Phalangeal and Metacarpal Fractures
R. Colin Brabender, M.D.
Hand and Upper Extremity Surgeon
Allegheny Health Network
Pittsburgh, PA

Disclosures
• I have no disclosures/conflicts of interest relevant to this presentation

Finger Fractures
• Most common fractures in the UE
• Most fractures can be treated nonoperatively
• Prolonged mobilization can lead to permanent deformity and stiffness
Zone of Injury

- Fractures are not in isolation
- Zone of injury can and will lead to scarring and adhesion formation

"The most common complication of hand fractures is not malunion or infection. Rather, it is joint contractures and tendon adhesions." [1] Baratz and Divelbiss, 1997

Goals

- Stabilization of fractures for bony healing
- Elimination of angular or rotational deformities
- Restoration of the articular anatomy
- Care of associated soft tissue injuries
- Rapid mobilization

Relative Indications for Fixation

- Irreducible fractures
- Malrotation
- Intra-articular fractures
- Subcapital fractures
- Open fractures
- Segmental bone loss
- Polytrauma
- Multiple hand fractures
- Fractures with soft tissue injury
Options of fracture fixation

- Kirschner wires
- Screws fixation
- Plate and screws
- Intramedullary fixation
- External fixation

Distal Phalange fractures

- Tuft fractures
  - Simple or comminuted
- Shaft fractures
  - Transverse: stable or unstable
  - Longitudinal
- Articular fractures
  - Volar
  - Epiphyseal
  - Dorsal

Tuft fractures

- Closed
- Stax splint or extension splint for 2-3 weeks
- Often result in a fibrous union

3-5 days of antibiotics
Tuft fractures

- Open
- I&D
- Nail bed repair
  - Caprosyn, biosyn, chronic (3-8 or smaller)
  - Dermabond
- Xeroform or nail (cleaned) under eponychial fold

Phalange fractures

- Multiple factors lead to poorer outcomes and decreased ultimate digital ROM


"The most common complication of hand fractures is not malunion or infection. Rather, it is joint contractures and tendon adhesions. Baratz and Divvish, 1997.

Phalangeal Fractures

- Patient factors
- Fracture factors
- Management factors

Phalangeal Fractures: Patient Factors

- **Age**
  - If 20 yrs or less: >88% of motion restored
  - 50 yrs or older: <60% of total active motion
- **Associated diseases and arthritis**
- **Socioeconomic status**
- **Motivation and compliance**


Phalangeal fractures: Fracture Factors

- **Location**
  - Intra vs extra articular
- **Geometry**
  - Simple, comminuted, impacted, bone loss, transverse, oblique, etc
- **Stability**
- **Injury to soft tissue**
- **Associated injuries**
  - Tendon, ligament, joint, vessel, nerve, multiple digits


Phalangeal fractures: Fracture Factors

- **Location**
  - Intra vs extra articular
- **Stability and alignment**
  - More important than articular congruency
- **Comminution, bone loss and instability**

Phalangeal fractures: Management Factors

- Immobilization no longer than 3 weeks
- If less than 4 weeks final active ROM was 80% of normal
- If longer than 4 weeks final active ROM was <60% of normal


Phalangeal fracture Classification

- Articular
  - Condylar, comminuted intra-articular, dorsal, volar, or lateral base factors
  - Fracture dislocations
- Extra-Articular
  - Shaft, neck, or base

Phalangeal Shaft fractures

- Stability
  - Potential to rotate, angulate or shorten are unstable
  - Open fractures are generally unstable
  - Most of these fractures have the potential to be unstable and warrant some intervention
Phalangeal Shaft fracture

- CRPP
- Good for transverse or short oblique fractures
- Two techniques
  - Cross pinning
  - Transarticular pinning


Phalangeal Shaft fractures

- Reduction technique
  - Finger flexion
  - Assess rotation
  - 0.045 or 0.062 in proximal phalange
  - 0.035 or 0.045 in middle phalange
  - Retrograde is better for skin
  - Antegrade is technically easier to do
  - Transarticular pinning is easiest

Phalangeal Shaft fractures

- Compared the two techniques
- Both groups had similar results
- More tenolysis done on transarticular group

Phalangeal Shaft fractures

- Oblique or spiral fractures
- Consider percutaneous pin or screw fixation
- Very stable fixation
- Open if cannot restore alignment
  - Pins
  - Screws
  - Plate


Phalangeal Shaft fractures

- Proximal Phalange
  - Dorsal approach
  - Split extensor
- Middle Phalange
  - Mid-axilla
  - Dorsal > between lateral band and central slip
  - 3 screws are as stable as a plate


Intramedullary Fixation

Metacarpal Fractures

- Head
  - Intra-articular
- Neck
  - Extra-articular
  - Shaft
  - Extra-articular
- Base
  - Intra-articular

Extra-Articular

- Neck
- Shaft

Neck Fractures

- Very common
- “Boxer’s” fracture
- 5th Metacarpal
- Young men
  - Punch a stationary object

5th Metacarpal Neck Fractures

- 5th CMC joint is relatively mobile.
- Can accept up to 70° of apex dorsal angulation.
- Only 10° in index digit.

5th Metacarpal Neck Fracture

- Surgical Indications
  - Adequate Reduction cannot be maintained
  - Open
  - Comminuted
  - Adjacent injuries
  - What to offer this patient?

5th Metacarpal Neck Fractures

- Cadaveric Studies
  - Two studies
  - Fracture angulation >30°
  - Shortening in intrinsic musculature
  - Possible “decay in the efficiency of flexor system”


Surgical Management

- Intramedullary Pinning
- Cross pinning
- Two Studies compared
  - No differences


Intramedullary Screw Fixation

Metacarpal Shaft

- Transverse
- Oblique
  - Spiral
- Comminuted

Transverse

- Axial loading
- Apex dorsal angulation
- Reduction
  - 5th digit >30°
  - 4th digit >20°
  - 3rd and 2nd: any angulation
  - Malrotation

Oblique/Spiral

- Torsional forces
- 5° of rotation can cause 1.5cm of overlap
- If rotationally off with clenched fist
  - Surgery
Comminuted
- Often direct trauma
- Soft-tissue injury
- Shortening
  - How much is acceptable?
  - 2mm of shortening = 7° extensor lag at the MCP


Kirschner pins
- Transverse
- Oblique
- Spiral
- Advantages?
- Disadvantages?

intramedullary pins
- Transverse
- Short oblique
- Advantages?
- Disadvantages?
Interfragmentary Screws
- Long Oblique
- Spiral
- Advantages?
- Disadvantages?

Plate Fixation
- Multiple digits
- Marked displacement
- Intra or periarticular extension
- Reconstruction of nonunion
- Advantages?
- Disadvantages?

Take home points
- Consider other injuries
- Stability and alignment are more important than perfect reduction
- 3 weeks is limit of immobilization
- No one “right” way to treat any fracture
- Stiffness is common (esp with prox phalange fx)
- Overall goals
  - Restore alignment
  - Stable fixation
  - Early ROM