CHAPTER

54

Repair of the Foveal Insertion of the TFCC Through the DF Portal

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RATIONALE AND BASIC SCIENCE PERTINENT TO THE PROCEDURE

Injury to the triangular fibrocartilage complex (TFCC) is a common cause of ulnar-sided pain and disability in the wrist.

In 1989, Palmer[1] proposed a classification system for disorders of the TFCC that considers two basic categories: traumatic (class 1) and degenerative (class 2) (Table 54-1). These classes are further subdivided into types, depending on the location of the tear and the presence or absence of associated chondromalacic changes. Class 1 traumatic lesions are subdivided into four types according to the tear's location. Type 1B injuries are peripheral tears located on the ulnar side of the TFCC. Recent advances in histology and functional anatomy show that the ulnar side of the TFCC is arranged in a complex tri-dimensional structure.

According to structure and function, the TFCC is separated into three components: the proximal triangular ligament, the distal hammock structure, and the ulnar collateral ligament (UCL).[2] Some authors debate the existence of the UCL[3,4] or consider it to be a part of the floor of the extensor carpi ulnaris (ECU) sheath,[5,6] eventually including some surrounding loose ligamentous tissue.[2] However, the functional UCL can be assimilated to the distal hammock structure, since they both share the same function of supporting and suspending the ulnar carpus.[2] The distal hammock structure and the UCL should be considered as the distal component of the TFCC (dc-TFCC), which is the opposite of the proximal component (pc-TFCC), represented by the proximal triangular ligament (Fig. 54-1). The proximal triangular ligament is a strong ligamentous structure that originates from the fovea ulnaris and spans to the ulnar corners of the distal radius with two limbs—volar and dorsal. It should be considered the true radioulnar ligament that stabilizes the distal radioulnar joint (DRUJ).

Because of the intensity and direction of the traumatic force, either the dc-TFCC or the pc-TFCC or both may be torn. Therefore, ulnar-sided pain, reduced grip strength, decreased forearm rotation, and clinical signs of DRUJ instability may be present accordingly.

Appropriate management of peripheral tears should aim at restoring the original anatomy by direct suture or osseous reattachment of the TFCC by open or arthroscopic repair.[7]

Many arthroscopic techniques have been proposed that suture the torn TFCC to the dorsal ulnocarpal joint capsule and the ECU tendon subsheath. These techniques restore TFCC tautness and thus improve the patient's symptoms. However, arthroscopic suture is of limited benefit when TFCC tears involve the pc-TFCC and when the DRUJ is clinically unstable. In these instances, an arthroscopic repair is unable to reconstitute the preinjury anatomy and provide adequate joint stability. Therefore, open repair is generally recommended, since it is the only technique that allows for a direct reattachment of the proximal component of the TFCC to its foveal insertion.[8] However, a careful and rather extensive exposure of the distal radioulnocarpal joint[9,10] is required to perform a TFCC reattachment via either transosseous sutures passed through drill holes[10,11] or bone anchors.[12]

Continuous advances in the understanding of the intra-articular anatomy and the kinematics of the wrist,[8] as well as the introduction of new volar portals,[13] have contributed to the emergence of an "all-arthroscopic" attitude toward ulnar-sided disorders of the wrist for many surgeons.[14–16]

This chapter describes a method of an arthroscopic-assisted foveal reattachment using a newly devised DRUJ working portal—the direct foveal (DF) portal—which is indicated for repairable proximal or complete peripheral TFCC tears associated with DRUJ instability, but without secondary degenerative changes.

CLINICAL CONSIDERATIONS

The typical candidate for an arthroscopic TFCC foveal reattachment is a patient complaining of ulnar-sided wrist pain, usually after a fall on an outstretched hand or a violent traction and twisting injury of the wrist or forearm.

Patients may complain that their wrist spontaneously "gives way" when they are trying to open a bottle, rotate a steering wheel, turn a door handle, or hold an object in their hand during forearm rotation. The suspected diagnosis is achieved by means of special provocative maneuvers and diagnostic tests.[8,17] Pain is exacerbated by passive forearm rotation and may be associated with the presence of a click or crepitus or an intra-articular grinding sensation. Resistance rotational movements are often weak and reproduce the patient's complaints. The ulnar foveal sign[18] is positive; that is, the patient has point tenderness over the ulnar capsule just volar to the ECU tendon. Provided that the forearm muscles are relaxed, provocative maneuvers for DRUJ instability show greater laxity in the painful wrist compared with the opposite side. Hypertonicity of the muscular stabilizers of the DRUJ may lead to false-negative findings; hence it is recommended that DRUJ stability should be evaluated under regional anesthesia before the operation.

Although all patients presenting with acute or chronic wrist pain should have radiographs taken of the wrist, these are usually of limited help in diagnosing isolated TFCC tears, but they may reveal an associated ulnar styloid fracture or nonunion. Still, the usefulness of magnetic resonance imaging (MRI), even with intra-articular gadolinium, is a controversial issue. Whereas an MRI arthrogram may be both sensitive and specific in diagnosing

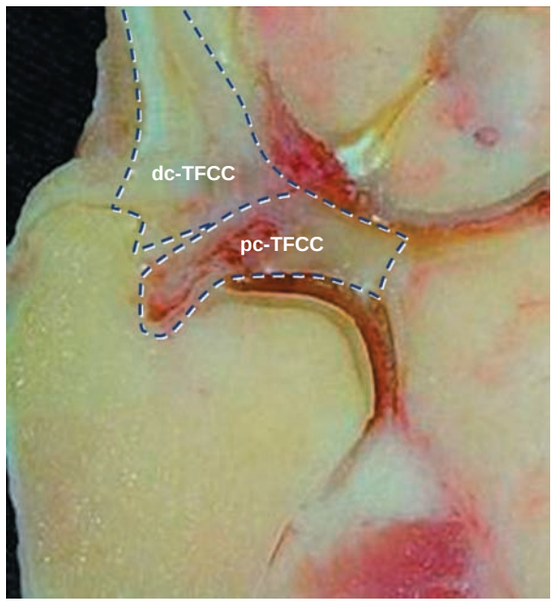
TABLE 54-1
Palmer Classification of TFCC Injuries

Class 1: Traumatic Injuries	
A	Central perforation of the disk proper
B	Peripheral avulsion from the ulna Without styloid fracture With styloid fracture
C	Distal avulsion from the carpus
D	Radial avulsion Without sigmoid notch fracture With sigmoid notch fracture
Class 2: Degenerative Injuries	
A	TFCC wear
B	TFCC wear + lunate and/or head chondromalacia
C	TFCC perforation + lunate and/or head chondromalacia
D	TFCC perforation + lunate and/or head chondromalacia + lunotriquetral ligament perforation
E	TFCC perforation + ulnocarpal arthritis

TFCC, triangular fibrocartilage complex.

Classification from Palmer AK: Triangular fibrocartilage complex lesions: a classification. J Hand Surg [Am] 1989;14:594–606.

FIGURE 54-1 Coronal slice of the ulnar wrist at the level of the fovea. The triangular fibrocartilage complex (TFCC) is outlined. It is separated into the distal component of the TFCC (D), formed by the ulnar collateral ligament and the distal hammock structure, and the proximal component (P), represented by the proximal triangular ligament, which originates from the ulnar fovea and the styloid. (From Atzei A. New trends in arthroscopic management of type 1-B TFCC injuries with DRUJ instability. J Hand Surg [Eur] 2009; Epub ahead of print.)



a tear, it has not shown similar accuracy in assessing tear size and location.[19] Studies comparing specificity and sensitivity of arthrography, MRI, and arthroscopy confirm arthroscopic visualization of a TFCC tear to be the gold standard for definitive diagnosis.[20,21]

Arthroscopy of the radiocarpal joint (RC-Arth) and the DRUJ (DRU-Arth) allows for a thorough evaluation of the tear's characteristics. RC-Arth is used to evaluate the dc-TFCC.[22] The tear is visualized in the dorsoulnar corner of the TFCC. The TFCC tension is evaluated by the trampoline test[11] and the hook test. The trampoline test evaluates the TFCC resilience (trampoline effect) by applying a compressive load across it with the probe. The test is positive when there is a peripheral TFCC tear, since the TFCC becomes soft and compliant. The hook test consists of applying traction to the ulnarmost border of the TFCC with the probe inserted through the 4-5 or 6R portal. The test is positive when the TFCC can be pulled upward and radially toward the center of the radiocarpal joint (Fig. 54-2). It is a useful maneuver for detecting a foveal disruption of the pc-TFCC.[23]

DRU-Arth is the only method for detecting any ligamentous laceration of the pc-TFCC or avulsion of the foveal attachments. It is mandatory when a hook test yields positive results or when the TFCC tear is associated with clinical signs of DRUJ instability.

Because the DRUJ is a very narrow and tight joint, it may be difficult to perform DRU-Arth when the pc-TFCC is still intact. However, when the pc-TFCC is torn, the articular disk is loose, and more space is available for DRUJ exploration. An 18-gauge hypodermic needle may be placed percutaneously 1 cm proximal to the 6U portal. It will enter the joint close to the fovea and may be used to lift the articular disk—thus enlarging the visual field—and to palpate the pc-TFCC. Furthermore, DRU-Arth allows DRUJ cartilage to be examined for chondromalacic changes.

RC-Arth and DRU-Arth provide a combination of findings that should be considered when deciding on the appropriate treatment of a TFCC tear. They are summarized in the following four parameters.[22]

Lacerated Components of the Triangular Fibrocartilage Complex

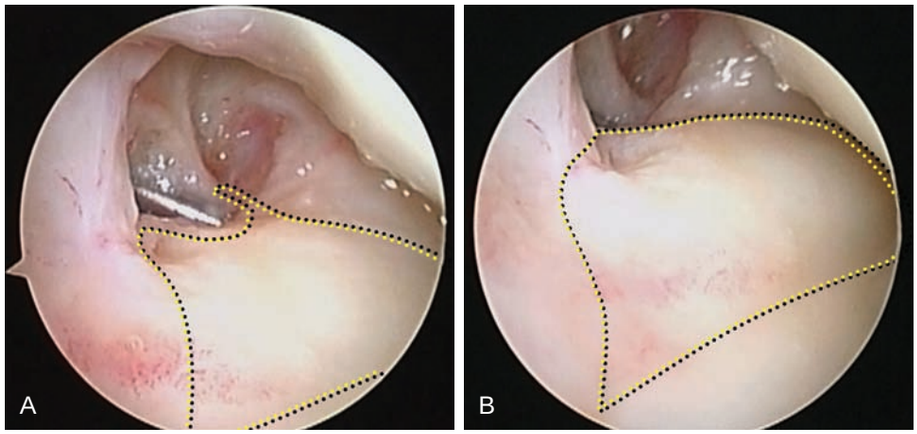
Establishing the extent of TFCC disruption is of utmost importance. Each component of the TFCC, that is, distal (dc-TFCC) and proximal (pc-TFCC), may be involved either separately or in association.

Three types of ligamentous damage are possible:

1. *Distal tear (isolated tear of the distal component of the TFCC)*: When only the dc-TFCC is lacerated, the trampoline test result is positive for loss of TFCC resilience, but the hook test result is negative. Integrity of the foveal attachments of the pc-TFCC is confirmed by DRU-Arth.
2. *Complete tear (tear of both distal and proximal components of the TFCC)*: Complete peripheral TFCC tear involves both components of the TFCC. A tear of the dc-TFCC is visible during RC-Arth, and a pc-TFCC avulsion is demonstrated by DRU-Arth. Both trampoline and hook test results are positive.
3. *Proximal tear (isolated tear of the proximal component of the TFCC)*: An isolated avulsion of the pc-TFCC from the fovea ulnaris can be demonstrated by DRU-Arth, which is mandatory to achieve the correct diagnosis. Standard RC-Arth fails to show any abnormalities of the contour and capsular reflection of the TFCC, even though both trampoline and hook tests show positive results.

Surgical treatment varies according to which TFCC component is lacerated.[22] In case of a proximal or complete tear, a TFCC reinsertion onto the fovea ulnaris is recommended. However, in case of a distal tear, arthroscopic suturing of the TFCC to the dorsal ulnocarpal joint capsule and the ECU tendon subsheath is appropriate.

FIGURE 54-2 **The hook test. A,** In a left wrist, the probe is inserted via the 6R portal through the triangular fibrocartilage complex (TFCC) tear. Traction is applied to the ulnarmost border of the TFCC. **B,** The test result is considered positive when the TFCC (outlined by the dotted line) can be pulled upward and radially as the pc-TFCC is interrupted or avulsed from the fovea. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)



Reducibility of the Triangular Fibrocartilage Complex Tear

With a small TFCC tear, as well as an avulsion type of rupture, the tear's edges can be reapproximated or reduced easily, and a TFCC repair can be successfully performed. By contrast, in the presence of a massive rupture of the TFCC and/or retraction of the ligamentous remnants, reapproximation of the avulsed ligament or repair of the TFCC tear to its anatomic position is not feasible. Therefore, reconstruction with tendon graft should be taken into consideration.

Healing Potential of the Triangular Fibrocartilage Complex Tear

Chronic midsubstance ligamentous tears showing degenerated or necrotic edges cannot be debrided back to a well-vascularized area; therefore, direct repair is unlikely to provide adequate healing. The same applies to the elongated and frayed ligament after a failed suture; direct repair is unlikely to be successful, and a TFCC reconstruction with tendon graft is recommended. In our experience, pc-TFCC tears have a good healing potential for up to 3 months after injury (acute tears), whereas tears treated from 3 to 6 months after injury (subacute tears) have unpredictable characteristics. More chronic tears usually have a poor healing potential. Moreover, congenital dysmorphisms of the styloid and foveal area of the ulna (e.g., styloid hypoplasia and flattened ulnar head) represent other conditions that are associated with poor healing potential after a repair, and hence require reconstruction.

Cartilage Status of the Distal Radioulnar Joint

Healthy cartilage status is of the utmost importance when planning any reconstructive surgery for TFCC disruption. After high-energy trauma, a cartilage defect over the ulnar head and sigmoid notch may have been produced at the time of the initial injury. Alternatively, degenerative chondromalacia may be the consequence of the altered joint kinematics resulting in chronic DRUJ instability. Well-preserved cartilage is a *sine qua non* for every type of ligament repair or reconstruction of the DRUJ. When DRUArth shows a chondral lesion, some type of salvage arthroplasty is recommended as an alternative.

Based on the above-mentioned criteria, a novel classification[22] is defined that considers the variety of TFCC peripheral tears and provides guidelines for specific treatment modalities: repair (suture or foveal insertion), reconstruction with tendon graft, or salvage procedures (arthroplasty or joint replacement) (Table 54-2).

INDICATIONS FOR FOVEAL REPAIR

When pain and impaired function show no improvement after a trial of conservative treatment, a foveal repair[23] is indicated with type 1B TFCC injuries of the Palmer classification. This is represented as both class 2 and 3 tears (complete and isolated proximal repairable TFCC tears) in the authors' proposed classification.

CONTRAINDICATIONS

A foveal reattachment is not indicated for classes 1, 4, and 5 tears in the authors' classification.

Class 1 (an isolated distal repairable tear) should be treated by arthroscopic suturing of the TFCC to the dorsal ulnocarpal joint capsule and the ECU tendon subsheath. Class 4 (nonrepairable tears, owing to either a large tear size or poor quality of the torn ligaments) should undergo ligament reconstruction by tendon graft, as either an open[24] or arthroscopic procedure.[22,25]

Chronic Essex-Lopresti injuries, in which longitudinal stability of the forearm is altered as a result of the laceration of the interosseous membrane, are not amenable to simple TFCC reattachment.

Other absolute contraindications include previous soft tissue infection, osteomyelitis, and severe osteoporosis of the ulnar head.

Relative contraindications include a positive ulnar variance with secondary ulnar impaction and carpal chondromalacia.

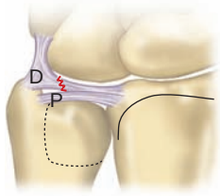
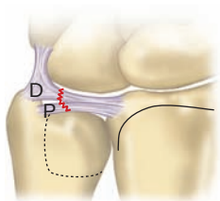
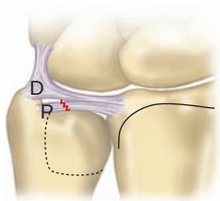
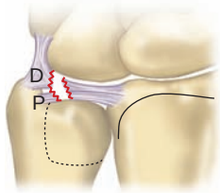
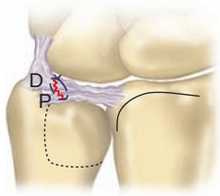
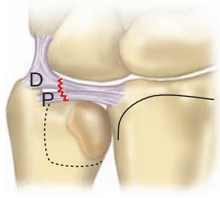
SURGICAL TECHNIQUE

Operative Setup and Diagnostic Arthroscopy

The patient is positioned supine with the affected arm on a hand table and a padded tourniquet on the proximal arm. After a brachial plexus block has been administered, the DRUJ laxity is

TABLE 54-2

Arthroscopic Classification of TFCC Peripheral Tears

Clinical		DRUJ Instability	Distal Component	Proximal Component	Tear Reducibility	Healing Potential	DRUJ Cartilage	Treatment
Class 1 Repairable distal tear		None – slight	Torn	Intact	Easy	Good	Good	Repair Suture (ligament-to-capsule)
Class 2 Repairable complete tear		Mild – severe	Torn	Torn	Easy	Good	Good	Repair Foveal refixation
Class 3 Repairable proximal tear		Mild – severe	Intact	Torn	Easy	Good	Good	Repair Foveal refixation
Class 4-A Non-repairable massive tear Non-reducible		Severe	Torn	Torn	Impossible	Good	Good	Reconstruction: Tendon graft
Class 4-B Non-repairable Failed suture Frayed ligament		Mild – severe	Torn	Torn	Impossible *	Poor	Good	Reconstruction: Tendon graft
Class 5 Arthritic DRUJ		Mild – severe	†	†	†	†	Poor	Salvage: Arthroplasty or joint replacement

* After debridement to bleeding edges.

† Variable findings that would not change treatment.

Nakamura classification[22] based on arthroscopic findings provides guidelines for treatment of different triangular fibrocartilage complex (TFCC) peripheral tears. The first column reports findings of clinical instability of the distal radioulnar joint (DRUJ). Classes 1–3 are repairable lesions that should be treated by either suture or foveal refixation. Classes 4-A and 4-B are nonrepairable lesions that should undergo reconstruction by tendon graft. Class 5 includes different conditions, whose main characteristic consists of cartilage degeneration of the DRUJ. Such cases should be treated by salvage procedures, that is, arthroplasties or prosthetic joint replacement. From Atzei A. New trends in arthroscopic management of type 1-B TFCC injuries with DRUJ instability. J Hand Surg [Eur] 2009; Epub ahead of publishing.

examined again before starting the arthroscopic procedure. Complete forearm muscle relaxation following anesthesia may reveal previously undetected DRUJ instability. The upper limb is exsanguinated, and the tourniquet is inflated to 250 mm Hg.

A standard wrist arthroscopy setup is used.[26] The wrist is suspended by finger traps using a wrist traction tower, with approximately 10 to 15 pounds of traction, depending on the size of the extremity. Joint distention by saline infusion is usually not required to completely visualize the joint.[26] The authors' preference is to use a dry technique, which facilitates arthroscopic repair methods.[27,28]

A 2.7-mm arthroscope is used routinely, but the 1.9-mm arthroscope is used for smaller wrists. The wrist is systematically evaluated by RC-Arth, with the scope in the 3-4 portal. Care is taken to detect any associated disorders of the ulnar carpus.

Tears of the dc-TFCC are visualized on the dorsoulnar portion of the articular disk and are frequently covered by hypertrophic synovitis or fibrovascular granulation tissue, which is removed with a small motorized shaver.

A probe is inserted into the 6R portal to palpate the articular disk and to assess the tension to the TFCC—by the trampoline test and the hook test.

If the TFCC is redundant and tests are positive for loss of normal resilience, pc-TFCC integrity and tautness are evaluated through DRU-Arth.

The forearm is supinated, the traction reduced, and the DRUJ explored through the distal DRUJ portal. In smaller wrists, use of a volar ulnar (VU) portal is recommended.[29] Scope insertion is easier when the pc-TFCC is torn, since the articular disk is loose and more joint space is available. DRU-Arth shows the ligamentous laceration or avulsion of the pc-TFCC from the fovea. For a preliminary assessment of pc-TFCC tautness, an 18-gauge needle is inserted percutaneously about 1 cm proximal to the 6U portal with the forearm held in full supination.

When a TFCC Palmer type 1B tear is associated with DRUJ instability, the most common finding is the combination of a dc-TFCC tear and a pc-TFCC avulsion (complete TFCC tear class 2). Less frequently, a pc-TFCC tear is present as an isolated finding (proximal TFCC tear class 3). In the latter case, a standard RC-Arth reveals a normal TFCC appearance, which may lead to the misdiagnosis of a normal TFCC, since the pc-TFCC tear can be demonstrated only by DRU-Arth. For this reason, DRU-Arth is considered mandatory in cases of a suspected TFCC tear that is associated with DRUJ instability.

Repair Technique

Repair of the foveal insertion of the TFCC is performed by reattachment of the pc-TFCC through a suture screw or anchor.[23]

The procedure begins with debridement of the foveal region as well as the torn edges of the TFCC back to healthy tissue using a small motorized shaver inserted through the 6R portal. Although the fovea can be debrided from the radiocarpal joint through the TFCC tear, it is recommended to establish a separate DRUJ portal not only to remove the ligamentous remnants and refresh the bone at the fovea, but also to drill and insert the suture screw/anchor. A dedicated working portal named the direct foveal (DF) portal has been devised to provide access to the fovea ulnaris.[22,23]

The DF portal is located about 1 cm proximal to the 6U portal and is created with the forearm held in full supination. Full forearm supination produces dorsal displacement of the ulnar styloid and the ECU tendon and uncovers the volar aspect of the distal ulna on wrist's ulnar side (Fig. 54-3). Thus, the fovea and the ulnarmost area of the distal ulna become subcutaneous and may be reached through a very limited exposure. The DF portal is less technically demanding compared with the formal VU portal,[29] but its use is limited to the introduction of working instruments in the area of the ulnar styloid and fovea (Fig. 54-4).

After portal placement is checked under arthroscopic control with an 18-gauge needle, the longitudinal skin incision of the 6U portal is extended proximally between the ECU and the flexor carpi ulnaris (FCU), for a total length of 2 to 2.5 cm. Through this mini-open approach, the dorsal sensory branch of the ulnar nerve (DSBUN) and its transverse branches are identified and protected by careful subcutaneous dissection. The risk of damaging the DSBUN is further reduced as the forearm is supinated, given that the DSBUN is displaced more volarly and along a slacker path than when the forearm is held in neutral position.

The extensor retinaculum is exposed and split along the course of its fibers. The DRUJ capsule is incised longitudinally to reach the distal articular surface of the ulnar head under the TFCC. The fovea is located volarly at the base of the ulnar styloid, just lateral to the capsule.

With the scope in the distal DRUJ portal, a small shaver or curet can be inserted through the DF portal to refresh the torn/avulsed ligament, to remove the inflammatory fibrovascular tissue from the fovea, and to prepare it for suture screw/anchor insertion. Curettage of the fovea can also be performed as a mini-open procedure.

Screw/anchor drilling and insertion are performed as a mini-open procedure as well (Fig. 54-5). The fovea is palpable as an area of soft bone at the base of the ulnar styloid, just lateral to the capsule. A power drill and intraoperative fluoroscopy are not required, although the latter may be advisable for the less experienced surgeon.

It is recommended to use a screw/anchor that supports a pair of sutures so that a distinct suture can be passed through each limb of the radioulnar ligament. This also improves the strength of the repair by recreating a broader footprint of the pc-TFCC, analogous to a rotator cuff repair in the shoulder.[30] The authors prefer to use a 2.8 or 3.2 titanium screw with two preloaded nonabsorbable 2-0 Ultrabraid sutures (Twinfix, Smith & Nephew, Andover, MA) or a 3.5-mm absorbable screw preloaded with two 2-0 FiberWire sutures (Bio-Corkscrew, Arthrex, Naples, FL).

Once the screw is in place, sutures should exit the DF portal from underneath the TFCC (Fig. 54-6). Then, the wrist is placed back in neutral pronosupination so that the screw's head is brought under the ulnarmost part of the TFCC.

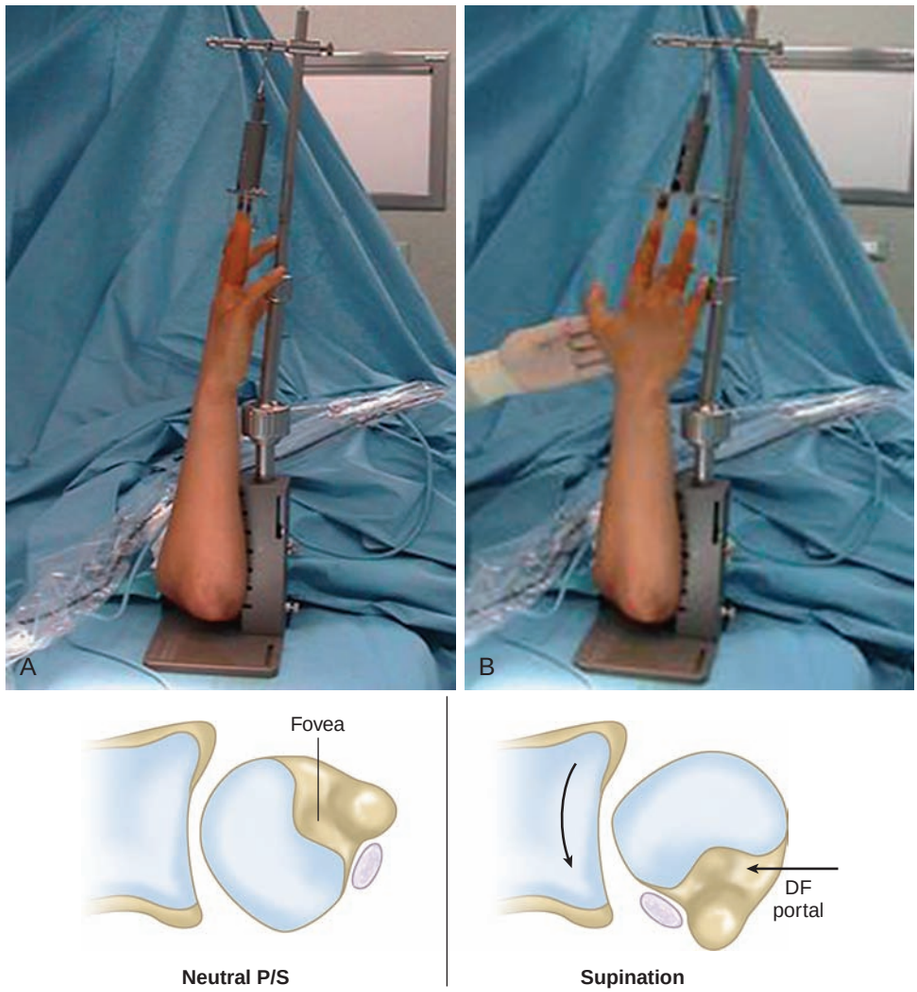
The suture ends are inserted into the tip of a 25-gauge needle, or preferably a Tuohy needle, to facilitate passage through the TFCC.

With the scope in the 3-4 portal, the first suture is inserted in an outside-in fashion from the DF portal, close to the TFCC's palmar contour, to hold the palmar limb of the radioulnar ligament (Fig. 54-7). A grasper is used to retrieve the suture from the 6U portal (Fig. 54-8). The same procedure is repeated for suturing the dorsal limb of the radioulnar ligament.

The wrist traction is then released, and the forearm is held in neutral rotation. The surgical assistant maintains the ulnar head in reduced position. The sutures are tied under arthroscopic control using a small knot-pusher, ensuring adequate pc-TFCC compression against the distal ulna (Fig. 54-9). Knots should be located at the prestyloid recess or just outside the DRUJ capsule (Fig. 54-10).

RC-Arth is used as a control to ensure complete tear closure. Even in the larger type 2 TFCC peripheral tears, it is seldom

FIGURE 54-3 Full forearm supination is required to create the direct foveal (DF) portal. After supination, the ulnar styloid and the extensor carpi ulnaris tendon displace dorsally, and the fovea and the ulnarmost area of the distal ulna become subcutaneous. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)



necessary to apply any further ligament-to-capsule sutures to close off the dc-TFCC.

The DRUJ is evaluated for complete range of pronosupination and residual instability.

The DRUJ capsule and the opening between retinaculum fibers are approximated with two PDS 4-0 stitches. Skin is closed by a subcuticular running suture.

Postoperative Treatment

The patient is placed in a long-arm splint in neutral forearm rotation for the first week, which is substituted by a short Münster splint for another 2 weeks.

Full wrist flexion/extension can be started as early as 3 weeks postoperatively. During the first week of rehabilitation, progressive forearm rotation is allowed, but the splint is still worn between exercises.

During the following 6 weeks, the patient is not permitted to perform any resistance movements. Progressive resistance wrist- and hand-strengthening exercises are begun after the sixth week until the patient is able to bear weight on the operated wrist. Sport and heavy work activities are started 3 months postoperatively.

COMPLICATIONS

Few complications should be encountered during arthroscopic-assisted palmar repair of the foveal insertion of the TFCC, provided that there is careful application of standard arthroscopic principles and of the described surgical technique. The most serious complication is potential injury to the DSBUN, which is related to surgical experience. It can be prevented by careful dissection techniques and a sound understanding of the underlying anatomy and its variation following forearm rotation. Transitory neuropraxia of the DSBUN may be observed, which recovers spontaneously in 3 to 4 months. The surgical scar of the ulnar side of the wrist may adhere to deeper structures and become painful during the first stages of physical therapy, especially after a prolonged period of wrist immobilization.

As in other arthroscopic procedures, infection remains a risk, which is usually prevented by a prophylactic dose of parenteral antibiotics before initiating the procedure.

The dry technique of joint exploration[27] is recommended to reduce soft tissue infiltration and swelling by the continuous leaking of saline through the portals.

FIGURE 54-4 The direct foveal (DF) portal is located about 1 cm proximal to the 6U portal. It has been devised as a working portal to provide access to the area of the ulnar styloid and fovea. With the scope in the distal radioulnar joint portal, a curet or small shaver is inserted through the DF portal to refresh the torn/avulsed ligament and the fovea. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)

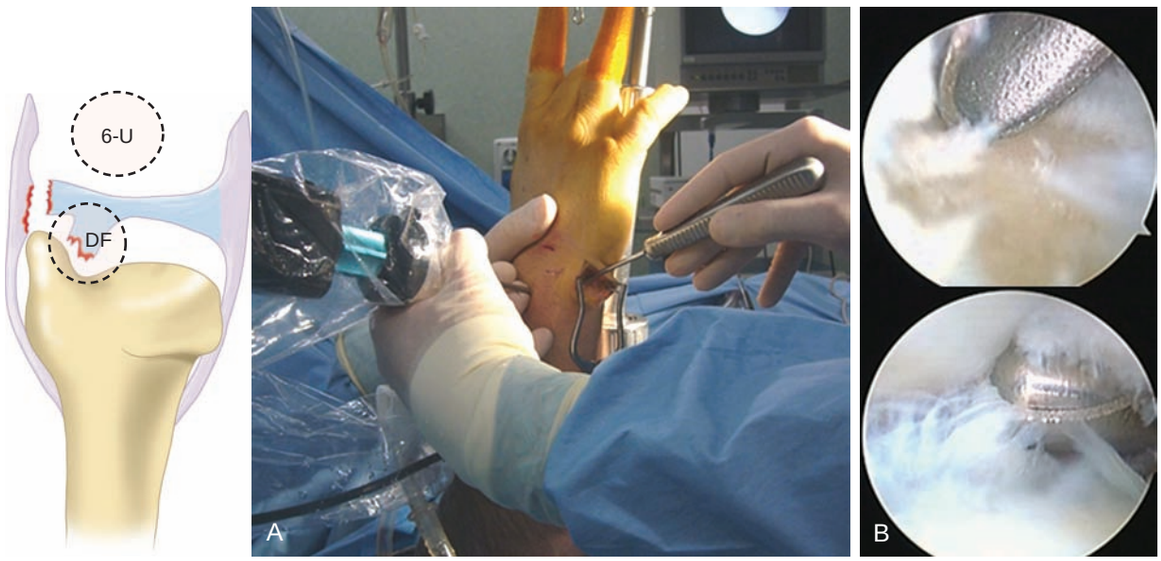


FIGURE 54-5 Screw/anchor drilling and insertion are performed as a mini-open procedure through the direct foveal portal. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)

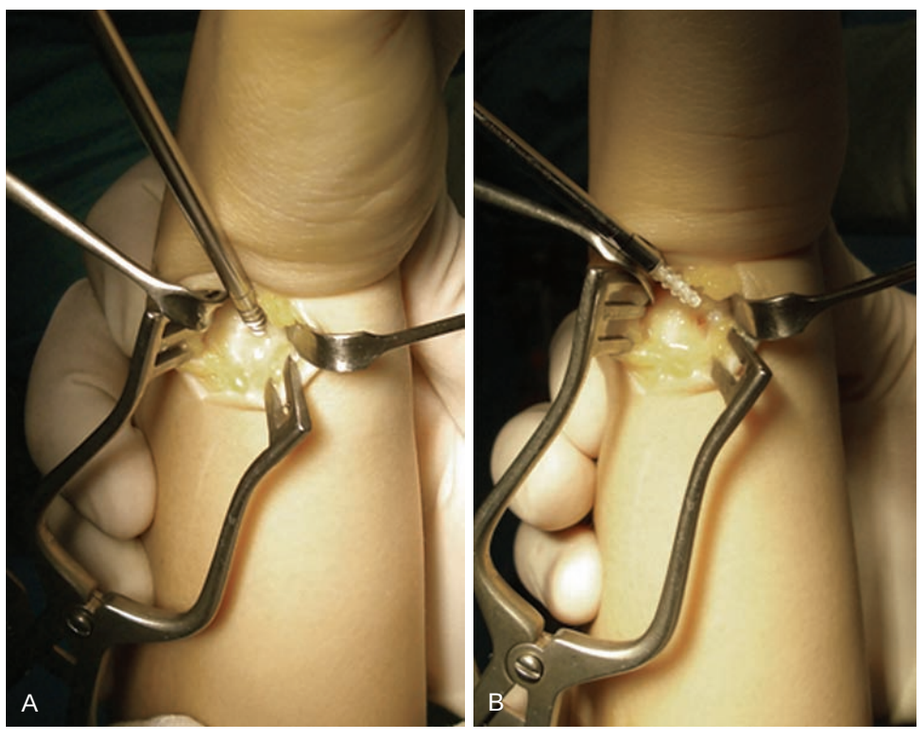


FIGURE 54-6 Once the screw is in place, sutures should exit the direct foveal portal from underneath the triangular fibrocartilage complex (TFCC). When the wrist is placed back in neutral pronosupination, the screw's head is brought under the TFCC. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)

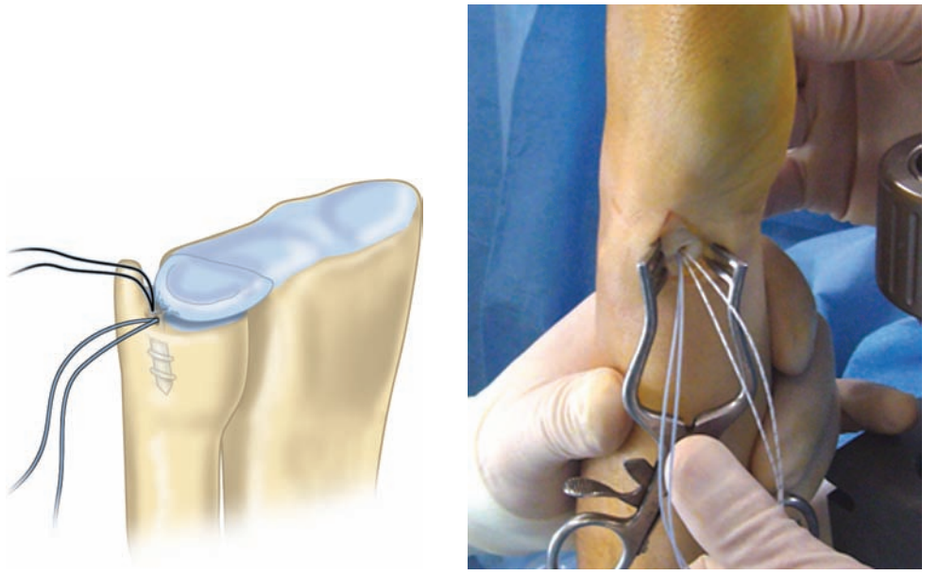
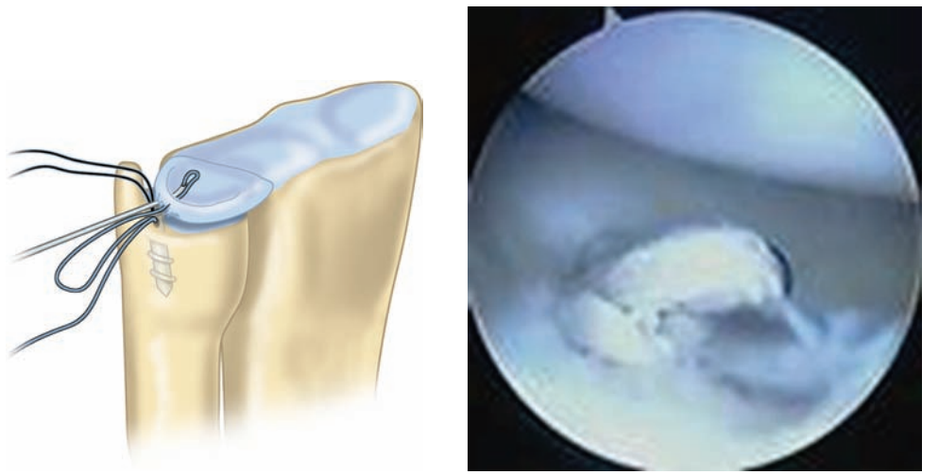


FIGURE 54-7 With the scope in the 3-4 portal, the first suture end is inserted into the tip of a 25-gauge needle (preferably a Tuohy needle). The needle is passed through the triangular fibrocartilage complex (TFCC) in an outside-in fashion via the direct foveal portal toward the palmar contour of the TFCC. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)



The technique of arthroscopic-assisted palmar repair of the foveal insertion of the TFCC has a learning curve. However, once the technique is mastered, the rate of complications for this procedure is comparable to that of larger series of common wrist arthroscopic procedures.[31]

RESULTS

The authors' clinical experience started in 2001, and up until now we have operated on 37 TFCC tears (29 type 2 TFCC peripheral tears and 8 type 3 tears).

In a control series study, 18 patients (13 males and 5 females, with a mean age of 34.2) were investigated prospectively for a minimum follow-up of 1 year (average 18 months, maximum 37 months). All patients had a history of trauma, complained of pain in the ulnar fovea, and had clinical signs of DRUJ instability, ranging from mild (10 patients) to moderate (8 patients). Although radiographs showed a positive ulnar variance in three patients, there were no detectable signs of ulnocarpal impaction or carpal degenerative chondropathy. Arthroscopy revealed a Palmer type 1B ulnar avulsion of the TFCC in all patients. Fourteen cases were classified as

FIGURE 54-8 A grasper is inserted through the 6U portal and used to retrieve the suture. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)

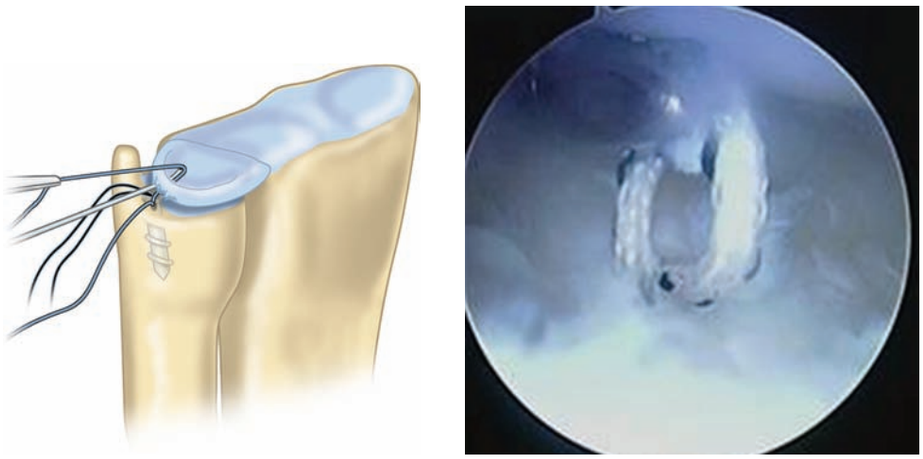


FIGURE 54-9 The suture is tied under arthroscopic control using a small knot-pusher. The pc-TFCC (proximal component of the triangular fibrocartilage complex) is pushed forcefully against the distal ulna, provided that the wrist traction is released, the forearm is held in neutral rotation, and the ulnar head is reduced by the assistant. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)

complete TFCC peripheral tears (type 2) and four as proximal tears (type 3).

At follow-up evaluation, the patients showed an increased range of motion (from 90.7% to 96% of the contralateral side) and grip strength (from 73% to 90%). Pain decreased from 8.3 to 1.2 on a 10-point visual analogue scale. Grip strength and pain changes reached statistical significance ($P < .005$). The Modified Mayo Wrist Score was excellent in 14 patients, good in 3, and fair in 1. A total of 94.4% of the results scored excellent and good. DASH (disabilities of the arm, shoulder, and hand) score averaged 10.5. Fifteen patients (83.3%) resumed previous work and recreational activities, and 3 patients (16.7%) returned to restricted employment.

FIGURE 54-10 At the end of the procedure, the knots of both sutures are located at the level of the 6U portal just outside the distal radioulnar joint capsule or in the prestyloid recess. (From Atzei A, Rizzo A, Luchetti R, Fairplay T: Arthroscopic foveal repair of triangular fibrocartilage complex peripheral lesion with distal radioulnar joint instability. Tech Hand Up Extrem Surg 2008;12:226–235.)

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