

Isolated Lesser Trochanter Fracture Associated With Leukemia

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Isolated lesser trochanteric fractures are rare¹; few cases have been reported in the literature. When an isolated lesser trochanteric fracture occurs in a patient with closed growth plates, it is thought to be pathognomonic for neoplasm.²⁻⁴

To our knowledge, this is the first report of a case of isolated lesser trochanteric fracture associated with leukemia. The other 18 reported cases of this fracture were associated with metastatic carcinoma (breast, pancreatic, thyroid, colon, prostate, lung, squamous cell), synovial cell sarcoma, non-Hodgkin lymphoma, or primary plasmacytoma.²⁻⁸

CASE REPORT

A woman in her late 40s presented to the emergency department with right hip pain after twisting with a slight slip in her kitchen. The patient stated that she had not fallen but was having terrible groin pain that inhibited her from ambulating. She said there had been no groin pain before the incident. She had been seeing an orthopedic surgeon for knee pain on the ipsilateral side for some time. The knee pain was global but had increased tenderness in the medial joint line. The surgeon had ordered magnetic resonance imaging (MRI) of the right knee, but it had yet to be performed.

Past medical history included acute myeloid leukemia, which the patient's medical oncologist had noted was in remission. She had finished chemotherapy 21 months before admission. Radiation treatment had not been given. Other medical history included depression (being treated with fluoxetine) and appendectomy, and the patient denied smoking, alcohol use, and illicit drug use.

On admission, white blood cell count was $7.2 \times 10^9/L$, with differential of neutrophils 71.8%, lymphocytes 17.7%, monocytes 9.6%, eosinophils 0.6%, and basophils 0.3%—all within normal limits. Red blood cell count was $4.42 \times 10^{12}/L$, and hemoglobin, hematocrit, international normalized ratio, and electrolytes were normal.

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Erythrocyte sedimentation rate was slightly elevated (23 mm/h). Radiographs of the right hip and pelvis showed an isolated lesser trochanteric avulsion fracture and no signs of a pathologic process (Figure 1). Given the patient's inability to ambulate and need for pain control and further workup, she was admitted. As MRI could not be performed that night without her case being declared an emergency,



Figure 1. Anteroposterior radiograph of right hip on admission.

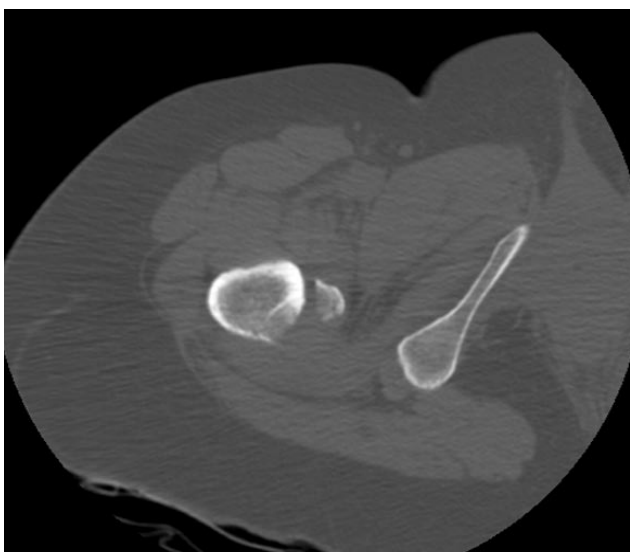


Figure 2. Axial computed tomography shows fracture on presentation.

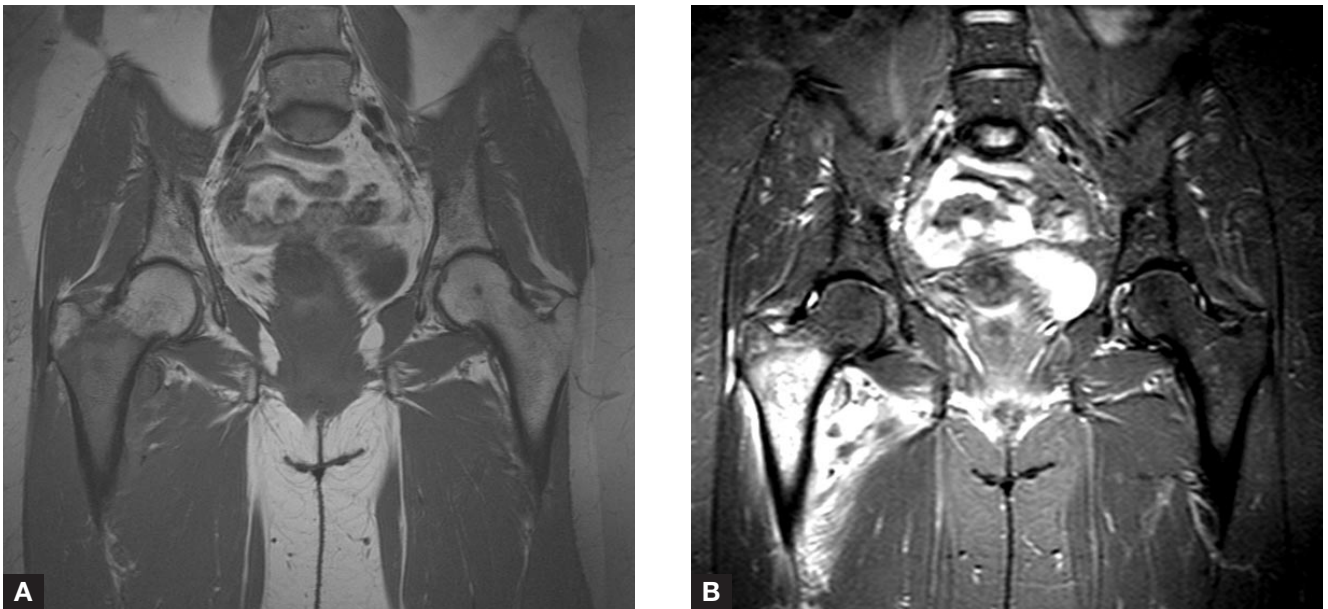


Figure 3. Magnetic resonance imaging of affected area: (A) T₁-weighted and (B) short tau inversion recovery (STIR) sequence coronal images.

computed tomography (CT) scan (Figure 2) was ordered instead. It showed what was thought to be some cortical irregularity and possibly a soft-tissue mass.

At presentation, the patient's vital signs were normal, and she was without fever. She had pain to palpation on the medial aspect of the groin on the right, along with pain with internal and external rotation of the limb. She was able to perform a straight leg raise but refused to bear weight because of pain. Right knee pain was global but was increased in the medial aspect of the joint line to palpation. The McMurray test was normal, as was the rest of the examination.

Given the known but rare pathognomonic sign of isolated lesser trochanteric fracture in adults and the suspicious CT scan, further workup was instituted. Total body bone scan demonstrated abnormality in the proximal humerus on the right and the proximal third of the femur on the right. Femur activity was noted as being more than it would have been had the problem been an avulsion fracture of the lesser trochanter. Therefore, MRI was ordered. It showed evidence of tumor in the right proximal humerus, evidence of tumor in the right proximal femur with an associated soft-tissue mass (Figures 3A, 3B), and normal right knee. CT-guided needle biopsy was performed to make a diagnosis for the presumed metastatic disease. However, it returned only necrotic tissue. Surgery was scheduled for open biopsy, and then a prophylactic intramedullary reconstruction nail was placed in antegrade fashion (Figure 4). Pathology found recurrence of acute myeloid leukemia (Figures 5A, 5B), as hematopoietic origin was confirmed with positive common leukocyte antigen staining. CD34 was negative.

The patient was followed by her medical oncologist throughout the hospital course and was referred back to this oncologist for further treatment. She was able to ambulate pain-free for 4 months but then was admitted to hospice

after a course of palliative radiation therapy for her systemic disease. She expired 4 months after surgery.

DISCUSSION

Isolated lesser trochanteric fractures have 2 typical causes. The much more common cause is strenuous flexion of the hip in a patient with open lesser trochanteric apophysis.⁷ The literature includes numerous case reports and descriptions of this type of injury.^{1,9-11} The other cause is the much rarer pathologic fracture.⁷ There have been few reports on this mechanism.²⁻⁸

We conducted an extensive review of the literature and found only 18 cases of isolated lesser trochanteric fracture in an adult with underlying pathology.²⁻⁸ The number of adult



Figure 4. Postoperative anteroposterior radiograph shows reconstruction nail.

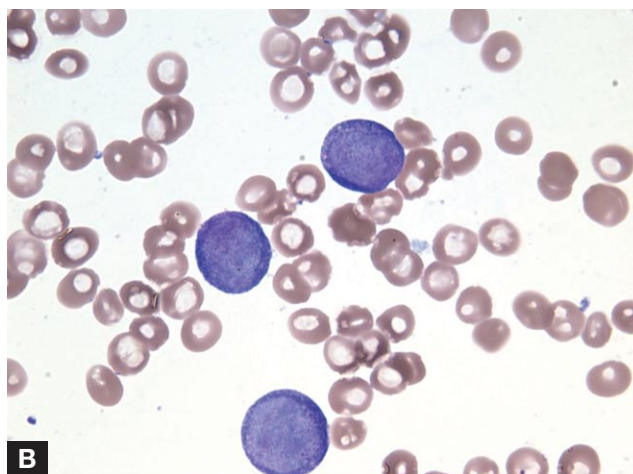
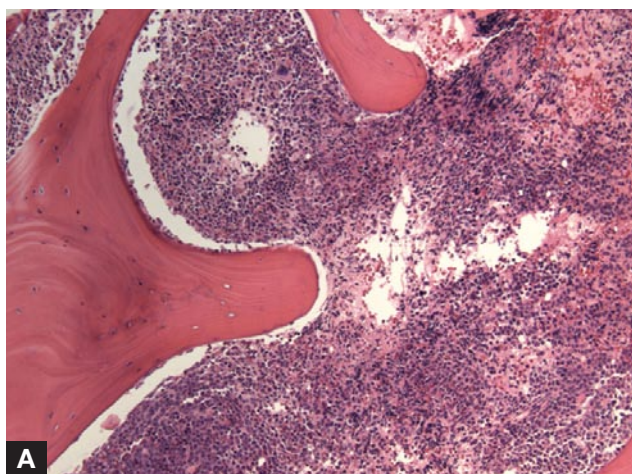


Figure 5. Microphotographs of removed tissue show (A) complete replacement of marrow space by blasts (hematoxylin-eosin, original magnification $\times 40$) and (B) large blasts with immature chromatin, including scant blue cytoplasm and indistinct nucleoli, but with normal red blood cell morphology (Wright's stain, original magnification $\times 1000$).

cases of isolated lesser trochanteric fracture not associated with an underlying oncologic process is extremely low as well. From multiple surgeons, Dimon¹² collected 30 cases, involving 25 teenagers, 1 child, and only 4 adults; mechanism of injury was not recorded in the adult cases. Poston¹³ noted that the literature prior to 1921 revealed only 4 adult cases of isolated lesser trochanteric fracture. It may be that further workup of all these cases would have revealed an underlying pathologic process (these cases lacked follow-up and were managed before MRI and CT became part of the orthopedic workup for these fractures). Current appropriate diagnostic studies are plain radiographs, technetium-99 bone scan, and MRI or CT or both.⁷

Bonshahi and colleagues¹⁴ provided a recent report of isolated lesser trochanteric fractures in adults without pathologic process. Two of their 3 cases later developed displaced intertrochanteric fractures; the third case was treated with a dynamic hip screw before mobilization, and it was likely an occult intertrochanteric fracture as well. Therefore, for proper treatment, any isolated lesser trochanteric fracture deserves special attention to ensure it is not pathologic (primary or metastatic disease must also be separated out⁷) and not part of a more complex injury pattern. These considerations are also important for implant selection. For our patient, we used an intramedullary nail to protect against pathologic fractures and to allow immediate weight-bearing.

An extremely high degree of suspicion for neoplasm must be maintained whenever an adult presents with an isolated lesser trochanteric fracture. The physician bears the burden of proving there is no tumor. We recommend using MRI and technetium-99 bone scan in the evaluation of each isolated lesser trochanteric fracture, even when radiographs and CT scans are normal.

The literature includes little information on isolated lesser trochanteric fractures in adults. Our patient's case is a rare presentation of one of these fractures and, to our

knowledge, the only one associated with leukemia. It again demonstrates that isolated lesser trochanteric fractures in adults are pathognomonic for underlying tumor.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article. The authors obtained written informed consent from the patient for publication of her case report and the figures.

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