Hand Fractures: When is closed treatment OK?
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Epidemiology in USA: 2009
• Distal radius fx’s: 16/10,000
• Phalangeal fx’s: 13/10,000
• Metacarpal fx’s: 8/10,000
• Boxer’s fractures #1
  – Karl, Olson, Rosenwasser JOT 2015

Metacarpal fractures:
• Transverse:
  – angulate apex dorsally
• Spiral/oblique:
  – rotate and shorten
Biomechanics of metacarpal fractures:

- Can tolerate 5 mm of shortening without extensor lag at the MP joint or loss of power
- Cannot tolerate malrotation: 2 mm of metacarpal malrotation produces a 20 degree or 2 cm overlap at fingertip level
- Angulation better tolerated at neck level and in 4th and 5th fingers due to more mobility

Metacarpal Shaft Fractures: The Effect of Shortening on the Extensor Tendon Mechanism

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Full 10 mm. For each 2-mm increment of metacarpal shortening, an average extensor lag of 7° was produced at the MCP joint. A total of 35° of extensor lag resulted from the maximum shortening of 10 mm.

Extensor lag was linear. Seven of the 9 hands had an average of 20° of hyperextension present at the MCP joint as a baseline value (Figs. 2 and 3).
Nonoperative treatment:

- **Transverse fractures:**
  - Reduce closed and apply three point bending to hold
  - Often not reducible if widely displaced due to interposition of muscle/periosteum

This study in a cadaveric model. Both increased shortening and increased digital flexion resulted in progressively greater losses of flexion force. In this model, shortening as little as 5 mm produced statistically significant losses.
Beware rotating the 4th metacarpal fracture with an ulnar gutter splint!
Beware of “pseudorotation” of the small finger

PSEUDOROTATION OF THE LITTLE FINGER METACARPAL

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Fractures of the little finger metacarpal are common, and are often associated with significant soft-tissue swelling and the appearance of rotational misalignment when the fingers are flexed. The hypothesis is that soft-tissue swelling causes the apparent rotational deformity of the flexed little finger. The fourth intermetacarpal space of the finger in the uninjured hand was injected with saline. Following injection, all the hands showed the appearance of internal rotation of the little finger. The mean change in rotation was 17° and the maximum was 27°. There was no change in the plane of the nail plate in extension of this hand. We conclude that soft-tissue swelling can cause the appearance of internal rotation of the flexed little finger in the absence of fracture. Journal of Hand Surgery (British and European Volume, 2003) 28B: 3: 895-901

Soft-tissue swelling in the fourth intermetacarpal space can cause an appearance of supination of the flexed little finger when the metacarpal is intact. Such an appearance should be interpreted with caution in the presence of a metacarpal fracture. True rotation at a metacarpal fracture will alter the plane of the nail when the finger is extended, and this is not caused by soft-tissue swelling.
The metacarpal splint:

- Takes 3 minutes to apply
- "one step" fiberglass splint
- 3 point molding
- Works for reducible transverse and spiral or oblique fractures
Spiral and long oblique fx’s:

- Three point bending to control slight apex dorsal angulation
- No way to control length with splint or cast—and no need to as usually does not shorten >5mm due to intermetacarpal ligaments
- Allow full finger active motion to “autocorrect” rotation
Problem occurred with splint holding MP’s in flexion and spiral/oblique fracture.

Functional bracing of fractures of the second through fifth metacarpals

A simple new brace aids in the reduction and immobilization of fractures of the second, third, fourth, and fifth metacarpals. This brace incorporates an adjustable strap and pads made of radiolucent materials. It provides 3-point fixation while allowing full range of motion of the wrist and digits. It has been preferred by patients to an elastic gutter splint, and its use resulted in less residual angulation of the fracture than occurred with other methods. (J Hand Surg 1987; 12A:198-203.)

Steven F. Viegas, M.D., Allan Tencer, Ph.D., Peggy Woodrow, B.S., and C. R. Williams, M.D., Galveston, Texas
These fx’s all heal in 4-6 weeks

• X-ray healing lags behind
• Rely on clinical signs of healing to return to full use
• Spiral fx’s really lag behind
• Minor mcp head prominence loss
Travestie
In the current study we used a palmar wrist splint to
maintain the wrist joint in 20° to 30° extension, leaving
all finger joints free for immediate mobilisation. We
believe that this simple splint is suitable for spiral/long
oblique metacarpal fractures that do not require fracture
reduction, since it is probably not adequate to maintain
the reduction of any dislocation.

The outcome of conservative treatment
of spiral metacarpal fractures and the
role of the deep transverse metacarpal
ligaments in stabilising these injuries

A. Khan and G. Gottes

Abstract
We carried out a prospective study to assess the outcome of spiral metacarpal fractures treated with early mobilisation and non-operative management. We treated 30 patients of whom we assessed 25. Of these, 20 had an excellent outcome and were pain-free. Subjectively all the fractures healed with some bowing of between 5°-10°. Only one patient had an unacceptable result; she had an unstable fracture and was reluctant to mobilise when warning. She also reported some pain in the distal fractures. The following notes should be made:

1. The distal fracture is generally unstable.
2. Any manipulation or closed reduction should be avoided.
3. The fracture should be treated with a stable, non-operative technique such as closed reduction and percutaneous pinning.
4. The proximal fracture should be treated with an open reduction and plate fixation.

Level of evidence: IV
**Hand Fx in Athlete**

**Distal Phalanx Base Fractures: ‘Mallet fracture’**

- No subluxation?
  - Splint DIP in extension for 4-6 weeks
- Subluxed joint:
  - extension block pinning

**Diaphyseal Middle & Proximal Phalanx Fx**

- Deforming forces depend on tendinous insertions of intrinsic and extrinsic muscles
Diaphyseal Middle Phalanx Fx

- Apex volar deformity
  - The pull of the FDS and the central slip

Diaphyseal Proximal Phalanx Fx

- Apex volar deformity
  - Proximally: pull of interosseous muscles
  - Distally: pull of the central slip and lateral band

Deforming forces summarized
Angulation or phalangeal shortening:

- Extensor mechanism over proximal and middle phalanges has minimal ability to ‘take up slack’
- Minimal amounts of shortening or angulation will cause the next most distal joint to have an extensor lag
- Over time, this often leads to a fixed flexion contracture
Hastings study:

- One mm of proximal phalanx shortening produces 12 degree extensor lag at PIP
- Apex palmar angulation of:
  - 16 degrees=10 degree PIP lag
  - 27 degree= 24 degree PIP lag

Treatment

Diaphyseal Middle & Proximal Phalanx

- Closed Reduction
- Works for transverse fx’s only
  - Metacarpal block
  - Gutter splint
  - Spiral and long oblique fractures will not maintain length and may need fixation
Operative fractures:

- Phalangeal fractures that are short, rotated or unacceptably angulated after reduction
- Transverse, displaced metacarpal fractures that cannot be reduced
- Articular fractures:
  - Condylar fractures of P1 or P2
  - Displaced Bennett’s fractures
  - Displaced Reverse Bennett’s fractures
  - Displaced scaphoid fractures
  - Non-displaced proximal pole scaphoid fractures
Thank You