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Case Report

Brachial artery thrombosis secondary to fixation screw pullout: Case report☆,☆☆

Griffin Harris, BS[a,*], *Nikhil Patel, BS*[a], *Daniel Quintero, BS/BA*[a], *Nathaniel Jenkins, MD*[b], *Lee Kaplan, MD*[c], *Jorge Rey, MD*[d], *Jean Jose, DO*[e]

[a] *University of Miami Leonard Miller School of Medicine, Miami, FL, USA*
[b] *Department of Orthopaedics, Miller School of Medicine, University of Miami, Miami, Florida*
[c] *UHealth Sports Medicine Institute, University of Miami Miller School of Medicine, FL*
[d] *University of Miami Miller School of Medicine, Department of Surgery, Division of Vascular and Endovascular Surgery*
[e] *University of Miami, Leonard Miller School of Medicine, Department of Radiology, Miami, FL, USA*

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ABSTRACT

The vascular supply of the shoulder and forearm are principal derivates of the ipsilateral subclavian artery. The trajectory of this arterial supply predisposes it to concomitant injuries in the shoulder and clavicular fractures proximally and elbow dislocation distally. Distal bicep tendon tears often occur most commonly in middle-aged men due to trauma to the elbow, typically in weight-bearing situations [1]. To our knowledge, this is the first case of distal biceps tendon tear repair resulting in distal brachial artery injury from displaced hardware due to postoperative re-injury. We present a case of a 41-year-old male who developed a vaso-occluding hematoma at the distal biceps secondary to a displaced fixation screw. The patient required emergency vascular surgery with embolectomy and arterial bypass. Although this patient fully recovered, the clinical course the patient experienced could have been minimized with appropriate postoperative care. This report aims to alert clinicians to the relevant local anatomy and relate it to the proposed mechanism of injury, thereby bringing attention to the importance of postoperative limb protection in at-risk patients. The timing of the injury, and the protracted rate of thrombus formation suggest that the brachial artery's thrombosis was associated with the screw pullout during reinjury of the area. Screw pullout in orthopedics is a rare phenomenon that can lead to significant complications. The risk of reinjury, screw pullout, and other complications such as thrombosis is evidence to support the careful treatment of the area postoperatively.

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* *Corresponding author.*
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Introduction

Distal biceps tendon tears often occur most commonly in middle-aged men due to trauma to the elbow, typically in weight-bearing situations [1]. Patients frequently present with diffuse elbow pain and may recall a "pop" during the inciting event [1,2]. Elbow hyperextension and open and closed fractures have also been identified as potential culprits in brachial artery rupture [3].

Common complications associated with distal biceps tendon repair surgery include infection of the wound site, nerve injury, heterotopic ossification, and rerupture [4]. With distal biceps tendon repairs using the endobutton fixation technique, fixation screw pullout is rarely observed [5]. The proximity of the brachial artery to the distal bicep tendon predisposes surgical repair to vascular complications, but this is also not a common occurrence.

In this case report, we present a patient who developed a vaso-occluding hematoma at the distal biceps secondary to a displaced fixation screw. After his initial repair, the patient experienced a high impact fall that resulted in the rerupture of his bicep tendon that required emergent vascular repair with embolectomy and arterial bypass. Imaging disclosed a fixation screw pullout that had a localized mass effect on the distal brachial artery. This report aims to alert clinicians to the relevant local anatomy and relate it to the proposed mechanism of injury, thereby bringing attention to the importance of postoperative limb protection in at-risk patients.

Case presentation

A 41-year-old Caucasian male presents to our clinic with concerns of right arm pain, swelling, and bloody drainage after undergoing revision surgery for a rerupture of the distal biceps tendon. The first of the two distal biceps tendon repair surgeries the patient underwent was due to a traumatic rupture of the tendon during in an underwater sports injury. The injury was repaired by our healthcare team using a fixation screw at the distal radial tuberosity (Fig. 1). The second week of the postoperative course was complicated by a fall from standing height onto the unprotected right arm, which resulted in distal rerupture of the biceps tendon. Preoperative (MRI) demonstrated pulling out of the fixation screw with localized mass effect onto the distal brachial artery (Fig. 2). There was no distal brachial artery occlusion at the time, and surgeons noted that appropriate hemostasis was achieved after cuff deflation. A focused musculoskeletal exam of the right upper extremity revealed: elbow edema and swelling at the biceps. There was notable watery-serosanguinous drainage from surgical incisions with mild swelling at the proximal forearm. There were no signs of crepitus, pus, soft tissue necrosis, or ulceration. The limb was neurovascularly intact with sensation to

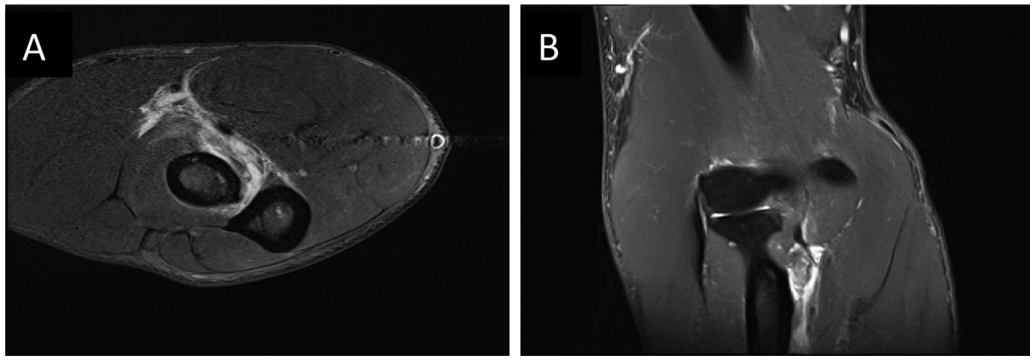

Fig. 1 – (A) Axial PD FS MRI and (B) coronal PD FS MRI showing complete full thickness tear of the biceps brachii tendon from its radial tuberosity insertion.

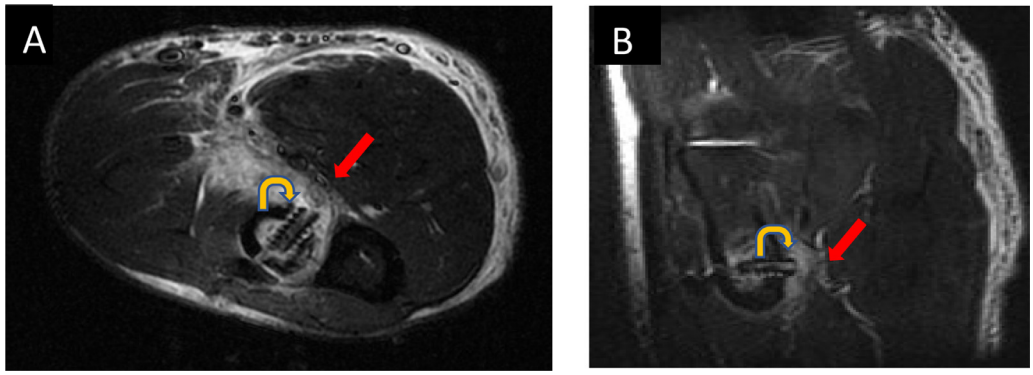

Fig. 2 – (A) Axial PD FS MRI and (B) coronal PD FS showing recurrent rupture of the biceps brachii tendon from its insertion with pullout of the fixation screw (curved yellow arrows), causing mass effect on the adjacent radial artery (red arrow).

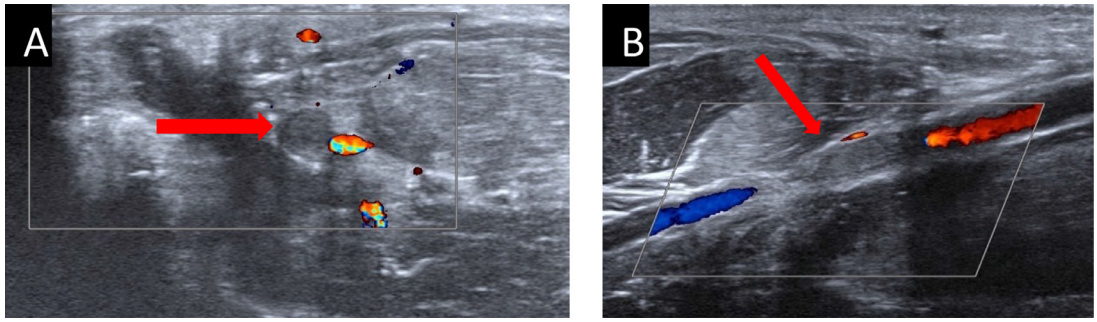

Fig. 3 – (A) Short axis and (B) long axis color Doppler US demonstrate a long segment of complete occlusive arterial thrombosis of the distal brachial artery and proximal radial artery, at the level of the operative bed (red arrows).

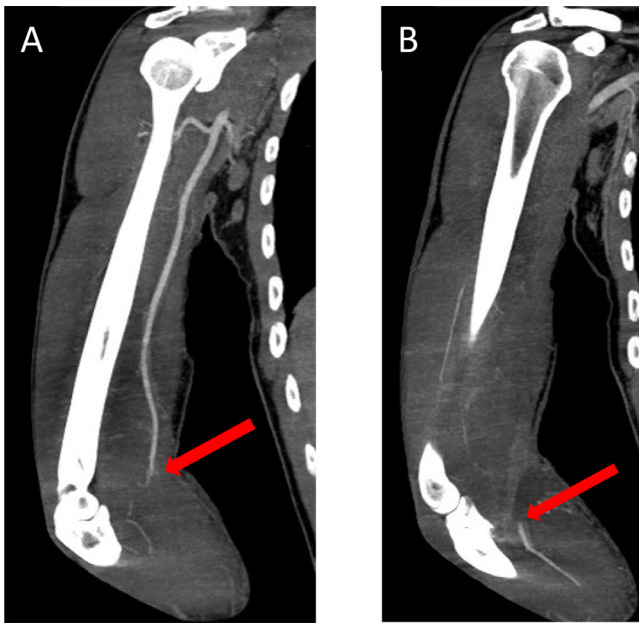

Fig. 4 – (A and B) Sequential coronal CT angiogram MIP reconstructions of the right upper extremity showing complete occlusion of the distal most segment of the brachial artery and proximal radial artery (red arrows) at the level of the radial tuberosity operative.

pinprick at all digits, forearm, with palpable radial and ulnar pulses distally. Additionally, there was a palpable tendon cord without biceps muscle belly retraction. Both upper extremities demonstrated unremarkable findings in passive and active range of motion testing.

At this point, our differential included hardware failure or infection, both requiring a prompt diagnosis with corrective surgical management. An ultrasound (U/S) with color Doppler was performed and demonstrated a 2.3 cm segment of the distal brachial artery and proximal radial artery at the level of the operative bed, which had complete occlusive arterial thrombosis. The proposed etiology for this acute occlusion were (1) mechanical dissection from hardware, (2) shearing damage from fibrotic tissue secondary to screw pullout, and (3) hardware infection. The patient was promptly referred for evaluation by vascular surgeons, who decided to conduct an emergent CT angiogram (Fig. 4), where immediate corrective surgery was indicated. The patient underwent embolectomy with an intraoperative collection for cultures of the distal brachial artery and radial artery. At 2 weeks, follow-up cultures were still negative, and the wound demonstrated healing with a 3-fold reduction of the wound across its largest diameter.

Discussion

After analysis of the case, we believe that the vascular injury was due to the screw-pullout mechanism that developed when the patient fell 2 weeks after the initial biceps repair surgery. Screw pullout is most often associated with pedicle screw fixation in spine procedures [6]. The length of the screw, diameter, threads, and insertion trajectories are carefully considered before insertion to minimize the chance of screw pullout [6]. This preparation makes screw pullout a relatively rare phenomenon, particularly in the case of a distal biceps repair surgery. Screw-pullout has rarely been associated with vascular injury. However, there are reports of other vascular injuries, primarily to the brachial artery [7]. In a study of 3091 primary distal bicep tendon repairs, 43 required a second surgery due to reinjury, 2 of which required further surgery due to rupture of the brachial artery [7]. Typically, complications that arise from distal biceps repair surgery include nerve damage, pain, radioulnar synostoses, and rerupture [8]. There are reports of distal biceps repair surgery with associated brachial artery rupture, but to our knowledge, there are no reports of ruptures due to screw pullout postoperatively.

Fig. 2 demonstrates the anterior pullout movement of the screw into the course of the proximal radial artery. Any possibility of a surgical technique complication was ruled out due to the lack of significant bleeding during the patients' second distal bicep tendon repair surgery. Therefore, it is likely that the patient's high impact fall may have created a small shear in the brachial artery from biotenodesis screw pullout leading to slow bleeding and scar tissue formation, furthering the damage to the area. Rupture of the artery should be addressed quickly with an associated Doppler ultrasound to confirm the lack of blood flow. There is an obstruction to blood

flow, as highlighted by the long-axis view of Fig. 3. In general, untreated artery lacerations can lead to severe complications of aneurysms, dissections, and fistulas. Therefore, these injuries must be treated quickly [9]. It is suspected that the combination of trauma and screw pullout led to the formation of a thrombosis, as seen in Fig. 4, thus requiring immediate vascular surgery. Although literature has stated the effectiveness of the Biotenodesis screw in its ability to repair bicep tendon ruptures [5], no evidence has been found regarding the impact of trauma on a patient's injury and the rerupture potential in repair surgeries using this screw type.

Conclusion

With this case, we provide a potential consideration for postoperative imaging and immobilization in select patients who underwent biceps tendon repair surgery. In the setting of possible screw pull out, the surgeon needs to be aware of the associated complication of distal brachial artery injury and evaluate accordingly with Doppler US. Routine MRI of the elbow without IV contrast tailored to evaluate the degree of tendon rupture will not identify vascular occlusion. CTA or MRA in these cases should be considered. Furthermore, it was evident that the injury after the first distal biceps repair occurred while the patient was not wearing the brace that he was told to wear in the recovery stage. This accident may have been avoided with casting, which points to the need for proper patient education about the importance of protecting the surgical site postoperatively. We believe patients who are at risk for poor bracing compliance should be casted for 4 to 6 weeks to avoid reinjury and potential vascular complications as seen in this case. Poor compliance with bracing may be commonplace after this procedure because the surgery immediately corrects the problem, so patients may feel like they have renewed their previous ROM and strength. Patients need to be reminded that this area is vulnerable to rerupture [10]. To avoid complications such as this one in the future, patients need to be educated about their condition and the complications that may arise.

Patient consent

Written informed consent for publication was obtained from the patient.

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