

Case Report

Popliteal Pseudoaneurysm After Total Knee Arthroplasty Secondary to Intraoperative Arterial Injury With a Surgical Pin

Review of the Literature

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Abstract: Pseudoaneurysms of the popliteal artery after total knee arthroplasty are rare. Although many possible explanations are proposed in the literature, no intimate mechanism of injury to the artery is previously described. We report on a case of popliteal pseudoaneurysm after a total knee arthroplasty that presented clinically on the second postoperative day. Open vascular surgery with resection of the pseudoaneurysm and end-to-end bypass of contralateral saphena vein graft was successfully performed. At the time of the surgery, a hole was clearly identified on the anterior wall of the popliteal artery due to a perforation with a pin used during the knee arthroplasty. The patient had no further complications. **Key words:** pseudoaneurysm, popliteal artery, total knee arthroplasty, vascular injury.
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Arterial complications after total knee arthroplasty (TKA) are not frequent. The incidence ranges from 0.03% to 0.5% [1,2]. Because of its morbidity, a prompt diagnosis and treatment should be performed to avoid major vascular complications including limb loss [3]. Rand [4] found 3 cases of postoperative vascular complications on analysis of 9022 arthroplasties. These complications include arterial thrombosis, arterial transection, arteriovenous fistula, true aneurysms, and pseudoaneurysms. There are very few cases in the literature regarding popliteal pseudoaneurysms after knee surgery. To

our knowledge, there are only 7 cases reporting on popliteal pseudoaneurysms after TKA [2,3,5-9], and although many possible explanations were given, in none of them was the exact mechanism of injury to the popliteal artery identified [7,10].

Case report

A 68-year-old woman with long-standing bilateral knee osteoarthritis underwent a left TKA. Five years before, she had undergone a total arthroplasty on her right knee in another institution and had no further complications. She had no previous history of arterial disease or cardiovascular risk factors. The left knee arthroplasty was performed with a thigh tourniquet, and the total ischemia time was 1 hour 25 minutes. A single-prong bent retractor placed medial to the intact posterior cruciate ligament was used during the surgery. There were no complications during the operation, and the pedal pulse was

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present after the tourniquet was released. The first day after the knee arthroplasty, the neurologic examination indicated decreased sensation of the left plantar surface and a motor deficit of the tibialis anterior and extensor hallucis longus muscles. The second day after the surgery, the patient complained of an acute onset of increasing pain in her left popliteal fossa. The examination revealed swelling and tenderness in the popliteal fossa, with a local hematoma. Compared with the day before, the neurologic condition concerning her left foot was slightly worse. All the extremity pulses were palpable, and there was no clinical evidence of deep venous thrombosis. A vascular surgeon was urgently consulted. The duplex showed a popliteal pseudoaneurysm with no signs of arteriovenous fistula. A computed tomography scan was performed (Fig. 1), showing a pseudoaneurysm of $41 \times 23 \times 38$ mm, dependent on the third portion of the popliteal artery. The arteriogram (Fig. 2) showed a pseudoaneurysm arising from the anterior face of the popliteal artery, underneath the femoral component of the TKA. The next day, the pseudoaneurysm was excised surgically (Fig. 3), and the popliteal artery was repaired with an end-to-end bypass of contralateral saphena vein graft. A well-shaped circular hole was identified on the anterior wall of the artery (Fig. 4), as well as a longitudinal tear in the opposite wall. Distal pulses were present at the end of the vascular surgery. The patient had no further com-



Fig. 1. A computed tomography scan image showing a pseudoaneurysm of the popliteal artery (arrowhead).



Fig. 2. Digital subtraction arteriogram showing a pseudoaneurysm arising from the anterior wall of popliteal artery at the joint level of the knee prosthesis.

plications and was discharged 1 week after vascular surgery. The postoperative duplex showed no evidence of residual pseudoaneurysm or shunting. Four months after surgery, the patient had a range of movement from 5° to 85° . The neurologic deficit persisted but was considerably less than early postoperative. At that time, she had no vascular symptoms in her left limb.

Discussion

The popliteal artery has a certain risk of injury during TKA because of its anatomical proximity to the operative site [7,10]. Classically, multiple explanations have been given to explain the mechanism of injury to the artery [11], but none of them were previously documented.

One case of popliteal pseudoaneurysm after TKA was described by Hozack et al [5]. A 70-year-old woman felt discomfort in the posterior aspect of her knee, which was associated with a firm pulsating mass in the popliteal area 5 months after an uncomplicated TKA. Arteriogram showed a pseudoaneurysm that was excised with no further complications. Holmberg [3] reported on a 70-year-old woman who noted sudden pain in her



Fig. 3. A photograph of the popliteal artery proximal to the lesion (on the left) and the capsule of the pseudoaneurysm (on the right).

left popliteal fossa 40 days after a TKA. Ultrasonography showed a pseudoaneurysm that was treated surgically with excision and end-to-end anastomosis of the artery. No other complications were reported. O'Connor et al [2] reported on a 71-year-old man with a popliteal pseudoaneurysm that presented 9 days after a TKA. The patient had also a neurologic deficit concerning the plantar sensation. He was treated successfully with neck pseudoaneurysm oversewing with interrupted sutures. The sensory deficit remained after 6 months of follow-up.

Plagnol et al [6] reported on a popliteal pseudoaneurysm after a TKA treated with a percutaneous endovascular stent graft. The patient was 71 years old and had had an acute onset of edema in her right leg 8 days after a TKA. The history of the patient revealed a bilateral stripping of the saphena magna vein and an angor pectoris. She recovered uneventfully, and no evidence of stent failure was found after 12 months. In spite of the uncertain outcomes of this technique in cases of popliteal aneurysms, the author finds endovascular grafting to be an

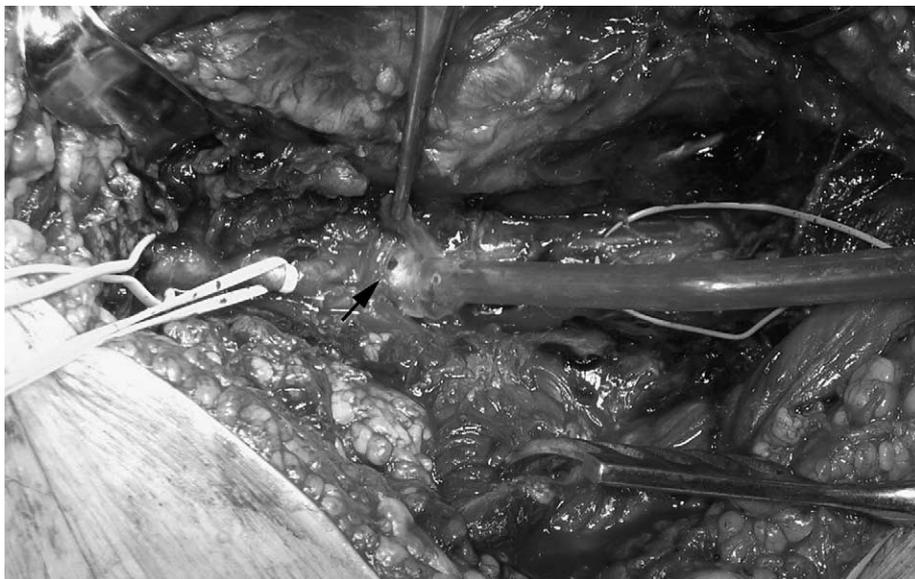


Fig. 4. A photograph showing a well-shaped circular hole on the anterior wall of the popliteal artery (arrow) secondary to a direct injury with a surgical pin.

appropriate treatment in cases of emergency in which there is no saphena magna available to perform the bypass with. Thereafter, Hartford et al [7] and Vaidhyanath and Blanshard [8] reported each on a case of endovascular treatment of a popliteal pseudoaneurysm after TKA showing no sign of stent failure in the duplex examination at 2 years and 18 months, respectively.

Ibrahim et al [9] treated a case of a 71-year-old woman who presented ecchymosis and swelling in her knee and calf 1 month after a TKA. A popliteal pseudoaneurysm was identified by a duplex and an arteriogram, and the patient was successfully treated with a percutaneous intraluminal thrombin injection. Two years after the treatment, the patient had no recurrence of symptoms.

Based on evidence from a small series of popliteal pseudoaneurysms treated with an endovascular stent graft, many authors recommend not placing covered stents across highly mobile joints because of the high occlusion rate that has been reported after midterm follow-up [12-16]. On the other hand, percutaneous injection of human thrombin to treat peripheral pseudoaneurysms has shown good short- and midterm results [9,17,18]. Kang et al [17] reported on 83 pseudoaneurysms treated with thrombin injection under ultrasound guide. All but 5 of them were catheter-related pseudoaneurysms. An early recurrence was found in 7 patients who required further embolizations. Surgical repair was required in 3 patients. Maleux et al [18] treated 101 iatrogenic postcatheterization pseudoaneurysms (100 femoral and 1 brachial) with percutaneous human thrombin injection. In 96 (95%) patients, a complete thrombosis of the pseudoaneurysm was obtained uneventfully after the first attempt. No long-term results are available for patients with peripheral pseudoaneurysms treated with percutaneous embolization with human thrombin.

In conclusion, there are very few reports in the literature regarding popliteal pseudoaneurysms after a TKA. From our perspective, this is a unique case, in which a direct injury with a surgical pin has been clearly identified, causing a popliteal artery lesion that needed vascular repair. For this reason, special care must be taken during TKA when placing pins, particularly those at the level of the joint line, and retractors [10] to avoid vascular complications. Clinically, popliteal aneurysms present as a painful pulsatile mass in the popliteal fossa, usually with edema and ecchymosis. The distal pulses are palpable in most cases, and frequently, a neurologic deficit concerning principally the peroneal nerve is identified at the

neurologic examination. Therefore, popliteal artery injury should be considered in the differential diagnosis of peroneal nerve deficit after TKA, particularly when there has been no lateral release for valgus deformity. Duplex ultrasound and arteriogram confirm the diagnosis, and vascular repair is mandatory. Surgical bypass appears to be a safe and successful treatment, and embolization of the lesion has shown good short- and midterm results in the literature [17,18]. The high rate of early occlusion showed by the endovascular techniques suggests it is a less desirable treatment for these injuries [9,12-14,16].

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