



Longitudinal stress fracture of the femur: A rare presentation



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ABSTRACT

We present the case of an 80 year old woman with hip pain, caused by a longitudinal femoral insufficiency stress fracture, depicted with radiographs, CT and MR. This type of fracture is very rare, with only a few cases reported. We conducted a literature review and compared the findings with the present case.

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1. Introduction

Stress fractures of the lower limb are a frequently encountered lesion. Morphologically, they are usually transverse and perpendicular to the cortical shaft when seen in long bones [1–4]. However, a longitudinal presentation is also possible, occurring with significant frequency in the tibia [3,4]. Longitudinal femoral stress fractures are quite rare, with only 12 cases described in the English literature, to our knowledge [5–9]. We describe a case of a longitudinal insufficiency stress fracture of the femur, depicted with conventional radiography, computed tomography (CT) and magnetic resonance (MR). We conducted a review of the cases reported in the literature and compared the findings with the present case.

2. Case report

An 80 year old woman, with history of Type 2 Diabetes Mellitus, congestive heart failure and hypertension presented with left hip pain of two weeks duration. There was no history of trauma or unusual physical activity, and the pain worsened with weight bearing and any limb movement, alleviating with rest. Range of motion of the hip was globally limited, due to pain. Conventional radiography was performed in the emergency department, showing a medial intracortical hypodense vertical line (Fig. 1) in the femoral shaft, immediately below the small trochanter. This finding, in asso-

ciation with the clinical presentation, prompted the diagnosis of insufficiency stress fracture, however its vertical orientation was clearly not typical. CT scan (Fig. 2) and MR imaging (Fig. 3) were performed, confirming the presence of a longitudinal intracortical stress fracture of the medial aspect of the femoral diaphysis, just below the small trochanter.

3. Discussion

Stress fractures are commonly encountered in daily practice, being classified according to their pathophysiology in fatigue or insufficiency fractures [1,2]. Fatigue fractures are caused by abnormal repetitive physical stress in a normal bone, occurring more frequently in unconditioned athletes and military recruits. Insufficiency fractures are caused by normal physical stress in abnormal, weakened bone, more frequently in osteopenic patients. Usually, stress fractures of the lower limb are transverse in orientation, perpendicular to the cortical shaft in the long bones [1–4]. However, a less frequent longitudinal orientation of stress fractures of the tibia is also well described in the literature [3,4,10]. Longitudinal stress fractures of the femur are exceedingly rare, with only a few cases described.

Our search of the literature found only 12 similar cases, 11 pertaining to insufficiency stress fractures [5–8] and 1 to a fatigue stress fracture [9]. The patients in the cases reported with insufficiency stress fractures are almost always female, with a mean age of 72 years, as reported in the literature review in the work of Maraval et al. [8]. Other risk factors for insufficiency stress fractures were found in the majority of cases: osteoporosis in 3 cases, vitamin D deficiency in 4 cases, osteoarthritis in 2 cases and osteotomy, alcohol abuse, fluoride ingestion and hyperparathyroidism each in

Abbreviations: CT, computed tomography; MR, magnetic resonance; MPR, multiplanar reformation.

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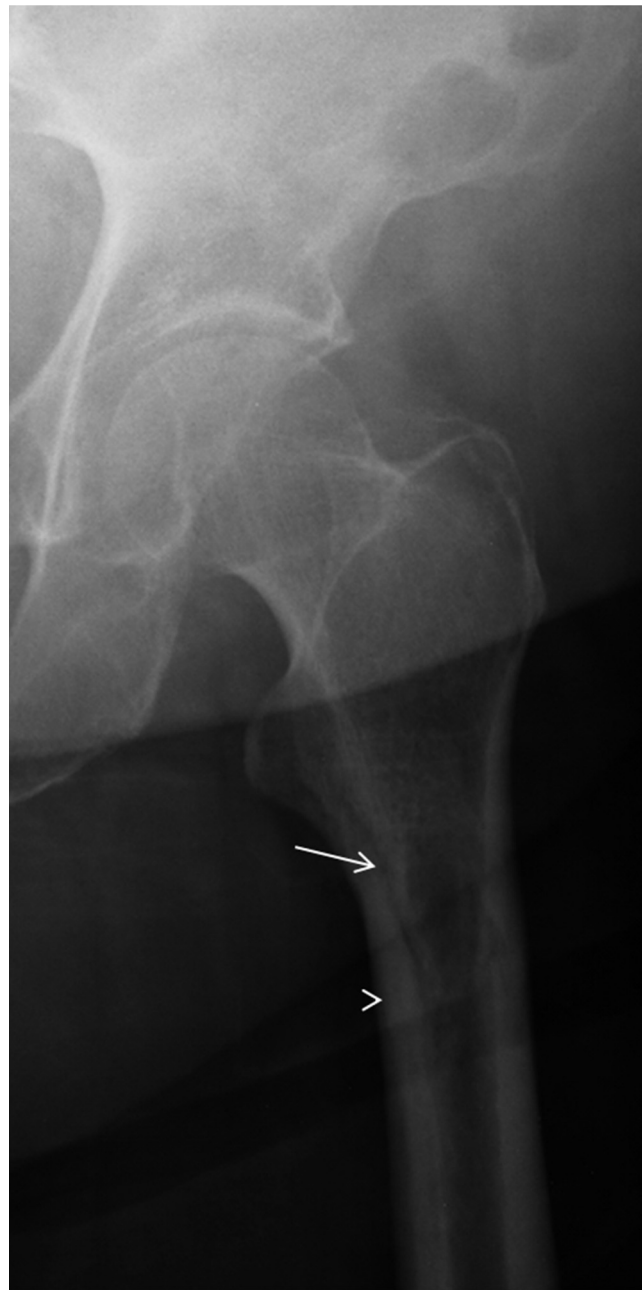


Fig. 1. Anterior-posterior radiograph of the hip, showing a linear longitudinal lucency (arrow), along the medial cortex of the femoral diaphysis just inferior to the small trochanter. There is also a small degree of associated cortical thickening (arrowhead).

1 case. The case here reported shows similar demographic findings, being an 80 year old female patient. Also, the absence of unusual physical activity supports the diagnosis of insufficiency stress fracture.

As reported by Maraval et al. [8] the radiographic findings consist mainly in a longitudinal fracture line and cortical thickening, both in 6 cases. CT was shown to be highly sensitive, depicting the longitudinal fracture line in 10 cases. MR findings reported consisted mainly of intracortical longitudinal fracture line (hyperintense on T2 weighted and hypointense on T1 weighted images), cortical thickening and enhancement after gadolinium administration, with bone marrow edema being reported in 2 cases. MR was not performed in 2 of the cases reviewed.

In the case here reported, the fracture line was readily visible on anterior-posterior radiograph of the hip (Fig. 1), as well as mild

cortical thickening, and CT confirmed the radiographic findings (Fig. 2), which can be clearly depicted with post-processing techniques, especially multiplanar reformations (MPR). MR also showed cortical thickening associated with the longitudinal fracture line, with signal hyperintensity both on T1 and T2 weighted images, as well as bone marrow edema adjacent to the fracture region (Fig. 3). The findings of bone marrow edema and hyperintense fracture line were better depicted with the fat-saturated sequences in T2 weighted imaging. As the diagnosis was straightforward, we did not administer intravenous gadolinium.

With our case, there are 12 longitudinal femoral insufficiency stress fractures described, and 1 morphologically similar fatigue stress fracture. As such, we suspect this rare morphological presentation to be associated with insufficiency stress fractures, but



Fig. 2. CT scan with axial and coronal MPR (multiplanar reformations) – an intracortical fracture line is clearly demonstrated (arrows). Also, note the associated cortical thickening (arrowhead).

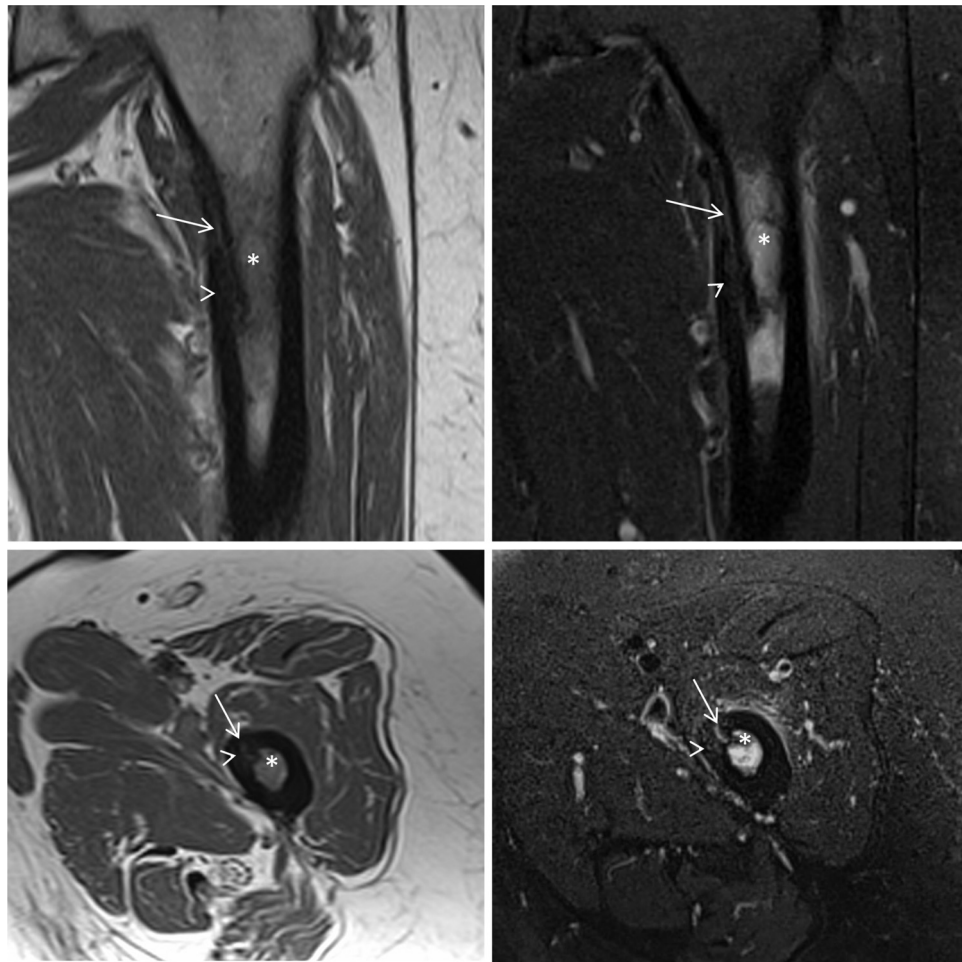


Fig. 3. Coronal (upper) and axial (lower) MR Images – T1 weighted (left) and T2 weighted with fat-saturation (right). A hyperintense longitudinal fracture line is clearly seen (arrows). There is associated cortical thickening (arrowheads) and bone marrow edema (asterisk), high signal intensity on T2 and intermediate signal intensity on T1 weighted images.

a higher number of cases is needed to draw any conclusions. Also, older age (mean age of 74 years in all the cases reported), female gender (11 cases), osteoporosis (6 cases) and vitamin D deficiency (6 cases) seem to be the most prevalent risk factors, as for insufficiency stress fractures in different skeletal locations [1,2]. These fractures were consistently located in the superior third of the femoral shaft (11 cases), and only in 1 case it was located in the lower third. 9 cases involved the medial cortex, 2 cases the posterior and lateral and 1 case only the lateral cortex. Radiographic abnormal findings were present in all the cases described, but the fracture line was evident in only 8 cases. CT and MR have demonstrated high sensitivity (fracture evident on CT in 11 cases, and on MR in all 9 cases where it was performed).

In conclusion, longitudinal stress fractures of the femur shaft remain a rare occurrence, but radiologists and clinicians alike should be aware of this possibility in older patients with new hip or thigh pain. Imaging is diagnostic, especially when performing CT and MR.

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