Hand Fractures: Indications, the Tried and True and New Innovations

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Continuing Medical Education

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Disclosures for this Article

Editors

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Learning Objectives

Upon completion of this CME activity, the learner should achieve an understanding of:

- Selection of operative and non-operative interventions
- Selection of optimum fracture fixation device
- The role of new innovations, such as dynamic external fixation, intramedullary phalangeal screws, hemi-hamate arthroplasty, and locking plates
- Where best evidence may still be lacking

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Hand fractures are the second most common fracture of the upper extremity, and management of patients with these injuries is common for most hand surgery practices. In this article, we outline the principles of management of these injuries with a special focus on those that are common or complex. We also highlight recent innovations in the context of these injuries. From this cross-section of contemporary evidence on phalangeal and metacarpal fracture treatment, we have noted a trend toward minimally invasive surgery with immediate postoperative mobilization, the use of wide-awake anesthesia, as well as sustained

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investigation and innovation in the biomechanics and treatment of proximal interphalangeal joint fracture dislocations. *(J Hand Surg Am. 2016;41(6):712–722. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)*

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HAND FRACTURES ARE THE SECOND most common fracture in the upper extremity after the distal radius, with an incidence of 12.5 and 8.4 per 10,000 person-years for the phalanges and metacarpals, respectively.[1] These fractures are treated by a range of physicians who achieve success by employing a broad spectrum of management strategies. These options run the gamut from immediate active range of motion (ROM) for the most stable fractures to complex internal stabilization using implants.[2] In this article, we outline the principles of management of these injuries with a special focus on those that are common or complex. We also highlight recent innovations in the context of these injuries.

PRINCIPLES AND INDICATIONS

The aims of treatment of hand fractures should be to restore prehension and avoid complications such as stiffness and deformity. Prevention of stiffness requires early finger motion to limit tendon adhesions and joint contractures. Avoiding deformity mandates adequate reduction and immobilization of the fracture until clinical stability is achieved. Unfortunately, whereas stiffness is prevented by motion, excessive early motion before healing may lead to fracture malunion or nonunion. Management of these distinctly conflicting goals is one of the basic tenets of fracture treatment.

Successful treatment with orthoses is possible provided the fracture is clinically stable after reduction. Although the definition of "clinical stability" is variable, we use the following as a guide: A fracture is clinically stable if a simple orthosis may hold it reduced while 50% of active ROM takes place at the adjacent joints without fracture displacement or intense pain. However, if the fracture configuration (eg, comminuted or spiral) does not allow this, the fracture should be considered clinically unstable and operative intervention should be considered when rotational deformity, excessive angulation, or excessive shortening is present. A caveat to this would be when the position of anticipated malunion is acceptable to the patient, such as in some fifth metacarpal neck fractures.[2,a,b]

Another frequently quoted indication for surgical intervention is the presence of multiple fractures (Fig. 1) resulting from the loss of stability that might otherwise be provided by uninjured adjacent bones.[3] Furthermore, good bone reduction as well as effective placement of an orthosis is challenging in the face of multiple fractures. Although there is little published evidence owing to the uncommon nature and heterogeneity of this pattern of injury, most authors still advocate surgical fixation, although the threshold at which to choose this over nonsurgical treatment is not clear.[3]

In addition to stiffness and deformity, neglected intra-articular hand fractures that heal with an articular stepoff may cause a bone block to joint motion and predispose the affected joint to symptomatic posttraumatic osteoarthritis (PTOA). A good example of where surgery is indicated in these fractures is the dorsal-fracture dislocation (DFD) of the proximal interphalangeal (PIP) joint, where hinging of the fracture site on the head of the proximal phalanx will limit PIP joint motion and lead to PIPJ PTOA.[4,c] Open fractures of the hand, especially of the distal phalanx, are common. They are reliably treated with irrigation, surgical debridement, and prophylactic antibiotics to prevent osteomyelitis. The decision to stabilize open fractures internally is determined based on the indications for closed fractures in conjunction with the cleanliness of the wound after debridement (Fig. 2).

Consider surgery and fracture fixation for:

1. clinically unstable or irreducible fractures in which, if left untreated, the predicted malunion would be unacceptable to the patient
2. multiple displaced hand fractures
3. displaced intra-articular fractures that will heal with an articular stepoff and cause a bone block to joint motion or the future development of posttraumatic osteoarthritis
4. open fractures that require excisional debridement and irrigation to prevent osteomyelitis

EXTRA-ARTICULAR FRACTURES

Transverse fractures

Transverse fractures of the phalanges and metacarpals are typically stabilized with closed reduction and percutaneous insertion of Kirschner wires[d] or open reduction internal fixation (ORIF) with a plate and screws. In the hand, and especially in the fingers where the extensor tendons are in close approximation to the dorsal surface of the phalanges, minimal