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Case Report

Popliteal lesion due to traction during unicompartmental knee revision surgery[☆]

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ARTICLE INFO

Article history:

Received 10 March 2012

Accepted 1 January 2013

Available online 1 March 2013

Keywords:

Popliteal lesion

Fibrosis

Knee surgery

Revision arthroplasty

ABSTRACT

Popliteal artery injury is a rare but known complication in knee surgery. Only one article in current literature reports that the risk increases during revision knee surgery. A new case is described in which an injury to the popliteal artery occurred during lateral unicompartmental to total knee arthroplasty revision surgery. This vascular injury occurred 5–10 cm below the tibial resection level in a healthy patient with a history of cruris fracture with plate osteosynthesis and lateral unicompartmental knee arthroplasty. This paper stresses the importance of being aware that trauma and surgery can create fibrosis in which the popliteal artery can get fixated, thus reducing the scope for safe manipulation of the knee during secondary surgery.

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1. Introduction

Vascular lesions of the popliteal artery are rare but have been described after total knee arthroplasty (TKA), unicompartmental knee arthroplasty (UKA), revision TKA, correction osteotomy procedures and dislocations of the knee.^{1–9} Etiology can be thrombosis, direct trauma or indirect trauma.^{3,6,7,10–16} Our case shows an indirect popliteal lesion 5 cm distal to the operation area in a patient during revision knee surgery and stresses the importance of meticulous surgery in order to prevent indirect trauma especially in cases in which fibrosis could be present due to prior surgery or trauma.

2. Case report

A fifty one year old healthy female was treated for lateral compartmental osteoarthritis of the right knee in another hospital. A lateral UKA was performed. Because of complaints on the lateral side of the knee she visited us two years after primary surgery. The diagnosis of tibial component overhang was made and revision surgery was planned. The aim was to remove the lateral UKA and insert a TKA. Preoperative planning did not show any problems. Her history however included a cruris fracture of the right leg. An open reduction and internal fixation with a plate and screw osteosynthesis was performed forty years ago with an operation for removal of

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the plate and screws a few years later. Scar tissue with local skin retractions on the lower leg was present. During revision surgery no tourniquet was used and removal of the prosthesis and bone resection for the new TKA occurred without problems. However, after preparing the tibia for the stem of the prosthesis bleeding from the posterior side of the knee was noted during extension of the knee. The knee was held in hyperflexion while preparing the tibia for the stem of the prosthesis with a posterior blunt retractor on the medial side of the posterior cruciate ligament in order to luxate the proximal tibia anteriorly thus creating a better view of the tibial plateau. A vascular surgeon was consulted directly after the bleeding was noted and stepped in during surgery to evaluate the cause of the bleeding. The bleeding stopped spontaneously and no focus was found at that time. The cruciate retaining TKA was correctly inserted and the wound was closed. Immediately following the operation, a Doppler ultrasound examination was performed. This examination showed good patency of the posterior tibial and dorsal pedal artery. Initially conservative treatment was started but during re-evaluation with Doppler ultrasound the next day absent distal pulses were observed and an angiogram was performed. A popliteal lesion was diagnosed and the patient was operated on by the vascular surgeon. A lesion of 4 mm in the popliteal artery 5–10 cm below the tibial resection level was observed. This lesion showed signs of bleeding and a local dissection with secondary thrombosis. An embolectomy was performed and the lesion was closed with a 6 mm thin-wall ptfe interposition graft. After this surgery the patient had no complaints and showed good knee function with an intact vascular status of the leg. One year after this surgery the patient had no complaints of the knee.

3. Discussion

The incidence of vascular complications after knee replacement is between 0.03% and 0.2%.¹² These complications include acute ischemia, thrombosis, hemorrhage, fistula, recurrent haemartrosis, pseudo aneurysm and aneurysm formation.^{3,7,10,12,17,18}

Direct trauma can cause hemorrhage, acute ischemia, recurrent haemartrosis and aneurysm forming. It can be caused by the oscillating saw, posteriorly placed retractors and perforating fixation pins.^{3,6,11,16} The popliteal artery is situated direct on the lateral side of the posterior cruciate ligament and posterior retractor positioning should be medial to this posterior cruciate ligament in order to reduce the risk of a lesion due to the position of this retractor.¹⁴ Anatomical anomalies however are reported and should be kept in mind.¹⁹ Indirect trauma is also described.¹⁵ The popliteal artery is especially at risk during hyperextension while patellar preparation is performed and during hyperflexion.¹⁴

Some authors report that arterial thrombosis is associated with tourniquet use.^{6,7,10,12,13} Others report that it can also occur when no tourniquet is used.^{6,13} Patients compromised by peripheral vascular disease are more at risk of developing complications and should be evaluated preoperatively by a vascular surgeon.²⁰

It is reported that preoperative selection could reduce the risk of vascular lesions during surgery.^{7,12} Others however report that no specific measures can be taken to prevent it.¹⁵ Our patient was a young female with no risk factors for vascular impairment preoperatively such as smoking, intermittent claudication or hypercholesterolemia. During preoperative physical examination she had good palpable pulses of the dorsal pedal artery and posterior tibial artery and a good capillary refill of the foot. Also the scar tissue with skin retractions due to the fixation of the cruris fracture was noted. Further preoperative planning included the forming of patient specific instrumentation guides for peroperative placement of the cutting blocks for resection of the femur and tibia using preoperative CT-imaging according to the Signature Personalized Patient Care (Biomet, Inc., Warsaw, In) protocol.²¹ This allows correct cutting block positioning with minimal detachment of structures or manipulation of the knee.

Care was taken during the whole procedure and especially while manipulating the knee, while using the oscillating saw and during placement of the posterior blunt retractor. Post-operative findings, especially a distinct lesion of the popliteal artery, do postulate an operation related cause of the lesion. The fact that it was obviously distal to the operation area does not exclude a direct trauma but presumes an indirect trauma. Since adequate care was taken and manipulation of the knee did not exceed standard manipulation as usually performed in TKA an additional factor seems to be present in this case. In our opinion the problem may have been caused by pre-existent traumatic fibrosis of the structures surrounding the knee on the level of the lower leg in this case. This is supported by previous literature which notes an increased incidence of vascular complications in redo arthroplasty.²² The patient however had not been operated on this leg once but three times. The osteosynthesis of the tibial fracture and subsequent removal of plate and screws might even be of more importance in the forming of fibrosis in the popliteal area than the previous TKA. This fibrosis may involve the posterior vascular structures and thus reduce the scope for safe manipulation of the knee during secondary surgery. In order to prevent vascular lesions around the knee, it is in our opinion important to be aware of possible pre-existent fibrosis that can cause problems during consecutive knee surgery.

Conflicts of interest

All authors have none to declare.

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