

Wrist Injuries, Part II

Imaging

Radiographic decision-making for the wrist is dictated by the degree of trauma with acute injury (suspicion of fracture or ligament rupture) or suspicion of arthritide involvement with a chronic pain history. Following are some common examples:

- A combination of anatomical snuff-box tenderness in a patient with a history of a fall on an outstretched hand would suggest scaphoid injury. A scaphoid series includes a posteroanterior (PA) view, a true lateral, a 45 degree pronation view (PA view), and an ulnar deviation PA view.¹ Another view that may be helpful is the Stecher view.² This is a PA shot with an angle of 20 degrees to the vertical angled from distal to proximal. When no fracture is evident but suspicion of fracture is high, additional angled views may help catch the fracture line. Initial radiographs are often unrevealing, even when a fracture is present. When the suspicion of a fracture is high, yet radiographs are negative, immobilization for 2-3 weeks in a thumb spica cast is recommended, followed by a second radiographic evaluation. Most fractures become apparent at this time. If an immediate determination is necessary (e.g., a professional athlete), a bone scan should be performed at three days post-injury. A negative bone scan rules out fracture.³ CT scans may also be beneficial in equivocal presentations.
- If a patient has joint-line tenderness, coupled with a history of a fall on a dorsiflexed hand and a positive Watson's test, ballottement, or midcarpal stability test, scapholunate dislocation or subluxation, lunotriquetral, or midcarpal instability respectively are likely. The lateral view will show a disrelationship between the radius, lunate, capitate, and third metacarpal. Two patterns may be evident: the dorsal intercalated segmental instability (DISI) pattern, or the volar intercalated segmental instability (VISI) pattern (sometimes called PISI). These instability patterns are based on the position of the lunate in relationship to the radius. Several angles can be measured, however the most common is the scapholunate angle that normally ranges between 30-60 degrees; greater than 70 degrees indicates scapholunate dissociation. If not evident statically, stability or stress views should be added. These include the clenched fist (anterior to posterior) view or a traction view, lateral views in flexion and extension, and AP views in radial and ulnar deviation.⁴
- A combination of trauma to the pisiform with local tenderness coupled with any sensory abnormalities into the fourth and fifth fingers would be suggestive of a hook of hamate fracture. The PA view may demonstrate subtle signs, such as absence of the hook or cortical ring, or sclerosis in the area of the hook.⁵ A carpal tunnel view and/or a 45 degree supinated oblique view is suggested.⁶ When these views are unrevealing, yet the suspicion of fracture is high, referral for a CT is warranted.⁷

It is crucial to include the distal radiulnar joint on wrist radiographs. The view should extend 5-7 cm proximally in an effort to determine:

- any subtle breaks in cortical margins;
- disruption of the epiphysis in the child or adolescent; or

- callus formation subsequent to an undiagnosed fracture, especially when a younger patient reports a history of a fall 2-3 weeks previous (e.g., torus fracture of distal radius).

Management

Fractures and instability are the two major considerations when there is a history of trauma. Management is dependent on radiographic evidence or lack thereof. If a fracture is evident, refer for orthopedic consult (some chiropractors are experienced with casting for scaphoid fracture). If the suspicion of fracture is high, yet the radiographic evaluation is negative, a bone scan might be appropriate in higher level athletes. If there is insufficient evidence of fracture on initial radiographs, yet fracture is still being considered, a period of 2-3 weeks of immobilization followed by repeat films is prudent. Often the fracture is not evident until 14-21 days post-injury.

Instability is a difficult matter. There is some disagreement as to the appropriateness of immobilization as an initial management approach. With scapholunate dissociation, it is generally agreed that the damage is significant enough and the potential disability great enough that surgery is the first course of action. With other forms of instability, such as lunotriquetral dissociation or midcarpal instability, a period of six weeks splint immobilization is considered a reasonable initial approach.

If the patient is left with pain or obvious disability, a surgical consult is necessary. The chiropractor must be aware that permanent disability may result from an assumption that an athlete's wrist pain is simply a sprain and will resolve with time. It is beyond the scope of this small article to detail surgical options, but these approaches are generally divided into two categories: (1) arthrodesis/intercarpal fusion, and (2) ligament reconstruction. Ligament reconstruction, although appearing as the most logical approach, has had limited success. Arthrodesis is more successful, but may result in a significantly limited range-of-motion that can profoundly affect performance in some sports. It may, however, be the only option in patients with chronic pain failing conservative management.

It is important to consider the possible restrictions to play if the athlete is fitted with a splint or a cast. Some sports do not allow participation of athletes wearing these devices. The primary concern is injury to other players by the protective device. Rigid devices made of fiberglass, plastics, or thermoplastics are banned from most high school, college, and professional sports. The GE RTV-11 is a playing cast made of silicone and is accepted by the NCAA, NAIA, and the National Federation of State High School Associations (NPSHSA).⁸ Thermoplastic splints are allowed in some sports if a silicone rubber overwrap is used. The padding must be no less than one-half inch thick and be constructed of high-density, closed-cell polyurethane or similar material.

Soft tissue injuries are usually due to overuse or misuse and require an evaluation of the inciting activity. Sometimes it is possible to modify the activity and prevent future occurrence. In the acute phase of management, it is important to decrease the inflammatory reaction and prevent exacerbation by imposing a period of rest, coupled with ice and a possible course of myofascial release to the related muscles. Many athletes will be noncompliant with rest recommendations requiring a period of imposed immobilization. Using a soft-splint that is bivalved, the athlete is able to take off the device for small periods of time. If the patient is still noncompliant, a hard cast with a thumb spica may be required.

Repetitive dorsiflexion impact injuries such as handstands or vaulting may be addressed with a dorsal block. This involves taping or strapping a felt or similar soft obstruction on the extensor side of the

wrist. This will prevent forced hyperextension, yet provide a soft end feel. This approach is often used in gymnastics during acute exacerbations.

The wrist is a difficult complex of joints to stabilize muscularly. The individual joint restraint provided by the various intercarpal ligaments is not easy to duplicate given the inherent design of the muscle tendon architecture around the wrist. Wrist tendons mainly insert onto metacarpals and can only indirectly provide support due to the physical overlap across the wrist joints.

In considering a generalized wrist strengthening program, it is important to consider that the wrist flexors are inherently stronger than the wrist extensors. This is primarily a protective design strategy; most survival activities and functional activities require flexion of the wrist. One such survival reflex is grabbing onto a support to prevent falling. There are few functional activities that require active extension of the wrist. Due to this natural imbalance, it is not unusual to overstrain the weaker extensor muscles. One strategy for prevention is to focus on extensor exercises. Like all exercises, overuse is possible and the athlete must be reminded that the wrist extensors require high frequency low repetition exercises.

Prevention is needed when falls on an out-stretched hand are likely, such as with skateboarding and roller blading. Wrist guards are a requisite.

References

1. Leonard RN. Fractures and dislocations of the carpus. In: Brown BG, Jupiter JB, Levine AM et al., eds. *Skeletal Trauma*. Philadelphia, PA: WB Saunders, 1992.
2. Stechers WR. Roentgenography of the carpal navicular bone. *AJR*. 1937;37: 704-705.
3. Jorgenson TM, Anderson J, Thammesen P et al. Scanning and radiology of the carpal scaphoid bone. *Acta Orthop Scand*. 1979; 50: 663-665.
4. Dobyns JH, Linscheid RL, Chao EYS, et al. Traumatic instability of the wrist. American Academy of Orthopaedic Surgeon Instructional Course Lectures 1975; 24: 182.
5. Norman A, Nelson J, Gren S. Fracture of the hook of the hamate. Radiographic signs. *Radiology*. 1985; 154: 49-53.
6. Nisenfield FG, Neviasser RJ. Fracture of the hook of the hamate. A diagnosis easily missed. *J Trauma*. 1974; 14: 612-616.
7. Polivy KD, Millender LH, Newberg T, et al. Fractures of the hook of the hamate: a failure of clinical diagnosis. *J Hand Surg (Am)*. 1985; 10: 101-104.
8. Sailer SM, Lewis SB. Rehabilitation and splinting of common upper extremity injuries in athletes. *Clin Sports Med*. 1995; 14: 411-446.

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MARCH 1997