

ECU Tendon Injury in an Elite Golfer

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ABSTRACT

This case describes an elite golfer who developed medial wrist pain in his leading hand. His condition had been provoked by high volume golf practice, a discrete episode of injury and a change in golf technique. The change to his swing in the back swing and at impact manipulated the leading wrist into a firmer position at impact to create "hold off" shot. The injury sustained was an acute on chronic overuse injury to the Extensor Carpi Ulnaris (ECU) tendon and tendon sheath. Treatment was provided in a non-surgical fashion, with the use of Platelet Enriched Plasma (PRP) injections and rest. Return to play required alteration in swing biomechanics. The paper highlights the role of training error in the development of this common golf related injury.

Keywords: Extensor Carpi Ulnaris tendon, Golf Swing biomechanics Overuse injury, Training error.

CASE DESCRIPTION

History

65-year-old Elite international scratch golfer presents with acute on chronic pain at the ulnar border of the left wrist. This is exacerbated by hitting golf shots. The problem came on insidiously. There was one particular episode of acute pain when playing out of heavy rough in a competitive match. 80% swing speeds are relatively comfortable, faster swings are painful, and playing "hold off" shots exacerbated the pain and are associated with a snapping sensation at the wrist. There have been episodes of sensory alteration into the ring, long and 5th fingers.

Examination

Local tenderness at the base of the ulnar side of the wrist. Pain exacerbated by ulnar and radial resisted deviation testing. There was no audible pop or click, and no clinical evidence of subluxation on the ulnar side of the wrist. Negative Finkelstein test. Negative Tinel test of median, ulnar and radial nerves. Pain over the ECU tendon with a snapping sensation on wrist supination. Subjective pain and sensory alteration over the hamate and pisiform bones.

Differential diagnosis

- ECU Tendon injury
- Subluxation of ECU tendon secondary to sub-sheath tear
- TFC injury
- Hook of hamate fracture
- Guyon's Canal Syndrome

Test and results

Plane X-ray: no fractures were detected.

Ultrasound: ECU tendonitis with minor medial subluxation.

MRI: Moderate ECU tenosynovitis with small split tear and heterogeneity of retinaculum on the ulnar aspect, with adjacent soft tissue oedema. Small central tear in TFC (Figures 1 and 2).

Nerve conduction studies: normal, with no pathology noted in the median, ulnar or radial nerves.

Diagnosis

ECU tenosynovitis with sub-sheath injury with minor instability, local tear in Triangular fibrocartilage.

Treatment

He was initially placed in a wrist splint in ulnar deviation and had a course of diclofenac sodium for a 4-week period. He was subsequently treated with prolotherapy under ultrasound guidance, which initially was with triamcinolone acetonide. He was reviewed 6 weeks later and a PRP injection into the injured tendon was performed also under ultrasound guidance.

Follow up

MRI scanning continued to show the inflamed tendon at 5 months, but the oedema had resolved.

Return to play

A full return to competitive play was achieved after 6 months. Ultrasound examination of the

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Figure 1: Coronal MR image showing ECU tear and tenosynovitis.



Figure 2: Axial MR image showing a split ECU tendon tear with disruption of the sub-sheath structure on the ulnar aspect, resulting in localised subluxation.

ECU tendon confirmed that the tendonitis had improved and there was no apparent subluxation of the ECU tendon. A neutral wrist position at the top of the golf back swing was recommended by a teaching golf professional. The alteration in swing biomechanics and a reduction in the number of weekly practice balls hit were a significant element in reducing symptoms. The alteration in swing biomechanics centered on keeping the hands in a more neutral and less active during the back swing and down swing.

Modern golf recommends that the leading wrist should be held in a flexed and radial deviated position at the top of the swing returning towards ulnar deviation on the down swing through impact. Holding the wrist for as long as possible in the radial deviated, flexed and pronated position stores more kinetic energy which is released as the wrist “un-cocks” prior to straightening up the club face at impact. Uncocking the wrist accurately delivers greater speed to the golf club head, which results in a greater force hitting the ball with a resulting longer shot. These manoeuvres of the leading wrist places great strain on the medial wrist structures such as the ECU tendon. Quieting the hands in back swing and follow through are essential training alterations in preventing a reoccurrence of ECU tendon pathology.

DISCUSSION

Golf is a health promoting activity,^[1] but is associated with a significant injury profile.^[2] Wrist injury is the second most commonly injured site in the general golfing population, and the most frequently injured anatomical site in elite and professional players.^[3,4] The ulnar side of the leading wrist is the most prevalent area of injury. The Extensor Carpi Ulnaris (ECU) tendon is regularly injured,^[2-4] either alone or in combination with the Triangular fibrocartilage (TFC). The biomechanics of the swing are a major factor in this overuse type injury which can result in tendinitis, tendinopathy or subluxation of the tendon out of its sub-sheath (Figure 3).

Hitting a golf ball with a club consistently and accurately is deceptively more complicated than first appears to be the case. Techniques and the laws of physics affect the delivery of a perfect and consistent golf shot. The golf swing encompasses two discrete movements. 1) The arms and shoulders 2) the hands and wrists. These 2 elements are often referred to by teaching professionals as “2 triangles”.

The first triangle of arm and shoulder creates speed which delivers the club head which travels in a circular fashion to the ball. The faster the swing speed the harder the ball is hit and the further it travels.

The second triangle is made between the wrists and the golf club. The golf club head travels in a circular fashion around the wrists and hands. The natural centripetal force dictates that the club will travel away from the circle. If you let the club go it will fly straight out of your hands. The wrists and hands constrain this centripetal acceleration by holding onto the golf grip. By holding on to the golf club with the wrist flexed on the down swing extra energy is stored.^[4,5] The energy is then released by uncocking the wrists and transitioning to impact.

When the wrist uncocks at the bottom of the swing to straighten up the golf club face, extra speed is added to the descending club.^[5] This creates a further increase in swing speed. This late hit “increases swing speed, but has the disadvantage of placing greater stress on the leading wrist.^[5,6] A hold off shot is a further variation on this theme. In this instance after the wrists uncock, the golfer holds the leading wrist firm at impact preventing excessive supination, extension and ulnar deviation. This results in the club face producing a “cut spin”, but with the consequences of extra forces on the medial side of the leading wrist. Like many overuse injuries the un-natural motion has injury sequelae.^[7-10]

The medial (ulnar) aspect of the leading wrist in a golfer is particularly vulnerable to injury. This is part is due to the motion and subsequent stresses placed on the medial wrist structures during a golf swing.^[2-6] These involve ulnar and medial deviation of the wrist joint. Pronation and supination of the first carpal row, and flexion and extension of the wrist joint, often referred to as “bowing” and “cupping” of the wrist joint. These different biomechanical manoeuvres can be used to increase club head speed, but also place extreme forces on the anatomical structures situated on the medial aspect of the wrist.^[2]

The wrist can be readily observed at 3 discrete positions in the golf swing. Address, the top of the back swing and impact. There are 3 dynamic motions of the leading wrist during a golf swing (Figure 4).

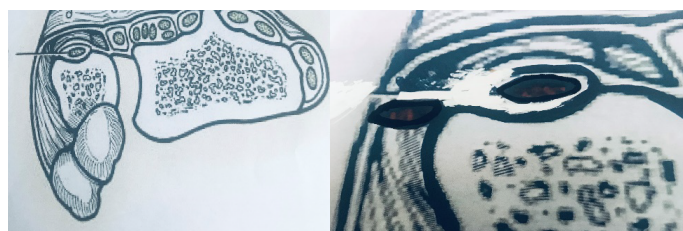


Figure 3: Graphic display of location of the ECU tendon, its sub-sheath and retinaculum, and medial subluxation following sub-sheath rupture.

At address the wrist is held in an ulnar deviated position, transfers to a radial deviated position and returns to a neutral to ulnar deviated position at impact.

The first carpal row starts at address in a neutral or pronated position, is further pronated at the top of the swing, before transferring to a supinated position at and after impact.

The wrist is usually positioned in a mildly flexed position at address and travels to the top of the swing thus the newer more powerful elite swings often show significant flexion at the top of the swing, referred to as bowing. This places the golf club head into a closed position at the top of the swing creating greater lag and subsequent power at impact. This is often referred to as a "power move." Elite golfers have the ability to control the golf club through impact in an effort to create a particular shot shape or ball spin. A hold off shot involves the player holding the leading wrist firm through impact, preventing the first carpal row of bones travelling into supination. This results in a left to right, or "fade" ball flight in the right-handed golfer. This manoeuvre is often employed to influence the ball flight in adverse weather or course conditions, and is seen as a skilful way of controlling the club face in faster golf swings.

The older traditional swings favoured a flat "neutral wrist position at the top of the swing, which gave greater consistency,^[10] but less lag and power. Certain golfers and teachers favour an extended or cupped wrist at the top of the swing to improved consistency (Figure 5). This position was favoured by traditional swingers of the 1940's and 50's such as Ben Hogan and Bobby Jones. The newer golf clubs with composite heads and lighter shafts have promoted greater swing speeds in the general golf population. This has encouraged a quest among all golfers for greater length in their shots. This has resulted in golfers seeking instruction to improve their striking power. Hence the bowed wrist at the top of the swing and rapid distraction of the medial wrist from a pronated and radial deviated position to a supinated ulnar deviated location at impact is now common place in the golfing population. The supinated ulnar deviated wrist places great stress on the ECU tendon and its surrounding retinacular sheath and sub sheath structure as the swing transitions at speed (over 100 mph in elite golfers). This regularly results in injury to this tendon and soft tissue structure.



Figure 5: Top of the back swing. A neutral wrist position reduces stress on the leading wrist.

Treatment involves significant rest, anti-inflammatory treatments, Platelet Rich Plasma injection and occasionally surgery.^[11] In this instance resolution was achieved by oral NSAIDs and PRP injection. Surgery was not required as the sub-sheath tear was a type 3 lesion. Return to play requires golf biomechanical assessment and splinting. In this case alteration in the swing mechanic, by "quieting the hands" proved to be helpful. Specific attention to the address grip position and reducing radial deviation at the top of the back swing will ultimately reducing the impact force on the tendon as the wrist returned to ulnar deviation at impact. Similarly striving for a neutral position with less wrist bowing at the top of the swing will also assist allowing a safe return to play.^[12] In many instances a return to the classical swing positions will reduce unnecessary stresses on the medial leading wrist (Figure 4). This may result in a loss of distance off the tee, but should be replaced by pain free, consistent golf. As with all overuse injuries, a reduction in activity time and intensity is also necessary in preventing reoccurrence.^[13] In simple terms reduce the numbers of balls hit on the practice fairway. All training sessions should focus on quality rather than quantity of golf balls hit. In golf there is an old adage that states "practice makes permanent, rather than perfect". This has particular resonance in the case of ECU tendon injuries.

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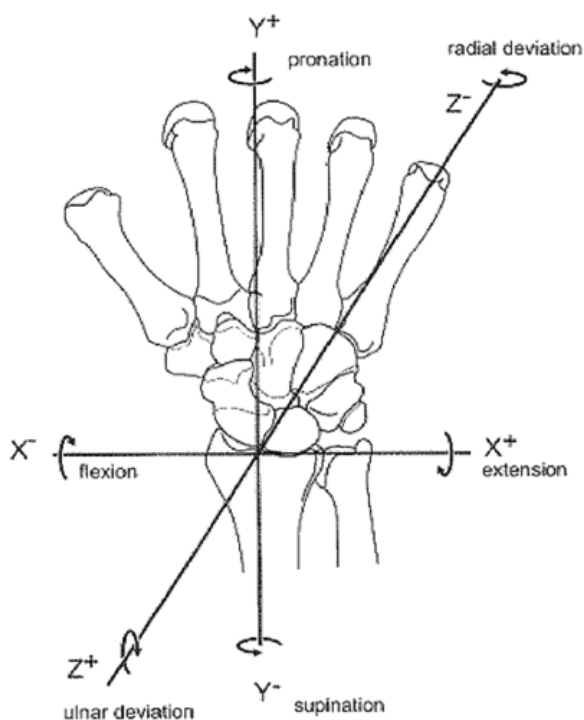


Figure 4: 3 dynamic motions of the leading wrist during a golf swing.

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