Focused Shockwave Therapy for Degenerative Triangular Fibrocartilage Complex Injury: A Case Report

Abstract

Degenerative injuries of the triangular fibrocartilage complex (TFCC) are a common source of chronic ulnar-sided wrist pain, particularly in individuals engaged in repetitive wrist movements. We report the case of a 36-year-old right-hand dominant male surgeon with a chronic central TFCC tear (Palmer class 2C) that was unresponsive to standard conservative treatments. The patient was treated with four weekly sessions of focused extracorporeal shockwave therapy (SWT) to the affected wrist. Following this intervention, he experienced complete resolution of wrist pain and full restoration of function, allowing him to return to unrestricted surgical duties. No adverse effects were observed during treatment. This case suggests that focused SWT may be a promising non-invasive therapeutic option for degenerative TFCC lesions that fail to improve with conventional management.

Introduction

The triangular fibrocartilage complex (TFCC) is a critical structure that stabilizes the distal radioulnar joint (DRUJ) and transmits axial loads across the ulnar side of the wrist. TFCC injuries may result from acute trauma or chronic degenerative overuse. Degenerative TFCC lesions, particularly Palmer type 2C, frequently occur in individuals who perform repetitive wrist motions, such as surgeons or manual laborers, and are often located in the central avascular zone of the TFCC. Because this central region has a limited vascular supply, such tears have minimal intrinsic healing potential (Fedorczyk, 2016). Degenerative TFCC disorders typically arise from the accumulation of micro-stresses over time, leading to persistent ulnar-sided wrist pain, reduced range of motion—especially in ulnar deviation and forearm rotation—and impaired wrist proprioception (Park et al., 2018).

Standard non-operative management for TFCC injuries includes immobilization (wrist bracing), activity modification to reduce load, nonsteroidal anti-inflammatory drugs (NSAIDs), and structured physical therapy focusing on gradual strengthening and proprioceptive retraining (Aboubakr et al., 2024; Park et al., 2018). While these measures can benefit acute or minor TFCC tears, they are often insufficient for chronic degenerative tears that persist beyond initial rehabilitation. For example, a recent controlled study reported only modest (~40%) pain reduction after a six-week course of conventional therapy in patients with degenerative TFCC injuries, whereas adding shockwave therapy led to a significantly greater (~74%) improvement (Aboubakr et al., 2024). Given the suboptimal outcomes of conservative treatment alone, there is growing interest in alternative interventions to enhance healing and pain relief.

Focused extracorporeal shockwave therapy (SWT) is a non-invasive modality that has demonstrated beneficial effects in various musculoskeletal conditions, such as tendinopathies and nonunion fractures. Shockwaves deliver high-energy acoustic pulses to targeted tissues, triggering mechanotransductive biological responses. Preclinical and clinical studies have shown that SWT can stimulate angiogenesis and tissue regeneration by upregulating growth factors such as vascular endothelial growth factor (VEGF) and promoting extracellular matrix remodeling (Huang et al., 2016). Additionally, shockwave application has anti-inflammatory and analgesic effects, in part by enhancing nitric oxide signaling and modulating nociceptive pathways (Takahashi et al., 2003). These mechanisms provide a strong theoretical rationale for applying SWT to difficult-to-heal soft-tissue lesions such as degenerative TFCC tears.

Despite this promising biological basis, clinical evidence for SWT in TFCC injuries remains limited. To date, few published reports have documented the use of shockwave therapy specifically for TFCC lesions, and no standard protocol has been established for this indication. This case report aims to contribute to the emerging evidence by describing the successful application of focused SWT in a patient with a chronic degenerative TFCC tear that had not improved with conventional therapy.

Patient Information

A 36-year-old right-hand dominant male surgeon presented with several months of chronic left ulnar-sided wrist pain. The pain was insidious in onset (with no single precipitating trauma) and was aggravated by the demands of surgery and other fine manual tasks. He had no history of acute injury to the wrist and no known systemic conditions (such as rheumatoid arthritis) that could predispose to wrist problems. The patient's prior management included conservative measures initiated elsewhere: he had tried activity modification, intermittent NSAID use, and a course of outpatient physical therapy. However, these interventions provided minimal relief, and his wrist pain continued to limit both his occupational and daily activities.

Clinical Findings

On physical examination, the patient exhibited tenderness at the ulnar fovea (just distal to the ulnar styloid), with a positively elicited ulnar fovea sign. The distal radioulnar joint showed mild laxity on stress testing. Grip strength in the left (affected) hand was reduced to approximately 60% of that in the right hand, measured via dynamometer. Provocative maneuvers reproduced his symptoms: resisted ulnar deviation of the wrist and resisted abduction of the little finger (a stress test for the TFCC) elicited sharp ulnar-sided wrist pain, rated 8/10 on a visual analog scale (VAS). Aside from pain and weakness, there was no visible swelling, ecchymosis, or deformity in the wrist and hand. Distal neurovascular exam of the hand was normal.

Timeline

Week 0 (Initial Evaluation): Baseline assessment of the left wrist pain (VAS 6/10). The patient had already completed a trial of conventional therapy (rest, NSAIDs, and physical therapy) with no significant improvement in symptoms.

Weeks 1–4 (Intervention Period): The patient underwent focused shockwave therapy once weekly for 4 weeks, with concurrent use of a forearm-based wrist splint at night and twice-daily cryotherapy (ice packs applied ~20 minutes each session). No strengthening exercises or heavy loading of the left wrist were performed during this period to avoid exacerbating the injury.

Week 4 (Post-Treatment Outcome): After four weekly SWT sessions, the patient's wrist pain had resolved (VAS 0/10). He reported restored function and was able to resume full surgical duties without restriction.

Diagnostic Assessment

Magnetic resonance imaging (MRI) of the left wrist was obtained to characterize the injury. The MRI confirmed a central radial tear of the TFCC, corresponding to a Palmer class 2C degenerative lesion. The tear was located in the central articular disk region of the TFCC (an area with poor vascularity). A small volar ganglion cyst was noted adjacent to the radiocarpal joint, and evidence of an old injury to the volar scapholunate ligament was present. There were no signs of distal ulna impaction, and extensor carpi ulnaris (ECU) tendinopathy or subluxation was ruled out on imaging. The central TFCC tear's location in an avascular zone indicated a low likelihood of spontaneous healing with conservative management alone, reinforcing the decision to pursue an intervention beyond standard therapy.

Standard laboratory tests (e.g. inflammatory markers) were not indicative of any underlying rheumatologic condition. Given the chronic nature of the injury and imaging findings consistent with a degenerative TFCC tear, the clinical diagnosis was established as a chronic degenerative TFCC injury (Palmer 2C) of the left wrist.

Therapeutic Intervention

The patient underwent a course of focused extracorporeal shockwave therapy directed at the TFCC region of the left wrist. A total of four SWT sessions were administered, once per week over four consecutive weeks. Each session delivered 1,500 shockwave impulses focused on the ulnar fovea (TFCC area) at an energy flux density of 0.25 mJ/mm² and a frequency of 4 Hz. The treatment was performed by a physical therapist with specialized training in musculoskeletal shockwave application. During the treatment sessions, the shockwave probe was positioned over the ulnar wrist (patient seated with forearm in neutral rotation), and ultrasound gel was used as a coupling medium to ensure effective transmission of the acoustic waves.

Adjunctive therapies were employed in parallel with SWT to support the healing process. The patient was instructed to wear a supportive wrist splint (ulnar gutter orthosis) each night to immobilize the wrist and reduce stress on the TFCC. He also applied ice packs to the ulnar wrist region for 20 minutes, twice daily, to manage pain and local inflammation. Importantly, strengthening exercises and any activities that provoked pain were temporarily withheld during this 4-week treatment period to avoid overloading the recovering tissue.

By the end of the 4-week SWT regimen, the patient reported a complete resolution of his wrist pain. His VAS pain score improved from 6/10 at baseline to 0/10 after treatment. Grip strength in the left hand increased to roughly 95% of the contralateral side, indicating significant recovery of function. Following the treatment course, the patient was able to return to performing surgeries and other manual tasks without any restrictions. No adverse events were observed during therapy – the patient did not experience any skin irritation, bruising, nerve symptoms, or other complications related to SWT. Overall, the intervention was well tolerated and compliance with the splint and cryotherapy was good.

Follow-Up and Outcomes

3-Month Follow-up: At three months post-treatment, the patient remained completely pain-free. He demonstrated full wrist range of motion and could perform all activities of daily living and surgical duties without difficulty. There was no recurrence of ulnar-sided wrist pain even with regular use of the hand in surgical procedures.

1-Year Follow-up: By one year after the intervention, the patient continued to have full function of the wrist. He reported only occasional, mild discomfort in the left wrist during extremely strenuous or prolonged manual activities (for example, after a long day of back-to-back surgeries). This intermittent discomfort was minor and did not impair his performance or require analgesic medications. No new wrist injuries or instability were noted on clinical exam.

2-Year Follow-up: At two years post-treatment, the patient maintained excellent overall outcomes. He experienced infrequent ulnar wrist soreness only after very extended periods of high-intensity bilateral surgical work. These symptoms were effectively self-managed with conservative measures (such as using a resting wrist splint in the evenings and doing warm water hydrotherapy/soaks for comfort). He did not require any additional medical interventions for the wrist. The patient's grip strength and dexterity remained near normal, and he continued to work as a surgeon without limitations. There were no indications of symptom relapse or new functional deficits at the two-year mark.

Discussion

This case illustrates the potential role of focused shockwave therapy in managing chronic degenerative TFCC injuries. The patient in our report achieved complete pain relief and near full restoration of wrist function within four weeks of initiating SWT, despite having a TFCC tear that had previously failed to improve with standard conservative treatment. Such a rapid and pronounced improvement is noteworthy, and it aligns with emerging evidence from recent studies. For instance, a controlled trial by Aboubakr et al. (2024) found that adding focused SWT to a conventional rehabilitation program resulted in a significantly greater reduction in chronic wrist pain (approximately 74% improvement in VAS scores) compared to rehabilitation alone (~40% improvement). Similarly, a study by Huang et al. (2016) reported substantial pain relief and functional gains in a cohort of military trainees with TFCC-related wrist injuries treated with focused shockwave therapy. These findings suggest that shockwave treatment can augment or accelerate recovery in cases of TFCC degeneration, potentially outperforming traditional conservative measures in suitable patients.

Several biological mechanisms may underlie the therapeutic effects of shockwave therapy observed in this case. SWT induces a cascade of cellular responses that can stimulate tissue repair even in regions with limited blood supply. Prior studies have demonstrated that shockwaves promote the formation of new blood vessels (angiogenesis) and foster fibrocartilage healing by upregulating growth factors such as VEGF and by enhancing collagen remodeling in the extracellular matrix. In the avascular central portion of the TFCC, these effects could facilitate reparative processes that would otherwise be unlikely to occur with conservative management alone. Additionally, shockwave therapy appears to exert direct analgesic effects through neuromodulation of pain pathways. Takahashi et al. (2003) showed in an animal model that shockwave application significantly reduced the expression of calcitonin gene-related peptide (CGRP) in dorsal root ganglion neurons, a neuropeptide involved in pain transmission. This down-regulation of CGRP provides a plausible mechanism for pain relief, suggesting that SWT can decrease nociceptive signaling from the injured wrist. The neuromodulatory effect might explain the rapid symptom resolution in our patient, even before any definitive structural healing of the TFCC could be confirmed via imaging.

It is also important to consider the contribution of the adjunctive interventions used alongside SWT in this case. The patient's nightly splinting and routine cryotherapy likely helped by offloading the TFCC during healing and controlling pain and inflammation, respectively. These supportive measures, combined with the avoidance of aggravating activities, created an optimal environment for recovery. However, given the chronic nature and prior non-responsiveness of the injury, it is probable that the focused shockwave therapy was the critical factor driving the accelerated improvement. This case is limited by the lack of follow-up imaging to objectively assess the anatomical status of the TFCC post-treatment. Without MRI or ultrasound verification, we cannot

conclusively determine whether the tear has partially healed, or if the pain relief was achieved primarily through neurophysiological modulation and scar tissue stabilization. Nonetheless, the patient's sustained functional recovery over two years of follow-up strongly indicates a meaningful clinical benefit from the SWT-based approach.

Finally, further research is warranted to validate the efficacy of shockwave therapy for TFCC injuries and to establish evidence-based protocols. While this single-case outcome is encouraging, larger case series and controlled trials (randomized studies) are needed to determine optimal treatment parameters (such as energy level, number of sessions, and interval between treatments) and to assess long-term outcomes across various TFCC tear types. As the evidence base grows, focused extracorporeal SWT could become an important addition to the armamentarium for managing chronic TFCC lesions, offering patients a non-invasive treatment option that may help them avoid or delay more invasive procedures like arthroscopic debridement or surgical repair.

Patient Perspective

From the patient's perspective, the shockwave therapy intervention provided significant relief and a return to normal function. He reported being extremely satisfied with the outcome, noting that his left wrist "felt as good as new" following the treatment. The elimination of pain allowed him to perform both daily activities and demanding surgical procedures with confidence. He expressed gratitude that an invasive surgery was not required, and he was pleasantly surprised by how quickly the therapy worked in alleviating his chronic wrist pain. The patient has acknowledged that he remains mindful of his wrist during very prolonged surgical cases, taking short breaks as needed to rest his hands. However, he has emphasized that the occasional mild fatigue he experiences is manageable and that he is able to fully carry out his professional duties without any significant discomfort or limitations.

Informed Consent

Written informed consent was obtained from the patient for publication of this case report, including the presentation of clinical data and any accompanying images.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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References

References

Aboubakr, A. K. A., Abd Elmegeed, S. F., Safoury, Y., & Abd Allah, D. S. (2024). Combined effect of shock wave therapy with conventional physical therapy on wrist pain in degenerative triangular fibrocartilage complex injury. *The Egyptian Journal of Hospital Medicine, 95*(1), 1848–1852. https://doi.org/10.21608/ejhm.2024.270675

Fedorczyk, J. M. (2016). Triangular fibrocartilage complex. *Physical Medicine and Rehabilitation Clinics of North America, 27*(3), 589–605. https://doi.org/10.1016/j.pmr.2016.04.005

Huang, L., Lin, K., & Lian, K. (2016). Efficacy analysis of extracorporeal shock wave therapy on triangular fibrocartilage complex injury of the wrist caused by military training [In Chinese]. *Journal of Preventive Medicine of PLA, 34*(3), 407–409.

Park, J. H., Kim, D., Park, H., Jung, I., Youn, I., & Park, J. W. (2018). The effect of triangular fibrocartilage complex tear on wrist proprioception. *Journal of Hand Surgery (American Volume), 43*(9), 866.e1–866.e8. https://doi.org/10.1016/j.jhsa.2018.01.022

Takahashi, N., Wada, Y., Ohtori, S., Saisu, T., & Moriya, H. (2003). Application of shock waves to rat skin decreases calcitonin gene-related peptide immunoreactivity in dorsal root ganglion neurons. *Autonomic Neuroscience: Basic and Clinical, 107*(2), 81–84. https://doi.org/10.1016/S1566-0702(03)00134-6