Diabetic Foot Gangrene Precipitated by Deep Venous Thrombosis: A case report

Authors: C.O. Ekpebegh 1, P. Musoke 2, A. Akinrimade 3

Abstract: There are no published reports of deep vein thrombosis as an etiological factor for diabetic foot gangrene. We report on a 75-year-old male with type 2 diabetes complicated by peripheral neuropathy and peripheral arterial disease who was admitted for mild ketoacidosis precipitated by a chest infection. He subsequently developed foot gangrene which was preceded by calf swelling that was subsequently confirmed to be deep venous thrombosis. Deep venous thrombosis should be considered in the differential diagnosis of foot gangrene associated with calf swelling.

Key words: Diabetes, foot gangrene, venous thrombosis.

Introduction

Diabetic foot gangrene results from peripheral arterial disease with or without foot sepsis. It is associated with excess mortality. Although venous thrombosis has been reported in association with gangrene, there are no published reports of venous thrombosis as a contributory factor in the etiology of diabetic foot gangrene. We describe a case of diabetic foot gangrene precipitated by thrombosis of the deep veins of the calf.

Case Presentation

A 75-year-old male with type 2 diabetes and hypertension for 31 years presented at the casualty unit of Nelson Mandela Academic Hospital, Mthatha, South Africa with a 1 week history of malaise, vomiting, cough and breathlessness. There were long standing severe pains in both lower limbs. He claimed good compliance with metformin 500 mg twice daily, biphasic insulin (actraphane) 32 units before breakfast, and 16 units before supper for the treatment of hyperglycemia. Hypertension was being treated with perindropil 4 mg daily, nifedipine retard 30 mg daily, and hydrochlorothiazide 12.5 mg daily.

Physical examination revealed an elderly male who was well oriented to person, place and time, febrile (temp of 38°C) and moderately dehydrated. The heart rate was 130 beats per minute and regular with blood pressure of 159/86 mmHg. Chest examination revealed right lower lung lobe consolidation.
Parameter (normal range) | Value
---|---
HbA1c (<7%) | 9.5%
Glucose (73.8-200.0) | 487.8 mg/dl
Serum sodium (135 -147) | 187 mEq/L
Serum potassium (3.5 -5.2) | 4.1 mEq/L
Serum chloride (95 - 107) | 101 mEq/L
Serum bicarbonate (18-29) | 18 mEq/L
Serum urea (8.4-32.4) | 67.8 mg/dl
Serum Creatinine (0.8-1.20) | 1.4 mg/dl
White blood count (4-10) | 11.14 x 10⁹/l
Hemoglobin (11.7-14.9) | 12.2 g/dl
Platelet count (165-450) | 217 x 10⁹/l
Serum AST (0-40) | 43 u/l
Serum ALT (0-40) | 31 u/l
Ketonuria (0) | +2

Table 1  Laboratory parameters at presentation

The dorsalis pedis and posterior tibial arterial pulses were reduced in both feet. Vibration sense and ankle reflexes were absent in both feet.

Blood glucose measurement with a glucometer was unrecordably high and was associated with a 2+ ketonuria. Laboratory plasma glucose level was 487.8 mg/dl with serum bicarbonate of 18 mEq/l. The assessment at this stage was mild diabetic ketoacidosis precipitated by a right lobar pneumonia with severe lower limb pains from peripheral neuropathy and peripheral vascular disease. Chest radiograph revealed inhomogenous opacities in the right lower lung zone. The results of other laboratory investigations are shown in Table 1.

The patient was commenced on intravenous fluids, insulin infusion, parenteral cefuroxime and analgesics. Gangrene of the left toes with swelling of the left calf (Figure 1) was observed on the 11th day of admission. Re-examination of the patient on noticing the gangrenous toes revealed the left foot to be colder than the right foot with absent dorsalis and posterior tibial arterial pulsations in the left foot.

Figure 1  Gangrenous affectation of the left lower limb from the toes to the mid portion of the leg.

Plain radiograph of the feet and legs excluded gas gangrene in the left lower limb. Doppler ultrasonography showed compressibility of the right leg venous system with good right venous and arterial blood flow.

There was loss of compressibility of the left deep popliteal veins with minimal arterial flow at the level of the popliteal artery. There was, however, compressibility and good flow in the left femoral vein. Subcutaneous enoxaparin 80 mg twice daily was commenced for thrombosis of the left popliteal vein and surgical consultation was sought. The left lower leg was assessed by the surgical unit as unsalvageable and an above knee amputation was performed on admission day 18. The patient, however, demised on hospital day 23 with the suspected cause of death being pulmonary embolism.
Discussion

Venous thrombosis in diabetes has been described in the portal and cerebral veins.\textsuperscript{4,5} Although our patient had peripheral arterial disease which is a major etiological factor for diabetic foot gangrene, deep venous thrombosis (DVT) was the identified precipitating cause for the foot gangrene. Left foot gangrene in association with left calf swelling occurred after admission into hospital. This is the first report of diabetic foot gangrene precipitated by DVT.

Foot gangrene likely resulted from further compromise of an already precarious distal lower limb arterial circulation with the occurrence of the DVT. Deep venous thrombosis will lead to a rise in venous pressure distal to the site of thrombosis while peripheral arterial disease which was already present results in reduced lower limb arterial pressures. Foot gangrene is the likely consequence of a further decline in capillary perfusion pressure from the raised left lower limb venous pressure in the face of existing lower limb arterial pressures. Peripheral arterial disease at presentation as a cause of limb pains and reduced distal lower limb pulsations was confounded by the presence of peripheral neuropathy and dehydration. Although limb coldness is consistent with arterial disease, the finding of calf swelling meant that co-morbidities such as venous thrombosis, cellulitis, necrotizing fasciitis, abscess and ruptured popliteal cyst needed to be excluded. Diabetic foot gangrene in association with limb swelling is typically associated with cellulitis and necrotizing fasciitis. These were however, unlikely in our patient as the left foot and calf were not warm as may be expected with an infection. Ultrasonography apart from confirming venous thrombosis also excluded cystic conditions like abscess and popliteal cyst. The other techniques for the diagnosis of DVT include impedance plethysmography and contrast venography.\textsuperscript{6} Advanced age, dehydration and immobilization are factors that may have contributed to the development of DVT in our patient.

Although our patient was a male with long standing diabetes and hypertension, and had all risk factors for PAD\textsuperscript{7}, the occurrence of gangrene and subsequent death may have been prevented if there had been regular monitoring for PAD. Peripheral arterial disease is objectively assessed by determining the ankle-brachial pressure-index (ABPI), with an ABPI < 0.4 indicating critical limb ischaemia.\textsuperscript{8} Electively performed salvage revascularization procedures guided by arteriography may prevent the occurrence of gangrene in critically ischaemic limbs.\textsuperscript{9,10} At the occurrence of gangrene, tissue viability can further be determined by measuring transcutaneous oxygen tension.\textsuperscript{11}

Deep vein thrombosis should be excluded in diabetic foot gangrene associated with calf swelling particularly where features of local sepsis are lacking. Foot gangrene associated with deep vein thrombosis in diabetes mellitus may be avoided by early detection and treatment of peripheral vascular disease, as well as appropriate thrombophrophylaxis during hospitalization or extended periods of immobility.

References

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