

# Peroneal Artery Pseudoaneurysm after Surgery for Non-union of Tibia: A Case Report with Review of Literature

Sankalp<sup>1</sup>, Gaurav Kumar Upadhyaya<sup>2</sup>, Pulkesh Singh<sup>2</sup>, Sanjay Singh Rawat<sup>2</sup>, Niraj Kumar Srivastava<sup>3</sup>, Abhishek Dwivedi<sup>2</sup>

## Learning Point of the Article:

Recurrent soft-tissue swelling after limb surgery should arise the suspicion of arterial pseudoaneurysm.

## Abstract

**Introduction:** Arterial pseudoaneurysm is a hematoma that is formed after damage to the arterial wall. We report a rare case of peroneal artery pseudoaneurysm after open reduction and internal fixation with interlocking nailing and partial fibulectomy for non-union for the right tibia in a 31-year-old male. The patient presented with a bleeding sinus over the leg swelling, and it was managed with an exploration of the pseudoaneurysm and ligation of the peroneal artery.

**Case Report:** A 30-year-old male patient presented with a non-union tibia on the right side and had undergone plating of the tibia at another institute for a fracture of both bone legs approximately 18 months ago. The revision surgery was performed in which a previously inserted implant was removed and an interlocking nail was inserted, along with a partial fibulectomy. The post-operative period was uneventful. At 8 weeks after the second surgery, the patient came with a complaint of swelling at the outer aspect of the right leg. Computed tomography and angiography confirmed a peroneal artery pseudoaneurysm of 3.2 × 2.8 × 3.8 cm. Pseudoaneurysm was explored, and the artery was overrun with a Figure-8 stitches using a monofilamentous, and non-absorbable suture.

**Conclusion:** This case report highlights the occurrence of pseudoaneurysm after an orthopaedic procedure such as a partial fibulectomy. A high level of clinical suspicion, proper imaging, and early endovascular or surgical intervention is recommended to prevent complications.

**Keywords:** Pseudoaneurysm, peroneal artery, partial fibulectomy.

## Introduction

Arterial pseudoaneurysm is a hematoma that is formed after damage to the arterial wall. The covering of pseudoaneurysm does not include all three layers of the arterial wall; instead, it is formed by the clotting products and surrounding tissue. Arterial pseudoaneurysm is formed either after trauma or infection. Trauma, either blunt or penetrating, may cause damage to the arterial wall and contribute to the formation of pseudoaneurysms [1,2]. Peroneal artery pseudoaneurysm is a

rare entity. We report a rare case of peroneal artery pseudoaneurysm after open reduction, internal fixation with interlocking nailing, and partial fibulectomy for non-union of right, tibia in a 31-year-old male. The patient presented with a bleeding sinus over the leg swelling, and it was managed with an exploration of the pseudoaneurysm and ligation of the peroneal artery.

## Case Report

The patient, a healthy male in his early thirties, sustained a

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## Author's Photo Gallery



Dr. Sankalp



Dr. Gaurav Kumar Upadhyaya



Dr. Pulkesh Singh



Dr. Sanjay Singh Rawat



Dr. Niraj Kumar Srivastava



Dr. Abhishek Dwivedi

<sup>1</sup>Department of Cardiothoracic and Vascular Surgery, AIIMS, Raebareli, Uttar Pradesh, India,

<sup>2</sup>Department of Orthopaedics, AIIMS, Raebareli, Uttar Pradesh, India,

<sup>3</sup>Department of General Surgery, AIIMS, Raebareli, Uttar Pradesh, India.

**Address of Correspondence:**

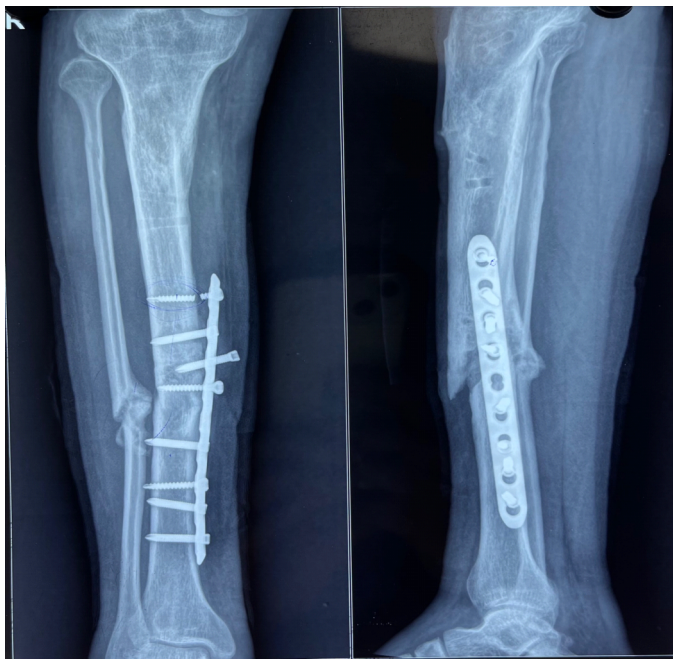
Dr. Gaurav Kumar Upadhyaya,  
Department of Orthopaedics, AIIMS, Raebareli, Uttar Pradesh, India.

E-mail: drgkupadhyaya@yahoo.co.in

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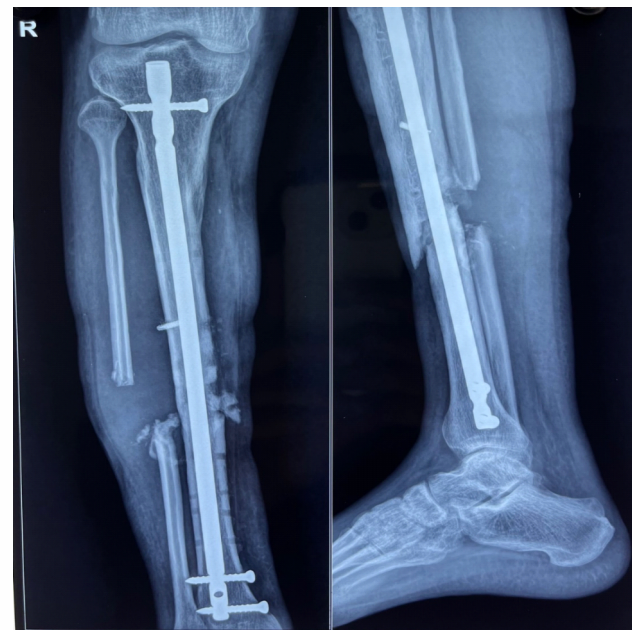
**Figure 1:** Pre-operative anteroposterior and lateral radiograph of the right leg showing Non-union tibia with plate and broken screw in situ (marked by arrow)



**Figure 2:** Post-operative anteroposterior and lateral radiograph of the right leg showing Interlocking nail with partial fibulectomy along with broken screw in proximal fragment.

fracture of the right tibia and fibula, for which he underwent plating of the tibia at another institute. Following the non-union of the tibia, he sought a second opinion with us approximately 18 months after his index surgery. Radiographs confirmed the diagnosis of non-union of the right tibia with the plate in situ (Fig. 1). The revision surgery was performed, in which plate and

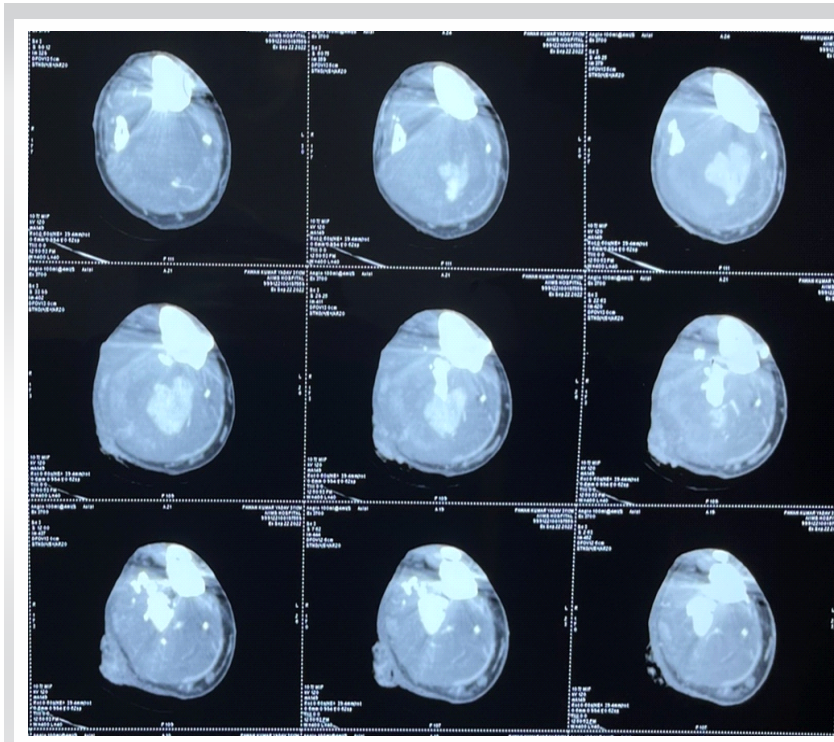
screws were removed from the medial approach. One screw was found broken in the proximal fragment. An attempt was made to remove the broken screw, but it could not be removed. A longitudinal lateral incision was made along the fibular shaft at mid-leg level. Soft-tissue dissection was done. The fibula was exposed, and a partial fibulectomy with the removal of approximately 1.5 cm of fibula was performed. Antegrade insertion of an interlocking nail was performed after reaming, followed by proximal and distal locking (Fig. 2). The post-operative period was uneventful. The patient was discharged after 7 days, and stitches were removed after 2 weeks.



**Figure 3:** Follow-up anteroposterior and lateral radiograph of the right leg at 8 weeks showing soft-tissue swelling (marked by arrow) at outer aspect of leg with interlocking nail in situ.

At 8 weeks after the second surgery, the patient came with a complaint of swelling at the outer aspect of the right leg (Fig. 3). On examination, there was fullness at the outer aspect of the mid-leg, which was warm, tender, and fluctuant. The swelling was non-pulsatile. The foot was warm, distal pulses were palpable, and there was no neurological deficit. There was no history of fever. A clinical diagnosis of an abscess was made. 20 mL of serosanguinous fluid was aspirated and sent for culture. The patient was prescribed anti-inflammatory medications and antibiotics. The culture was sterile.

The patient again presented after 1 month with a discharging sinus at the site of aspiration. Around 30 mL of serosanguinous fluid was aspirated, and a sample for Gram stain and culture sensitivity was sent. A compression bandage was applied. Swelling subsided with repeat aspiration and a compression



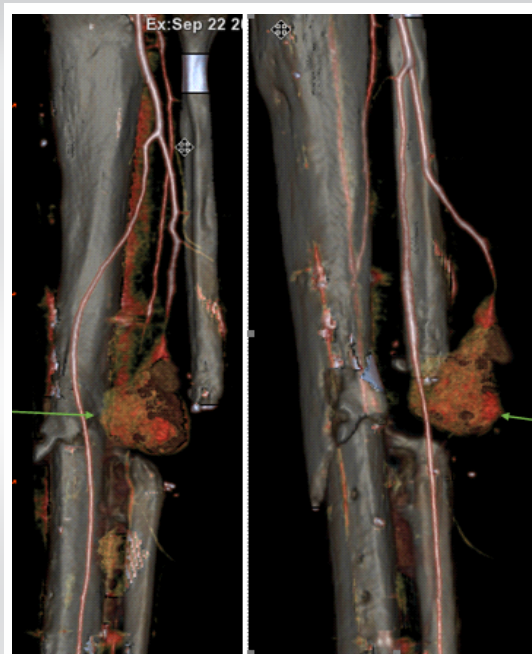
**Figure 4:** Axial sections of computed tomography angiography of the right leg showing pseudoaneurysm arising from peroneal artery (marked by arrow).

bandage. Culture reported methicillin-resistant coagulase-negative Staphylococci sensitive to linezolid. Antibiotics were started according to the culture and sensitivity report. The patient presented again after a gap of 1 week with a complaint of blood loss through the sinus after a walk of approximately 1 km.

A Doppler study was advised, and it showed a hematoma of 10 × 5 cm in size with a peroneal artery pseudoaneurysm of 4 × 3 × 3 cm in size. Computed tomography (CT) angiography further delineated the peroneal artery pseudoaneurysm of 3.2 × 2.8 × 3.8 cm, approximately 17 cm distal to the knee joint (Fig. 4 and 5). Patient's hemoglobin was 7.4 g%. It may be assumed that bleeding pseudoaneurysms will cause anemia. Two units of packed red blood cells were transfused. The patient was optimized, and pseudoaneurysm was explored under tourniquet control. A large pseudoaneurysm was noted, with layered clots and a 0.5 cm rent in the wall of the peroneal artery. Clots were evacuated. Due to the friable nature of the tissues around the peroneal artery opening, the artery was overrun with a Figure-8 stitch, using monofilamentous non-absorbable suture. The cavity was thoroughly irrigated and packed. The pack was removed on the 2nd post-operative day. Secondary closure was performed after 4 days. Sutures were removed after 14 days. Tibia is united at 1-year follow-up, and the patient is asymptomatic now at 1-year follow-up (Figs. 6 and 7). In this case report, it is postulated that the peroneal artery was partially injured during a partial fibulectomy, either by drill bit or osteotome. The injury may have caused the artery to go into spasm, due to which it went unrecognized during surgery and formed a pseudoaneurysm in due course of time.



**Figure 5:** Coronal section of computed tomography angiography of the right leg showing pseudoaneurysm arising from peroneal artery.



**Figure 6:** (a and b) three-dimensional reconstruction view of computed tomography angiography of the right leg showing pseudoaneurysm arising from peroneal artery (marked by arrow).

### Review of Literature

On searching the English literature, 16 cases of traumatic pseudoaneurysm of the peroneal artery or perforating branches of the peroneal artery have been reported. However, only eight case reports out of those have proposed the cause of pseudoaneurysm of the peroneal artery or perforating branch of the peroneal artery as an iatrogenic injury during surgery [3, 4, 5, 6, 7, 8, 9, 10] Table 1.

Pseudoaneurysm of the peroneal artery is a rare entity. Pseudoaneurysm covering does not have all three layers of the arterial wall as found in true aneurysm. This makes the aneurysm sac weaker and



**Figure 7:** Follow-up radiograph at 1-year follow-up showing tibia union with interlocking nail in situ.

prone to rupture. Aneurysms connect to the parent artery through a narrow opening. The diameter of this opening is small as compared to the aneurysm sac. Blood enters the aneurysm sac during systole and leaves the sac during diastole. However, when emptying of the sac is incomplete, it leads to the expansion of aneurysm and complications of bleeding. This may occur when an intimal flap tear acts as a valve, preventing the complete emptying of the aneurysm sac during diastole [1].

Traumatic pseudoaneurysms are the most common. It can be either a blunt or penetrating injury. Penetrating trauma in the form of injury by intravenous drug abuse, vascular interventions, fracture ends, or orthopedic surgical interventions including manipulation of fractures, drill bits, osteotomes, or screws is the reasons for the pathogenesis of pseudoaneurysm [4, 11, 12].

Traumatic arterial pseudoaneurysm has a male preponderance. The most common clinical presentation is painful swelling followed by pulsatile mass and painful pulsatile mass. The clinical presentation may vary with the location and size of the pseudoaneurysm as well as the presence of surrounding structures. The median time delay in the clinical presentation is

S. No.	Author/year	Age/sex	Diagnosis	Surgery	Delay in presentation	Treatment
1	Kasai et al./2022	64 year/Male	Osteoarthritis right ankle	Ankle arthrodesis	7-week post-operative	Endovascular coil embolization
2	Pathinathan et al./2021	27 year/Male	Compound fracture left tibia and fibula	External fixator	6-month post-operative	Ligation of peroneal artery proximally and distally
3	Ileperuma and Hewavithana /2019	22 year/Female	Compound fracture right tibia	External fixator	45-day post-operative	Proximal ligation of pseudoaneurysm
4	Kosmidis et al./2016	65 year/Female	Fracture right bimalleolar ankle	ORIF with plating and 2 cancellous screws	4-week post-operative	Ultrasound-guided percutaneous thrombin injection
5	Sala et al./2013	19 year/Male	Compound fracture tibia	Initially external fixator followed by taylor spatial frame application with osteotomy and partial fibulectomy	N/A	Embolization using glue (N-butyl-2-cyanoacrylate)
6	Henton and Dabis/2006	71 year/Male	Fracture left calcaneum	ORIF with plating	24-day post-operative	Proximal ligation of artery
7	Kurian et al./2003	51 year/Male	Fracture right bimalleolar	ORIF with plating and screws	6-week post-operative	Endovascular coil embolization
8	Pai/1999	51 year/Female	Fracture left lateral malleolus and posterior malleolus	ORIF with plating	9-week post-operative	Repair of arterial defect with sac excision
9	This case/2023	31 year/Male	Non-union right tibia with plate in situ	Implant removal with ORIF with I/L nail and bone grafting and partial fibulectomy	8-week post-operative	Ligation of peroneal artery proximally and distally
<b>ORIF: Open reduction internal fixation</b>						

**Table 1: Review of various case reports of Peroneal artery pseudoaneurysm.**



30 days. Accompanying clinical findings may include systolic bruit, thrill, and ecchymosis. Approximately 20% of the patients may have complications such as nerve palsy, compartment syndrome, and rupture [4, 11]. In this case, it is also reported that the location of aneurysms in close proximity may cause pressure necrosis on the surrounding skin and can lead to infection and sinus formation. In cases of secondary infection of pseudoaneurysm, staphylococcus aureus is the most common organism to colonize the wound, followed by Escherichia coli and Pseudomonas [12]. Recurrent bleeding in the pseudoaneurysm may also lead to anemia, as reported in this case report.

### Discussion

Doppler ultrasound, arteriography, CT angiography, and magnetic resonance imaging (MRI) can be used for diagnosing pseudoaneurysm. The Doppler study is the first line investigation to be performed for confirming the diagnosis. It has the advantage of being inexpensive, radiation-free, quick, portable, and non-invasive. However, the disadvantage is that it is operator-dependent and cannot provide three-dimensional images for assessment. CT angiography provides more information about the pseudoaneurysm but carries the risk of high radiation doses. Arteriography is an invasive investigation but has the advantage of being therapeutic in performing endovascular procedures. MRI is also an excellent investigation in providing the required anatomical details but is costly, time-consuming, and difficult to perform in the presence of metallic implants [4, 11, 12].

Various treatment modalities have been described in the literature, ranging from conservative ultrasound-guided thrombin injection to endovascular procedures such as coil/glue embolization or intraluminal stent placement, ligation of the artery, arterial repair, and arterial reconstruction [4, 6, 9, 11, 12, 13]. As the pseudoaneurysm is usually full of layers of clots, the size of the true cavity is often grossly underestimated on color on Doppler and angiograms. Open surgery provides the benefit of clot evacuation and the management of elements of local infection (if any) over endovascular procedures. Surgery for distal pseudoaneurysms carries low morbidity and mortality while remaining simple, expeditious, and curative. Pseudoaneurysms of vessels that may require laparotomy or thoracotomy or in moribund patients may benefit more from endovascular interventions.

### Conclusion

This case report highlights the occurrence of a pseudoaneurysm after an orthopedic procedure such as a partial fibulectomy. Delayed presentation and non-specific complaints make it challenging to diagnose. A high level of clinical suspicion, proper imaging, and early endovascular or surgical intervention is recommended to prevent complications.

### Clinical Message

It is that high index of suspicion is required for the diagnosis of arterial pseudoaneurysm of peroneal artery after surgery involving the leg.

**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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