The Emergent Evaluation and Treatment of Hand Injuries

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KEYWORDS

• Hand injuries • Metacarpal fracture • Phalangeal fracture • Tendon injury
• Emergency physician • Orthopedic injury

KEY POINTS

- A detailed history and physical examination is imperative to correct diagnosis and management of small but important structures of the hand.
- Plain film radiographs remain the standard of care for identifying bony injuries, but ultrasound shows promise in identification of both bony and soft tissue injuries, and can guide reduction.
- An orderly approach to assessment and description of injuries using the NO LOADS mnemonic helps to guide the examiner to appropriate initial and definitive treatment of hand injuries.

BACKGROUND

Hand fractures are among the most common skeletal injuries. Injuries to the hand can be challenging to diagnose and manage owing to the complex anatomy and highly specialized function of this area of the body. Even seemingly minor injuries can inhibit the ability to perform activities of daily living, and lead to devastating infections, chronic pain, and dysfunction. A detailed knowledge of the anatomy of, and common injuries to, bone and soft tissues of the hand is essential to proper diagnosis and management, and thus avoidance of debilitating complications.

EPIDEMIOLOGY

- Fractures of the hand account for 19% to 28% of all fractures.[1]
- Finger fractures are the most common sports-related fractures in adolescents and adults.[2]

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- The small finger ray is the most commonly fractured digit.
- The distal phalanx is the most frequently fractured bone of the hand.[1]
- Dorsal dislocation of the proximal interphalangeal (PIP) joint is the most frequent dislocation in the hand.
- The most common ligament injury in the thumb, and second most common skiing injury overall, is disruption of the ulnar collateral ligament (Skier's thumb).
- An extensor tendon injury overlying the distal interphalangeal joint (Mallet finger) is the most common tendon injury.[3]

HAND ANATOMY

The hand is composed of 5 metacarpals and 14 phalanges. These bones span 4 joints: the carpometacarpal (CMC) joint, the metacarpophalangeal (MCP) joint, the PIP joint, and the distal interphalangeal (DIP) joint. Refer to each digit by name (thumb, index, long, ring, and small) rather than number.

Digital Metacarpals

- The more proximal bones of the hand are the metacarpals. The metacarpals articulate proximally with the distal row of carpal bones, forming the CMC joint.
- The metacarpals form a volar concave arc along their length, with flares at the bases and the necks. The metacarpal head articulates with the base of the proximal phalanx as a condylar joint that permits flexion, extension, and radial and ulnar motion.
- The accepted convention for naming of the fingers is as follows: thumb, index, middle, ring, little. The fingers should be described as such to avoid confusion with numbering.

Phalanges

- Distal to the metacarpals are 3 rows of phalanges, with the exception of the thumb, which has only 2 phalanges.

Soft Tissue Structures

The median, ulnar, and radial nerves and their branches provide motor and sensory innervation to the hand. Although a detailed review of innervation of the hand is important, it is beyond the scope of this article. In brief, the median nerve innervates the muscles involved in fine precision and pinch function of the hand. Its anterior interosseous branch innervates intrinsic muscles of the hand.

The median nerve gives off a palmar cutaneous branch, which provides sensation to the thenar eminence, and a recurrent motor branch, which innervates the thenar muscles. The ulnar nerve innervates the muscles involved in hand grasp. Its palmar cutaneous branch provides sensation to the hypothenar eminence. Its dorsal branch provides sensation to the ulnar portion of the dorsum of the hand. Its superficial branch forms the digital nerves to the small and ring fingers, and its deep motor branch innervates the hypothenar muscles. The radial nerve innervates the wrist extensors (via the deep posterior interosseous branch). The superficial branch provides sensation at the radial aspect of the dorsum of the hand, thumb, index, long, and radial half of the ring fingers.

The flexor tendons of the hand course through sheaths on the volar (palmar) aspect of the fingers. The extensor tendons attach by a tendinous slip to the proximal phalanx. The central tendon, or slip, proceeds dorsally to attach to the base of the middle phalanx, where tension can extend the PIP joint. The lateral bands proceed on either