Journal of Health and Aging
Published online at https://tcsuckhoelaohoa.vn

Original Research

PRELIMINARY OUTCOMES OF ARTHROSCOPIC REPAIR FOR TRAUMATIC TRIANGULAR FIBROCARTILAGE COMPLEX (TFCC) INJURIES

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ABSTRACT: The triangular fibrocartilage complex (TFCC) plays a crucial role in stabilizing the distal radioulnar joint; TFCC injuries commonly cause ulnar-sided wrist pain and functional impairment of the hand. Arthroscopic wrist surgery is an effective and minimally invasive treatment option; however, domestic reports remain limited. Therefore, we conducted the study entitled "Preliminary outcomes of arthroscopic wrist surgery for the repair of traumatic triangular fibrocartilage complex injuries" with the aims of describing the clinical and paraclinical characteristics of TFCC injuries and evaluating treatment outcomes following arthroscopic wrist surgery. Subject and Methods: A total of 15 patients aged 18 years and older with triangular fibrocartilage complex (TFCC) injuries were included in this study. The diagnosis was confirmed through clinical examination, wrist X-ray, and MRI. Patients underwent arthroscopic TFCC repair at Thong Nhat Hospital from June 2021 to June 2024. Results:The study cohort consisted predominantly of female patients, with a mean age of 36.8 ± 9.14 years, the right wrist was the most commonly affected side, with household accidents being the primary cause of injury, palmer type IB TFCC injury was the most frequently observed type, the mean surgical time was 62 ± 15 minutes, the mean hospital stay was 4.4 ± 1.24 days, the VAS pain score significantly improved from 6.01 ± 0.88 preoperatively to 0.36 ± 0.63 at 6 months postoperatively ($p<0.05$), the MMWS score improved from 45.33 ± 3.52 to 91 ± 5.07 at 6 months postoperatively ($p<0.05$). Conclusion: arthroscopic TFCC repair is a minimally invasive, effective, and safe surgical approach that alleviates pain and restores wrist function.

Keywords: Triangular fibrocartilage complex (TFCC), trauma, wrist arthroscopy.

Received: 08/01/2026 Accepted: 25/01/2026 Published: 27/02/2026

1. INTRODUCTION

The triangular fibrocartilage complex (TFCC) is a critical structure of the wrist that plays an essential role in maintaining the stability of the distal radioulnar joint (DRUJ). In addition to its stabilizing function, the TFCC also acts as a shock absorber and load-bearing structure, facilitating the distribution of forces across the wrist during movement [1]. Due to its anatomical characteristics and functional demands, the TFCC is highly susceptible to injury, particularly in individuals who frequently subject the wrist to high mechanical loads, such as athletes and manual laborers [2].

TFCC injuries may result from acute trauma, commonly occurring in situations such as falls onto an outstretched hand, sports-related injuries, or occupational accidents. In addition, degenerative changes may contribute to progressive weakening of the TFCC over time, particularly in elderly individuals or those with a history of degenerative wrist joint disease. These injuries may occur in isolation or in association with other conditions, including distal radius fractures, distal radioulnar joint dislocation, or ligamentous injuries of the wrist [3].

TFCC injuries are a common cause of ulnar-sided wrist pain, leading to restricted range of motion and significant impairment of hand function. If not diagnosed and treated promptly, this condition may progress to chronic pain and distal radioulnar joint (DRUJ) instability [4]. Conservative treatment options, including immobilization, physical therapy, and intra-articular injections, may alleviate symptoms in a subset of patients. However, in cases of severe injury or failure to respond to conservative management, surgical intervention is considered the optimal option to restore wrist function and relieve pain.

In recent years, arthroscopic techniques have achieved significant advances in the management of TFCC injuries. Wrist arthroscopy allows detailed visualization of the lesions while facilitating repair using minimally invasive techniques, resulting in reduced postoperative pain, shorter recovery time, and improved clinical outcomes compared with traditional open surgery [4].

At Thong Nhat Hospital, Ho Chi Minh City, wrist arthroscopy has been implemented in recent years for the treatment of traumatic TFCC injuries and has yielded promising preliminary results. Therefore, we conducted this study entitled "preliminary outcomes of arthroscopic repair for traumatic triangular fibrocartilage complex (tfcc) injuries" with the following two main objectives:

1. To describe the clinical and paraclinical characteristics of patients with TFCC injuries.

2. To evaluate the treatment outcomes of TFCC injuries using wrist arthroscopic surgery.

2. MATERIALS AND METHODS

2.1. Study Population

A total of 15 patients aged 18 years and older with TFCC injuries were enrolled. The diagnosis was established based on clinical examination, wrist radiographs, and magnetic resonance imaging (MRI). All patients were scheduled for arthroscopic repair of TFCC injuries at Thong Nhat Hospital between June 2021 and June 2024.

2.1.1. Inclusion Criteria

Traumatic TFCC injuries unresponsive to conservative treatment for at least 3 months

Acute injuries (within 3 months) in patients with high functional demands

Persistent ulnar-sided wrist pain and distal radioulnar joint (DRUJ) instability

No contraindications to regional or general anesthesia

Minimum follow-up duration of 6 months

2.1.2. Exclusion Criteria

Active infection

Progressive wrist joint disease

Severe wrist osteoarthritis

Peripheral nerve injury of the operated limb

2.2. Study Design

A prospective study.

2.2.1. Data Collection

Data were collected through direct clinical examination. Patient demographics and TFCC-related characteristics were recorded, including age, sex, injured side, and clinical findings such as ulnar-sided wrist pain, fovea sign, TFCC compression test, ulnocarpal stress test, and DRUJ ballottement test.

Clinical outcomes were assessed using the Visual Analog Scale (VAS) and the Modified Mayo Wrist Score (MMWS) before and after surgery. The severity and type of TFCC injury were classified according to the Palmer classification.

Postoperative follow-up examinations were conducted to evaluate treatment outcomes and early complications, with scheduled visits at 6 weeks, 12 weeks, and 6 months, and at least 6 months postoperatively.

2.2.2. Surgical Technique

Preoperative Preparation:

Clinical confirmation and wrist radiographs to exclude fractures and assess ulnar variance

High-resolution 3-Tesla MRI to confirm the indication for arthroscopic TFCC repair

Routine preoperative laboratory tests and anesthetic evaluation

Preparation of all necessary surgical instruments

Anesthesia:

General anesthesia with endotracheal intubation or axillary nerve block

Patient Positioning:

The patient was placed in the supine position with the elbow flexed at 90 degrees.

The affected upper limb was suspended with 4.5 kg of traction applied through the fingers (Figure 1).

Anatomical landmarks: Lister's tubercle, scaphoid, lunate, distal radioulnar joint (DRUJ), and the extensor carpi ulnaris (ECU) tendon.

Arthroscopic portals: The wrist joint was accessed through the 3–4 portal, using a 2.7-mm or 2.4-mm arthroscopefor diagnostic evaluation and debridement of inflamed synovium. The 6R portal was used as the working portal, and the 4–5 portal was established when necessary (Figure 2).

Synovectomy was performed initially to improve visualization and facilitate accurate assessment of TFCC lesions. Diagnostic maneuvers included the trampoline sign and hook test. In cases of avulsion of the deep attachment of the distal radioulnar ligaments, visualization through standard radiocarpal portals was often limited; therefore, a DRUJ portal

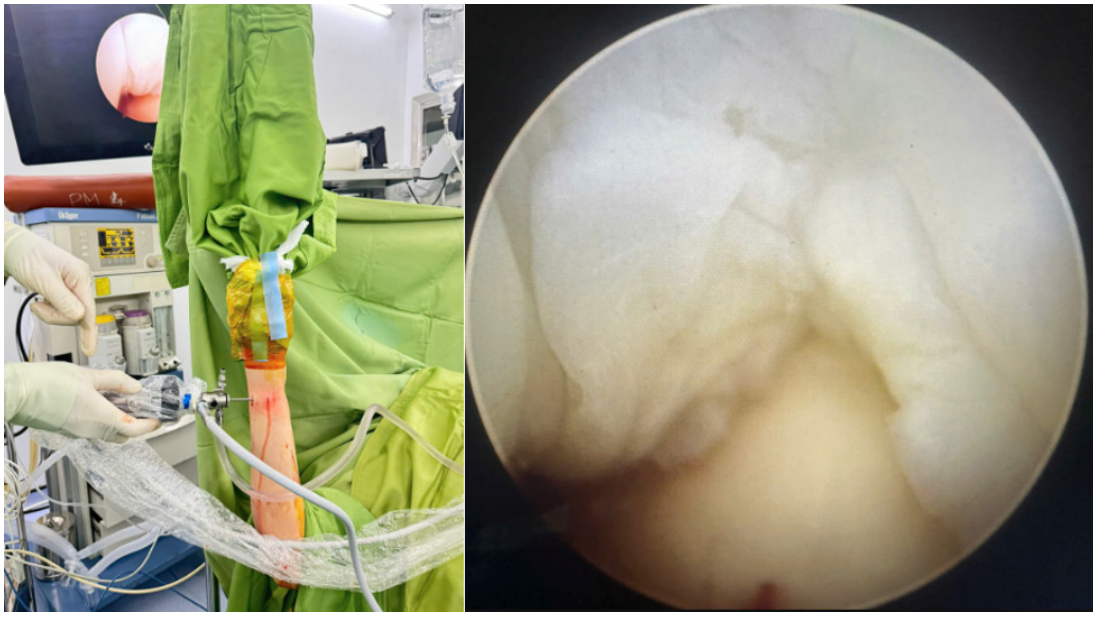

Figure 1. Patient positioning and arthroscopic view of the TFCC injury. (Source: Authors)

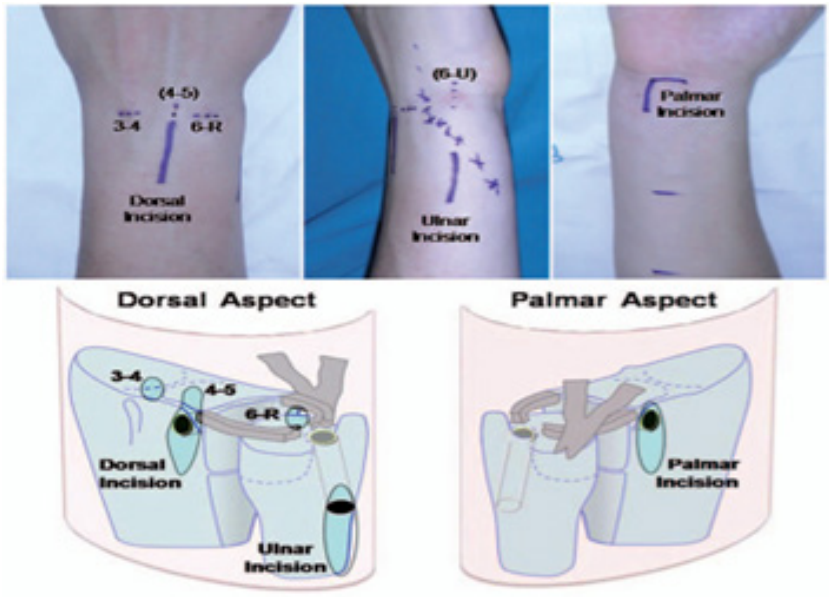

Figure 2. Wrist arthroscopy portals [5]

was established to allow direct inspection. Radiofrequency (ArthroCare) was used for debridement and capsular tensioning. TFCC integrity was assessed by direct visualization of the triangular fibrocartilage (TFC) disc. A normal TFC disc appears thick, white, and elastic, whereas a thin, yellow disc with a central perforation is indicative of chronic degeneration. The location and type of TFCC injury were classified according to the Palmer classification. The 6R portal was primarily used for TFCC evaluation and repair.

Surgical Techniques

Central TFCC tears (Palmer 1A) were typically managed with arthroscopic debridement, provided that resection involved less than two-thirds of the central TFCC, as this does not significantly compromise wrist biomechanics.

Superficial dorsal peripheral TFCC tears (Palmer 1B), usually positive on the hook test, were repaired using one of the following techniques: outside-in, inside-out, or all-inside suturing. For large tears, a double-loop suture technique was employed.

Isolated volar TFCC tears are rare (Palmer 1B/1C) and are often associated with concomitant injuries, such as lesions of the ulnocarpal ligament complex or the lunotriquetral interosseous ligament. In these cases, a single simple suture technique was used to repair the associated injuries.

Deep peripheral TFCC tears involving both the volar and dorsal components (Palmer 1B) were treated with isometric TFCC repair, using transosseous sutures or suture anchors to reattach the TFCC to the ulnar fovea.

Radial-sided TFCC tears involving both volar and dorsal aspects (Palmer 1D):

In pre–Palmer 1D lesions (tears located in the substance of the TFCC before insertion into the sigmoid notch, at least 5 mm from the radial attachment), repair was performed using 2-0 nonabsorbable sutures.

In cases of avulsion-type tears, suture anchor fixation was considered the optimal treatment option.

Postoperative Assessment of the DRUJ

Postoperative stability of the DRUJ was evaluated using the ballottement test, with normal stability characterized by a firm, solid endpoint. The piano key test was also performed. In equivocal cases, intraoperative fluoroscopy (C-arm)was utilized for further assessment.

Postoperative Management

After surgery, patients were immobilized with a forearm–wrist soft splint and received standard anti-inflammatory and analgesic medications. Dressings were changed every other day, and sutures were removed 10–14 days postoperatively. Passive range-of-motion exercises were initiated immediately after

surgery. Active wrist motion was allowed from week 6, and patients were permitted to return to normal occupational activities by the third postoperative month.

2.2.3. Follow-up and Outcome Evaluation

Postoperatively, patients were assessed for wound condition, ability to participate in rehabilitation, and pain intensity using the Visual Analog Scale (VAS). After discharge, follow-up visits were scheduled at 6 weeks, 12 weeks, 6 months, 1 year, and annually thereafter. Treatment outcomes were evaluated based on clinical examination, including pain severity (VAS), functional outcome using the Modified Mayo Wrist Score (MMWS) (Table 1), and the presence of complications.

2.3. Study Variables

A. Patient Characteristics

Sex, age, injured side, mechanism of injury, and TFCC injury classification according to the Palmer classification

Clinical findings: pain, TFCC compression test, and distal radioulnar joint (DRUJ) ballottement test

Category	Score	Findings
Pain (25 points)	25	No pain
	20	Mild pain with vigorous activities
	20	Pain only with weather changes
	15	Moderate pain with vigorous activities
	10	Mild pain with activities of daily living
	5	Moderate pain with activities of daily living
	0	Pain at rest
Satisfaction (25 points)	25	Very satisfied
	20	Moderately satisfied
	10	No satisfied, but working
	0	No satisfied, unable to work
Range of motion (25 points)	25	100% percentage of normal
	15	75% - 99% percentage of normal
	10	50% - 74% percentage of normal
	5	25% - 49% percentage of normal
	0	0% - 24% percentage of normal
Grip strength (25 points)	25	100% percentage of normal
	15	75% - 99% percentage of normal
	10	50% - 74% percentage of normal
	5	25% - 49% percentage of normal
	0	0% - 24% percentage of normal
Final result (total points)	90 - 100	Excellent
	80 - 89	Good
	65 - 79	Fair
	<65	Poor

Table 1. Modified Mayo Wrist Score (MMWS) [6]

B. Treatment Outcome Evaluation

Operative time, length of hospital stay, and mean postoperative follow-up duration

VAS and MMWS scores assessed preoperatively and at 2 weeks, 6 weeks, 3 months, and 6 months postoperatively

Complications, including:

Early complications: surgical site infection, postoperative bleeding, etc.

Late complications: extensor carpi ulnaris tendinitis related to suture anchor placement, digital numbness due to injury of the ulnar sensory nerve branch, residual instability, joint stiffness, hypertrophic scarring, etc

2.4. Data Processing and Statistical Analysis

Data were processed and analyzed using Microsoft Excel 2016 and SPSS software version 23.0.

2.5. Research Ethics

The study was approved by the Institutional Review Board (IRB) / Ethics Committee for Biomedical Research of Thong Nhat Hospital regarding the ethical considerations and safety of the research protocol (Approval No. 137/2025/CN-BVTN-HĐĐĐ, dated April 28, 2025).

3. RESULTS

3.1. General Characteristics

3.1.1. Age, Sex, and Injured Side

Table 2. Age, sex, and injured side characteristics.

Characteristics		Number (n)	Percentage (%)
Sex	Female	8	53.33%
	Male	7	63.67%
Age (years)	Mean ± SD	36.8 ± 9.14	
Injured side	Right wrist	11	73.33%
	Left wrist	4	26.67%

Regarding sex distribution, the study population consisted of 8 female patients (53.33%) and 7 male patients (46.67%). The proportion of female patients was slightly higher than that of male patients, which is consistent with findings reported in previous studies, such as those by Tran Nguyen Phuong et al [7] suggest that TFCC injuries may be associated with sex-related anatomical characteristics and patterns of hand use. However, other reports have indicated a higher risk among male patients, likely due to more frequent participation in physically demanding activities or high-risk sports [8]. These findings indicate that sex may influence the incidence of TFCC injuries; however, studies with larger sample sizes are required to clarify this association.

Regarding age, the mean age of the study population was 36.8 ± 9.14 years. This represents a highly active working-age group in which daily activities, occupational demands, and sports often require intensive wrist use, thereby increasing the risk of TFCC injury. This age distribution is consistent with previous studies reporting that TFCC injuries are more common in young and middle-aged individuals than in the elderly, likely due to greater mechanical loading of the wrist during routine activities.

With respect to the injured side, 11 patients (73.33%) sustained injuries to the right wrist, while 4 patients (26.67%) had left-sided involvement. This asymmetry may be explained by hand dominance, as the majority of the population is right-hand dominant, resulting in greater mechanical stress on the dominant wrist during daily activities and an increased risk of TFCC injury. Similar distributions have been reported in previous studies on wrist injuries [7].

3.1.2. Mechanism of Injury

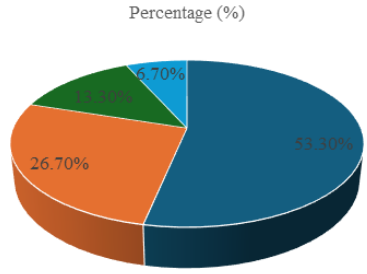

Figure 3. Distribution of mechanisms of injury.

The chart shows that daily-life accidents (53.3%) were the most common cause of TFCC injuries, predominantly resulting from falls onto an outstretched hand. Traffic accidents accounted for 26.7% of cases, most commonly involving motorcycle riders who sustained injuries due to direct trauma. Occupational accidents were often associated with repetitive microtrauma or heavy manual work. In 6.7% of cases, the cause of injury was unidentified, which may reflect insidious or progressive TFCC damage over time.

3.1.3. Clinical signs

Table 3. Clinical characteristics.

Clinical signs	Percentage (%)
Pain	100%
TFCC compression test	100%
Ulnocarpal stress test	86.67%
Distal radioulnar joint (DRUJ) ballottement test	0%

Ulnar-sided wrist pain (100%) and a positive TFCC compression test (100%) demonstrated high sensitivity for the diagnosis of TFCC injury, as all patients experienced pain during the maneuver. The ulnocarpal stress test was positive in 86.67% of cases, indicating that a high proportion of patients had mild to moderate instability of the distal radioulnar joint (DRUJ), reflecting the impact of TFCC injury on wrist stability. No patient demonstrated a positive DRUJ ballottement test (0%), suggesting the absence of severe DRUJ instability, which may be attributed to the predominantly mild to moderate severity of TFCC lesions in the study population.

3.1.4. MRI characteristics of TFCC injuries:

Table 4. MRI characteristics of TFCC injuries.

Palmer classification of TFCC injuries	Percentage
IA	26.67%
IB	53.33%
IC	13.33%
ID	6.67%

According to the Palmer classification, Palmer type IB injuries accounted for the highest proportion in our study (53.33%), representing tears at the ulnar attachment of the TFCC. This finding is consistent with previous reports indicating that Palmer IB is the most common pattern of traumatic TFCC injury [9]. Palmer type IC (13.33%) and type ID (6.67%) injuries were less frequently observed, as these lesions involve detachment at the lunate attachment or disruption of the distal radioulnar ligaments and are often associated with DRUJ instability. These results highlight the predominance of Palmer type IB lesions in traumatic TFCC injuries, indicating that most patients sustained damage at the ulnar attachment site.

3.2. Treatment Outcomes

3.2.1. Operative Time, Length of Hospital Stay, and Surgical Characteristics

Table 5. Operative time and length of hospital stay (n = 15).

	Min	Max	Mean ± SD
Operative time (minutes)	45	100	62 ± 15
Length of hospital stay (days)	3	7	4.4 ±1.24

The mean operative time was 62 ± 15 minutes, ranging from 45 to 100 minutes, indicating that arthroscopic TFCC repair is a relatively quick and minimally invasive procedure. Operative duration varied depending on the severity of the lesion and the surgeon's level of experience.

The mean length of hospital stay was 4.4 ± 1.24 days (range, 3–7 days), reflecting a relatively rapid postoperative recovery. This finding is consistent with the minimally invasive nature of arthroscopic surgery, which is associated with reduced postoperative pain and a lower risk of complications compared with open procedures.

Regarding intraoperative findings, synovitis was observed in 73.33% of patients. According to the Palmer classification, the majority of lesions were type 1B, accounting for 73.33% of cases. Combined type 1A and 1B lesions were identified in 13.33% of patients, while Palmer type 1D lesions accounted for 13.33%.

Table 6. Changes in VAS and Modified Mayo Wrist Score (MMWS) before and after surgery.

Outcome measure	Pre-op	Post-op 2 weeks	Post-op 6 weeks	Post-op 3 months	Post-op 6 months	P
VAS	6.01±0.88	4.33±0.89	2.27±0.88	1.27±0.46	0.36±0.63	<0.05
MMWS	45.33±3.52	55.67±4.58	65.67±6.11	74±6.87	91±5.07	<0.05

3.2.2. Clinical Outcomes Based on VAS and Modified Mayo Wrist Score (MMWS)

The Visual Analog Scale (VAS) score significantly decreased from 6.01 ± 0.88 preoperatively to 0.36 ± 0.63 at 6 months postoperatively ($p < 0.05$), indicating a substantial reduction in pain following arthroscopic TFCC surgery. A marked improvement was observed as early as 2 weeks after surgery, and the analgesic effect was maintained throughout the 6-month follow-up period (Table 6).

The Modified Mayo Wrist Score (MMWS) showed a significant improvement, increasing from 45.33 ± 3.52 preoperatively to 91.0 ± 5.07 at 6 months postoperatively ($p < 0.05$), reflecting a notable enhancement in wrist function. Functional recovery progressed gradually over time, with the most pronounced improvements observed at 3 and 6 months postoperatively.

Overall, these results are consistent with those reported by other authors [7] [10], upporting the effectiveness of arthroscopic TFCC surgery in achieving significant pain relief and functional improvement of the wrist, with favorable recovery outcomes at 6 months.

3.2.3. Complications

No cases of postoperative infection were recorded. Transient numbness of the fourth and fifth digits occurred in 3 out of 15 patients, attributed to irritation or injury of the sensory branch of the ulnar nerve. This condition showed gradual improvement and typically resolved within 6 months after surgery. According to the literature, this represents one of the most common complications, with a reported incidence of up to 17% [11]. Additionally, hypertrophic scarring was observed in 2 out of 15 patients. Regarding patient satisfaction, 26.67% of patients reported being very satisfied, 60% were satisfied, and 13.33% were not satisfied with the surgical outcome.

4. CONCLUSION

This study demonstrates that arthroscopic repair of TFCC injuries is a minimally invasive, effective, and safe treatment method, providing significant pain relief and functional recovery of the wrist. In addition, wrist arthroscopy remains the gold standard for the diagnosis and classification of TFCC lesions, allowing accurate assessment and appropriate therapeutic decision-making.

REFERENCES

[1] Kleinman WB. Stability of the distal radioulna joint: biomechanics, pathophysiology, physical diagnosis, and restoration of function what we have learned in 25 years. J Hand Surg Am. 2007;32(7):1086–106. doi: 10.1016/j.jhsa.2007.06.014. PubMed PMID: 17826566.

[2] Dineen HA, Greenberg JA. Ulnar-Sided Wrist Pain in the Athlete. Clin Sports Med. 2020;39(2):373–400. doi: 10.1016/j.csm.2019.12.008. PubMed PMID: 32115090.

[3] Roulet S, Ardouin L, Bellemère P, Leroy M. Scapholunate, lunotriquetral and TFCC ligament injuries associated with intraarticular distal radius fractures: Arthroscopic assessment and correlation with fracture types. Hand Surg Rehabil. 2020;39(2):102–6. Epub 20191223. doi: 10.1016/j.hansur.2019.11.009. PubMed PMID: 31874275.

[4] Zhou JY, Tuyishime H, Yao J. Arthroscopic-Assisted Repair of the Triangular Fibrocartilage Complex. J Hand Surg Glob Online. 2024;6(4):445–57. Epub 20240420. doi: 10.1016/j.jhsg.2024.03.011. PubMed PMID: 39166194; PubMed Central PMCID: PMC11331167.

[5] Atzei; A. New trends in arthroscopic management of type TFCC infuries with DRUJ instability. The journal of hand surgery. 2009;european volume(5):582–91.

[6] Hatim Abid MS, Abdelhalim El Ibrahimi, Abdelmajid El Mrini. Results of the Sauvé-Kapandji Procedure for Posttraumatic Disorders of the Distal Radioulnar Joint in Young Patients. Open Journal of Orthopedics. 2015;5.

[7] Trần NP, Đào , X. T. ., Bùi , H. T. K. ., Huỳnh , P. N. A. ., Lê , T. T. ., Lê , V. S. ., Nguyễn, P. C. ., & Vũ , X. T. . . ĐÁNH GIÁ KẾT QUẢ ỨNG DỤNG

PHẪU THUẬT NỘI SOI ĐIỀU TRỊ TỔN THƯƠNG PHỨC HỢP SỤN SỢI TAM GIÁC (TFCC) CỔ TAY TRÊN NGƯỜI TRƯỞNG THÀNH. Tạp Chí Y học Việt Nam. 2023;525.

[8] Bayoumy MA, Elkady HA, Said HG, El-Sayed A, Saleh WR. Short-term evaluation of arthroscopic outside-in repair of ulnar side TFCC tear with vertical mattress suture. J Orthop. 2016;13(4):455–60. Epub 20151206. doi: 10.1016/j.jor.2015.10.013. PubMed PMID: 27857481; PubMed Central PMCID: PMC5103042.

[9] McNamara CT, Colakoglu S, Iorio ML. A Systematic Review and Analysis of Palmer Type I Triangular Fibrocartilage Complex Injuries: Outcomes of Treatment. J Hand Microsurg. 2020;12(2):116–22. Epub 20200630. doi: 10.1055/s-0040-1713580. PubMed PMID: 32788827; PubMed Central PMCID: PMC7410809.

[10] Chen AC, Weng CJ, Chiu CH, Chang SS, Cheng CY, Chan YS. Results of Arthroscopic Repair of Peripheral Triangular Fibrocartilage Complex Tear With Exploration of Dorsal Sensory Branch of Ulnar Nerve. Open Orthop J. 2017;11:525–32. Epub 20170531. doi: 10.2174/1874325001711010525. PubMed PMID: 28694892; PubMed Central PMCID: PMC5470059.

[11] Chung SR, Huan KWSJ, Nah JH, Jerome TJ. Arthroscopic algorithm for acute traumatic triangular fibrocartilage complex (TFCC) tears. Journal of Hand and Microsurgery. 2025;17(1):100175. doi: https://doi.org/10.1016/j.jham.2024.100175.