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Case report

ANTERIOR TIBIAL ARTERY PSEUDOANEURYSM SUBSEQUENT TO NEGLECTED TRIMALLEOLAR FRACTURE DISLOCATION

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Abstract

Introduction: Traumatic pseudoaneurysms of the distal tibial vessels are uncommon entity, particularly those involving anterior tibial artery (ATA) following ankle trauma. In this report we present a case of anterior tibial artery pseudoaneurysm developing subsequently to trimalleolar fracture dislocation.

Case report: A 74-year-old man presented to our clinic 72 hours after sustaining a low-energy supination-external rotation ankle injury. Initial radiographs revealed a trimalleolar fracture-dislocation, managed by closed reduction and splinting. Osteosynthesis was postponed due to severe swelling and fracture bullae. On the tenth day of hospitalization, a pulsatile soft tissue mass developed over the anterior distal tibiofibular region. Computed tomography angiography confirmed an anterior tibial artery pseudoaneurysm. Open reduction and internal fixation of the fracture were performed alongside open resection and ligation of the pseudoaneurysm through a separate incision. Postoperative recovery was uneventful, with negative pressure wound therapy applied to the anterior incision. Follow-up showed progressive healing, resolution of swelling, and preserved distal perfusion, with mild residual pain and slight range-of-motion limitation at three months.

Conclusion: Anterior tibial artery pseudoaneurysm is a rare but clinically significant complication of trimalleolar fracture–dislocation. Diagnosis may be delayed due to overlapping symptoms with routine post-traumatic swelling. Persistent or pulsatile ankle swelling following fracture should prompt vascular imaging. Accumulation of similar cases will aid in developing standardized management approaches for these uncommon vascular injuries associated with complex ankle fractures.

Keywords: anterior tibial artery, pseudoaneurysm, trimalleolar, fracture-dislocation, osteosynthesis

Introduction

Traumatic pseudoaneurysms of the distal tibial vessels are uncommon, particularly those involving the anterior tibial artery (ATA) following ankle trauma. Most reported ATA pseudoaneurysms arise from low-energy injuries or iatrogenic causes, whereas association with

trimalleolar fracture–dislocation is exceedingly rare. We present a case of anterior tibial artery pseudoaneurysm developing subsequent to a trimalleolar fracture–dislocation following low-energy ankle trauma.

Case report

A 74-year-old male was referred to our institution from a regional general hospital for further treatment of an ankle injury following low-energy trauma 72 hours post-injury.
The patient had already been evaluated, and standard two plain radiographs of the ankle revealed a trimalleolar fracture-dislocation. Closed reduction and splinting were done (Figure 1). The patient was hospitalized and osteosynthesis was planned, which was uneventful.



A) AP plane B) LL plane

Fig. 1. Initial two-plain radiography following closed reduction

The patient presented to our emergency department with below-knee backslab splint. The examination revealed a painful and extremely swollen ankle and foot, with confluent fracture bullae (Figure 2). The neurovascular status was not compromised. The injury had resulted from a simple fall from one step, a supination-external rotation injury.



Fig. 2. Confluent fracture bullae on clinical examination

The patient had no comorbidities. He had sustained an ankle sprain injury 15 years earlier, with no functional consequences and had usual daily activities.

Due to the poor local soft tissue status, osteosynthesis was postponed until soft tissue swelling and fracture bullae subsided. In the meantime, routine everyday wound management was provided.

On the tenth hospital day, a pulsatile soft-tissue mass was noted in the anterior distal tibiofibular syndesmosis region. The clinical suspicion of an anterior tibial artery pseudoaneurysm was confirmed with computed tomography angiography (CTA) (Figure 3).



Fig. 3. CTA of the lower extremity displaying pseudoaneurysm of the distal anterior tibial artery

Treatment

A treatment plan was made, consisting of open reduction and internal fixation of the fracture in a standard manner and open ligation and resection of the anterior tibial artery pseudoaneurysm. After careful preparation and induction of spinal anesthesia, the patient was placed in the supine position on a radiopaque table. Adequate preparation and draping followed by direct lateral approach to the lateral malleolus with anatomic plate osteosynthesis. Consequently, an open reduction of the medial malleolus with two cannulated screws was done. Due to the poor condition of the local soft tissue and anatomical location of the pseudoaneurysm, a decision was made intraoperatively to proceed with separate incision.



Fig. 4. Intraoperative local status depicting lateral and medial approach closure with anterior incision left for “per secundum” management

Meticulous soft tissue dissection approach with cautious pseudoaneurysm ligation and resection was performed followed by wound closure in layers for the medial and lateral

approach respectively with the anterior approach wound left for "per secundum" management with subsequent dressing (Figure 4). The bellow-knee backslab splint was later replaced with an articulated ankle joint orthosis in a neutral position. Postoperative roentgenography in anteroposterior and lateral views confirmed the reduction and stable internal fixation.

Follow-up and outcome

The patient was closely monitored in the outpatient clinic, with regular follow-up examinations and wound dressings using ALLEVYN from Smith & Nephew. On the tenth postoperative day, the sutures were removed from the medial and lateral approaches. PICO 7, a portable Smith & Nephew, single-use negative-pressure wound therapy (NPWT) device was applied to the anterior approach wound (Figure 5). At one month follow-up postoperatively, partial weight-bearing was advised. Within the next two weeks, full weight-bearing was permitted and discontinuation of NPWT. An intensive physiotherapy and rehabilitation were initiated. At two months postoperatively, the patient had a slightly reduced range of motion in the affected ankle with mild-to-moderate pain in correlation with the intensity of daily activities, which decreased to mild pain by the three--month follow-up.



Fig. 5. Tenth postoperative day follow-up. Smith & Nephew "ALLEVYN" wound dressing and PICO 7 portable, single-use negative pressure wound therapy (NPWT) device

Discussion

Trimalleolar fractures are relatively uncommon injuries which show a bimodal distribution, peaking in young, active male patients (15–24 years) due to high-energy trauma and in older females (75–84 years) due to low-energy fragility fractures. They represent approximately 7–11% of all ankle fractures[1,2].

Pseudoaneurysm, or false aneurysm, results from a full-thickness injury to the arterial wall, leading to extravasation of blood and formation of a fibrous capsule-encircled blood collection outside the lumen of the damaged vessel[3,4].

Aneurysms and traumatic pseudoaneurysms of the distal tibial vessels are rare clinical entities, particularly involving the anterior tibial artery (ATA) following trimalleolar fracture–dislocations. Most reported ATA pseudoaneurysms in the literature arise from low-energy inversion injuries, sports trauma, or iatrogenic damage during arthroscopy, arthrodesis, or internal fixation, rather than from high-energy ankle fracture–dislocations[5,6].

In a systematic review of 161 limb traumatic arterial pseudoaneurysms, Raherinantenaina *et al.* demonstrated that lower-limb lesions accounted for 57% of cases, with anterior tibial/dorsalis pedis artery involvement in approximately 8% and posterior tibial, peroneal, or plantar arteries in nearly 20% of cases[7]. Their series included injuries at all levels of the leg, with ankle-level ATA pseudoaneurysms forming only a small subset.

When the focus is narrowed to the ankle region, the systematic review by Karthigesu *et al*., of 23 reported ankle pseudoaneurysms published between 1966 and 2018 provides a clearer picture[8]. In this review, the ATA was the most commonly injured vessel (61%), followed by the posterior tibial and peroneal arteries. Almost all ATA pseudoaneurysms occurred following ankle arthroscopy (64%), other ankle surgery (including arthrodesis), or blunt trauma around the ankle. Bimalleolar fracture–dislocation as the primary precipitating event was extremely under-represented, with most fracture-related lesions involving tibial shaft or fibular fractures higher in the leg or occurring secondary to intramedullary nailing or screw placement[8-11].

Our case therefore adds to the limited body of evidence demonstrating that major ankle fractures and fracture-dislocations can directly injure the ATA and result in delayed pseudoaneurysm formation, even when initial neurovascular status is intact.

Across the broader limb trauma literature, delayed painful swelling and/or a pulsatile mass represent the dominant presentations of traumatic limb pseudoaneurysms[7]. In ankle-focused reviews and case reports, ankle pain, enlarging swelling, and occasionally discoloration or skin breakdown are similarly emphasized[6,8,12-14]. Marron *et al.,* described a professional footballer who developed an ATA pseudoaneurysm presenting with severe swelling and ulceration over the lateral malleolus following an apparently innocuous hyper-plantarflexion injury[6]. Pai reported a case of perforating peroneal artery pseudoaneurysm following ankle fracture fixation that presented several weeks after cast removal with a small pulsatile mass near the fibula[9].

Our patient's clinical course mirrors these observations, with an initial phase in which symptoms were attributed to expected post-fracture swelling, followed by persistence and progression of localized swelling and pain beyond the expected recovery period. As emphasized by Raherinantenaina *et al.,* and multiple ankle pseudoaneurysm case reports, this overlap with common post-traumatic findings frequently leads to delayed diagnosis[7,8,12,13].

In the ankle region specifically, additional diagnostic pitfalls exist. Pseudoaneurysms may be misdiagnosed as postoperative hematoma or seroma, infection or abscess (particularly in the presence of overlying erythema or ulceration), soft-tissue tumors, or synovial lesions, as documented in several cases initially labelled as aggressive soft-tissue masses around the leg and ankle[6,13,15].

Our case reinforces recommendations that any non-resolving localized swelling or pulsatile mass around the ankle following fracture, fracture–dislocation, or surgery should prompt vascular imaging, even when distal pulses and capillary refill remain normal[6,14].

In the broader limb trauma series reported by Raherinantenaina *et al.*, surgical repair accounted for 37% of treatments, endovascular procedures for 29%, and ligation for 26%, with overall low morbidity and mortality[7]. Endovascular embolization was generally preferred for pseudoaneurysms arising from small branches or non-critical vessels, whereas injuries involving major axial vessels were more commonly managed with open surgical repair[7].

The management strategy selected in our trimalleolar fracture-dislocation case-open excision of the pseudoaneurysm sac was dictated by the size of the lesion, progressive swelling with risk of skin compromise, proximity to fracture hardware and callus formation, and the technical challenges associated with endovascular access and durable stent placement. Adequate posterior tibial and plantar arch perfusion was demonstrated on pre-operative imaging and confirmed intra-operatively[16,17].

Conclusion

The main limitation of the present report is inherent to its nature as a single case: conclusions regarding incidence, risk factors, and comparative efficacy of different treatment modalities cannot be drawn. Significant ankle fractures and fracture-dislocations can produce

clinically important ATA pseudoaneurysms. Diagnosis is frequently delayed unless vascular injury is consciously considered. The accumulation of similar cases and structured reporting of long-term outcomes may help refine management algorithms for traumatic ankle pseudoaneurysms associated with complex fractures.

Conflict of interest statement. None declared.
Written consent of the patients was obtained.

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