

Do not ignore persistent pain after total knee arthroplasty: Pseudoaneurysm of the popliteal artery after primary total knee arthroplasty

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ABSTRACT

A popliteal pseudoaneurysm following total knee arthroplasty is a rare but potentially life-threatening complication. The most critical step in diagnosing popliteal pseudoaneurysms is maintaining a high level of suspicion and conducting a clinical assessment. The presence of a pulsatile mass in the popliteal region, edema, ecchymosis in the leg, unusual and persistent posterior knee pain, swelling, and paresthesia are diagnostically valuable indicators for popliteal pseudoaneurysms. Lower extremity venous Doppler ultrasonography and computed tomographic angiography are valuable diagnostic tools for identifying pseudoaneurysms. This case report describes a patient who presented with clinically inconsistent pain on the first postoperative day following primary total knee arthroplasty and was subsequently diagnosed with a popliteal pseudoaneurysm. Additionally, a review of the literature on this topic is provided. An 81-year-old woman with a history of nocturnal knee pain and significant impairment in daily activities underwent total knee arthroplasty. On the first postoperative day, she reported discomfort in the lower extremities and posterior knee pain that did not align with her clinical presentation. Palpation of the distal pulses revealed no abnormalities, and no additional symptoms were observed. Venous Doppler ultrasonography of the patient's left lower extremity identified a spherical, low echogenic structure with pulsation, approximately 3.5 × 2.5 cm in size, located near the prosthesis and adjacent to the popliteal artery. This finding confirmed the diagnosis of a pseudoaneurysm. Following a comprehensive assessment and given the evidence of a neck size exceeding 5 mm and the potential for dissection in the vicinity of the pseudoaneurysm, the decision was made to implant a covered stent. In cases of severe pain that is inconsistent with the clinical and postoperative period, popliteal pseudoaneurysms should be considered.

Keywords: Arthroplasty; knee; orthopedic surgery; oscillating saw; persistent pain; pseudoaneurysm.

INTRODUCTION

In cases of advanced knee arthritis, total knee arthroplasty (TKA) is the preferred surgical option for patients who require improved mobility and pain relief. It is one of the most common orthopedic surgeries worldwide. However, this procedure is not without inherent risks. In addition to several common complications, popliteal artery pseudoaneurysms may occur following TKA, with a reported incidence between

0.003% and 0.51%.^[1-3] Despite the very low incidence, prompt intervention is critical to prevent limb-threatening outcomes.

The objective of this report is twofold: firstly, to present a case of a pseudoaneurysm that was promptly recognized and treated with intervention in a patient presenting with leg pain inconsistent with the clinical condition on the first postoperative day after total knee arthroplasty; and secondly, to provide the results of a comprehensive literature review on this subject.

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CASE REPORT

An 81-year-old woman presented with a history of nocturnal knee pain and significant impairment in her ability to perform daily activities during the daytime. After evaluation, a diagnosis of Kellgren-Lawrence stage four arthritis was confirmed (Fig. 1), and total knee arthroplasty was subsequently recommended. In accordance with techniques described in the literature, the procedure was completed without perioperative complications using the medial parapatellar approach. A total knee prosthesis (NexGen Knee®, Zimmer Biomet®, Indiana, USA) was implanted under tourniquet (Fig. 2). Following the application of the knee prosthesis with cement, the tourniquet was deflated, and bleeding control was performed. No circulatory issues were identified, and no complications were observed during the initial postoperative follow-up.

On the first postoperative day, the patient reported symptoms of crural discomfort and posterior knee pain in the operated side that were inconsistent with the clinical presentation. Distal pulses were palpable, and no additional complaints were noted. Since the pain was atypical for postoperative recovery and did not suggest deep vein thrombosis, further investigations were initiated. Venous Doppler ultrasonography of the patient's left lower extremity revealed a spherical, low echogenic structure approximately 2.5 × 3.5 cm in size, located posterior to the prosthesis and adjacent to the popliteal artery. Doppler evaluation of the structure



Figure 1. Preoperative anteroposterior (a) and lateral (b) knee radiograph of an 81-year-old female patient.

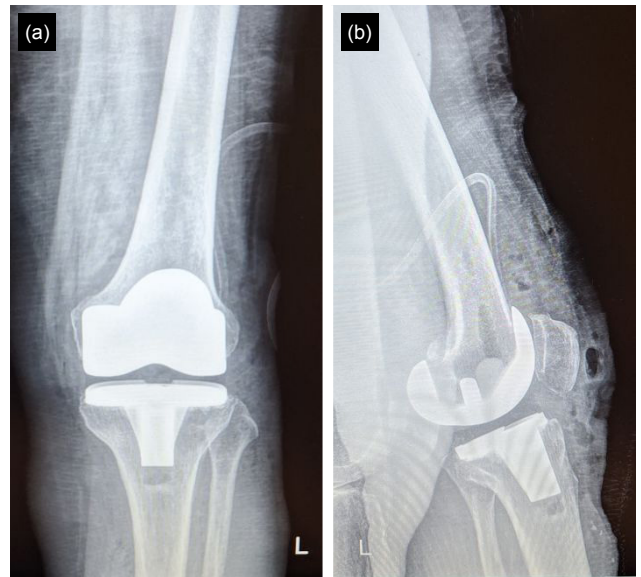


Figure 2. Postoperative anteroposterior (a) and lateral (b) knee radiograph. The operation was concluded uneventfully

revealed pulsations, confirming the diagnosis of a pseudoaneurysm. Contrast-enhanced computed tomography further confirmed the presence of the pseudoaneurysm and identified a dissection flap just proximal to the neck of the pseudoaneurysm. Based on the results of computed tomography angiography and Doppler ultrasonography, the patient was urgently referred to the cardiology and cardiovascular surgery departments. Given the high risk associated with re-operation, the vascular surgery team opted to treat the complication via percutaneous intervention. Taking into consideration that the neck size was approximately seven millimeters and the possibility of dissection proximal to the neck of the pseudoaneurysm, it was decided to implant a covered stent. On the third postoperative day, the patient was admitted to the angiography laboratory. A 7 French, 90 cm introducer sheath was inserted via the right groin and advanced to the left distal femoral artery by crossing over the aorta. After obtaining appropriate angiographic images of the pseudoaneurysm (Fig. 3), an 8 × 37 mm balloon-expandable covered stent (LifeStream™, BD Medical) was placed in the popliteal artery over a 0.035 hydrophilic wire. Total closure of the pseudoaneurysm and complete apposition of the stent were achieved (Fig. 4). Dual antiplatelet therapy, which had been initiated prior to the intervention, was planned to continue for three months.

During bedside follow-up after the procedure, it was observed that the patient's pain was relieved, and her clinical condition improved. No complications were observed during the postoperative follow-up period, and the patient was subsequently discharged. The patient was informed of the details of her case, and consent was obtained for its presentation.



Figure 3. Popliteal pseudoaneurysm and compression on the popliteal artery.



Figure 4. Popliteal artery immediately after the placement of the covered stent.

DISCUSSION

Primary total knee arthroplasty is one of the most highly anticipated surgical procedures worldwide, with a notable increase in its prevalence.^[4,5] Predictive models that the frequency of total knee replacement will increase by 659% by 2060.^[6] As the number of TKA procedures continues to rise, a corresponding increase in the incidence of complications is inevitable. Complications reported following total knee arthroplasty include bleeding problems, wound site complications, thromboembolism, neurological and vascular injuries, ligament injuries, instability, stiffness, malalignment,

infection, periprosthetic fractures, patellofemoral problems, implant loosening, and osteolysis.^[7] Although popliteal artery pseudoaneurysms are a relatively uncommon occurrence, they represent a significant and concerning complication that requires prompt diagnosis and treatment. This report provides a comprehensive account of the diagnostic process and an analysis of the existing literature on this complication.

The formation of a pseudoaneurysm following total knee arthroplasty is often a consequence of perioperative trauma. This trauma may result from various factors, including the use of retractors, oscillating saws, drills, heat generated by bone cement, or repeated local trauma.^[8] In a case report published in 2014, Shin et al.^[1] described a popliteal pseudoaneurysm that developed following primary total knee arthroplasty. The authors identified three critical steps during which injuries to the popliteal artery are most likely to occur: removal of proximal osteophytes, release of the posterior capsule, and cutting of the proximal tibia. They recommended flexing the knee during these maneuvers and exercising caution in the placement of retractors to ensure that the popliteal neurovascular structures are safely moved posteriorly. Similarly, in 2015, Papadopoulos et al.^[3] reported a series of two cases of popliteal artery damage following total knee arthroplasty. Their findings indicated that such injuries occurred during one of four surgical steps: tibial cut, posterior femoral condyle cut, retractor placement, or hyperextension of the knee after the cuts. We contend that, in our case, the popliteal artery injury occurred during the cutting of the proximal tibia with an oscillating saw.

In order to prevent ischemic changes in the lower extremities and avoid potential limb-threatening complications, it is crucial to diagnose pseudoaneurysms and associated arterial compression at an early stage. However, there have been documented instances in the medical literature where the diagnostic process for popliteal pseudoaneurysms was delayed, ranging from two days to five months.^[9] Timely diagnosis of these injuries is of utmost importance. Delayed diagnosis can lead to significant morbidity, including amputation.^[10] To facilitate the early diagnosis of popliteal pseudoaneurysms, maintaining a high level of clinical suspicion and addressing persistent pain following total knee arthroplasty is essential. Lower extremity venous Doppler ultrasonography is recommended as a rapid, non-invasive, and cost-effective diagnostic tool for initial assessment. For definitive diagnosis, however, computed tomographic angiography is more valuable.^[11] Additionally, the timing of tourniquet deflation plays a critical role in the early recognition of vascular injury. The tourniquet should be deflated before the procedure is concluded, allowing for an evaluation of arterial bleeding and signs of distal ischemia.^[12]

Nevertheless, the most pivotal phase in the diagnostic process for popliteal pseudoaneurysms is the initial clinical suspicion and diagnosis. In 2008, Sandoval et al.^[2] presented a case of

popliteal pseudoaneurysm resulting from a surgical pin injury. At the time of their report, they noted that only seven case reports on this topic had been published in the literature. In their report, the authors stated that the presence of a pulsatile mass in the popliteal region, edema, and ecchymosis in the leg are diagnostically valuable indicators and noted that distal pulses are usually palpable in cases of pseudoaneurysm. Furthermore, they highlighted the potential for peroneal nerve damage in cases of popliteal pseudoaneurysm, emphasizing the importance of considering this diagnosis in patients with peroneal nerve damage following TKA. Angelo et al.^[13] proposed that popliteal pseudoaneurysms can be diagnosed in patients presenting with unusual and persistent posterior knee pain, swelling, and paresthesia. It is important to recognize that these symptoms may be subclinical and could go undetected or be misdiagnosed as postoperative hematoma or deep vein thrombosis, which are common complications after total knee replacement.^[14] In our case, the diagnosis was based on the persistence of pain in the knee, particularly in the posterior popliteal region.

CONCLUSION

In conclusion, a popliteal pseudoaneurysm following total knee arthroplasty represents a rare but serious complication that can occur during any of the critical stages of the surgical procedure. While the precise etiology remains uncertain, early diagnosis is crucial, as delayed identification can lead to catastrophic outcomes. According to the literature, the presence of edema, ecchymosis, and a palpable mass are key findings in recognizing this complication. It is important to note that the presence of palpable distal pulses does not exclude the diagnosis of a popliteal pseudoaneurysm. As demonstrated in our case, popliteal pseudoaneurysms should be considered when severe pain arises that is inconsistent with the clinical presentation and postoperative period, prompting the initiation of a diagnostic process.

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OLGU SUNUMU - ÖZ

Total diz artroplastisi sonrası inatçı ağrıyı göz ardı etmeyin: primer total diz artroplastisi sonrası popliteal arter psödoanevrizması

Total diz artroplastisini takiben gelişen popliteal psödoanevrizma nadir görülen ancak potansiyel olarak hayatı tehdit eden bir komplikasyondur. Potansiyel olarak uzuvları tehdit eden sonuçlardan kaçınmak için hızlı tanı ve tedavi şarttır. Popliteal bölgede pulsatil bir kitle, bacakta ödem ve ekimoz varlığı popliteal psödoanevrizmalar için tanısız olarak değerli bulunmuştur. Bununla birlikte, palpe edilebilen distal nabızların varlığı tanı olasılığını ortadan kaldırmaz.

Bu vaka çalışmasında, primer total diz artroplastisi sonrası postoperatif birinci günde klinik olarak tutarsız ağrı ile başvuran ve popliteal psödoanevrizma tanısı konulan bir hasta sunuldu. Ayrıca, bu konudaki literatürün bir derlemesi sunulmuştur.

81 yaşında kadın hasta gece diz ağrısı ve gündüz günlük aktivitelerini yerine getirmede belirgin bozulma öyküsü ile başvurdu. Hasta değerlendirildi ve total diz artroplastisi ameliyatı geçirdi. Ameliyat sonrası birinci günde, hasta alt ekstremitelerde rahatsızlık ve klinikle uyumlu olmayan posterior diz ağrısı semptomları gösterdi. Distal nabızların palpasyonunda herhangi bir anormallik saptanmadı ve hasta başka bir semptomla başvurmadı. Hastanın sol alt ekstremitesinin venöz Doppler ultrason muayenesinde, protezin çevresinde ve popliteal arter bölgesinde yaklaşık 3,5 ila 2,5 cm boyutlarında küresel, düşük ekojenik ve pulsasyonlu bir yapı gözlemlendi ve bu da psödoanevrizma tanısını doğruladı. Kapsamlı değerlendirmenin ardından, boyun boyutunun 5 mm'yi aştığına dair kanıtlar ve psödoanevrizma çevresinde diseksiyon potansiyeli göz önüne alındığında, kapalı bir stent implante edilmesine karar verildi.

Klinik ve ameliyat sonrası dönemle uyumlu olmayan şiddetli ağrı varlığında, popliteal psödoanevrizmalar akılda tutulmalıdır.

Anahtar sözcükler: Artroplasti; Diz; Ortopedik cerrahi; salınımlı testere; inatçı ağrı; psödoanevrizma.

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