



A very rare complication of type 1 diabetes: insulin edema developed in a newly diagnosed type 1 diabetes

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Summary

Edema caused by insulin therapy is a rare complication. Here we report a 13 year old boy with newly diagnosed type 1 diabetes who developed edema in lower extremities in the third day of insulin therapy. After exclusion of other causes leading to edema, we diagnosed insulin edema which has been very rarely reported in children. Within 7 days of insulin therapy, edema resolved spontaneously. In newly diagnosed type 1 diabetic children and adolescents insulin-induced edema should be considered after the initiation of insulin therapy. (*Turk Arch Ped* 2013; 48: 62-64)

Key words: Adolescent, diabetes, edema, insulin

Introduction

Edema in the absence of underlying cardiac, hepatic or renal disease is a very rare condition which can be encountered during insulin treatment. It has been reported that edema may occur a short while after the onset of insulin treatment or after increasing insulin doses (1,2,3). Although the first known case was published in 1928, the pathophysiology of the event has not been elucidated yet (2). We presented this case considering that it would be beneficial to know that edema may be observed during insulin treatment.

Case

Blood glucose was found to be high in an 13-year-old male patient who had polydipsia and pollacuria for the last one month and nocturnal enuresis for the last 15 days.

Body weight for height was found to be 74% (lower) in the patient who had normal physical examination findings except for mild fluid loss. Blood glucose was found to be 342 mg/dL, glucosuria was (+++), urine ketone was found to be positive. Blood gases were as follows: pH 7,28, bicarbonate 16,5 mmol/L, metabolic acidosis was absent. Glycosylated hemoglobin A1c level was found to be high (11.5%) and C peptide was found to be low (0.2 ng/mL) during

hyperglycemia. A diagnosis of type 1 diabetes was made and crystallized insulin treatment was started. On the third day of insulin treatment, pitting edema was observed in both ankles and the pretibial region (Figure 1). In urinary sample, sodium excretion was found to be mildly decreased (9 mEq/L) (normal: 10-20) and proteinuria was not present. Microalbumin level in the 24-hour urine was found to be normal (5 µg/min). Renal and hepatic function tests were within normal limits. At presentation, total protein was found to be 6.5 g/dL and albumin was found to be 3.5 g/dL. Serum cortisol level was found to be 11 µg/dL (normal: 3-21), plasma renin level was found to be 38 U/L (normal: 3.3-41) and plasma aldosterone level was found to be 550 pmol/L (normal: 100-950) which were all measured at 08.00 o'clock in the morning. Abdominal ultrasonography, echocardiographic examination and Doppler ultrasonographic examination of the legs were found to be normal. 4 days after the onset of edema it was observed that edema regressed and disappeared spontaneously without treatment with decrease in daily insulin dosage.

Discussion

Insulin-related edema which occurs considerably rarely has not been well understood. Since it is not recognized

adequately and more importantly, most cases have a mild course and improve spontaneously, it may have been underreported. In this article, we wanted to draw attention to a condition observed rarely during diabetes treatment and inform physicians about this poorly known complication. Although most cases are manifested with mild peripheral edema, diffuse and severe edema have been reported in some cases (3,4,5,6,7). Rarely, it has been reported that edema is not limited to the peripheral regions, fluid accumulation extends to the serosal spaces and leads to ascites, pleural effusion and even cardiac failure (8,9). One of the potential mechanisms which leads to edema is that insulin hormone affects electrolyte conduction in the kidney and causes antinatriuretic action (10). Insulin treatment stimulates Na^+/K^+ -ATPase and Na^+/H^+ exchange systems in the renal tubules and provides sodium retention in the body (11,12). Transient hyperaldosteronism which occurs during insulin treatment has been proposed to contribute to sodium and fluid retention in the body (13). It is known that inhibition of glucagon hormone with insulin treatment decreases renal excretion of sodium and fluid (14). Studies have shown that insulin hormone increases capillary permeability and decreased albumin levels in the circulation contribute to development of edema in both diabetes patients and in healthy controls (15,16). Although serum albumin, plasma renin and aldosteron levels were found to be normal in our patient, the fact that urinary sodium excretion was mildly decreased (near the lower limit) suggested that the above mentioned mechanisms might have been involved in the development of edema. Hence, insulin-related edema has been reported despite normal serum albumin level (1). In other studies, it has been claimed that insulin treatment may lead to a decrease in albumin levels, but this is not enough for development of edema (3,16). Interestingly, body weight for height values were observed to be low in some patients in whom insulin-related edema was reported as in our patient (1,3,17). Loss of body weight in



Figure 1. Edema in both legs

these children is related with catabolism arising from insulin defect. In the catabolism process which occurs during insulin deficiency, administration of intensive fluid treatment leads to leakage of the administered fluid into the subcutaneous tissues. Increased vascular permeability together with chronic hyperglycemia facilitates this (18).

Independent of the cause, it is known that edema which develops during insulin treatment is usually self-limiting and improves spontaneously. However, fluid and salt restriction is recommended in these patients and diuretic treatment is recommended in decompensated patients with severe edema (1,4). Spironolactone which is an aldosteron antagonist is recommended especially in cases of inappropriate hyperaldosteronism and it is advised to be used in combination with other diuretics (19).

In this article, edema which developed during insulin treatment in an adolescent newly diagnosed type 1 diabetes patient was presented because it is a considerably rare complication. Better recognition of insulin-related edema and the fact that most cases improve spontaneously without treatment would decrease the concern about this subject and prevent unnecessary interventions.

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