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Operative Techniques in

Sports Medicine

Triangular Fibrocartilage Complex Repair Through Bone Tunnels (Palmer Type 1D)

David J. Gerlach, MD, Kyle F. Chun, MD, and Thomas E. Trumble, MD

The triangular fibrocartilage complex (TFCC) is an important and complex anatomic structure. At the distal radioulnar joint (DRUJ), the TFCC provides mechanical stability and absorbs axial and translational forces. Discrete anatomic structures impart specific functions. By adulthood, the blood supply is limited to the peripheral border, and the radial origin of the TFCC has minimal vascularity. Acute traumatic tears frequently follow high-force injuries onto an outstretched hand and are classified according to Palmer. Tears occurring along the radial border of the TFCC (Palmer class 1D) have poor healing potential because of the lack of vascularity. Magnetic resonance arthrogram has high sensitivity and specificity for TFCC injuries. Palmer class 1D lesions are identified by standard wrist arthroscopy. TFCC tears are debrided, with the radial TFCC origin is resected to bleeding bone. Meniscal repair sutures are carefully placed through the TFCC via an ulnar-based cannula. Bone tunnels are then created in the appropriate orientation, and the sutures are passed through the radius. A small radial-sided incision is made overlying the exiting sutures, which are tensioned and tied over bone or a biotenodesis screw. Patients are immobilized in a long-arm splint for 2 weeks followed by a graduated rehabilitation program.

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The triangular fibrocartilage complex (TFCC) is a ligamentous and cartilaginous structure containing multiple anatomically confluent but functionally distinct portions. The TFCC stretches from the distal portion of the lesser sigmoid notch on the radius to the ulnar styloid base. The important volar and dorsal radioulnar ligaments, which appear as thickenings at the junction of the TFCC articular disk and capsular structures, provide distal radioulnar joint (DRUJ) stability against both rotational and axial translational. The ulnocarpal ligaments (ulnotriquetral, ulnolunate, and ulnar collateral) stabilize the ulnar aspect of the wrist. The extensor carpi ulnaris (ECU) tendon sheath contributes to both ulnocarpal and DRUJ stability. The central and thinnest portion of the TFCC consists of collagen fibers interwoven at oblique angles so as to resist multidirectional forces and compression across the ulnocarpal joint (Fig. 1).[1,2]

Department of Orthopaedics, University of Washington School of Medicine, Seattle, WA.

Address reprint requests to Thomas E. Trumble, MD, Hand Surgery Center, Department of Orthopedics and Sports Medicine, University of Washington, 4245 Roosevelt Way NE, Box 354743, Seattle, WA 98195-4743. E-mail: jkocha@uw.edu

The vascular supply to the TFCC is analogous to that of the menisci. The primary blood supply is derived from the radiocarpal branches of the ulnar artery, with further contributions from volar and dorsal branches of the anterior interosseous artery. Bednar et al[3] histologically showed the radially oriented peripheral blood supply of the TFCC. In children, this blood supply penetrates greater than 50% of the TFCC diameter; in adults, the blood supply dwindles to penetrate only 15% to 25% of the TFCC body (Fig. 2). Notably, the central portion and the radial attachment are avascular.[4] The peripheral blood supply to the TFCC is integral in determining the appropriate treatment of tears. Peripheral tears along the ulnar border have a robust vascular supply and may be repaired directly. Central tears and radial-sided tears do not heal predictably. Therefore, central tears are commonly arthroscopically debrided, whereas radial-sided tears require decortication of the radial TFCC insertion site at the sigmoid notch before suture fixation.[5]

The TFCC functions as the major stabilizing structure for the DRUJ. The volar and dorsal radioulnar ligaments resist rotational instability, with the volar ligament restricting supination and the dorsal ligament limiting pronation.[6,7] In

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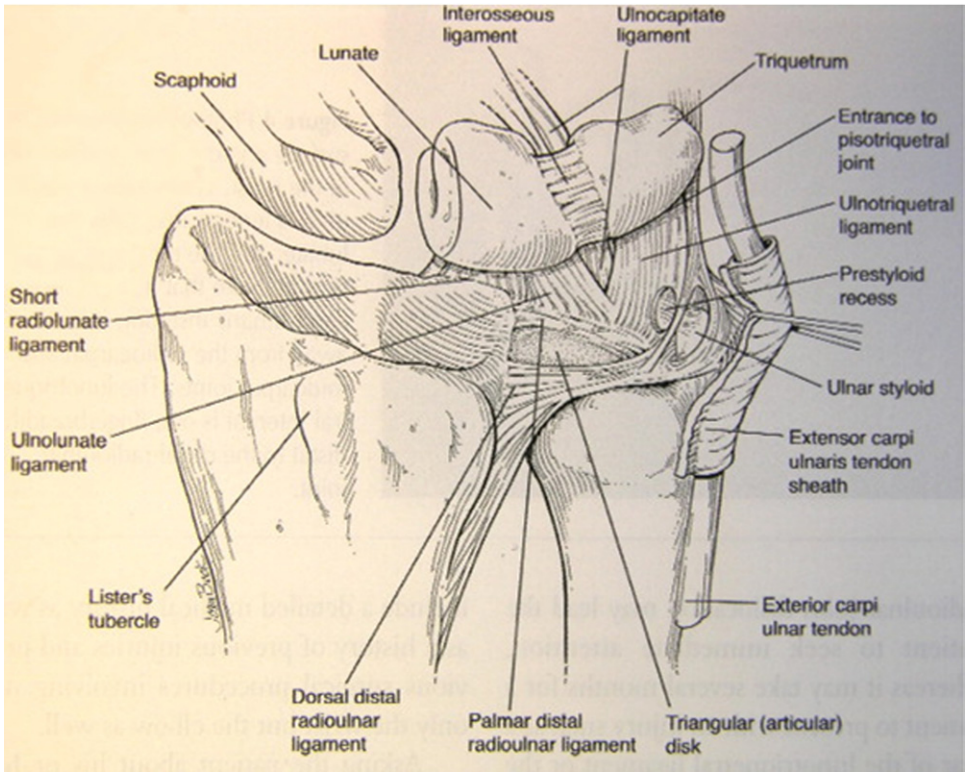

Figure 1 Triangular fibrocartilage complex (TFCC) anatomy.

addition, the TFCC also provides ulnocarpal stability as well as ulnar-sided load absorption. Ulnocarpal load is directly related to ulnar variance. Increased variance causes substantially increased forces at the ulnocarpal interface. For example, 2.5 mm of increased variance increases the ulnocarpal load by 133%.[6-8] Increased ulnar variance has also been associated with decreased TFCC thickness.[6,9] The combination of increased forces and decreased TFCC thickness likely potentiates both traumatic and degenerative TFCC lesions in ulnar-positive wrists.

Classification

TFCC tears are commonly classified according to the system described by Palmer.[1] This system differentiates between traumatic TFCC tears (Palmer class 1) and degenerative tears (Palmer class 2). For the purposes of this chapter, only traumatic lesions are discussed (Fig. 3). Traumatic TFCC lesions are further delineated according to the location of the lesion.

Class 1A tears involve the thin central portion of the TFCC. These lesions occur approximately 2 to 3 mm medial/ulnar to the radial TFCC insertion and are commonly oriented perpendicular to the long axis of the TFCC. These lesions should

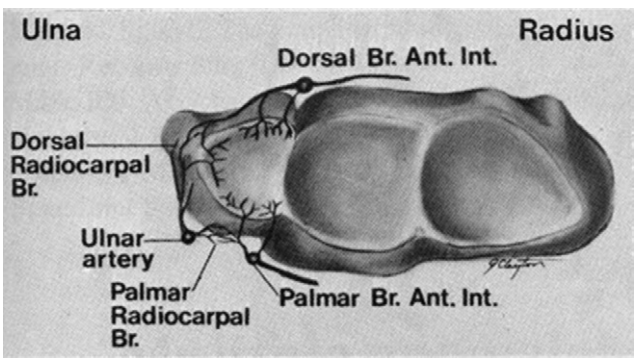

Figure 2 TFCC vascular supply. Note the lack of vascularity along the radial border of the TFCC.

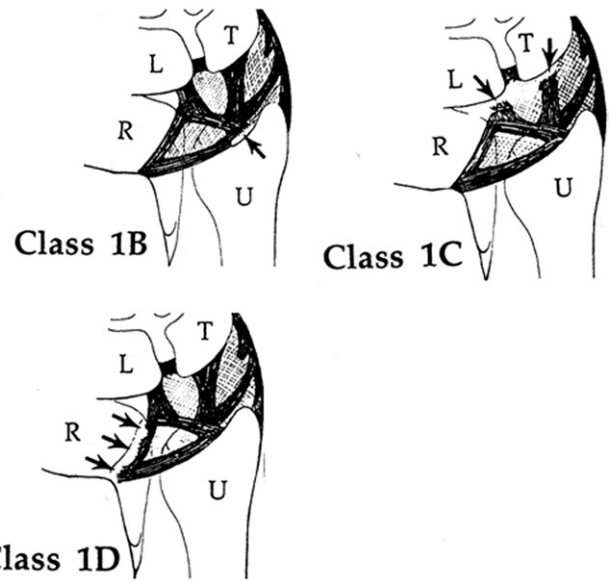

Figure 3 Palmer classification of traumatic TFCC injuries.