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Case Report

A rare case of intra-articular heterotopic ossification of knee following intra-medullary nailing of fracture tibia in a patient with fat embolism

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Introduction

Heterotopic ossification (HO) is the formation of bone in non-skeletal soft tissues where it is normally not expected to form. Development of HO was observed and reported by Reidel and Ceilliar among patients with spinal cord injury in World War I.² Gerhard Küntscher, the pioneer of intramedullary nailing, reported 'callus caps' in the soft tissues around the hip after femoral nailing in the 1960s.³

HO is known to occur following a variety of situations such as severe muscular injury, following total hip and knee replacement surgery, severe head and spinal cord injury, prolonged assisted ventilation, prolonged immobilisation, ARDS, burns and pancreatitis.^{1,4–7}

The pathogenesis of HO is unknown. An imbalance between certain forms of bone morphogenetic protein and their antagonists has been suggested as likely precipitating factor in development of HO. Mesenchymal stem cells have been noticed to differentiate into bone via the endochondral pathway due to over-expression of BMP in the traumatised soft tissues.^{1,6}

Majority of orthopaedic literature have focused on HO in the hip subsequent to operative fixation of hip and femur pathology.^{8,9} Few cases of HO of the ligamentum patellae after intramedullary nailing of the tibia have been reported in literature.^{10–12} However, till date there have been no reported cases of intra-articular HO in the knee involving the entire retropatellar fat pad and ligamentum patellae following intramedullary nailing of a tibial shaft fracture in the setting

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of fat embolism. In symptomatic HO of knee, excision of HO mass may be required to improve joint mobility. Here, we present a case of a young individual with symptomatic intra-articular HO in the knee following closed intramedullary nailing of a tibial shaft fracture in the setting fat embolism managed successfully by excision of the heterotopic bone mass.

Case report

This case is of a 24-year-old male patient who suffered a fracture of distal third shaft of Tibia and Fibula on the left side with no other injuries following a two wheeler accident on 10 May 2014. He was managed at a nearby private hospital with initial resuscitation and first aid. However, within the first 24 h of injury, the patient developed features of fat embolism in the form of altered sensorium, blurring of vision associated with respiratory distress warranting the need for mechanical ventilation. After haemodynamic stabilisation, the patient was transferred to our hospital for further management on 12 May 2014.

On arrival at our centre, the patient was on mechanical ventilator with a GCS of $E_2V_T M_4$. However, rest of the vital parameters were normal. Systemic examination revealed decreased air entry in right infra axillary and infra-scapular region. Clinico-radiologically, he had a closed fracture distal third shaft of Tibia and Fibula on the left side without any distal neurovascular deficits. Fundoscopy was normal. MRI brain done on the day of injury was unremarkable, D-dimer level was 834 ng/ml (normal <200 ng/ml) and haematological and biochemical parameters showed leucocytosis with raised serum creatinine and liver enzymes.

The patient was managed by closed reduction and internal fixation of left Tibia by unreamed intramedullary interlocking nail on 14 May 2014. Surgery was performed using a patellar tendon splitting approach. Post-operatively, the patient

showed a steady recovery in his haematological and biochemical parameters. He was weaned off mechanical ventilator on the 8th post-op day and sutures were removed on 14th post-op day. The patient was rehabilitated with physiotherapy, touchdown weight bearing ambulation and discharged for home based convalescence with a knee range of motion of 5–120°.

On review after 6 weeks, the patient complained of restricted range of motion left knee. Clinically, he had 2 cm of thigh wasting, well healed operative wounds and a ROM of 20–45° in left knee without any distal neurovascular deficits. He had a palpable non-tender mass in the infra patellar region of left knee anteriorly. Neither erythema nor swelling was noted. AP and lateral radiographs and CT scan of the left knee revealed HO in the retropatellar fat pad involving the ligamentum patellae (Figs. 1 and 2a, b). The patient was diagnosed with symptomatic HO within the left knee and offered surgical excision after ascertaining normal serum alkaline phosphatase levels at a week's interval (ALP – 79 IU/L and 51 IU/L). Within 2 weeks, he underwent excision of the HO mass adherent to ligamentum patellae. Per-operatively, the entire retropatellar fat pad was an irregular bony mass severely restricting flexion of his knee (Figs. 3 and 4). Post-operative radiographs confirmed complete excision of heterotopic bone mass (Fig. 5). Pathology report confirmed HO. Post-operatively, the patient was put on oral indomethacin and physiotherapy. Following up at six months, the individual had a healing fracture shaft tibia with normal range of motion in the knee and no recurrence of HO.

Discussion

HO is the formation of trabecular bone in extra osseo-articular soft tissues where it does not normally exist. It is a known complication arising in critical care patients, causing significant long-term morbidity. The condition results in progressive

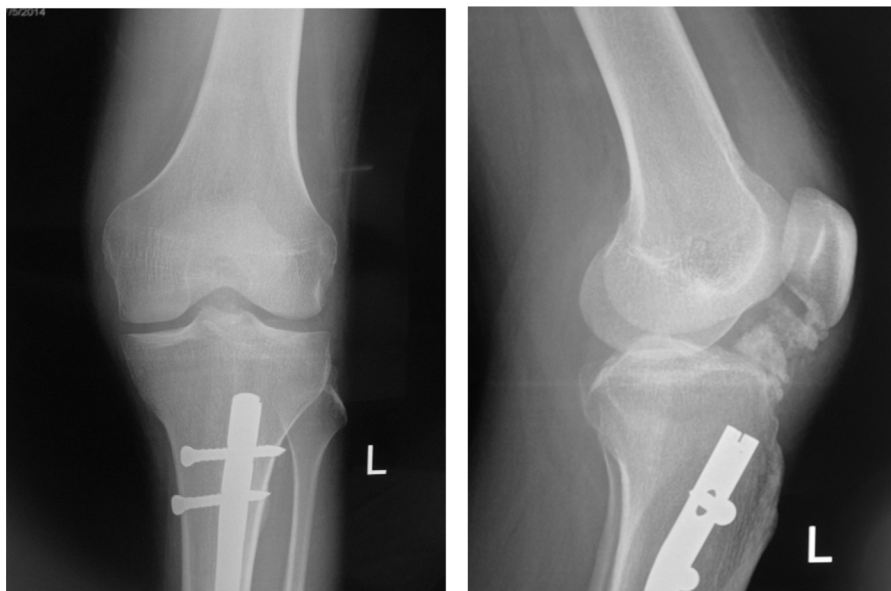


Fig. 1 – AP and lateral radiographs of the left knee showing heterotopic ossification in the retropatellar fat pad involving the patellar tendon.

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