Original Article Clinics in Orthopedic Surgery 2025;17:1046-1053 • https://doi.org/10.4055/cios25084

Effect of Postoperative Immobilization Method on Outcomes Following Triangular Fibrocartilage Complex Transosseous Foveal Repair: Long-Arm Cast Versus Muenster Brace

Hyun-Cheol Oh, MD*,†, Hyoung Bok Kim, MD*,†, Hyun Tak Kang, MD*, Youngwoo Lee, MD*,†, Jun-Ku Lee, MD*,†

*Department of Orthopedic Surgery, National Health Insurance Service Ilsan Hospital, Goyang,
†Department of Orthopedic Surgery, Yonsei University College of Medicine, Seoul, Korea

Background: The optimal postoperative immobilization method following triangular fibrocartilage complex (TFCC) foveal repair remains debated. While long-arm casting effectively restricts wrist rotation, it also limits elbow movement and may cause discomfort. The Muenster brace, which allows partial elbow flexion while restricting wrist rotation, has been proposed as an alternative. This study compared clinical outcomes, patient satisfaction, and complication rates between long-arm cast (LAC) and Muenster brace immobilization.

Methods: A retrospective comparative study was conducted on 40 cases from 37 patients who underwent TFCC transosseous foveal repair between March 2021 and February 2024. Patients were categorized into 2 groups: the LAC group (n = 19) and the Muenster brace group (n = 21). Demographics, radiologic assessments, operative details, and pre- and postoperative functional outcomes were analyzed. Pain and function were assessed using a visual analog scale (VAS) and the Disabilities of the Arm, Shoulder and Hand (DASH) score. Patient satisfaction and complications were recorded.

Results: The mean patient age was 29 years, with an average follow-up of 282 days. Preoperative VAS scores (6.3 ± 1.9) improved to 1.2 ± 1.4, and DASH scores improved from 52.6 ± 16.0 to 10.4 ± 12.4. No significant differences were found between groups in demographics, tear classification, operative time, or preoperative functional scores. Postoperative pain relief, functional improvement, grip strength, and satisfaction were comparable. Minor complications included 1 case of transient cubital tunnel syndrome and 1 case of persistent pain requiring revision in the LAC group. In the Muenster group, 1 patient sustained a traumatic re-injury, and another developed distal radioulnar joint instability. No infections, tendon ruptures, or severe stiffness occurred.

Conclusions: Both immobilization methods yielded comparable outcomes and satisfaction. While the Muenster brace improves elbow mobility, its effectiveness in preventing retears was similar to that of LAC.

Keywords: *Triangular fibrocartilage complex, Foveal repair, Postoperative immobilization, Long-arm cast, Muenster brace*

The triangular fibrocartilage complex (TFCC) is a soft tissue structure located between the carpal bones and the distal ulna on the ulnar side of the wrist. It plays a crucial role in maintaining the stability of the distal radioulnar joint (DRUJ) and stabilizing the ulnar side of the wrist. Injuries can occur from various mechanisms, ranging from low-energy trauma such as a simple twisting injury to high-energy trauma such as falls from height.[1-3] These injuries may be associated with wrist instability and syno-

Received February 26, 2025; Revised April 21, 2025;
Accepted May 22, 2025
Correspondence to: Jun-Ku Lee, MD
Department of Orthopedic Surgery, National Health Insurance Service Ilsan Hospital, 100 Ilsan-ro, Ilsandong-gu, Goyang 10444, Korea
Tel: +82-31-900-0340, Fax: +82-31-900-0343
E-mail: jg197@naver.com

vitis, leading to chronic pain and, ultimately, degenerative arthritis.

With recent advances in the anatomical understanding of the TFCC and improvements in arthroscopic techniques, significant progress has been made in the diagnosis and treatment of these injuries. The Palmer classification categorizes TFCC tears, with type 1 describing traumatic tears. Among these, type 1B (peripheral tears) is particularly associated with wrist instability. Notably, the proximal component inserting into the foveal attachment plays a crucial role in DRUJ stability.[3-5] Recognizing the significance of this structure, Atzei and Luchetti[6] proposed a classification for isolated foveal tears along with corresponding treatment recommendations. When conservative treatment fails, foveal reattachment is advised.[3] Currently, transosseous TFCC foveal repair, which involves creating a bone tunnel through the distal ulna to suture the torn TFCC, is widely performed.[3,6-10]

Nevertheless, achieving adequate ligament-to-ligamentous attachment and bone healing requires prolonged immobilization postoperatively, and there is still no consensus among surgeons regarding the optimal fixation method after surgery. Traditionally, long-arm casting has been used to restrict wrist pronation-supination, providing stable fixation for the repair site. However, prolonged elbow immobilization causes significant discomfort for patients. As an alternative, the Muenster cast, which allows elbow flexion and extension while restricting wrist rotation to a lesser extent, has been introduced.[8,11-13] More recently, detachable orthoses have been developed to enhance patient comfort. While these advancements improve convenience, concerns persist regarding potentially reduced fixation strength compared to traditional methods, which may result in inferior healing.

In this study, we aim to compare the surgical outcomes and complications, including inferior healing, between long-arm cast (LAC) immobilization and Muenster brace immobilization following arthroscopic transosseous foveal repair of TFCC type 1b tears performed at our institution.

METHODS

This study was approved by Institutional Review Board and the Ethics Committee of National Health Insurance Service Ilsan Hospital (IRB No. NHIMC-2023-03-062). As this study was designed retrospectively, the requirement for informed consent was waived by the IRB. The patient shown in Fig. 1 provided consent for the use of the photograph for publication purposes.

Study Protocol

Between March 2021 and February 2024, we conducted a retrospective comparative study. Initially, we screened all patients who underwent TFCC repair during this period. All surgeries were performed by a single hand surgeon (JKL) at the same institution. The proximal component repair was performed using the large transosseous TFCC foveal repair technique, as introduced by Park et al.[7]

We included patients with Palmer 1B TFCC tears but excluded those with only superficial rim tears, which represent a less unstable subtype of 1B tears. Therefore, the study population corresponded to Atzei type 2 or 3 TFCC tears.[6] Additionally, we did not exclude cases with concomitant traumatic TFCC tears, such as 1A central tears requiring central debridement. To ensure adequate follow-up, we included only patients with at least 3 months of outpatient follow-up after TFCC foveal repair.

Despite undergoing TFCC foveal repair, patients who had a concurrent ulnar shortening osteotomy were excluded from the study. During the study period, the operating surgeon modified the postoperative immobilization protocol, transitioning from an LAC with 45° supination and 90° elbow flexion in the early phase to a Muenster brace in the later phase, which allowed partial elbow flexion-extension movement (Fig. 1).

Immediately after surgery, a long-arm splint with 45° supination was applied, and sutures were removed approximately 2 weeks postoperatively. Before and after suture removal, patients were immobilized with either an LAC or a Muenster brace, depending on the protocol in place at the time. Patients using the Muenster brace were instructed to wear it continuously throughout the day, except for brief removal during washing.

The total immobilization period was 6 weeks, the same for both methods. Afterward, range-of-motion exercises, including volar flexion, dorsiflexion, pronation, and supination, were initiated. Gradual resistance exercises were introduced 3 months postoperatively, with unrestricted activity permitted at 6 months.

Investigation

Preoperatively, we collected demographic and clinical data, including patient sex, age, weight, height, and comorbid conditions such as diabetes, hypertension, nephropathy, liver disease, thyroid disorders, and smoking status—factors that could potentially affect TFCC healing. Additionally, we recorded details of the affected wrist, the mechanism of injury, and the time interval from injury to surgery.

For radiologic assessment, we evaluated the pres-

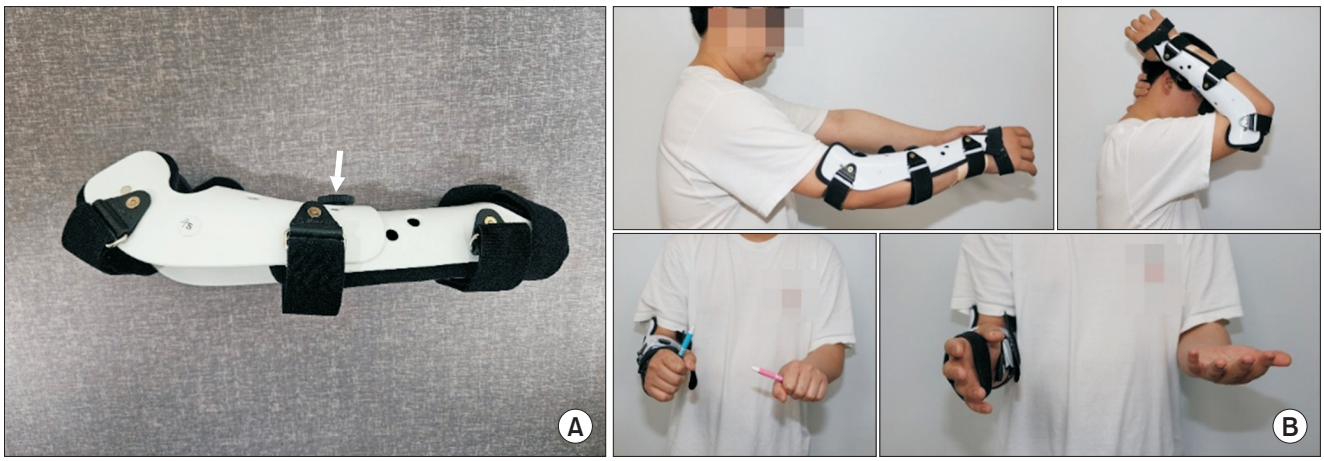

Fig. 1. Clinical photographs of the Muenster brace and its application in a postoperative patient. (A) The brace consists of 2 overlapping segments, allowing length adjustment to fit the patient's arm via an adjustable fastener (arrow). Additionally, 3 separate straps provide controlled tightness at the elbow, forearm, and wrist. (B) With its application, the patient can achieve partial elbow flexion and extension, while pronation-supination is significantly limited.

ence of concomitant ulnar styloid fractures and classified TFCC tears according to the Palmer and Atzei classification. We also assessed for an associated central TFCC tear. Final classification was determined based on preoperative magnetic resonance imaging (MRI) and intraoperative arthroscopic findings.

To quantify functional outcomes, we measured preoperative pain levels using a visual analog scale (VAS) and assessed upper limb function using the Disabilities of the Arm, Shoulder and Hand (DASH) score. However, we did not assess VAS or DASH in patients who underwent surgery immediately after trauma due to a TFCC tear combined with DRUJ subluxation or dislocation, which limited wrist supination.[14] Regarding operative factors, we documented any concomitant procedures performed and recorded total operative time, except for patients who underwent multiple procedures other than TFCC foveal repair. Postoperatively, we evaluated the follow-up duration and monitored for complications, including infection, retears, tendon and nerve injuries, joint stiffness affecting daily activities, and the need for revision surgery resulting from any of these complications. If patients demonstrated a positive ballottement test or distal radioulnar diastasis during follow-up, wrist MRI was recommended to confirm a retear.

At the final outpatient follow-up, we reassessed pain levels using the VAS and evaluated functional recovery using the DASH score, as well as grip and pinch strength. Grip and pinch strength were not recorded for patients who underwent bilateral wrist surgery or had concurrent wrist conditions, such as foveal repairs performed after distal radius fracture (DRF) treatment. Grip and pinch strength were recorded in kilograms and compared as a percentage of the unaffected hand.

Phone Survey

After receiving approval for this study on October 7, 2024, we attempted to contact patients by phone to assess pain using the VAS and to evaluate functional recovery using the DASH score. Through the telephone survey, we also assessed patient satisfaction with a single question. The question was, "How would you describe the final result of your TFCC repair?" Possible responses included "very satisfied (5)," "satisfied (4)," "average (3)," "poor (2)," and "very poor (1)."

Groups and Comparison

We categorized patients into 2 groups based on postoperative immobilization methods: LAC (group 1) and the Muenster brace (group 2). Among all patients, 3 underwent bilateral TFCC foveal repairs at different time intervals. Since these surgeries were performed separately, each case was treated as an independent event for statistical analysis. Notably, 1 patient had 1 wrist assigned to group 1 and the other to group 2 due to a change in the postoperative immobilization protocol over time. To maintain the integrity of the comparison, both surgeries were analyzed separately as independent cases, despite being performed on the same individual.

Before analyzing outcomes, we compared demographic factors, radiologic assessments, operative details, and preoperative pain and functional levels. We then

compared postoperative outcomes, including VAS pain scores and DASH functional scores, between the groups. Additionally, satisfaction scores were evaluated through a phone survey. Finally, we assessed and compared the incidence of complications between the 2 groups.

Statistical Analysis

Before performing comparisons, all variables underwent a normality test using the Shapiro-Wilk test. Continuous variables with a normal distribution are presented as the mean and standard deviation (SD), while those without a normal distribution are presented as the median and interquartile range. Categorical variables are reported as numbers and percentages. For continuous variables, comparisons were made using either the Student *t*-test or the Wilcoxon rank-sum test, depending on the data's normality. Categorical variables were compared using Fisher's exact test. A *p*-value less than 0.05 was considered statistically significant.

RESULTS

We included 40 cases from 37 patients, consisting of 25 men and 12 women, including 3 men who underwent bilateral wrist surgeries at different times. The average age of the 40 total cases was 29 years (SD, 10.9). In the preoperative medical history, 3 patients had hypertension and 1 had diabetes. Additionally, 8 patients were current smokers at the time of surgery (group 1: 5, group 2: 3). The mechanisms of injury varied, including wrist twisting, falls, high falls, and car accidents. Seven patients did not recall how their injury occurred. Seven patients presented with a TFCC tear combined with a DRF. In 6 of these cases, only the DRF was initially treated with open reduction and internal fixation using a plate. During follow-up, TFCC tears were subsequently identified and treated with TFCC foveal repair due to persistent clinical symptoms. These repairs were performed concurrently with plate removal after bony union of the radius. In 1 patient, TFCC foveal repair was performed simultaneously with DRF surgery due to marked DRUJ instability observed intraoperatively.

The average time from initial trauma to TFCC foveal repair was 19.6 months (SD, 24.7). Postoperatively, patients were followed up for an average of 282 days. Preoperative VAS pain scores averaged 6.3 (SD, 1.9) and improved to 1.2 (SD, 1.4) at the final follow-up. The preoperative DASH score, which was 52.6 (SD, 16.0), improved to 10.4 (SD, 12.4) at the final follow-up.

Group Comparison

Among the 40 cases, 19 were immobilized with an LAC (group 1) and 21 with a Muenster brace (group 2). There were no significant differences in demographic variables, including sex, age, height, weight, operated arm, or time elapsed from initial trauma (Table 1). Similarly, TFCC tear classification, the presence of concomitant ulnar styloid fractures, preoperative pain VAS, and functional DASH scores did not differ between the groups. The operative time was shorter in group 2 (median, 80.0 minutes) than in group 1 (median, 58.0 minutes), but this difference was not statistically significant (Table 2).

At the final follow-up, no significant differences were observed between the groups in terms of pain VAS, functional DASH scores, or grip and pinch strength. During the study, all patients were successfully contacted via phone survey, and no significant differences were found in satisfaction scores between the groups.

Complications

No patients reported wound infections, or nerve or tendon ruptures. All patients achieved a full range of wrist motion, and none reported subjective symptoms of stiffness. One patient in group 1 developed cubital tunnel syndrome after LAC immobilization, which gradually improved with observation, though mild hypoesthesia persisted at the final follow-up. Another patient in group 1 reported persistent pain and functional impairment despite a negative ballottement test after foveal repair. This patient underwent revision surgery at another hospital 1.5 years postoperatively but reported no improvement in the follow-up phone survey.

One patient in group 2 sustained another traumatic injury at 3.5 months postoperatively when a large dog rushed out while she was holding a leash, twisting the operative hand. This patient subsequently underwent revision surgery and rated the outcome of the initial TFCC foveal repair as poor. Another patient in group 2 underwent TFCC foveal repair 10 months after distal radius volar plate fixation due to persistent TFCC tear-related symptoms. Despite strict adherence to the postoperative protocol, follow-up radiographs revealed DRUJ widening and instability, leading to a poor outcome.

DISCUSSION

This study compared 2 different postoperative immobilization methods, LAC and the Muenster brace, following arthroscopic transosseous foveal repair of type 1B TFCC tears. The results demonstrated that both methods pro-

Table 1. Comparison of Demographic and Preoperative Features

Variable	Group 1 (n = 19)	Group 2 (n = 21)	*p*-value
Sex			0.407
Female	4 (21.1)	8 (38.1)	
Male	15 (78.9)	13 (61.9)	
Age (yr)	27.0 (21.0–35.0)	26.0 (21.0–33.0)	0.914
Height (cm)	175.0 (171.4–177.0)	170.0 (164.5–175.0)	0.087
Weight (kg)	75.8 ± 16.3	71.8 ± 15.3	0.427
Current smoking			0.580
No	14 (73.7)	18 (85.7)	
Yes	5 (26.3)	3 (14.3)	
Direction			1.000
Right	9 (47.4)	10 (47.6)	
Left	10 (52.6)	11 (52.4)	
Time interval from trauma (mo)	12.0 (5.0–22.5)	12.0 (6.5–28.0)	0.978
Classification			
Palmer			1.000
1a + 1b	5 (26.3)	5 (23.8)	
1b	14 (73.7)	16 (76.2)	
Atzei			0.975
2	8 (42.1)	10 (47.6)	
3	11 (57.9)	11 (52.4)	
Ulnar styloid process fracture combined			0.812
No	16 (84.2)	16 (76.2)	
Yes	3 (15.8)	5 (23.8)	
Preoperative pain and functional status			
VAS score	6.0 (4.0–7.0)	7.0 (5.0–8.0)	0.181
DASH score	55.6 ± 17.5	49.7 ± 15.1	0.320

Values are presented as number (%), median (interquartile range), or mean ± standard deviation.
VAS: visual analog scale, DASH: Disabilities of the Arm, Shoulder and Hand.

vided comparable functional outcomes, as assessed by the VAS for pain and the DASH score. No significant differences were observed in postoperative grip strength, pinch strength, or patient satisfaction between the 2 groups. Additionally, the incidence of complications, including retears, nerve injuries, and postoperative stiffness, was low in both groups. These findings suggest that the Muenster brace, which allows partial elbow motion while restricting forearm rotation, may serve as an effective alternative to the LAC for postoperative immobilization without compromising clinical outcomes.

Despite significant comprehension of the TFCC's role in DRUJ instability and the crucial importance of its footprint reattachment in Atzei type 2 and 3 TFCC tears, the optimal postoperative immobilization method following TFCC repair remains a topic of debate, with no univer-

Table 2. Comparison of Outcomes between Groups

Variable	LAC group (n = 19)	Muenster brace group (n = 21)	*p*-value
Operation time (min)	80.0 (56.0–86.0)	58.0 (52.0–63.5)	0.070
VAS score	0.5 (0.0– 2.0)	1.0 (0.0– 2.0)	0.406
DASH score	1.7 (0.0–13.3)	8.3 (0.8–19.6)	0.416
Power of operated arm (% of opposite hand)			
Grip	84.6 (72.7–92.6)	87.3 (77.6–98.0)	0.497
Key pinch	94.8 ± 16.5	96.8 ± 22.1	0.816
Phone survey – satisfaction grade			0.660
Very satisfied (1)	11 (57.9)	14 (66.7)	
Satisfied (2)	4 (21.1)	4 (19.0)	
Fair (3)	3 (15.8)	1 (4.8)	
Poor (4)	1 (5.3)	2 (9.5)	
Very poor (5)	0	0	

Values are presented as median (interquartile range), mean ± standard deviation, or number (%).
LAC: long-arm cast, VAS: visual analog scale, DASH: Disabilities of the Arm, Shoulder, and Hand.

sally accepted rehabilitation protocol.[1,2,6] Key controversies include the appropriate duration of postoperative immobilization, the most effective and patient-tolerable immobilization method for promoting TFCC ligament healing, and the optimal timing and type of range-of-motion exercises to introduce.[15,16]

Regarding immobilization duration, authors have attempted to limit wrist motion, particularly supination, for the first 6 weeks postoperatively. Ligament-to-bone healing occurs in 3 phases: the inflammatory, proliferative, and maturation stages. Although individual variations exist due to patient-, injury-, and operation-related factors—such as age, comorbidities, smoking status, TFCC tear patterns, time from injury to reattachment, and surgical details—joint immobilization is generally recommended throughout the proliferative phase, which lasts approximately 6 weeks after repair.[3,15,17] Subsequently, during the maturation phase, when sufficient strength is believed to have been achieved, mobilization can begin. A recent scoping review of previous literature identified 6 weeks as the most commonly reported postoperative immobilization duration among surgeons.[15] Similarly, a survey of Australian hand therapists found that 6 weeks of immobilization was the most frequently recommended protocol.[16]

The next issue to consider is the method of immobilization. Wrist motion, particularly pronation, immediately after foveal reattachment can generate unfavorable tension at the repair site, potentially hindering TFCC healing. The LAC has traditionally been used due to its ability to restrict forearm rotation (pronosupination) and enhance DRUJ stability, preventing excessive stress on the repaired TFCC.[7,18-21] The original surgeons of the large bone tunnel technique utilized in this study also employed LAC as their preferred method of immobilization.[7] However, while LAC effectively limits wrist range of motion, it also restricts elbow motion, which may lead to complications such as stiffness, discomfort, and prolonged rehabilitation.[19,22,23] Trocchia et al.[18] demonstrated that although LAC effectively restricts forearm pronation-supination, it completely immobilizes the elbow, potentially resulting in joint stiffness and muscle atrophy. In our study, 1 patient in the LAC group experienced ulnar neuropathy after immobilization, though the symptoms resolved with observation. Similarly, McCarron et al.[16] reported that prolonged immobilization after TFCC repair can delay functional recovery and compromise patient satisfaction. Additionally, patients frequently experience significant discomfort, particularly when performing daily activities. The bulkiness and inconvenience of LAC often lead to poor compliance, which can negatively impact rehabilitation outcomes.[5,22]

Given these limitations of the LAC, there is a growing need for a more patient-friendly alternative approach that does not negatively affect TFCC healing.[7,22,24] The Muenster cast has emerged as a practical alternative to

LAC, as it effectively restricts forearm pronation-supination while allowing partial elbow flexion and extension.[8,11-13,18] Biomechanical studies indicate that the Muenster cast maintains stability of the DRUJ without excessive elbow immobilization, reducing the risk of stiffness.[18] Trocchia et al.[18] demonstrated that while LAC permits only 11 degrees of forearm motion, the Muenster cast allows approximately 35°, concluding that the Muenster cast provides sufficient forearm immobilization while preserving partial elbow mobility.

In this study, we further developed a modified Muenster brace for the patients in the second group. This brace was designed to be adjustable in length according to the patient's forearm size and to control the tension of the circular strap. Additionally, we provided thorough patient education regarding the importance of wearing the brace throughout the day except for hygiene purposes. This study has several limitations. First, the retrospective design may introduce selection bias, as treatment decisions were based on a protocol change rather than randomization. Second, the relatively small sample size may limit the statistical power to detect subtle differences between the groups. Third, while we maintained a 6-week immobilization period for both methods, the optimal duration of postoperative immobilization remains a topic of debate. Lastly, follow-up duration varied among patients, and long-term outcomes, such as the risk of late instability or degenerative changes, were not evaluated.

Both the LAC and Muenster brace immobilization demonstrated comparable clinical outcomes, patient satisfaction, and complication rates following TFCC transosseous foveal repair. While the Muenster brace allows for improved elbow mobility, its effectiveness in preventing retears remains similar to that of traditional casting.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Professor Ji-Sup Kim (Department of Orthopaedic Surgery, College of Medicine, Seoul Hospital, Ewha Womans University, Seoul, Korea) for his invaluable assistance in designing and providing the Muenster brace used in this study.

This Work was Supported by National Health Insurance Service Ilsan Hospital grant (No. NHIMC-2024-CR-067).

ORCID

Hyun-Cheol Oh https://orcid.org/0000-0003-4490-5154
Hyoung Bok Kim https://orcid.org/0000-0001-6798-6386
Hyun Tak Kang https://orcid.org/0000-0001-8050-3246
Youngwoo Lee https://orcid.org/0009-0001-8443-4580
Jun-Ku Lee https://orcid.org/0000-0003-4640-9357

REFERENCES

1. Nakamura T, Takayama S, Horiuchi Y, Yabe Y. Origins and insertions of the triangular fibrocartilage complex: a histological study. J Hand Surg Br. 2001;26(5):446-54.
2. Palmer AK, Werner FW. The triangular fibrocartilage complex of the wrist: anatomy and function. J Hand Surg Am. 1981;6(2):153-62.
3. Srinivasan RC, Shrouder-Henry JJ, Richard MJ, Ruch DS. Open and arthroscopic triangular fibrocartilage complex (TFCC) repair. J Am Acad Orthop Surg. 2021;29(12):518-25.
4. Nakamura T, Makita A. The proximal ligamentous component of the triangular fibrocartilage complex. J Hand Surg Br. 2000;25(5):479-86.
5. Omokawa S, Iida A, Kawamura K, et al. A biomechanical perspective on distal radioulnar joint instability. J Wrist Surg. 2017;6(2):88-96.
6. Atzei A, Luchetti R. Foveal TFCC tear classification and treatment. Hand Clin. 2011;27(3):263-72.
7. Park JH, Kim D, Park JW. Arthroscopic one-tunnel transosseous foveal repair for triangular fibrocartilage complex (TFCC) peripheral tear. Arch Orthop Trauma Surg. 2018;138(1):131-8.
8. Shinohara T, Tatebe M, Okui N, Yamamoto M, Kurimoto S, Hirata H. Arthroscopically assisted repair of triangular fibrocartilage complex foveal tears. J Hand Surg Am. 2013;38(2):271-7.
9. Nakamura T, Sato K, Okazaki M, Toyama Y, Ikegami H. Repair of foveal detachment of the triangular fibrocartilage complex: open and arthroscopic transosseous techniques. Hand Clin. 2011;27(3):281-90.
10. Johnson JC, Pfeiffer FM, Jouret JE, Brogan DM. Biomechanical analysis of capsular repair versus arthrex TFCC ul-

nar tunnel repair for triangular fibrocartilage complex tears. Hand (N Y). 2019;14(4):547-53.

11. Schmelzer-Schmied N. Arthroscopic refixation of TFCC by bone screw anchor. Oper Orthop Traumatol. 2016;28(4): 251-62.
12. Badia A, Khanchandani P. Suture welding for arthroscopic repair of peripheral triangular fibrocartilage complex tears. Tech Hand Up Extrem Surg. 2007;11(1):45-50.
13. 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(5):836-42.
14. Kim S, Lee JK, Oh CH, Lee S, Lee BH, Han SH. Traumatic posterior distal radioulnar joint instability treated with open versus arthroscopic methods: a retrospective cohort study. Arch Hand Microsurg. 2024;29(3):146-53.
15. McCarron L, Bindra R, Coombes BK, Bisset L. Wrist and forearm range of motion commencement time following primary triangular fibrocartilage complex foveal repair surgery: a scoping review. J Hand Ther. 2023;36(1):179-95.
16. McCarron L, Coombes BK, Bindra R, Bisset L. Current rehabilitation recommendations following primary triangular fibrocartilage complex foveal repair surgery: a survey of Australian hand therapists. J Hand Ther. 2023;36(4):932-9.
17. Cavanaugh JT, Powers M. ACL rehabilitation progression: where are we now? Curr Rev Musculoskelet Med. 2017; 10(3):289-96.
18. Trocchia AM, Elfar JC, Hammert WC. Biomechanical measurements of forearm pronosupination with common methods of immobilization. J Hand Surg Am. 2012;37(5):989-94.
19. Atzei A, Luchetti R, Braidotti F. Arthroscopic foveal repair of the triangular fibrocartilage complex. J Wrist Surg. 2015; 4(1):22-30.
20. Jung HS, Song KS, Jung HS, Yoon BI, Lee JS, Park MJ. Clinical outcomes and factors influencing these outcome measures resulting in success after arthroscopic transosseous triangular fibrocartilage complex foveal repair. Arthroscopy. 2019;35(8):2322-30.
21. Abe Y, Fujii K, Fujisawa T. Midterm results after open versus arthroscopic transosseous repair for foveal tears of the triangular fibrocartilage complex. J Wrist Surg. 2018;7(4):292-7.
22. Jung HS, Park JG, Park HJ, Lee JS. Postoperative immobilization using a short-arm cast in the semisupination position is appropriate after arthroscopic triangular fibrocartilage complex foveal repair. Bone Joint J. 2022;104(2):249-56.
23. Halanski M, Noonan KJ. Cast and splint immobilization: complications. J Am Acad Orthop Surg. 2008;16(1):30-40.
24. Tawonsawatruk T, Phoophiboon P, Kanchanathepsak T, Tuntiyatorn P. Comparative analysis of treatment outcomes: modified ulnar gutter slab vs. sugar tong slab for distal radioulnar joint instability following triangular fibrocartilage complex repair. J Clin Med. 2023;12(20):6574.