

Successful Endovascular Repair of a Rare Delayed Axillary Artery Pseudoaneurysm after Humeral Fracture

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Axillary artery pseudoaneurysms following proximal humeral fractures are rare, particularly in elderly patients after low-energy trauma, and may present in a delayed manner, posing diagnostic challenges. We report a 76-year-old woman with a displaced proximal humeral fracture who returned four days later with severe anemia and extensive shoulder ecchymosis. Computed tomography angiography revealed a 35 × 20 mm axillary artery pseudoaneurysm within a large hematoma. The lesion was successfully excluded using a covered endovascular stent via femoral access, with post-procedure imaging confirming patency and complete pseudoaneurysm exclusion. The patient recovered uneventfully and was discharged two days later. This case highlights the need for high clinical vigilance in elderly patients and demonstrates that endovascular repair provides a safe, minimally invasive, and effective alternative to open surgery, expanding therapeutic options for combined orthopedic and vascular trauma.

Keywords: Axillary Artery Pseudoaneurysm; Proximal Humeral Fracture; Endovascular Repair; Covered Stent; Stent Graft; Traumatic Vascular Injury

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INTRODUCTION

Axillary artery injuries are uncommon but potentially limb- and life-threatening complications of upper extremity trauma, most often caused by penetrating injuries, shoulder dislocations, or high-energy blunt trauma [1,2]. Occurrence after proximal humeral fractures is rare, with few cases reported [2,3]. Displaced fractures can cause intimal injury, rupture, or delayed pseudoaneurysm formation, even when distal pulses are preserved [2–4]. Proximal humeral fractures account for 4–6% of adult fractures, particularly in elderly osteoporotic patients after low-energy falls [5]. Delayed pseudoaneurysm may present with swelling, pain, anemia,

or neurologic deficits from brachial plexus compression, making early diagnosis challenging [3,6]. Computed tomography angiography (CTA) is essential when vascular injury is suspected. Open surgical repair has been the standard, but it is technically demanding and associated with morbidity in frail patients [1,4]. Endovascular repair using covered stents has emerged as a minimally invasive alternative, allowing rapid exclusion while preserving arterial patency and reducing perioperative risk [1,6,7]. Although several reports describe axillary artery pseudoaneurysms after proximal humeral fractures managed with covered stents [6,8–13], most involve high-energy trauma, very small or giant pseudoaneurysms, or early presentation. Few reports describe moderate-sized pseudoaneurysms developing four days after low-energy fractures in elderly patients, highlighting a gap in the literature regarding diagnosis and endovascular management. We report a 76-year-old woman who developed a 35 × 20 mm axillary artery pseudoaneurysm four days after a displaced proximal humeral fracture, successfully treated with a covered stent. This case illustrates diagnostic challenges, technical considerations, and the expanding role of minimally invasive endovascular management in elderly patients with combined orthopedic and vascular trauma.

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This case report has been prepared in accordance with the CARE (CAse REport) guidelines.

CASE PRESENTATION

A 76-year-old woman with a history of structural heart disease, permanent pacemaker implantation for third-degree atrioventricular block, Parkinson's disease, and senile dementia presented to the Emergency Department at Cardarelli Hospital following a domestic trauma involving the left shoulder. Plain radiography demonstrated a complex, displaced, and angulated comminuted fracture of the humeral head and neck with involvement of the proximal humeral shaft. Temporary external immobilization was applied. However, the patient left the hospital against medical advice at the request of her relatives. Four days later, she returned to the Emergency Department owing to severe anemia, with a serum hemoglobin level of 5.7 g/dL at admission, and extensive ecchymosis involving the left shoulder and ipsilateral pectoral region. CTA revealed, in addition to the known fractures, a large hematoma measuring 105 × 100 mm extending into the deltoid, axillary, and pectoral regions

(Figure 1). Within the hematoma, a sizable pseudoaneurysm (35 × 20 mm) arising from the left axillary artery was identified. Following multidisciplinary discussion and considering the patient's significant comorbidities, a minimally invasive endovascular approach was deemed the most appropriate therapeutic option. The patient was transferred to the angiography suite, where selective catheterization of the left subclavian artery was performed via a standard right common femoral arterial access. Digital subtraction angiography confirmed the computed tomography (CT) findings, demonstrating a large pseudoaneurysm originating from the left axillary artery (Figure 2). A 6 Fr, 90-cm-long sheath was advanced into the left subclavian artery. Over a 0.018-inch guidewire, a 6 × 100 mm self-expanding covered stent was deployed within the left axillary artery, successfully excluding the pseudoaneurysm (Figure 3). Post-deployment remodeling was performed using a 6 × 80 mm balloon catheter to optimize stent apposition. After blood transfusion, the patient showed progressive improvement in hemoglobin levels. Follow-up CTA performed the day after the endovascular procedure confirmed correct stent patency and complete exclusion of the pseudoaneurysm from the

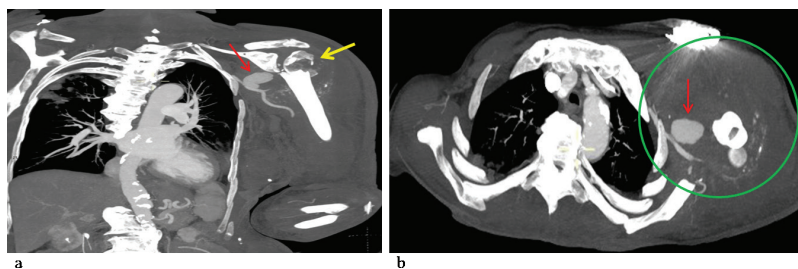


Figure 1 Computed tomography (CT) scan. CT scans in (a) coronal and (b) axial maximum intensity projection reconstruction showing the presence of complex, displaced, and angulated fracture of the humeral head and neck (yellow arrow), with involvement of the proximal humeral shaft, and a large hematoma (green circle) measuring 105 × 100 mm, extending into the deltoid, axillary, and pectoral regions. Within the hematoma, a sizable pseudoaneurysm (35 × 20 mm) (red arrows), arising from the left axillary artery is seen.

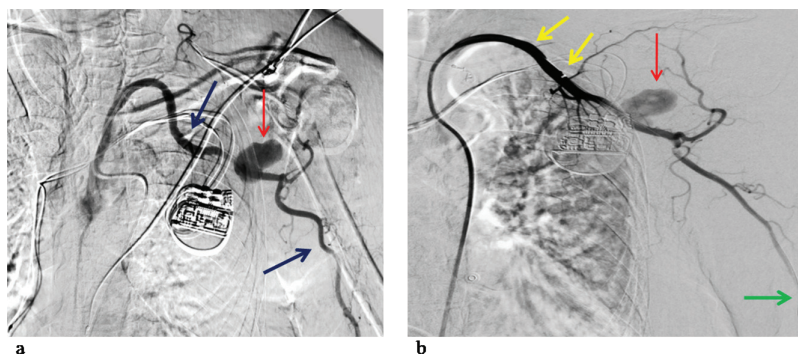


Figure 2 Digital Subtraction Angiography. (a) Selective catheterization of the left subclavian artery, and (b) 6 Fr, 90-cm-long sheath advanced into the left subclavian artery (yellow arrows) over a 0.018-inch guidewire (green arrow), showing a large pseudoaneurysm (red arrows) originating from the left axillary artery (blue arrows).

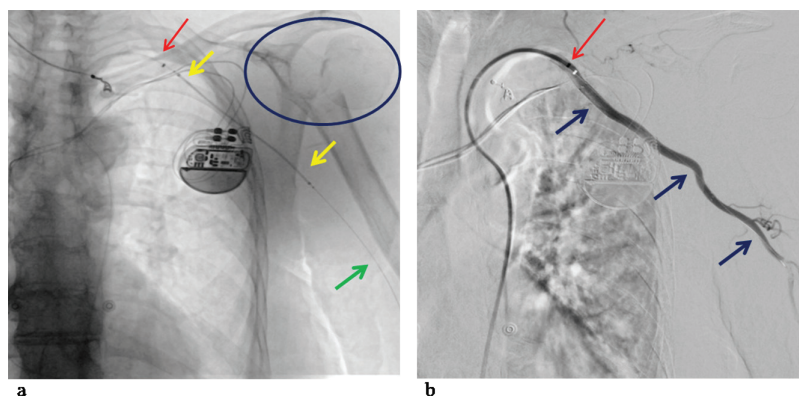


Figure 3 Digital Subtraction Angiography. A 6 Fr, 90-cm-long sheath was advanced into the left subclavian artery (red arrows). (a) Over a 0.018-inch guidewire (green arrow), a 6 × 100 mm self-expanding covered stent (yellow arrows) was deployed within the left axillary artery. The blue circle highlights the complex, displaced, and angulated fracture of the humeral head and neck. (b) The stent successfully excluded the pseudoaneurysm and preserved the flow in the lumen of the main arterial axis (blue arrows).

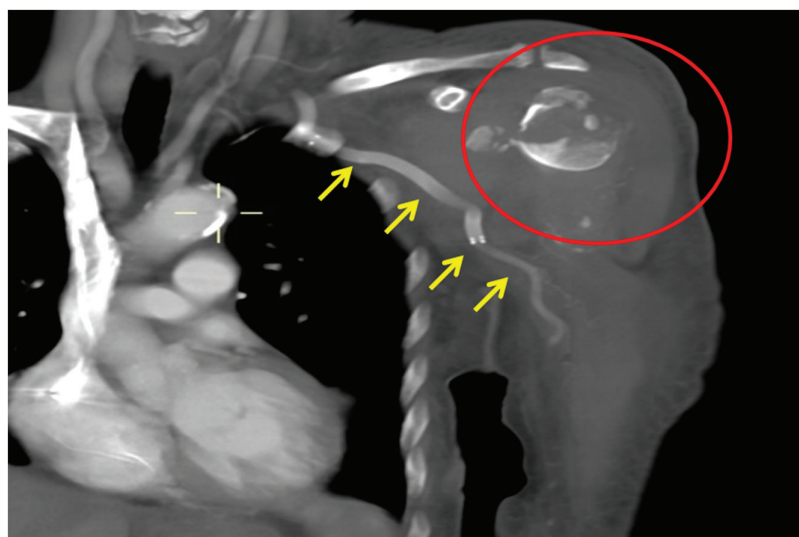


Figure 4 Computed tomography (CT) scan. A follow-up CT scan after the endovascular procedure showing in coronal maximum intensity projection reconstruction patency of the self-expanding covered stent and of the downstream brachial artery (yellow arrows). The large hematoma and the complex, displaced, and angulated fracture of the humeral head and neck is still visible (red circle).

arterial circulation (Figure 4). The patient was discharged two days after covered stent implantation. The patient did not receive additional post-stent antiplatelet or anticoagulant therapy because she was already on chronic anticoagulation and antiplatelet treatment for her underlying cardiac disease and pacemaker.

Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not required. The information has been anonymized.

DISCUSSION

Axillary artery injury associated with proximal humeral fractures is rare but potentially life-threatening. Although proximal humeral fractures are common in elderly osteoporotic patients [5], concomitant vascular lesions remain infrequent, reported mostly in case reports and small series [2,3]. When present, they may lead to massive hemorrhage, pseudoaneurysm formation, limb ischemia, or delayed clinical deterioration. The mechanism of injury differs from penetrating trauma. Displaced or sharp fracture fragments can directly lacerate or shear

the arterial wall, particularly at the third portion of the axillary artery, which is relatively fixed by surrounding structures [2,3]. Previous reports have described pseudoaneurysm formation from bone spicules causing partial wall disruption [2,3,6]. Our case illustrates a similar pathophysiology, with comminuted fracture fragments inducing focal arterial injury, subsequently evolving into a 35 × 20 mm pseudoaneurysm within an extensive hematoma. Notably, unlike many published cases, this lesion developed weeks after low-energy trauma in an elderly patient, emphasizing delayed presentation as a key diagnostic challenge. Clinical features may be subtle. While classic “hard signs” may appear, elderly patients often present with progressive anemia, swelling, or ecchymosis [2,3]. Early recognition and systematic evaluation of suspected peripheral vascular injuries are crucial [14,15]. Non-invasive imaging techniques, including Doppler ultrasound, may also play an important role in the initial evaluation and follow-up of peripheral pseudoaneurysms [16]. CTA enables rapid diagnosis, lesion localization, hematoma assessment, and precise planning of endovascular repair. Traditionally, open repair has been standard, but surgical exposure can be challenging owing to deep location, proximity to the brachial plexus, and hematoma or fracture distortion [4]. Endovascular therapy has emerged as a minimally invasive alternative, showing high technical success and favorable outcomes with covered stent placement in axillosubclavian injuries [1,6–8]. Endovascular techniques are also increasingly used in the management of peripheral vascular complications and blowout syndromes, particularly in high-risk patients or advanced disease settings [17]. Comparative studies indicate reduced blood loss, shorter operative times, and lower physiologic stress in appropriately selected patients [1,8]. Long-term data support satisfactory patency of stent grafts in mobile arterial segments [7,9,10]. This case highlights several points: (1) fracture-induced pseudoaneurysms may evolve in a delayed manner, unlike penetrating injuries; (2) high clinical suspicion and early CTA are essential in displaced proximal humeral fractures with unexplained hematologic changes; (3) endovascular repair can be safe and effective in elderly, high-risk patients, avoiding extensive surgical dissection and preserving distal perfusion. A limitation is the lack of long-term follow-up, as the patient was lost to subsequent evaluation owing to comorbidities. Nonetheless, this report adds to the literature by describing delayed, moderate-sized axillary pseudoaneurysm after low-energy fracture successfully managed with a covered stent, filling a gap not well represented in prior case reports.

CONCLUSION

Delayed axillary artery pseudoaneurysms following low-energy proximal humeral fractures in elderly patients are rare and may be difficult to recognize.

Timely diagnosis with CTA enables effective intervention. Endovascular repair with covered stents offers a safe, minimally invasive alternative to open surgery, particularly in high-risk patients. Reporting such cases underscores the importance of clinical vigilance, raises awareness of delayed vascular complications, and supports endovascular strategies as a valuable option in managing combined orthopedic and vascular trauma.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Author Contributions

All the authors substantially contributed to the study and manuscript writing.

Data Availability

The data supporting the findings of this study are not publicly available due to patient privacy and ethical restrictions.

Declaration of the Use of Generative AI and AI-assisted technologies in the writing process

No generative AI or AI-assisted technologies were used during the writing process of this manuscript.

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