



False aneurysm of the superficial femoral artery following minimally invasive plate osteosynthesis of a femoral shaft fracture

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We present the case of a 50-year old man who developed a delayed progressive swelling over the medial aspect of his right thigh, six weeks following minimally invasive plate osteosynthesis (MIPO) of a supracondylar femur fracture. Angiography showed a false aneurysm of the superficial femoral artery, caused by progressive displacement of a butterfly fragment. Open vascular repair was performed and the sharp edge of the butterfly fragment was removed.

Keywords : false aneurysm ; femoral artery ; fracture ; butterfly fragment.

INTRODUCTION

An iatrogenic false aneurysm of the superficial femoral artery is usually caused by an endovascular intervention. Manipulation and application of orthopaedic instruments can also damage the arterial wall, and cause a bleeding or false aneurysm. We report the case of a patient in which secondary displacement of a large and sharp butterfly fragment caused the arterial injury which resulted in a false aneurysm. We are not aware of other described cases in which secondary displacement of a bone fragment caused a false aneurysm of the superficial femoral artery.

CASE REPORT

A 50-year old man sustained a comminuted supracondylar fracture of the right femur caused by

a fall. No other significant injuries were found. Peripheral pulses were palpable. The fracture was operatively treated with a Synthes® LISS-plate (Less Invasive Stabilisation System). There were no immediate postoperative complications. Postoperative radiographs of the femur revealed a progressive displacement of a large butterfly fragment (fig 1). There was no functional interference.

Six weeks postoperatively, progressive swelling over the medial aspect of the right thigh was detected. Peripheral pulses remained palpable. Arteriography revealed a large false aneurysm of the superficial femoral artery (fig 2). The femoral artery was explored and a large haematoma evacuated. The aneurysm was excised and the arterial wall defect was repaired with separate Prolene 6/0 sutures. The butterfly fragment was lying close to the false aneurysm, at the top of Hunter's channel. The end of the fragment was very sharp, and considering location, this was thought to be the cause of the false aneurysm. The sharp edge of the fragment was removed.

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Fig. 1. — Radiograph of the distal femur after plate osteosynthesis (A,B : 3 days postoperative – C,D : 24 days postoperative). There is progressive displacement of the butterfly fragment.

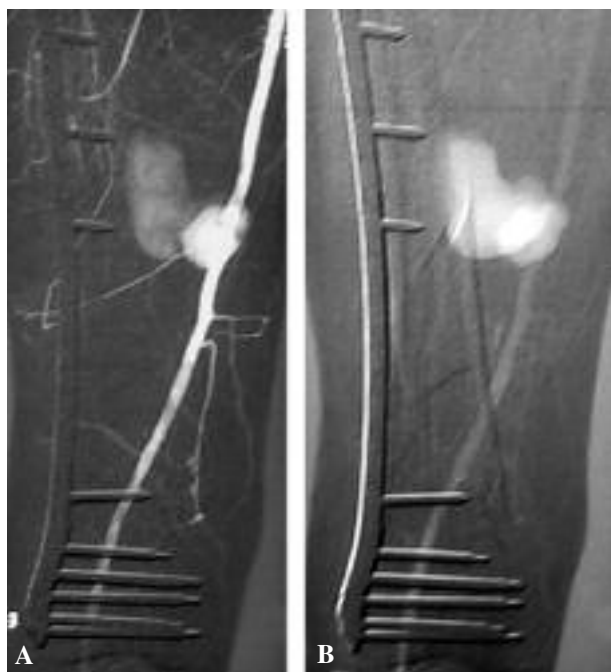


Fig. 2. — Arteriography (A : early phase – B : late phase) of the distal right femoral artery revealed a large pseudoaneurysm of the superficial femoral artery. Note the sharp end of the bone fragment.

Four weeks later, secondary fracture displacement occurred due to delayed union and fatigue failure of the proximal screws (fig 3). Revision osteosynthesis with cerclage wires and bulk allograft was performed, resulting in uneventful healing of the fracture (fig 4).

DISCUSSION

False aneurysms are caused by incomplete section of the arterial wall, resulting in leakage of a limited amount of blood. The uninjured portion of the arterial wall prevents the vessel from contracting, leading to unbridled blood extravasation, which organises and develops as a fibrous capsule (2,5).

False aneurysm of the superficial femoral artery, secondary to fracture of the distal femur or to operative reduction and fixation, is a very rare complication. The profunda femoris artery is far more commonly involved, and most of the published cases describe this complication after proximal femur or (inter)trochanteric hip fractures (1,4).

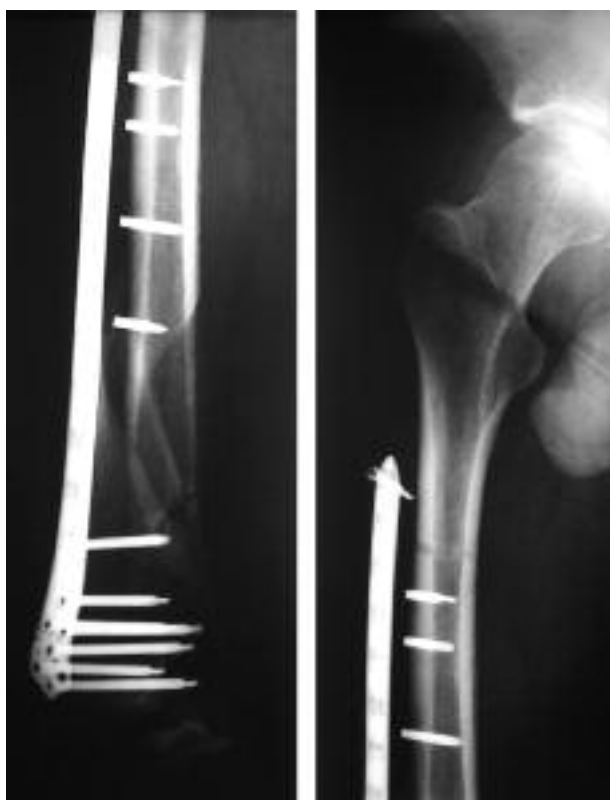


Fig. 3. — Radiograph of the distal femur. Screw breakage resulted in fixation failure in the proximal fragment.

Diagnosis is usually delayed for days or weeks because of the subtle signs and symptoms. The classical presentation is that of an enlarging pulsatile swelling. A systolic bruit may be audible and a thrill may be present. Signs of vascular insufficiency are not always present, and distal pulses may be normal (5). Aneurysms may mimic soft-tissue masses including abscesses or neoplasms. The inflammation that results subsequent to organisation of the haematoma may masquerade as an infection because local heat and tenderness are usually present (2).

Clinical diagnosis is usually confirmed with selective arteriography. Duplex ultrasonography can be used to detect the false aneurysm in the peripheral artery and to determine its location and size (5).

The management of false aneurysm requires intervention. One option is ultrasound-guided



Fig. 4. — Radiograph of the distal femur, nine months after revision osteosynthesis with cerclage wires and bulk allograft.

thrombin injection. Another option is open vascular surgery with resection of the aneurysm and reconstruction of the vessel, if necessary with a venous or prosthetic patch (6). If left untreated, there is a risk of expansion and ultimate rupture, which may lead to exsanguination and death. It also can cause distal arterial insufficiency, infection or distal embolisation (4).

Most of the postoperative iatrogenic false aneurysms are caused by overpenetration of the drill bit or any sharp instrument while applying the internal or external fixation device. In this case, however, indirect reduction with minimally invasive osteosynthesis was performed with a LISS-plate. Satisfactory reduction was obtained without direct exposure of the fracture site. Direct injury to the vessel could therefore be excluded. It is our belief that early ROM (Range Of Motion) exercises led to progressive displacement of the fracture fragment

due to muscle contractions, causing the delayed lesion to the superficial femoral artery.

A more aggressive approach, with additional fixation of the large fragment could possibly have prevented the secondary displacement. LISS-plate osteosynthesis does normally not include fixation of the fracture fragments, in order to preserve the periosteal perfusion and thus to encourage fracture healing (3).

We are not aware of other described cases where a secondary displaced butterfly fragment caused a false aneurysm of the superficial femoral artery.

CONCLUSION

False aneurysms are difficult to diagnose because of their variable clinical presentation. A progressive swelling over the fracture site or at the level of the implanted material, should raise suspicion for a false aneurysm, and arteriography should be done. To minimise the chance of iatrogenic false aneurysm, meticulous operative technique and careful screw placement is mandatory. Newer techniques with less exposure of the fracture site have numerous advantages, such as a decreased risk of devascularisation and potentially rapid and uneventful fracture healing.

This case report, however, illustrates the potential downside of non-containment of fracture

fragments. Late displacement of fracture fragments not only impedes fracture healing, but may also lead to nerve and vessel injury. This should be taken into consideration to decide if and to what extent a less invasive technique should be used ; especially the presence of large and sharp fragments may be an indication for a more aggressive approach.

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