

An Unusual Presentation of Delayed Hemarthrosis Following Total Knee Arthroplasty: A Case Report

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Learning Point of the Article:

Superior medial genicular artery pseudoaneurysm is a rare complication of Total Knee Arthroplasty that can present as recurrent hemarthrosis post-TKA. Timely diagnosis and urgent management with minimally invasive techniques such as embolization can result in a favourable functional outcome.

Abstract

Introduction: Vascular complications following Total Knee Arthroplasty (TKA) are rare but can be potentially life-threatening. This case report describes a rare vascular complication after an elective TKA that was successfully managed with minimally invasive interventional radiology.

Case Report: We describe the case of a 79-year-old hypertensive male who underwent a left elective primary cemented TKA. 10 days postoperatively, he presented with acute-onset pain and swelling of his left knee, lower thigh, and calf. An initial ultrasound scan ruled out deep vein thrombosis but demonstrated a large organized hematoma anterior to the femur with no active bleeding. Due to persistent pain and swelling, the patient underwent an arthroscopic washout and evacuation of the hematoma. Post-procedure, he developed recurrent knee hemarthrosis. Repeat ultrasound scan and angiography revealed the formation of a pseudoaneurysm due to active bleeding from the superior medial genicular artery. This was successfully managed with fluoroscopic embolization. At the final follow-up of 1 year, the patient was pain-free and had a good knee range of motion. He had made excellent progress in terms of daily living and quality of life.

Conclusion: Pseudoaneurysms of the superior medial genicular artery are extremely rare complications following TKA. They can present as painful and recurrent hemarthrosis and can be effectively managed with minimally invasive interventional radiology, avoiding the complications and morbidity of traditional open repair.

Keywords: Total knee arthroplasty, pseudoaneurysm, recurrent hemarthrosis, superior medial genicular artery, deep vein thrombosis, angiography.

Introduction

Symptomatic pseudoaneurysms following total knee arthroplasty (TKA) are rare, with an estimated incidence of 0.01–0.09% [1]. They are commonly caused by iatrogenic trauma to the popliteal, anterior tibial, or geniculate arteries [2]. Vascular complications following TKA have been associated

with vascular comorbidities, including hypertension, diabetes, peripheral vascular disease, and atherosclerosis [1]. Although extremely rare, these injuries warrant a high index of suspicion as they can evolve rapidly and pose a risk to life [3]. Hence, timely diagnosis and urgent management are of vital importance.

We report a rare case of a symptomatic superior medial genicular

Author's Photo Gallery



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Access this article online

Website:
www.jocr.co.in

DOI:
<https://doi.org/10.13107/jocr.2025.v15.i08.5904>

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Submitted: 15/05/2025; Review: 24/06/2025; Accepted: July 2025; Published: August 2025

DOI: <https://doi.org/10.13107/jocr.2025.v15.i08.5904>

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Figure 1: (a and b) Postoperative anteroposterior radiograph and lateral radiographs showing well-fixed cemented femoral and tibial components.

artery (SMGA) pseudoaneurysm following an elective primary TKA in a male with long-term vascular comorbidities. The patient was successfully managed with diagnostic angiography followed by fluoroscopic embolization of the lesion.

Case Report

A 79-year-old male underwent an elective cemented left TKA (Stryker, Triathlon) for symptomatic knee osteoarthritis (Fig. 1). He had a background of chronic labile hypertension and atherosclerosis. The procedure was performed using the standard medial parapatellar approach using a tourniquet. There were no immediate intraoperative or perioperative complications. He was started on standard venous



Figure 2: Initial Duplex Doppler ultrasound scans showing a large, organized hematoma anterior to the left femur with no active bleeding.

thromboembolism (VTE) prophylaxis using subcutaneous Enoxaparin (40 mg) to be taken once daily for 2 weeks. He was discharged on the 2nd day after surgery, having achieved knee flexion of 90°. Following discharge, the patient's blood pressure remained high, and 10 days post-operatively, he presented to the hospital with acute-onset swelling and pain in the left knee, lower third of the thigh, and calf. Clinically, he was afebrile and hemodynamically stable, with no clinical evidence of compartment syndrome. On examination, he had a firm and non-fluctuant swelling around the knee and lower third of the thigh. There were no signs of localized infection, but there was a restricted range of motion with flexion limited to 45°. Initial bloods were unremarkable, with normal inflammatory markers and D-dimer levels. An urgent Duplex Doppler ultrasound scan

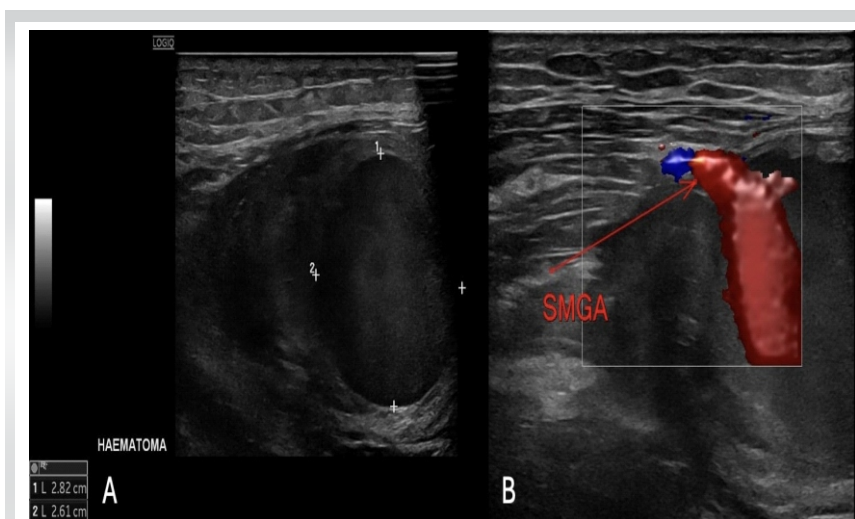


Figure 3: (a) Repeat Duplex Doppler ultrasound showing a large haematoma anterior to the left femur with active bleeding. (b) The source of the active bleeding was the superior medial genicular artery.



Figure 4: Computed tomography angiogram confirming active bleeding from the superior medial genicular artery.

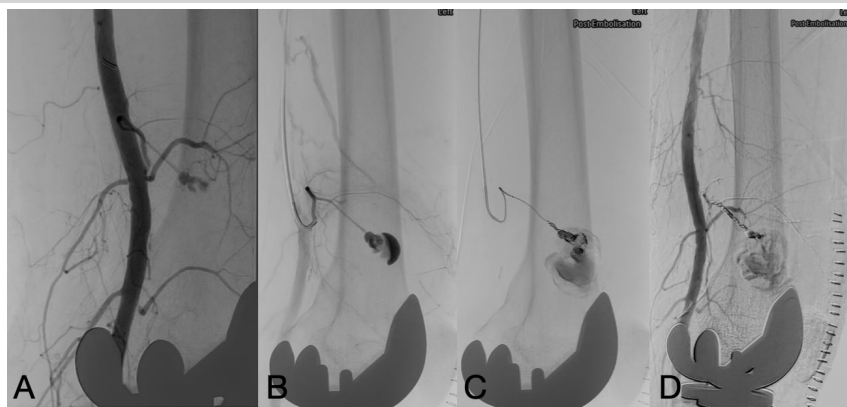


Figure 5: (a-d) Sequential images showing the procedure of embolization with the use of coils and onyx sealant.

showed no evidence of deep-vein thrombosis (DVT) with normal three-vessel runoff. A large, organized hematoma anterior to the left femur was demonstrated without any signs of active bleeding (Fig. 2). Due to intractable pain, the hematoma was evacuated arthroscopically. No active bleeding was noted. However, the patient developed recurrent hemarthrosis 24 h after the procedure. A repeat ultrasound scan demonstrated the recurrence of a large hematoma anterior to the left femur with the formation of a pseudoaneurysm with active bleeding. The source of the bleed was the SMGA (Fig. 3). An urgent computed tomography angiogram showed that the common femoral, superficial femoral, and popliteal arteries were patent with good three-vessel runoff. It revealed a large pseudoaneurysm arising from the SMGA and measuring $3.2 \times 2.5 \text{ cm}^2$. It was surrounded by a large hematoma extending into the left anterior thigh (Fig. 4). Following multidisciplinary discussion, the active small-vessel bleeding was managed with angiographic embolization of the atherosclerotic SMGA by the

interventional radiology team. Embolization was achieved with multiple coils and onyx sealant (Fig. 5). Post-procedure, the patient made a rapid recovery and, within 6 weeks, regained 120° of knee flexion (Fig. 6). A follow-up ultrasound scan at 6 weeks showed that the hematoma in the right anterior thigh had resolved with no evidence of a pseudoaneurysm and no active bleeding (Fig. 7). At the final follow-up of 1 year, the patient had made an excellent functional recovery regarding activities of daily living and quality of life.

Discussion

Pseudoaneurysms are locally contained hematomas that develop secondary to arterial injury. If untreated, they can enlarge, compress surrounding structures, or rupture, resulting in a variety of clinical presentations. These include recurrent hemarthrosis, bruising, swelling, neurological injury, or, most severely, death [4]. As the blood flow is maintained, the patient can have normal distal pulses, and the diagnosis of the vessel injury is delayed. An expanding pseudoaneurysm may compress a vein and lead to symptoms of DVT [5]. Therefore, these lesions are often diagnosed on scans that have been originally ordered to rule out DVT.

Possible etiologies of pseudoaneurysm after TKA include intraoperative injury to the vessels during medial and lateral retinacular release [4]. Posterior capsular release poses a risk of injury to the popliteal artery, whereas a lateral retinacular release has a risk of injury to the superolateral geniculate artery [6]. Other reported mechanisms during TKA include direct perforation of the vessel by a retractor or secondary effects due to the exothermic reaction seen during cementing [7].

Vascular injuries to the geniculate arteries after TKA are extremely rare, with a few anecdotal reports in the literature [5-14]. Of these, only two authors have reported involvement of the SMGA [5,14]. Most commonly, the lateral geniculate artery is affected [3], with damage occurring during exposure when lateral release is performed [11]. It is unknown whether the anatomical location and course followed by the SMGA make it vulnerable to pseudoaneurysm formation following TKA [5].

The optimal management of pseudoaneurysms depends on the artery involved and the size and location of the pseudoaneurysm [1]. The main management options include endovascular stenting, coil embolization, or open vascular repair [1]. Therefore, a multidisciplinary approach is crucial for optimal management. In our case, the bleed was successfully managed with fluoroscopic embolization using multiple coils



Figure 6: (a) Clinical image at 6 weeks post-procedure shows that the patient was able to achieve an active knee range of motion up to 120° . (b) Clinical image at 6 weeks post-procedure showing the healed surgical scar on the left knee with full knee extension.



Figure 7: Normal Duplex Doppler ultrasound done at the follow-up of 6 weeks. The scan did not show any evidence of active bleeding or pseudoaneurysm.

and sealant. Open surgery to manage the bleeding would have had a very high risk of failure as the bleeder was located posteriorly and had retracted. Moreover, due to atherosclerosis, the vessels were calcified and fragile, making repair difficult. Coil embolization has shown favorable results when managing geniculate artery pseudoaneurysms [1], with angiographic coil embolization considered the best of all management options [15]. This gave an evidence base to our choice of approach. In addition, this minimally invasive procedure avoided the significant complications associated with traditional open surgery [16]. Pseudoaneurysm formation, in our case, was multifactorial. The direct mechanism of injury was likely iatrogenic trauma to the SMGA, a small-vessel measuring approximately 1.6 mm in diameter [17]. Typically, in

pseudoaneurysms <1.8 cm, spontaneous thrombosis occurs [1]. However, the presence of a large hematoma in our case suggests that additional factors predisposed the vessel to injury. The patient's long-standing hypertension, atherosclerosis, and age-related capillary fragility contributed to the pseudoaneurysm formation as well as the hematoma's failure to clot. In addition, routine postoperative VTE prophylaxis may have hindered clotting. Therefore, in patients with recurrent hemarthrosis following TKA, particularly those with these underlying comorbidities, a high index of suspicion for pseudoaneurysm formation is warranted to enable timely diagnosis and management.

To the best of our knowledge, only two cases of SMGA pseudoaneurysms have been reported in the literature. Julien et al. reported a case of SMGA pseudoaneurysm in a 71-year-old female that was managed by open ligation of the bleeding vessel via the direct posterior approach [5]. The aneurysm was $3.5 \times 2.3 \text{ cm}^2$ in size. Gaheer et al. reported a $2.5 \times 3.5 \text{ cm}^2$ in size, spontaneously resolving SMGA pseudoaneurysm in a 68-year-old male [14]. The size of the pseudoaneurysm in our case was $3.2 \times 2.5 \text{ cm}^2$, and it was successfully managed with minimally invasive coil embolization. Our case is the first documented case successfully treated with this modality. The patient achieved excellent functional recovery without postoperative complications, highlighting coil embolization as an effective treatment modality for SMGA pseudoaneurysms.

Conclusion

Pseudoaneurysm formation involving the SMGA following TKA is rare but extremely devastating if not diagnosed and managed promptly. Early diagnosis and prompt management using minimally invasive techniques like embolization ensure complete recovery without hampering rehabilitation after TKA.

Clinical Message

Urgent diagnosis and timely intervention with minimally invasive techniques are critical to ensure recovery from SMGA pseudoaneurysms that occur following TKA.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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Conflict of Interest: Nil

Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

How to Cite this Article

Prabhu R, Pimpalnerkar S, Pimpalnerkar A, Gudla V, Ganeshan A. An Unusual Presentation of Delayed Hemarthrosis Following Total Knee Arthroplasty: A Case Report. *Journal of Orthopaedic Case Reports* 2025 August;15(8): 111-115.

