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Case Report

Missed pathological femoral neck fracture undergoes spontaneous healing ☆,☆☆

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ABSTRACT

Pathologic fractures are common complications of metastatic bone disease in patients with breast cancer. Fractures involving the proximal femur generally cause significant pain that is exacerbated by ambulation. Due to excessive stress on the weight-bearing hip joint, these fractures present a significant burden on the quality of life among patients. Here we describe a case of a 38-year-old female patient who was found to have a pathologic fracture of the proximal femur missed on imaging studies that underwent spontaneous union. Pathologic fractures rarely heal on their own, since a tumor at the fracture site interferes with bone healing and most fractures have to be managed with surgical intervention. Fractures can be missed on imaging studies in the setting of extensive metastatic disease. Physicians should be cognizant of this fact and maintain a high level of suspicion to recognize fractures with unusual presentations where patients may not present with the typical findings of acute onset of pain and inability to ambulate or bear weight.

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Introduction

Pathologic fractures are bone fractures that arise from pre-existent bone lesions such as those caused by metastatic disease spread. The weakened bone predisposes the patient to pathologic fractures and other skeletal-related events (SRE) associated with bone metastases. These fractures commonly arise among patients with breast cancer, which constitutes a significant burden to healthcare [1]. Other frequent primary malignancies known to spread to bone are prostate, kidney, thyroid

and lung [2]. Common sites include the vertebrae, pelvis, and long bones. Within the long bones, the proximal femur is the most common site of involvement since significant forces are loaded onto the weight-bearing hip joint [3]. Pathologic lesions involving the weight-bearing portion of the hip joint cause pain that is exacerbated with ambulation. Additionally, most patients present to the oncology orthopedic surgeon with an inability to bear weight and ambulate [4].

Pathologic fractures rarely heal on their own, since a tumor at the fracture site prevents bone healing [5]. The majority of fractures are successfully managed with surgical interven-

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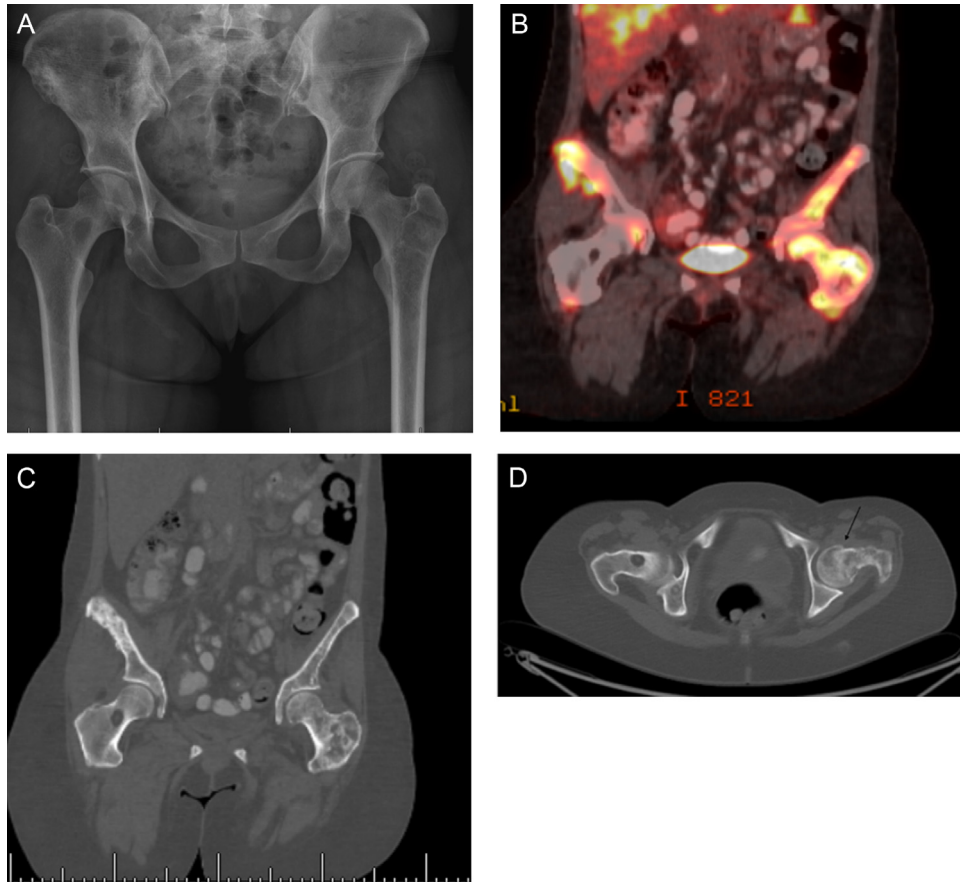


Fig. 1 – Initial images. (A) Pelvis AP radiograph obtained in 2018 due to left hip pain, no fracture is noted on the exam. Subsequent PET-CT scan obtained in 2019 for disease surveillance, intense uptake with SUV of 13.34 noted in the proximal left femur **(B)** along mixed lytic-sclerotic lesion in the proximal left femur **(C)** and femoral neck fracture (arrow) better visualized on the axial view **(D)**.

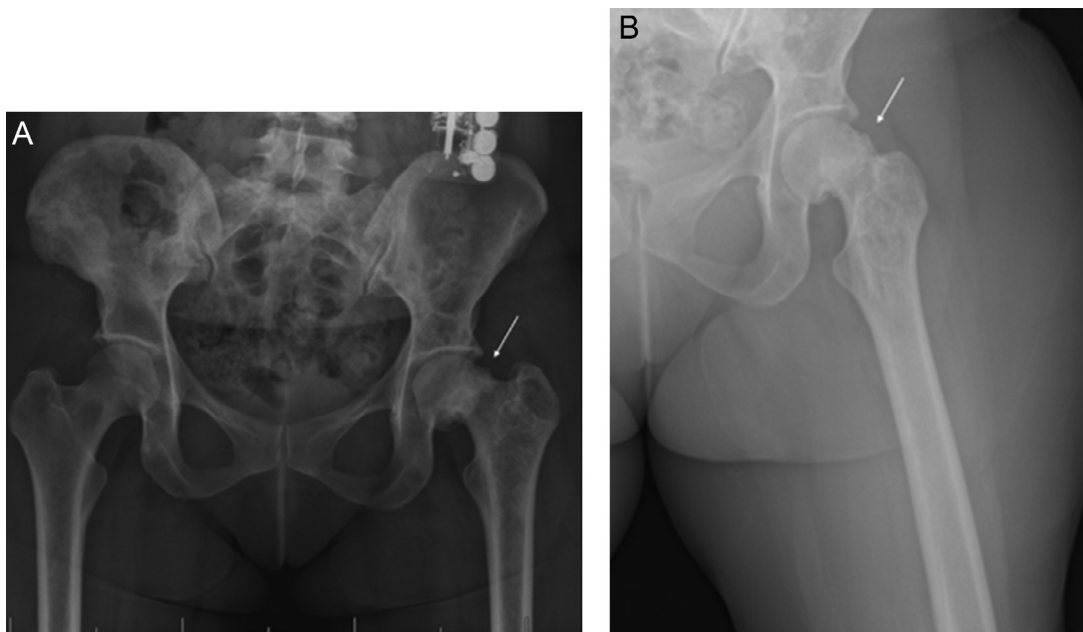


Fig. 2 – Radiograph AP pelvis (A) and lateral (B) left femur obtained in 2019 showing extensive metastatic disease of the bony pelvis with minimally displaced pathologic fracture (arrow) of the subcapital region of the left femoral neck.

tion. The procedure of choice can range from intramedullary nailing, plate and screws or a resection and endoprosthetic reconstruction, the final treatment decision will depend on the location of the lesion within the bone and the extent of the metastatic lesion [6]. According to the literature, spontaneous healing of non-surgically treated pathologic long bone fractures is not the rule and in most cases these fractures require a surgical intervention along adjuvant treatments such as radiotherapy and systemic cancer treatment [5, 7]. Here we describe a case of a patient with a pathologic fracture involving the proximal femur that was initially missed on cancer surveillance exams however evolved to complete healing without a surgical intervention.

Case Report

A 38-year-old female with a history of stage IV breast cancer with bone metastases was referred to our orthopedic oncology clinic for further evaluation and management of lower left leg weakness. The patient was initially diagnosed with breast cancer in 2009 and underwent bilateral mastectomy followed by chemotherapy and radiation therapy to the left breast. She began experiencing intermittent left hip pain in 2017, with the feeling of leg instability. She underwent radiographs and positron emission tomography (PET) scans, but the pathological fracture was initially missed and not reported (Fig. 1). The patient was instructed to continue chemotherapy, attend physical therapy, and was provided a referral to see an orthopedic oncologist. However, the patient held off for over almost 2 years before presenting at the oncology orthopedics office while continuing her physical therapy exercises and ambulating with difficulty with the assistance of a walker.

During the evaluation on her initial appointment at the oncology orthopedics service in November 2019, the patient claimed to feel much better since the onset of her symptoms 2 years prior. She stated that her symptoms had been well controlled with physical therapy and reported an overall improvement in pain. Moreover, the patient confirmed that she was able to ambulate with the help of her walking cane. She denied any joint pain, swelling, or stiffness. She denied any recent fatigue, unintentional weight loss, fever, chills, night sweats, or loss of appetite. On physical examination the patient was noted to walk with a minor limp and with the help of a cane.

Radiographs of the femur and pelvis were then obtained and revealed a pathologic left femoral neck chronic impacted fracture, heterogeneous marrow osteolysis with surrounding sclerosis involving the left femoral greater trochanter and intertrochanteric region compatible with metastatic disease (Fig. 2). The fracture was noted to be healed although in a varus position with a decreased femoral neck-shaft angle (Fig. 3). During follow up in November 2020, one year since her initial presentation at the oncology orthopedics clinic, the fracture was noted to have remained healed and stable without any disease progression in the left femoral neck (Fig. 4).

Given that the bone fracture was now healed and stable, with evidence of bone union signs such as sclerosis surrounding the fracture line and the patient was able to bear weight and ambulate without pain, a multidisciplinary and combined

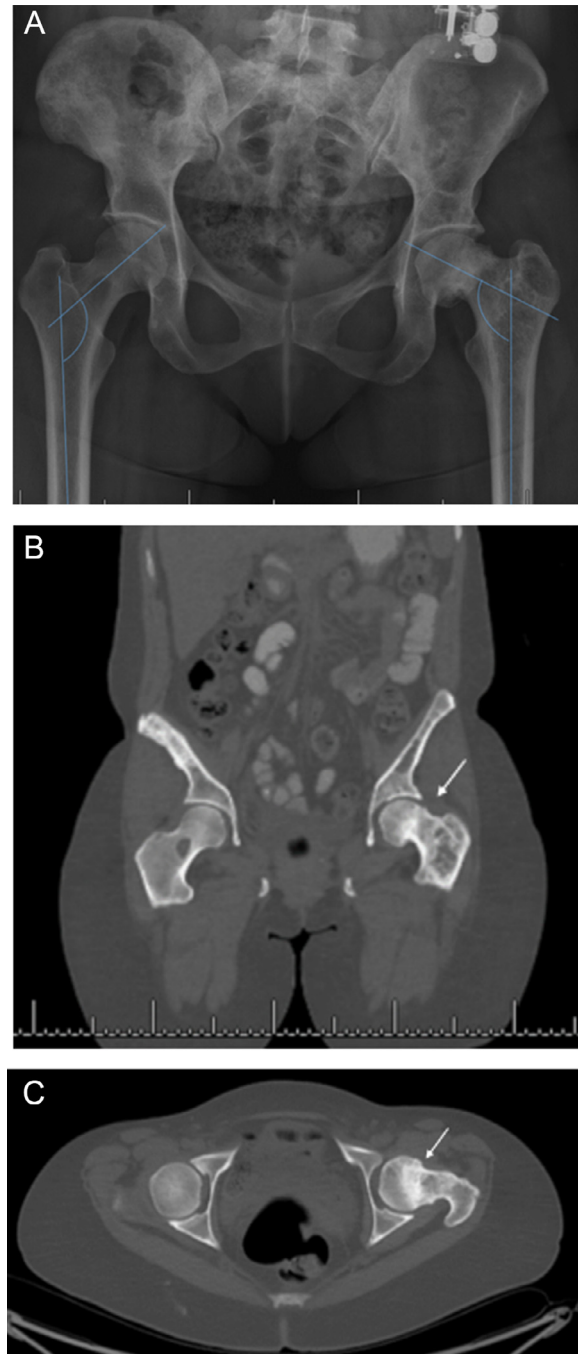


Fig. 3 – Radiograph AP pelvis (A) demonstrating a normal femoral neck-shaft angle on the right and a decreased one on the left femoral neck (blue lines). PET-CT scan images obtained at the same time (2019), coronal (B) and axial view (C) showing new bone formation along the previously seen fracture line (arrow).

decision was made to postpone surgery until the completion of systemic treatment. Additionally, the patient was prescribed continuation of physical therapy, and weight-bearing as tolerated with the use of her cane for support. Once systemic treatment is completed, surgery would involve a partial

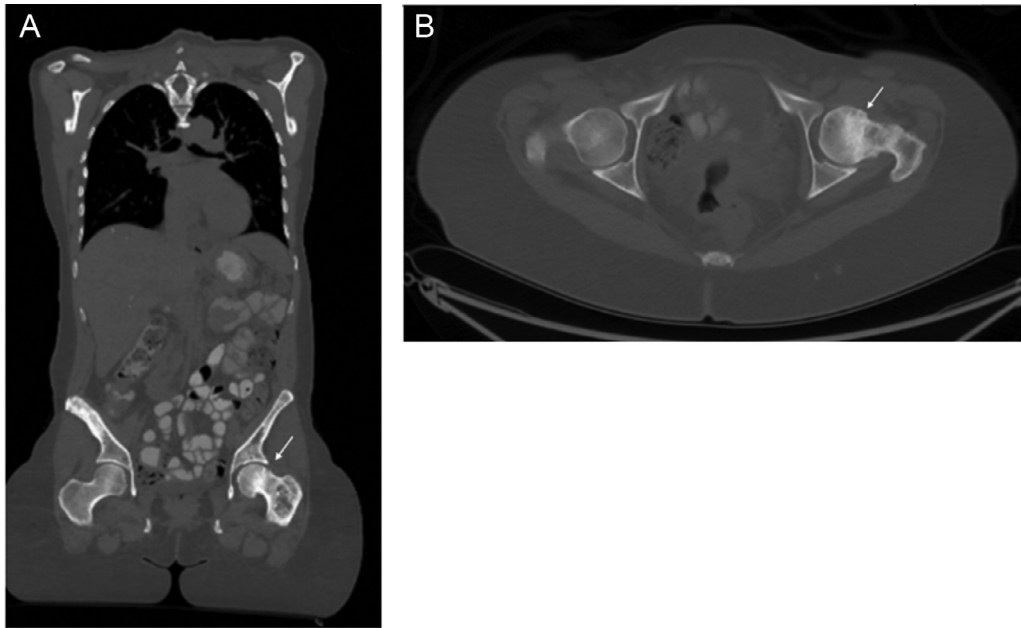


Fig. 4 – Surveillance PET-CT scan obtained a year after the presentation to the oncology orthopedic service (2020), coronal (A) and axial view (B) depicting the left femoral neck healed fracture (arrow) that remained in a stable position.

hip replacement to correct the deformity and potential combination of radiotherapy with or without chemotherapy.

Discussion

Pathologic fractures significantly affect quality of life among patients with metastatic bone disease [8]. Patients with breast cancer who experienced a SRE had worse health-related quality of life outcomes in physical and functional well-being compared to patients without a SRE [9]. Furthermore, when the proximal femur is involved, patients experience impaired mobility, impaired function, and decreased quality of life. One study found that in 300,000 hospitalizations associated with bone metastases, 5% of patients presented with a pathologic fracture [1]. These patients were more likely to have a longer length of stay, an increased cost of stay, and to require radiation therapy or surgery during their hospitalization [1]. Thus, early diagnosis is crucial to address the impending fracture, restore function and prevent complications associated with pathologic fractures caused by metastatic disease.

In the literature, few reports describe the healing potential of pathologic fractures in patients treated conservatively [7]. Generally, pathologic fractures are unlikely to heal without intervention since the tumor at the fracture site alters the biologic repair properties of the bone [10]. Furthermore, metastatic bone lesions cause trabecular disruption and microfractures with subsequent loss of bony integrity [11]. Bone healing in a non-pathologic bone involves several different cells and processes, for example the activation of inflammatory cells such as macrophages, the induction of a hematoma

formation, along the initiation of anabolic mechanisms, these would ultimately lead to removal of the altered tissues and repair of the bone structures [12–14].

While fractures are often preceded by pain, the characteristics vary depending on factors including endosteal nerve compression, nerve injury from extension of the bone metastasis out of the bone, and the location of the metastasis within the bone [15]. The proximal femur is the most common location for long bone fracture since significant forces are loaded onto the weight-bearing hip joint [3]. Although most patients with bone metastases describe the insidious onset of pain, patients with a pathologic fracture can also often describe an acute onset of pain associated with little to no trauma. Surprisingly, the patient in this case did not describe any signs of an acute episode pain or sudden inability to bear weight. She was able to ambulate with a walker and on progress reported functional and physical improvement compared to her initial onset of symptoms. Due to her unusual presentation, the patient was initially misdiagnosed and treated with conservative management that consisted of physical therapy and pain control. The pathologic fracture was not noticed until 2 years later when she presented for an initial evaluation at the oncology orthopedics service.

Analyzing the patient's initial radiographs to the radiographs obtained at her visit to the oncology orthopedic service, it was unexpected to find that the pathologic fracture was now stable and healed. Therefore, this case attempts to highlight the importance of maintaining a high level of suspicion for an occult or missed pathological fracture in the setting of extensive metastatic disease even when patients do not present with the classical symptoms of acute pain and inability to bear weight.

Conclusion

In summary, pathologic fractures secondary to bone metastases are common complications seen in patients with a history of breast cancer and other primary malignancies. A pathological fracture without the classic presentation in the setting of extensive metastatic disease can potentially be missed on imaging exams. It is paramount for the treating physicians to recognize unusual presentations where patients may not present with the typical findings of acute onset of pain and inability to ambulate or bear weight to avoid missed diagnosis.

Patient Consent

Per the local Institutional Review Board consent was exempt due to this being the case of research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimen with the information being recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

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