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A Rare Injury to Superior Gluteal Artery Following Intramedullary Nailing for Trochanteric Fracture

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Abstract

Introduction: Vascular injury after proximal femoral fracture fixation is uncommon, and Superior Gluteal Artery (SGA) involvement is extremely rare. We report a case of SGA pseudoaneurysm following intramedullary nailing to highlight the diagnostic and management challenges of this life-threatening complication.

Case Presentation: A 68-year-old male developed persistent anemia following Gamma nail fixation for a trochanteric fracture. CT angiography revealed a 2cm SGA pseudoaneurysm, initially treated with percutaneous thrombin injection. Due to recurrence, a second procedure on POD29 combined thrombin with percutaneous microcoil embolization, achieving technical success. Despite hemoglobin stabilization, the patient had a complicated course and succumbed to cardiac arrest on POD36.

Conclusion: SGA pseudoaneurysm is a rare but critical complication. Its indolent presentation warrants a high index of suspicion for unexplained postoperative anemia, prompting prompt CT angiography. Vigilance for recurrence is essential even after a technically successful intervention.

Keywords: Aneurysm; False; Gluteal arteries; Fracture fixation; Intramedullary nail; Postoperative complications; Embolization

Introduction

The surgical treatment of trochanteric femoral fractures includes extramedullary devices, intramedullary nailing, and arthroplasty. Vascular injury following internal fixation of proximal femoral fractures is uncommon, with an overall incidence of 0.49% [1]. Most cases involved deep femoral artery and its perforating branch, followed by superficial femoral artery [1]. Superior gluteal artery (SGA) involvement is extremely rare, with only 5 previous case reports to our knowledge [2-6]. Types of vascular injury include restricted blood flow, intimal flap, arterial thrombosis or thromboembolism, active haemorrhage, pseudoaneurysm, or arteriovenous fistula [1].

Here, we report a rare case of pseudoaneurysm of the superior gluteal artery (SGA) following intramedullary nailing for an intertrochanteric fracture. We highlight the difficulty in establishing the diagnosis particularly for pseudoaneurysm arising from SGA, and discuss management of pseudoaneurysm as well as its pitfalls.

Case Presentation

A 68-year-old Chinese male with a complex medical history including dermatomyositis (on prednisolone and azathioprine), previous nasopharyngeal carcinoma, impaired fasting glucose, chronic iron-deficiency anemia with baseline haemoglobin (Hb) level around 8 g/dL, and syncope with bradycardia (pacemaker refused), was admitted after a fall. He sustained multiple injuries: a left trochanteric femur fracture, fractures of the left 5th-9th ribs, and a left humeral neck fracture. Initial investigations revealed sinus bradycardia (38 beats per minute), Hb near baseline (7.9 g/dL), and acute kidney injury (creatinine elevated to 253 µmol/L from baseline of 140 µmol/L).

After medical optimization, including management of peri-operative Mobitz type 2 block requiring temporary pacing, the patient underwent closed reduction and internal fixation of the left hip intertrochanteric fracture using a Gamma nail on June 25, 2021, 10 days after admission (Figure 1). Positioned supine on a traction table, closed reduction was achieved under image intensification. A lateral surgical approach was utilized. Following guidewire insertion and opening of the proximal femur, the intramedullary canal was reamed to 13.5mm. A Gamma 3 nail (11mm x 360mm) was then inserted. A 90mm lag screw was placed into the femoral head, followed by distal static locking with two 5.0mm locking bolts, which were secured using a T25 star driver. After thorough irrigation and ensuring hemostasis, the wounds were closed in layers using Vicryl sutures, Ethilon sutures, and skin staples.

In the immediate post-operative period, a significant hemoglobin drop was noted (nadir 3.7 g/dL on POD1), requiring blood transfusions. His subsequent presentation became more indolent, characterized by a slow, persistent downward drift of hemoglobin necessitating transfusions every 1-2 days, without clear hemodynamic instability. Prompted by this ongoing anaemia, a contrast-enhanced CT scan of the left femur performed on POD5 revealed a large intramuscular hematoma (15.9 x 12.3 x 22.8 cm) in the left buttock, deep to the gluteus maximus and extending into the pelvis and posterior thigh. Within the hematoma, a 2 x 1.6 cm pseudoaneurysm was identified, suspected to originate from branches of the superior gluteal artery (SGA) (Figure 2). Ultrasound on the same day identified the corresponding pseudoaneurysm (Figure 3a). Given the narrow neck of the pseudoaneurysm, we opted for direct percutaneous injection of more than 2000 units of thrombin under ultrasound guidance, which successfully obliterated the pseudoaneurysm (Figure 3b). A follow-up ultrasound 2 days later confirmed thrombosis of the pseudoaneurysm with no residual Doppler flow, although a residual hematoma was still noted (Figure 3c). Following this initial intervention, the patient's hemoglobin stabilized around his baseline of 8 g/dL, and the frequent need for transfusions ceased.

The patient's subsequent hospital course, however, was complicated by intermittent fevers, elevated inflammatory markers (peak C-reactive protein 266 mg/L), necessitating broad-spectrum antibiotics (eventually Meropenem). He also experienced hypernatremia requiring fluid management adjustments.

Due to the slow resolution of inflammatory markers and persistent left hip and buttock swelling, a repeat CT was arranged on POD29, showing a reduction in the size of the buttock hematoma (12.2 x 6.5 x 7.7 cm), but crucially, it revealed a persistent/recurrent 2.3 x 2.2 cm pseudoaneurysm within the hematoma, again arising from a branch of the left SGA (Figure 4). On the same day, the pseudoaneurysm was obliterated using a combination of >3500 IU of thrombin injection. Eight microcoils were further inserted percutaneously under ultrasound-guidance with the intent to enhance thrombotic effect. The coils used were three MWCE-35-3-4 coils, two MWCE-35-7-8-Nester coils, one MWCE-35-7-10-Nester coil, and two MWCE-35-7-12-Nester coils. Post-procedure ultrasound showed stasis of flow (Figure 5).

After this second intervention, Hb remained static near baseline. Unfortunately, the patient had a complicated hospital course with comorbidities and succumbed on POD36 after a sudden cardiac arrest.

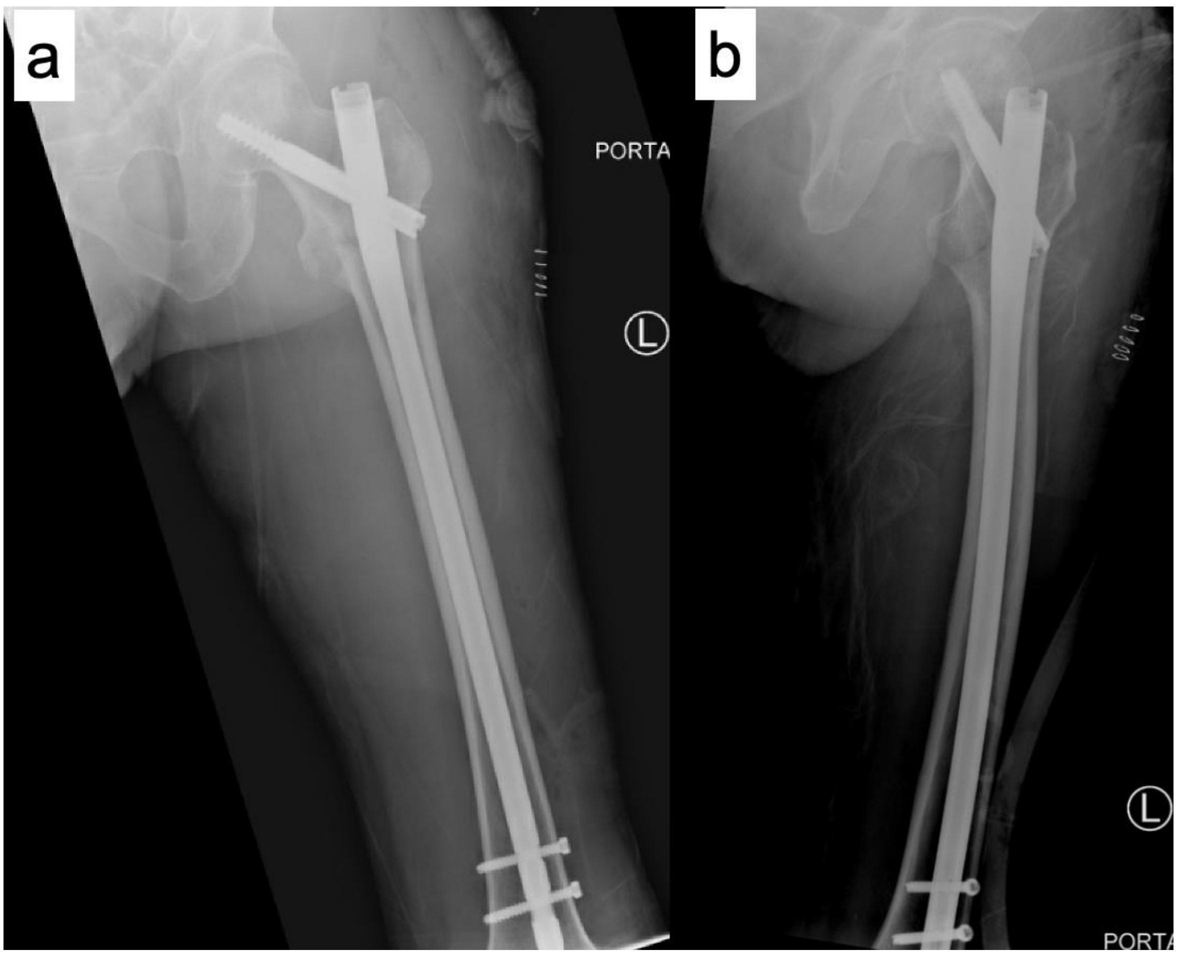

Figure 1: Post-operative radiographs showing left intertrochanteric fracture with gamma nail in-situ. (a) frontal projection and (b) lateral projection.

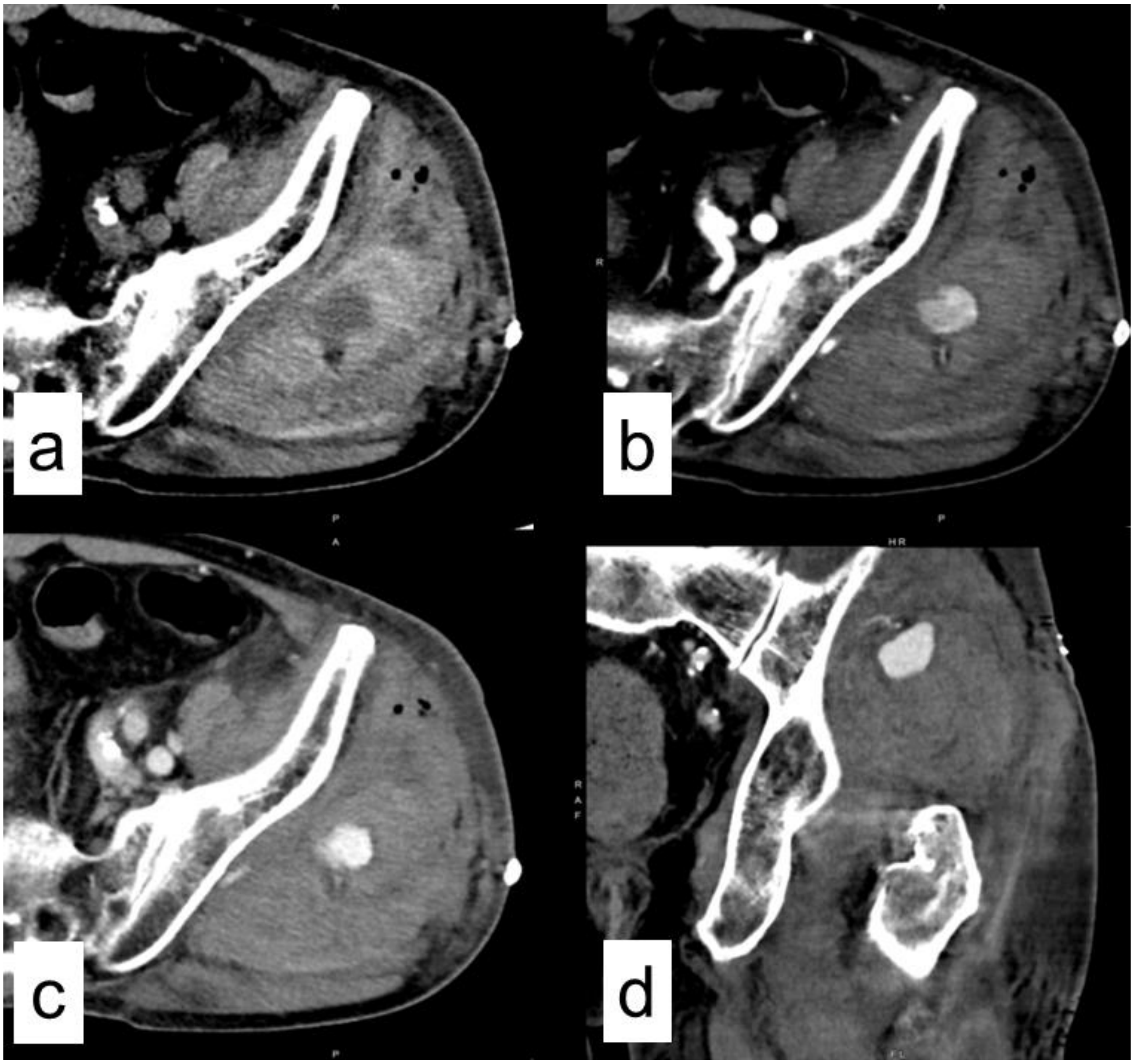

Figure 2: Initial CT showing the pseudoaneurysm likely arising from SGA. (a) pre-contrast axial slice, (b) arterial phase axial slice, (c) venous phase axial slice, (d) venous phase coronal slice. No further contrast extravasation in the venous or delayed phases.

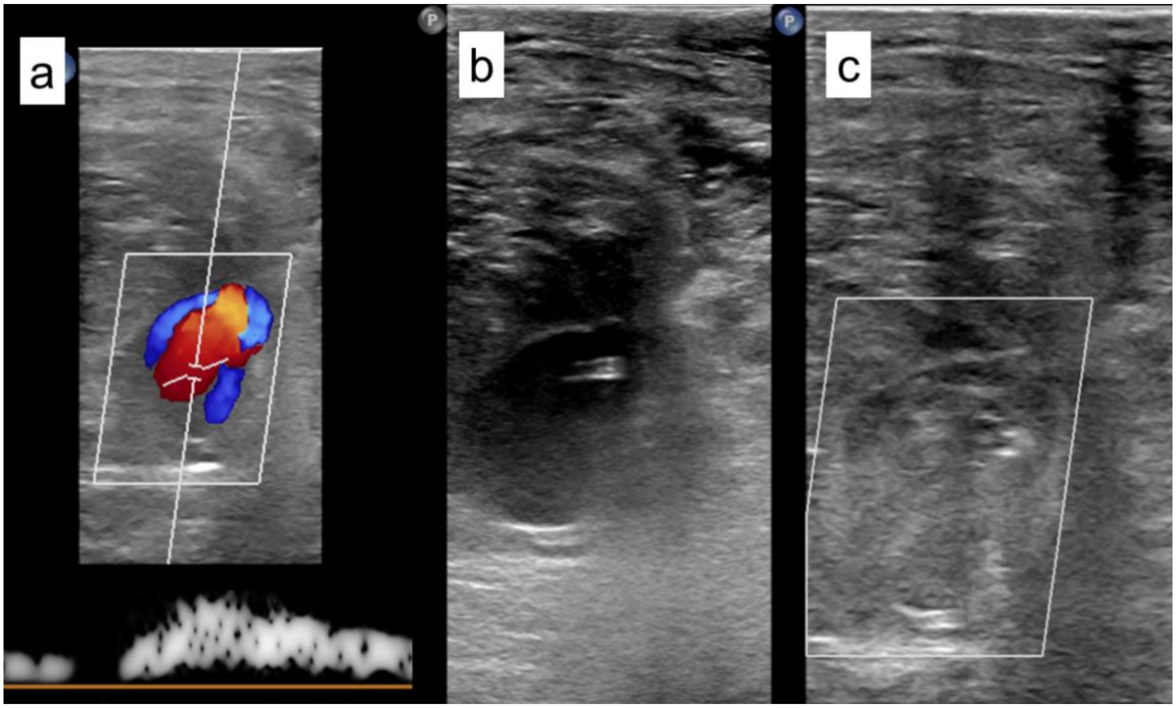

Figure 3: (a) First ultrasound showing the pseudoaneurysm with turbulent doppler flow demonstrating "yin-yang" sign. (b) Ultrasound-guided thrombin injection. (c) Thrombosed pseudoaneurysm with no residual flow afterwards.

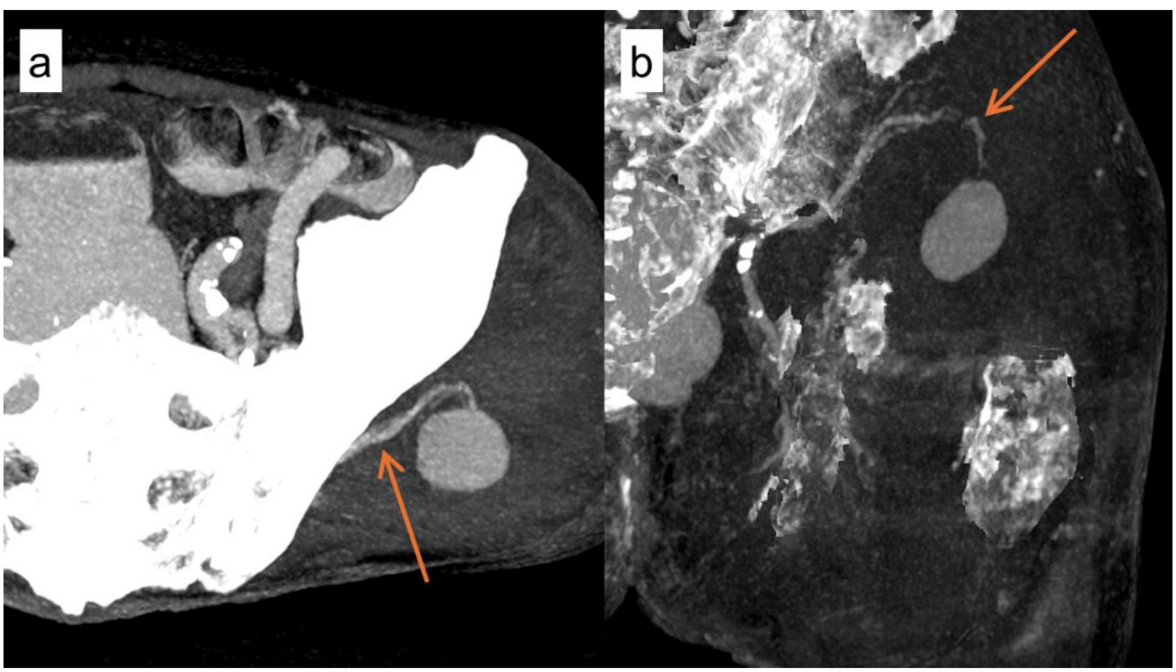

Figure 4: Maximum intensity projection (MIP) of the follow up CT in arterial phase, showing recurrence of pseudoaneurysm, this time showing its origin from SGA branch (arrow). (a) axial slice, (b) coronal slice. No definite extravasation was demonstrated in subsequent phases

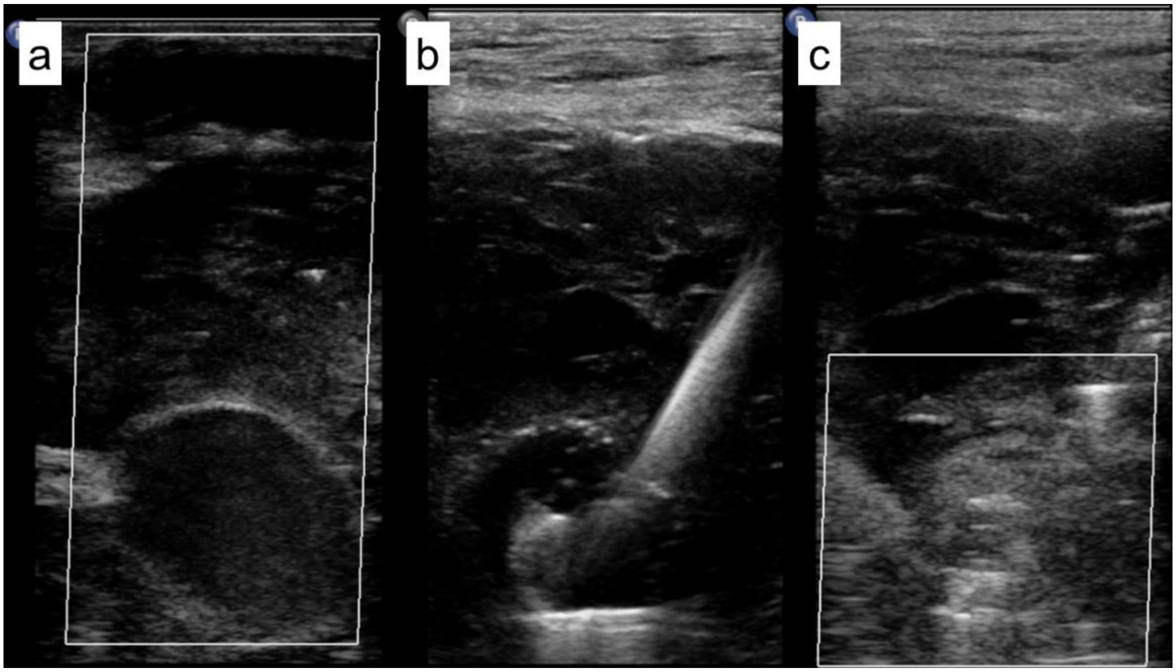

Figure 5: Repeat ultrasound showing (a) Thrombosed pseudoaneurysm after repeat thrombin injection. (b) Further percutaneous insertions of coils. (c) Absent doppler flow after procedure.

Discussion

SGA injury is a rare but potentially life-threatening complication following hip fracture surgery. The intramedullary nail insertion site is closely related to SGA or its branches, and therefore various sequential steps within the nailing procedure are considered potential causes of SGA injury, which includes guidewire insertion, reaming and insertion of the intramedullary nail itself. Other proposed mechanisms include use of retractors, and scalpel use in proximal incision [2-6]. In contrast, the more commonly reported deep femoral artery injuries are often described as resulting from direct penetration by a drill, retractor, or screw due to proximity. Revision surgery is a risk factor for SGA injury [3]. Proposed ways to avoid SGA injury includes caution with guidewire placement under fluoroscopy guidance and not overmedializing the starting point [5], and avoid incision positioned too anterior and proximal which may require excessive traction [2].

A notable feature of this case was the delayed and indolent presentation of the SGA pseudoaneurysm. The patient initially maintained relatively stable vital signs despite developing a sizable hematoma, with the diagnosis only confirmed via CT imaging prompted by a persistent hemoglobin drop refractory to transfusion on POD5. An important learning point is that vascular injury should be considered in any post-hip surgery patient with an unexplained or ongoing decrease in hemoglobin, even if overt signs of hemorrhage or hemodynamic instability are absent. The hematoma can be difficult to detect clinically even when it is sizable, potentially masked by typical post-operative swelling and tenderness in the hip and buttock region, and due to the fact that SGA runs deep in the gluteal muscle and buttock region.

The imaging findings provided further insight into the nature of the bleeding. In both the initial and follow-up CT studies, a pseudoaneurysm was identified within the large hematoma. However, neither scan demonstrated active contrast extravasation beyond the confines of the pseudoaneurysm itself, on venous and delayed phases. This lack of frank extravasation likely indicates that the bleeding was either occurring at a very slow rate or was intermittent, consistent with the relatively stable clinical picture observed initially and during the period of recurrence.

Furthermore, this case demonstrates the potential for delayed recurrence after initial treatment of pseudoaneurysm, occurring nearly four weeks after initial successful intervention. While some pseudoaneurysms present acutely, delayed manifestations or recurrences days to weeks later have been reported [2,7,8]. Potential mechanisms include the gradual expansion of an initially small contained injury, or later lysis or dislodgement of the initial thrombus plug that had temporarily sealed the arterial defect [2,3]. The recurrence in this patient necessitated a second percutaneous embolization using thrombin and coils.

There are a few ways of treating pseudoaneurysms [9]. Ultrasound-guided compression may be initially considered but often has limited efficacy if the pseudoaneurysm is large (e.g. over 2cm), and pressure can only be adequately applied if the pseudoaneurysm is superficially located. Ultrasound-guided percutaneous thrombin injection has a high technical success rate, but could be relatively contraindicated if the pseudoaneurysm has a large neck size (e.g. more than 1cm) due to risk of peripheral embolization via the parent artery [10]. If treatment by thrombin injection is unsuccessful or contraindicated, endovascular treatments including embolization of the pseudoaneurysm such as by coils or glue, or stent placements in the supplying artery, can be attempted, although these are more technically advanced, and catheterization may not be always possible. Finally, if these options have failed or are not suitable, surgical closure is a traditional and effective treatment, although having drawbacks such as requiring general anesthesia, and associated with more complications such as infection or nerve damage.

In our case, the initial management of the 2cm pseudoaneurysm, which demonstrated a narrow neck on imaging, was direct percutaneous thrombin injection, a choice well-suited to these anatomical features. However, upon its recurrence, a more definitive therapeutic strategy was required. Therefore, the second intervention combined thrombin injection with the percutaneous placement of microcoils to provide a durable mechanical occlusion and mitigate the risk of further recurrence. The decision to use a direct percutaneous route, rather than a more conventional endovascular approach, was made due to the patient's severe femoral atherosclerosis and vessel tortuosity, which would have made selective catheterization of the SGA difficult and high-risk. This direct access technique is well-described in the literature as a safe and effective alternative in various pseudoaneurysms [11,12]. Both interventions achieved immediate technical success.
The patient's eventual death from cardiac arrest, though not directly related to the embolization or pseudoaneurysm, highlights the high risks when managing surgical complications in patients with multiple comorbidities.

Conclusion

SGA injury following intramedullary nailing is very rare but life-threatening. This case highlights several pitfalls of such a vascular injury. The presentation of vascular injury could be delayed and indolent, necessitating high index of suspicion when encountering ongoing unexplained anemia, with potentially masked local swelling or tenderness. Prompt recognition and investigation with CT angiography are essential. Despite initial technical success from an interventional procedure treating the pseudoaneurysm, the patient should still be closely monitored due to the chance of recurrence.

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