Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Analysis of Results of Arthroscopic Repair of Triangular Fibrocartilage Complex (TFCC) Injury.

Prasanta kumar saha[1]

[1]Associate Professor, Department of Orthopaedics, Calcutta National Medical College And Hospital, Kolkata, India.

Received: November 2016
Accepted: November 2016

ABSTRACT

Background: Triangular fibrocartilage complex (TFCC) tears are a major source of ulnar-sided wrist pain and may result in patient disability, ranging from activities of daily living to high-level athletics. The purpose of this study is to evaluate the long-term clinical outcomes in patients affected by TFCC lesion and in association with or without distal radio ulnar joint (DRUJ) instability after arthroscopic repair. **Methods:** Younger patients (50 years of age or younger), presented with mechanical symptoms at least 6 weeks of failed conservative treatment, a positive, foveal tenderness test, were included in the study. Patients were excluded if they had ulnar impaction syndrome, arthritis of wrist joint or other wrist pathology on arthroscopic examination. Final results were evaluated after 1 year. **Results:** Forty-nine wrists in 48 patients had arthroscopy for a possibly repairable peripheral TFCC tear during the study period. Thirty four wrists in 34 patients remained after exclusions. The Mayo score from pre-operative value 46.9±10.4 was increased to 91.7±5.0 postoperatively. At final follow-up, 2 patients had foveal tenderness, and no patients had a piano-key sign or caput ulna. **Conclusion:** Arthroscopic repair for traumatic TFCC foveal tear can restore stability to the DRUJ and provide satisfactory subjective and objective results without serious complications after more than 12 months' follow-up.

Keywords: Arthroscopic repair, distal radioulnar joint, triangular fibrocartilage complex, wrist arthroscopy.

INTRODUCTION

The triangular fibrocartilage complex (TFCC) is the major ligamentous stabilizer of the distal radioulnar joint (DRUJ) and the ulnar carpus. In 1981, Palmer and Werner introduced the term triangular fibrocartilage complex (TFCC) to describe the ligamentous and cartilaginous structures that suspend the distal radius and ulnar carpus from the distal ulna. It provides a continuous gliding surface across the entire distal face of the two forearm bones for flexion-extension and translational and rotational movements of the radiocarpal unit around the ulnar axis. It suspends the ulnar carpus from the dorsal ulnar face of the radius, cushions the forces transmitted through the ulnocarpal axis and solidly connects the ulnar axis to the volar carpus.

Name & Address of Corresponding Author
Dr. Prasanta kumar saha
Golden view apartment,
2nd floor, Room no- 305
T,N Mukherjee road, Monoharpur
(Near Dankuni railway station)
Dankuni, Hoogly.

So TFCC is a critical component of wrist mechanics, serving important functions in both load transmission (20%) and distal radioulnar joint (DRUJ) stability.[1–4] A TFCC disruption can cause DRUJ instability and functional impairment due to ulnar-sided wrist pain and decreased grip strength.[5–13]

Recommended treatment of TFCC tears is variable, depending on the location and chronicity of the tear, concomitant pathology, and the anatomy of the individual patient's radiocarpal and distal radioulnar joints.[14] The articular disk of the TFCC has a rich blood supply at its outer margin, and acute peripheral tears are amenable to suture repair.[15,16] Both open and arthroscopic series have shown good improvement in pain, grip strength, and function with repair of peripheral tears. Although initial reports of open repair showed good results, those of more recent arthroscopic series show good outcomes with improved grip strength and range of motion and possibly decreased ulnar nerve pain compared with open techniques.[17-23]

As interest in the TFCC evolved, open repair techniques for this structure were devised. Small-joint arthroscopy provides the opportunity for new

techniques in the debridement or repair of these structures. The purpose of this prospective study is to evaluate the result of arthroscopic repair for treatment of TFCC repair.

MATERIALS AND METHODS

This is an observational prospective cohort study. The study was conducted in our institution after getting ethical permission. All the patients were counseled about the advantages, disadvantages, and complications of the procedure. After getting written consent from patients, we performed the arthroscopic procedure. The study period was from January 2013 to April 2016. The inclusion criteria were younger patients (50 years of age or younger), mechanical symptoms (isolated ulnar-sided wrist pain and restricted wrist motion), at least 6 weeks of failed conservative treatment, a positive, foveal tenderness test, and radiographic criteria for TFCC. Patients were excluded if they had ulnar impaction syndrome preoperative radiographic evidence of radiocarpal arthritis, inflammatory arthropathy, previous distal radius fracture or other wrist pathology on arthroscopic examination, including scapholunate or lunotriquetral ligament injury, simultaneous excision of a painful ulnar styloid nonunion at the time of TFCC repair, or other pathology in the affected extremity that could affect function. The diagnosis of ulnar impaction syndrome was supported by a combination of tenderness at the ulnar fovea and typically over the lunotriquetral interval, often combined with radiographic or MRI findings of a degenerative appearing TFCC tear, lunotriquetral tear, or chondromalacia/ cystic changes in the lunate. These findings were seen most commonly in the setting of ulnar positive variance. Patients with a clear diagnosis of ulnar impaction were most commonly offered a joint leveling procedure.

Surgical technique

The affected wrist was placed in 4 to 7 kg of traction through the fingertraps for distraction of the wrist.by using the TractionTower Extremity Traction Device. A 3,4 arthroscopic portal and 6R portal (radial to the extensor carpi ulnaris tendon of the sixth extensor compartment) was made. A 2.7-mm arthroscope was then inserted and arthroscopic shaver was then introduced .A standard diagnostic arthroscopy was performed, and attention was then directed to characterizing the TFCC tear.

Central (Palmar 1A Tear): These tears do not heal due to lack of vascularity and are thus treated with simple debridement to a stable edge using a 3.5-mm full-radius motorized shaver.[24]

Peripheral (Palmar 1B C): When a peripheral tear was identified, the arthroscopic probe was used to lift up the articular disk from its undersurface ulnarly so as to identify whether it was still attached to the fovea by its deep fibers. If foveal attachment was present, the tear was repaired by outside-in suture repair technique.[25-27] Obliteration of the tear was confirmed by arthroscopy [Figure - 1, 2 and 3]. If foveal detachment was present, transosseous suture fixation was done.

Figure 1: Arthroscopic view of TFCC tear.

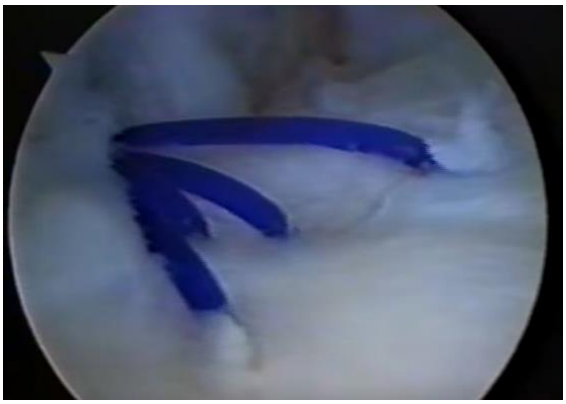

Figure 2: Sutures are placed through TFCC.

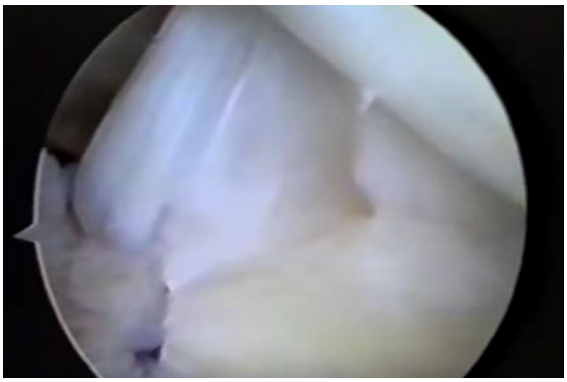

Figure 3: TFCC after repair.

Radial sided (Palmar 1D) avulsion: These tears are first debrided back to a stable margin. While multiple techniques have been reported for repair, we prefer simple debridement because of the lack

of vascularity of the radial aspect of the TFCC.[24,28] However, if DRUJ instability is present because of the radial avulsion, repair may be indicated. We prefer a modified technique described by Sagerman and Short.[29] After surgery, patients were immobilized in a longarm splint full time, with the forearm in supination for 3.5 weeks, and then forearm range of motion was started. Protecting the repair in forearm supination for this length of time did not cause difficulty for the patients in restoring pronation. At 6 weeks, patients began wrist flexion/extension, and at 10 weeks, they returned to activity as tolerated. Patients were followed up 3 monthly intervals for a period of at least one year. Patients were examined for presence of foveal tenderness, piano-key sign, and caput ulna. Anteroposterior, oblique, and lateral wrist radiographs were reviewed for any evidence of wrist arthritis. The final results were evaluated by grip strength VAS, DASH, and Mayo wrist score.

Statistical analysis

SPSS for Windows (Version 13) was used for data management and statistical analysis. Because the data had statistically non-normal distributions, nonparametric statistical methods were used to analyze the data. The Friedman test was used to compare preoperative and postoperative data and for side-to-side comparisons between the injured and uninjured sides. The Mann- Whitney test was used to compare independent groups (such as athletes and non-athletes) with respect to non-categorical variables. Spearman correlations were obtained to evaluate association between non-categorical variables. A .05 significance level (2-tailed) was used for all statistical analyses.

RESULTS

Forty-nine wrists in 48 patients had arthroscopy for a possibly repairable peripheral TFCC tear during the study period. There were no negative diagnostic arthroscopies. Fifteen wrists were excluded, including 5 for presence of intercarpal tears seen arthroscopically, 4 for simultaneous excision of painful ulnar styloid nonunion, 3 for inflammatory arthropathy, 2 for previous distal radius fracture, and 1 for chronic intersection syndrome. Thirty four wrists in 34 patients remained after exclusions. The mean age in the final cohort was 25 years (range, 15–46 yrs.). There were 25 men and 9 women. The dominant side was affected in 22 wrists. Eight patients were office workers, 10 were students, 7 were heavy laborers, 4 were light laborers or housewives, 3 had a job requiring fine dexterity, and 2 was retired. Mechanism of injury included an acute event or injury in 22 (64.7%), insidious onset in relation to as specific activity in 9 (26.5%), and no identifiable cause in 3 (8.8%). During arthroscopy procedure, type 1A tear in 7 cases type 1B & C tear 22 cases, type 1D tear in 5 cases was found. Positive ulnar variance (+ 2mm) was found in 10 cases and neutral or negative ulnar variance (- 1mm) was found in 24 cases.

Thirty four patients were available for follow-up at the end of one year. The mean VAS score improved from a preoperative score of 5.4 (range, 2 to 8) to a score of 0.9 at final follow-up (range, 0 to 4) ($p < .001$). The mean DASH score improved from a preoperative score of 48 (range, 21 to 55) to a score of 8 at final follow-up (range, 0 to 36) ($p = .003$). The Mayo score from pre-operative value 46.9±10.4 was increased to 91.7±5.0 postoperatively which was statistically significant ($p < .001$). There was significant improvement was seen in grip strength (Table -1). Twenty-nine patients (85%) said that the surgery was a success, 4 patients (12%) said that it was not, and 1 (3%) was unsure. Twenty-two patients (88%) would have the procedure again, and 3 (12%) would not. Two patients at final follow-up were on regular anti-inflammatory medication treatment for their wrist, and 32(92%) were not. According to Mayo wrist score positive ulnar variance (+ 2mm) wrist indicated 2 excellent 4 fair and 4 poor result. Neutral to – 1mm variance wrist indicated 20 excellent 2 good 2 fair result. There were no significant relationships found between independent variables and DASH or VAS score at follow-up, including gender, age, athlete/non-athlete, duration of symptoms, or ulnar variance.

At final follow-up, 2 patients had foveal tenderness, and no patients had a piano-key sign or caput ulna. Mean ranges of motion and grip strength in the affected and unaffected sides are shown in [Table 1]. There were no measurable side-to-side differences in either range of motion or grip strength. Radiographic review at final follow-up showed no evidence of radiocarpal or DRUJ arthritis.

Table 1: Summary statistics.

Parameters		Preoperative	Postoperative	p Value
Grip strength		10.9±2.9	26.7±10.5	<0.001
Range of motion	Extension	39.3±11.2	70.3±9.2	<0.001
	Flexion	44.8±16.8	60.3±17.8	<0.001
	Pronation	75.3±14.5	84.0±7.2	<0.001
	Supination	16.0±7.5	79.8±15.5	<0.001
Pain (VAS)		5.4± 1.3	0.9±0.2	<0.001
Functional outcome	DASH Score	48±13.5	8±1.7	0.003
	Mayo Score	46.9±10.4	91.7±5.0	<0.001

Two patients developed non-painful paresthesias in the distribution of the dorsal sensory ulnar nerve that resolved by 12 months after surgery. One patient developed extensor carpi ulnaris tendonitis, and 1 patient developed flexor carpi radialis tendinitis, both of which were temporary and self-limiting.

DISCUSSION

Since 1777, when DeSault's original dissertation first described DRUJ injuries, much has been written about this joint and the TFCC. As Palmer pointed out, humans are differentiated from lower primates by a radiocarpal joint with a TFCC interposed between the ulna and carpus.[30-32] This TFCC improves wrist functional stability and allows six degrees of freedom at the wrist—flexion, extension, supination, pronation, and radial and ulnar deviation. Diagnosis and treatment of ulnar-sided wrist pain has improved with advances in technology in imaging and arthroscopy.

Palmer's original classification divides TFCC tears into traumatic (type I) and degenerative (type II), with type IB representing an avulsion of the TFCC from its insertion on the distal ulna, with or without a concomitant ulnar styloid fracture, which Palmer noted was usually associated with DRUJ instability.

Central TFCC tears are often treated with debridement alone, and success rates are universally good. Debridement using thermal probes has been hypothesized to have the added benefit of local denervation of pain fibers Minami et al reviewed 16 patients (average age, 30 years) with a follow-up of 35 months. Palmer class 1 tears were found in 11 patients, and Palmer class 2 tears were found in five. Of the 16 patients, 13 returned to their previous jobs. Positive ulnar variance and LT tears were associated with a poor outcome; Palmer class 1 tears were associated with excellent results; and Palmer class 2 tears were associated with poor results.[33]

Westkaemper et al reviewed 28 patients (average age, 30 years) with a follow-up of 15.4 months. Excellent results were found in 13 patients, with good results in eight, fair results in two, and poor results in five.[34]

De Smet et al conducted a retrospective survey of 46 patients who underwent debridement with or without wafer distal ulna resection.[35] Patients were sent a questionnaire on pain, disability, and time off from work. Mean scores on the Disabilities of the Arm, Shoulder, and Hand (DASH) scale decreased from 42 to 28. The pain was considered severe in 12 patients; 32 patients were satisfied. There were significant differences in the outcome between use of debridement only and use of debridement with wafer resection of the distal ulna.

Failure rates of TFCC debridement are significantly higher in patients with ulnar positive variance, ranging from this is likely secondary to underlying degenerative TFCC and ulnocarpal pathology. Interestingly, Nishizuka et al.[36] found a lack of clinical improvement in patients treated by TFCC debridement alone in a cohort that excluded patients with greater than 3-mm ulnar variance, ulnocarpal arthritis, and peripheral TFCC tears. In our study, we have found

Arthroscopic capsular repairs of peripheral TFCC tears have been generally promising, with good to excellent results reported in a range of 61–91% based mostly on patient satisfaction questionnaires and clinical outcome measures.[37,38] Yao and Lee performed arthroscopic FasT-Fix repair of 1B tears patients, with 11 of 12 patients reporting excellent results based on Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) and PRWE questionnaires.[37] Wolf et al.[39] compared short and midterm results in a group of 40 patients using an all-inside arthroscopic capsular repair, finding further improvement over time in pain, wrist scores, grip strength, and motion.

Since 2011, there have been several descriptions of arthroscopic-assisted direct foveal repairs, all reporting good success. Shinohara et al. treated 11 patients with arthroscopic-assisted transosseous foveal repair, reporting good to excellent outcomes in 10 patients and complete restoration of DRUJ stability in nine patients.[40] Kim et al.[41] reported 80% good to excellent outcomes when performing arthroscopic assisted foveal repair in 15 patients with both moderate ulnar positive variance and DRUJ instability, concluding that the procedure can be successful even under less than favorable circumstances. Tay et al. described an outside-in technique for repair of ulnar extrinsic longitudinal split tears in a series of 36 patients and reported 89% patient satisfaction and 90% of the patients having no limitations of activity.[42] In our study Radial sided (Palmer 1D) lesions are technically challenging to repair and are thought to have lower potential for healing secondary to poor vascularity. Sagerman and Short[43] described an outside-in transosseous technique combined with pinning of the distal radioulnar joint and noted 67% good or excellent clinical results in a series of 14 patients. Trumble et al. described an inside-out transosseous suture technique and reported complete pain relief in 13 of 15 patients.[44] More recently, Tang et al.[49] described a technique using a meniscal-double barrel cannula more commonly used in knee arthroscopy. In their review of 11 patients, they reported 50% excellent or good results and 50% fair results.[45]

Trumble et al reviewed 24 patients after arthroscopic repair of Palmer classes 1B, 1C, and 1D tears. The average patient age was 31 years. Treatment occurred within 4 months after injury,

with a follow-up of 34 months. Postoperative range of motion was 89%, and grip strength was 85%. Thirteen of 19 patients returned to their original jobs or sports. Follow-up studies demonstrated that the TFCC was intact in 12 of 15 patients.[46]

Corso et al reviewed 44 patients (average age, 32.5 years) and 45 wrists with zone-specific repair and follow-up of 37 months and found excellent results in 29 patients, good results in 12, fair results in one, and poor results in three.[47]

In a study from 2001 through 2005 of 16 competitive athletes with wrist TFCC, McAdams et al found that arthroscopic debridement or repair of TFCC injury provided pain relief and allowed patients to return to play, with slower recovery in patients with concomitant ulnar-side wrist injuries.[48]

Yao et al compared an all-arthroscopic TFCC repair technique with an outside-in technique in 10 matched pairs of fresh-frozen cadaveric wrists and found that the all-arthroscopic technique resulted in decreases in operating time, postoperative immobilizations, and irritation from suture knots below the skin.[49,50]

In our study of 34 patients with TFCC repair by arthroscopic technique between 2003 and 2006, (85%) said that the surgery was a success, 12% said that it was not, and 3% was unsure.

CONCLUSION

Wrist arthroscopy is a sensitive modality to evaluate for tears of the triangular fibrocartilage complex. It allows precise identification of the tear pattern as well as the severity of the tear. Wrist arthroscopy allows evaluation of the integrity of the articular disk through palpation with a probe and documents when the tear extends to involve radioulnar ligaments.

Arthroscopic repair tears of the TFCC is safe and effective. Arthroscopic techniques have less morbidity and potentially accelerated rehabilitation for patients compared to open repair. New techniques continue to be developed to further simplify the procedure.

.

REFERENCES

1. Adams BD, Holley KA. Strains in the articular disk of the triangular fibrocartilage complex: a biomechanical study. J Hand Surg 1993;18A:919–925.
2. Palmer AK, Werner FW. The triangular fibrocartilage complex of the wrist—anatomy and function. J Hand Surg 1981;6:153–162.
3. Palmer AK, Werner FW. Biomechanics of the distal radioulnar joint. Clin Orthop Relat Res 1984:187:26 –35.
4. Trumble T, Glisson RR, Seaber AV, Urbaniak JR. Forearm force transmission after surgical treatment of DRUJ disorders. J Hand Surg 1987;12A:196–202.
5. Cole DW, Elsaidi GA, Kuzma KR, Kuzma GR, Smith BP, Ruch DS. DRUJ instability in distal radius fractures: the role of sigmoid notch and triangular fibrocartilage complex revisited. Injury 2006;37:252– 258.
6. Haugstvedt JR, Berger RA, Nakamura T, Neale P, Berglund L, An KN. Relative contributions of the ulnar attachments of the triangular fibrocartilage complex to the dynamic stability of the DRUJ. J Hand Surg 2006;31A:445–451.
7. Anderson ML, Larson AN, Moran SL, Cooney WP, Amrami KK, Berger RA. Clinical comparison of arthroscopic versus open repair of triangular fibrocartilage complex tears. J Hand Surg 2008;33A: 675–682.
8. Hermansdorfer JD, Kleinman WB. Management of chronic peripheral tears of the triangular fibrocartilage complex. J Hand Surg 1991;16A:340–346.
9. Menon J, Wood VE, Schoene HR, Frykman GK, Hohl JC, Bestard EA. Isolated tears of the triangular fibrocartilage of the wrist: results of partial excision. J Hand Surg 1984;9A:527–530.
10. Osterman AL. Arthroscopic debridement of triangular fibrocartilage tears. Arthroscopy 1990;6:120 –124.
11. Trumble TE, Gilbert M, Vedder N. Arthroscopic repair of the triangular fibrocartilage complex. Arthroscopy 1996;12:588 –597.
12. Trumble TE, Gilbert M, Vedder N. Isolated tears of the triangular fibrocartilage: management by early arthroscopic repair. J Hand Surg 1997;22A:57–65.
13. Viegas SF, Patterson RM, Hokanson JA, Davis J. Wrist anatomy: incidence, distribution, and correlation of anatomic variations, tears, and arthrosis. J Hand Surg 1993;18A:463–475.
14. Palmer AK. Triangular fibrocartilage complex lesions: a classification. J Hand Surg 1989;14A:594–606.
15. Bednar MS, Arnoczky SP, Weiland AJ. The microvasculature of the triangular fibrocartilage complex: its clinical significance. J Hand Surg 1991;16A:1101–1105.
16. Thiru RG, Ferlic DC, Clayton ML, McClure DC. Arterial anatomy of the triangular fibrocartilage of the wrist and its surgical significance. J Hand Surg 1986;11A:258–263.
17. Cooney WP, Linscheid RL, Dobyns JH. Triangular fibrocartilage tears. J Hand Surg 1994;19A:143–154.
18. Corso SJ, Savoie FH, Geissler WB, Whipple TL, Jiminez W, Jenkins N. Arthroscopic repair of peripheral avulsions of the triangular fibrocartilage complex of the wrist: a multicenter study. Arthroscopy 1997;13:78–84.
19. Estrella EP, Hung LK, Ho PC, Tse WL. Arthroscopic repair of triangular fibrocartilage complex tears. Arthroscopy 2007;23:729–737, 737.e1.
20. Jantea CL, Baltzer A, Ruther W. Arthroscopic repair of radial-sided lesions of the triangular fibrocartilage complex. Hand Clin 1995;11:31–36.
21. Haugstvedt JR, Husby T. Results of repair of peripheral tears in the triangular fibrocartilage complex using an arthroscopic suture technique. Scand J Plast Reconstr Surg Hand Surg 1999;33:439–447.
22. Ruch DS, Anderson SR, Ritter MR. Biomechanical comparison of transosseous and capsular repair of peripheral triangular fibrocartilage tears. Arthroscopy 2003;19:391–396.
23. Shih JT, Lee HM, Tan CM. Early isolated triangular fibrocartilage complex tears: management by arthroscopic repair. J Trauma 2002;53:922–927.
24. Bednar MS, Arnoczky SP, Weiland AJ. The microvasculature of the triangular fibrocartilage complex: its clinical significance. J Hand Surg Am. 1991; 16:1101–1105.
25. Trumble TE, Gilbert M, Vedder N. Isolated tears of the triangularfibrocartilage: management by early arthroscopic repair. J Hand Surg 1997;22A:57–65.
26. Miwa H, Hashizume H, Fujiwara K, Nishida K, Inoue H. Arthroscopic surgery for traumatic triangular fibrocartilage complexinjury. J Orthop Sci 2004;9:354 –359.

27. Papapetropoulos PA, Wartinbee DA, Richard MJ, Leversedge FJ, Ruch DS. Management of peripheral triangular fibrocartilage complextears in the ulnar positive patient: arthroscopic repair versusulnar shortening osteotomy. J Hand Surg 2010;35A:1607–1613.
28. Thiru RG, Ferlic DC, Clayton ML, et al. Arterial anatomy of the triangular fibrocartilage of the wrist and its surgical significance. J Hand Surg Am. 1986; 11:258–263.
29. Sagerman SD, Short W. Arthroscopic repair of radial-sided triangular fibrocartilage complex tears. Arthroscopy.1996; 12:339–342.
30. Palmer AK, Werner FW. The triangular fibrocartilage complex of the wrist--anatomy and function. J Hand Surg [Am]. 1981 Mar. 6(2):153-62. [Medline].
31. Palmer AK. Triangular fibrocartilage complex lesions: a classification. J Hand Surg [Am]. 1989 Jul. 14(4):594-606. [Medline].
32. Palmer AK, Glisson RR, Werner FW. Relationship between ulnar variance and triangular fibrocartilage complex thickness. J Hand Surg [Am]. 1984 Sep. 9(5):681-2. [Medline].
33. Minami A, Ishikawa J, Suenaga N, Kasashima T. Clinical results of treatment of triangular fibrocartilage complex tears by arthroscopic debridement. J Hand Surg [Am]. 1996 May. 21(3):406-11. [Medline].
34. Westkaemper JG, Mitsionis G, Giannakopoulos PN, Sotereanos DG. Wrist arthroscopy for the treatment of ligament and triangular fibrocartilage complex injuries. Arthroscopy. 1998 Jul-Aug. 14(5):479-83. [Medline].
35. De Smet L, Van Nuffel M, Koorneef P, Degreef I. Arthroscopic debridement with and without distal ulnar resection in the treatment of triangular fibrocartilage complex tears. Acta Orthop Belg. 2014 Mar. 80(1):112-5. [Medline].
36. Nishizuka T, Tatebe M, Hirata H, et al. Simple debridement has little useful value on the clinical course of recalcitrant ulnar wrist pain. Bone Joint J. 2013; 95(B):1687–1696.
37. Compares arthroscopic TFCC debridement for recalcitrant ulnar wrist pain excludign patients with ulnocarpal impaction and frank TFCC tears finding little benefit to debridement. Yao J, Lee AT. All-arthroscopic repair of Palmer 1B triangular fibrocartilage complex tears using the FasT-Fix device. J Hand Surg Am. 2011; 36:836–842.
38. Anderson ML, Larson AN, Moran SL, et al. Clinical comparison of arthroscopic versus open repair of triangular fibrocartilage complex tears. J Hand Surg Am. 2008; 33:675–682
39. Wolf MB, Haas A, Dragu A, et al. Arthroscopic repair of ulnarsided triangular fibrocartilage complex (Palmer Type 1B) tears: a comparison between short- and midterm results. J Hand Surg Am. 2012; 37:2325–2330.
40. Shinohara T, Tatebe M, Okui N, et al. Arthroscopically assisted repair of triangular fibrocartilage complex foveal tears. J Hand Surg Am. 2013; 38:271–277.
41. Case series of 11 patients with good outcomes using transosseous arthroscopic foveal repair of traumatic TFCC tears. Kim B, Yoon HK, Nho JH, et al. Arthroscopically assisted reconstruction of triangular fibrocartilage complex foveal avulsion in the ulnar variance-positive patient. Arthroscopy. 2013; 29:1762–1768.
42. Reports good outcomes of foveal repair even in a group of patients with ulnar positive variance. Tay SC, Berger RA, Parker WL. Longitudinal split tears of the ulnotriquetral ligament. Hand Clin. 2010; 26:495–501.
43. Sagerman SD, Short W. Arthroscopic repair of radial-sided triangular fibrocartilage complex tears. Arthroscopy.1996; 12:339–342.
44. Trumble TE, Gilbert M, Vedder N. Arthroscopic repair of the triangular fibrocartilage complex. Arthroscopy. 1996; 12:588–597
45. Tang CY, Fung B, Rebecca C, et al. Another light in the dark: review of a new method for the arthroscopic repair of triangular fibrocartilage complex. J Hand Surg Am. 2012; 37:1263–1268.
46. Trumble TE, Gilbert M, Vedder N. Isolated tears of the triangular fibrocartilage: management by early arthroscopic repair. J Hand Surg [Am]. 1997 Jan. 22(1):57-65. [Medline].
47. Corso SJ, Savoie FH, Geissler WB, et al. Arthroscopic repair of peripheral avulsions of the triangular fibrocartilage complex of the wrist: a multicenter study. Arthroscopy. 1997 Feb. 13(1):78-84. [Medline].
48. Adams BD. Partial excision of the triangular fibrocartilage complex articular disk: a biomechanical study. J Hand Surg [Am]. 1993 Mar. 18(2):334-40. [Medline].
49. Lucey SD, Poehling GG. Arthroscopic treatment of triangular fibrocartilage complex tears. In: Techniques in Hand and Upper Extremity Surgery. Vol 1. Philadelphia, Pa: Lippincott Williams & Wilkins;. 1997: 228-36.
50. Nakamura T, Yabe Y, Horiuchi Y. Fat suppression magnetic resonance imaging of the triangular fibrocartilage complex. Comparison with spin echo, gradient echo pulse sequences and histology. J Hand Surg [Br]. 1999 Feb. 24(1):22-6.

How to cite this article: Saha PK. Analysis of Results of Arthroscopic Repair of Triangular Fibrocartilage Complex (TFCC) Injury. Ann. Int. Med. Den. Res. 2017; 3(1):OR14-OR19.

Source of Support: Nil, **Conflict of Interest:** None declared