

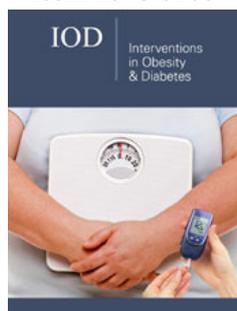
Severe Hypoalbuminemia Following Roux-En-Y Gastric Bypass in a Patient with Type 1 Diabetes

Eva Christina Krzizek*, Johanna Maria Brix and Bernhard Ludvik

Department of Medicine 1, Rudolfstiftung Hospital, Vienna

Karl Landsteiner Institute for obesity and metabolic diseases, Vienna

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***Corresponding author:** Eva Christina Krzizek, Department of Medicine 1, Rudolfstiftung Hospital, Vienna

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Abstract

Albuminuria in the context of diabetic nephropathy is a known complication of poorly controlled diabetes. Data of the Swedish Obese Study showed a reduction of albuminuria after bariatric surgery. On the other hand, Roux-en-Y gastric bypass carries the risk of protein malabsorption due to changes in the gut anatomy and physiology. In this case report we describe the results of a patient with both, diabetes mellitus type 1 and bariatric surgery. A 49-year old woman (height 157cm, weight 95kg, BMI 38.5kg/m²) with type 1 diabetes since 1983 underwent Roux-en-Y gastric bypass in 2005. She was admitted to our hospital due to generalized edema in December 2017. Routine check-up for bariatric patients was performed including blood tests after an overnight fasting and a urine sample. Amongst others HbA1c, creatinine, albumin and albumin-creatinine-ratio were evaluated. Yearly check-ups of these parameters were evaluated retrospectively since 1999. As expected, there was a significant weight loss after bariatric surgery (2005: 122kg, BMI 49.4kg/m²; 2007: 80kg, BMI 32.4kg/m²).

Diabetes control has always been poor (HbA1c 8.9% (1999), 8.7% (2005), 10.3% (2007), 10.8% (2017)). Diabetic nephropathy and retinopathy have been known since 1999. Albuminuria was present before bariatric surgery and got worse over the years (ACR 32.6mg/g (1999), 158mg/g (2005), 2246.4mg/g (2014), 1336.1mg/g (2017)). Furthermore, hypoalbuminemia has been present before surgery and deteriorated subsequently (albumin 29.0% (1999), 60.6% (2005), 32.2% (2012), 21.6% (2017)). In this patient, albuminuria unexpectedly worsened after Roux-en-Y gastric bypass despite weight loss, most likely due to insufficient metabolic control. Following surgery, decreased protein absorption contributed to the severe hypoalbuminemia resulting in generalized edema. Thus, patients at high risk for hypoalbuminemia, especially those with progressive diabetic nephropathy, need to be carefully evaluated preoperatively and be offered non-malabsorptive bariatric procedures such as sleeve gastrectomy, if indicated.

Keywords: Severe hypoalbuminemia; Roux-En-Y-gastric bypass; Diabetes mellitus type 1; Macro albuminuria

Abbreviations: RYGB: Roux-En-Y Gastric Bypass; BPD: Bilio Pancreatic Diversion; BMI: Body Mass Index; A1C: Hemoglobin A1c; ACR: Albumin/Creatinine Ratio; SOS: Swedish Obese Study

Introduction

Patients with diabetes mellitus are at risk for several long-term complications due to insufficient diabetes control. Increased albuminuria is considered to be an early sign of diabetic nephropathy and is associated with an elevated risk for cardiovascular disease and early mortality [1,2]. Albuminuria usually occurs in association with poor glycemic control, elevated blood pressure and longer diabetes duration [3]. 30-40% of patients with type 1 diabetes develop microalbuminuria [4,5]. In type 2 diabetes, ten years from diagnosis the prevalence of microalbuminuria is 24.9% [6]. During the last decades bariatric surgery for morbid obese patients became more and more frequent. Between 2014 and 2018 there were 190.177 of primary bariatric surgeries performed worldwide [7]. 69.2% of these patients were diagnosed with diabetes [7]. Besides significant weight reduction, beneficial effects of bariatric surgery comprise (transient) remission of type 2 diabetes and improvement of other risk factors such as hypertension and hyperlipidemia [8]. Therefore, bariatric surgery is mentioned as a potential treatment in obese, type 2 diabetic subjects in current guidelines [9,10]. Regarding albuminuria, data from the Swedish Obese Subjects Study (SOS) showed a reduction in its incidence after bariatric surgery [8,11,12].

On the other hand, malabsorptive procedures such as Roux-en-Y gastric bypass (RYGB) and biliopancreatic diversion (BPD) carry the risk of protein malabsorption due to changes in gut anatomy and physiology, since the small intestine as the major site of protein absorption is partly bypassed. It is characterized by hypoalbuminemia, edema, alopecia, and asthenia. Protein malnutrition is a complication mainly seen in patients undergoing BPD with an occurrence rate of 7-21% [13], has, however, also been reported after RYGB with an incidence of 13% at the 2-year follow-up [14]. While the typical patient with type 1 diabetes is not commonly regarded as overweight or obese, there is a growing number of patients with type 1 diabetes and morbid obesity who seek treatment by bariatric surgery [15]. In this case report we describe the consequences of bariatric surgery in such a patient.

Case Presentation

A 49-year old woman (height 157cm, weight 95kg, body mass index (BMI) 38.5kg/m²) with type 1 diabetes since 1983 underwent Roux-en-Y gastric bypass in 2005. In 2017, she was admitted to our hospital due to generalized edema. Her history revealed routine check-ups for bariatric patients including blood tests after an overnight fasting and a urine sample. Amongst others, A1C, creatinine, albumin and albumin-creatinine-ratio were evaluated since 1999. As expected, there was a significant weight loss after bariatric surgery (2005: 122kg, BMI 49.4kg/m²; 2007: 80kg, BMI 32.4kg/m², % excess weight loss 69.56, % total body weight loss 34.43). Over the years, some of the weight was regained. At the time of hospital admission the patient's weight was 95 kg (BMI 38.5kg/m²). Diabetes control has always been poor (A1C 8.9% (1999), 8.7% (2005), 10.3% (2007), 10.8% (2017)). The patient was using basal-bolus-therapy with insulin glargine and insulin aspart. She was seen by a specialist for diabetes every three months and had repeatedly courses of instruction, however, diabetes control continued to be poor. Already in 1999 diabetic nephropathy and retinopathy have been diagnosed, only 16 years after first diagnosis. Albuminuria was present before bariatric surgery and increased over the years (albumin/creatinine ratio (ACR) 32.6mg/g (1999), 158mg/g (2005), 2246.4mg/g (2014), 1336.1mg/g (2017)). Furthermore, hypoalbuminemia has been present before surgery and deteriorated subsequently (albumin 29.0% (1999), 60.6% (2005), 32.2% (2012), 21.6% (2017)).

On admission, A1C was 10.8%, serum albumin 40% (normal range: 55.8-66.1%) and ACR was 1336.1mg/g, Creatinine 2.07mg/dl, and GFR 25ml/min/1.7m². Subsequently, the patient was substituted intravenously with albumin which caused only a slow regression of edema only. She was advised about the appropriate protein intake for bariatric patients by a trained dietologist and prescribed "Ressource Protein"® (a protein-rich, high-calorie drinking food, containing 18.8gms of protein per bottle) twice a day. During in-hospital treatment a very good diabetes control

was achieved. After nearly four weeks of in-hospital treatment the patient could be discharged in good general health. Regular check-ups were planned. One year after hospital admission ACR was 1522mg/g, albumin was 32.9g/l, Creatinine was 1.14mg/dl, and GFR 50ml/min/1.7m².

Discussion

Although the SOS study demonstrated that patients undergoing bariatric surgery show an improvement of albuminuria [8], these results cannot be generalized. This case report describes the deleterious consequences of malabsorptive bariatric surgery in a poorly controlled patient with type 1 diabetes and already preoperatively existing albuminuria. Regarding the long diabetes duration, persistent poor diabetes control and the already substantially increased albumin excretion, a further worsening of albuminuria and the development of macroalbuminuria and overt renal insufficiency should have been anticipated. In addition, poor diabetes control might indicate a lack of compliance which is necessary for the required follow-up consultations after bariatric surgery. In this patient, hypoalbuminemia is most likely the consequence of deterioration of kidney function with development of macroalbuminuria and protein malabsorption following a malabsorptive procedure. In addition, reduced protein intake might be an additional contributing factor.

The course of the disease highlights the need for interdisciplinary consultation between internists/endocrinologists, surgeons, dietitians and psychologists. While there is no absolute contraindication for bariatric surgery in morbidly obese patients with type 1 diabetes, a careful preoperative evaluation is mandatory. This includes screening for diabetes complications, especially nephropathy with increased albumin excretion, and information on patient's compliance regarding regular follow-up and appropriate substitution of macro- and micronutrients as well as vitamins. In patients at risk for hypoalbuminemia due to albuminuria a non-malabsorptive method such as the sleeve gastrectomy should be considered. This, however, does not preclude hypoalbuminemia, taking into account a possibly decreased protein intake due to gastric restriction or loss of appetite.

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E-Ch K-made the research and wrote the manuscript. JMB-contributed to the interpretation of the results. BL-supervised the findings of this work. All authors provided critical feedback and contributed to the final version of the manuscript.

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