OBSERVATIONS

Case Report: Insulin Edema and Acute Renal Failure

Generalized edema due to insulin is a rare phenomenon. We report a 35-year-old woman with newly diagnosed type 1 diabetes who presented with generalized edema, serous effusions, and acute renal failure a few hours after starting insulin.

The patient presented with diabetic ketoacidosis after a 12-month history of polydipsia and polyuria. She had lost 2 kg over a 2-month period and weighed 47 kg, BMI 18 kg/m^2. Blood pressure was 131/84 mmHg. Clinical examination showed Kussmaul dyspnea, but was otherwise normal. Biological findings were consistent with severe diabetic ketoacidosis: pH 6.80, bicarbonate 1.4 mmol/L. Plasma glucose was 23 mmol/L and HbA_{1c} 13.3% (122 mmol/mol). Serum creatinine concentration was 90 μmol/L. The patient received a total of 15 L of intravenous fluids over a 96-h period. Insulin therapy was started at a rate of 8 units/h.

Subcutaneous insulin was initiated on the second day, total daily dose 30 units. From the second day on, serum creatinine concentration began to increase, up to 253 μmol/L; estimated glomerular filtration rate 18 mL/min, accompanied by generalized edema. A computed tomography scan, performed when serum creatinine concentration and body weight had already started to increase, showed bilateral pleural effusions and abundant peritoneal effusion. The morphology of the kidneys was normal, and there was no sign of obstruction. A sample of pleural fluid was obtained; protein concentration was 19 g/L. At day 5 the patient had gained 16 kg, the serum creatinine concentration was 260 μmol/L and serum albumin concentration was 22 g/L. Furosemide was started, 80 mg/day. Both body weight and serum creatinine concentration immediately started to decrease and returned to baseline within a couple of days. At day 30, body weight was 54 kg and serum creatinine 73 μmol/L.

Generalized transient edema due to insulin is a rare phenomenon with unknown incidence. It is generally benign and may occasionally recur (1). Our observation is, however, unusual by the development of acute renal failure after resolution of ketoacidosis, at a time when body weight had already increased, in the absence of shock at presentation or precipitating factor, such as rhabdomyolysis. Increased microvascular permeability was shown in insulin-treated patients with diabetes (2), and a parallel can be made with the systemic capillary leak syndrome, or Clarkson syndrome, a rare condition characterized by life-threatening attacks of capillary hyperpermeability, with low concentrations of albumin and high creatinine concentration (3). A monoclonal gammapathy is often associated with Clarkson syndrome, a negative finding in our patient. Insulin can directly trigger vascular endothelial growth factor (also called vascular permeability factor) expression in some vascular beds (4), and in another context, high serum concentration of vascular endothelial growth factor is causal in the extravascular volume overload and increase in vascular permeability of the POEMS syndrome (5). In our patient, we hypothesize that the acute renal failure was the consequence of relative hypovolemia due to a systemic capillary leak, resembling Clarkson syndrome, that was triggered by insulin. This hypothesis might be sustained by the very low albumin concentration, without proteinuria, during the acute renal failure, with spontaneous resolution.

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