MUSCLE INFARCTION AND SEVERE DETERIORATION OF RENAL FUNCTION IN A PATIENT WITH TYPE 1 DIABETES MELLITUS AND CHRONIC KIDNEY DISEASE

R.M. Sánchez-Hernández^{1,2,*}, M.P. Alberiche-Ruano^{1,2}, Y. López-Plasencia¹, D. Marrero-Arencibia¹, C.A. Rodríguez-Pérez¹, F.J. Nóvoa^{1,2}, M. Boronat^{1,2}

¹Hospital Universitario Insular de Gran Canaria, Department of Endocrinology and Nutrition, ²Instituto Universitario de Investigaciones Biomédicas y Sanitarias (IUIBS) - University of Las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain

Abstract

Context. Spontaneous muscle infarction is a rare complication of diabetes mellitus, mainly affecting women and patients with long-lasting type 1 diabetes.

Objective. This report is aimed to describe the case of a patient with type 1 diabetes and diabetic nephropathy in whom a severe deterioration of renal function was triggered by a muscle infarction.

Subject and Methods. Subject of the study was a 33-years-old woman with an 18 years history of type 1 diabetes mellitus, proliferative diabetic retinopathy, nephropathy at stage 3 chronic kidney disease, somatic sensory-motor polyneuropathy and autonomic neuropathy.

Results. The patient presented with severe pain and dysfunction of the left thigh without prior trauma plus progressive deterioration of the renal function. Nuclear magnetic resonance of the thigh showed inflammatory changes in the external vastus with hyperintensity on T2 sequence and edema of the subcutaneous cellular tissue. After other possible etiologies were ruled out, a clinical diagnosis of spontaneous muscle infarction was established. The patient needed hospital admission for two months, during which the renal function worsened until she required hemodialysis. No other possible triggers of kidney injury were identified.

Conclusions. Up to our knowledge, this is the first described case where muscle infarction is suspected to have caused exacerbation of an existing chronic kidney failure. Monitoring the renal function should be considered in patients with diabetic nephropathy presenting with this rare complication of diabetes.

Key words: muscle infarction, type 1 diabetes mellitus, chronic kidney disease, diabetic nephropathy.

INTRODUCTION

Spontaneous muscle infarction is a rare complication of diabetes mellitus (DM), with less than

200 cases described in the literature (1-3). It occurs most frequently in women and patients with long-lasting type 1 DM, although it can also affect patients with type 2 DM (2). It is associated with chronic microvascular complications, especially diabetic nephropathy (4, 5). The prognosis is initially good, with complete resolution in most cases, although in the long term, it is associated with higher mortality and cardiovascular complications (6). However, as far as we know, no published reports have suggested that it might contribute to the deterioration of preexisting kidney disease.

CASE REPORT

The patient was a 33-years-old woman with a 18-years history of type 1 DM with chronic poor metabolic control, multiple hospital admissions because of diabetic ketoacidosis (more than 15 in the last 10 years), proliferative retinopathy treated with panphotocoagulation, diabetic nephropathy (stage 3 chronic kidney disease, macroproteinuria and grade III arterial hypertension), sensorimotor polyneuropathy, neurogenic bladder and diabetic enteropathy. She was under treatment with intensive insulin therapy following a basal-bolus regime. Last laboratory analysis, obtained two months before presentation, showed HbA1c 7.7%, serum creatinine 1.6 mg/dL and estimated glomerular filtration rate (MDRD4 formula) of 37 mL/min/1.73 m². Her previous history also included a biliopancreatic diversion surgery for morbid obesity (2006), Dupuytren's disease of the right hand (2007), multifactorial normocytic anemia treated with erythropoietin since 2011, periodontal disease, subacute prurigo, atopic dermatitis, liver steatosis and mixed anxiety-depressive disorder.

*Correspondence to: Rosa María Sánchez-Hernández, MD, Hospital Universitario Insular de Gran Canaria, Department of Endocrinology and Nutrition, Avenida Marítima S/N, Las Palmas de Gran Canaria, Las Palmas, Canarias, 35016, Spain, E-mail: rosamariasanher@gmail.com

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Figures 1 and 2. NMR of thigh: inflammation of the whole left external vastus and edema of surrounding subcutaneous cellular tissue. Hyperintensity in T2 sequences and hypointensity in T1 sequences.

She reported a one-month history of severe pain and dysfunction of the left thigh without prior trauma or signs of infection. The patient weighted 74 kg and was 164 cm tall. Physical examination revealed inflammation and severe pain upon palpation of the distal third of the thigh. Active movement of the left leg was impaired secondary to pain. Laboratory test results showed anemia (Hb 6,8 g/dL), mild leukocytosis (11.400/mm³), serum creatinine 2.02 mg/dL, metabolic acidosis (pH 7.11, HCO₃ 13 mmol/L), hyperkalemia (6.8 mmol/L) and normal CPK levels. Nuclear magnetic resonance of the left thigh showed inflammation of the whole external vastus with major edema of the surrounding subcutaneous cellular tissue. The image was hyperintense on T2 and hypointense on T1 sequences (Figs 1 and 2). A final diagnosis of muscle infarction was established after a complete diagnostic work out ruled out other conditions. Bone scintigraphy was normal and there were no clinical or laboratory evidences of infectious processes (cellulitis, polymyositis or osteomyelitis extending into soft tissues). A doppler ultrasound study of the lower limbs ruled out deep vein thrombosis. Electromyogram revealed severe mixed polyneuropathy of the lower limbs, which was unlikely to be secondary to diabetic amyotrophy. The patient had not suffered any trauma that could have caused a Morrel-Lavallée lesion (deep tissue injury after trauma) or muscle strain. Primary (lipoma, fibroma, leiomyoma) or secondary muscle tumors (liposarcoma, rhabdomyosarcoma) were excluded by imaging studies.

The patient was admitted for improvement of metabolic control and supportive care, including rest and analgesia. However, glycaemic control was very hard to achieve. In probable relation to bariatric surgery-

induced malabsorption and diabetic enteropathy, the patient had a highly labile DM with alternating hypo- and hyperglycaemia episodes.

She stayed in hospital for two months, during which the renal function progressively deteriorated. No other evident triggers of kidney injury could be identified. The serum creatinine level at the moment of discharge was 3.9 mg/dL. Consequently, she required renal replacement therapy with hemodialysis. Muscle infarction improved so that she could walk four months after discharge. Fifteen months after this episode, she died of sudden death.

DISCUSSION

Spontaneous muscle infarction is a rare complication of DM. It may affect patients with either type 1 (59.1%) or type 2 diabetes, especially those with poor metabolic control and diabetic nephropathy. It is more frequent in women (54%) and often associated with other microvascular complications (97%), such as nephropathy (75%), retinopathy (56.6%) and neuropathy (54.5%) (2, 3). The mean age of onset is 43 (range 19-81). It generally occurs in patients with long-term DM (mean duration 14 years) and poor control of the disease (for at least 5 years) (2). The clinical picture is typical: acute onset – without trauma or infection – of the following signs and symptoms: edema (75.9%), severe pain of the involved muscle (80%), weakness and restriction of active movement and palpable mass (33.7%), without accompanying systemic symptoms or skin alterations. The lower limbs are as the presented case, the most common location (the thighs in 86% of cases) and it is bilateral in approximately 10% of cases (3, 7).

The diagnosis requires a high suspicion index and is usually based on the clinical signs and the results of nuclear magnetic resonance, which typically shows hyperintensity in T2 sequences with edema of the subcutaneous cellular tissue (8, 9). Laboratory test results are usually within normal limits, although elevated creatine kinase levels (between 4 and 40 weeks after onset of the clinical signs) can be observed (2). This entity should be considered in patients with chronic poorly controlled DM with complications – especially nephropathy – who complain of acute onset of muscle pain without prior trauma. Early diagnosis may help prevent unnecessary investigations (muscle biopsy) (10) and, in some cases, reduce hospital stay (11).

Treatment consists of rest, control pain, and rigorous glycaemic control. Possible additional therapies include administration of pentoxifylline, nifedipine, non-steroidal antiinflammatory drugs, corticoids, gammaglobulin or anticoagulants (2).

This condition is self-limiting with a good prognosis in the short-term. Pain and inflammation resolve spontaneously after several weeks or months; 35-48% of patients suffer recurrences (8.69% on the same muscle; 39-61% on a different muscle) (3,12). As in the here-described case, the onset of this condition often precedes major vascular complications, which may worsen the long-term prognosis (10% mortality two years after muscle infarction, due to vascular complications) (2, 4). However, while muscle destruction and rhabdomyolysis is a well-known cause of acute renal failure, no previous cases of rapid progression of chronic kidney disease have been reported in patients with spontaneous muscle infarction. Rhabdomyolysis is the result of muscle necrosis and release of myocyte intracellular contents into the circulation, usually after prolonged immobilization, trauma, drug toxicity, electrolyte disturbances or alcohol or illicit substances abuse. Renal failure associated with this condition has been traditionally attributed to tubular obstruction due to precipitation of myoglobin with Tamm Horsfall protein. As we did not find myoglobinuria or serum elevation of CPK levels in our patient, other mechanisms of kidney injury, such as renal vasoconstriction or tubular damage by oxidative

injury (13), maybe operating in a milder but steady manner, could have played a major role in our case.

In conclusion, up to our knowledge, this is the first described case, where spontaneous muscle infarction is suspected to have caused exacerbation of an existing chronic kidney failure. Therefore, we suggest that renal function monitoring should be considered in patients with diabetic nephropathy, who present with this rare complication of DM.

Conflict of interest

The authors declare that they have no conflict of interest concerning this article.

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