



Pseudoaneurysm of the Superficial Femoral Artery After Cephalomedullary Nailing in An Intertrochanteric Fracture

Sergio Pérez Ortiz*, Blanca Alastrué Giner, Carles Martínez Pérez, Miguel Gallego Cruz and José Luis Rodrigo Pérez

Department of Orthopedic Surgery and Traumatology, Hospital Universitario Doctor Peset, Valencia, Spain

*Corresponding Author: Sergio Pérez Ortiz, Department of Orthopedic Surgery and Traumatology, Hospital Universitario Doctor Peset, Valencia, Spain.

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Abstract

Objective: The iatrogenic vascular lesions in the surgery of intertrochanteric fractures are a rare complication but can have devastating consequences. Adduction and internal rotation in the reduction maneuver of these fractures approximate the superficial femoral artery to the femur, being susceptible to injury during drilling or screwing of the distal locking screw.

Material and Methods: We report the case of an 85-year-old Caucasian female patient with an intertrochanteric fracture of right femur (AO/OTA 31A1.2) who underwent surgery by closed reduction and internal fixation with Gamma3® nail (Stryker®, Mahwah, NJ) with distal locking screw. After the surgery, the patient developed a vast hematoma on the lateral aspect of the thigh and progressive anemia that required the transfusion of seven units of packed red blood cells over twelve days, without achieving adequate post-transfusion hemoglobin levels, so a computed tomography (CT) angiography was performed that revealed a pseudoaneurysm in the right superficial femoral artery next to the distal locking screw.

Results: A Gore® Viabahn® covered endoprosthesis and posterior remodeling with percutaneous transluminal angioplasty balloon was performed to exclude the pseudoaneurysm. After that, the hematoma was reabsorbed, and the hemoglobin levels returned to normal levels, requiring one single packed red blood cell unit after surgery.

Conclusion: The limb position in neutral position during the drilling and screwing of the distal locking screw maneuvers in this surgery is essential to minimize the risk of injury to the superficial femoral artery.

Keywords: Hip Fracture; Intertrochanteric Fracture; Gamma Nail; Pseudoaneurysm; Femoral Artery

Abbreviations

CT: Computed Tomography.

Introduction

Due to the increase in life expectancy over the years, an increment in the incidence of osteoporotic hip fractures is being observed and, within these, the intertrochanteric femoral fractures constitute the most common subtype [1], being early treatment by reduction and internal fixation (with cephalo-medullary nails or sliding hip screws) an important measure to decrease mortality [2]. Vascular iatrogenic lesions in the surgery of intertrochanteric fractures are rare, but they can have catastrophic consequences. Because of this, it is convenient to minimize the risk of injury with preventive measures, early diagnosis and adequate treatment. Adduction and internal rotation of the limb in the reduction ma-

neuver of these fractures approximates the femoral artery to the femur and can be injured during surgery by over drilling or by the tip of the distal locking screw, or in the postoperative period by the migration of the screw. We report the case of a patient with an intertrochanteric fracture who developed a pseudoaneurysm of the superficial femoral artery after internal fixation of the fracture.

Case report

We report the case of an 85-year-old Caucasian female patient who was brought to the Emergency Room of our hospital after suffering a fall with trauma in the right hip. Physical examination revealed intense pain located in the right hip, leg shortening and external rotation of the limb. The patient was hemodynamically stable and did not associate other lesions. The correct neurovascular status of the limb was assessed.

Conventional X-ray revealed an intertrochanteric fracture of the right femur (AO/OTA 31A1.2, Figure 1). Surgery was done on the first day after the injury. Closed reduction was achieved by traction, adduction and internal rotation of the limb. Internal fixation was performed with Gamma3® nail (Stryker®, Mahwah, NJ) system with distal locking screw. Before the drilling of the distal locking screw, traction was removed, and the limb was placed in neutral position. There were no complications during surgery with minimal blood loss and, in the postoperative radiographic control, correct reduction of the fracture and adequate positioning of the osteosynthesis material was observed.

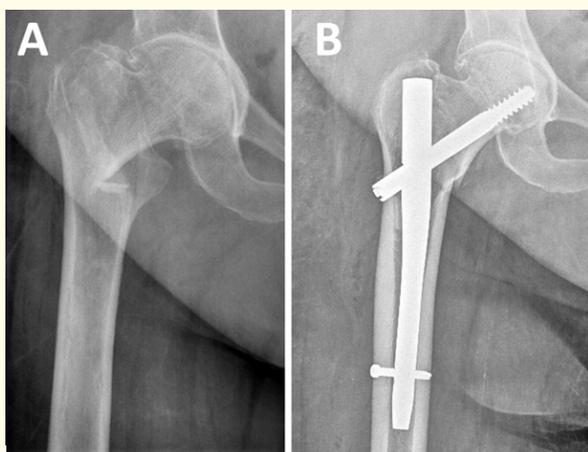


Figure 1: A: Right intertrochanteric femoral fracture; B: Immediate postoperative X-ray showing adequate fracture fixation with Gamma3® (Stryker®) nail.

During early postoperative period, the patient complained severe pain in the proximal right thigh, developed a vast hematoma in the lateral aspect of the thigh and a progressive anaemia with a minimum hemoglobin level of 7.1 g/d and 20.7% of hematocrit. We observed a falling hemoglobin trend over the next twelve days that required the transfusion of seven units of packed red blood cells without achieving adequate post-transfusion hemoglobin levels. Suspecting vascular injury with active bleeding, a computed tomography (CT) angiography was performed, revealing a false aneurysm in the right superficial femoral artery near the distal locking screw (Figure 2). The interventional radiology team of our center was contacted and the patient underwent surgery by introducing a 6 x 50mm Gore® Viabahn® (w. L. Gore and Associates, Inc., Flagstaff, Arizona) covered endoprosthesis and remodeling it by percutaneous transluminal angioplasty with a 7 x 40mm balloon to exclude the pseudoaneurysm (Figure 3 and 4). After that, the hematoma was reabsorbed, and the hemoglobin levels returned to normal levels. The patient needed one single packed red blood cell unit after surgery.



Figure 2: CT angiography showing the pseudoaneurysm of the superficial femoral artery (arrow).

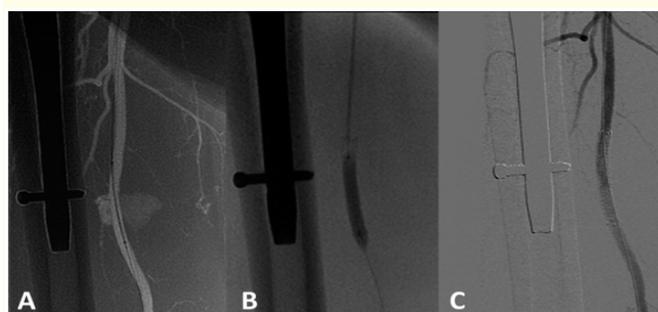


Figure 3: A: Identification of the pseudoaneurysm in the superficial femoral artery; B: Introduction of the endoprosthesis; C: Absence of pseudoaneurysm with the endoprosthesis.

Discussion

Iatrogenic vascular lesions are a rare complication in the internal fixation of intertrochanteric fractures. Among them, the formation of pseudoaneurysms or false aneurysms in the fixation by dynamic hip screws [3] and cephalo-medullary nails, such as the Gamma3® (Stryker®) nail, [4] have been described with an estimated incidence of 0.21% [5], being more frequent in the profunda femoris artery than in the superficial femoral artery [6]. Pseudoaneurysm formation in intertrochanteric fractures has been described in the literature as a result of diverse causes such as the injury during the drilling or screwing maneuver [4,7], continued irritation at the tip of the screw [8], laceration by bone fragments

[9,10], manipulation of the gluteal muscles during the surgical approach to the fracture [11] or positioning of the guide wire [12,13].

The superficial femoral artery, continuation of the common femoral artery, is the main artery of the lower limb and its injury can compromise the viability of the limb. This artery runs posterior to the sartorius muscle, being located anterior to the femoral vein in the adductor canal and continuing as the popliteal artery when exiting through the adductor hiatus [14]; while the profunda femoris artery emerges as a branch from the posterior and lateral part of the common femoral artery, 2.2 to 5 cm distal to the inguinal ligament, and terminates within the tight forming perforating arteries [3,15]. In the 5-7 cm distal to the lesser trochanter, both the superficial femoral artery and the profunda femoris artery are located close to the femoral cortex.

For the reduction of the fracture, the patient is usually placed on a traction table and traction, adduction and internal rotation of the limb are performed [16], although sometimes this type of fractures are reduced with external rotation of the limb [17]. The usual reduction maneuvers for this type of fractures along with the use of the perineal pole, change the course of vascular structures by approaching them to the femoral cortex and increasing the risk of injury to the femoral artery in the drilling and screwing maneuvers.

In a study carried out by Yang, et al. in 59 patients (11 patients with intertrochanteric fractures and 48 healthy subjects) evaluating the position of the superficial femoral artery using color-flow duplex scanning method during the different reduction maneuvers [1], they observed that the distance between the artery and the femoral cortex was 14 mm with the limb in a neutral position, 6.2 mm with the limb in adduction and 5 mm with the limb in adduction and internal rotation, recommending the insertion of the interlocking screw in a neutral position after removing traction to minimize the risk of vascular injury. In our patient, although we reduced the fracture by internal rotation, the distal locking screw was drilled and inserted in the neutral position of the limb after removing traction, so we suspected that the swelling of soft tissues along with the perineal support were responsible for the approximation of the superficial femoral artery to the cortex of the femur.



Figure 4: (conventional X-ray): Control X-ray at the 3-month follow up.

The clinical symptoms of these patients are usually persistent pain in the thigh together with the triad described by Chong, et al. [18]: thigh swelling, bleeding from the fasciotomy wound and anemia with a falling hemoglobin trend. Occasionally, bleeding does not occur from the surgical wound, but a large hematoma develops in the lateral area of the hip or inguinal region [8]. In addition, small lacerations of the artery can be contained by the formation of a clot and manifest after time, when the clot begins to lysis [11]. In our case, we suspected the vascular lesion due to falling hemoglobin trend that was not improved by transfusion of packed red blood cells along with the formation of a large hematoma. Therefore, the clinical and analytical control of the patient is essential to rule out such a serious complication.

Due to the low frequency of this complication, the diagnosis of this lesion is difficult and a high degree of suspicion for the diagnosis plays a crucial role with the clinical symptoms listed before. CT angiography is recommended for the diagnosis of this complication, since Ultrasonic Doppler may have limitations in detecting lesions in the profunda femoris artery because of its location [19].

Treatment depends on the location of the lesion, its etiology and its diameter among others. Although open repairs of the affected vessel have been described [10], endovascular repair of the lesion by stents or embolization with coils or thrombin [20] is becoming more frequent and is preferred over open surgery in most of the cases [9,19].

It is essential to prevent injury to the femoral vessels by placing the lower limb in a neutral position before to drilling and screwing the distal locking screw. Likewise, it is vitally important to perform the surgery with surgical tools in good conditions, because if the guide wire presents a deformity due to continued use or tissue is interposed in the cannula, the surgeon can make an excessive force for the drilling and overdrill the femur, putting at risk the vascular structures in spite of having carried out preventive maneuvers to move them away from the femoral cortex [21,22].

Conclusion

Vascular lesions during surgery to fix intertrochanteric fractures, although rare, are very important, since they can compromise the patient's life. To prevent them, it is essential to place the injured limb in a neutral position without traction during the drilling and screwing maneuvers and carry out careful maneuvers in order to minimize the risk of injury with surgical material or bone

fragments. We must pay special attention to the postoperative period of the patients who have undergone this type of surgery, since, in the case of detecting analytical or clinical alterations compatible with the diagnosis of a vascular lesion, our diagnosis and treatment should be as fast and promptly as possible.

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None

Conflict of Interest

All the Authors state they do not have any conflict of interest related to this article.

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