

# Conservative Treatment of an Acute Traumatic Extensor Carpi Ulnaris Tendon Subluxation in a Collegiate Basketball Player: A Case Report

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**Objective:** To present the case of an acute traumatic extensor carpi ulnaris (ECU) subluxation in a National Collegiate Athletic Association Division II female basketball player.

**Background:** The ECU tendon is stabilized in the ulnar groove by a subsheath located inferior to the extensor retinaculum. The subsheath can be injured with forced supination, ulnar deviation, and wrist flexion, resulting in the ECU tendon subluxing in the palmar and ulnar directions during wrist circumduction. Several methods of intervention exist, but controversy remains on how to best treat this condition.

**Differential Diagnosis:** Distal ulnar fracture, ulnar collateral ligament sprain, triangular fibrocartilage complex lesion, lunotriquetral instability, distal radioulnar joint injury, pisotriquetral joint injury, ECU tendinopathy or subluxation.

**Treatment:** The wrist was placed in a short-arm cast in slight extension and radial deviation for 4 weeks. At that time,

the patient was still able to actively sublux the ECU tendon, so a long-arm cast was applied with the wrist in slight extension, radial deviation, and pronation for an additional 4 weeks. The ECU tendon was then found to be stable. She wore a rigid wrist brace for 3 more weeks while she pursued rehabilitation. At the final follow-up appointment, the ECU tendon remained stable, and the wrist was asymptomatic.

**Uniqueness:** Subluxations of the ECU are rare. If the patient does not improve with conservative measures, surgical intervention is warranted to repair the sixth dorsal compartment.

**Conclusions:** A long-arm cast with the elbow flexed to 90° and the wrist in approximately 30° of extension, radial deviation, and pronation was appropriate treatment for this type of injury.

**Key Words:** wrist, injury management, athletic injuries

Ulnar-sided wrist pain is a common complaint among athletes that can result from either acute or chronic injury mechanisms. Numerous complex structures can be damaged, contributing to the enigmatic nature of this problem. Possible sources for ulnar-sided wrist pain include triangular fibrocartilage complex injury, lunotriquetral instability, distal radioulnar joint injury, extensor carpi ulnaris (ECU) injury, flexor carpi ulnaris tendinopathy, and pisotriquetral joint injury.<sup>1</sup> Therefore, it is critical for the clinician to understand the anatomy of this region.

The anatomy of the sixth dorsal or extensor compartment is complex, consisting of a fibro-osseous tunnel between the caputulum and the styloid process of the ulna.<sup>2-4</sup> The ECU tendon is situated in this groove and is held in place by a subsheath, which lies inferior to the extensor retinaculum.<sup>3,5,6</sup> The extensor retinaculum attaches to the pisiform and triquetrum and therefore has no direct attachment to the ulna and so does not play a role in stabilizing the ECU.<sup>3</sup> As the ECU tendon passes through the sixth dorsal compartment to its attachment at the base of the fifth metacarpal, an ulnarly directed obtuse angle is formed, resulting in translational stress with muscular contraction.<sup>7</sup> Disruption or attenuation of the subsheath is caused by supination, ulnar deviation, and flexion as the angle becomes more acute, placing increased stress on the restraining subsheath.<sup>2,4-12</sup> Once the subsheath is damaged, the ECU tendon can sublux and slide under the intact extensor retinaculum.<sup>3</sup> Further wrist complica-

tions can occur because an intact ECU tendon and subsheath also play a role in stabilizing the distal radioulnar joint.<sup>3</sup>

Traumatic injuries to the ECU resulting in dislocation or subluxation are rare in the literature.<sup>9,11</sup> However, they may be more common than originally suspected because they are often misdiagnosed, resulting in habitual subluxation and delayed treatment.<sup>5,10,12</sup> Controversy exists as to whether to treat ECU instability conservatively or surgically.<sup>4-6,9,10-12</sup> If a prompt and accurate clinical diagnosis is made, then proper treatment can be administered, which may obviate surgical measures. Therefore, our purpose is to present a case of acute traumatic ECU subluxation and the conservative treatment that was used to return this athlete to activity.

## CASE HISTORY

A 23-year-old, right-hand dominant National Collegiate Athletic Association Division II women's basketball player presented to the athletic training facility 2 days after injuring her right wrist during practice. The patient had ulnar-sided wrist pain and "popping" with circumduction of the wrist. The injury was attributed to a rebounding drill during which she was undercut by an opponent. In an attempt to brace against the subsequent fall, she twisted her wrist, but the exact position of the wrist at the time of injury was unknown. No abnormal snap or pop was noted at the time of injury, and the patient

was able to finish the practice and participate in the next day's practice.

At the initial evaluation, she had exquisite tenderness over the distal ulna, specifically with palpation over the ulnar groove and the ECU tendon. The triangular fibrocartilage complex, pisiform, and radial side of the wrist were nontender. Hand and finger function was normal, and the circulatory, motor, and sensory systems were intact. Active range of motion at the wrist and fingers was full and pain free except for pain with ulnar deviation. Passive range of motion was also full and pain free, and no strength deficits were noted. The patient could actively sublux the ECU tendon over the ulna with combined active wrist flexion and supination, but the athletic trainer (AT) could not passively sublux the tendon. Subsequently, the patient could relocate the tendon by wrist extension and pronation. Tests for varus and valgus stress, glide, triangular fibrocartilage complex load, and supination lift-off were all negative. After a telephone consultation with the orthopaedic clinic, the AT arranged a referral to a board-certified hand surgeon the next afternoon. At the appointment, plain radiographs showed no evidence of acute fracture. No other imaging studies were obtained. The physician's clinical diagnosis concurred with the AT's initial impression of a traumatic ECU tendon subluxation.

## TREATMENT

Before the patient was referred to the hand surgeon, we tried to maintain the ECU tendon in the ulnar groove using various taping, padding, and splinting materials. Unfortunately, these efforts did not succeed in maintaining the tendon's position and allowing continued basketball participation. The patient was treated with ice to control acute symptoms and put in a Colles splint for the night. The hand surgeon recommended conservative treatment with a short-arm cast in slight extension and radial deviation. The cast was too loose and did not provide enough support to the damaged structures, so the cast was replaced at the beginning of the second week. The second cast provided superior stabilization to facilitate healing; the patient could no longer voluntarily sublux the ECU tendon. During the third and fourth weeks, the cast became too large due to atrophy of the forearm muscles, and the ECU tendon subluxed during some activities of daily living. The hand surgeon recommended an additional 4 weeks of immobilization. Initially, another short-arm cast with an interosseous mold (to limit extreme pronation and supination) was applied. Unfortunately, in this cast the patient was still able to feel popping with supination movements, so a long-arm cast with an interosseous mold was applied. The wrist was placed in slight extension, radial deviation, and essentially full pronation, with the elbow flexed to 90°. She had no episodes of subluxation or other problems during the 4 weeks in the long-arm cast. While immobilized, the patient was instructed to avoid excessive elbow flexion and supination loading during activities of daily living.<sup>6</sup> She was also directed to refrain from any upper body weight lifting but continued to exercise her core and lower body. At 4 weeks (ie, 8 weeks of immobilization in total), the cast was removed, and the hand surgeon determined that the tendon was stable. The patient was then placed in an over-the-counter rigid wrist brace for another 3 weeks; during this time, range-of-motion and strength exercises were initiated. In the athletic training facility, treatment consisted of a warm whirlpool (110°F [43°C]) for 20 minutes while the patient worked on uniplanar active range of

motion of the wrist and elbow. Once full active range of motion was achieved by the end of the first week, the warm whirlpool and range-of-motion exercises were discontinued. By the beginning of the second week, she was able to remove the brace for daytime but continued to use it at night and when walking outdoors. Isotonic strengthening of the shoulder girdle, elbow, and wrist with free weights was started. The patient had a final follow-up with the hand surgeon 3 weeks after removal of the long-arm cast. The ECU tendon had remained stable and asymptomatic. She was allowed to return to basketball activities without any restrictions, although we did tape the involved wrist for practices and competition.

## DISCUSSION

Instability of the ECU is an uncommon wrist injury. We were unable to identify any cases after an extensive search of the current athletic training literature. The clinical diagnosis is easily missed, resulting in insufficient treatments and less than favorable outcomes. Furthermore, controversy remains as to whether conservative treatment or surgical intervention provides the best clinical outcome.<sup>4-6,9-12</sup> Most authors<sup>4,5,8,10,11</sup> recommended surgical reconstruction of the sixth dorsal compartment, followed by a period of immobilization and gradual return to activity over several months for optimal results. Despite these recommendations, our medical team decided that conservative treatment would offer the patient the best chance of return to play for her senior season. The literature suggests that an acute ECU subluxation can be treated conservatively with 4 to 6 weeks of immobilization.<sup>10</sup> Surgical intervention for ECU subluxation generally necessitates immobilization in a long-arm cast for 6 weeks and restricted athletic and vigorous rehabilitation for an additional 3 months before return to play.<sup>8,9</sup> Following the conservative approach, our patient was able to return to full practice and competition, with taping to prevent extreme flexion and extension motions, within the same season (11 weeks after injury).

Differences of opinion exist regarding the management of ECU subluxation with nonsurgical interventions. Montalvan et al<sup>6</sup> suggested a short-arm cast in conjunction with monthly magnetic resonance and ultrasound imaging to confirm healing of the ECU subsheath. Because of our patient's clinical presentation and visible subluxation of the ECU tendon, the hand surgeon elected to forgo additional imaging studies other than plain routine radiographs at the time of evaluation. If the subluxation is not as obvious, additional imaging (including magnetic resonance imaging, computed tomography, or ultrasound techniques) has been suggested.<sup>6</sup>

Montalvan et al<sup>6</sup> treated 12 patients with traumatic ECU instability in short-arm casts for 8 weeks. Stability of the ECU tendon was then checked via stress test: If stability was achieved, full return to play was allowed after 4 additional weeks (ie, 12 weeks to return to play). If the ECU tendon was unstable, 4 more weeks of immobilization were required (ie, 16 weeks to return to play). Conversely, Burkhart et al<sup>10</sup> suggested 6 weeks of immobilization in a long-arm cast with the elbow flexed to 90° and wrist in approximately 30° of extension, radial deviation, and pronation. Although Montalvan et al<sup>6</sup> successfully used a short-arm cast for ECU subluxation, this casting technique did not provide our patient with the necessary stabilization; she was able to actively sublux the ECU tendon within the cast despite reapplication. The hand surgeon elected

to attempt greater stabilization using a long-arm cast with the elbow flexed to 90° and wrist in approximately 30° of extension, radial deviation, and pronation. Immobilizing the elbow and wrist in these positions allowed the ECU tendon to remain in a safe position, essentially reversing the hypersupination mechanism of injury. This immobilization pattern seems appropriate based on suggestions in the literature<sup>2,4-12</sup> that ECU tendon subluxation occurs with active supination or combined supination and wrist flexion and the tendon subsequently relocates in pronation.

The use of a long-arm cast provided our patient with a stable dorsal sixth compartment and a favorable outcome. Immobilization did not result in loss of motion at the shoulder or casted joints, which can be a concern with the long-arm cast recommended by Burkhart et al.<sup>10</sup> After the immobilization period, if the tendon is stable, a ridged brace can be used for 3 weeks while the patient regains range of motion and strength.

Regardless of the casting technique used in the conservative management of traumatic ECU subluxations, the most important factor appears to be the inherent stability of the ECU tendon within the ulnar groove during immobilization. If stability cannot be achieved through a short-arm cast, a long-arm cast is appropriate, as it was for our patient.

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