

Vascular Aneurysm Secondary to a Femoral Intertrochanteric Fracture Concealed by Anticoagulation Therapy

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Arterial injuries are known complications of long bone fractures but are rare with intertrochanteric femoral fractures [1-3]. These injuries may present with acute hemorrhage or, more commonly, as pseudo-aneurysms that may take years to diagnose. The injury is usually a complication of the intervention performed, including the use of drills, screws, pins, retractors, manipulation of the fracture [2], and less commonly is due to a bony spike [2,3]. We describe the case of an intertrochanteric fracture complicated by a false aneurysm that occurred concurrently with deep vein thrombosis (DVT) and anticoagulation therapy, resulting in a delay in diagnosis and proper treatment.

PATIENT DESCRIPTION

An 80 year old man fell and sustained an unstable intertrochanteric fracture of the right femur. Forty-eight hours after the fall he underwent closed reduction and internal fixation of the fracture with a sliding nail (Richards Hip Screw System™, Richards Medical Company, Memphis, TN, USA). The postoperative radiographs indicated that the fracture had a subtro-

chanteric extension and he was instructed not to bear weight. Prophylactic anticoagulation therapy was routinely started with subcutaneous low molecular weight heparin (enoxaparin sodium) 40 mg once daily. During his hospitalization, his hemodynamic parameters were stable, hemoglobin > 10 mg/dl, and he did not receive a blood transfusion. Postoperative follow-up was uneventful and the patient was discharged 5 days post-surgery to a nursing home. Prophylactic anticoagulation was continued for 3½ weeks.

A week and a half after anticoagulation treatment was discontinued and 5 weeks after the trauma, the patient returned to the emergency room with a swollen painful right leg which had increased in size over several days. His hemoglobin count was 8.7 mg/dl, and ultrasound demonstrated a DVT of the right popliteal vein. Repeat radiographs of the operated leg demonstrated loss of fracture reduction with a bony fragment detached from the greater trochanter and medial translation of the femoral shaft.

The patient was hospitalized for the second time and full-dose anticoagulation treatment was started. Due to a drop in hemoglobin levels to 7.1 g/dl the anticoagulation was stopped the following day and a lung computed tomography (CT) scan was performed which demonstrated multiple bilateral pulmonary emboli (PE). In place of the anticoagulation therapy, a filter was inserted into the inferior vena cava. Treatment included 4 units of packed cells for 12 days following this procedure, with hemoglobin levels maintained around

8 g/dl and beginning to rise.

There was an impression of improvement in the patient's wellbeing although the thigh remained swollen. Two weeks after his second admission, an additional drop in hemoglobin levels was measured which finally reached 5.7 g/dl. After consultation with a vascular surgeon and considering the relative stability of the patient's hemodynamic status, an urgent angiography of the thigh vessels was performed. Active bleeding from a pseudo-aneurysm of the medial circumflex femoral artery was demonstrated [Figure 1A]. Embolization was performed using coils, and the bleeding stopped [Figure 1B].

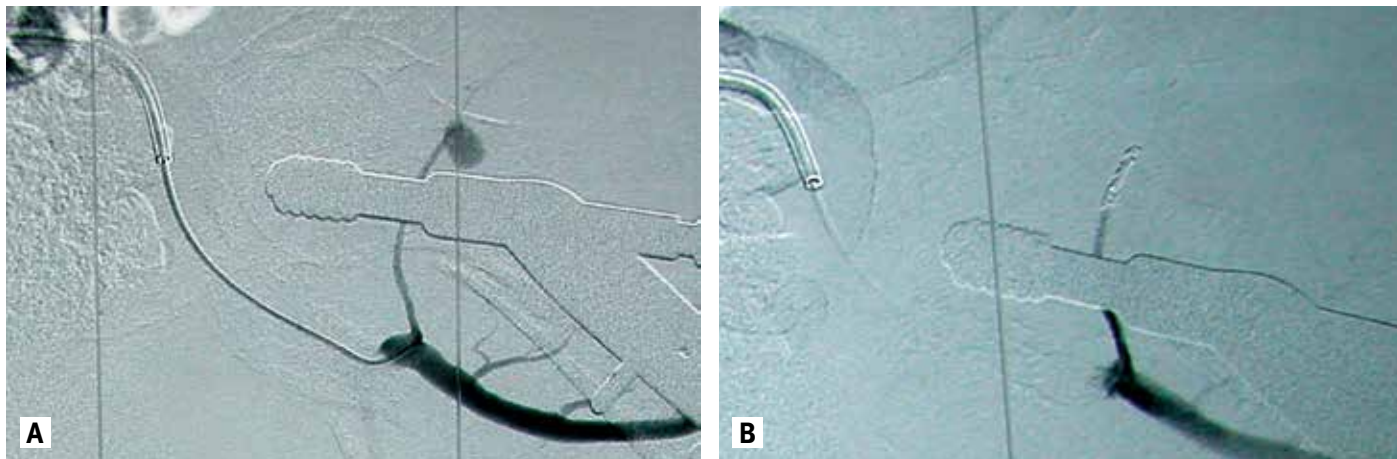
During the second hospitalization, he was treated with 13 units of packed cells. During this period, there was no decrease in limb pulse or other signs of limb ischemia. Following the angiography, the patient stabilized hemodynamically and did not receive any further blood transfusions.

He was gradually mobilized, started bearing weight, and was discharged to the rehabilitation department. Follow-up demonstrated stable hemoglobin levels, reduced swelling of the thigh and radiographic evidence of fracture healing. He resumed walking and returned to his previous life activities.

COMMENT

The estimated incidence of iatrogenic arterial injury in hip joint surgery is 0.25% [2]. The injured vessels vary as well as the injury type and there is a spectrum of clinical presentations. The arterial injury

Figure 1. [A] Angiography demonstrating a pseudo-aneurysm of the medial circumflex femoral artery, occurring adjacent to an unstable intertrochanteric fracture of the femur, and **[B]** after coil insertion into the artery. Note the proximity of the vessels to the femoral neck (silhouette)



could occur during the trauma, the operative fixation of the fracture, or during the postoperative rehabilitation period. During surgery, arterial injury is associated with injury from the hardware (screw, nail or pin), bone spike, drilling or manipulation of the fracture.

Vascular injury may present as either hemodynamic compromise, distal ischemia, expanding hematoma, a bruit or thrill suggesting the existence of an arteriovenous fistula at the site of the fracture, or even frank arterial bleeding during fracture fixation. Pseudo-aneurysms are more common than hemorrhage following hip fractures [2]. Delayed presentation of a pseudo-aneurysm typically includes pain, swelling or progressive anemia [1-3]. Peripheral pulses are usually present [1,2]. Pulsatile swelling may be palpated although the injured artery is usually deep in the thigh, and the lesion may be difficult to palpate [1,3,4]. DVT or PE has not been reported [1] although the combination is obviously possible. These cases may take weeks to years to present and a high index of clinical suspicion is crucial [2].

The most common artery to be injured in association with hip fractures is the profunda femoris artery [2]. The artery and its branches are deep and relatively fixed vessels adjacent to the fracture, and are thus prone to injury [5]. It is possible

that in most cases a minor arterial injury resolves by thrombosing spontaneously and is not diagnosed [1,3]. Penetration of the posterolateral aspect of the profunda femoris artery by a spike of the lesser trochanter fragment of the femoral neck accounts for 20% of these injuries [2]. The loose fragment of the lesser trochanter is pushed against the adjacent vessels causing repetitive trauma [1]. Contraction of the iliopsoas muscle during postoperative mobilization may be an additional cause of repetitive trauma. This may explain the delayed presentation of thrombosis or anemia [1]. Resection of a lesser trochanter's bony spike during fracture fixation has been suggested to prevent arterial injury in selected cases [2].

Duplex ultrasonography and CT angiography, which are non-invasive means of diagnosis, are highly sensitive and specific [3]. Formal angiography may be therapeutic as well. In the case presented, angiography was chosen due to the high suspicion of continuous bleeding with no decrease in pulse or signs of limb ischemia. Under these conditions, we assumed the vessel was probably minor, expandable, and adequate for embolization. If not, surgical intervention would have been the next stage in management, to control the continuous bleeding or reconstruct a more significant artery.

It has been suggested that small asymptomatic lesions may be observed for 4–6 weeks for spontaneous resolution. Treatment of lesions that are symptomatic or large (> 3 cm) depends on the size and location of the vessel. Treatment options include open vascular repair or ligation, placement of a covered stent, or embolization. The distal profunda femoris artery and its vessels are considered expendable and are candidates for embolization [1-3]. An additional treatment option is ultrasound-guided percutaneous thrombin injection of the lesion. This technique has the advantage of avoiding intraarterial catheter techniques.

The diagnosis of the arterial injury was delayed in the case presented due to the surgical team's focus on the DVT and its treatment. Mobilization of the patient's loose fracture fragment is the probable cause of the arterial injury. Bleeding and swelling of the thigh caused an increase in local pressure, decreasing the limb's venous return, resulting in DVT followed by PE. The prolonged full anticoagulation therapy prevented spontaneous thrombosis of the false aneurysm, resulting in continuous bleeding and anemia.

Only one comparable case has been published, which described a mentally retarded patient with a closed fracture of the humerus. The patient was treated non-

operatively: he developed PE which was treated with heparin, and received blood transfusions for persistent anemia. The arm's condition deteriorated over a period of 2½ months and was finally treated by means of disarticulation of the shoulder. During the operation a false aneurysm was diagnosed [4]. An amputation rate of 7% of arterial injuries associated with hip fractures has been reported [2].

CONCLUSIONS

An intertrochanteric fracture complicated by arterial injury is rare. When treating post-fracture persistent anemia in the presence of DVT and anticoagulation

therapy, this possibility may be overlooked. Vascular injury could be concealed and the source of bleeding and persistent anemia should be sought.

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