

Case Report

Ipsilateral Femoral Neck and Shaft Fracture; A Case Series of 5 Patients.

Johan Abdul Kahar¹, Muhammad Najmi Ab Ghani²

Abstract

Femoral shaft fractures are very common following trauma in adults and sometimes the patient may have an ipsilateral neck of femur fractures too. Unfortunately, the neck of femur fractures may be missed. The challenge lies in detecting and properly managing the neck of femur fracture in the presence of a femoral shaft fracture. We share our experience in treating 5 patients with ipsilateral neck and shaft of femur fractures and discuss the learning points in regards to diagnosis and treatment of this condition.

Keywords: Ipsilateral neck and shaft of femur fractures, missed neck of femur fracture.

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Introduction

Femoral shaft fracture is a commonly seen injury in orthopaedic practice. It typically occurs following high energy trauma and is commonly associated with other injuries which may influence the initial and definitive managements of the femoral fracture. Various options of treatment are available for managing isolated femoral shaft fractures but choosing the correct treatment may be difficult when the femoral neck is fractured as well. Concomitant neck of femur fractures is not unusual and may be missed. We wish to share our experience in managing 5 cases of ipsilateral femoral neck and shaft fractures.

Case Reports

Case Report 1:

A 30-year-old male construction worker fell from 10th floor into a pile of plywoods. He sustained open fracture of distal 1/3 shaft of his right femur (Gustillo II), closed comminuted fracture of the right patella and a scalp laceration. Initially the femoral neck fracture was not apparent on the

trauma radiographs. Following suspicion by the treating surgeon, the femoral neck was examined with image intensifier during the same anaesthesia for the debridement of the open femoral shaft fracture. Stress views under anaesthesia revealed a basal neck of femur fracture. Patient was put on temporary skeletal traction and delayed fixation of the femur was performed 6 days later. The femoral neck and shaft were fixed with a reconstruction nail.

Case Report 2:

A 37-year-old female pedestrian was allegedly hit by a car and sustained open fracture of mid shaft of left femur (Gustillo II) with ipsilateral basal neck of femur fracture. She had no other injuries. The patient underwent wound debridement, broad dynamic compression plate (DCP) fixation of the shaft fracture and in-situ percutaneous screw fixation of the neck of femur fracture using two cannulated half-threaded 6.5mm screws.

Case Report 3:

A 23-year-old male was involved in alleged motor vehicle accident where his motorcycle collided

1. Department of Orthopaedic, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.
2. Department of Orthopaedic, Hospital Pengajar Universiti Putra Malaysia, Persiaran Mardi-UPM, 43400 Serdang, Selangor Darul Ehsan, Malaysia.

Correspondence to: Johan Abdul Kahar, Department of Orthopaedic, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia. E-mail: akjohan@upm.edu.my

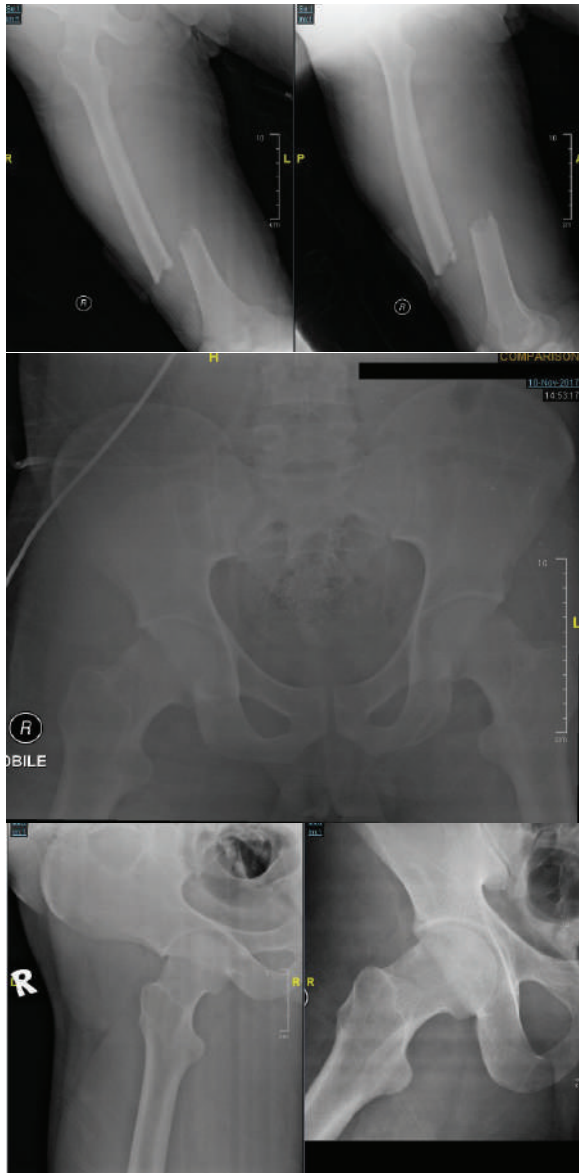


Figure 1-5: The initial plain radiographs of the patient on the day of trauma. Fracture line at the neck of femur was not visible.

with another car. He sustained closed fracture of the mid shaft of his left femur with ipsilateral basal neck of femur fracture. He also sustained closed fracture of mid shaft of tibia and fibula and a posterior cruciate ligament avulsion on the same side. At 8 hours post trauma, he was diagnosed to have fat embolism syndrome and was brought to operating to undergo fracture fixation of his left femur and tibia. The tibia was fixed with a narrow DCP, followed by broad DCP fixation of the femoral shaft and percutaneous screw fixation of the neck of femur using two cannulated half-threaded 6.5mm screws.

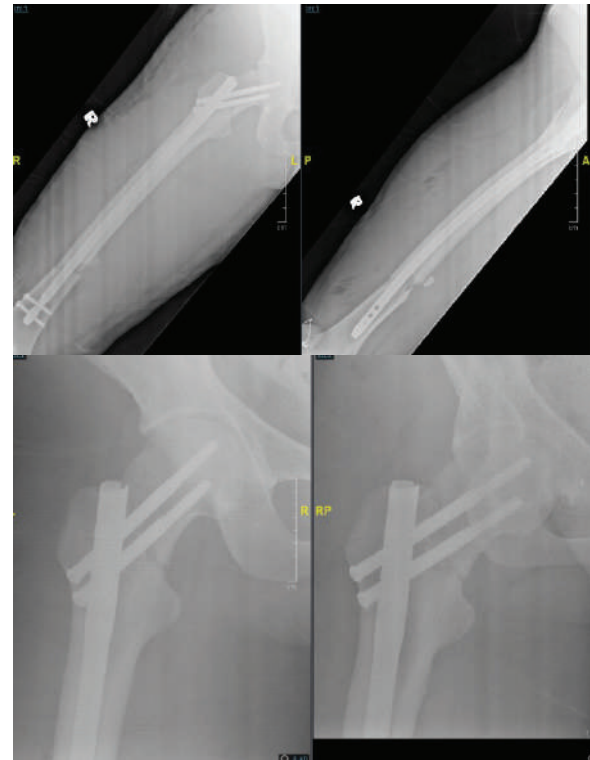


Figure 6-9: Post-operative plain radiographs of the patient. The neck of femur fracture can be clearly seen.

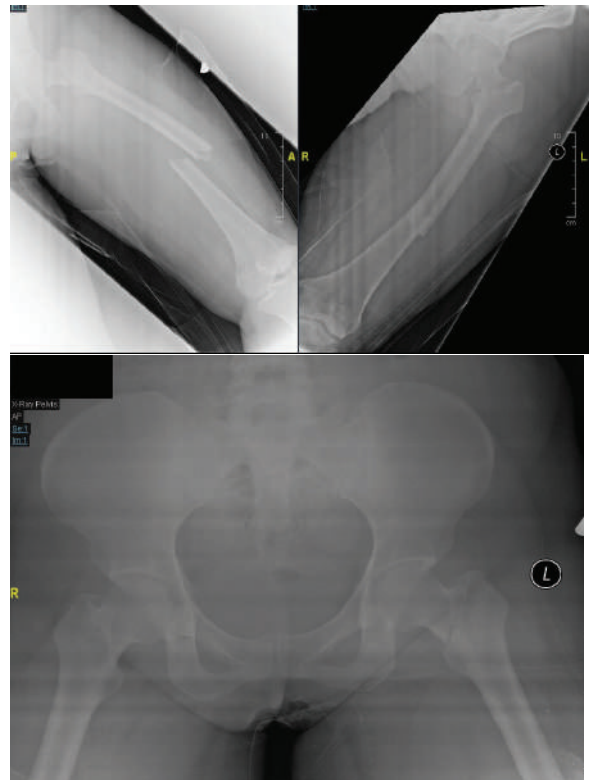


Figure 10-12: The initial plain radiographs of the patient on the day of trauma. Basal neck of femur fracture can be seen on femur and pelvis films.



Figure 13-16: Post-operative plain radiographs of the patient.

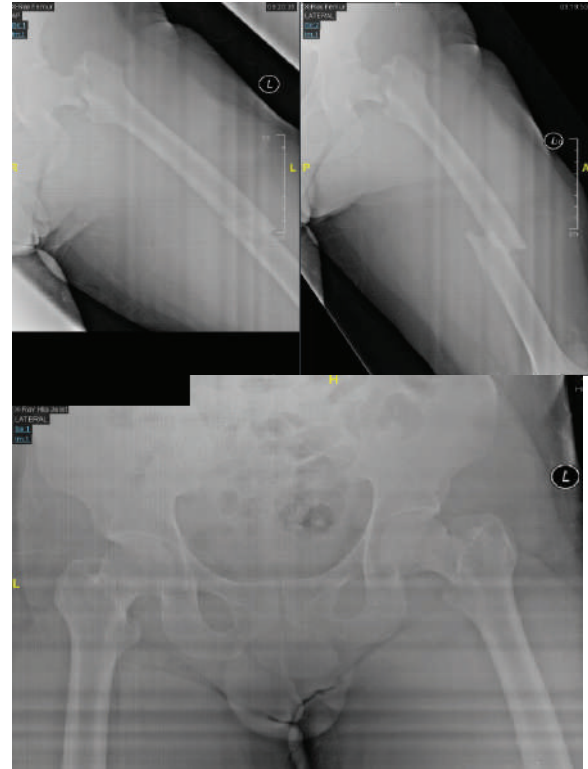


Figure 21-23: The initial plain radiographs of the patient on the day of trauma. Basal neck of femur fracture can be seen on femur radiographs.

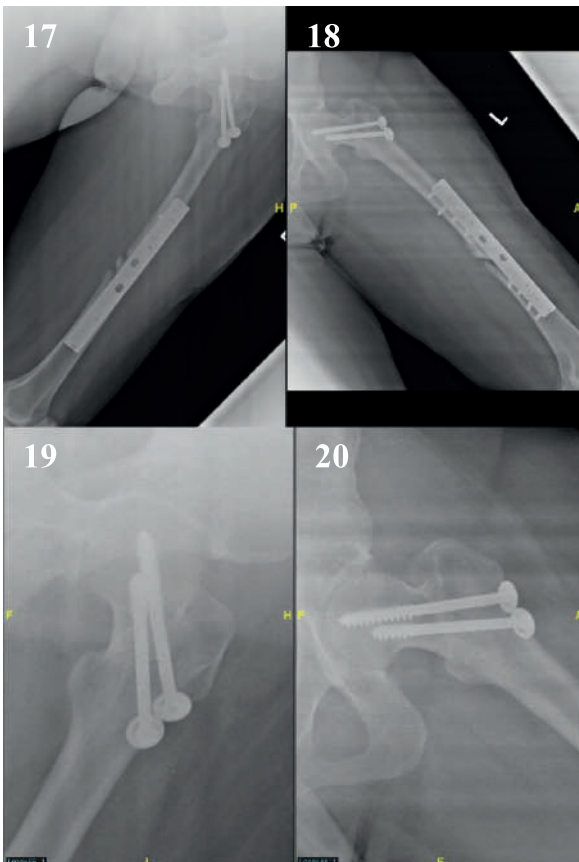


Figure 17-20: Plain radiographs of the patient at two months post-operatively. No sclerosis of head of femur seen and the neck of femur fracture was not displaced.

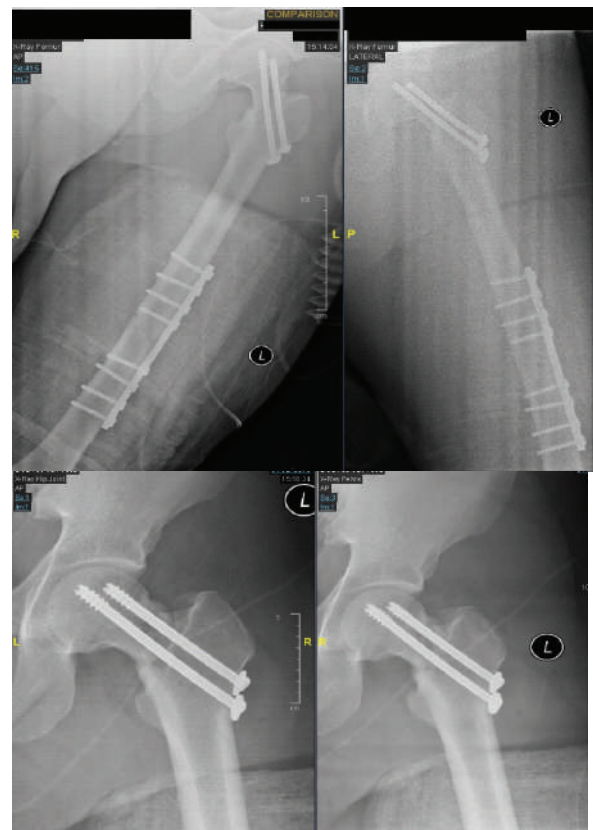


Figure 24-27: Post-operative plain radiographs of the patient.

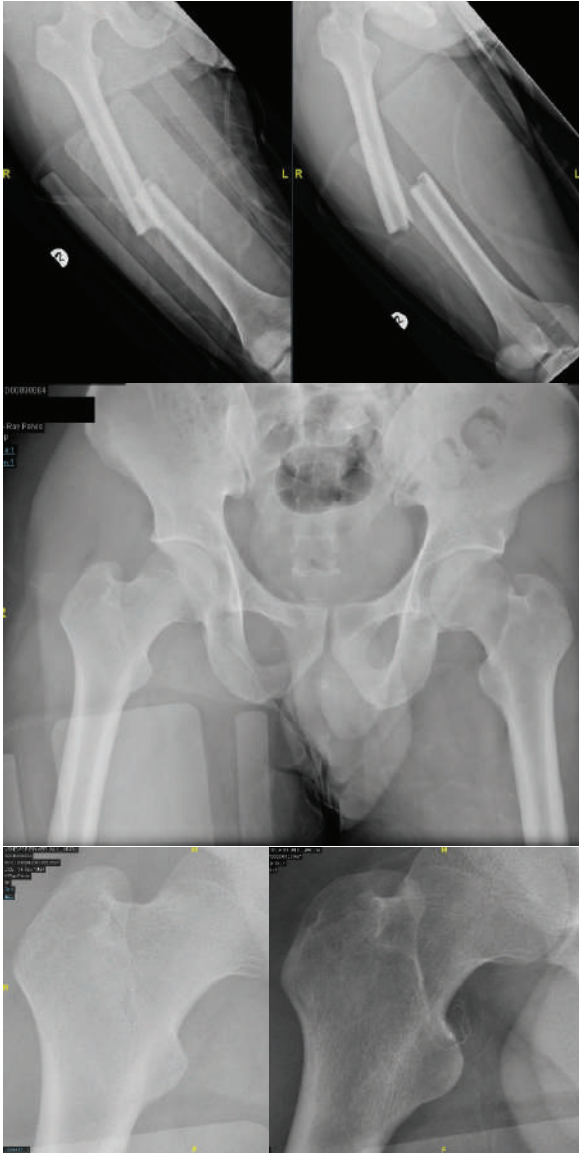


Figure 28-32: The initial plain radiographs of the patient on the day of trauma. Basal neck of femur fracture can barely be seen even after enlarging the image and adjusting the contrast.

Case Report 4:

A 33-year-old male sustained a closed fracture of the left femur following a motor vehicle accident where his motorcycle rear-ended a car. The patient had no other injuries. A careful examination by contrast adjustment of the pelvis and hip radiographs on the computer revealed a thin fine line which represents a basal neck of femur fracture. The fractures were fixed with a reconstruction nail on day 5 post-trauma.

Case Report 5:

A 53-year-old polytrauma patient was admitted

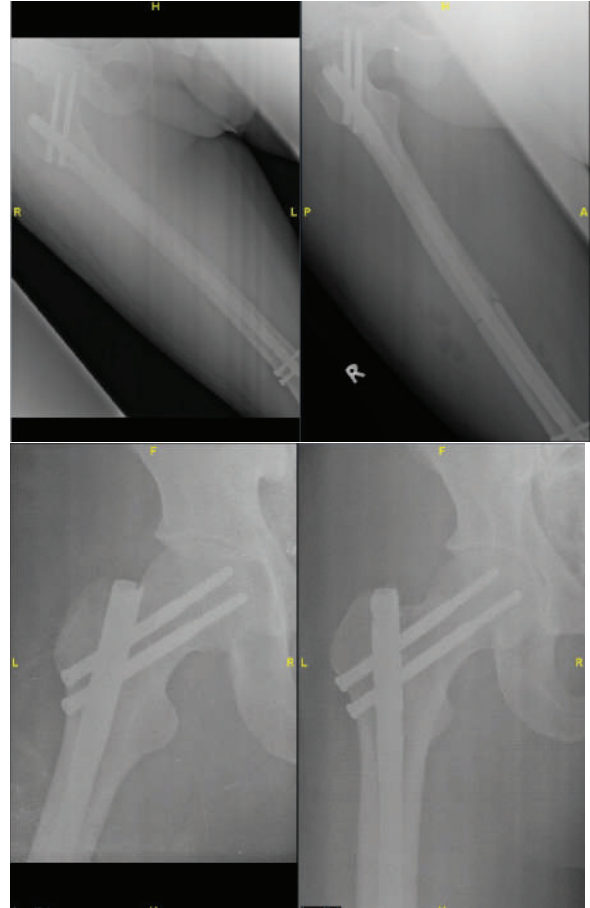


Figure 33-36: Post-operative plain radiographs of the patient. No displacement of the neck of femur fracture.



Figure 37-39: The initial plain radiographs of the patient on the day of trauma.

into intensive care unit following his involvement in an alleged motor vehicle accident. He sustained multiple rib fractures with chest contusion, mandible fractures, closed fracture mid shaft of left femur with an ipsilateral neck of femur fracture, bilateral distal radius fracture as well as an open pilon fracture of the left tibia. The subcapital neck of femur fracture was undisplaced and vertical. He was put on traction and admitted into intensive care unit (ICU). For the femoral fractures, he was planned for screw fixation of the neck of femur and retrograde nailing. However due to his unstable general condition, definitive fracture fixations were unable to be done. He remained hypoxic despite being on high ventilator settings and was ventilator dependent throughout his ICU stay, until day 19 of admission when he passed away due to multi organ failure and acute respiratory distress syndrome (ARDS).

Discussion

While femoral shaft fractures are very common, to have an ipsilateral femoral neck fracture at the same setting is unusual. Emphasis should be on detection of its occurrence and proper management of the neck of femur fracture while treating the concomitant shaft fracture. The incidence of ipsilateral femoral neck and shaft fractures is estimated to be up to 6%^{1,2}; which is quite high considering an orthopaedic surgeon will encounter one such case in about every 20 femoral fractures. The ipsilateral neck of femur fractures typically exhibit a common trait. Usually, they are vertical and minimally displaced^{1,3}. This fracture pattern consistency was clearly demonstrated in our case series.

Unfortunately, concomitant neck of femur fractures are commonly missed; it can be undetected in up to 30% of the patients. Other than the fact that the fracture is often undisplaced, suboptimal views of post-traumatic plain radiograph may mask the injury. The hips are often in external rotation causing the neck of femur to be obscured by the greater trochanter. Occasionally, artefacts such as traction splint bar may obstruct the view of the neck of femur too. It is also possible that the trauma series radiographs failed to include the hip especially in emergency situations in an unstable patient. These factors are recognised to contribute to missed ipsilateral neck of femur fracture in the presence of femoral shaft fracture¹⁻³. Late detection or missing a neck of femur fracture may lead to devastating complications such as avascular necrosis of the femoral head and non-union of the

neck of femur fracture^{1,3-5}.

Early detection of the fracture is of paramount importance as early management of neck of femur fractures results in better outcome. Within the limits of the plain radiographs in the trauma settings, the attending doctor should scrutinize every hip and pelvis films of a patient with femoral fractures. This is because it is almost impossible to suspect neck of femur fracture by physical examination as hip range of motion is not testable in the presence of femoral shaft fracture. Suspicious radiographs should be repeated too. Using computerised system to view these imaging studies may make detection of occult neck of femur fracture easier as the surgeon can adjust the contrast and enlarge the area of interest to further enhance the fracture line appearance. Another way is making use of computed tomography (CT) scan of the abdomen that may have been done for assessment of concomitant intraabdominal or pelvic injuries in a patient with a femoral shaft fracture. Most of the time the CT images will include the upper part of femur which can be further examined carefully^{1,2,4}. However, despite its presumable accuracy in detecting occult femoral neck fractures, CT scan may lack sensitivity as demonstrated by a blinded study by O'Toole et al⁵. Therefore, a surgeon needs to be vigilant when interpreting the CT scan images of the proximal femur.

Sometimes, the ipsilateral neck of femur fracture is not detected until intramedullary nailing were done for the shaft fractures. These fractures are usually presumed to be iatrogenic due to inappropriate entry point and improper technique of introducing the nail; but they may actually be missed fractures that only became apparent following manipulation during the nailing procedure². A few studies have demonstrated this; for example, Yang et al found that most of their ipsilateral neck n shaft femur that was nailed actually sustained it pre-operatively based on the CT scan that was done for concomitant suspected intraabdominal injuries². Riemer et al also found occurrence of ipsilateral neck of femur fractures in shaft fractures that are treated with plates⁶. This goes to show that the intramedullary nailing does not necessarily cause the neck of femur fractures.

Considering the importance and challenges in detecting concomitant ipsilateral femoral neck fractures, it is a good practice for the surgeon to carefully examine the neck of femur under image intensifier during positioning and preparation

prior to starting intramedullary nailing of the femur. It is also advisable to perform a stress test for the neck of femur under image intensification once the femoral shaft is stabilised following fixation, so that any fracture can be managed under the same anaesthesia^{1,3,5}. A study by Avilucea et al demonstrated superior sensitivity of intraoperative dynamic stress fluoroscopy in detecting femoral neck fractures when compared to pre-operative CT scan and intra-operative static plain hip radiographs. They proposed a manoeuvre that consist of axial loading, valgus stress, internal rotation and external rotation³.

Another aspect of managing ipsilateral neck and shaft of femur fracture is deciding the method of fixation of the fractures. It is not unusual that the neck of femur fracture is incidentally discovered during intramedullary nailing procedure. If it is found during patient positioning, the fractured neck of femur should be reduced and held temporarily with threaded guidewires to maintain reduction. With the wires in-situ, reaming of canal and insertion of nail can be completed before finally locking it proximally with a reconstruction screw into the femoral neck^{1,7}. If the fracture is detected after completion of nailing or reconstruction screws are not readily available, two or three half-threaded cannulated screws can be used to fix the neck of femur fracture using the “miss-a-nail” technique⁷⁻⁹.

In the situation where the neck of femur fracture was detected upon patient's presentation, the surgeon has the liberty to choose the appropriate method of fixation. Options available include plating of the shaft and screw fixation of the neck of femur⁶, retrograde nailing of the shaft and screw fixation of the neck of femur¹ and reconstruction nail fixation^{7,10-12}. Most if not all authors would agree that there is no single best solution to this type of injury and treatment need to be individualised to each patient⁸.

Regardless the method chosen, loss of reduction of the neck of femur fracture should be avoided especially considering they are usually undisplaced initially in these situations^{2,6}. This can be avoided by temporarily placing guidewires across the neck of femur fracture first. Then reaming and nail insertion can proceed without conflicting hardware, before finally inserting the reconstruction screw. For plating and retrograde nailing, the neck of femur can be fixed first, but excessive manipulation of the proximal femur

must be avoided during the shaft fixation to avoid implant failure.

In our series, we plated the shafts of femur of Patient 2 and Patient 3 before proceeding with closed reduction and screw fixation of the neck of femur. We feel that the neck of femur fracture could have been compressed further. Perhaps better reduction can be obtained had we fixed the neck of femur first. Similarly, in Patient 1, the neck of femur fracture site appeared more opened up compared to pre-operative radiographs. The reconstruction nailing for Patient 1 and Patient 4 were done following the usual steps. Perhaps if we have temporarily held the neck of femur fracture with a few threaded guidewires before reduction, reaming and nail insertion, the neck of femur fracture would not have displaced. We were fortunate that in Patient 4, no displacement of neck of femur fracture occurred.

Conclusion

Ipsilateral neck and shaft of femur fractures may occur in high energy trauma. Unfortunately, the neck of femur fracture may be undetected in the presence of shaft fractures and may even be presumed iatrogenic following intramedullary nailing procedures. Emphasis should be on early detection and proper treatment of both fractures. To avoid missing a concomitant neck of femur fracture in a case of femoral shaft fracture, the treating doctor need to carefully examine the hip/pelvis radiographs and available CT scans that include the proximal femur. Subsequently, once the femoral shaft is fixed, intra-operative fluoroscopic stress views of the femoral neck will help to minimise the likelihood of overlooking femoral neck fractures. Options of treatment should be individualised to each patient. Regardless the method of fixation, displacement of the neck of femur fracture site should be avoided.

Conflict of interest

Both authors declare that they have no conflicts of interest.

Ethical clearance

Both authors declare that they have no conflicts of interest.

Authors' contribution

Both authors were involved equally in patient management, data collection, literature review and manuscript preparation.

References

1. Wolinsky PR, Johnson KD. Ipsilateral femoral neck and shaft fractures. *Clinical Orthopaedics and Related Research*®. 1995; 318:81-90.
 2. Yang KH, Han DY, Park HW, et al: Fracture of the ipsilateral neck of the femur in shaft nailing: the role of CT in diagnosis. *J Bone Joint Surg*. 1998; 80:673.
 3. Avilucea FR, Joyce D, Mir HR. Dynamic stress fluoroscopy for evaluation of the femoral neck after intramedullary nails: improved sensitivity for identifying occult fractures. *Journal of Orthopaedic Trauma*. 2019; 33(2):88-91.
 4. Tornetta III P, Kain MS, Creevy WR. Diagnosis of femoral neck fractures in patients with a femoral shaft fracture: improvement with a standard protocol. *JBJS*. 2007; 89(1):39-43.
 5. O'Toole RV, Dancy L, Dietz AR, et al. Diagnosis of femoral neck fracture associated with femoral shaft fracture: blinded comparison of computed tomography and plain radiography. *Journal of orthopaedic trauma*. 2013; 27(6):325-30.
 6. Riemer BL, Foglesong ME, Miranda MA: Femoral plating. *Orthop Clin North Am*. 1994; 25:625.
 7. Shetty MS, Kumar MA, Ireshanavar SS. Ipsilateral hip and femoral shaft fractures treated with intramedullary nails. *International orthopaedics*. 2007; 31(1):77-81.
 8. Bucholz RW, Rathjen K. Concomitant ipsilateral fractures of the hip and femur treated with interlocking nails. *Orthopedics*. 1985; 8(11):1402-6.
 9. Wiss DA, Sima W, Brien WW. Ipsilateral fractures of the femoral neck and shaft. *Journal of orthopaedic trauma*. 1992;6(2):159-66.
 10. Hossam E, Morsey A, Eid E. Ipsilateral fracture of the femoral neck and shaft, treated by reconstruction interlocking nail. *Arch Orthop Trauma Surg*. 2001; 121:71.
 11. Koldenhoven GA, Burke JS, Pierron R. Ipsilateral femoral neck and shaft fractures. *South Med J*. 1997; 90:288.
 12. Randelli P, Landi S, Fanton F, et al. Treatment of ipsilateral femoral neck and shaft fractures with the Russell-Taylor reconstructive nail, *Orthopedics*. 1999; 22:673.
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