Disclosures

• None
Hand Fractures

• History
  • 3000 B.C. - Imhotep –
    • Ancient Egyptian describes reduction and immobilization of fractures
  • 160 A.D – Galen
    • Prolonged immobilization and frequent dressing changes
  • 10th century – Middle East – plaster based materials
  • 1904 – Lambotte
    • Described operative care of phalangeal fracture
    • Stabilized the proximal phalanx with fixateur externe
Hand Fractures

• The hand is resilient
  • Most fractures can be treated non-operatively
  • Bone injuries are forgiving
  • Soft tissues injuries are not
  • Surgery – more harm than good?
Hand Fractures

• Young men and elderly women
• Young – sports and work related
• Older patients – fall or MVC
• Distal phalanx most common fracture in the hand
• Young males – 5th metacarpal commonly fractured
Diagnosis

- Skin integrity
- NVI
- Angular/rotational deformity
  - May be subtle
  - Patient unable to make full fist
  - End on digital pulp and planar nail alignment versus opposite hand
Hand Fractures

• Stable fractures
  • Non-displaced or reduced fractures with stable configuration
  • Splint in “safe” or “functional” (intrinsic plus) position for 3-4 weeks

• Unstable fractures
  • Excessive shortening
  • Angular deformity
  • Rotational malalignment
  • Intraarticular step-off
  • If it looks unstable it probably is…
Hand fractures

• Non-operative
  • Stiffness, pressure sores
  • Intrinsic plus position
  • Do not immobilize more than 4 weeks
  • Radiographs lag behind clinical healing
Distal phalanx – Problem fractures

- Seymour fracture
  - Dorsal epiphyseal avulsion
  - Apex dorsal angulation
  - Nail plate avulsion – reduce nail plate or repair nail bed

- Sterile matrix may be trapped in fracture (adult) or physis (child)
Middle and Proximal Phalanx

- Stable fractures – buddy tape and early motion
- Unstable fractures
  - Displaced
  - Intra-articular fractures
  - Volar base injuries of middle phalanx
  - Longitudinal Bicondylar/unicondylar fx of head of proximal/middle phalanx
  - Comminuted
Middle and Proximal phalanx

- Wide variety of options for fixation
  - Intramedullary wires, intramedullary screws, plates/screws
- Which fixation depends on the case and surgeon preference
  - Keep it simple!
  - Attention to soft tissue is paramount
  - Brief immobilization in intrinsic plus
  - Anatomic fixation not always best
Proximal phalanx exposure

- Mid-lateral or dorsal tendon splitting
- Adhesions common
- ? Less adhesions with mid-lateral
- Early motion critical
Middle Phalangeal Neck Fractures – Quick Tip

Pinning very distal neck fractures can be challenging
Middle Phalangeal neck fracture

Surgical Technique

Percutaneous Pinning of Middle Phalangeal Neck Fractures: Surgical Technique

Nader Pakzima, DO, MPH, Julie Johnson, BA, Adam Brown, MFA, Michael Cohn, MD
Lag Screw Fixation

- The rule of 2’s
  - A minimum of two lag screws must be used for stable fixation
  - The fracture must be two times as long as the width of bone.
  - Screws must be placed at least two screw diameters from each other.
Proximal phalanx base fracture – Beware!!!!

- Assume an apex volar angulation
- Malunion may lead to pseudo claw position
  - Hyperextension at fracture site
  - Extensor lag at IP joints
  - Adherence of the flexor tendons
  - Unhappy patients!
Beware of **adhesions** with plates and tendon splinting approach!

****PIP contracture and extensor lag***
Percutaneous Pinning of Fractures in the Proximal Third of the Proximal Phalanx: Complications and Outcomes

Safi Faruqui, DO, Peter J. Stern, MD, Thomas R. Kiefhaber, MD

- 50 fractures
- Transarticular versus extraarticular pinning
- 50% flexion loss > 20 degrees
- 1/3 flexion contracture >15 at PIP
- More transarticular had secondary procedures
- Outcomes equal
PIP fracture dislocation

• Common injury
• Goals: Joint stability and concentric reduction
• Risks: Recurrent instability, arthritis, stiffness, pain
• Stability – size/degree of comminution of middle phalangeal volar base fragment
PIP fracture dislocation

- Stability
  - <30% stable
  - 30-50% tenuous
  - >50% unstable

- V Sign
PIP fracture dislocation

• Surgery - No procedure is superior
  • Dorsal block pinning
  • Volar plate arthroplasty
  • Hemi-hamate arthroplasty
  • Percutaneous pinning
  • ORIF

• ORIF is preferred
  • If simple
  • Easy to fix with screws
  • Early motion can be achieved

• Outcomes
  • Stiffness, post-traumatic oa
Shotgun approach
PIP fracture dislocation

- ORIF
Cerclage wire

12 patients
2.1 year f/u
No post traumatic oa
Avg final arc 89 (72-109)
Extensor loss 8 (0/16)
No complications

Post traumatic OA
A Percutaneous Technique to Treat Unstable Dorsal Fracture–Dislocations of the Proximal Interphalangeal Joint

Mark A. Vitale, MD, MPH, Neil J. White, MD, Robert J. Strauch, MD
External fixator

- Ruland, JHS 2008
- Dynamic traction device
- K wires block the middle phalanx from subluxing dorsally
Tips and Tricks
Unicondylar/Bicondylar fractures

- Unstable
- ORIF versus CRPP?
Unicondylar/Bicondylar fractures

- Excellent reduction and alignment of joint surface
- Patient had severe tendon adhesions
- Underwent tenolysis but never regained DIP motion
Unicondylar fractures
Figure of 8 – tension band
6 week follow up
Tips and Tricks

Osteochondral shearing fracture
The Treatment of an Osteochondral Shearing Fracture-Dislocation of the Head of the Proximal Phalanx: A Case Report

Neil Harness, MD, Jesse B. Jupiter, MD, Boston, MA
Journal of Hand Surgery, 2004
Metacarpal fractures

- **Alignment**
  - One degree at MC – 5 degrees at finger tip (1.5cm digital overlap w/ closed fist)
  - 6 mm shortening tolerated before ext lag or weakness
  - Angulation tolerated well at neck

- **Metacarpal neck** – among the most common
  - "Boxer’s fracture" – 5th metacarpal
  - Most mobile metacarpal – compensates for malunion

- **Malunion**
  - 40 degrees (some authors accept up to 70 degrees)
Boxer’s fracture

• No difference in outcome
  • Immobilization of MP in flex/neutral
  • Cast for four weeks vs bracing/buddy taping
  • Percutaneous pinning vs cr and casting
  • Reduction and casting – angulation recurs

• Consider surgery when adjacent metacarpal also fractured
Metacarpal fractures

• Shaft fx – less angulation tolerated
  • Index/long – 0 degrees; Ring – 20; Little – 30
• Operative tx for open, excessive bone loss, mal-rotation or adjacent mc fx
  • Rotational malalignment is the least well tolerated of all displacements
• MC fx
  • K-wires, lag screws, plates and screws, tension band, intramedullary devices, headless screws, ex fix
Locking vs Non-locking plates
Metacarpal fractures

• IM fixation – Best for fractures in the mid-diaphysis, transverse and non-comminuted
• Implant designed with proximal locking pin
• Must be removed
“Bouquet” Osteosynthesis in Metacarpal Neck Fractures: A Series of 66 Patients

Guy Foucher, MD, Strasbourg, France
Clinical Outcomes of Limited-Open Retrograde Intramedullary Headless Screw Fixation of Metacarpal Fractures

David E. Ruchelsman, MD, Sameer Puri, MD, Natanya Feinberg-Zadek, BA, Matthew I. Leibman, MD, Mark R. Belsky, MD

- 39 patients
  - MC Neck 26
  - MC Shaft 13
- Active motion by 1 week
- Full motion in all
- Union by 6 weeks
Articularly Placed Interfragmentary Screw Fixation of Difficult Condylar Fractures of the Hand

Jacqueline S.W. Tan, MD, Anthony T.L. Foo, MD, Winston C.Y. Chew, MD, Lam Chuan Teoh, MD
Metacarpal head fracture
Tips and Tricks

Malunion
Unicondylar malunion
Extra-Articular Osteotomy for Malunited Unicondylar Fractures of the Proximal Phalanx

Neil G. Harness, MD, Boston, MA, Alvin Chen, MD, Taiwan, Jesse B. Jupiter, MD, Boston, MA

• Osteotomy through original fracture site technically demanding
• Risk of osteonecrosis of small fragment
• Risk of joint contracture
• Extraarticular osteotomy
  • Larger surface area for healing
  • Fixation less technically demanding
  • Shortening is minimal – no extensor lag!
Unicondylar malunion
6 weeks postop
Complications

• Loss of motion
  • Most common

• Malunion
  • Malrotation, angulation, shortening

• Nonunion
  • Uncommon
Conclusions

• Respect the soft tissues
  • Balance the need for rigid fixation and early mobilization

• Percutaneous K-wire & Intramedullary fixation
  • May avoid stiffness/adhesions associated with plates/screws

• Tension band constructs
  • Helpful in small marginal fractures

• Plates and screws
  • Comminuted fractures
  • Minimize soft tissue dissection and beware of adhesions

• Intraarticular malunion
  • Consider extraarticular osteotomy
Thank You