Chapter 1

Hand and wrist emergencies

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Distal radius and ulnar injuries

PEARL: Fractures of the distal radius and ulna are the most common type of fractures in patients younger than 75 years.

PEARL: Distal radius and ulnar injuries are often associated with median and ulnar neuropathies.

Distal radius fracture

Key facts

- A ***Colles fracture*** (Figures 1.1 and 1.2): A transverse fracture of the distal radial metaphysis with dorsal displacement and angulation, often caused by a fall on an outstretched hand
- A ***reverse Colles*** or ***Smith fracture*** (Figure 1.3): A transverse fracture of the metaphysis of the distal radius, with associated volar displacement and volar angulation. The mechanism of injury is often a fall on to the dorsum of the hand with the wrist in flexion
- ***Barton fracture*** (Figure 1.4): A distal radius fracture with dislocation of the radiocarpal joint
  - A volar Barton fracture occurs when the wrist is volarly flexed, and affects the volar rim of the radius.
  - A dorsal Barton fracture occurs with dorsal flexion and affects the dorsal rim of the radius
- ***Hutchinson fracture*** (Figure 1.5): An intra-articular transverse fracture of the radial metaphysis with extension through the radial styloid, often caused by a direct blow or a fall on the radial side of the wrist
  - Also termed a Chauffer's fracture
- Clinical presentation: distal radius fracture patterns usually present with pain, swelling, and deformity of the wrist
- On physical examination, Colles fractures have a dinner-fork deformity caused by the dorsal displacement and angulation of the radius
- Smith fractures often have fullness on the volar aspect of the wrist
- Median nerve injury can occur with Colles and Smith fractures and a careful neurovascular examination both on initial presentation and following treatment is required

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Figure 1.1 Colles fracture. Note the dorsal angulation of the distal radius as shown in Figure 1.2. (Image courtesy of Carl Germann, MD.)

Diagnostic testing

- For Colles and Smith fracture patterns, radiographs of the wrist will demonstrate the fracture through the radial metaphysis. The lateral radiograph is the best view to determine the degree of dorsal or volar displacement and angulation
- The lateral radiograph is the best view for revealing an intra-articular fracture of the radius and any associated carpal displacement in Barton fractures. A posteroanterior (PA) radiograph often shows a comminuted fracture of the distal radius
- PA radiographs of the wrist are best to see a Hutchinson fracture

Treatment

- Colles fractures should undergo closed reduction. This can be facilitated by the use of a hematoma block and finger traps. After successful reduction, patients should be immobilized in a **long-arm splint** in neutral position or pronation with orthopedic follow-up in 7 to 10 days. Emergent orthopedic consultation is necessary if initial attempts at closed reduction are unsuccessful, if there is neurovascular compromise, or if there is an open fracture

Figure 1.2

- Smith fracture should undergo closed reduction. Following reduction, patients should be placed in a **long-arm splint** in supination. Emergent orthopedic/hand-specialist consultation is recommended for these fractures because they are more likely to be unstable and urgent surgical management is more often necessary
- Barton fractures require emergency orthopedic/hand-specialist consultation for early operative management
- Non-displaced Hutchinson fractures can be managed with a **short-arm splint** and routine orthopedic/hand-specialist follow-up. Displaced fractures require reduction and immobilization. Accurate anatomic alignment following reduction is essential because multiple ligaments of the wrist attach to the radial styloid process and inappropriate alignment can cause future complications

Prognosis

- Complications include:
  - Malunion
  - Radioulnar and radiocarpal instability
  - Arthritis

Figure 1.3 Smith fracture. The hand and wrist is volarly displaced with respect to the forearm. (Image courtesy of Carl Germann, MD.)

Figure 1.4 Volar Barton fracture. A fracture of the volar margin of the carpal surface of the radius. (Image courtesy of Carl Germann, MD.)

Figure 1.5 Hutchinson fracture: An intra-articular fracture through the radial styloid process. (Image courtesy of Carl Germann, MD.)

  - Chronic pain
  - Non-union
- However, good to excellent results are often achieved in most patients

Distal radioulnar joint disruption (DRUJ)

Key facts

- Disruption of the distal radioulnar joint (DRUJ) may be seen as an isolated injury, or more commonly, in association with distal radius fractures
  - Initially unrecognized in up to 50% of cases
- Dorsal dislocations are the most common and are typically the result of a fall on to an outstretched arm with a rotational pronation force to the impact
- Volar dislocations are typically the result of a fall on to an outstretched arm with a rotational supination force to the impact

Clinical presentation

- Often overshadowed by more apparent injuries
- On physical examination a dorsal dislocation reveals excessive prominence of the ulnar head and lack of forearm rotation secondary to pain when the wrist is supinated
- Volar dislocations will have a loss of the typical dorsal prominence of the ulnar head and lack of forearm rotation secondary to pain when the wrist is pronated

Diagnostic testing

- **PEARL: In DRUJ injuries, the lateral radiograph usually demonstrates volar or dorsal displacement of the ulna that normally overlap the radius.** Standard radiographs of a DRUJ dislocation demonstrate overlap of the distal ulna with the distal radius on the PA view. On the lateral view the ulnar head will be displaced:
  - Dorsally for dorsal dislocations
  - Volarly with volar dislocations
- Radiographic signs of DRUJ instability are:
  - Ulnar styloid fracture involving the base with more than 2 mm displacement
  - Irreducible dislocation of the DRUJ
  - Fractures involving the sigmoid notch of the radius
  - Wide displacement of the DRUJ
  - Radial shortening

Treatment

- If DRUJ instability is suspected, based on clinical examination or radiographic studies, an emergent orthopedic or hand-specialist consultation should be obtained for reduction and immobilization

Prognosis

- DRUJ injuries have a high recurrence rate and may require reconstructive surgery

Carpal bone fractures and dislocations

Scaphoid fracture

PEARL: The scaphoid is the most commonly fractured carpal bone yet one of the most commonly missed wrist injuries. A thorough history and physical examination, coupled with a high index of suspicion, are necessary to make the diagnosis.

Key facts

- Scaphoid fractures account for 60–70% of all diagnosed carpal injuries
- Radiographic findings (Figure 1.6) can be subtle or absent, rendering the diagnosis difficult to make
- Accurate early diagnosis of scaphoid fractures is critical, as a missed or delayed diagnosis can result in long-term pain, loss of mobility, and decreased function
- The scaphoid has a high rate of non-union
- Avascular necrosis of the scaphoid is because its blood supply arises distally from small branches of the radial artery and the palmar and superficial arteries. The proximal portion of the scaphoid is completely dependent on this distal blood supply, thus it is at risk of avascular necrosis following fracture
- In general, the more proximal, oblique, or displaced the fracture, the greater the risk of interrupting the blood supply

Figure 1.6 Scaphoid fracture: An acute non-displaced fracture is shown in anteroposterior view. (Image courtesy of Carl Germann, MD.)

Clinical presentation

- Snuff box tenderness is classically cited as the most common finding, although the sensitivity of this test is disputed
- Many authors feel a better test for scaphoid injury is axial compression of the thumb along its longitudinal axis
- The examining physician (EP) should remain vigilant for associated injuries that can be found on physical examination
  - Common associated injuries include fractures of the distal radius, lunate, or radial head at the elbow
  - Median nerve injury has also been described in association with scaphoid fractures

Diagnostic testing

PEARL: Even with appropriate films, fractures of the scaphoid can be subtle and difficult to visualize. Conservative estimates suggest that 10–20% of these fractures will not be visible on any view in the acute setting.

- A typical wrist series includes a PA and lateral radiograph of the wrist
- In cases where there is high clinical suspicion, a scaphoid view of the wrist can also be obtained

  - This reduces the foreshortening of the scaphoid that occurs on a normal PA view, and displays the entire length of the scaphoid
  - However, even with excellent radiographic technique, a fracture may not be visualized
- Magnetic resonance imaging (MRI) and computed tomography (CT) have much better sensitivity and specificity in detecting scaphoid fractures. However, these are not routinely done in the ED as it does not affect the initial treatment, which consists of immobilization and orthopedic follow-up for clinically suspected scaphoid injury

Treatment

- Reduce swelling in the extremity (i.e., elevate, apply ice)
- Provide adequate pain control
- Remove any restrictive clothing, splints, casts, jewelry, etc
- Confirmed or suspected scaphoid fractures with normal radiographs require a **thumb spica splint**

PEARL: Confirmed or suspected scaphoid fractures require that the patient be placed in a thumb spica splint.

Prognosis

- The most common complication of scaphoid fractures is non-union, which has an overall occurrence rate of 8%–10%
- The rate of non-union varies with the actual fracture site
  - Non-union complicates up to 20%–30% of proximal- third fractures, and 10% –20% of middle-third fractures
  - Non-union of distal-third fractures is relatively rare
- Besides non-union, patients are also at risk to develop avascular necrosis (AVN) of the scaphoid, which occurs in approximately 10% of proximal pole fractures, and 5% of middle-third fractures

Lunate fracture

Key facts

- Lunate fractures account for 3.9% of all carpal bone fractures
- Isolated lunate fractures are uncommon except in the case of Kienböck's disease, also known as idiopathic avascular necrosis of the lunate
- Associated injuries of the radius, carpal bones, or metacarpals occur 50% of the time

Clinical presentation

- The typical mechanism of injury for a lunate fracture is a fall on to an outstretched hand
- Patients with lunate fractures will present with pain over the dorsum of the wrist that is exacerbated by palpation of the dorsal aspect of the lunate
- Axial loading of the third metacarpal can also accentuate the pain

Diagnostic testing

- Standard wrist radiographs often fail to demonstrate lunate fractures because visualization of the lunate is often obscured by superimposed bones
- CT has been found to be more sensitive than plain radiography at identifying fractures of the lunate

Treatment

- Early identification and management of these fractures is essential to prevent AVN, carpal instability, and non-union
- Patients with suspected or diagnosed lunate fractures should be immobilized in a thumb spica splint with the hand and thumb in neutral position
- Lunate fractures require a hand-specialist follow-up in 1 to 2 weeks

Prognosis

- Lunate fractures are at risk of avascular necrosis leading to:
  - Osteoarthritis
  - Chronic pain
  - Decreased grip strength

Triquetral fracture

Key facts

- Third most common carpal bone fracture following scaphoid and lunate fractures
- A fall can lead to impingement of the hamate or ulnar styloid process on to the triquetrum

Clinical presentation

- Patients often present following a direct blow to the wrist or a fall on to an outstretched hand
- Localized tenderness should be present over the dorsum of the wrist distal to the ulnar styloid

Diagnostic testing

- Lateral wrist radiographs may show a dorsal chip fracture of the triquetrum
- A pronated lateral view often projects the dorsal triquetrum away from other carpal bones
- Triquetral body fractures are best visualized on anteroposterior (Figure 1.7) and oblique radiographs

Treatment

- Immobilization of the wrist with a **short-arm splint** and prompt orthopedic follow-up is recommended
- Displaced fractures often require internal fixation

Figure 1.7 Triquetral fracture: Anteroposterior radiograph of a subtle triquetral fracture. (Image courtesy of Timothy Sweeney, MD.)

Prognosis

- The deep branch of the ulnar nerve lies in close proximity to the triquetrum and may cause motor impairment
- Non-union, malunion may occur

Pisiform fracture

Key facts

- The pisiform is rarely fractured and accounts for only 1.3% of all carpal bone fractures
- Pisiform fractures are most often caused by a direct blow or fall on to an outstretched hand
- Less commonly the pisiform can be avulsed by the flexor carpi ulnaris during forced wrist hyperflexion or from the strain of lifting a heavy object

Clinical presentation

- Patients with fractures of the pisiform complain of ulnar-sided wrist pain that is accentuated by resisted wrist flexion
- Physical examination demonstrates pain over the pisiform
- Occasionally, ulnar nerve palsy may result from compression by a fragment of the pisiform which serves as the ulnar wall of the Guyon's canal, which the ulnar nerve transverses