

# Femoral Insufficiency Fracture

Patrick Graham

## Introduction

Bone growth, remodeling, and homeostasis comprise an ongoing process involving a balance of osteoblast and osteoclast functions. Osteoblasts work to build up bone, whereas osteoclasts resorb bone. The equilibrium between these two cellular processes is primary in maintaining bone strength and health (deWeber, 2023; Jackson, 2023; Kiel & Kaiser, 2023; Matcuk et al., 2016; National Institutes of Health [NIH], 2023).

A stress reaction, which can ultimately lead to insufficiency fracture, is a condition in which there is increased metabolic activity within the bone, indicating an imbalance in the osteoblastic–osteoclastic function. This adversely affects the intrinsic strength and stability of bone and, if left unchecked, can lead to true complete cortical fracture. Associated risk factors include activity-related factors such as repetitive or excessive loading such as running, plyometrics, or heavy lifting, especially if prior limited physical fitness or activity level at baseline. Patient-specific risk factors include weight (extremes of high or low body mass index), nutritional deficits, female sex and amenorrhea, age, prior stress fracture, and race/ethnicity, with White non-Hispanics at highest risk (deWeber, 2023; Jackson, 2023; Kiel & Kaiser, 2023; Matcuk et al., 2016; McInnis & Ramey, 2016; NIH, 2023; Saunier & Chapurlat, 2018).

Although the overall incidence is not known, through observational studies, it has been proposed that femoral insufficiency fractures account for an estimated 1%–25% of all stress fractures. This most commonly occurs in the femoral neck or diaphysis, is associated with running or other prolonged repetitive impact activities, and is independent of age (deWeber, 2023; Jackson, 2023; Kiel & Kaiser, 2023; Matcuk et al., 2016; McInnis & Ramey, 2016; NIH, 2023).

## Case Presentation

A 47-year-old woman presented to the outpatient orthopaedic clinic with complaints of a month of progressive left knee pain. She did not recall any specific injury or incident but did note working at a fulfillment center, on her feet for 8–10 hours a day. Initially, her knee would be “sore after work” and resolve with rest. After a couple of weeks, she noted mild aching pain even at rest. She took a few days off work and there was minimal improvement. She then worked 3 days in a row and noted the knee became more painful and “blew up” with swelling. She was concerned about continued pain

and presented to urgent care where radiographs were obtained (see Figure 1). These were noted to be without focal abnormality. She was given a shot of Toradol (ketorolac tromethamine) and instructed to follow up with orthopaedics. Unfortunately, she had continued severe symptoms and was unable to return to work. In discussing her case, she also admitted to half-pack per day smoking for the last 27 years.

On presentation was an alert, oriented, affect-appropriate female in no apparent distress. She ambulated with notably antalgic gait, without assistive device. Knee with moderate swelling and mild comparable warmth. No gross deformity or discoloration. Exquisite tenderness about the lateral femoral condyle and joint line. Passive range of motion was 0–110, as compared with 0–125 on the contralateral side, with painful end-range flexion. She was painful and guarded with ligamentous testing without gross appreciable laxity. Strength was pain limited 4+/5. She was found to be distally neurovascularly intact. Special testing included positive bounce home, McMurray, and Thessaly.

## Management

Given reported progressive and severe symptoms, examination with tenderness and pain out of proportion to radiographic findings with concern for occult process or internal derangement of knee, the patient was referred for magnetic resonance imaging (MRI). She was also fitted for crutches and instructed on maintaining toe touch weight-bearing on the left. Tramadol was prescribed for pain, and she was instructed to rest and ice the knee with frequency. The MRI scan was revealing for an avid stress response, consistent with insufficiency or stress fracture, of the lateral femoral condyle (see Figure 2; deWeber, 2023; Jackson, 2023; Kiel & Kaiser, 2023; Matcuk et al., 2016; McInnis & Ramey, 2016; NIH, 2023; Saunier & Chapurlat, 2018).

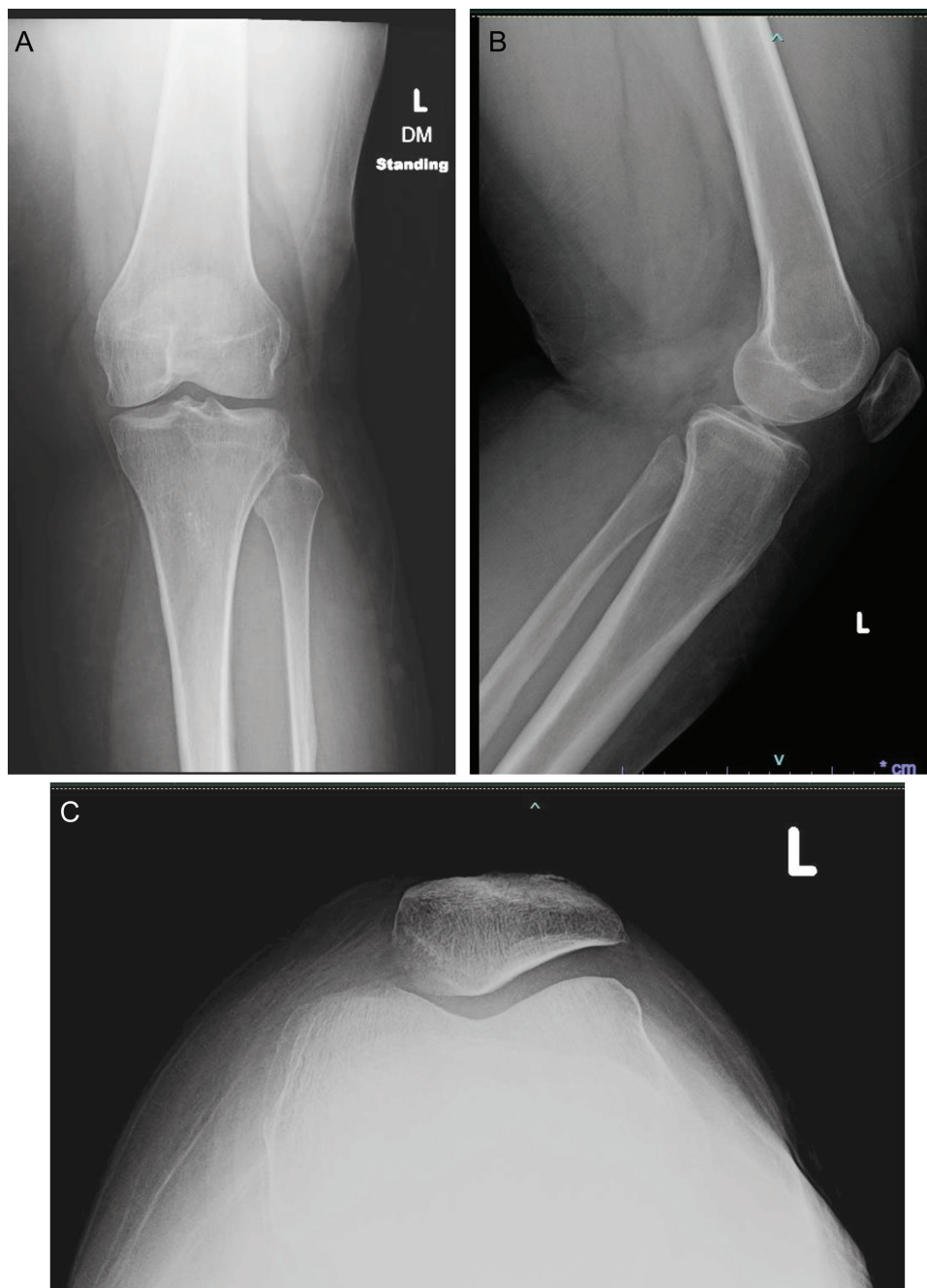
The patient returned a week and a half later for MRI review, noting she was having difficulty managing the

Patrick Graham, MSN, RN, APRN/ANP-BC, Banner University Medical Center Tucson, Tucson, AZ.

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**Correspondence:** Patrick Graham, MSN, RN, APRN/ANP-BC, Banner University Medical Center Tucson, 265 West Ina Rd, Tucson, AZ 85704 (graham.pw@gmail.com).

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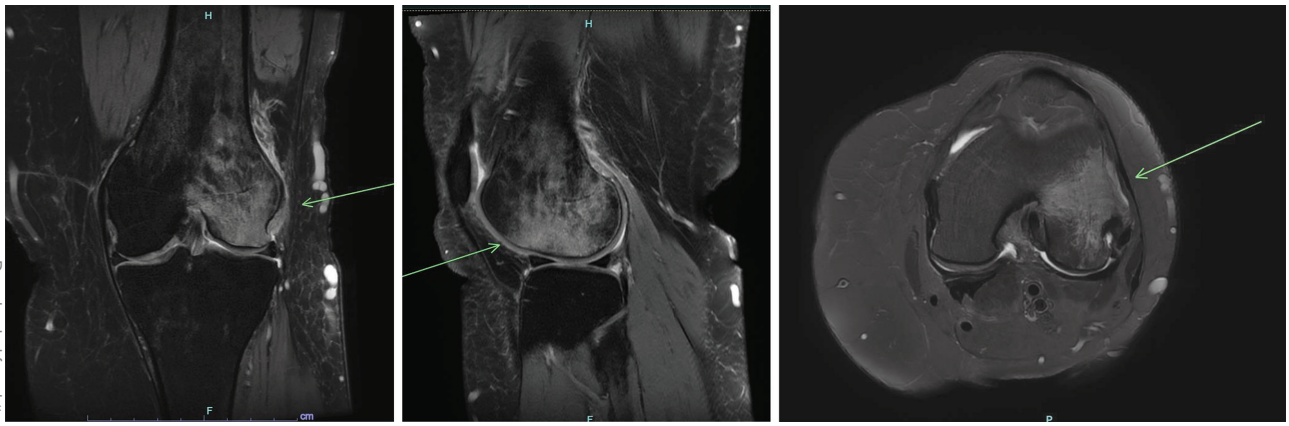
**FIGURE 1.** Left knee radiographs—anteroposterior, lateral, and sunrise views—No evident fracture or dislocation.

crutches, having almost fallen a couple of times. With that, she was fitted for a walker and instructed on continued protected weight-bearing. Pain medication was refilled. She was also referred for dual-energy x-ray absorptiometry (DEXA), which showed bone density consistent with osteopenia. It was recommended that she start a supplement with calcium and vitamin D and was given a referral to endocrinology. She was also given information for a smoking cessation program and discussed the importance of avoidance of all nicotine-containing products. She confirmed her intent to quit.

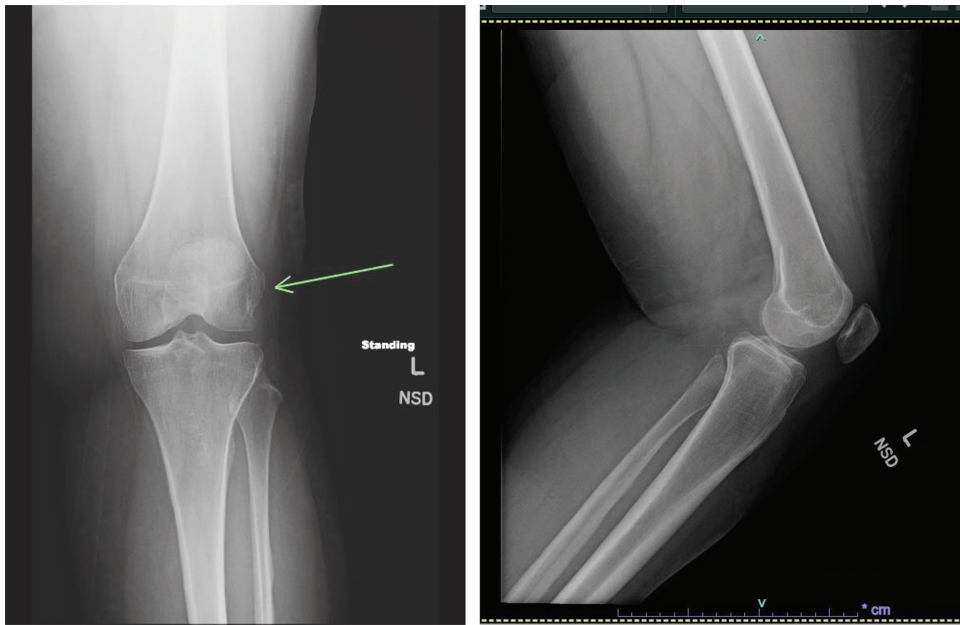
At 1-month follow-up, the patient noted reduced knee pain but had not been compliant in avoiding any

weight-bearing. Radiographs were stable (see Figure 3), and the patient was referred to physical therapy to work on knee range of motion, isometric strengthening, as preparation for return to weight-bearing and work. She had continued good response to therapy and, at 2-month follow-up, noted no continued swelling or pain at rest with ability to comfortably walk without assistive device for about 10–15 minutes before onset of knee “soreness.” Strength testing on follow-up was 5/5. Follow-up knee radiographs remained stable (see Figure 4).

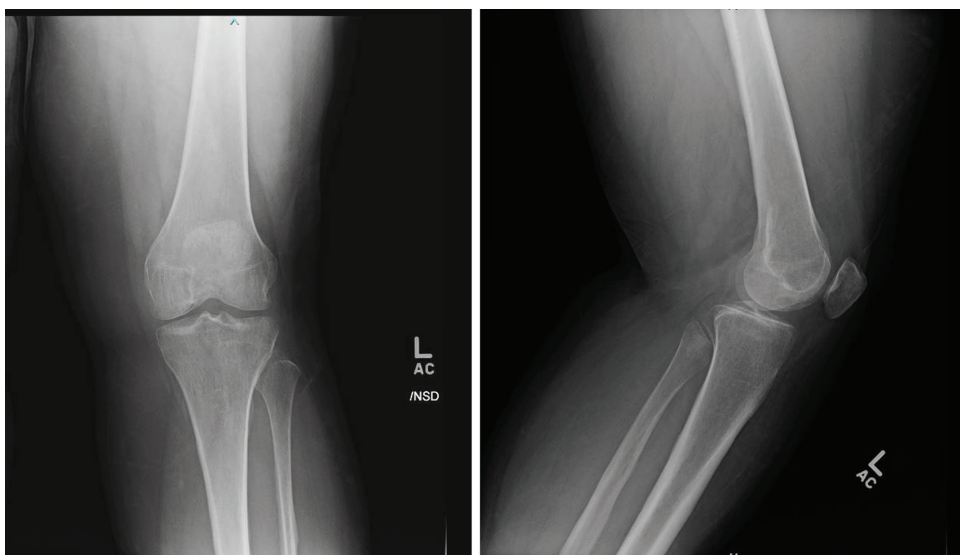
Being cautious to not have a setback, it was recommended she gradually progress activities over the



**FIGURE 2.** Magnetic resonance imaging coronal, sagittal, and axial T2 images with fat suppression. The arrow denotes area of avid stress response with subtle lateral cortical disruption, consistent with a stress fracture of the distal femur.



**FIGURE 3.** Follow-up knee radiographs. The arrow denotes area of lucency in the lateral femoral condyle consistent with the known stress fracture.



**FIGURE 4.** Two-month follow-up radiographs—Improved lucency of the lateral femoral condyle without evident cortical disruption.

course of the next 4–6 weeks. She was successful in doing so and returned to work the following month. Further evaluation by endocrinology was unrevealing, with recommendation that she continue with supplementation of calcium and vitamin D with a recheck of DEXA in 2 years.

## Discussion

Although overall rare, insufficiency fracture should be in the differential diagnosis when attending to any patient with worsening symptoms associated with prolonged and repetitive weight-bearing activities, especially in athletes or those with risk factors as noted. Any modifiable risk factors, including nutrition, nicotine intake, and weight should be addressed with the patient. If there is failure to respond to typical treatment of protected weight-bearing, rest, and symptomatic control with pain medication, laboratory values for calcium and vitamin D should be checked and, given findings, the patient should be referred to an endocrinologist for further workup. In most cases, one can provide reassurance of a good prognosis and typical outcome of return to prior level of function and sport. In rare but severe cases, surgical intervention may be necessary to stabilize the affected bone while other patient factors are addressed (deWeber, 2023; Jackson, 2023; Kiel & Kaiser, 2023; Matcuk et al., 2016;

McInnis & Ramey, 2016; NIH, 2023; Saunier & Chapurlat, 2018).

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## Errata

### Orthopaedic Nurse Navigators and Total Joint Arthroplasty Preoperative Optimization: Improving Patient Access to Musculoskeletal Care: Erratum

### Orthopaedic Nurse Navigators and Total Joint Arthroplasty Preoperative Optimization: Substance Use: Erratum

In the September/October and November/December 2023 issues of the journal, the titles of two articles were incorrect. They should have read as follows:

*September/October issue:* Orthopaedic Nurse Navigators and Total Joint Arthroplasty Preoperative Optimization: Improving Patient Access to Musculoskeletal Care, Part 1 of the Movement Is Life Special *ONJ* Series

*November/December issue:* Orthopaedic Nurse Navigators and Total Joint Arthroplasty Preoperative Optimization: Substance Use, Part 2 of the Movement Is Life Special *ONJ* Series

The editorial office regrets the error.

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