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Research Paper Review

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Sports-related extensor carpi ulnaris pathology: a review of functional anatomy, sports injury and management

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ABSTRACT

The extensor carpi ulnaris (ECU) muscle plays a key role not only in the active movements of wrist extension and ulnar deviation but also in providing stability to the ulnar side of the wrist. Its position relative to the other structures in the wrist changes with forearm pronation and supination. As such, it must be mobile yet stable. The ECU tendon relies on specific stabilising structures to hold it in the correct positions to perform its different functions. These structures can be injured in a variety of different athletic activities such as tennis, golf and rugby league, yet their injury and disruption is predictable when the mechanics of the ECU and the techniques of the sport are understood. The ECU tendon is also vulnerable to tendon pathologies other than instability. It lies subcutaneously and is easily palpated and visualised with diagnostic ultrasound, allowing early diagnosis and management of its specific conditions. Treatment includes rest, splintage and surgery with each modality having specific indications and recognised outcomes. This review described the functional anatomy in relevant sporting situations and explained how problems occur as well as when and how to intervene.

ANALYSIS

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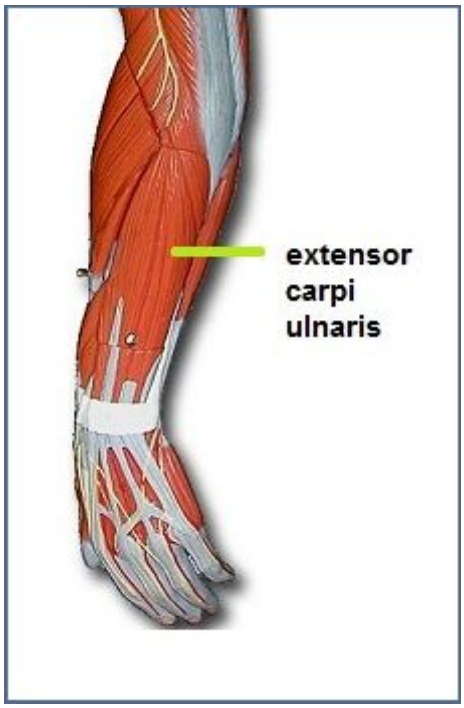
Background Information

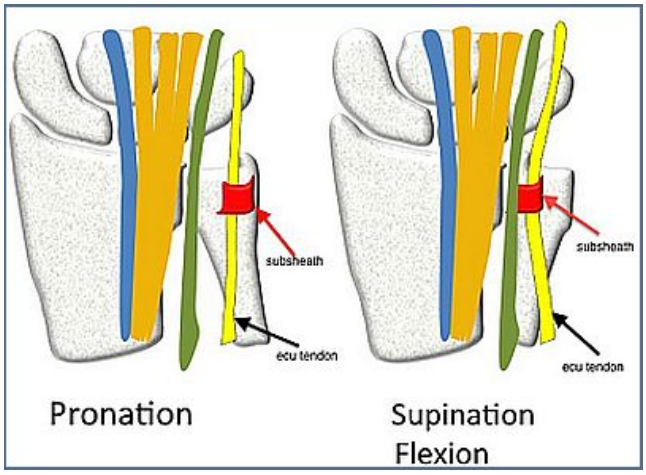
The extensor carpi ulnaris (ECU) tendon and its retaining sheath are associated with a variety of complex and common sports injuries. The relatively complicated biomechanics associated with the ECU are summarized in this review, as are recommended treatment options for a variety of pathologies that can affect this structure.



SUMMARY:

Anatomy and Function

The ECU is a long, thin muscle, originating at the lateral epicondyle and inserting at the base of the fifth metacarpal. Its function varies, depending on the position of the forearm, and it contributes to both wrist flexion and extension. In full supination, ECU contributes to wrist extension, whereas in pronation, it lies in a more palmar and ulnar position, thus diminishing its contribution to wrist extension.



The ECU tendon passes through a fibro-osseous tunnel as it leaves the forearm and rests in a groove on the dorsal surface of the ulna, maintained in this position by a retinaculum and subsheath. Maintaining this proper orientation is integral for proper wrist function.

Pathology Affecting the ECU

Tenosynovitis

Tenosynovitis is commonly associated with repetitive sporting activity, to which tendon instability may be a contributing factor. Repetitive flexion/extension, especially with the wrist in a supinated orientation, can lead to irritation of the tendon sheath, due to the angulation of the tendon as it leaves the fibro-osseous tunnel.

Tendinopathy

ECU tendinopathy is an adaptive response of the tendon to repetitive stress and/or trauma. It generally progresses through stages: reactive (direct trauma, rapid injury), disrepair (continued excessive load) and degenerative (chronic overloading), although these stages are not distinct and are more accurately viewed as a continuum. Prolonged tendinopathy can lead to partial tear and rupture of the ECU tendon.

Tendon Instability

Instability is the result of disruption or dysfunction of the ECU subsheath, often as a result of an acute injury. Instability ranges from minor subluxation of the ECU during normal movements to dislocation and forearm locking. The large variation in the movement of the ECU tendon noted in asymptomatic volunteers (1) makes assessment of tendon instability difficult.

Sport-Specific ECU Injuries

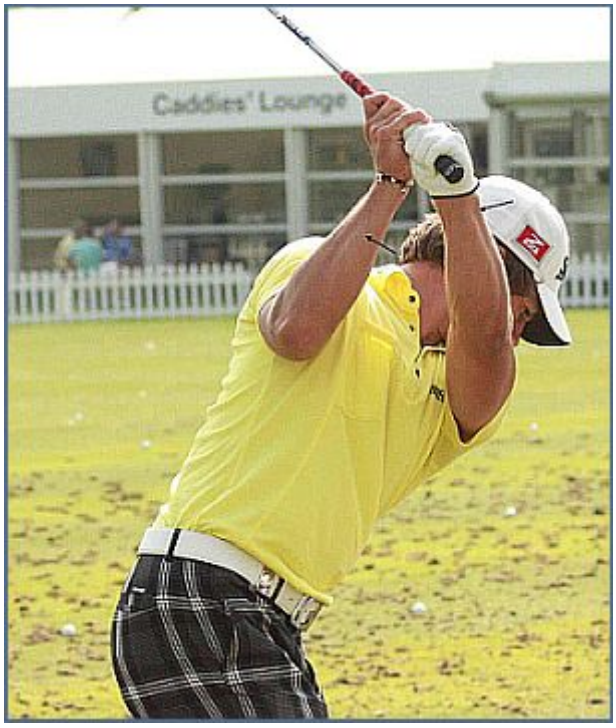
ECU injuries are most often reported in tennis and golf. Sports that pose a risk for ECU injury share the common characteristics of placing the ECU in a vulnerable position, either wrist flexion during supination and ulnar deviation or sudden lateral force applied to the wrist when the tendon is engaged in strong isometric contraction.

Tennis

In professional tennis players, the rate of ECU injury has been estimated to be 1 case per 18 players per year (2), with men more frequently injured than women. Most injuries are acute in nature and result from the double-backhand stroke, where the dominant hand moves quickly from pronation to supination to impart spin on the ball. Additional injuries of a more chronic nature have been reported and likely reflect a tendinopathy, as there are generally no acute signs of tendon subluxation.

Golf

While the wrist is a common locale of injury for both professional and recreational golfers, injuries involving the ECU tendon are poorly documented. A survey of professional European Tour players indicated a 30% wrist injury rate, with 8% involving inflammatory issues of the tendon and tendon sheath. Acute wrist injuries tend to involve the "leading" wrist, which moves quickly from radial deviation to ulnar deviation during the golf swing. As a result of this movement, the ECU tendon contracts isometrically during the swing, and if the club strikes a hard object on the ground at impact, the momentum of the swing is interrupted. Because the rest of the body continues moving throughout the swing motion while the wrist is stopped, a traumatic radial deviation can occur, resulting in a "popping" or "tearing" sensation associated with ECU tendon injury.



Rugby/Football

ECU tendon injuries occur at a rate of 1 injury per 60 players per year in English rugby. Injuries are generally associated with the clutching of the ball while anticipating contact, which is similar in rugby and North American football. In these sports, the ball carrying arm is held in maximal supination, with wrist flexion and ulnar deviation. The increased force of the isometric contraction of the ECU when anticipating contact can result in a traumatic tear of the subsheath with acute subluxation of the ECU tendon in an ulnar direction.

Clinical Assessment

Several aspects of the clinical assessment are important in identifying possible ECU injuries, including:

- The timing of onset of pain,
- The presence of a "pop" or "snap" at onset, which can indicate an acute sheath tear,
- Careful palpation of the tendon beginning at its insertion, which will help to identify injury sites,
- Pain on resisted active extension with ulnar deviation, which indicates an ECU injury,
- Weakness, which is often associated with pain, except in cases of complete tendon rupture, where no pain is felt and no strength is present, and
- Vague and subtle swelling over the dorsoulnar aspect of the affected wrist, which can be indicative of chronic ECU tendinopathy or tenosynovitis.

Imaging

Ultrasound or MRI are the imaging modalities of choice to supplement diagnosis; plain films are not routinely required. On imaging, a normal ECU has a flattened ovoid configuration in transverse section at the level of the ulnar groove and lies deep to the subsheath. Injuries tend to be associated with specific imaging findings, such as:

- In tenosynovitis – easily compressible fluid surrounding the tendon is identified on US (high signal intensity fluid on MRI).

- In early tendinopathy – the degree of tendon thickening may be subtle, so comparison with the opposite side on US is helpful. As the disease progresses, the tendon thickening becomes more pronounced.
- In tendon subluxation – the normal ability of the ECU tendon to displace by up to 50% in asymptomatic patients increases the difficulty associated with distinguishing tendon subluxation that occurs following athletic subsheath injuries.

Clinical Management and Outcomes

ECU Tendinosis

Acute tendinosis generally responds well to conservative care, including rest, activity modification, splinting and occasionally casting. Rehabilitation strategies are based on the severity of tendinopathy (3). Early stage treatment (5-10 days) usually consists of load management and isometric exercises, with loads best increased in stages. In more chronic injuries, a combination of load management, eccentric work, isometrics and strength exercises are recommended.

If symptoms do not resolve with conservative management, steroid injections into the fibro-osseous sheath should be considered. In patients with persistent ECU tendinosis, compartment release should be considered (4).

Return to sports activities is based on improved strength and range of motion and should not begin until both factors reach a level of 80% of the uninjured side.

ECU Instability

Asymptomatic subluxation of the ECU tendon does not always require treatment. In cases of tendon instability associated with secondary tendinosis, conservative management of the tendinosis alone is unlikely to be successful. Cases such as this often require surgical management involving reduction of the subluxed tendon and immobilization for up to 6 weeks. In some cases of chronic subluxation, surgical reconstruction of the 6th extensor compartment may be indicated, especially in elite athletes. Anatomic reconstructions are indicated when the periosteum and tendon sheath strip off the distal ulna and the tendon subluxes within an expanded subsheath.

CLINICAL APPLICATION & CONCLUSIONS

ECU muscle and tendon injuries are common in sports such as tennis and golf, and in many cases can be managed conservatively, although distinction must be made between stable and unstable conditions.

Imaging with US or MRI is often useful to supplement the clinical examination, especially when atypical features are noted. Surgery is not often required but may be indicated in cases of acute injury or chronic subluxation in combination with tendinopathy.

Additional References

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