the stage of microalbuminuria) was found in one of them. Bariatric surgery should be recommended to significantly obese type 1 diabetes patients with the view of possible decrease of vascular complication risk.

Conflict of interest None

References