Distal biceps brachii tendon rupture is an uncommon injury. Compartment syndrome of the upper arm is rarely described in the literature. The diagnosis of upper arm compartment syndrome requires a high index of suspicion, and emergent surgical treatment with fasciotomy in the acute setting is necessary to avoid devastating neurovascular complications. This article reports a case of acute compartment syndrome of the anterior compartment of the upper arm after a complete rupture of the distal biceps brachii tendon.

A healthy 45-year-old man presented with increasing arm pain; paresthesia in the lateral antebrachial cutaneous nerve distribution; and a tense, swollen anterior compartment of his upper arm. Side port catheter absolute pressure measurement was 83 mm Hg with a diastolic blood pressure of 92 mm Hg. The patient underwent an emergent fasciotomy and was found to have a complete rupture of his distal biceps brachii tendon. He subsequently underwent distal biceps tendon repair and delayed primary closure of his incision. Postoperatively, his paresthesia improved and he has no neurological deficit.

There is a paucity of case reports describing compartment syndrome after rupture of either the proximal or distal end of the biceps brachii tendon, and none of the reports describe compartment syndrome of the upper arm after rupture of the distal biceps tendon. This article highlights an unusual complication of an uncommon injury and reviews diagnostic and treatment principles for the management of acute compartment syndrome of the upper arm.

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Distal biceps brachii tendon ruptures are uncommon injuries with an annual incidence of 1.2 ruptures per 100,000 patients. The typical presentation occurs after eccentric contraction of the biceps tendon, most commonly in middle-aged men. Compartment syndrome of the upper arm is rarely described in the literature. None of the reports describe compartment syndrome of the anterior compartment of the upper arm after rupture of the distal biceps tendon. The diagnosis of upper arm compartment syndrome requires a high index of suspicion. Emergent surgical treatment with fasciotomy in the acute setting is necessary to avoid neurovascular complications.

CASE REPORT
A healthy 45-year-old man presented to the emergency department with severe, increasing pain in the anterior aspect of his right upper arm 10 hours after sustaining an eccentric load to his biceps brachii while lifting a heavy appliance. The patient also reported paresthesia in the lateral antebrachial cutaneous nerve distribution of the forearm. The patient had no history of bleeding disorders and was not taking any anticoagulants.

On examination, the patient kept his arm in slight flexion, and he had significant pain with attempted passive range of motion of the elbow. The anterior compartment of his upper arm was swollen and firm. The remaining compartments in the involved extremity were soft and compressible. His vascular examination revealed palpable radial and ulnar arterial pulses equal to his contralateral extremity. Orthogonal radiographs of his humerus were negative for fracture.

A side port catheter was used to measure the compartment pressure of the anterior compartment of his upper arm. The absolute pressure was 83 mm Hg, and his diastolic blood pressure was 92 mm Hg. The patient underwent emergent fasciotomy due to suspected acute compartment syndrome of the anterior compartment of the upper arm.

During surgery, a 12-cm incision was made over the anterior aspect of the humerus. The anterior compartment was tense, and herniation of the muscle through the fascia was noted. The biceps was edematous, and the muscle within the compartment was visible. Approximately 200 mL of blood was evacuated from the interval between the biceps brachii and the brachialis muscle; there was no evidence of vascular insult. A complete rupture of the distal biceps brachii tendon was found (Figure 1). A negative pressure wound therapy device was placed over the wound to avoid undue skin tension from primary closure. Postoperatively, the patient reported significant pain relief and some improvement of his paresthesia in the lateral antebrachial cutaneous nerve distribution. Orthogonal radiographs of his humerus showed a complete rupture of the distal biceps brachii tendon repair using a cortical Endobutton (Smith & Nephew, Memphis, Tennessee) with high-strength suture fixation.

Two weeks postoperatively, the splint was removed. His incisions were healing well without drainage. At his 6-week follow-up appointment, the patient remained neurovascularly intact and the paresthesia in the lateral antebrachial cutaneous nerve distribution had improved significantly.

DISCUSSION
The incidence of acute compartment syndrome of the upper arm is poorly defined and rarely reported in the literature. McQueen and Gaston reviewed 164 cases of both upper and lower extremity compartment syndrome; they found that 69% were associated with fracture, while 23.2% were associated with soft-tissue injury. One patient (0.6%) in their series developed compartment syndrome of the upper arm after sustaining a humerus shaft fracture. Duckworth et al reviewed compartment syndrome of the forearm in 29 patients and similarly found that 69% of cases were associated with fracture while 31% were associated with soft-tissue injury.

In addition to trauma, previous case reports have identified pneumatic tourniquet compression, noninvasive blood pressure monitoring, extravasation of intravenous
fluid in a patient with hemophilia, and muscle contusion during athletic competition as causes of upper arm compartment syndrome.7-10 Holland et al10 reported a case of a high school athlete who sustained a contusion of the anterior compartment of the upper arm that resulted in acute compartment syndrome. Unlike the current case, however, their patient did not sustain a distal biceps tendon rupture.

Reports of compartment syndrome after biceps brachii rupture are rare in the literature. Only 2 cases of compartment syndrome that involve rupture of either the proximal or the distal ends of the biceps brachii tendon have been reported in the literature. Richards and Moss11 reported a patient who developed acute compartment syndrome of the upper arm after partial rupture of the long head of the biceps tendon. A supratherapeutic international normalized ratio (INR) while the patient was on warfarin therapy was noted to be a contributing factor in the development of compartment syndrome.11 In the current case, the patient was not on anticoagulation therapy, had an INR of 1.17, and had no personal or family history of coagulopathy. In the report by Foxworthy and Kinninmonth,12 a woman developed forearm compartment syndrome with median nerve compression following a partial rupture of her distal biceps tendon. In contrast to the current case, the anterior compartment of the upper arm was uninjured in their patient.

The diagnosis of acute compartment syndrome of the upper arm requires a high index of suspicion. Physical examination alone can be unreliable in diagnosing acute compartment syndrome.13 McQueen et al14 found that in tibia shaft fractures, intracompartamental pressure monitoring has a high sensitivity and specificity. There is a paucity of literature pertaining to compartment pressure measurement in the upper arm. Although the values for intracompartamental pressure monitoring are derived mostly from animal models or tibia shaft fractures in humans,15-19 it is reasonable to extrapolate this data for application in the upper arm.

A combination of physical examination findings and accurate compartment pressure measurement can aid in the diagnosis of upper arm compartment syndrome. In a prospective series of 116 patients, McQueen et al19 found no adverse sequelae of compartment syndrome after a minimum of 6 months of follow-up when a ΔP<30 mm Hg was used as a threshold for fasciotomy in patients with tibia shaft fractures (ΔP=diastolic blood pressure−intracompartmental pressure). For the current patient, the ΔP=9 and his absolute anterior arm compartment pressure was 83 mm Hg.

**Conclusion**

Compartment syndrome of the upper arm following rupture of the biceps tendon is rare. This article describes a case of acute upper arm compartment syndrome involving the anterior compartment following complete rupture of the distal biceps brachii tendon in a patient without coagulopathy. Clinicians must maintain a high index of suspicion to make a prompt and accurate diagnosis. Emergent fasciotomy is required when there is concern for acute compartment syndrome of the upper arm to avoid neurovascular complications and poor functional outcomes.

**References**