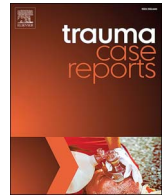


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Case Report

Profunda femoris artery injury caused by lesser trochanter fragment in intertrochanteric fracture: A case report

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ABSTRACT

Vascular injuries following intertrochanteric fracture have been sporadically reported. Despite its rare occurrence, this complication can be potentially life and limb threatening. The authors report an unusual presentation of false aneurysm of profunda femoris artery following an intertrochanteric fracture with marked displacement of lesser trochanter fragment. The patient presented with thigh swelling and unexplainable dropped hematocrit. Surgical exploration and vascular repair were done. It is essential for the surgeon to be aware of possible associated vascular injuries in intertrochanteric fracture, particularly in fracture with lesser trochanter fragment.

Introduction

Vascular injuries following intertrochanteric fracture is rare with overall incidence of 0.49% [1]. This complication could result in severe morbidity (10.17%) and mortality (6.58%) [1]. Surgeons are usually aware of the repeated iatrogenic vascular injuries caused by instruments, such as drill bit and Hohmann retractor [2–5]. Nevertheless, injuries from fracture fragment have been extremely rare [6–9]. The authors report a case who had excessive thigh swelling with unremitting dropped hematocrit from profunda femoris artery injury caused by displaced lesser trochanter spike.

Case history

A 70-year-old expat lady sustained a left intertrochanteric fracture following slippage and fall onto the floor. At a local private hospital, she underwent plain X-ray and CT scan of the hip. The initial diagnosis was comminuted intertrochanteric fracture, classified as AO 31-A2 according to AO classification (Fig. 1). Lab investigation showed hematocrit level of 19%. She did not have prior history of anemia. Preoperatively, she received blood transfusion and hematocrit level was raised to 24.9% but subsequently dropped to 22.2% two days later. After medical consultation, she underwent an internal fixation with proximal femoral nail antirotation (PFNA, Synthes, Switzerland) three days after injury.

Postoperative films (Fig. 2a) revealed malreduction of intertrochanteric fracture. In addition to the fracture reduction problem, she also received additional 4 units of packed red cell and hematocrit level was increased to 32.9%. Rehabilitation program included non-weight bearing with walker and quadriceps training. The patient was discharged 4 days after operation.

Two days after discharge (6 days after operation), she went back to the first hospital due to left hip pain and bloody discharge

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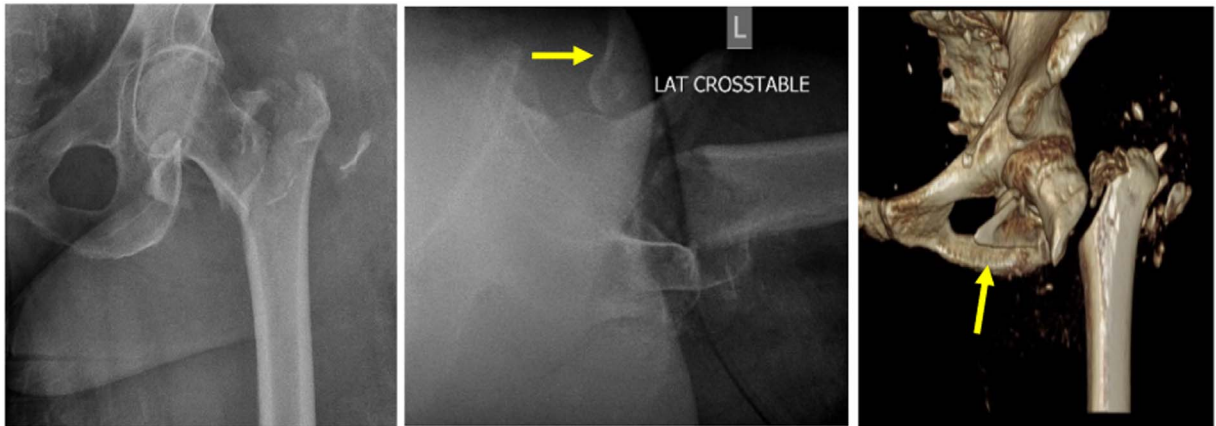


Fig. 1. Preoperative films and CT showing unstable intertrochanteric fracture. The lesser trochanter was markedly displaced with its sharp spike turning anteriorly (arrows).

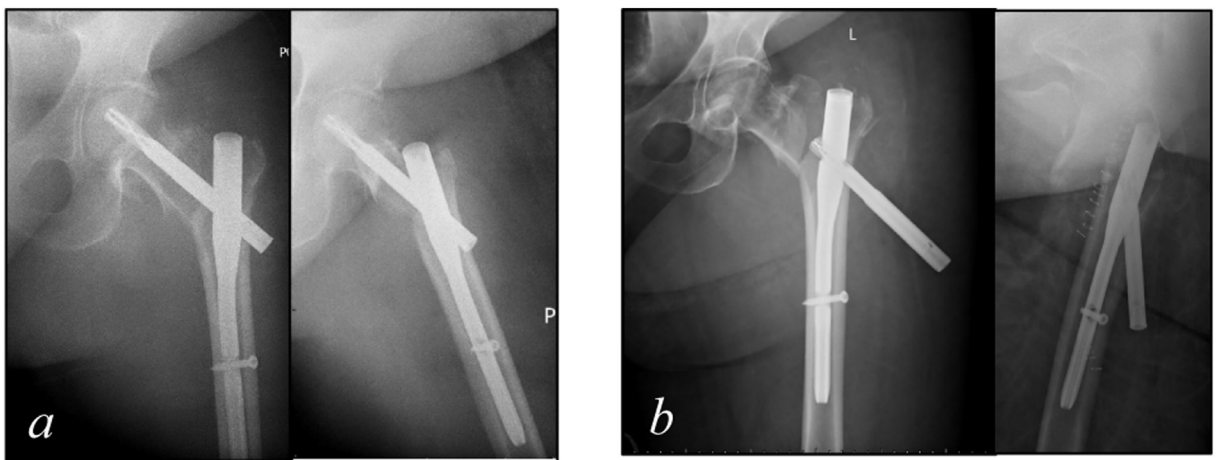


Fig. 2. (a) Postoperative films showed malreduction of fracture. (b) Implant failure occurred 6 days after malreduction of intertrochanteric fracture.

from the wound while sitting on a toilet seat. Radiographs showed fixation failure with varus displacement of the fracture (Fig. 2b). Her hematocrit dropped again to 23.8%. After 3 units of packed red cell transfusion, hematocrit had risen to 31.9%. With skin traction and pain control, she was transferred to the authors' hospital for a revision surgery of failed fixation.

At the time of arrival, she had marked thigh swelling without pulsatile mass. Ipsilateral pulses and capillary refill were intact as confirmed with Doppler signals. Ultrasonography was done followed by CT angiogram showing an arterial injury at femoral artery forming a false aneurysm size $5.7 \times 3.5 \times 5.0$ cm (Fig. 3) and a large hematoma in left thigh measuring $14 \times 8 \times 7.8$ cm.

After retrieving operative information from the first surgeon, there was no excessive traction on the fracture table. There was also no attempt on mobilization of the lesser trochanter fragment or application of any instruments anteriorly to the hip joint which might cause iatrogenic vascular injury. The initial X-ray and CT were reviewed and showed that the lesser trochanter fragment lay at the same location of the false aneurysm (Fig. 1). The initial CT scan, without contrast, also showed a doubtful shadow at the same position of the aneurysm showing in CT angiogram (Fig. 3). These radiographic features were strong evidence that the vascular injury likely occurred since the initial injury.

Operations were set for vascular exploration followed by revision of internal fixation. It was 12 days after initial injury. Exploration by vascular surgeon revealed a completely torn profunda femoris artery just distal to its bifurcation from the common femoral artery (Fig. 3c). The false aneurysm was measured 4.5×3 cm. After unroofing the aneurysm, the lesser trochanter spike was obviously found impaling on the torn artery (Fig. 4a,b). The proximal stump of injured artery stump was controlled and ligated. Distal stump was found occluded. Subsequently, the lesser trochanter fragment was then removed by separation from its iliopsoas attachment. Revision surgery was done with separated lateral incision, large collection of hematoma was also identified and evacuated. Removal of PFNA was followed by medialization of femoral shaft to achieve internal stability and fixation with 130° angled blade plate (Synthes, Switzerland) (Fig. 4c). Postoperatively, the patient recovered well and received a comprehensive rehabilitation program. Final hematocrit was 34.9%. She was discharged without ongoing morbidity.

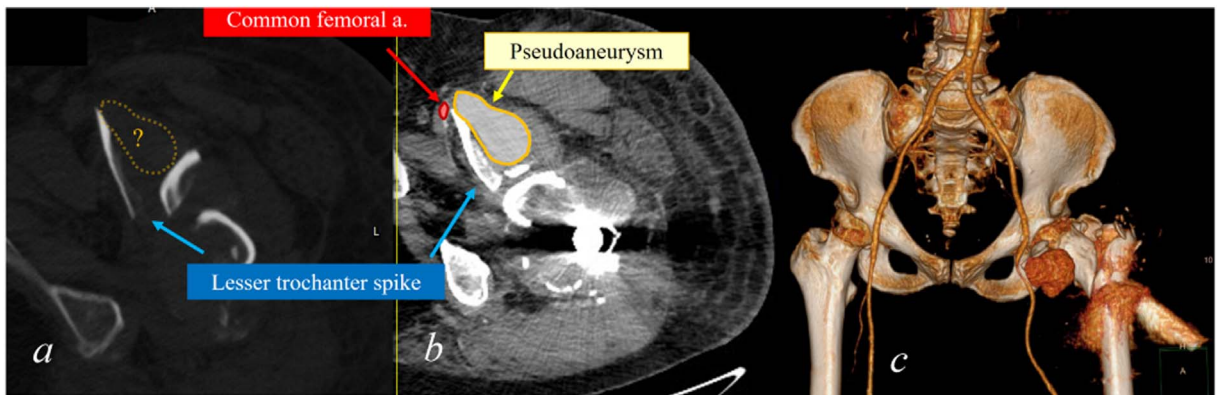


Fig. 3. (a) Initial CT scan.

(b) CT angiogram before revision surgery. The lesser trochanter fragment position remained unchanged. Despite that the initial CT scan had no contrast media, there was a doubtful shadow at the same position of the aneurysm.

(c) CT angiogram showed bone spike penetrating the profunda femoris artery, false aneurysm formed adjacent to the injury site. Left profunda femoris artery branch disappeared.

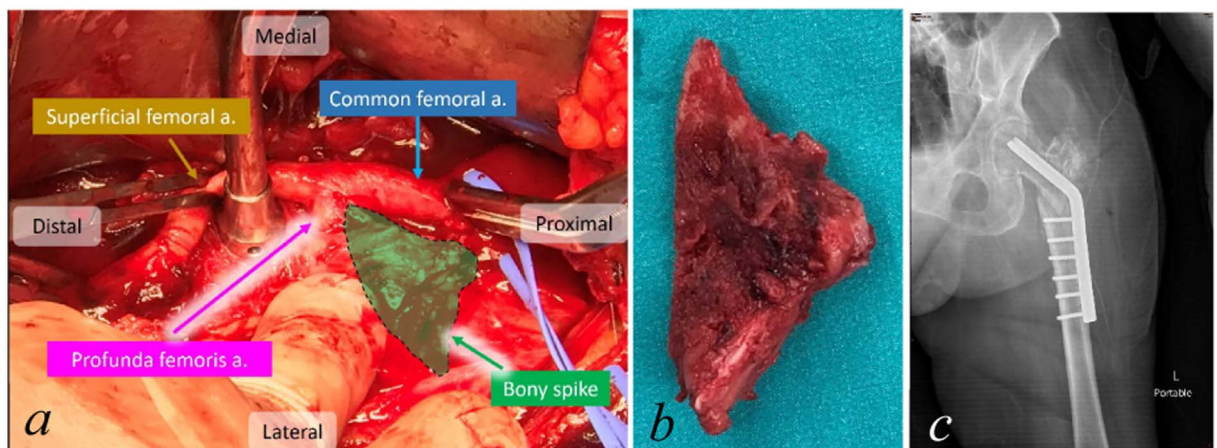


Fig. 4. (a) Intraoperative picture; the bony spike was seen impaling the artery. (The body of lesser trochanter was obscured underneath the soft tissue.)

(b) Lesser trochanter fragment.

(c) Postoperative film of revision with angled blade plate.

Discussion

In the present case, there were two major issues, the fixation failure and the extremely rare vascular injury following intertrochanteric fracture. Apparently, the fixation failed because of malreduction in both coronal and sagittal planes. With the unstable reduction, the PFNA blade possibly toggled inside the osteoporotic femoral head and eventually back out. In addition to the fixation issue, the vascular injury was even more devastating.

Vascular injuries following intertrochanteric fracture have been sporadically reported with the extremely rare occurrence (0.49%) [1]. The cause of injury can be iatrogenic [2–5] or non-iatrogenic [6–9]. Recent systematic review revealed that iatrogenic causes were much more common (96.15%), such as from the reduction process, protrusion of instruments or implants [1]. Documented non-iatrogenic causes were rarely reported in prior literature [6–9].

Regardless to the cause of injury, it is interesting that the profunda femoris artery is the most common injured vessel. This can be explained by the course of the artery running medially to the proximal femur. The lesser trochanter fragment was pulled by its iliopsoas attachment making it closer to the artery. Atherosclerosis also makes the fragile artery more vulnerable to get injured [1].

The common clinical presentation of vascular injuries includes unexplained dropped hematocrit, persistent postoperative pain, and noticeable thigh swelling. The present case demonstrated similar features to prior reports [1,10]. Furthermore, unremitting fall in hematocrit level was almost indicative of vascular injury. These common clinical clues should alert the surgeon for recognizing possible vascular injuries, while formation of large hematoma and pseudoaneurysm represent more severe consequences. It should be noted that the intact distal pulses and normal distal perfusion in this case did not exclude the vascular injury.

Importantly, the initial X-ray in this case showed markedly displaced lesser trochanter with its sharp spike turning anteriorly. These features could draw the attention on the possibility of vascular injury and awareness must be taken during the entire clinical

course, particularly during operative fixation wherein such maneuvers or instruments could cause iatrogenic injury.

Outcome of vascular injuries could be minimal or more severe such as limb loss and death [1]. Therefore, awareness and early diagnosis are of paramount importance to prevent and minimize catastrophic complications which may come with medicolegal consequences.

Conclusion

Despite a rare occurrence, this case highlights the importance of vigilance for diagnosing vascular injury in proximal femoral fracture. Markedly displaced lesser trochanter has high risk of vascular injury. Excessive swelling and unexplained dropped hematocrit are important clinical clues leading to early recognition and comprehensive management.

Conflict of interest

None.

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