Acta Orthop. Belg., 2004, **70**, 361-364

TECHNICAL NOTE

Minimally invasive intervention for acute bleeding from a pseudoaneurysm after revision hip arthroplasty

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After multiple revisions of her right hip arthroplasty, an 83-year-old woman developed deep infection with a chronic draining sinus. In August 2002 severe acute bleeding occurred through this fistula. Angiography revealed a pseudoaneurysm of the right external iliac artery.

Because of the multiple pathologies affecting this ASA grade IV patient, conventional surgical treatment was considered to be contra-indicated, and a stent was placed percutaneously under fluoroscopic control to seal the vascular laceration. No haematoma and no further bleeding was observed on the control CT-scan or at angiography. However the patient died with terminal renal failure forty days later. The case reported shows a rare complication of total hip arthroplasty. The method used in this case to seal the leakage, using a covered stent, is uncommon but effective in cases where conventional surgery is contra-indicated.

INTRODUCTION

A false aneurysm is an encapsulated haematoma which communicates with a defect in the arterial wall. The wall of the aneurysm is formed by compressed haematoma, rather than muscle and connective tissue. The central cavity of this pulsating mass is covered by endothelium, and is in continuity with the lumen of the artery. A false aneurysm can develop as a result of a complete defect in the arterial wall. The pseudoaneurysm has no specific wall, so that it tends to expand into the soft tissues. Clinically, a false aneurysm is usually characterised by a warm, palpable pulsating mass with a systolic murmur audible on auscultation. Under compression, no attenuation of the peripheral pulse is observed. In contrast to the literature (*4, 8, 10*) which mostly reports treatment by bypass surgery or patch repair, we present a minimally invasive intervention for a false aneurysm of the external iliac artery which developed after multiple total hip revisions. A covered stent was implanted percutaneously to seal the laceration and to stop the severe bleeding through a pre-existing chronic cutaneous fistula in an inoperable 83-year old female patient.

CASE REPORT

On August 15, 2002 an 83-year old white female patient was referred to our Department with

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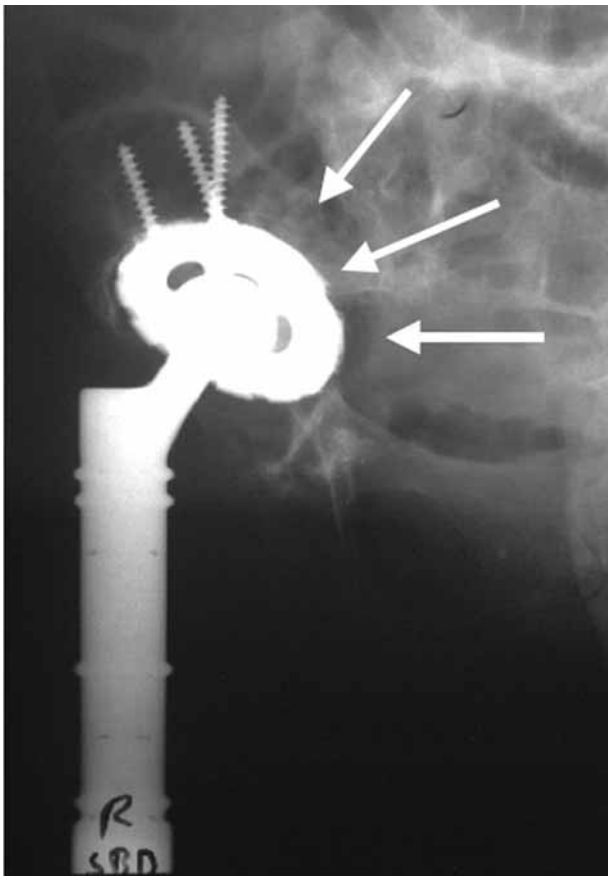

Fig. 1. — Plain radiograph of the right hip revealing acetabular protrusion (→) due to loosening of the Wagner cup.

increasing pain in her right hip, inability to walk and a 24-hour history of bleeding from a chronic draining sinus. Her blood pressure was 90/60 mm Hg and her heart rate was 120/minute. Her body temperature was 36.6°C. Upon further physical examination, the chronically ill patient appeared in poor nutritional health. Body weight and height were 50 kg and 160 cm respectively. The right hip was painful but had a good range of motion.

Laboratory studies showed the following : Haemoglobin 7.0 g/dl, white blood cells 23.0 G/l, bleeding time > 10 min., protein 55.8 g/l, creatinin 119 µmol/l, CRP 6.33 mg/dl and slightly elevated liver enzymes. Urine culture and sticks were negative. Due to multimorbidity the operation risk was estimated as Grade IV following the criteria of the American Association of Anaesthesiology (ASA).

Previous history :

The patient underwent total hip arthroplasty on the right side in another institution in 1973, and on the left side in 1974. In 1975, the right hip was revised. Further revisions were necessary in 1984, 1990 and 1991. Due to aseptic loosening of both hip components, a cemented Parhofer stem and a Wagner revision cup were implanted in 1993. The acetabular component was fixed with three screws. As a result of a traumatic periprosthetic femoral fracture, a MUTARS® resection stem with a short head was implanted in May 2000. Because of multiple dislocations, a change of the proximal component of the resection stem from 50 mm to 70 mm and a change of the head from short to long were performed in July 2000. Unfortunately, deep infection with a resulting draining sinus subsequently developed.

Plain radiographs of the right hip on August 15, 2002 demonstrated protrusion of the acetabular component and a correct position of the revision stem (fig 1). Angiography revealed a false aneurysm of the right external iliac artery which had come into communication with the deep sinus (fig 2a, b). The patient was transferred to the department of vascular surgery. Considering her general status (ASA IV), a minimally invasive procedure was planned. On the following day a covered stent was placed under fluoroscopic control over the breach in the arterial wall, promptly stopping the bleeding.

Post-interventional angiography revealed regular vascular relations (fig 3 a, b). A computed tomography two days after intervention confirmed the correct position of the stent, and also showed the pre-existing haematoma (fig 4). However, on September 29th the patient died of acute renal failure. No additional bleeding through the fistula had occurred since treatment.

DISCUSSION

The incidence of vascular complications during total hip replacement is reported to be about 0.25%, but it may in fact be higher *(4)*. The external iliac artery is most frequently affected, owing to its proximity to the acetabular floor, superiorly to the

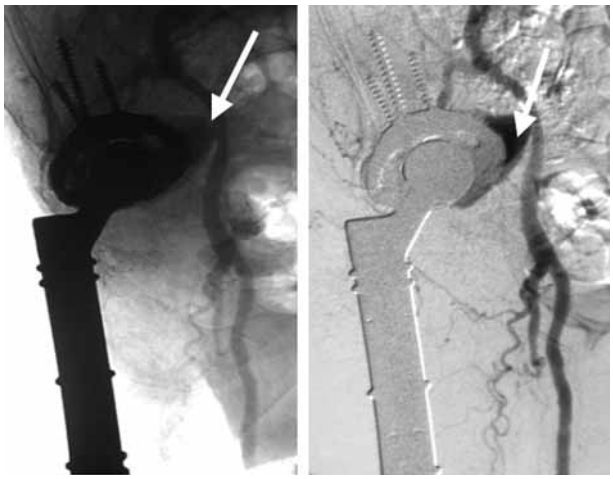

Fig. 2a, b. — Angiography (a) and digitally subtracted angiography (b) : False aneurysm of the external iliac artery (→).

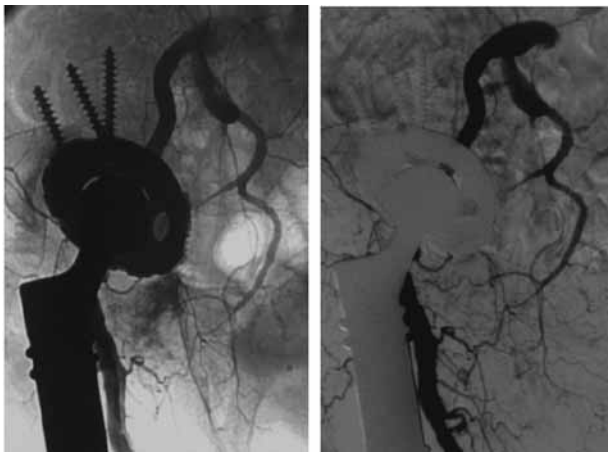

Fig. 3a, b. — Angiography (a) and digitally subtracted angiography (b) after placing the covered stent : No further bleeding is noted and the pseudoaneurysm no longer communicates with the arterial lumen.

external iliac vein (*2*). Among vascular complications, the development of a pseudoaneurysm is generally considered rare (*4*), but it is the vascular complication most commonly reported (*2*). Pseudoaneurysms affecting the common femoral artery (*7*), the deep femoral artery (*5*) and the external iliac artery (*4, 8, 10*) have been reported.

Different mechanisms of vascular injury have been described in the literature. Gradual intimal erosion by spicules of bone cement may lead to vascular injury or thrombosis (*1, 3, 6, 8, 10*). Repeated trauma by osteophytes or screws entering the pelvis (*5, 9*), direct arterial injury from malpositioned retractors (*1, 7*) and protrusion of the prosthetic socket and subsequent impingement on the internal or external iliac arteries or veins (*3, 4, 6, 8*) have also been reported as possible pathogenic factors for the development of pseudoaneurysms. Other mechanisms of vascular injury also described following hip arthroplasty include myositis ossificans (*9*) and migration of a threaded cup (*4*).

Certain risk factors can be identified. Bergqvist *et al* (*3*) noted an overrepresentation of vascular complications on the left side, and attributed this to the orientation of the aortic bifurcation and the left iliac artery.

Periarterial fibrosis secondary to previous surgery (*6*) or infection (*7*) and advanced arteriosclerosis (*1*) increase the vulnerability to manipulations and reduction maneuvers common in hip arthroplasty. Medial acetabular wall defects and protrusion of the acetabular component are frequently coincident with vascular complications. In inflammatory arthritis, the long-term usage of steroids and metabolic inhibitors predisposes to the development of vascular lacerations (*4*).

The clinical picture varies from acute intraoperative haemorrhage (*3, 6, 7, 8*) to postoperative limb ischaemia (*1*). Initially localised swelling, a painful and pulsating mass and anaemia can often be observed (*1, 3, 4, 5, 8, 9, 10*). Other presentations included limb oedema (*6*) and bleeding from a fistula (*4, 8, 10*).

Thromboembolism as an initial manifestation has also been reported (*3*). The majority of vascular complications require a vascular surgical consultation.

Treatment may consist of suture repair, patch angioplasty, thromboendarterectomy, free vein graft, prosthetic bypass graft, or ligature. Poor outcomes usually correlate with delay in diagnosis and implementation of therapy.

In the case presented, arterial damage due to protrusion of the acetabular component (*8*) in combination with arteriosclerotic changes in the vessel wall, which predisposes to arterial laceration (*1*), caused the development of the aneurysm. The arterial bleeding started after the infection had

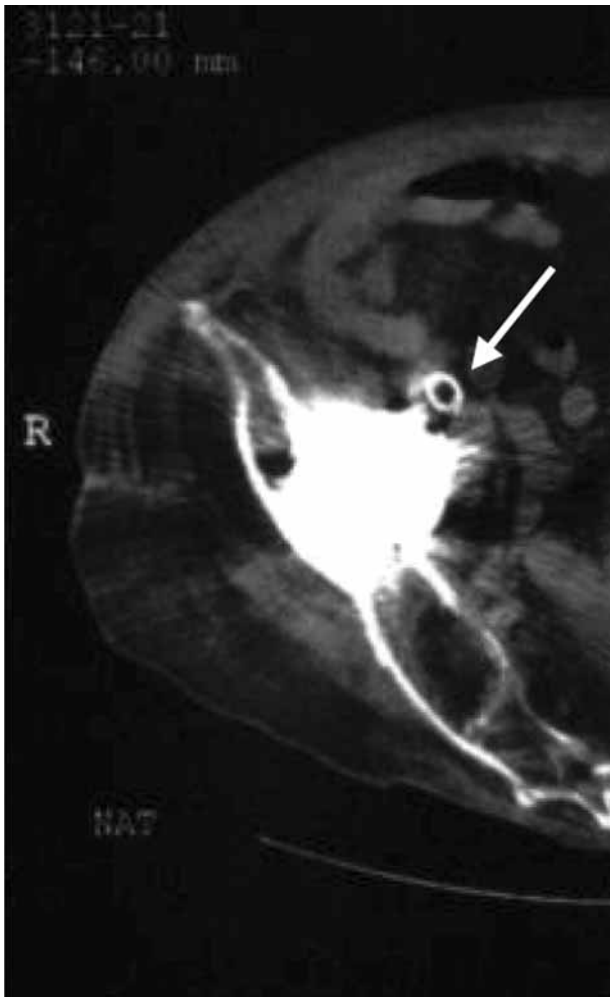

Fig. 4. — Transversal CT-scan of the right pelvis, two days after intervention : Correct position of the stent (→) and no increase in size of the haematoma.

reached and opened the false aneurysm, which had been asymptomatic until then. Arguments for this thesis are the original radiograph, which showed protrusion of the acetabular component, and the anatomical distance to the injured external iliac artery (fig 1). In a literature review we only found four similar cases of pseudoaneurysms of the external iliac artery, which became symptomatic with a bleeding fistula (*4, 8, 10*). The surgical treatment consisted of a femoro-femoral bypass and resection of the aneurysm in three cases (*4, 8*) ; in one case the false aneurysm was isolated and closed with a patch (*10*). All patients recovered and the postoperative course was satisfactory (*4, 8, 10*).

CONCLUSION

Vascular complications occurring during total hip replacement are rare.

Knowledge of the vascular anatomy of the hip region may help prevent catastrophic injury. An understanding of the aforementioned mechanisms and risk factors is essential to further minimise vascular complications. The quality of the bone stock should be taken into account for selection of the acetabular implant. Careful placement of the anterior acetabular retractors, cautious reaming and drilling during the socket preparation are recommended. Holes that penetrate the medial pelvic cortex should be plugged. Spicules of cement must be removed. Preoperative assessment of the arterial pulse in the lower limb is essential to allow comparison after intervention.

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