On-line Case Report

Delayed presentation of lateral femoral circumflex artery injury post cannulated hip screw surgery – a case report

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ABSTRACT

An elderly patient underwent cannulated hip screw surgery for a subcapital neck of femur fracture. Nine days post surgery, she was noted to have collapsed with a falling haemoglobin level. Computed tomography revealed a large haematoma to the thigh. Further angiography showed active bleeding from one of the branches of the lateral femoral circumflex artery (LFCA), which we postulate was caused by the sharp tip of a version guidewire used during fracture fixation surgery. Iatrogenic injury during hip fracture fixation is a rare event, particularly to the circumflex branches of the profunda femoris artery (PFA), and may occur from hard wire use intra-operatively or from the fracture itself. The LFCA branches laterally from the PFA, runs anterior to the femoral neck, where we suspect it was injured in our case. Whilst a version wire is a useful radiological guide intra-operatively, manually clearing a passage for its insertion into the femoral head/neck junction and using the blunt end is recommended. A combination of acute swelling in the operated region and falling haemoglobin post surgery should alert the clinician to possible vascular injury. Compared to duplex ultrasonography, CT angiography remains the gold standard in its specificity and sensitivity for diagnosing arterial injuries. With early recognition and prompt radiological intervention, this rare complication of fracture fixation surgery can be treated without the need for further surgery.

Keywords: Iatrogenic injury with guidewire – Lateral femoral circumflex artery injury – Profunda femoris artery injury – Vascular complications of hip fracture fixation surgery – Version guidewire

Case report

An 86-year-old woman presented to our department with a valgus impacted subcapital fracture of the left neck of femur. She underwent cannulated hip screw fixation 2 days post admission. The fracture was fixed *in situ* with no attempt at reduction. One version wire was used

during surgery, which proceeded unremarkably. There were no intra-operative or immediate postoperative complications.

Nine days post procedure, the patient was found collapsed and unable to lift her left leg. Blood analysis revealed a haemoglobin of 6.8 g/dl. Urgent computer tomographic pulmonary angiography (CTPA) was

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Figure 1 CT angiogram demonstrating a large circumferential haematoma to the anterolateral left thigh.

organised to investigate for a pulmonary embolus and exclude proximal femoral or iliac vessel deep vein thrombosis. This revealed a large circumferential haematoma enveloping the left thigh (Fig. 1).

Figure 2 Digital subtraction angiogram demonstrating the radiographic 'blush' of active bleeding from the lateral circumflex branch of the profunda femoris artery in the region of cannulated hip screws.

Angiography confirmed active bleeding, from the lateral femoral circumflex artery (LFCA) branch of the profunda femoris artery (PFA). The site of the bleeding point (Fig. 2) lead the authors to suspect that the cause was vessel laceration by the sharp tip of a guidewire, which had been used as a 'version' wire during surgery.

The bleeding branch was successfully embolised with three vascular occlusion coils, with the patient making an uncomplicated recovery thereafter.

Discussion

Iatrogenic vascular injury during trauma orthopaedic surgery is an uncommon event. We could find no data on the true incidence of occurrence in fracture fixation surgery, nor were there any cases of probable iatrogenic injury to the LFCA branch of PFA with a guide wire in a subcapital neck of femur fracture, as in our report. The case is made more unusual by its presentation over a week post surgery.

Version wire technique

A version guidewire, as used here, is commonly employed during proximal femoral fracture surgery, whereby it is normally inserted along the anterior aspect of the femoral neck, with the pointed tip gently impacted into the head-neck junction. The angle of the wire relative to the horizontal facilitates accurate passage of the first actual wire up the femoral neck, in preparation for cannulated screw insertion. Although this method saves time by reducing the number of passes one makes into bone, this case illustrates the potential risk of this technique to the closely related vasculature. The authors suggest that the technique can be made safer by manually clearing the path for the version wire and by using its blunt end.

Anatomy of the profunda femoris and its branches

The common femoral artery (CFA) usually bifurcates into the superficial femoral artery (SFA) and PFA (Fig. 3). The medial femoral circumflex artery (MFCA) arises from the PFA, winds around the medial aspect of the femur to lie posterior to the femoral neck.

The LFCA arises from the lateral side of the PFA, across iliopsoas anterior to the femoral neck, running beneath sartorius to lie deep to rectus femoris.¹ It divides into three further branches: the ascending, transverse and descending, one of which was likely to have been injured in our case. The relatively anterior position of the LFCA renders it at-risk from a version wire passed along the femoral neck towards the head.

The MFCA, primarily, and the ascending branch of LFCA form an extracapsular ring that enters the hip joint capsule, in order to supply the femoral head.² These vessels are at the greatest risk of disruption in intracapsular fractures of the neck of femur.

Imaging

CT is a reliable modality for diagnosing arterial injuries after blunt and penetrating trauma to the extremities. Studies have shown the sensitivity of CT angiography to be 90–100% and its specificity 98.7–100% for detecting arterial injury to the extremities after trauma.^{3,4} The CT angiographic signs of arterial injury include active extravasation of contrast material as in our case, pseudo-aneurysm formation, abrupt arterial narrowing, loss of opacification of a segment of artery, and arteriovenous fistula formation. Metallic streak artefact, motion artefact and inadequate arterial opacification may render a CT angiogram non-diagnostic.

In comparison, duplex ultrasonography may be limited by errors in identifying secondary branches and examinations performed by inexperienced operators. Bone, metal fragments and haematomas may render the examination more difficult as well as the presence of atherosclerosis. Where clinical findings such as distal pulse deficit and falling haemoglobin levels are absent, but the suspicion of occult arterial injury remains, duplex ultrasonography may prove to be a useful non-invasive preliminary investigation.⁵ With this type of presentation, the sensitivity has been shown to be 90.5%, with a specificity of 100% and accuracy of 96.1%.⁶ CT angiography remains the gold standard and the appropriate investigation in the hospital ward setting.

Conclusions

Iatrogenic arterial injury in hip fracture surgery remains rare particularly from the use of guide wires. The use of a

Figure 3 Schematic diagram demonstrating the branches of the PFA. (Adapted with changes from the online edition of Gray's *Anatomy of the Human Body*, available at <www.bartleby.com>).

sharp-ended version guidewire risks injury to the anteriorly located branches of the LFCA. The presentation maybe delayed for sometime post surgery, but early recognition of clinical signs and prompt appropriate investigations can result in a positive outcome, without the need for further surgical intervention.

References

1. Gray H. *Anatomy of the Human Body* (Online), 20th edn. 2000 <www.bartleby.com>.
2. Koval KJ, Zuckerman JD. *Handbook of Fractures*, 3rd edn. Philadelphia, PA: Lippincott Williams & Wilkins, 2006.
3. Inaba K, Potzman J, Munera F, McKenney M, Munoz R, Rivas L *et al*. Multi-slice CT angiography for arterial evaluation in the injured lower extremity. *J Trauma* 2006; **60**: 502–6.
4. Miller-Thomas MM, Clark West O, Cohen AM. Diagnosing traumatic arterial injury in the extremities with CT angiography: pearls and pitfalls. *Radiographics* 2005; **25**: S133–41.
5. Applebaum R, Yellin AE, Weaver FA, Oberg J, Pentecost M. Role of routine arteriography in blunt lower – extremity trauma. *Am J Surg* 1990; **160**: 221–4.
6. Kuzniec S, Kaufmann P, Molnar LJ, Aun R, Puech-Leao P. Diagnosis of limbs and neck arterial trauma using duplex ultrasonography. *Cardiovasc Surg* 1998; **6**: 358–66.