Development of calcific myonecrosis as a late complication of an open fracture

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Abstract

A 76-year-old man presented with a mass on his right leg. He had sustained an open fracture of the right tibia 58 years ago. Imaging showed a well-circumscribed fusiform calcified mass and atrophy of the right calf muscles. The findings and the history led to the diagnosis of calcific myonecrosis.

Keywords

Calcific myonecrosis; complication of compartment syndrome; complication of fracture; open fracture; chronic calcific mass.

Introduction

Calcific myonecrosis is a rare condition that can occur as a late complication of compartment syndrome or neurovascular injury\textsuperscript{[1,2]}. Patients can present with a slowly enlarging painless mass that has a dramatic radiologic appearance\textsuperscript{[2,3]}.

Case report

A 76-year-old man presented with a 3-month history of a firm swelling on the lateral aspect of his right leg. An episode of cellulitis (which had resolved with oral antibiotics) preceded the onset of swelling. The patient was otherwise well with no other symptoms. He had a past medical history of an open right tibia and fibula fracture 58 years previously following a road traffic accident, which had been treated with debridement and traction. The patient denied suffering from compartment syndrome or significant neurovascular injury during this event. Other relevant history included bilateral total knee replacements, right total hip replacement and psoriasis.

On examination he had a well-defined, firm lump on the lateral aspect of his right leg measuring approximately 4 cm in diameter. It was not tender and caused no neurovascular deficits or restriction of movement.

On investigation, he had normal full blood count, liver function tests, C-reactive protein and erythrocyte sedimentation rate. Plain radiographs showed marked calcification in the muscles of the right leg and healed fractures of the right tibia and fibula (Fig. 1). Ultrasound scan showed extensive calcific density within the soft tissues of the posterior and lateral compartments of the right leg.
right leg. Magnetic resonance imaging (MRI) of the right lower leg revealed marked atrophy of the proximal calf muscles on the right side compared with the left leg, suggesting previous compartment syndrome. There was replacement of the distal calf muscles by a low signal mass on all sequences. It demonstrated a distinct area of calcification which was separate to the bony skeleton and seemed to line the muscular sheaths of the lateral compartment of the right leg (Fig. 2). A cod liver oil radiologic marker was able to indent the lesion, indicating some compressibility of the mass. The atrophy of the right leg musculature (which implied previous compartment syndrome) and the pattern of calcification led to the diagnosis of calcific myonecrosis.

The patient has remained asymptomatic from the swelling and the plan is for conservative management and clinical follow up.

Fig. 1. Anteroposterior and lateral radiographs showing a well-defined fusiform calcific mass in the right leg.

Fig. 2. Coronal MR images (short tau inversion recovery sequence) showing muscular atrophy and a well-circumscribed oval mass in the right leg.
Discussion

Originally described in the 1960s as a late complication of Volkmann ischaemic contracture, calcific myonecrosis is thought to be a rare late complication of compartment syndrome or neurovascular injury\[^{1,2}\]. Calcification seems to occur predominately in the lower limb with the most frequent site being the anterior compartment of the leg\[^{1-4}\]. However, in some case reports, this phenomenon is reported in the upper limb and the foot\[^{5,6}\].

It typically manifests as a fusiform area of calcification on radiographs. MRI shows a well-circumscribed linear mass with peripheral calcification and a liquid centre. This mass may be located within a compartment or involve one particular muscle\[^{2-4,7}\]. In the case presented here, the area of calcification was distinct from the bony skeleton. However, there are case reports of erosion of neighbouring bone\[^{5,8}\].

Previous reports have shown patients presenting between 10 and 64 years after injury. There is usually a history of trauma that resulted in compartment syndrome. Alternatively there may be a history of muscle ischaemia secondary to vascular injury\[^{3}\]. Peripheral nerve injury has been strongly implicated in the development of this condition and the common peroneal nerve is reported as being the most frequently involved\[^{2}\]. In the case illustrated here, the patient developed this condition after an open fracture. Although the rate of developing compartment syndrome after an open fracture is low, quoted at 9.1%\[^{9}\], there is a greater risk of sustaining neurovascular injury, which may have triggered the development of this condition in this case.

The pathogenesis of this condition remains unclear. The current hypothesis is that compartment syndrome leads to vascular compromise resulting in muscular necrosis and replacement with fibrous tissue. Continued intralesional haemorrhaging then leads to the formation of a chronic calcific mass\[^{8}\]. It has been proposed that the pathophysiology of myonecrosis is the same as chronic expanding haematoma and posttraumatic cysts of soft tissue. Repeated haemorrhaging into a fascial space in the presence of increased compartment pressure leads to the formation of a fusiform mass with a soft cystic centre, called ancient haematoma\[^{10}\].

Calcific myonecrosis is a benign condition and recognition of this entity is important in order to exclude other diseases that can lead to soft tissue calcification such as neoplasms, myositis ossificans, polymyositis and dermatomyositis. The most appropriate form of imaging for diagnosis is MRI as it outlines soft tissues in detail\[^{2,4,7}\]. However, computer tomography (CT) can also provide valuable information for diagnosis as it demonstrates the pattern of calcification\[^{2,4}\]. If there is doubt regarding the diagnosis or if the lesion continues to enlarge or become symptomatic, the patient should be referred for further investigation\[^{2-4}\].

Operative management was not undertaken in this case. There is conflicting opinion regarding the merits of surgery. Some authors have advocated complete excision of the lesion\[^{7}\]. Others have recommended avoiding any operative intervention altogether if diagnosis has been established through imaging as there is a high rate of complications including significant blood loss, infection, chronic sinus formation and amputation\[^{2-4,8}\].

Teaching points

Calcific myonecrosis is a rare late sequela of compartment syndrome or neurovascular injury. Accurate diagnosis of this condition is essential as malignant conditions such as sarcoma can also present as enlarging lesions containing calcified soft tissue.
Diagnosis of calcific myonecrosis is based on a previous history of trauma and the radiologic appearance of the lesion. These lesions characteristically show a well-circumscribed area of peripheral calcification and a liquefied centre on imaging.

The mechanism leading to the development of this condition is not fully understood. Operative intervention has a high rate of complication and should be avoided if the diagnosis is clear and the patient is asymptomatic.

In this case report the condition occurred after an open fracture. There was no clinical presentation of compartment syndrome or neurovascular injury. However, MRI imaging showed muscle atrophy similar to that found after compartment syndrome. As the diagnosis was established through imaging and the mass did not enlarge or cause any symptoms, the patient was managed with clinical monitoring.

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**References**