

Case Report

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Metacarpal Fractures: Current Concepts of Management



*Elalfy M Mohamed

Orthopedic Surgeon, Mansoura University Hospital, Egypt

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*Corresponding author: Elalfy M Mohamed, Faculty of Medicine, Orthopaedic surgery resident at Mansoura University Hospitals, Egypt, Email: elalfy2299@gmail.com

Introduction

Epidemiology: Metacarpal fractures comprise between 18–44 % of all hand fractures. Non-thumb metacarpals account for around 88 % of all metacarpal fractures, with the fifth finger most commonly involved [1-3] (Figure 1).



Figure 1: Non-thumb metacarpals account for around 88 % of all metacarpal fractures, with the fifth finger most commonly involved.

Mechanism of Injury: Most metacarpal fractures occur in the active and working population, particularly adolescents and young adults and usually result from a direct blow, crush, or missile injury. Trauma to the hand is common, frequently resulting in metacarpal, fractures and dislocations head [3,4].

Symptoms and Examination Findings: Prominent swelling, decreased range of motion, and tenderness is found at the metacarpophalangeal (MCP) joint. Axial load to the MCP joint worsens pain (Figure 2).



Figure 2: Axial load to the MCP joint.

Treatment Options

Appropriate treatment includes adequate assessment, physical examination, and directed imaging. Such an approach should lead to a rational plan that focuses on the rehabilitation of all damaged components, including osseous, articular, and soft tissue structures [5,6]. Management of non-thumb metacarpal shaft fracture is depending on the stability and personality of the fracture. Undisplaced fracture with any fracture configuration can be managed by conservative method with a slab or a splint immobilizing the wrist in extension and MP joint in flexion greater than 70° (Clam digger slab/cast), allowing early IP mobilization [7-11].

Indications for Operative Treatment Include the Following

- i. Failure to achieve or maintain acceptable reduction using closed techniques
- ii. Open fractures.
- iii. Multiple hand fractures.
- iv. Displaced intra-articular fractures.
- v. Fractures with severe soft-tissue loss requiring a stable skeleton (Figure 3).



Figure 3: Operative method Bouquet Pinning of a small finger metacarpal neck fracture.

Many surgical options have been described to treat metacarpal shaft fractures [12-14] with no consensus on optimal technique. Options include open reduction internal fixation (with various configurations described), Kirschner (K-) wire fixation (with multiple described techniques), suture fixation, and cerclage wiring. Percutaneous pinning with Kirschner wires is an attractive option, as extensive surgical dissection soft tissue devitalisation at the fracture site can be avoided. It also limits the potential complication of extensor irritation by a dorsal plate, lessening the chance of extensor tenosynovitis, although this complication has still been reported with K-wire fixation. Described methods include the bouquet technique, ante grade and retrograde intramedullary placement, locking techniques and transverse pinning to adjacent metacarpals [13,14].

A study of bouquet pinning versus transverse pinning did not demonstrate differences in outcomes, but the authors recommended bouquet pinning with buried wires. A study utilizing transverse pinning of MC shaft fractures demonstrated improved maintenance of reduction of the fracture with two distal pins and one proximal pin over one distal and one proximal pin. A single K-wire can be used with intramedullary technique for transverse or short oblique angulated fractures while long oblique or rotationally malaligned fractures require more fixations to control the deformities [15]. Plate and screw fixation does appear to lead to good functional results [16,17] Varying plating methods can be used from non-locking to locking.

Outcomes

Outcomes are generally positive with various reporting methods, including the Disabilities of the Arm, Shoulder, and Hand (DASH) scoring system. Reported excellent or good outcomes range from 78% to 94% [18-20]. There does appear to be predictable healing of these fractures with rates as high as 90 to 100%. Osseous union typically occurs between five and eight weeks. Non-operative treatment results in predictable healing rates as well with one study showing 100% union of 54 fractures in a retrospective review of treatment with palmar wrist splints and mobilization of all fingers [21,22]. Percutaneous pinning has good outcomes with up to 100% bony union rates. One study of retrograde K-wire fixation in 105 patients with 10 month follow-up showed the same ROM as non-injured side. Plate and screw fixation leads to 78-85% acceptable to excellent function [23,24].

Complications

Despite predictable healing and excellent or good outcomes, surgical procedures can lead to complications. The most common complications include superficial infections, extensor tenosynovitis, stiffness, hardware failure, and sensory disturbances (cold intolerance as well as complex regional pain syndrome) [25-27]. Prevention of disability from hand injuries is the primary goal of treatment. Maintenance of function rather than cosmesis is of paramount concern in the management of hand injuries.

Conclusion

Metacarpal fractures of the hand are common injuries and can cause significant disability if not treated properly. Not all fractures require surgical intervention, as good outcomes have been reported with conservative care. K wire fixation as well as open reduction and internal fixation are acceptable methods to treat MC shaft fractures. Lag screws for long oblique fractures provides good fixation. Outcomes appear to be good regardless of surgical technique, with high rates of union. Surgical treatment is not without complications and these should be elucidated to patients before proceeding with any treatment option. Until foreign body reactions can be eliminated, we recommend against the use of absorbable implants at this time. Randomized prospective studies are needed to help determine appropriate indications for the surgical treatment of metacarpal shaft fractures, as well as guide best treatment options.

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