# Extensor Carpi Ulnaris Instability Following Ulnar Shortening Osteotomy

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## Abstract

**Background** Ulnar shortening osteotomy (USO) is a well-established procedure for the treatment of ulnar impaction syndrome. Although uncommon, the procedure can be associated with complications including nonunion, malunion, and hardware irritation.

**Case Description** We present a 56-year-old woman who developed extensor carpi ulnaris (ECU) tendon instability following an USO.

**Literature Review** The etiology of such a complication can be multifactorial.

**Clinical Relevance** The recurrence of ulnar pain following an USO should raise the suspicion of possible ECU instability within the differential diagnosis.

**Keywords**
- extensor carpi ulnaris instability
- ulnar shortening osteotomy

Ulnar shortening osteotomy (USO) can be used to treat patients with ulnar impaction syndrome who fail nonoperative management.[1] The procedure has the advantage of preserving the ulnar articular cartilage and does not violate the distal radioulnar joint (DRUJ) or ulnar carpal articulation.[2] It may be indicated in patients with positive ulnar variance without DRUJ arthritis.[3] The procedure may also address mild DRUJ laxity and lunotriquetral instability by tightening the distal oblique band of the interosseous membrane and the ulnocarpal ligaments.[3] The ulna may be shortened through either the diaphysis[4] or metaphysis.[5] Proponents of the former note an improved ability to tighten the distal band of the interosseous membrane whereas a metaphyseal osteotomy is through bone with improved vascularity and potential for healing. Although uncommon, ulnar shortening procedure can be associated with complications including nonunion, malunion, or hardware irritation.

The structural integrity of the extensor carpi ulnaris (ECU) tendon and its subsheath is essential for normal mechanics and function of the tendon. Once the subsheath is disrupted, the ECU tendon can subluxate volarly from its groove in the distal ulna.[6] We present a case of a patient who developed ECU tendon instability following an ulnar shortening diaphyseal osteotomy.

## Case Report

A 56-year-old right-hand dominant woman presented with a history of gradual onset of left ulnar-sided wrist pain. She denied any history of recent trauma. Upon examination, she had pain with power grip, especially with pronosupination. She had tenderness over the lunotriquetral joint on compression and shear loading, and provocative signs of ulnar impaction. Her grip strength was 16% of the uninjured side (3 kg compared with 18 kg). Radiographs (►**Fig. 1**) and magnetic resonance imaging scans were suggestive of ulnar impaction. Despite a 3-month course of nonoperative treatment, she continued to have signs and symptoms of ulnar impaction. She underwent a wrist arthroscopy which demonstrated a central triangular fibrocartilage complex (TFCC) defect with fibrillations on the ulnar aspect of the lunate classified as Palmer IIC suggestive of ulnar impaction (►**Fig. 2**). Following wrist arthroscopy, the patient underwent a concomitant diaphyseal USO removing 3 mm of the bone. During the procedure, care was taken to incise the fascia between the ECU and flexor carpi ulnaris to access the ulnar diaphysis, with no violation of the 6th extensor compartment. The plate was placed volarly minimizing the possibility of ECU

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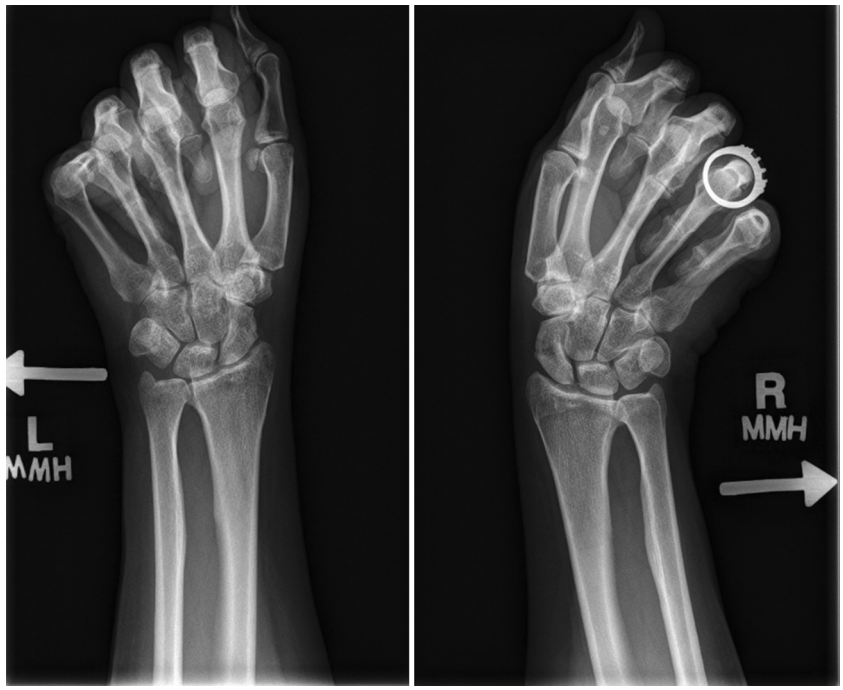


**Fig. 1** Preoperative (**A**) left and (**B**) right wrist radiographs in maximum ulnar deviation demonstrating increased positive ulnar variance on the left compared with the right.

irritation. The osteotomy healed uneventfully, with resolution of her preoperative symptoms.

One year postoperatively, the patient presented with atraumatic ulnar-sided wrist pain with a visual analogue pain scale of 6 to 8 out of 10. This pain was worse with pronation and supination movements. Upon examination, her surgical scars were well healed without any signs of infection, complex regional pain syndrome, or abnormal sensation of the dorsal sensory branch of the ulnar nerve. She had point tenderness over the ECU tendon with a positive synergy test[7] and signs of ECU tendon instability upon pronosupination of the forearm. There was no evidence of any DRUJ instability when compared with the contralateral side. Her grip strength was 20% of the uninjured side. Radiographs of the left forearm revealed a well healed osteotomy and a negative ulnar variance (►**Fig. 3**). Ultrasound evaluation revealed an intact left ECU tendon with volar dislocation. The dynamic evaluation with wrist supination and pronation demonstrated dislocation of the ECU tendon over the medial aspect of the ulna with partial reduction toward the medial aspect of the ulnar groove suggesting ECU tendon instability. A mild hypoechoic synovial thickening of the ECU tendon sheath was consistent with tenosynovitis. A repeat magnetic resonance image showed this volar dislocation of the ECU tendon at the level of the distal ulna consistent with ECU subsheath tear (►**Fig. 4**). Despite a 3-month course of nonoperative management that included splinting and occupational therapy, the patient's symptoms continued to persist. Therefore, we proceeded with surgical evaluation. Intraoperatively, we noticed that the ECU had dislocated from its groove and the subsheath was disrupted and deemed irreparable. There was also an abundant amount of ECU tenosynovitis that was debrided. We proceeded with an ECU stabilization procedure (Spinner–Kaplan)[8] (►**Fig. 5**). The ulnar groove was found to be of sufficient depth to not require deepening. Following the procedure, the patient made a satisfactory postoperative recovery with resolution of her symptoms. Fourteen months post-surgery, she had recovered well and had improvements of her ulnar-sided wrist pain.

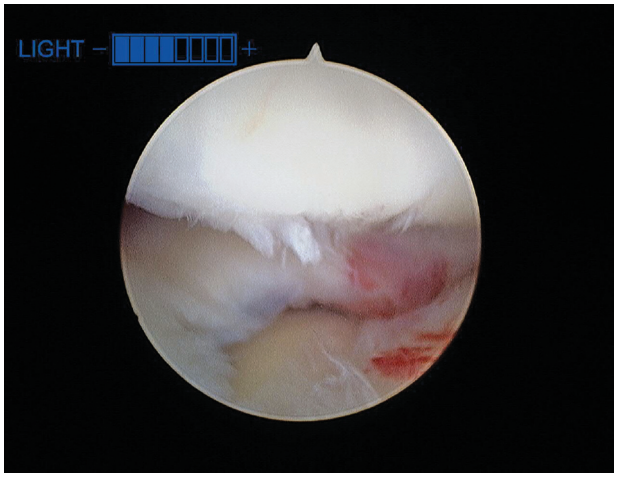


**Fig. 2** An arthroscopy photograph demonstrating a central triangular fibrocartilage complex defect and fibrillations on the ulnar aspect of the lunate consistent with ulnar impaction (Palmer IIC).

## Discussion

The ECU tendon passes through the ulnar groove roofed by the tendon subsheath. This fibro-osseous tunnel provides mechanical constraints and stability. Once disrupted, the ECU tendon may subluxate medially.[9,10]


**Fig. 3** Postoperative (**A**) anterior posterior and (**B**) lateral left wrist radiograph at 1 year demonstrating plate-and-screw fixation across a healed ulnar shaft osteotomy and negative ulnar variance.

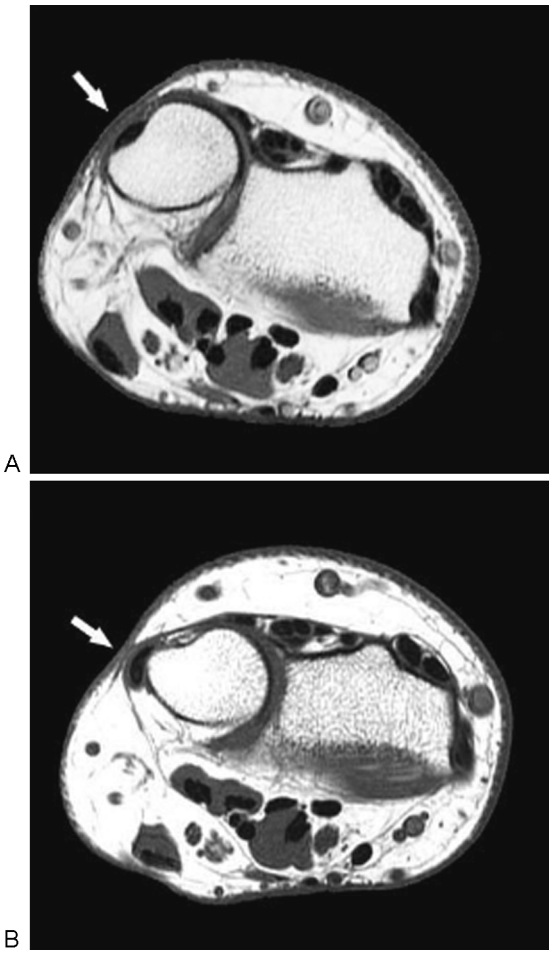


**Fig. 4** (**A**) Preoperative and (**B**) 1-year postoperative left wrist axial T1 weighted magnetic resonance imaging views demonstrating a dislocated extensor carpi ulnaris tendon out of the ulnar groove postoperatively.

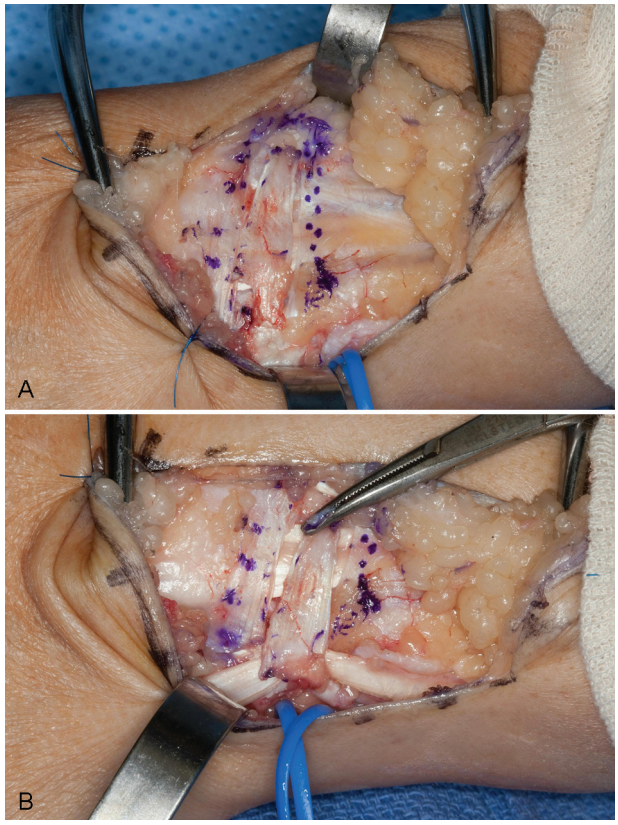


**Fig. 5** Intraoperative photographs demonstrating (**A**) the retinaculum flap in place, and (**B**) the stabilized extensor carpi ulnaris tendon with a flap from the extensor retinaculum.

**Fig. 6** A coronal magnetic resonance imaging scan of the left wrist showing a central triangular fibrocartilage complex defect with degenerative changes along the ulnar component taken before the extensor carpi ulnaris stabilization procedure.

Chang et al reported an association between ECU instability in patients with ulnar negative variance and shallow ECU grooves.[11] Our patient had a negative ulnar variance following the ulnar shortening procedure which may have predisposed to ECU instability. We also suspect that the mobilization of the ECU may have caused a degree of subsheath laxity predisposing the tendon to instability.

Iida et al reported that the ECU tendon and subsheath can dynamically stabilize the DRUJ in supination and neutral forearm rotation when the TFCC is completely sectioned,[12] and in a clinical setting the ECU tendon is likely to dislocate when the wrist is positioned in ulnar deviation and flexion. Our patient was found to have a TFCC defect (►**Fig. 6**) which predisposed the ECU tendon for subluxation.

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None.

Conflict of Interest
Sanjeev Kakar is a consultant for Arthrex and Skeletal Dynamics.

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