Selection of Appropriate Treatment Options for Hand Fractures

Douglas M. Sammer, MD*, Tarik Husain, MD,
Rey Ramirez, MD

KEYWORDS

• Hand fractures • Metacarpal fractures • Phalangeal fractures • Principles

KEY POINTS

- The scientific evidence available to guide hand fracture management is poor, so adherence to simple principles can guide decision-making.
- Although anatomic reduction of articular fractures is important, with extra-articular fractures the goal is to restore anatomic relationships.
- Stable fixation should be achieved with minimal soft-tissue injury, and motion should be instituted as early as possible.
- The ultimate goal is to achieve good hand function: treat the patient, not the x-ray.

EVIDENCE-BASED MEDICINE FOR HAND FRACTURES

The decision of how to manage a hand fracture is often made without the support of scientific evidence, and is usually based primarily on the hand surgeon's training and experience. This is in spite of a rapidly expanding body of knowledge. For example, a recent search of PubMed using the term "metacarpal fracture" resulted in 1392 hits, and 66 articles on the topic were published last year alone. When faced with a clinical problem, the individual hand surgeon cannot coherently synthesize all of the relevant information to guide his or her treatment. The sheer volume of information has become an impediment rather than an aid to evidence-based decision making.

Another problem is the poor quality of evidence in the hand surgery literature. The vast majority of studies that address the management of hand fractures are retrospective case series, often without a control cohort.[1,2] There is a paucity of high-quality randomized controlled trials, and those that exist usually compare 2 nonoperative treatments. A recent editorial in the *Journal of Hand Surgery* underlines the need for better evidence in the form of randomized controlled trials that will increase the quality of care provided by the hand surgeon.[3] Unfortunately, there are many hurdles to conducting randomized trials that compare surgical treatment options for hand fractures, not the least of which are the wide spectrum of fracture variations that are seen in the hand, and the difficulty in recruiting patients to undergo randomization.

Due to an increased recognition of these problems, a number of hand surgery–related journals have instituted practices that make it easier to evaluate the quality of evidence, and that help to summarize the existing evidence related to specific topics. Journals have recently begun to display the level of evidence for every article published (**Table 1**),[4,5] and regularly feature articles that focus on applying evidence-based medicine to common hand problems. These and other efforts have greatly helped make the available evidence of more practical use to the hand surgeon.

Department of Plastic Surgery, University of Texas Southwestern Medical School, 1801 Inwood Road, Dallas, TX 75390, USA
* Corresponding author.
E-mail address: Douglas.Sammer@UTSouthwestern.edu

Hand Clin 29 (2013) 501–505
http://dx.doi.org/10.1016/j.hcl.2013.08.005

Table 1
Levels of evidence for therapeutic studies

Level of Evidence	Therapeutic Studies
I	High-quality randomized controlled trial
II	Prospective comparative, or lesser quality randomized controlled trial
III	Case-control, retrospective comparative
IV	Case series
V	Expert opinion

PRINCIPLES OF HAND FRACTURE MANAGEMENT

Because high-quality scientific evidence cannot be applied to the treatment of most hand fractures, it is critical to have an understanding of the core principles of hand fracture management. These principles should always be kept in mind when treating hand fractures, and should be relied on particularly when scientific evidence is limited or contradictory. These principles include the following:

- Anatomic reduction of articular fractures
- Restoration of anatomic relationships in extra-articular fractures
- Stable fixation that minimizes soft tissue injury
- Institution of early motion

Anatomic Reduction of Articular Fractures

Articular fractures should be reduced to anatomic or near-anatomic alignment to prevent joint pain, loss of motion, and accelerated degenerative changes. Because of the precise reduction required, and because of the deforming forces that ligaments and tendons exert on articular fragments, open reduction with percutaneous or internal fixation is often required. Although it is not known exactly how much articular incongruity can be tolerated in the small joints of the hand, many investigators recommend correction of step-offs of 1 mm or larger. This is supported by the findings of Seno and colleagues,[6] in which the outcomes of 140 intra-articular middle phalanx base fractures were reported. In patients who underwent surgical treatment, the presence of a residual articular step-off of 1 mm or more was associated with poor clinical outcomes. The amount of articular involvement should be considered as well. A displaced fragment that involves 5% of an articular surface is likely to be less problematic than a fragment that involves 45% of the articular surface. Again, there is little evidence to support a specific threshold for surgical intervention based on the amount of the articular surface involved. Recommendations vary by investigator and by the specific joint or fracture, but displaced articular fractures in the hand that involve more than 15% to 25% of the articular surface benefit from articular reduction.[7,8] Finally, articular fractures that result in persistent subluxation after reduction usually require operative management to maintain a congruous and concentric joint, if not an anatomic articular surface.

Restoration of Anatomic Relationships in Extra-Articular Fractures

For much of the last half of the twentieth century there was an emphasis on achieving anatomic fracture reduction, including in extra-articular fractures. Over the past 2 decades, however, there has been an increased recognition that, for extra-articular fractures in the hand, the restoration of critical anatomic relationships is more important than the anatomic reduction of fracture fragments. This means that the goal of reduction for extra-articular fractures should be the correction of clinically significant shortening, angulation, and rotation so as to avoid problems such as tendon imbalance, weakness, or scissoring. It is not necessary to achieve anatomic fracture reduction to have an excellent clinical outcome.

The amount of shortening, angulation, and rotation that can be tolerated varies by location and fracture pattern. In general, angulation within the primary plane of motion (flexion/extension) is more readily tolerated than angulation in the coronal plane. In the proximal phalanges, biomechanical and clinical studies suggest that a clinically significant proximal interphalangeal extension lag occurs, with more than 20 to 25° of apex volar angulation of the proximal phalanx.[9,10] More than 10° of angulation in the coronal plane, however, may interfere with function. In metacarpal fractures, the degree of angulation that can be tolerated varies depending on the metacarpal and on the location of the fracture within the metacarpal. Because there is very little compensatory motion at the index and long finger carpometacarpal (CMC) joints, index and long finger metacarpal neck fractures only tolerate up to 10° of apex dorsal angulation respectively.[11] In the ring metacarpal neck, 20° to 30° of apex dorsal angulation is acceptable. And because of the highly mobile small finger CMC joint, excellent hand function is observed in small finger metacarpal neck fractures that heal with up to 70° of apex dorsal angulation.[12]