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# Visual Diagnosis in Emergency Medicine

## ULTRASOUND DIAGNOSIS OF TRAUMATIC PARTIAL TRICEPS TENDON TEAR IN THE EMERGENCY DEPARTMENT

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### INTRODUCTION

Triceps tendon rupture is a rare injury that is uncommonly reported in the medical literature (1,2). Anzel et al. reviewed 1014 tendon ruptures, of which < 1% involved injury to the triceps tendon (2). Given the rare nature of this injury, misdiagnosis and underestimation of the degree of injury can lead to increased patient morbidity (3–6).

### CASE REPORT

A 20-year-old man was a restrained front-seat passenger involved in a rollover motor vehicle accident that included a secondary impact with a tree. On arrival to the emergency department (ED), the patient was noted to be clinically intoxicated. He was complaining of pain in multiple areas including the face, neck, abdomen, and right upper extremity. The patient denied any past medical history, surgical history, illegal drugs, or current prescription medications. A full review of systems was negative for any significant findings.

Primary and secondary surveys were both normal except for obvious swelling of the elbow and proximal forearm. Motor strength of the right upper extremity was severely limited by pain on both passive and active range of motion. No motor or sensory deficits were noted distal to the elbow in the right upper extremity.

Initial trauma X-ray and computed tomography scans were negative for any injury. Mild to moderate soft-tissue swelling was noted on X-ray scans of the right elbow with no intra-articular effusion (Figure 1A). Laboratory data were insignificant, other than a blood alcohol level of 325 mg/dL. A bedside ultrasound examination (SonoSite Titan™; SonoSite Inc., Bothell, WA) of the right upper extremity in the transverse and longitudinal plains demonstrated a partial intratendinous triceps tendon rupture (Figure 1C).

#### *Procedure*

When imaged in a longitudinal plane, a normal tendon will appear on ultrasound as multiple hyperechoic lines in a tightly packed fibrillar arrangement. These hyperechoic lines correspond to the interfaces between connective tissue bundles within the tendon's structure (Figure 1B) (7). In the transverse plane, the tendon will appear as a homogenous structure composed of multiple

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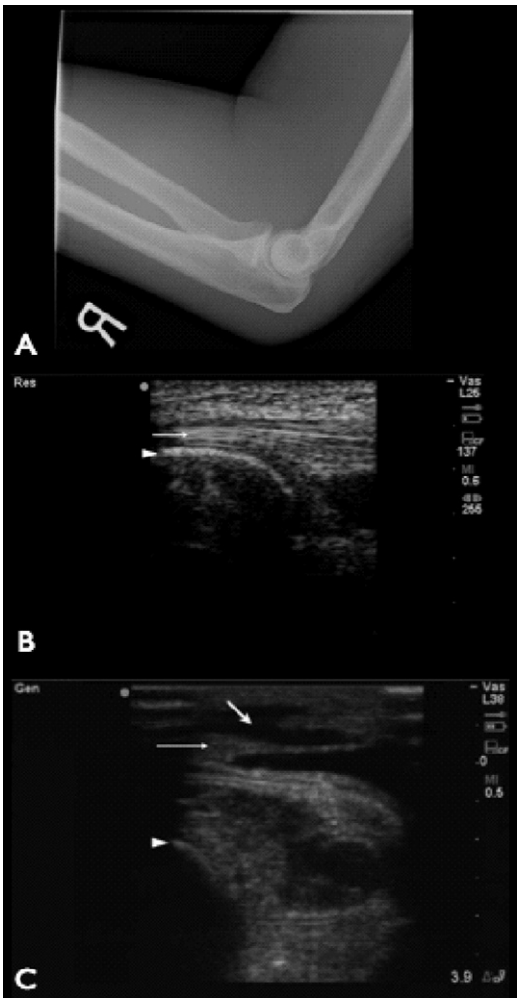


**Figure 1. (A) Lateral elbow x-ray study demonstrating no fracture of joint effusion. (B) Ultrasound image in longitudinal orientation at distal humerus showing distal triceps tendon (thin arrow); olecranon cortex (arrowhead). (C) Ultrasound image in longitudinal orientation at distal humerus showing distal triceps tendon (thin arrow); anaechoic area (thick arrow) demonstrating lack of tendon continuity; olecranon cortex (arrowhead).**

hyperechoic dots (7). The apparent echogenicity of a tendon will depend on the ultrasound beam's angle of incidence with the tendon. If the angle of incidence is perpendicular to the tendon, the tendon will appear hyperechoic; whereas if the ultrasound waves hit at an angle that is not perpendicular, the tendon will appear more hypoechoic (7). This phenomenon, "anisotropy," can confound the ultrasound examination of a tendon if the images are not obtained with the probe at a 90° angle to the tendon.

In evaluating this patient, we followed the procedure for imaging the triceps tendon previously explained in the case report by Kaempffe and Lerner in 1996 (8). A 7–10 MHZ (Sonosite Titan™) linear transducer was initially placed over the uninjured contralateral triceps tendon to determine normal fibrillar tendon architecture. The probe was then placed over the distal posterior aspect of the humerus on the injured extremity. First, complete imaging of the entire triceps tendon was performed in the longitudinal plane with respect to the humerus. The probe was moved distally until the insertion of the triceps tendon onto the olecranon was visualized. Any disruption in the normal fibrillar pattern or change in the echogenicity of the tendon was noted.

This procedure was then repeated with the probe oriented in the transverse plane with respect to the humerus. As in the longitudinal view, a complete visualization of the tendon was performed, with focused attention to the area of insertion of the triceps tendon on the olecranon. Once a complete examination of the injured triceps tendon was performed, detailed imaging of the actual torn segment of the tendon was performed in the longitudinal and transverse planes. If the contralateral tendon is uninjured it should be used for comparison if abnormal areas are found.

## DISCUSSION

The mechanism of injury for a triceps tendon tear is most commonly an acute deceleration injury on an outstretched arm. These patients are usually in moderate-to-severe discomfort and have significant swelling and limited range of motion, making physical examination and diagnosis difficult. The diagnostic modality most commonly used to diagnose tendon injury is magnetic resonance imaging, which is not routinely available in most EDs. Failure to diagnose a traumatic triceps tendon injury may lead to a delay in treatment and increase in complications. The orthopedic literature demonstrates the benefit of close follow-up and, if indicated, early surgical intervention. This may allow for more simplified surgical procedures and improved clinical outcomes (6).

Without the availability of bedside ultrasound, the rapid and definitive determination of a ruptured triceps tendon would have been far more difficult to confirm given the patient's clinical intoxication and poor cooperation with the physical examination. Available data from case reports and case series indicate that this may be another useful indication for the ultrasound-trained emergency physician.

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## SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at doi: 10.1016/j.jemermed.2008.03.047.

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