

Bilateral occult hip fracture

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ABSTRACT

One of the most common acute injuries seen in the emergency department is the hip fracture. This injury is usually diagnosed by plain radiographs, however these fractures are sometimes not obviously apparent. Occult hip fractures present a pitfall for emergency department physicians. We present a case of a patient who sustained bilateral occult hip fractures. We review the epidemiology of the condition, examine what diagnostic studies are available that may help the physician avoid missing the occult hip fracture and what the literature tells us about the utility of each of these modalities. The prognosis of the occult hip fracture along with options for treatment is also discussed.

Keywords: bone scan, bone scintigraphy, computed tomography, femur, hip fracture, magnetic resonance imaging, occult hip fracture, ultrasonography

Occult hip fractures present a pitfall for emergency department (ED) physicians, and clinicians must maintain a high index of suspicion when assessing patients with posttraumatic hip pain and normal plain radiographs. We present a case of a patient who sustained bilateral occult hip fractures and review some epidemiologic features, the choice of diagnostic studies, and treatment options for the occult hip fracture.

CASE REPORT

A 90-year-old male presented to our ED after suffering a fall onto his buttocks. He complained of right hip, knee, and groin pain. Plain radiographs of his pelvis and right hip were interpreted as normal by both the ED physician and the radiologist (Figure 1). Able to walk, the patient was discharged home only to return 6 days later complaining of right hip pain and difficulty mobilizing, with no additional falls reported. Repeat

plain films revealed a nondisplaced fracture of the right femoral neck (Figure 2), suggesting that this fracture was radiographically occult on his first visit. The patient fell from bed while in hospital prior to the surgery on his right hip. Postoperative radiographs were later interpreted by a radiologist as revealing a left subcapital hip fracture (Figure 3). The patient, now at a rehabilitation facility and complaining of left hip pain, was transferred back and underwent a second operation, this time to repair the left hip fracture. It was thought that the patient had suffered the left hip fracture in falling from the hospital bed; however, on review of the patient's sequential radiographs, it was determined that there was evidence of a nondisplaced left hip fracture on the patient's radiographs taken on his second visit to the ED, 6 days after his original fall (Figure 4). This fracture was not visible on the first radiograph taken during his initial visit to the ED (see Figure 1) and was missed by both the ED and orthopedic treating physicians on the second visit. Therefore, his left hip fracture was not caused by his fall from bed after admission. Rather, he had suffered bilateral occult hip fractures in his initial fall, with the left hip fracture likely only displacing and becoming evident after he fell from the hospital bed.

DISCUSSION

Almost 148,000 Canadians suffered a hip fracture between 2001 and 2005, with 75.1% of these fractures occurring in those over 75 years of age.¹ The mean cost of hip fracture per patient in Canada is estimated at over \$26,000/year, with a total annual burden of care in the range of \$650 million/year,² which is expected to rise to \$2.4 billion/year by 2041.³ Mortality

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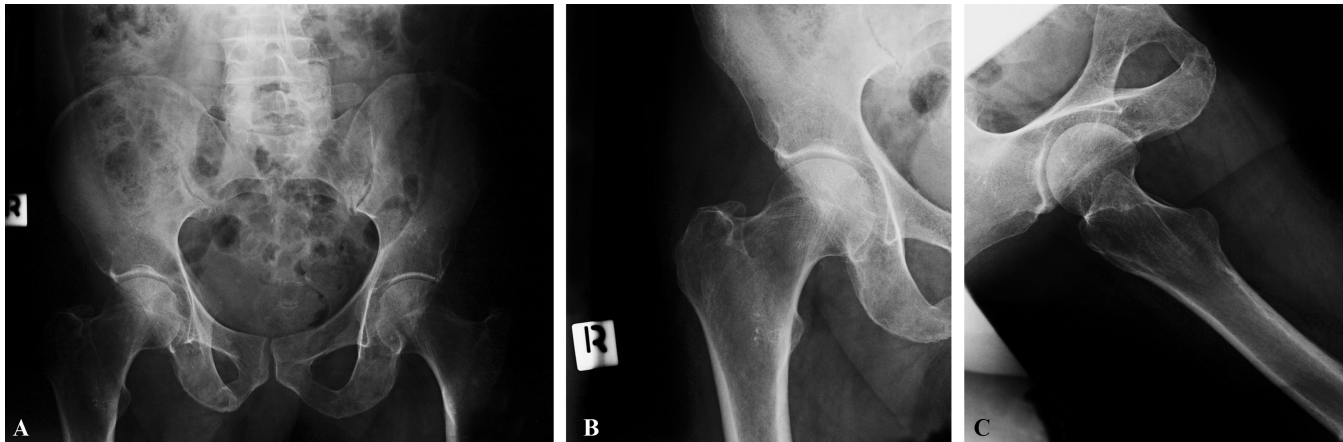


Figure 1. (A) Anteroposterior x-ray view of the pelvis along with (B) anteroposterior and (C) lateral views of the right hip done on the patient's initial presentation to the emergency department.

rates of 20 to 24% have been reported for the first year after hip fracture,^{4,5} with a four times greater risk of death 3 months after the fracture compared to controls.⁵ This increased risk of death may persist for up to 5 years afterwards.⁶ As well, up to 40% of hip fracture patients will still not have recovered to their prefracture walking abilities 6 months postinjury.⁷

A *MEDLINE* search was performed using varying combinations of the terms "hip," "femur," "occult," "fracture," and "radiology." The occurrence of a bilateral occult hip fracture is rare.⁸⁻¹¹ Although the diagnosis in this case became evident without advanced imaging, it behooves the clinician to consider the possibility of the occult hip fracture and initiate appropriate diagnostic studies before displacement occurs. It also demonstrates the role of distracting injuries in masking the presence of a second injury and the distinction between an occult fracture and a missed fracture. Although this distinction might seem self-evident (occult fracture generally refers to fractures that are not visible on plain radiographs but are found later to be present on other imaging modalities¹²), the



Figure 2. Anteroposterior x-ray of the right hip 6 days after the initial radiographs demonstrating a nondisplaced fracture of the right femoral neck (*arrow*) that was not visible on the original radiograph.



Figure 3. Anteroposterior radiograph of the pelvis after the fall from the hospital bed and subsequent surgery for the right hip fracture, demonstrating a displaced left femoral neck fracture.

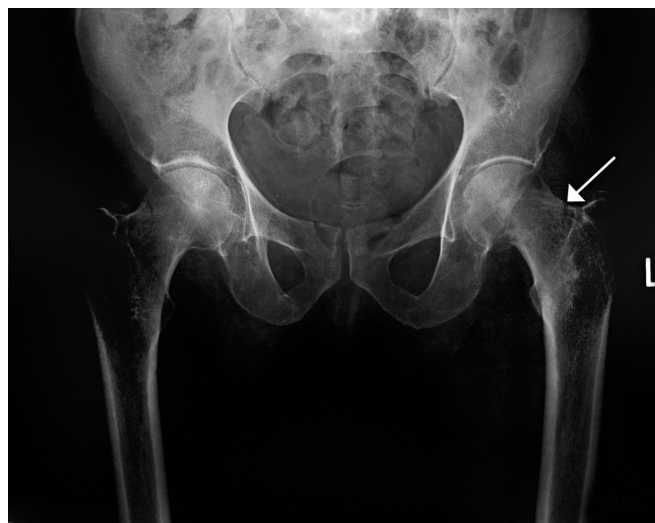


Figure 4. Anteroposterior radiograph of the pelvis performed on the same day as Figure 2, on the patient's second visit to the emergency department, 6 days after the original fall. It demonstrates a nondisplaced fracture involving the left femoral neck (*arrow*), which was radiographically occult on the radiographs done on the patient's initial presentation (see Figure 1). This fracture was missed on this visit. The nondisplaced fracture of the right femoral neck, which was correctly diagnosed on this visit, is evident as well.

failure to appreciate this difference is one of the factors that has led to the misrepresentation in the literature of the incidence of occult fractures of the hip, often quoted in the 2 to 10% range.^{9,13-18} Examining the literature that has produced this figure, we focused on the work of Parker, who was searching for missed fractures; his combined missed and occult rate was 1.9%.¹⁹ His true occult fracture rate was only 0.4%. Frequently referenced studies by Rizzo and colleagues and Feldman and colleagues do not provide any estimate of the incidence of occult hip fracture.^{20,21} Other earlier estimates of the occult hip fracture rate were in the order of 1.3%,²² 2%,²³ and 0.7%.²⁴

Further methodological inconsistencies in the literature add to the confusion surrounding the incidence of occult hip fracture. For example, one study reported a 2.9% incidence using all operative and nonoperative occult fractures of the hip and pelvis found as the numerator and the total number of patients who underwent plain radiographs as the denominator.²⁵ Meanwhile, another study reported a 4.2% incidence, which was derived by dividing the number of occult operative hip fractures found by the total number of patients with operative hip fractures diagnosed during their study period.²⁶

Although magnetic resonance imaging (MRI) is universally recognized as the gold standard for

diagnosing the occult hip fracture,^{13,27} with sensitivity and specificity approaching 100%,^{20,28-31} earlier studies used either clinical progression or bone scanning for diagnosis.^{19,22-24} Bone scanning, or bone scintigraphy, has a reported sensitivity and specificity of 93% and 95%, respectively³²; however, it is thought to take 24 to 72 hours for a scan to become positive in older patients. Other drawbacks of this modality are that it may not delineate the full extent of the fracture line²⁰ and the recent inconsistent availability of the substrate radionuclide material used to perform the examination.³³ Although MRI is a more expensive test, some have argued that it is a more cost-effective one, given that the diagnosis can be made within 4 hours of the injury and may be done with a limited field of view in as little as 15 minutes.²⁰ Because MRI is not available at all sites, cannot be used on everyone (such as patients with pacemakers), and/or might have limited availability during certain hours of the day, alternative strategies may be required to expedite the diagnosis.

Dominguez and colleagues provide sufficient data to derive a more valid incidence measure of occult hip fracture.³⁴ They demonstrated that 1.1% of all patients with negative plain radiographs (2.7% of all hip fractures identified) had occult operative hip fractures. This represented 0.8% of all patients who received hip radiographs for symptomatic pain. Occult fractures about the hip and pelvis of any kind were found in 4.4% of all patients who underwent plain radiographs, with 3.1% of those being from subjects with negative plain films. Overall, 39% of patients in the Dominguez and colleagues study who were selected to undergo MRI were found to have a fracture of any type, and they compared this to the proportions for similar findings noted in three other ED-based studies of 46%, 67%, and 56%, respectively.^{8,25,35} In the Dominguez and colleagues study, only 9.7% of the fractures found on MRI were operative in nature. Cannon and colleagues reviewed 17 studies on occult hip fracture using advanced imaging of all types in a non-ED population and found a cumulative incidence of operative occult hip fracture of 38%.³⁶ The disparity between these two studies was attributed to a selection bias in the non-ED studied patients reviewed by Cannon and colleagues, which probably represented higher-risk patients who came to the attention of the orthopedic and radiology services.

The few studies that have examined the utility of computed tomography (CT) in the diagnosis of occult

hip fracture did not provide support for its use; false-negative rates ranged from 20 to 100%, with limited numerical data reported.^{10,14,28,37,38} In the largest study, Cabarrus and colleagues determined that CT had a sensitivity of 53% (range 39–64%) for all fractures about the hip and pelvis.³⁸ CT has difficulty detecting disruptions in trabecular bone, which typically exists in greater proportion to cortical bone in the femoral neck of elderly or osteoporotic patients.²⁶ CT is also felt to be less sensitive in identifying small impacted fractures or a nondisplaced fracture that runs parallel to the axial plane of the image.³⁹ An intriguing question raised here is the fact that few of the studies of CT in occult hip fracture were performed on the current 64-slice multi-image detector computed tomographic (MDCT) scanners. Food and Drug Administration approval for 64-slice CT scanners occurred in 2004, so most studies were performed on earlier-generation machines of 16 slices or less.^{10,28,37} A 2005 study did not use a 64-slice MDCT scanner.¹⁴ Cabarrus and colleagues' study used a combination of 8-, 16-, and 64-slice MDCT scanners in comparison with MRI, but they did not indicate which, if any, of the 31% of fractures missed by CT were missed specifically by the 64-slice machines.³⁸ Current practice in our institutions is to perform a CT on those with suspected occult hip fractures and clear the patient if it is negative. This is consistent with the thinking of others in Canada who have confidence in the current 64-slice MDCT machines despite the lack of adequate studies to support this practice.⁴⁰

A recent small study demonstrated a sensitivity of 100% and a specificity of 65% for ultrasonography in diagnosing occult hip fractures.⁴¹ This modality is particularly intriguing to emergency physicians and awaits further investigation. The suggestion of whom to perform advanced imaging on, namely those who are unable to walk, have pain on axial loading, have passive hip rotation, or are unable to straight leg raise,⁴² has been questioned by others.^{43,44}

Management of the occult hip fracture patient has only recently been questioned. Rubin and colleagues argued that occult hip fracture patients should be divided into those with femoral neck fractures and those with intertrochanteric fractures.⁴⁵ Based on their experience and that of others,^{20,25,26,28,29,46} their suggestion that those with intertrochanteric fractures might be considered for a nonoperative approach and early mobilization has merit.

Mortality in those with occult hip fracture has not been shown to be higher than initially detected hip fractures,¹⁶ despite the fact that delay to surgery is associated with greater morbidity and mortality.⁴⁷ Delay in diagnosis may lead to displacement and a lower chance of conservative management of the fracture, with a decreased activity level in the long run.⁴⁸

CONCLUSION

This unusual case of bilateral occult hip fracture supports vigilance in the consideration of this diagnosis. In an ED population, best available data suggest that approximately 1% of all those with normal posttraumatic plain hip and pelvic radiographs will ultimately be shown to require surgery for a hip fracture and about 3 to 4% will be found to have an occult fracture about the hip and pelvis of any kind. This is a lower incidence than is typically reported in the literature. Approximately 40 to 66% of those undergoing MRI of the hip and pelvis will be found to have any kind of occult fracture, with about 1 in 10 of this group having a potentially operative hip fracture. Although MRI is recognized as the gold standard for diagnosis, many centres in Canada rely on 64-slice MDCT scanners to diagnose this condition, and confirmation of the merits of this approach awaits further studies. It is possible that occult intertrochanteric fractures might be managed nonoperatively, and limited data suggest that mortality in those with the occult hip fracture is similar to those whose fractures are radiographically evident.

Competing interests: None declared.

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