Pseudoaneurysm of the geniculate artery following total knee arthroplasty: a report of two cases

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ABSTRACT

We report 2 cases of pseudoaneurysm of the geniculate artery after a total knee arthroplasty (TKA). The first one was located in the superomedial geniculate artery and resolved after compression dressing and warfarin cessation. The second one was located in the superolateral geniculate artery and was successfully treated with transarterial embolisation. There was no recurrence in both cases. The rare occurrence and delayed presentation of pseudoaneurysms pose a diagnostic challenge. A high index of suspicion is required to make the diagnosis. Early duplex Doppler ultrasonography is recommended when patients present with atypical knee pain and prolonged swelling after a TKA.

Key words: aneurysm, false; angiography; arthroplasty, replacement, knee; ultrasonography, Doppler, duplex

INTRODUCTION

Arterial injury is uncommon and a pseudoaneurysm is a rare complication of total knee arthroplasty (TKA). We report 2 cases of pseudoaneurysm after a TKA: one after a primary TKA that resolved spontaneously, the other after the first stage of a revision TKA that was treated with embolisation.

CASE REPORT

Case 1

In April 2004, a 63-year-old woman underwent a left TKA for tricompartmental osteoarthritis. Preoperative clinical examination revealed a varus deformity of 5° and a range of movement of 5° to 120°. A medial parapatellar capsulectomy was performed for exposure. A posterior stabilised prosthesis (Legacy posterior stabilized, NexGen, Zimmer) was implanted under navigation guidance. The tourniquet...
was deflated after 99 minutes. The patient was given an anti-embolic stocking for deep vein thrombosis prophylaxis. No pharmacological prophylaxis was given. Five days after surgery, the patient complained of chest pain and calf swelling. Computed tomography of the thorax and duplex Doppler ultrasonography of the left lower limb showed a pulmonary embolism and deep vein thrombosis. Low-molecular-weight heparin (0.4 ml every 12 hours) and warfarin (a loading dose of 5 mg/day for 2 days followed by a maintenance dose of 2 mg daily) were started. The international normalised ratio (INR) was maintained within the range of 2 to 2.5 and low-molecular-weight heparin was stopped 4 days later. Physiotherapy and mobilisation exercises were commenced. At the 6-week follow-up, a firm, non-tender, and non-pulsatile suprapatella swelling measuring 5x4 cm was noticed. There was no increase in the skin temperature or joint effusion; the range of movement was 10º to 95º without pain; and the INR was 2.23. Ultrasonography showed an oval, mildly hypo-echoic, solid-looking lesion of 5.6x2.7x 4.3 cm with a well-defined smooth outline and heterogenous echotexture over the superomedial aspect of the left knee, suggestive of a haematoma (Fig. 1a). Duplex Doppler ultrasonography showed a pulsatile mass of 1.3x1.1x1.3 cm arising from the superomedial geniculate artery (Fig. 1b). Swirling blood flow was present within the cystic lesion, with a short narrow neck between the arterial branch and the mass, suggestive of a pseudoaneurysm arising from the superomedial geniculate artery. A compression dressing was applied and the warfarin was stopped. The INR returned to 1.1. Five days later, angiography showed no evidence of the pseudoaneurysm, suggesting that it thrombosed spontaneously. The compression dressing was continued for 2 more weeks. At day 19, the pseudoaneurysm had resolved completely (Fig. 1c). Warfarin was re-started and the INR was maintained at around 2 to 2.5. By day 36, the haematoma was organised and resolving gradually (Fig. 1d).

**Case 2**

In March 2005, a 56-year-old, afebrile man presented with left knee pain. He had undergone a left TKA for tricompartmental osteoarthritis one year earlier. Clinical examination showed a mild effusion of the left knee with an increase in skin temperature, and a range of movement of 0º to 70º. 10 ml purulent fluid was aspirated from the knee and the culture grew *Staphylococcus aureus*. A white cell scan showed increased tracer uptake over the left distal femur, indicating infection. Debridement was performed and a temporary prosthesis with antibiotic-loaded acrylic cement was inserted 2 weeks later. The lateral retinaculum was not released; the tourniquet was deflated after 115 minutes.

One week after implant removal, a swelling developed gradually over the superolateral aspect of the left knee. Ultrasonography showed a haematoma over the lateral aspect of the left knee (Fig. 2a) and a pseudoaneurysm of 1.1x1.2x1.1 cm inside, arising from the superolateral geniculate artery with a surrounding haematoma over the suprapatellar pouch region (Fig. 2b). Conservative treatment with a compression dressing was attempted, but the pseudoaneurysm had not resolved 5 days later (Fig. 2c). The feeding vessels were embolised with coils (Fig. 2d) and the pseudoaneurysm was obliterated (Fig. 2e). One month after embolisation, there was no evidence
of recurrence. The second stage of the revision of TKA was performed 8 months after the first stage surgery. At the 13-month follow-up, there was no sign of re-infection or a pseudoaneurysm.

DISCUSSION

The incidence of arterial complications following TKA is around 0.03 to 0.12%. There are few reports on the formation of pseudoaneurysms following TKA. A pseudoaneurysm is a pulsating haematoma that communicates with an artery through a disruption of the arterial wall. These may occur in the popliteal artery, and the superolateral, inferolateral, and inferomedial geniculate arteries. Pseudoaneurysms may be caused by unrecognised injuries, either from direct intra-operative manipulations or indirectly by intimal plaque disruption of calcified atherosclerotic vessels by the pneumatic tourniquet or thermal injury by hot cement. The popliteal artery is at risk during resection of posterior femoral condyles or the proximal tibia, or during release of the posterior capsule. The superolateral geniculate artery, which supplies the lateral retinaculum, is at risk during lateral retinacular release, whereas the inferomedial geniculate artery, which winds around the medial head of gastrocnemius is at risk during release of medial structures along the proximal tibia.

The long interval between the operation and the formation of the aneurysm, and the low incidence of this complication make it difficult to diagnose. Signs of arterial insufficiency are usually absent and patients may have normal distal pulses. The most common presentation is a knee swelling or haemarthrosis 4 weeks after the TKA, followed by recurrent haemorrhagic episodes. Delayed presentation at 7 weeks has also been reported. It is not uncommon for a pseudoaneurysm to be misinterpreted as a postoperative haematoma or a deep vein thrombosis.

Duplex Doppler ultrasonography is an accurate and non-invasive diagnostic tool. It shows the size and origin of the pseudoaneurysm and guides intervention. Angiography is invasive but has both diagnostic and therapeutic value.

Treatment options depend on the size and location of the pseudoaneurysm. The most common methods include selective arterial embolisation with coils or thrombin. Endoluminal stenting has successfully treated an aneurysm of 3.7 cm. Open surgery for evacuation of the thrombus, ligation, and patch repair of defective vessels is the treatment of choice when the aneurysm is not suitable for a percutaneous endovascular procedure.

Not all pseudoaneurysms need surgical treatment. In case 1, the pseudoaneurysm resolved spontaneously after compression dressing and cessation of warfarin. This may be due to the small size (1 cm) of the aneurysm, compared with others (3–5 cm) that needed invasive intervention. In case 2, conservative treatment failed and embolisation was used.

A pseudoaneurysm is a rare but serious complication after a TKA. Its rare occurrence and delayed presentation pose a diagnostic challenge. A high index of suspicion is required and early duplex Doppler ultrasonography is recommended when patients present with atypical knee pain and prolonged swelling after a TKA. Treatment options depend on the size and location of the pseudoaneurysm and include embolisation with coils or thrombin.
REFERENCES