

Atypical Femoral Stress Fracture with Uncommon Location and Mechanism of Injury: A Case Report

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Abstract

Atypical femoral fractures (AFFs) typically present in patients predisposed to brittle bones or greater biomechanical stresses along the shaft of the femur. Risk factors include, Asian population, women, high body mass index, and users of bisphosphonates, glucocorticoids, and proton pump inhibitors. Most commonly the injury occurs in the proximal or middle portion, but few studies have documented distal femoral stress fractures.

This case illustrates a patient presenting with right lower extremity pain for over a month and difficulty ambulating for a few days. He initially had a negative conservative work up when the pain started. The patient lacked high energy trauma history and other predisposing conditions. After imaging with both X-ray and MRI, he was diagnosed with an occult transverse stress fracture of the distal femoral diaphysis. He was treated conservatively with non-weight bearing to the right lower extremity for 6 weeks. On follow up, his fracture healed well and clinically the patient was able to return to his daily activities.

This report emphasizes a unique fracture mechanism and location to the limited evidence of AFFs. The case urges clinicians to consider ordering additional imaging for patients if the provider has a high clinical suspicion of fractures. A comprehensive history is warranted for the case of occult fractures as knowledge of risk factors can help diagnostic accuracy and improve patient care.

Keywords: Atypical Femoral Fractures (AFFs); Distal Diaphysis; MRI; Fall; Non-Weight Bearing

Abbreviations

AFFs: Atypical Femoral Fractures; ROM: Range of Motion; ASBMR: American Society for Bone and Mineral Research

Introduction

Atypical femoral fractures (AFFs) are injuries located along the femur distal to the lesser trochanter and proximal to the supracondylar flare. They present with lack of trauma history and comminution, and typically exhibit a transverse fracture morphology [1]. These characteristics have correlated in the

literature with patients having brittle bones or greater bending stresses due to anterolateral bowed femurs [2]. Predisposing risk factors cited include, long-term bisphosphate use, glucocorticoid use, proton pump inhibitor intake, and a higher body mass index (BMI) [1]. These treatments can suppress bone turnover and cause fragility or microdamage accumulation, posing an increased fracture risk [2].

Distal femur fractures typically occur in young populations (under age 50) and the elderly. In younger patients, the cause is found to be from high energy injuries, such as falls from significant

heights or motor vehicle accidents [3]. Elderly people tend to have weak, thinner bones with overall lower bone quality. Thus, lower force incidents such as a fall from standing height can cause a distal femur fracture. Common symptoms from this fracture include pain with weight bearing, swelling and bruising, tenderness to touch and deformities [3].

Stress fractures of the femur affect the inferior surface of the neck, the shaft, and distal metaphysis [4]. This injury is most common with repetitive movements seen in endurance athletes, however, it can also occur in patients with abnormal biomechanics and coxa vara deformity.

The case in this report illustrates an atypical stress fracture of the distal femoral diaphysis found in an elderly male without noticeable risk factors. The unique fracture mechanism and location has not been well documented in literature. Management guidelines of AFFs are also not well established, and the treatment of this patient supports an unconventional nonsurgical approach.

Case Presentation

A 63-year-old male with a past medical history of enlarged prostate and hyperlipidemia presented to the urgent care office with right knee and thigh pain that began 6 weeks ago. 2 weeks prior to the onset of pain, he sustained a fall forward as he was going down his porch steps. He landed on his hands and knees. At that time he was able to bear weight without any pain to his leg. He first sought medical attention via an orthopedic office visit approximately 3.5 weeks after his fall. After initial X-rays of the knee, the patient was diagnosed with arthritis and was provided with a cortisone injection. He stated he had no relief with the injection and his pain was 9 out of 10 at the time. Patient attempted to follow up with the office due to increasing pain but was instructed to continue taking anti-inflammatories and attend physical therapy. He saw his PCP about 1.5 weeks after the initial orthopedic office visit. He started meloxicam, which relieved his pain from a 10 to 4. Patient was requesting an MRI, which was eventually ordered 2 weeks after his PCP visit. The MRI was finally approved and completed 1 week later, approximately 8 weeks after his fall. After the results were read, he was instructed to come to urgent care for immediate evaluation. At this point, he came in via wheelchair, as he was unable to ambulate anymore.

Surgical history includes Tonsillectomy, Hemorrhoidectomy and Vasectomy.

Social history includes former smoker with 35 pack/year. He drinks couple beers on the weekends but used to drink more previously. Patient does have a family history of bone cancer in his father and vocal cord cancer in his sister. Mother had a history of diabetes and heart disease.

Physical exam shows no obvious deformity in the right leg. Range of motion (ROM) was 0 to 120 degrees in the right knee. No joint effusion. Patient did have medial and lateral joint line tenderness, but no pain proximally at his hip. No laxity to valgus or varus stress. His extensor mechanism was intact without pain across the quadriceps and patellar tendon. The skin was intact and he was neurovascular intact.

X-ray of the right knee and distal femur (AP view) completed at the urgent care visit demonstrated periosteal thickening at the diaphysis junction with no apparent fracture line (Figure 1).

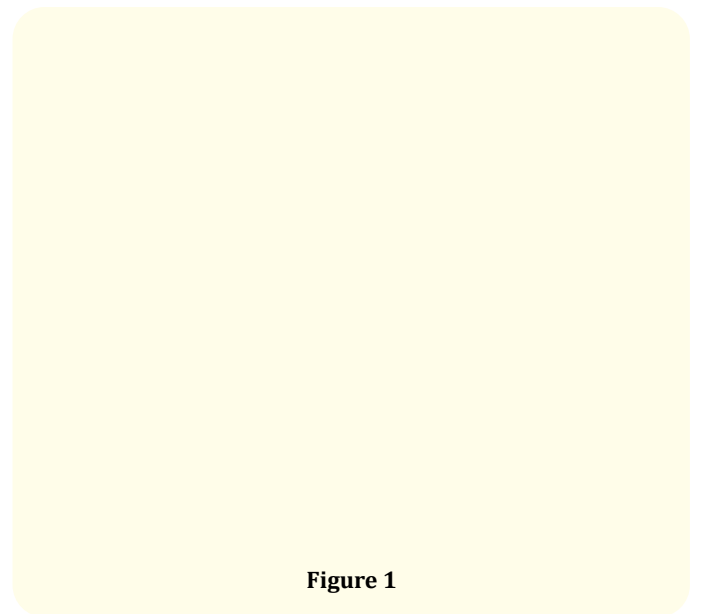


Figure 1

MRI of the right knee without contrast was remarkable for a large transverse stress fracture through the distal femoral diaphysis extending through the medullary bone to the cortex (Figure 2). The fracture spared the anterolateral quarter of the bone and periosteal edema was demonstrated about the fracture. There

was also mild medial compartment osteoarthritis with tearing and intrasubstance medial meniscus injury of the posterior horn.

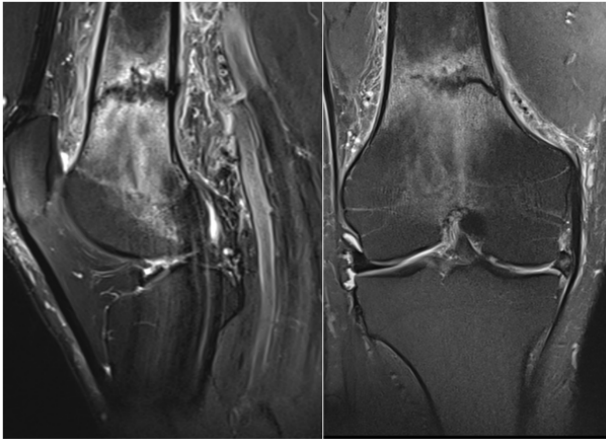


Figure 2

At this point, the patient was instructed to continue taking aspirin 81 mg daily and remain non-weight bearing to the right lower extremity on crutches. He was scheduled to follow up with an orthopedic trauma specialist in 5 days. Patient was to continue to take meloxicam 15 mg for pain control. Possible treatment options discussed at this time included conservative treatment, intramedullary rod, and open reduction internal fixation.

Outcome and follow up

Patient followed up 5 days later and was feeling better; he stated he had no discomfort unless he was bearing weight. Right lower extremity ROM, motor function and sensation were intact. The X-rays taken at urgent care were reviewed and showed reactive callus formations.

The imaging findings were reviewed with orthopedic oncology and there was no concern for malignancy.

This fracture was discussed with the patient and believed to heal given enough time with protected weight bearing. It was explained to the patient that there was a small chance the fracture can displace, but unlikely given the medial side of it. Patient agreed to the plan and remained non weight bearing to the right lower extremity and treated conservatively for 6 weeks.

During the 6 week follow up, the patient was doing well and had no pain. He has tried on several episodes to put some weight on his leg and has had no discomfort. Repeat AP and lateral X-ray of right distal femur showed that his fracture line is consolidating with extra callus and remodeling as shown in figure... On exam, patient was able to bear weight on right lower extremity but had significant weakness throughout. Motor function and ROM were both normal. Patient was now to progress to weightbearing as tolerated and conditioning to tolerance. Repeat X-rays in two months of AP and lateral views of right distal femur were ordered and showed greater consolidation and healing.

Discussion

The occurrence of AFFs have been described in bone diseases with decreased bone turnover, such as hypophosphatasia, pycnodysostosis, osteopetrosis, vitamin D deficiency, and rheumatoid arthritis [1]. Asian women have been found to have the highest incidence of AFFs due to lower limb geometry and marked femoral bowing [5]. A retrospective study in Asian women found a significance in bisphosphate users who had experienced AFFs. The more distal diaphyseal fractures occurred with a higher degree of anterolateral femoral bowing [6].

The only risk factor our patient had for this fracture to correlate is smoking and a family history of cancer. Without preexisting bone conditions or medication use listed above, we believe this fracture pattern and location is quite rare in this individual.

There are rarely images depicting a stress fracture of the distal femoral metadiaphysis. One was documented in a 16-year-old male runner, however, due to the repetitive nature of running, this stress injury can be viewed as expected [4].

In an institutional review from 2007-2013, a study analyzed the fracture location and characteristics of patients with atypical femoral fractures [7]. 12 fractures were proximal, 25 were middle, and 1 was distal. There was a significant association between older age and coronal bowing for middle fracture locations, while glucocorticoid therapy was correlated with proximal fracture locations. The distal fracture in this study was a bisphosphate user, however, did not have any other risk factors.

Given the fracture was not visualized on two separate radiographs about 1 month apart, this injury can be classified as

an occult fracture. As the patient continued to bear weight 4-6 weeks after the onset of pain, it is yet unclear when exactly this fracture took place. Although a fall was sustained, it was associated with minimal trauma (i.e., fall from standing height) and there was initially a negative work up, which indicates that this was an atypical fracture. This delay in diagnosis and lack of MRI imaging could have made the fracture worse in the 1 month interim period. The diagnostic performance for MRI in diagnosing occult fractures has been well established [8]. Although MRI is typically only used in high risk patients with negative x-rays, this case supports the use of it if providers have a high clinical suspicion of an occult fracture.

Limited evidence is available to optimally manage patients with AFFs. The American Society for Bone and Mineral Research (ASBMR) recommends cephalomedullary nailing as the preferred surgical option for incomplete or complete fractures [1]. Patients with incomplete fractures and no pain should limit weight-bearing and limit vigorous activity. Other pharmacologic therapy and biologics that affect bone remodeling has been discussed for a conservative approach [9]. For distal femur fractures in particular, skeletal traction, casting and bracing can be considered if the injury is stable [3]. Our patient did very well with non-operative conservative treatment. The injury had healed on its own after the patient was non weight-bearing for 6 weeks. Given the distal location and incomplete pattern of the fracture, this case supports a conservative approach with minimal treatment interventions.

Conclusion

This case highlights the importance of a more comprehensive history in patients that present with persistent lower extremity pain. Timeline and attention to injury progression can help avoid more serious fractures in the elderly population. Primary care and sports medicine providers can learn from this unique patient presentation and fracture pattern so that they are more equipped to diagnose similar injuries in their practice.

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