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CASE REPORT

# Knee Implant Dislocation Leading to Major Amputation 13 Years Later

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**WHAT UNIQUE EDUCATIONAL MESSAGE IS PROVIDED AND WHY IS IT RELEVANT?**
This is the first case describing total occlusion of the popliteal artery 13 years after total knee replacement due to polyethylene insert dislocation, but also the first report describing the histopathology in a peripheral stent in the setting of acute limb ischaemia.

**Introduction:** Injury to the popliteal vessels during total knee replacement is rare but can lead to catastrophic outcomes.
**Report:** An 81 year old female presented with Rutherford IIb acute left limb ischaemia (ALI) 13 years after total knee replacement. The polyethylene insert in the knee implant had dislocated from the other components and had moved into the popliteal fossa, leading to popliteal artery compression. She underwent emergency multidisciplinary surgery including removal of the polyethylene component, thrombectomy, and popliteal artery stenting, but major amputation was required. The popliteal artery and the stent were removed and submitted to histological analysis. The stent was well expanded but focal malapposition was observed.
**Conclusion:** Regular follow up is mandatory in order to anticipate malfunction of the prosthesis and avoid long term complications.

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## INTRODUCTION

Vascular complications and ischaemic syndromes are well known complications of total knee or hip arthroplasty, although these remain limited.[1] Although rare, these complications deserve attention because of catastrophic outcomes, with mortality rates of up to 7% and an amputation rate of 42%.[2,3] Injury to the popliteal vessels during total knee replacement (TKR) is rare, with a reported incidence of 0.03%–0.51%.[4,5] Early and mid term arterial injuries include thrombo-embolic events, direct vessel laceration or dissection, arteriovenous fistula, and pseudoaneurysm.[4] The aetiologies of these vascular complications include joint manipulation and dislocation, intra-joint protrusion of foreign bodies, excessive retraction, and heat injury from the exothermic reaction generated during cement polymerisation. The majority of vascular injuries usually occur intra-operatively or in the immediate post-operative period. Here, a vascular complication 13 years after TKR, leading to major amputation is reported.

## SHORT REPORT

An 81 year old woman underwent left TKR (Scorpio®, Stryker®, Pusignan, France). Surgery was successful and the post-operative course was uneventful. However, 13 years later, she presented with Rutherford IIb acute limb ischaemia (ALI) of the left lower limb. A solid mass was palpable in the left popliteal fossa. Right distal pulses were present. The time elapsed from the onset of symptoms to arrival in the emergency department was six hours.

Radiographs (Fig. 1A) showed posterior dislocation of the polyethylene insert. Computed tomography angiography (Fig. 1B) revealed occlusion of the popliteal artery (PA) due to the compression by the polyethylene component. The PA was deviated medial to the popliteal fossa and there was a thrombus above and below the popliteal compression. The femoral artery showed irregularity from atheromatous change including mild calcification.

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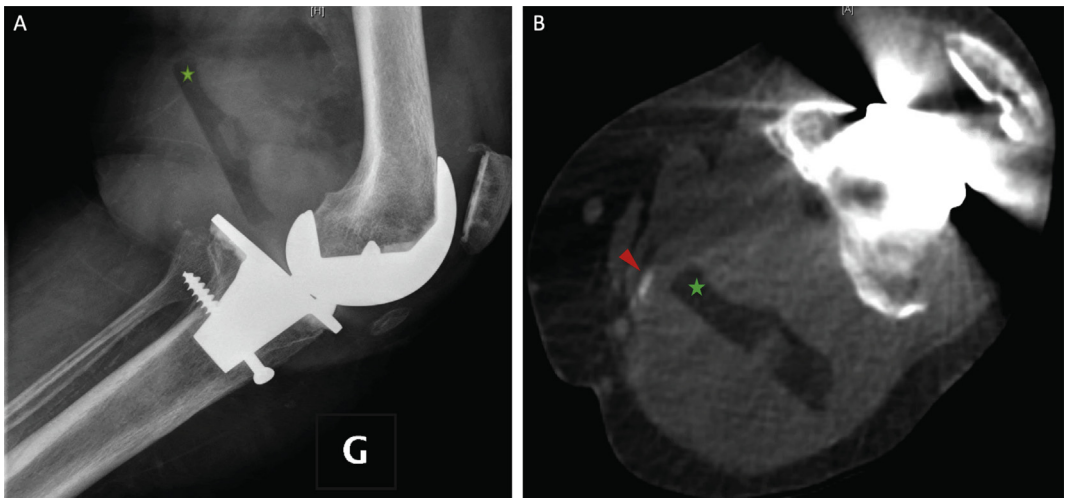


**Figure 1.** Pre-operative imaging. Radiographs showing (A) the posterior dislocation of the polyethylene insert (green star) and (B) computed tomography angiography cross section, showing the polyethylene insert in the popliteal fossa, surrounded by fluid, and compressing the popliteal artery, which is occluded (red arrowhead).

Dislocation of the polyethylene component in the popliteal fossa had been known for three years. It had been diagnosed previously due to increasing knee pain, but was not associated with vascular injury or hypoperfusion of the limb. A knee brace allowed the patient to walk, but the patient was a poor candidate for a new TKR due to her frail status.

Emergency surgery involving a multidisciplinary team (vascular surgeon, orthopaedic surgeon, and anaesthetist) was performed. The polyethylene component was removed using an open posterior approach, in order to release the PA. Selective thrombectomy of both the anterior tibial artery and tibioperoneal trunk was then performed through a below knee PA arteriotomy. Following thrombectomy an angiogram was performed using an antegrade common femoral approach. It revealed a stenosis of the PA and residual thrombus in the anterior tibial artery. Owing to age and poor general status, an endovascular approach was selected rather than a vein bypass. Anterior tibial artery angioplasty was thereby performed and urokinase was administered locally. PA stenting was performed using a Tigris® vascular stent (Gore®, Flagstaff USA) 5 mm diameter, 100 mm long stent and a 5 mm diameter, 100 mm long Ultraverse® Bard® balloon catheter was used to post-dilate the stent (Fig. 2A—C). The time elapsed from arrival in the emergency room to revascularisation was five hours. The final angiogram showed good patency of the PA and the tibial vessels, but poor outflow in the pedal arch. No pedal pulse was present, but a Doppler signal could be recorded. No adjuvant procedure was performed due to the poor general status of the patient. Intravenous heparin was administered. The patient suffered from myocardial infarction on Day 2. The limb remained unsalvageable and major amputation was required on Day 7.

Following amputation, the stent and PA were removed and submitted for histological analysis to rule out compression (Fig. 2D and E). The stent was well expanded; however, focal malapposition was observed with thrombus present luminally and extraluminally. The luminal thrombus was moderate with some struts and fluoropolymer mesh showing presence of thrombus and inflammation. The underlying plaque showed mild dissection with trapped blood. Malapposed struts were observed in the proximal portion of the vessel, with almost 50% of struts malapposed (Fig. 3). Morphometric analysis of the sections showed a median percentage (interquartiles) of malapposition of 35.7% (0—45%). No fibrosis was noted. No evidence of such findings was found on the final angiogram.

## DISCUSSION

Major amputation following posterior dislocation of the polyethylene insert of a total knee implant, 13 years after surgery is described.

Management of vascular complications following orthopaedic surgery is complex and depends on the underlying cause, but there is no consensus on the optimal management.[6,7] Although this patient underwent multidisciplinary care, major amputation was required. In this patient with advanced and prolonged ALI Rutherford IIb, revascularisation with emergency bypass might have been considered the first option. Moreover, a vein bypass might have been considered before addressing the dislocated plate. However, it was decided to perform a selective thrombectomy followed by an endovascular approach due to the frail status of the patient and the absence of underlying vascular disease. Mechanical thrombectomy devices or covered stents were not available. However, major amputation was required since the limb remained unsalvageable, revascularisation being achieved only 11 hours after the onset of symptoms, rather than because of the approach.

The pathological evaluation of the explanted material demonstrated a wide open stent lumen and no recurrence of thrombus. Malposition involving half of stent struts did

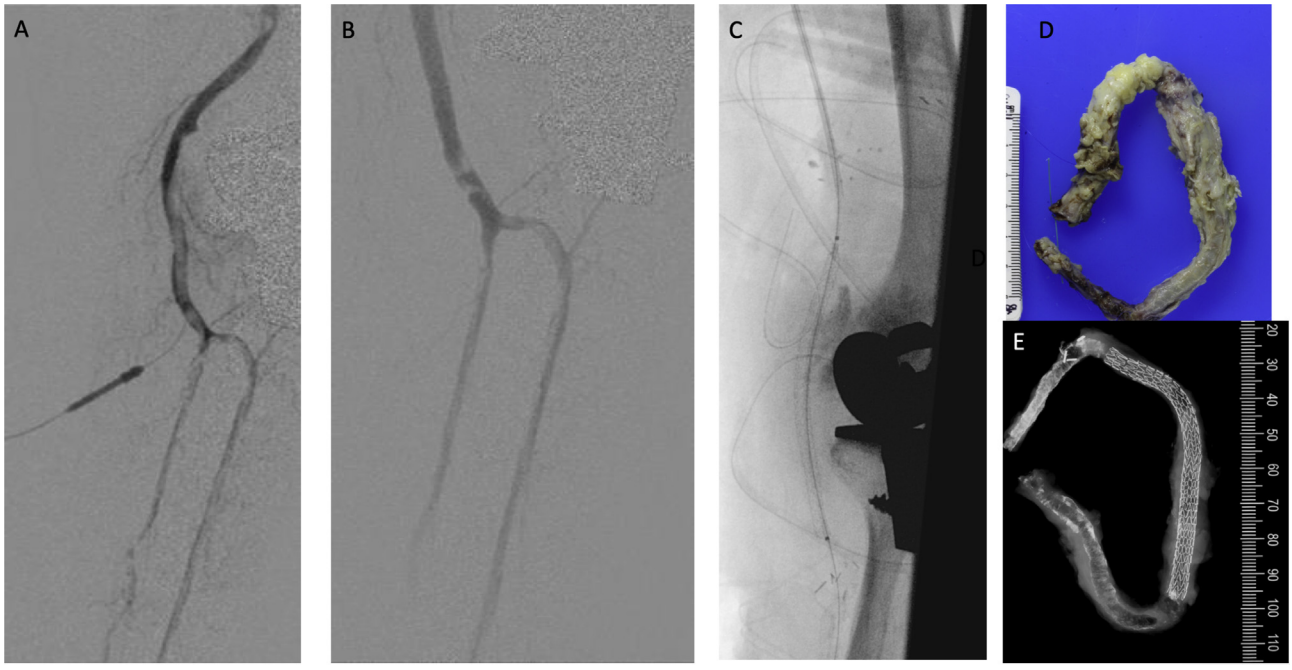


**Figure 2.** Peripheral artery images pre- and post-endovascular therapy (EVT) and after removal. Angiography (A) after thrombectomy showing suboptimal result and hypoperfusion. Angiography after popliteal stenting (B) and anterior tibial angioplasty. Post-operative radiograph (C) showing the stent implantation. Gross picture (D) and high resolution Faxitron radiographic image (E) of the left popliteal artery seven days after EVT (the sample was fixed in 10% buffered formalin.

not result in luminal thrombus occlusion. This might be due to the heparin bonding of the stent. Limb loss may therefore have been the result of late presentation after acute onset of symptoms rather than poor vascularisation of the limb.

Posterior displacement of a polyethylene insert has only been reported once four years after revision TKR surgery.[8] A posterior stabilised constrained design (LCCK®, Zimmer®) was used to replace both the femoral and the tibial components. The patient complained four years later of sudden

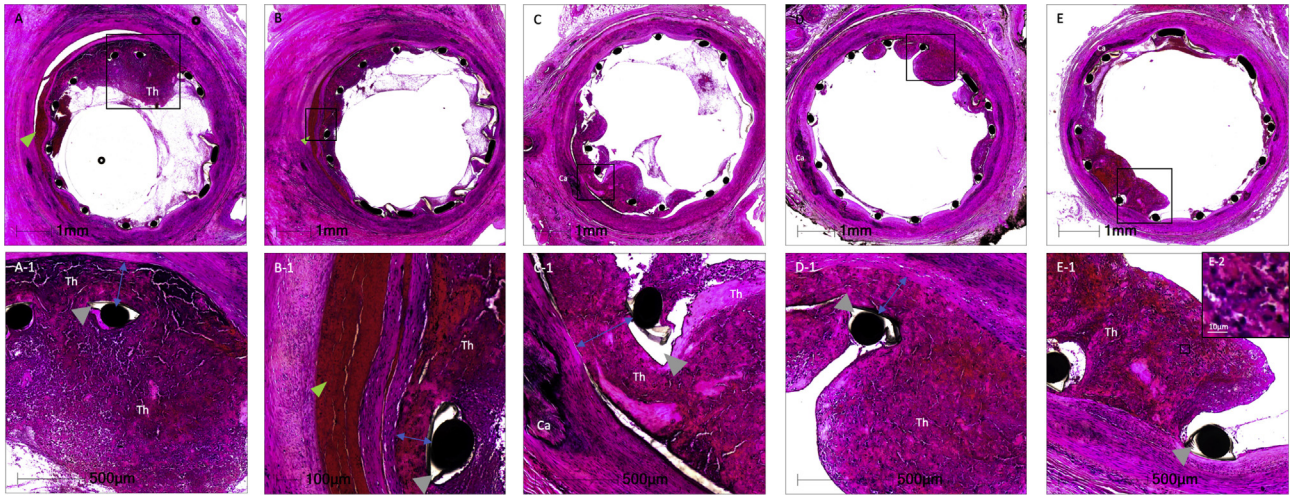


**Figure 3.** Pathological findings of stented segment in the superficial femoral artery (haematoxylin and eosin stain). The vessel with the stent was dehydrated and embedded in Spurr resin, sectioned every 3—4 mm, ground by the Exakt method, and stained with haematoxylin and eosin. Multiple sections were examined by light microscopy. Low power images of sequential sections (A—E) of the stent are shown in the top row, whereas the high power images are shown from A-1 — E—1 in the bottom row. The stent is well expanded with a round shape in all sections (A—E). Moderate luminal thrombus is observed in photomicrographs A-1 — E—1, whereas extraluminal thrombus is seen in photomicrographs (A-1 — D-1). Inflammation within the thrombus was present focally (as seen in E—1). Grey arrowheads point to the fluoropolymer mesh (A-1 — E—1). Focal malapposition was observed in sections A — D and shown with blue double arrows in sections A-1 — D-1. The underlying plaque showed dissection (A, B, and B-1) due to endovascular treatment with trapped blood (green arrowhead). The vessel wall showed the presence of focal areas of medial calcifications (C1). Ca = calcium; Th = thrombus.

onset of left knee pain when standing from a sitting position, and subsequent difficulty walking. Although the dislocated polyethylene was noted to be very close to neurovascular structures, no neurovascular deficiency was detected. Revision surgery was performed, the old polyethylene tibial insert and locking screw were replaced with new components of the same size from the same manufacturer. The post-operative course was uneventful. In this report, ALI occurred 13 years after TKR but this complication should have been expected, since the patient complained of knee pain, and radiographs had already revealed a posterior dislocation of the polyethylene insert.

In conclusion, when a problem is identified, it is better to solve it immediately, rather than waiting for possible complications, even in elderly patients. Moreover, it is mandatory to evaluate any explanted material in the future.[9,10]

## CONFLICTS OF INTEREST

None.

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