

# Imaging Intertrochanteric Extension of Greater Trochanteric Fracture in a 59-year-old Man: A Case Report

Lu Z, MD | Lee K, MD | Chen J, MD

**Author Affiliation:** Department of Radiological Sciences, David Geffen School of Medicine at UCLA

**Corresponding Author:** J.C. [jchen@mednet.ucla.edu](mailto:jchen@mednet.ucla.edu)

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**Abstract:** Intertrochanteric fractures occur in the region between the greater and the lesser trochanters along the junction of the femoral neck and the shaft. Isolated greater trochanteric fractures seen on initial radiographs may be shown to have intertrochanteric extension on additional imaging modalities, including magnetic resonance imaging (MRI), computed tomography, and bone scintigraphy. We report a case of intertrochanteric extension of greater trochanteric fracture in a 59-year-old man who presented with acute worsening of chronic left hip pain after a minor fall. Radiographs of the hips revealed a left greater trochanteric fracture with suspected intertrochanteric extension. Computed tomography of the left hip, one day later, showed a minimally displaced fracture of the left greater trochanter without intertrochanteric extension. The same-day MRI of the hip showed an acute nondisplaced intertrochanteric extension of a minimally displaced greater trochanteric fracture. While the greater trochanteric fracture was seen on all three imaging modalities, the intertrochanteric extension was distinctly visualized only on MRI.

**Keywords:** femur fracture, intertrochanteric extension, greater trochanteric fracture, CT of the hip, MRI of the hip

## Case Presentation

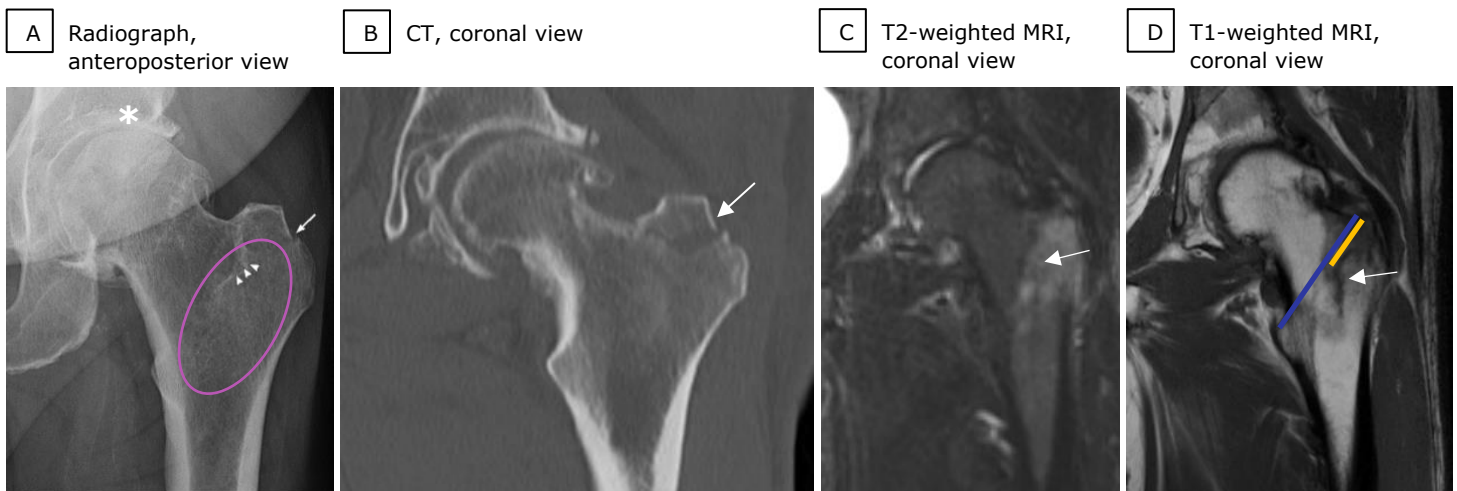
A 59-year-old man with a medical history of human immunodeficiency virus and diabetes mellitus presented with acute exacerbation of chronic pain of the left hip. The patient had fallen on his left hip seven weeks prior to presentation. After the fall, the patient was initially unable to bear weight, but gradually tolerated weight bearing after three weeks. On presentation, radiographs of the left hip showed severe osteoarthritis, a minimally displaced fracture of the greater trochanter (GT), and a subtle radiolucency in the trochanteric region suggestive of intertrochanteric extension of the fracture (Figure A).

## Key Points

- A high number of isolated greater trochanteric fractures found on radiographs show an intertrochanteric extension on additional imaging modalities, such as MRI, bone scintigraphy, or CT.
- MRI is more sensitive than radiographs in the detection of an intertrochanteric fracture extension.

Computed tomography (CT) of the left hip obtained 24 hours after presentation failed to show intertrochanteric extension (Figure B), prompting the same-day magnetic resonance imaging (MRI) of the left hip. On MRI, hyperintensity in the trochanteric region on T2-weighted images and hypointensity on T1-

**Figure.** Radiography, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) of the Left Hip of a 59-year-old Man with a Fracture of the Greater Trochanter (GT)



Initial radiograph (A) of the left hip shows severe osteoarthritis (A, asterisk), a minimally displaced fracture of the GT (A, arrow), and a subtle radiolucency (A, arrowheads) in the trochanteric region (A, violet oval) suggestive of intertrochanteric extension of the GT fracture. CT, coronal view, image (B) shows a minimally displaced left GT fracture (B, arrow) with no definite intertrochanteric extension. Coronal MRI T2-weighted image (C) and T1-weighted image (D) show T2 hyperintensity and T1 hypointensity, respectively, in the left trochanteric region (C and D, arrows) indicative of an acute nondisplaced intertrochanteric extension of the GT fracture and the minimally displaced greater trochanter. The total length of intertrochanteric line (D, blue line) measured 66 mm. The length of the fracture extension into the trochanteric region (D, yellow line) measured 28 mm, 42.4% of the intertrochanteric line length.

weighted images were observed, confirming nondisplaced intertrochanteric extension of the greater trochanteric fracture (Figure C, D). While the GT fracture was visible on all three imaging modalities, intertrochanteric extension was visible only on MRI.

Considering the chronicity and stability of the fracture, its less than 50% extension into the trochanteric region (Figure D), and the patient's ambulatory status, conservative treatment with physical therapy was initiated. A follow-up hip radiograph, two weeks after initial presentation, showed on-going healing of the fracture with unchanged alignment.

## Discussion

The trochanteric region extends between the greater and the lesser trochanters below the junction of the femoral neck and the shaft and above the inferior border of the lesser trochanter.<sup>1</sup> It is a highly vascularized area composed of cancellous bone. Fractures of this region present approximately half of all fractures of the femur and are often caused by low-energy trauma, such as

ground-level fall.<sup>2</sup>

Yet, isolated fractures of the greater trochanter (GT) are relatively rare,<sup>3</sup> and there is no consensus on the management of these injuries. Because many GT fractures are associated with occult intertrochanteric extensions, prompt and accurate evaluation of these fractures is necessary.<sup>4</sup> A delay in diagnosis of intertrochanteric extension of GT fracture can lead to displacement of a nondisplaced intertrochanteric fracture, increased morbidity, complex surgical treatment, prolonged hospitalization, and delayed rehabilitation.<sup>5</sup>

The detection of intertrochanteric extensions of GT fractures may be difficult.<sup>5-7</sup> Some authors<sup>5,6</sup> suggested that up to 90% of these extensions were seen only with the use of additional imaging modalities. Multiple studies<sup>5-8</sup> recommended the use of MRI for further, more accurate evaluation of GT fractures, especially when occult intertrochanteric fracture is suspected on radiograph.

In the largest study evaluating the extent of GT fractures, Noh et al<sup>6</sup> reviewed radiographs of 100 patients with isolated GT fractures and found that 90% of the patients had occult intertrochanteric

fracture extension shown on additional examination with MRI, CT, or bone scintigraphy. Although the direct comparison between efficiency of CT and MRI was not possible because of the small number of cases where both modalities were used, the authors confirmed that MRI was the most sensitive, quickest, and cost-effective modality to diagnose intertrochanteric fracture extension.<sup>6</sup>

In our case, the failure of CT to confirm intertrochanteric extension suspected on initial radiographs prompted performing hip MRI to confirm the presence of fracture.

To help determine the appropriate treatment of patients with intertrochanteric extension of GT fracture, Kent et al<sup>9</sup> demonstrated that fractures with less than 50% extension into the trochanteric region have a low likelihood of further displacement and a high probability of union when treated conservatively. In our patient, the length of intertrochanteric extension was 42.4% of the total length of the intertrochanteric line. This, in addition to the fracture stability and patient's ambulatory status, warranted a nonsurgical treatment approach.

The reported case shows that in patients with fractures of the greater trochanter MRI should be used for further investigation. Our experience suggests that MRI may be more accurate and efficient than radiographs in determining the extent of seemingly isolated greater trochanteric fracture.

### Author Contributions

Conceptualization, J.C.; Acquisition, analysis, interpretation of data, and writing – original draft preparation, Z.L. and K.L.; Review and editing, Z.L, K.L., and. J.C; Supervision, J.C. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

### Disclosures

None to report.

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