MICHIGAN
Hand Center
Specialists in treatment & rehabilitation from the fingertips to shoulder

Newsletter

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Wrist Fractures

Figure 1

Figure 2

Figure 1 and 2.
A severely comminuted intra-articular, displaced, unstable, irreducible fracture.

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Each year, there are over 200,000 wrist fractures in the United States. Wrist fractures make up a sixth of all fractures seen in emergency rooms. Therefore significant health care resources are utilized to treat this injury.

Mechanisms for this fracture vary. They range from falls from various heights to direct blows to the wrist. They can occur on an outstretched, pronated wrist, or on a flexed, supinated wrist. The position at the time of injury influences the fracture configuration and associated injuries.

There have been numerous attempts to classify the various fracture configurations that occur. Each classification has its strengths and weaknesses. All of them depend on good quality x-rays that should include, at the minimum, a PA and lateral view. Eponyms such as “Colle’s” and “Barton’s” should be avoided. Perhaps the best classification is the “Universal Classification.” A fracture is reduced to four descriptors: intra-articular or extra-articular; displaced or nondisplaced; reducible or irreducible; stable or unstable. This classification can allow the treating surgeon to plan the appropriate care for the fracture. For example, an extra-articular, nondisplaced, stable fracture is likely to be treated with a splint or cast. On the other hand, an

Figure 3

Figure 4

Figure 5

intra-articular, displaced, irreducible, unstable fracture will in most cases require surgical intervention. While this classification does not describe a fracture in detail, it does allow for the construction of a therapeutic algorithm. Naturally, to determine if a fracture is "reducible" or "irreducible" and "stable" or "unstable" requires an attempt at a closed reduction.

Associated injuries occur frequently. They can be radiographically apparent or occult. These include carpal injuries such as scaphoid fractures, scapholunate ligament disruption, TFCC tears with or without an ulnar styloid fracture, acute carpal tunnel syndrome, artery laceration/ rupture, compartment syndrome, etc. An exam including the ipsilateral hand, forearm, elbow, and shoulder are mandatory to rule out adjacent injuries. A precise neurological exam should be performed and documented. There are some reports that document a 50% prevalence of carpal tunnel syndrome associated with distal radius fractures! Because certain carpal injuries are subtle, an x-ray of the contralateral wrist is helpful. Even with a careful exam and x-rays, not all associated injuries will be identified at the time of first presentation. A high index of suspicion is required to identify these injuries early. Ancillary studies such as MRI arthrograms can be considered. Also, some of these fractures can be treated in an arthroscopic manner thus allowing the surgeon a chance to view the entire carpus and identify any associated lesions.

The decision regarding the type of treatment is based upon the fracture configuration, patient age/functional status, and concomitant injuries. More aggressive treatment is favored in an active patient, unstable or irreducible fractures, wrist fractures with associated carpal injuries or median nerve symptoms, and for certain combined trauma cases.

Treatment has evolved over the last several decades. The goals of treatment are to restore and maintain alignment of the fracture while maximizing early rehabilitation of the hand and wrist. The most modern fracture care revolves around 4 concepts that technology has made available. These include fragment specific fixation, limited open reduction and internal fixation/percutaneous reduction, arthroscopically assisted reduction, and fixed angle volar plating.

Fragment specific fixation has been made possible by the development of new low profile implants that can be used in buttressing and subchondral support roles where screw fixation cannot be achieved. This has reduced the need for long periods of immobilization of the wrist, loss of fracture reduction, and has allowed earlier aggressive rehabilitation (Figures 1, 2, 3, and 4).

Figure 3 and 4. The same fracture as in Figure 1 and 2 fixed with fragment specific fixation including subchondral support "pin-plates". Excellent restoration of the articular surface was achieved. Note the widening of the scapho-lunate interval. The ligament was viewed directly during surgery and was found to be intact. The contra-lateral wrist has similar widening on x-ray.

Limited open reduction and internal fixation (LORIF) has evolved with the smaller implant designs and with the use of fluoroscopy. By using very careful exposure techniques, surgical dissection can be reduced. This allows an improvement in postoperative range-of-motion and a decrease in scarring and tendon adhesion problems. Arthroscopically assisted reduction is the pinnacle of LORIF. The arthroscope allows very precise localization and reduction of intra-articular fragments. Associated carpal injuries can be identified and treated at an early stage (Figure 5 and 6).

Figure 6

Figure 5 and 6. An intra-articular fracture has been reduced with arthroscopic assistance and a radial placed "pin-plate" satisfactorily holds both extra-articular and intra-articular components in reduction. A fixed-angle implant holds the ulnar head fracture in position.

Fixed angle volar plating has allowed rigid fixation of unstable fractures while avoiding the problems associated with dorsal plating. The avoidance of dissection and placement of hardware around the extensor tendons decreases problems with dorsal wrist pain and tendon irritation/ruptures (Figure 7, 8, 9, and 10). The fixed angle construct is rigid enough to start early active motion of the wrist in many cases.

Figure 7

Figure 7 and 8. An intra-articular, unstable, unreducible fracture.

Figure 9 and 10. The same fracture as in Figure 7 and 8. It is held reduced with a fixed-angle volar plate that allowed early range-of-motion. A single screw stabilizes the ulnar head to permit early forearm motion.

The type of surgery and choice of implants depends on both the patient and the fracture configuration. Not every fracture is amendable to the same strategy of fixation. The goal is to minimize invasiveness of the surgery wherever possible commensurate with obtaining an anatomic reduction. The goals of reduction include limiting intra-articular step-off of fractures to less than 1mm, shortening of the radius to less than 2-3mm, and having achieved at least neutral to slight volar tilt of the articular surface.

Figure 8

Figure 9

Figure 10

Rehabilitation begins the day after surgery emphasizing finger, elbow, and forearm motion. Wrist motion is started based on the stability achieved with the treatment method. Passive range-of-motion can begin once consolidation of the fracture has occurred. Strengthening can start when motion is being regained in a rapid manner. An important step of the rehabilitation process is skill and work conditioning of the hand. The patient is encouraged to resume normal activities as soon as possible. It can take 12-18 months to reach maximal medical improvement with the most severe of wrist fractures.

The surgeons of The Michigan Hand Center have considerable experience in treating these injuries and the related carpal injuries that can occur with distal radius fractures. The advanced techniques, as noted above, are offered to patients seen at the hand center. The specialized rehabilitation services for these injuries are located onsite allowing the physician to dynamically adjust the therapy process. If there is a need to obtain additional information about this topic or others, please contact The Michigan Hand Center at 616-957-HAND.