

TEARS OF THE TRIANGULAR FIBROCARILAGE COMPLEX

PHILIP BLAZAR, MD

BRIGHAM AND WOMEN'S HOSPITAL

Ulnar sided wrist pain is a common complaint. The patient's age, hand dominance, avocations and occupation are important historical factors, and the nature and date of injury should be determined from the patient. Patterns of injury have been associated with particular recreational activities (*e.g.* hook of the hamate fractures with sports involving a bat or club). Neurologic complaints are common and the physical examination should attempt to define any abnormalities. The differential diagnosis of ulnar sided wrist pain is lengthy; a detailed history and careful physical examination can greatly assist in focusing the diagnosis and treatment.

The term triangular fibrocartilage complex (TFCC) was originally used by Palmer and Werner to define the group of structures that stabilize the carpus and distal radius to the distal ulna. This complex includes the volar and dorsal radio-ulnar ligaments, the ulnar collateral and ulno-carpal ligaments and the articular disc. The articular disc separates the carpal bones from the distal radio-ulnar articulation. The complex is central to three biomechanical functions of the wrist: 1) stability of the distal radioulnar joint (DRUJ), 2) axial load transmission from the carpus to the ulna and 3) ulnar sided carpal stability.

TFCC lesions were classified by Palmer in the *Journal of Hand Surgery*, 1989. There are two main categories, traumatic and degenerative.

Type 1-Traumatic

- A) Horizontal tear adjacent to the radius.
- B) Peripheral detachment from the ulna.
- C) Tear of the Ulnocarpal ligaments.
- D) Avulsion from sigmoid notch.

Type 2-Degenerative

- A) Partial thickness thinning of the articular disc.
- B) A + Chondromalacia of lunate and/or ulnar head
- C) B + full thickness tear of the articular disc.
- D) C + Partial tear of the lunatotriquetral ligament.
- E) D + Full tear of the lunatotriquetral ligament and arthrosis.

Dr. Blazar is an Assistant Professor of Orthopaedic Surgery, Brigham and Women's Hospital and Harvard Medical School.

Please address correspondence to:

Dr. Philip Blazar
Department of Orthopaedic Surgery
Brigham & Women's Hospital
75 Francis Street
Boston, MA 02115

DIAGNOSIS

Examination of the TFCC is performed in conjunction with a thorough exam of the wrist, elbow and hand including neurovascular structures. Direct palpation of the bony and soft tissue structures of the ulnar side to localize point tenderness is the most helpful examination maneuver. Tenderness radial or ulnar to the extensor carpi ulnaris (ECU) tendon with the wrist in neutral rotation may be consistent with a TFCC lesion. The DRUJ is examined with the elbow on a table in front of the examiner. The DRUJ is stressed with one of the examiners hand grasping the distal ulna and the other grasping the radius. Volar and dorsal translation is assessed in neutral, pronation and supination. A TFCC grind test is performed with the wrist in ulnar deviation and dorsiflexion with an axial load applied to the hand by the examiner as the carpus is rotated on the fixed forearm. Radiographs aid in establishing the diagnosis of a malunion of the distal radius or a nonunion of the ulnar styloid. Fractures at the base of the ulnar styloid are more likely to be associated with a TFCC injury that will produce persistent symptoms if untreated. Ulnocarpal abutment is more likely in patients with ulnar positive or ulnar neutral variance.

Pearls

1. Patients with injuries to the wrist, particularly displaced distal radius fractures, should be examined after reduction for instability of the DRUJ.
2. The majority of patients presenting with ulnar sided wrist pain can be managed non-operatively and returned to normal activities.
3. The central component of the TFCC can be excised to a stable rim without compromising its biomechanical function.

Pitfalls

1. The differential diagnosis of ulnar sided wrist pain is lengthy. A careful examination of the ulnar side of the wrist will frequently rule in others causes of patients' symptoms.
2. The dorsal branch of the ulnar nerve crosses from volar to dorsal in the region of ulnar (6U) wrist arthroscopy portals. Careful dissection and protection of this nerve is mandatory to prevent complications.

NONSURGICAL MANAGEMENT

Recommended initial management of traumatic TFCC injuries based on history and physical examination is 4 weeks of immobilization. The intimate relationship of the articular disc and the DRUJ typically requires the use of an above elbow

cast. At 4 weeks, patients are begun on range of motion and strengthening exercises and progress as tolerated. Surgical management is indicated for failure of conservative treatment.

Degenerative lesions are more common in patients with ulnar positive variance. Recommended initial treatment includes activity modification, splinting and non-steroidal medications. The author's experience has been that patients with negative or neutral ulnar variance are more likely to respond to conservative treatment. If conservative management fails, surgical intervention may be indicated.

SURGICAL MANAGEMENT

Surgical treatment of lesions of the TFCC continues to evolve. Traumatic lesions are typically classified at the time of diagnostic arthroscopy. Wrist arthroscopy is performed with the wrist in 10 pounds of traction to facilitate visualization of the TFCC. The portals for visualization and manipulation of the TFCC include 3-4, 4-5 and 6R portals. 1A or central lesions are the most common traumatic injury seen. Arthroscopic

debridement of the unstable edges of the tear is typically recommended. Cadaveric studies have demonstrated that excising the central two thirds of the articular disc does not alter the biomechanical functions of the TFCC. Post-operatively patients are encouraged to do immediate mobilization. Return to work or athletics is usually within 6-12 weeks.

The finding of a peripheral detachment of the TFCC (Type 1B) is not always as obvious at arthroscopy as one might anticipate. A helpful diagnostic maneuver is the trampoline sign that is elicited with a probe in the 4-5 portal and the arthroscope in the 3-4 portal. The elasticity of the articular disc is tested with the probe and a positive test is loss of the normal tissue tautness. (Figure 1A,1B) Peripheral tears are through the vascular zone of the TFCC and are typically repaired. A variety of techniques have been described including open, arthroscopically assisted and arthroscopic techniques. For the outside-in technique, a small incision is made just ulnar to the ECU tendon and blunt dissection is performed to isolate and protect the dorsal branch of the ulnar nerve. Two Tuohy needles are used to penetrate the wrist capsule and the articular disc in the appropriate location and a horizontal mattress suture is used with 2.0 nonabsorbable suture in an outside-in technique. Two or three sutures are placed and tied over the capsule. Care is taken to ensure the dorsal branch of the ulnar nerve and extensor tendons are not trapped in the suture. Post-operatively the patient is immobilized for 4 to 6 weeks in a Munster cast to eliminate rotation of the forearm, and an additional 2 to 4 weeks in a wrist splint. Return to full activity is allowed at 3 months.

Treatment of type 1C and 1D TFCC injuries has not received as much attention as the more common injury patterns, and thus choice of treatment remains controversial. Classically it was believed that radial detachments would not heal and were debrided to stable edges, unless there was a bony fragment attached to the articular disc. Recently, open and arthroscopically assisted repair of avulsion of the TFCC from the sigmoid notch (1D lesions) has been described but outcome data is limited. Distal avulsions (1C) are the least common injury pattern described in most series. Whether debridement or repair of 1C or 1D lesions is superior is unclear at present.

Treatment of degenerative lesions of the TFCC depends on the Palmer classification stage. Lesions classified as 2A or 2B are typically treated nonoperatively with anti-inflammatories, splinting and activity modification. An extra-articular ulnar shortening or an intra-articular "wafer" procedure (with removal of 2-4mm of distal ulna) can be considered in the unusual case of symptoms refractory to these measures. If the lesion has progressed to stage 2C a TFCC debridement is performed. If the patient is ulnar positive, this may be combined with a "wafer" procedure. Treatment of stage 2D lesions includes an ulnar shortening and treatment of the wrist instability if it is substantial. Stage 2E lesions may present with substantial degeneration of the ulnar carpus and typically require a salvage procedure.

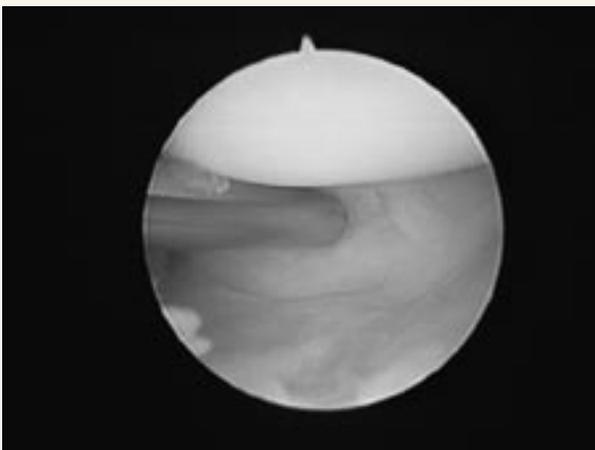


Figure 1A

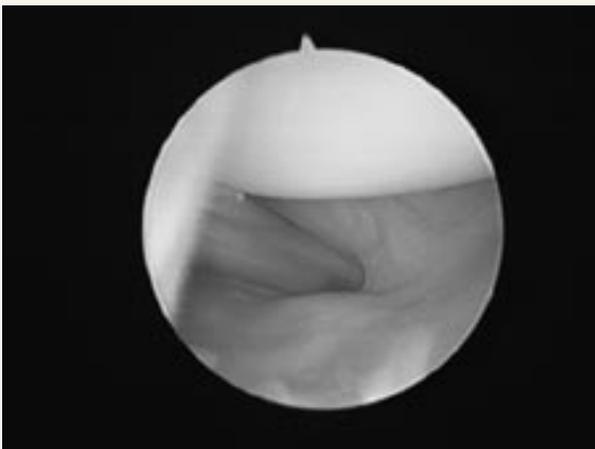


Figure 1B

Figure 1A,B. Trampoline test. The arthroscope is in the 3-4 portal and a probe is in the 4-5 portal. In this case the probe demonstrates laxity of the articular disc as a positive trampoline sign, suggesting the presence of a peripheral TFCC tear (Type 1B).

References

1. **Kleinman WB, Graham TJ.** "Distal Ulnar Injury and Dysfunction" in *Surgery of the Hand and Upper Extremity*. New York, New York, McGraw-Hill. 1996.
2. **Fulcher SM, Poehling GG.** The role of operative arthroscopy for the diagnosis and treatment of lesions about the distal ulna. *Hand Clinics*.14(2):285-96.1998.
3. **Graham TJ (ed.)** Problems about the distal end of the ulna. *Hand Clinics*. May 1998.
4. **Botte M. et. al.** Arthroscopy of the wrist: Anatomy and Technique. *Journal of Hand Surgery*. 14A:313-6, 1989.
5. **Palmer AK, Werner FW.** The triangular fibrocartilage complex of the wrist-Anatomy and function. *Journal of Hand Surgery*. 6A:151-162, 1981.
6. **Palmer AK.** Triangular fibrocartilage complex lesions: A classification. *Journal of hand Surgery*. 14A:594-605.1989.