Surgical Treatment, Hardware Removal, and the Wide-Awake Approach for Metacarpal Fractures

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KEYWORDS

• Metacarpal fracture • Internal fixation • Hardware removal • Wide-awake surgery

KEY POINTS

- Metacarpal fractures are mostly treated with cast or plaster splint immobilization for 5 to 6 weeks after closed reduction. If the reduction is unstable, percutaneous insertion of single (or double) intramedullary Kirschner wires is an easy and minimally invasive solution for most of these cases.
- Only large, oblique fractures may have to be fixed with 1 or 2 screws or a plate. Multiple fractures in the shaft or oblique fractures in multiple metacarpals may need plate fixation as well. Indications for plating metacarpal fractures are very limited.
- After internal fixation, the authors advocate early intermittent active motion. The patient actively moves the metacarpophalangeal joint fully, or over a limited range, with a protective plaster splint or with finger buddy taping. The Kirschner wire is removed after bone healing (ie, 4–6 weeks after surgery). Screws and plates may not be removed, but if removal is necessary, it should be done 6 months after surgery.
- The wide-awake approach is applicable to internal fixation and hardware removal in fractured metacarpals.

The authors' hand surgery unit handles 150 to 200 metacarpal fractures each year. Review of upper extremity fractures shows that 163 metacarpal fractures were treated by the authors in 2012. These metacarpal fractures accounted for 7.8% of the all upper extremity fractures or 21.6% of all fractures in the hand (including fractures of carpal bones) (**Fig. 1**). In the literature, fractures of the metacarpals are reported to account for 18% of fractures below the elbow.[1] The metacarpals of the ring and small fingers are most often involved and fractures occur at the shaft most frequently (**Table 1**). Cause of the fractures varies greatly. The authors see that most fractures are caused by punching something hard, by machines or tools, or during fighting or sports activities. Pain is the most common complaint. Swelling and limitation in hand motion are common. Plain radiographs are usually sufficient to confirm the diagnosis and assess displacement of the fracture. The radiographs should routinely include posteroanterior, lateral, and oblique views of the affected hand.

Brewerton view dorsally places the hand down and shoots the film at an ulnar oblique angle, allowing better visualization of the metacarpal bases. In the *Robert view*, the hand is hyperpronated so that the dorsum of the thumb lies on the radiograph plate; this gives a true anteroposterior view of the thumb. In the *Bett view*, the hand is pronated approximately 20° to 30° and the imaging beam is directed obliquely at 15° in a distal

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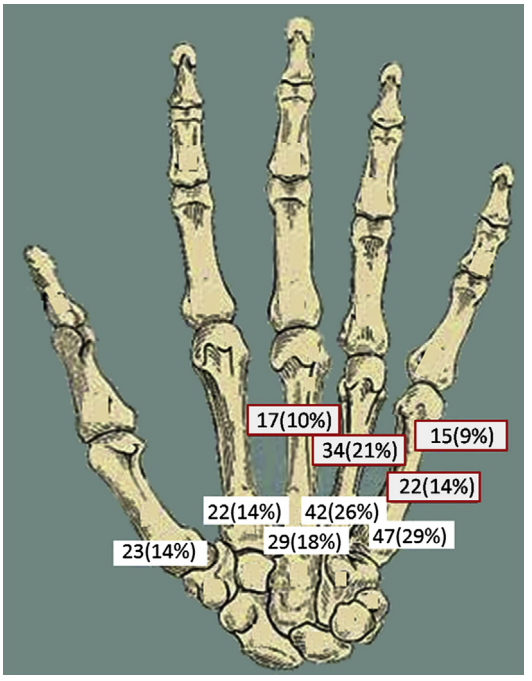

Fig. 1. Incidences of metacarpal fractures in different digits in the hand are shown at the base of each digit. The data shown within the deep red outlines are at the sites with the highest occurrence (all data are based on the metacarpal fractures treated in the authors' unit in 2012).

to proximal direction, centered over the trapeziometacarpal joint. In this view, the thumb carpometacarpal (CMC) joint is well visualized as well as the articulations of the trapezium with the trapezoid, scaphoid, and index metacarpal. Roberts and Betts views, to evaluate the thumb, may help the diagnosis of more subtle injuries.

It is not usual to use advanced imaging, such as computed tomography (CT), to make a diagnosis. CT scan or 3-dimensional (3D) CT reconstructed images, which permit multiplanar analysis of fractures, however, are useful in fractures involving the CMC joint. In the authors' experience, CT scans and their 3D reconstructions are not necessary unless surgeons want to know details of the CMC joint involvement, displacement, intra-articular fracture, or fracture-dislocation. Because of the complex nature of the thumb CMC joint fracture, CT scans may provide better understanding for articular involvement. Magnetic resonance imaging is not indicated except with avulsion fractures of the thumb metacarpophalangeal (MCP) collateral ligaments.

Clinical examination begins with an assessment of alignment, skin condition, and neurovascular status of the hand. Trauma may cause open metacarpal fractures and complex soft tissue defects. These cases require great attention in assessing the circulatory status. For the hand with open injury involving an articular surface, thorough irrigation is necessary and special attention should be directed to restoring joint surface integrity. Cases with severe trauma are often accompanied by segmental bone loss or loss of a part of the articular surface—especially at the MCP joint.[2]

DECISIONS ON TREATMENT OPTIONS

Nonoperative Treatment with Casting or Splinting

When deciding among treatment options, it must be understood that most metacarpal fractures are treated successfully with nonoperative functional cast or splint immobilization. A cast is used for stable fractures and extends from the distal forearm to the proximal phalanges. It allows for moderate MCP joint motion and free motion at the proximal interphalangeal (PIP) joints. The MCP joint is kept in 50° to 70° of flexion (intrinsic

Table 1
Total number of metacarpal fractures that the authors treated in 2012 and their locations[a]

Fracture Locations	Thumb	Index	Middle	Ring	Little	Total
Head	2 (1.2%)	2 (1.2%)	2 (1.2%)	1 (0.6%)	2 (1.2%)	9 (5.5%)
Neck	1 (0.6%)	5 (3.1%)	6 (3.7%)	4 (2.5%)	15 (9.2%)[b]	31 (19.0%)
Shaft	12 (7.4%)	11 (6.7%)	17 (10.4%)[b]	34 (20.9%)[b]	22 (13.5%)[b]	96 (58.9%)
Base	8 (4.9%)	4 (2.5%)	4 (2.5%)	3 (1.8%)	8 (4.9%)	27 (16.6%)
CMC joint	7 (4.3%)	2 (1.2%)	2 (1.2%)	2 (1.2%)	5 (3.1%)	18 (11.0%)
Total	23 (14.1%)	22 (13.5%)	29 (17.8%)	42 (25.8%)	47 (28.8%)	163

[a] In the fractures that the team treated in the year 2012, upper extremity fractures were 1487 (7.8% were metacarpal fractures). Hand fractures were 537, among which 163 (21.6%) were metacarpal fractures and 374 (78.4%) were phalangeal fractures. Total patients with metacarpal fractures were 116. Below-elbow fractures were 940. The 163 metacarpal fractures accounted for17.3% of all below-elbow fractures.
[b] The sites with the highest incidence of the fracture.