

Anterior Tibial Artery Pseudoaneurysm Following Tibial Nailing: A Rare Vascular Complication Managed With Coil Embolization

Murat Acar¹, Scott D Wuertzer¹

Learning Point of the Article:

Delayed anterior tibial artery pseudoaneurysm is a rare but important complication of tibial nailing, and early diagnosis with imaging, followed by minimally invasive endovascular treatment, can lead to excellent outcomes.

Abstract

Introduction: Intramedullary nailing is a widely accepted and effective treatment for tibial shaft fractures. Anterior tibial artery (ATA) pseudoaneurysms caused by interlocking screws are exceedingly uncommon, with only a few cases reported in the literature.

Case Report: We present the case of a 56-year-old male who developed worsening swelling and pain in his left lower extremity 8 months after undergoing intramedullary nailing for a tibial shaft fracture. Doppler ultrasound revealed an ATA pseudoaneurysm with characteristic imaging findings, which was confirmed by computed tomography angiography (CTA). The patient was treated with coil embolization of the ATA pseudoaneurysm, followed by surgical evacuation of the thrombus. The post-operative course was uncomplicated, and the patient recovered well.

ATA pseudoaneurysm related to tibial nailing can be easily overlooked due to expected post-operative edema and swelling. Early detection through Doppler ultrasound and CTA is essential. Treatment options range from non-invasive methods to open surgery and endovascular interventions. In this case, a combination of coil embolization and surgical hematoma evacuation proved to be a minimally invasive and effective approach.

Conclusion: This case highlights the importance of considering rare vascular complications after tibial nailing. Timely diagnosis and endovascular treatment approaches can lead to successful outcomes.

Keywords: Tibial fracture, tibia nailing, interlocking screw, pseudoaneurysm, coil embolization.

Introduction

Intramedullary nailing is a well-established and effective treatment for tibial shaft fractures, with a very low incidence of vascular complications. To date, only a few cases of anterior tibial artery (ATA) pseudoaneurysms linked to interlocking screws of intramedullary nails have been reported [1-7]. Here, we present a case of delayed diagnosis of an ATA pseudoaneurysm caused by a proximal interlocking screw, identified through comprehensive

diagnostic imaging, including computed tomography angiography (CTA) and Doppler ultrasound. The condition was successfully managed with a combination of coil embolization and surgical evacuation of a large hematoma.

Case Report

A 56-year-old male presented to the emergency department of our institution with worsening swelling and pain in his left lower

Author's Photo Gallery



Dr. Murat Acar



Dr. Scott D Wuertzer

Access this article online

Website:
www.jocr.co.in

DOI:
<https://doi.org/10.13107/jocr.2025.v15.i10.6156>

¹Department of Radiology, Wake Forest University School of Medicine, Winston-Salem, North Carolina, United States.

Address of Correspondence:

Dr. Murat Acar,
Department of Radiology, Wake Forest University School of Medicine, Winston-Salem, North Carolina, United States.
E-mail: macar@wakehealth.edu

Submitted: 09/07/2025; Review: 26/08/2025; Accepted: September 2025; Published: October 2025

DOI: <https://doi.org/10.13107/jocr.2025.v15.i10.6156>

© The Author(s). 2025 Open Access. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and non-commercial reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.





Figure 1: (a) Pre-operative radiograph reveals acute, mildly comminuted fractures of the mid/distal tibia and proximal fibular shaft. (b) Post-operative radiograph reveals intramedullary nailing of tibial shaft fracture in improved alignment and proximal fibular shaft fracture with increased displacement and apex posterior angulation.

extremity. Eight months prior, he had sustained fractures of the left mid-tibial shaft, proximal fibular shaft, and posterior malleolus after dropping a piece of plywood on his leg (Fig. 1a). Initial management involved closed reduction of the tibial shaft fracture with the application of a uniplanar external fixator, alongside open reduction and internal fixation of the posterior malleolus fracture. Subsequently, the tibial fracture was stabilized with intramedullary nailing, and the external fixator was removed. Additional blocking screws were placed proximally and distally to maintain alignment and prevent varus collapse. Two proximal interlocking screws were inserted in a medial-to-lateral direction using an outrigger jig (Fig. 1b). No significant bleeding or acute swelling was noted intraoperatively or in the immediate post-operative period. Routine follow-up examinations revealed swelling and stiffness, which were initially considered expected findings given the high-energy nature of the injury and extensive soft tissue involvement. A peripheral venous Doppler study was performed following external fixation and showed no evidence of thrombosis. However, the assessment was limited due to the presence of a large cutaneous wound and bandaging.

Upon the present presentation with the increased lateral calf pain and swelling, Doppler ultrasound revealed a large pseudoaneurysm of the ATA with the characteristic yin-yang sign (Fig. 2). CTA confirmed a pseudoaneurysm arising from

the proximal ATA, surrounded by a large hematoma in the leg (Fig. 3). The largest aneurysmal sac measured approximately $8.7 \times 10.4 \times 16.1$ cm, with an actively filling, non-thrombosed component measuring about $3.4 \times 3.8 \times 6.5$ cm. Given the significant compressive symptoms caused by the hematoma, coil embolization of the ATA was performed to exclude blood flow into the pseudoaneurysm cavity. Selective catheterization of the left ATA was achieved through ultrasound-guided puncture of the right common femoral artery. Multiple Penumbra Ruby coils were deployed into the proximal and distal segments of the ATA, effectively sealing the pseudoaneurysm defect. A pre- and post-procedural angiogram demonstrated successful cessation of blood flow into the pseudoaneurysm cavity (Fig. 4a and b).

Following embolization, a left leg incision was made over the most prominent area of fluctuance, and the large hematoma cavity was entered. Suction and manual evacuation were used to remove approximately 250 cc of old thrombus along with the pseudoaneurysm capsule. A closed suction drain was placed in the evacuated cavity, and the incision was closed with interrupted nylon sutures. Sterile dressings were applied. The post-operative course was uncomplicated, and the patient recovered well. At the 3-month follow-up, CTA demonstrated post-procedural changes consistent with embolization of the ATA pseudoaneurysm. The distal ATA remained patent, with no evidence of recurrence. The aneurysm neck was successfully sealed, and there was a reduction in the size of the aneurysm sac

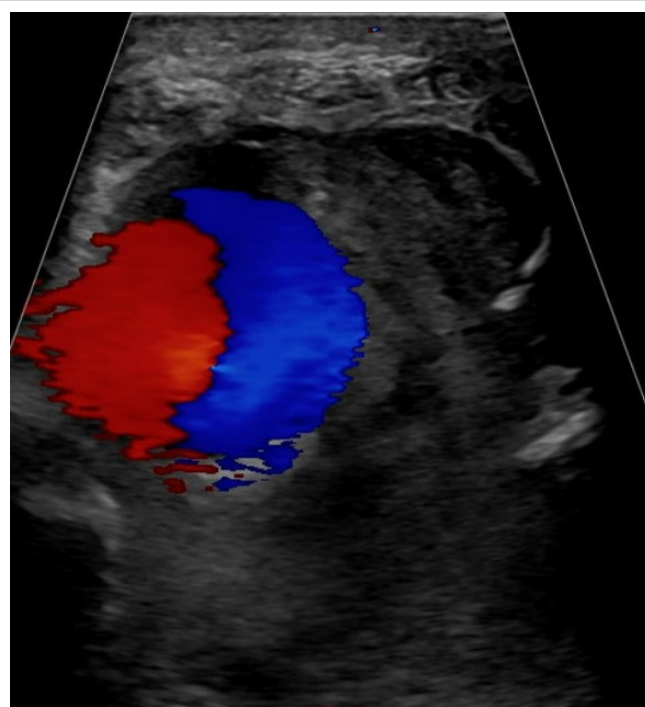


Figure 2: Color Doppler ultrasound shows a large, rounded structure with a classical yin-yang sign arising from the region of the anterior tibial artery.



Figure 3: Computed tomography angiography confirms the large pseudoaneurysm arising from the proximal anterior tibial artery, with a surrounding hematoma.

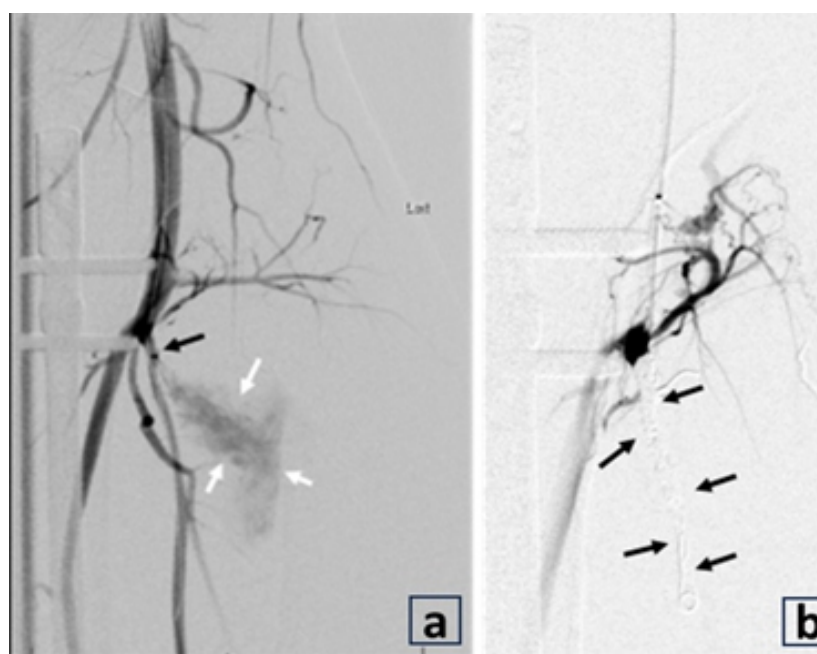


Figure 4: (a and b) Angiogram after selective catheterization of the left anterior tibial artery (ATA) demonstrates contrast filling of pseudoaneurysm (white arrows) and the origin at the proximal ATA (black arrow) near the screw. After coil embolization (b), the angiogram shows no contrast filling into the pseudoaneurysm cavity (black arrows), consistent with the successful cessation of blood flow into the pseudoaneurysm cavity.

(Fig. 5).

Discussion

Intramedullary nailing with interlocking screws is a reliable method for managing tibial fractures, with a low incidence of complications. Vascular complications, specifically pseudoaneurysm of the ATA following lateral-to-medial distal locking of an intramedullary nail for tibial shaft fractures, were first reported by Han et al., in 2004, with a few additional cases documented since then [1, 2, 4, 5, 6].

A pseudoaneurysm can develop in any artery but is most commonly seen in the femoral artery, particularly following cardiac catheterization. It occurs due to an injury to the adventitial layer of the artery, leading to the gradual leakage of blood into the surrounding tissue. Unlike a true aneurysm, which involves all three layers of the arterial wall, a pseudoaneurysm is characterized by a fibrous pseudocapsule that encases the leaking blood [1, 8]. Although the exact timing of pseudoaneurysm formation is uncertain, we hypothesize that it likely occurred during drilling or the early phase of proximal interlocking screw fixation, with gradual enlargement over time. The growth rate of a pseudoaneurysm can vary widely depending on factors such as its etiology, anatomical location, and surrounding tissue. In smaller pseudoaneurysms, typically

those measuring <3 cm, spontaneous thrombosis may occur, potentially leading to resolution without the need for intervention [7].

Symptoms of a pseudoaneurysm primarily arise from swelling and the mass effect exerted on surrounding nerves and vessels, causing pain, numbness, and muscle weakness [4]. Typically, most superficial pseudoaneurysms present as a painful, pulsatile mass and are relatively easy to diagnose. In contrast, deep pseudoaneurysms, as in this case following tibial nailing, are rare and often overlooked. They can be concealed by expected post-operative edema and soft tissue swelling. In this patient, the swelling and stiffness were initially attributed to normal healing after extensive cutaneous and soft tissue injury, delaying diagnosis and treatment.

Doppler ultrasound is the preferred initial screening tool for assessing potential vascular and soft tissue complications. In this case, it revealed an ATA pseudoaneurysm with the characteristic “yin-yang” sign, indicating bidirectional blood flow within the pseudoaneurysm sac. These findings were subsequently confirmed by CTA.

Various treatment options are available for pseudoaneurysms, including open surgery with arterial repair, reconstruction, or ligation, as well as minimally invasive methods such as ultrasound-guided compression, thrombin injection, and



Figure 5: Coronal computed tomography angiography shows embolization of the anterior tibial artery pseudoaneurysm (black arrow) and patent distal anterior tibial artery (white arrow) without extravasation to suggest recurrence of the pseudoaneurysm.

endovascular interventions such as stenting, coiling, or embolization. While surgical repair and endovascular stenting are typically reserved for pseudoaneurysms arising from large arteries, coiling is preferred for pseudoaneurysms of smaller arteries [8, 9, 10, 11].

A review of the literature shows that management approaches for ATA pseudoaneurysms

associated with tibial nailing have varied. Reported cases include non-invasive treatment with ultrasound-guided thrombin injection [6], coil embolization [3], and ATA

embolization with coils following surgical hematoma evacuation [4]. Several other cases were managed surgically [1, 2, 5]. In the present case, the neck of the pseudoaneurysm was successfully closed using coiling as a minimally invasive and effective method. Because of the mass effect and neurovascular compression from the large thrombus, suction and manual evacuation were performed through a small leg incision.

Conclusion

This case highlights the importance of considering vascular complications in patients presenting with swelling and pain after tibial nailing. Prompt diagnosis and a tailored treatment approach can lead to successful outcomes.

Clinical Message

ATA pseudoaneurysm is a rare but important vascular complication following tibial nailing that can mimic routine post-operative swelling. Clinicians should maintain a high index of suspicion in patients with persistent or worsening symptoms. Early imaging with Doppler ultrasound and CTA is essential for diagnosis. Minimally invasive treatment, such as coil embolization combined with surgical evacuation when necessary, can lead to effective resolution and favorable outcomes.

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

References

1. Han KJ, Won YY, Khang SY. Pseudoaneurysm after tibial nailing. *Clin Orthop Relat Res* 2004;418:209-12.
2. Greve F, Cronlein M, Beirer M, Kirchhoff C, Biberthaler P, Braun KF. Pseudoaneurysm of the anterior tibial artery after interlocking tibial nailing: An unexpected complication. *Eur J Med Res* 2016;21:36.
3. Park JJ, Perry LD, Tamburrini D, Kumar S. Successful coil embolization of a large anterior tibial artery pseudoaneurysm after open reduction internal fixation of a bi-condylar tibial plateau fracture. *Am Surg* 2023;89:3886-8.
4. Gahlot N, Kanojia RK. Anterior tibial artery pseudoaneurysm due to interlocking bolt of tibial nail: A case report and review. *Acta Orthop Traumatol Turc* 2017;51:77-83.
5. Inamdar D, Alagappan M, Shyam L, Devadoss S, Devadoss A. Pseudoaneurysm of anterior tibial artery following tibial nailing: A case report. *J Orthop Surg (Hong Kong)*

2005;13:186-9.

6. Hanson CG, Hanson LF. Non-invasive repair of an iatrogenic tibial artery branch pseudoaneurysm after intramedullary nailing. *J Clin Orthop Trauma* 2017;8 Suppl 2:S49-51.

7. Matsubara N, Fukuo Y, Yoshimura K, Kashiwagi H, Futamura G, Park Y, et al. A case of puncture-site giant pseudoaneurysm following recanalization therapy for acute ischemic stroke: Marked growth and rupture of a femoral artery pseudoaneurysm. *J Neuroendovasc Ther* 2021;15:366-72.

8. Pathinathan K, Sivakumaran D, Dimantha WH, Nishanthan AA, Chanaka KA, Munidasa D. Late-onset pseudoaneurysms of lower limb arteries following late complications of orthopaedic constructs - two cases and review of literature. *Int J Surg Case*

Rep 2021;87:106457.

9. Luther A, Kumar A, Negi KN. Peripheral arterial pseudoaneurysms-a 10-year clinical study. *Indian J Surg* 2015;77 Suppl 2:603-7.

10. Kinoshita H, Hashimoto M, Hirayama J, Fujita K, Takeuchi Y, Iwasaki J, et al. Huge pseudoaneurysm of the femoral artery after internal fixation of femoral trochanteric fracture. *Case Rep Orthop* 2018;2018:3182643.

11. Raheerantenaina F, Rakotorahalahy RA, Andrianandraina MC, Rakoto Ratsimba HN, Rajaonahary TM. [Management of traumatic and iatrogenic arterial pseudoaneurysms in a tropical environment]. *J Med Vasc* 2017;42:338-48.

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

Acar M, Wuertzer SD. Anterior Tibial Artery Pseudoaneurysm Following Tibial Nailing: A Rare Vascular Complication Managed With Coil Embolization. *Journal of Orthopaedic Case Reports* 2025 October;15(10): 52-56.

