

Lesions of Triangular Fibrocartilage Complex of the Carpe (TFCC): About Two Case Reports

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Abstract

The triangular fibrocartilage complex (TFCC) is an anatomical entity located on the ulnar side of the wrist joint having the role of primary stabilizer of the distal radio-ulnar joint (DRUJ) and also bone protector as a shock absorber across the ulnocarpal joint.

Injuries to the triangular fibrocartilage complex may be misdiagnosed as a wrist sprain. Thus, patients remain painful with a persistent grip weakness during daily activities or sports despite correct orthopedic treatments.

Inappropriate treatment of this injury or a massive irreparable tear may result in chronic pain and wrist instability. Thus, management is initially based on cast immobilisation and physiotherapy, surgical treatment is proposed after failure of conservative treatment.

The advent of arthroscopy has made it possible to better understand these lesions and to hope for clinical improvement in these patients.

Keywords: DRUJ; Ulnar Styloid; Ulnar Shortening Osteotomy

Introduction

Triangular fibro-cartilage complex of the carpus plays an essential biomechanical role, it absorbs stresses from the wrist to the forearm, stabilizes the distal radio-ulnar joint and participates to ulnar stability of the carpus.

Positive ulnar index and ulnar impaction syndrome are an anatomic risk factor of triangular fibrocartilage complex tear. Therefore, surgical repair must be associated with ulnar procedures like ulnar shortening osteotomy or Wafer procedure.

We present two case reports of TFCC lesions, one patient with associated neutral ulnar variance and the second one with positive ulnar variance.

Case Reports

Case 1 was a 22-year-old patient with a history of trauma to his right wrist dating 2 years ago, and who reports chronic pain in the right wrist increased by effort and pronosupination. Clinical examination reveals pain on the ulnar side of the wrist and on deep palpation of the articular disc more accessible in front (Figure 1).



Figure 1: Clinical view of wrist ulnar inclination test.

Wrist X-rays showed neutral radio-ulnar index (Figure 2). MRI displayed a peripheral lesion of the TFCC at its ulnar insertion type 1b of Palmer's classification (Figure 3).

After failure of medical treatments and rehabilitation, surgical approach was retained through arthrotomy and opening of the extensor carpi ulnaris (ECU) sheath, revealing a disinsertion of the distal component of the triangular ligament while the meniscus and proximal component were intact, it was repaired by peripheral reinsertion to the deep sheath of the ECU with 2/0 vicryl. The right upper limb was then immobilized with the hand supinated for four weeks, followed by secondary rehabilitation.

Case 2 was a 28-year-old mal without any history of trauma, complain of ulnar sided right wrist pain essentially in movements which involve rotation of wrist like rotating the door knobs, opening the lid of a jar or a bottle. Radiograph analysis showed a positive radio-ulnar index and MRI imaging revealed a TFCC tear type Ib. Surgery involved ulnar oblique shortening osteotomy with plate osteosynthesis and orthopedic treatment of TFCC tear (Figure 4).

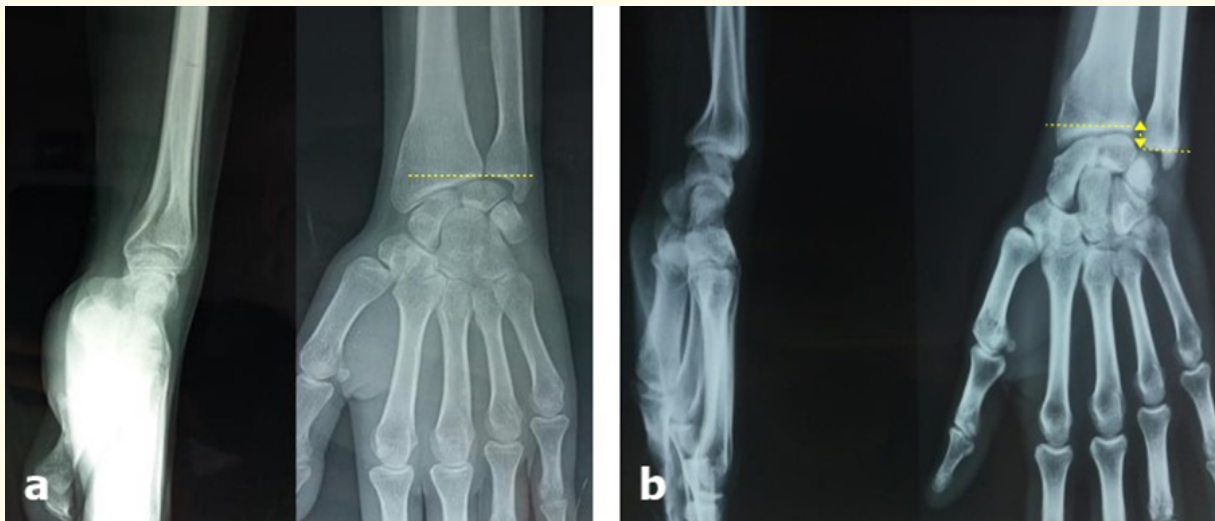


Figure 2: X rays of two cases, first one (a) showing neutral ulnar variance and the second positive ulnar variance showing (b)..

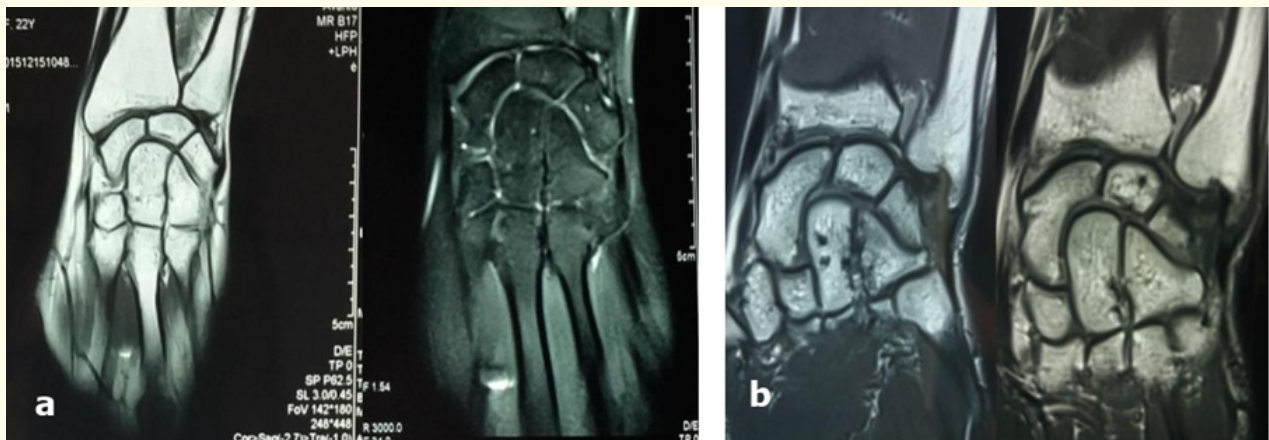


Figure 3: MRI images of two cases showing TFCC lesions type.

The short and long-term follow-up were good with an excellent Mayo wrist score. Osteotomy consolidation and the two patients resumed their normal wrist function (Figure 5).



Figure 4: Operative view of ulnar oblique shortening osteotomy.



Figure 5: Postoperative radiograph.

Discussion

The triangular fibrocartilage complex (TFCC) also named triangular ligament or rather the triangular complex is in fact more complex than it seems, it suspends the ends of the radius and ulna over the wrist. It is triangular in shape made up of dorsal and volar radio-ulnar ligaments, fibrocartilage disc, meniscal homologue, extensor carpi ulnaris (ECU) tendon and sub-sheath, ulnocarpal ligaments and ulnar collateral ligament (UCL). Many anatomical structures and functions of the TFCC were documented since the two-dimensional structure of the TFCC by Palmer and Werner in 1981, then Nakamura's studies divided the TFCC complex into 3 dimensions or portions; proximal portion inserted into the triangular foveal ligament and contributes to DRUJ stability. Distal portion representing the "hammock" supporting the carpus. And ulnar collateral ligament. The three structures suspend each other and their suspension arrangement and loose internal structure allows for both mobility and stability of the ulnar side of the wrist. Recently, TFCC was divided based on the wrist arthroscopy constatation into proximal component (pc-TFCC) and distal component (dc-TFCC) according to the iceberg concept. moreover, a new 3-dimensional structure was proposed by Guillaume Herzberg, first TFCC structure is "V-shaped" radioulnar ligamentous reins (R) stabilizing the DRUJ and always injured in traumatic etiologies, the second structure is peripheral capsular wall (W), stabilizing TFCC to medial carpus structure and also injured in traumatic causes, finally the TFCC disc proper (D) that plays a role in ulno-carpal shock absorber and can be implicated in traumatic or degenerative changes [1-3].

Traumatic TFCC tears usually occur during a fall on outstretched hand in hyperextension and pronation of the wrist joint. However, degenerative lesions are often associated with long ulna (positive ulnar variance) which will compress the triangular complex on the carpal bones essentially lunate and triquetrum in the way of a "sandwich" leading to its perforation. Moreover, ulnar styloid is an integral part of the TFCC which attaches to its base, thus any fracture sitting at this level must be considered as a disinsertion of triangular complex (equivalent to a Palmer 1b lesion) and treated as such. The foveal insertion of the TFCC can be avulsed partially or over its entire thickness as demonstrated by Andrea Atzei in his TFCC foveal tear's classification [3,4].

Patients with TFCC injury complain of pain or discomfort in the ulnar aspect of the wrist essentially during movements that involve rotation of wrist such as rotating a door handles, opening pot cover or bottle. Pain may also be associated with grip weakness, wrist instability or snapping. Weakness in wrist pronation and supination is a common sign reported with TFCC generally due to underlying DRUJ instability.

The exam will look for pain in the deep palpation of the articular disc more reachable forward. The ends of passive pronosupination movement applied to the forearm while elbow is blocked and flexed at 90°, will prove painful as well as hyperpronation and ulnar inclination. An anteroposterior drawer test in neutral position will mark instability and significant lesions of the TFCC.

Neutral postero-anterior (PA) radiographs and lateral radiographs of the wrist, allow to measure the ulnar variance (often positive in this type of lesion), to look for of ulnar impaction syndrome signs (geodes, subchondral sclerosis) and to assess the stability of the DRUJ. Ulnar variance is not inert, thus hand hyper pronation increases positive ulnar variance, whereas hyper supination decreases it to neutral or negative variance. Also, ulnar variance is more positive with power grip and decrease with cessation of the grip. These variations demonstrate the effect of daily activities involving rotation of the forearm and grip on the ulnocarpal articulation [5,6].

Palmer classification system for TFCC lesions based on MRI imaging is the most used classification system that is very helpful to determine the mechanism of injury and dictate clinical management. It divides lesions into two classes. Class I refers to traumatic lesions, divided according to the site of TFCC involvement in four types: Type Ia or central perforation of the triangular fibrocartilage (TFC) disc proper. Type Ib or ulnar avulsion with or without distal ulnar fracture, may involve the proximal or distal lamina (foveal and styloid attachment, respectively), or both. Type Ic or distal avulsion of the TFCC involving ulnocarpal ligaments, Type Id or radial avulsion of the TFC disc proper often associated to sigmoid notch fracture. However, Class II refers to degenerative lesions that are associated with ulnar impaction syndrome and are divided according to the degree of structures involvement on the ulnar side of the wrist. Type IIA injuries

represent TFCC wear with thinning. Type IIB injuries include TFCC wear with associated lunate or ulnar chondromalacia. Class IIC injuries represent a TFCC perforation in association with lunate or ulnar chondromalacia. Type IID lesions include a TFCC perforation, lunate or ulnar chondromalacia, and lunotriquetral (LT) ligament perforation. Type IIE injuries designate a TFCC perforation, lunate or ulnar chondromalacia, LT ligament perforation, and additional ulnocarpal arthritis [7].

Optimal medical management is the first-step treatment based on modification of daily activities and stop playing intense sports which involve wrist axial loading, extension or torsional moment, a brief splint or cast immobilisation can also be used along with anti-inflammatory medication or corticosteroid injection.

Surgical treatment is advocated if conservative management fails to provide relief, or in cases presenting initially with DRUJ instability. Choice of operative treatment is guided by type and extent of injury and may include debridement and repair of TFCC tear.

TFCC lesions associated with long ulna or degenerative changes secondary to ulnar impaction syndrome, will need ulnar unloading procedures like Wafer procedure or ulnar shortening osteotomy that provides better outcomes for these lesions. In addition, associated DRUJ instability will need an anatomical reconstruction of the dorsal and palmar radio-ulnar ligament of the TFCC following Adams and Berger's method [8].

TFCC repair can be performed open or under arthroscopic instrumentation, however arthroscopic management includes significant advantages such as less soft tissue dissection and improved cosmesis it can be instituted successfully in most if not all TFCC lesions. Important arthroscopic signs of TFCC lesion include trampoline sign: loss of normal elasticity of the articular disc while checking with a hook probe it is positive in distal or complete tears and negative in isolated proximal lesions. Hook sign or wave effect created while the TFCC is lifted off from its proximal attachment and pushed to the radial side while examining with a probe it is positive in a complete tear. Finally, ghost sign (Fontes) while the hook is inserted in the DRUJ portal, a wave effect is created by lifting off the TFCC from beneath it, it is positive in isolated proximal tears [4,9].

The potential healing of the triangular complex depends largely on its vascularization. Arises from the branches of the ulnar artery and the palmar and dorsal branches of the anterior interosseous artery. The peripheral 20% of the TFCC is vascularized and thus has good healing potential. A poor vascularization cannot allow to consider a quality repair as it is sometimes seen in central zone or old cases with a retraction of the triangular ligament [10].

Conclusion

Triangular fibrocartilage complex (TFCC) is very complex triangular structure made up of several ligaments and cartilage that offers intrinsic stability to the distal radioulnar joint and the ulnocarpal aspect of the wrist.

Injuries to the TFCC are the most common cause of ulnar side wrist pain.

Arthroscopic repair is gaining more and more place in surgical treatment.

Conflict of Interest

Nothing to report.

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