

# Overview of Wrist Injuries Treatment

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**Abstract.** This paper discussed an overview of wrist injuries, and the various methods used to treat them. Since there are different methods, this paper uses examples and research to help with the analysis and to find the most suitable ones. In this case, conservative methods are often used first, followed by operative treatments if needed. Also, this paper provides numerous ways to diagnose, such as objective methods like MRI and more subjective methods like function tests. Additionally, advice on preventing wrist injuries is given.

**Keywords:** Wrist, TFCC, Fractures, Treatment.

## 1. Introduction

The wrist joint is made up of eight carpal bones, or diarthrodial joints, which are situated between the forearm and five metacarpal bones. The proximal carpal row (PCR) and distal carpal row (DCR) are two classifications for the eight carpal bones. In addition to the eight carpal bones, the wrist's weight is supported by the triangular fibrocartilage complex (TFCC). On the medial side of the wrist lies a triangular fibrocartilage articular disc. Additionally, by shifting the axial strain from the carpus to the ulna and allowing for easier wrist movements, the TFCC aids in the prevention of ulnocarpal abutment. [1,2].

The ligaments of the wrist joint, including extrinsic and intrinsic ligaments, help guide carpal bone motion into a restricted range during hand movements [1].

Only the muscular tendons affect the hand, and the forearm contains the muscles that regulate the wrist joint. Six major muscles are implanted at the DCR, even though no tendons directly link to the carpus and PCR. The six muscles solely work on the wrist, providing strength and support for hand movements.

Roughly 15% to 25% of all sports-related injuries are wrist and hand injuries. Multiple studies have shown that fractures are the most typical ones. The Cleveland Clinic study looked at 113 injuries of the hands and wrists. 38 of the 96 fractures that the study documented were metacarpal fractures. The investigation also noted four dislocations and twelve sprains. According to a different study by Rettig, football was the sport with the highest number of injuries among the eight evaluated, with fractures accounting for 52% of the total. This suggests that football is a high-risk activity for wrist injuries. 15% to 25% of sports injuries are related to the hands and wrists. Hand and wrist injuries account for about 15% to 25% of all sports injuries. For the boy-to-girl ratio, 6,493 fractures from 6,389 children under the age of 16 who were admitted as inpatients to one center over ten years were examined in total. From 1.4:1 in the newborns to 4.9:1 in the teens, there was an increase in the boy-to-girl ratio. The most common cause of discomfort in the ulnar wrist is TFCC injuries, which are more common in individuals

70 years of age and older (49%) than in those 30 years of age and younger (27%). Of the 34 individuals included in Fotiadou's study, 24 had chronic injuries, and just 10 had acute injuries. [3-5].

## **2. Diagnosis and evaluation**

Magnetic Resonance Imaging (MRI) is a frequently used technique for detecting wrist injury. It affects the hydrogen atoms in the human body using radiofrequency pulses and a high magnetic field to produce detailed images. MRI scans with high resolution offer a 97% accuracy. It can help to identify the most frequently seen common solid masses but cannot effectively distinguish between benignity and malignancy. It allows for a precise evaluation of the horizontal structure of the joint disc but may cause difficulty in detecting peripheral wrist tears. However, the study by Andrew Haims concluded that MRI isn't accurate enough when diagnosing cartilage defects in the distal radius, scaphoid, lunate, or triquetrum. The sensitivity percentage is only around 18% to 27%, which is relatively lower than the specificity ranges from 75% to 93%. In this case, enhanced MRI can be used to improve the visibility of soft tissues. The same study also concluded that the accuracy was not influenced by variables such as sex, age, or the presence of multiple bones with lesions. Others may prefer MRI particularly because the clinical diagnosis is focused on occult scaphoid fractures. In this specific case, MRI is the most reliable detection method. Other ways of detection include plain films and CT. They can detect calcification and provide a clearer view of bony structures; but they are less useful in tissue characterization. A study published by the Accident and Emergency Department (A&E) Bergen, Norway mentioned that 155 patients who have been detected as normal in the CT still suffer from severe wrist pain. MRI was then done after an average of 1 day. The results then showed that among all 155 cases, only 30 cases were normal. 54 fractures, 56 bone bruises and 73 soft-tissue injuries have been detected. Therefore, the author concluded that for patients, MRIs should be considered as preliminary investigations. With severe wrist pain, especially when CT cannot identify the injury. Another research conducted by Fotiadou also shows that in 34 cases of wrist injuries, only one case used CT, and the other all picked MRI. Ultrasound can localize lesions but may not work as efficaciously for further tissue characterization. Moreover, some research suggested that wrist arthroscopy is best for diagnosing some types of cartilage injuries, such as TFCC injuries. It can also provide appropriate treatment during the same procedure and is considered the most sensible and specific, offering the ability to visualize anatomical structures for a precise diagnosis directly [6-9].

Function activity test is also a crucial aspect when determining wrist injuries. Each of these tests has its unique assessment method. The assessment of wrist joint function loss is used when joint issues, like degenerative changes, are suspected and affect function. It compares the function of the injured wrist to the healthy one. The Chinese Medical Association's guidelines help assess the overall function of the wrist and the whole limb. The DASH score allows patients to rate their function and pain. The PRWE focuses on pain and activity-related functions. The Cooney wrist score skips radiological evaluation, while the Krimmer score adjusts pain and function assessments, adding rotational movement. The Lamberta score is for wrist function after replacement surgery, evaluating balance, movement, and pain relief.

Among all eight assessments listed, quick DASH and PRWE are considered the most effective ones. This is because they rely on patients' self-assessment of pain and activity, which makes it accurate in reflecting the severity of injury. PRWE, in particular, has more sensitivity and offers a more detailed functional assessment compared to Quick DASH. Other assessments mainly focus on the objective aspect of injury severity but lack a subjective pain assessment. Therefore, in clinical practice, it is recommended to use two evaluations, Quick DASH or PRWE and any other assessments, together for a more comprehensive and precise diagnosis [10].

## **3. Treatment**

For all types of wrist injuries, the initial treatment will always be conservative, which includes physical therapy, activity modification, or corticosteroid injections. If conservative treatments don't work, early surgical intervention is recommended.

### 3.1. *Conservative treatment*

Conservative treatment aims to achieve healing and reduce pain. Some recommendations include complete abstinence from sports, modifying activities, using splints or casts, taking medications that alleviate pain and inflammation, and applying cold packs to decrease swelling. In stubborn cases, corticosteroid injections or platelet-rich plasma therapy can be used. They can significantly reduce inflammation in tendinitis, arthritis, and carpal tunnel syndrome. By decreasing inflammation, these injections help alleviate pain and swelling. Therefore, the alleviation of pain can eventually avoid surgeries for chronic injuries.

Physical therapy is also crucial for maintaining range of motion and avoiding stiffness after acute trauma or inflammation-related discomfort has subsided. The normal time to start strengthening workouts is six weeks after a full recovery. In most cases, if there is no major distal radioulnar joint (DRUJ) instability or an urgently needed fracture, a 6-month conservative treatment can help significantly lessen the damage. [11-13].

### 3.2. *Operative treatment*

Surgical suggestions will be given to patients if conservative treatments are not working.

**3.2.1. Wrist fracture.** A wrist fracture is a crucial aspect when discussing wrist injuries. Open Reduction and Internal Fixation (ORIF) is a common surgical treatment when non-surgical treatments, such as casting, cannot maintain proper bone alignment; or the fracture is severe, displaced, or unstable. The surgeon will realign the broken bones to their normal position, and use metal hardware, such as plates and screws to hold the bone together to ensure a proper recovery. After the surgery, a period of immobilization is required, and some physical therapy can help with the restoration of mobility.

External fixation can also be used if the fracture involves significant soft tissue damage or for open fractures where the bone has pierced the skin. It can also be used for children to avoid damage to growth plates because it is less invasive than internal fixations. The surgeon will make a small incision in the skin and inserts a metal needle or screw into the bone on either side of the fracture. These needles or screws are then attached to an external frame outside the skin to stabilize the bone in the correct position. The external frame can also be adjusted as needed during the healing process if there is severe swelling or changes in bone alignment. But this frame can also restrict the range of motion, which can be inconvenient [5,14,15].

**3.2.2. TFCC tears.** For tears resulting from trauma and situated in the center the fibrocartilage disc, arthroscopic debridement is the most common and effective operative treatment. Debridement aims to trim off the loose flaps that cause significant pain and synovitis to secure the TFCC rim. Debridement success rates for this kind of TFCC rupture have been documented in the literature, and they range from 66% to 87%, which is quite high [11].

For traumatic tears of the TFCC occurring at its ulnar attachment in the peripheral region, refined repair techniques have been commonly used. Because it's vascular damage, it is more conducive to successful healing and repair. Reattachment techniques are required to rejoin the radio-ulnar ligaments to the bone once the TFCC is avulsed from the foveal insertion, hence restoring DRUJ stability and function. [11].

Other operative treatments include open repair of TFCC and arthroscopic repair of TFCC. Open repair of TFCC is for injuries that cannot be adequately addressed arthroscopically or injuries associated with significant distal radioulnar joint (DRUJ) instability. There are three repair techniques: direct repair, reattachment and tendon graft. For direct repair, the TFCC is reattached to its foveal insertion or repaired with sutures when there is sufficient healthy tissue. Reattachment is to secure the avulsed TFCC back to the bone. In severe cases, tendons can be used to bridge the gap and reconstruct TFCC, which is tendon graft; furthermore, arthroscopic repair of TCFF is used for rare, high-impact injuries affecting the ligament complex on the wrist's palm side near the ulna; injuries where bone or soft tissue is torn away from the radius's sigmoid notch; and injuries not involving a significant radioulnar ligament injury

and distal radioulnar joint (DRUJ) instability. There are two types of repair techniques, suturing and anchoring. Suturing is to suture together the torn edges of TFCC; anchoring uses small anchors to reattach the TFCC to the bone [11].

**3.2.3. Wrist arthritis.** For patients with wrist arthritis, especially synovitis or rheumatoid arthritis, synovectomy can be used when conservative treatment doesn't work. Synovectomy will remove the synovial membrane, the lining of the joint that produces synovial fluid, to reduce inflammation and alleviate pain. For wrist injuries, arthroscopic synovectomy is often used as the wrist joint is relatively small.

Patients with severe deformities can also choose wrist arthroplasty. In 1917, Swanson introduced the first implant made of silicone which acted as flexible spacers in the body. However, these implants, later in time, showed lots of unexpected outcomes. First, over time, silicone can degrade. The silicone particles will then disperse into the surrounding tissue, causing inflammation and other problems. Moreover, the flexible silicone cannot provide enough support for patients, causing the implant to loosen, finally resulting in the failure of treatment. These two reasons also lead to the limitation of longevity. Many young or more active patients need to have a revision surgery. Therefore, wrist arthroplasty nowadays chooses to use metal and plastic for the implant. The surgeon will remove the deformed structure and insert the implant. After the surgery, rehabilitation is important to restore movement and strength. This surgery can help to relieve pain and regain patients' ability to move. However, although materials are very advanced today, there is still a possibility of the implant loosening and wearing out. Longevity is also another concern [2].

#### **4. Prevention**

For prevention, it is important to maintain good overall body health for stronger strength. Also, it is important to do wrist-strengthening exercises that target around the wrist and forearm to provide stability. Some exercises include wrist cruel, reverse wrist cruel and wrist rotation. Stretching is also a crucial aspect when discussing TFCC injuries. It helps to reduce tension and create flexibility for the wrist and forearm muscles. Sometimes, protective gear can prevent injuries. It also plays an important role when rehabilitating. For instance, research conducted by Asmus et.al highlighted that a wrist brace can improve the performance of the injured wrist and provide support for a healthy wrist to reduce the risk of injury. The wrist brace helps increase the injured hand's max weight bearing by around 8 kg [16].

#### **5. Conclusion**

In sports, injuries are inevitable. The most important thing is to take proper protective measures to prevent injuries and reduce joint pressure. If an injury occurs, don't hesitate to seek medical help—timely intervention is the best choice. The doctor will make an initial diagnosis based on your condition. It's crucial to actively cooperate with the treatment and complete your rehabilitation exercises. This paper still lacks more detailed methods and step-by-step treatments, it also needs more focus on injuries that are not commonly faced and is only for readers who need a basic overview of diagnosis, treatments and prevention. Future research will expand on the treatments for uncommonly faced wrist injuries and provide surgical advice for expertise.

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