Hand Fractures: Keeping it simple – Tips and Tricks

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Disclosures

- None

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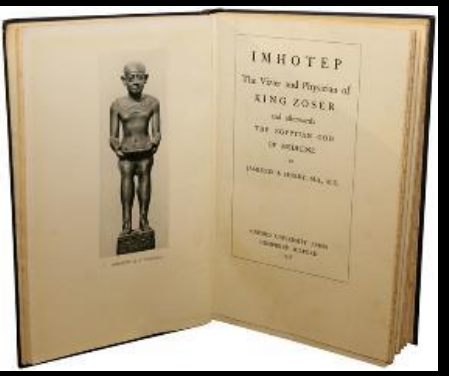
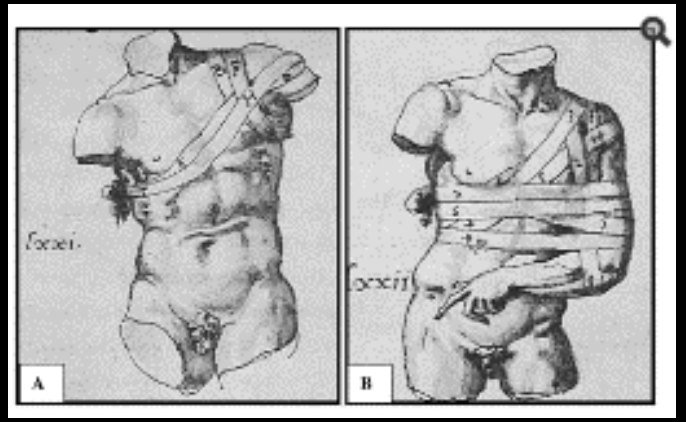
Hand Fractures

- 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?

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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

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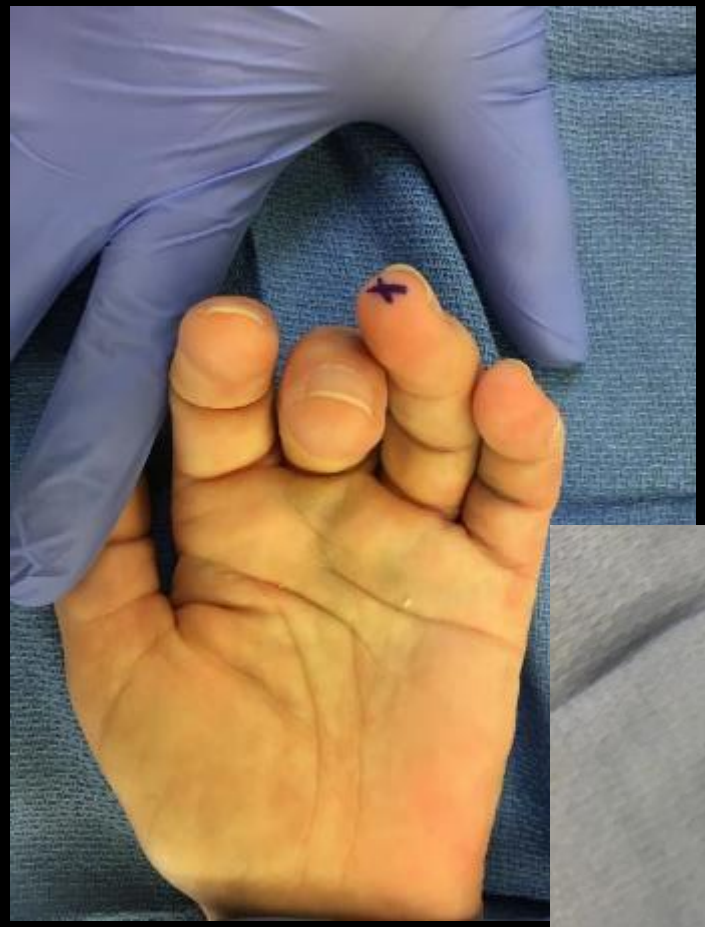
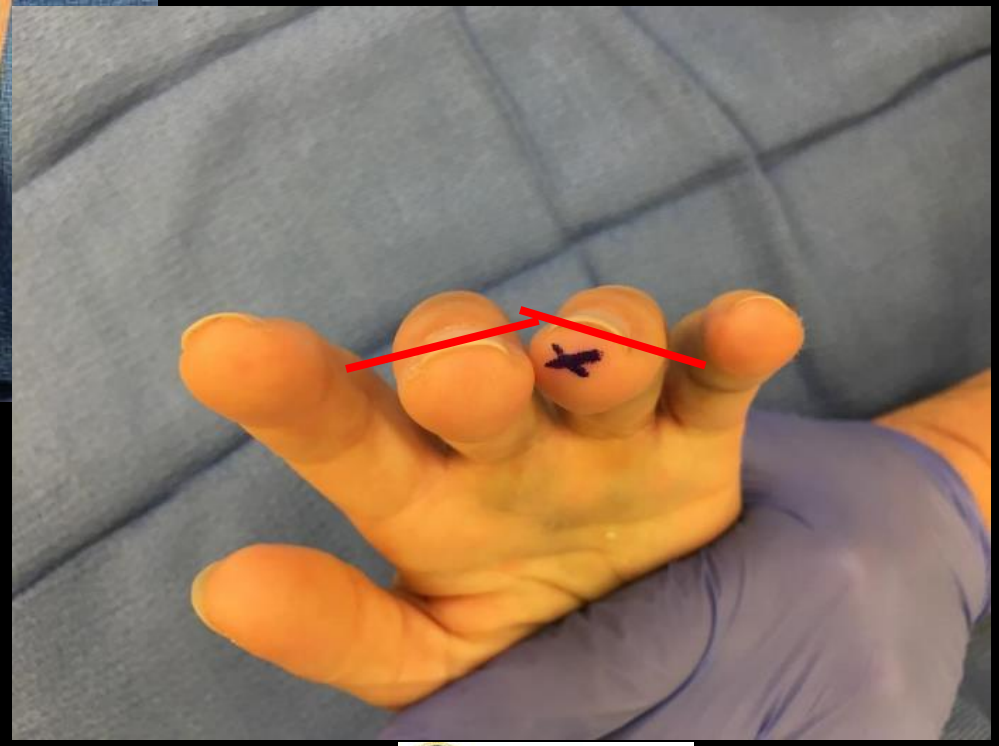
Diagnosis

- 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





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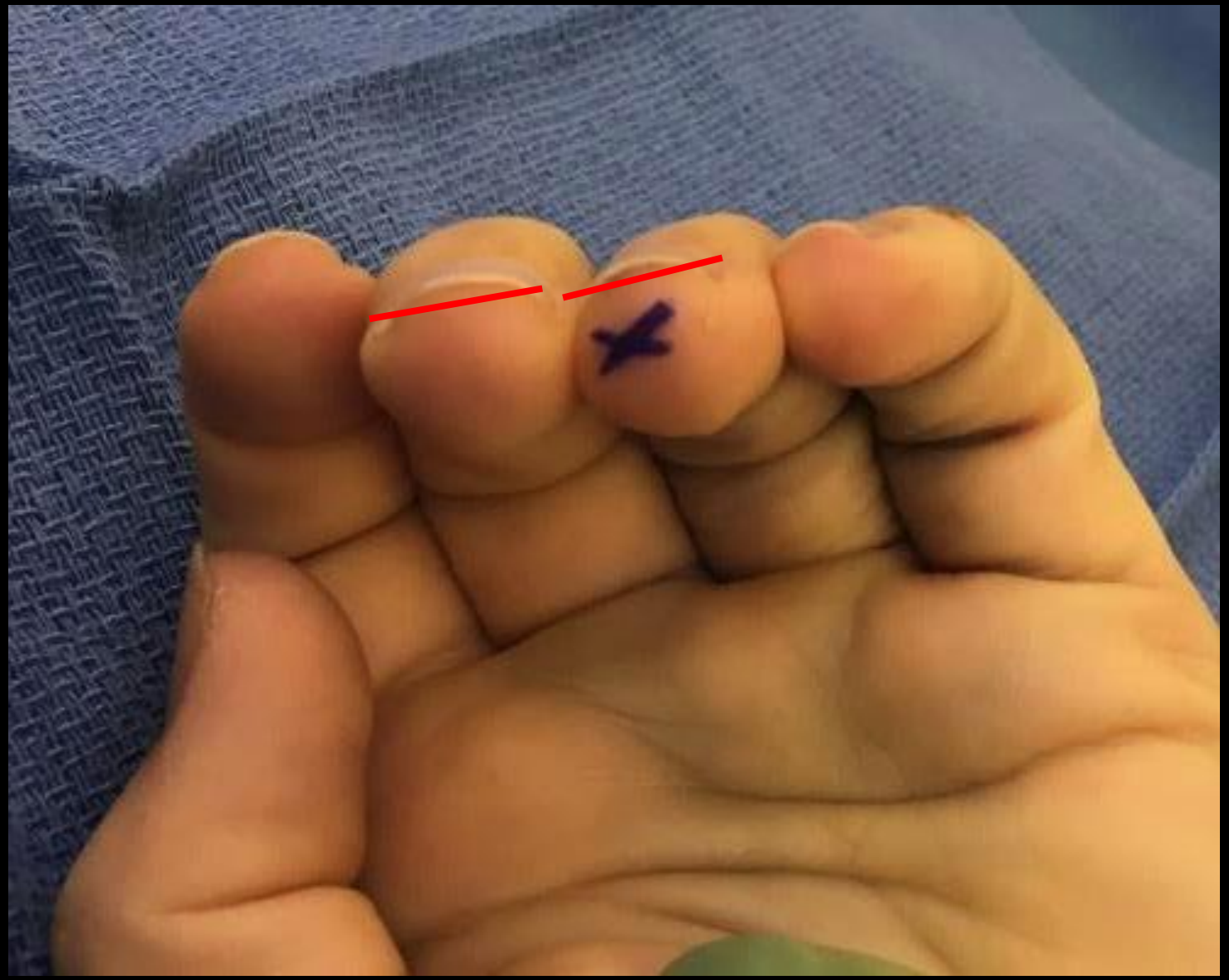

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Hand Fractures

- 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…

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Hand fractures

- Non-operative
  - Stiffness, pressure sores
  - Intrinsic plus position
  - Do not immobilize more than 4 weeks
  - Radiographs lag behind clinical healing

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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)

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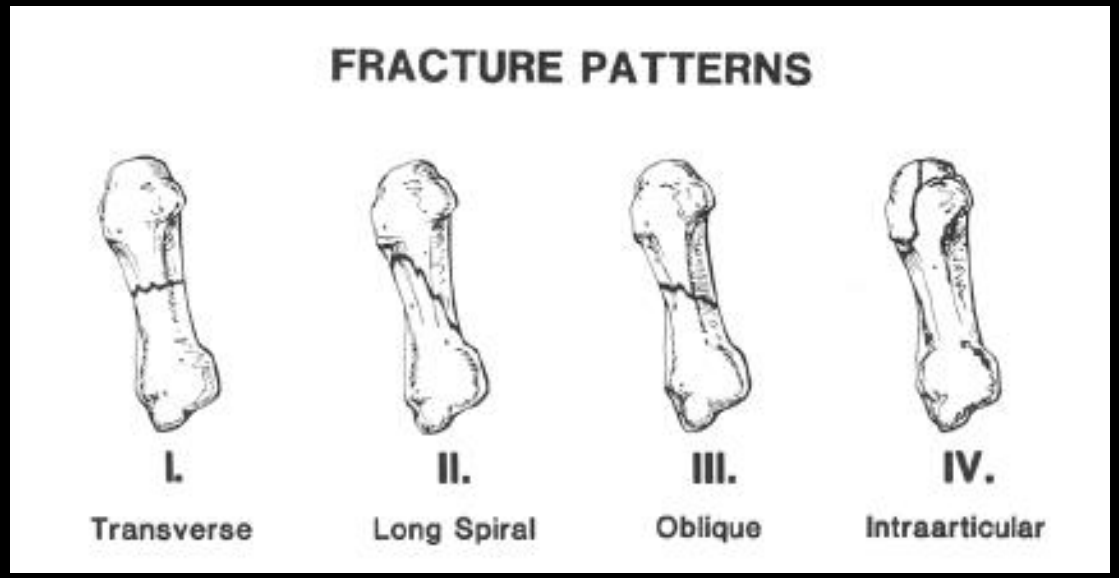
Middle and Proximal Phalanx

- 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



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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 is simple!
  - Attention to soft tissue is paramount
  - Brief immobilization in intrinsic plus
  - Anatomic fixation not always best

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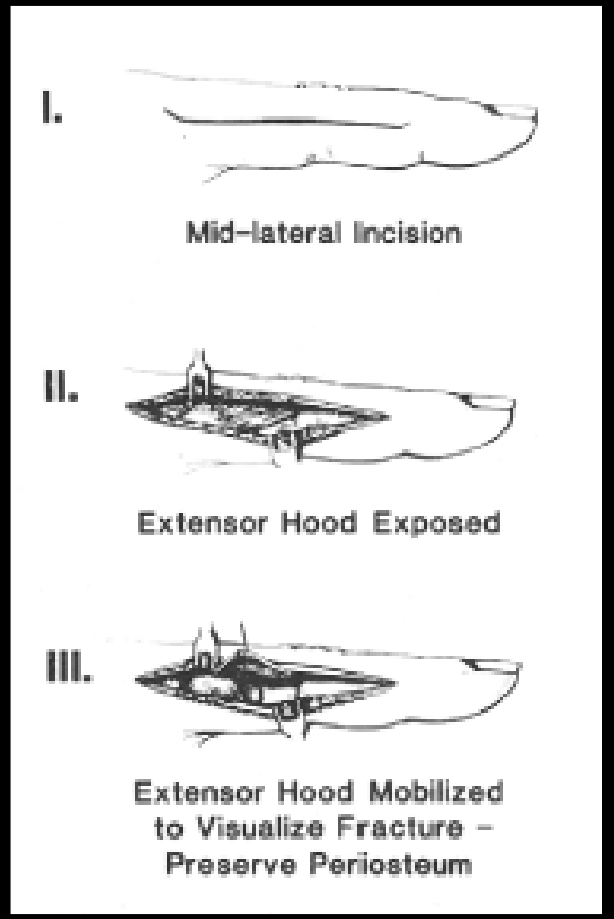
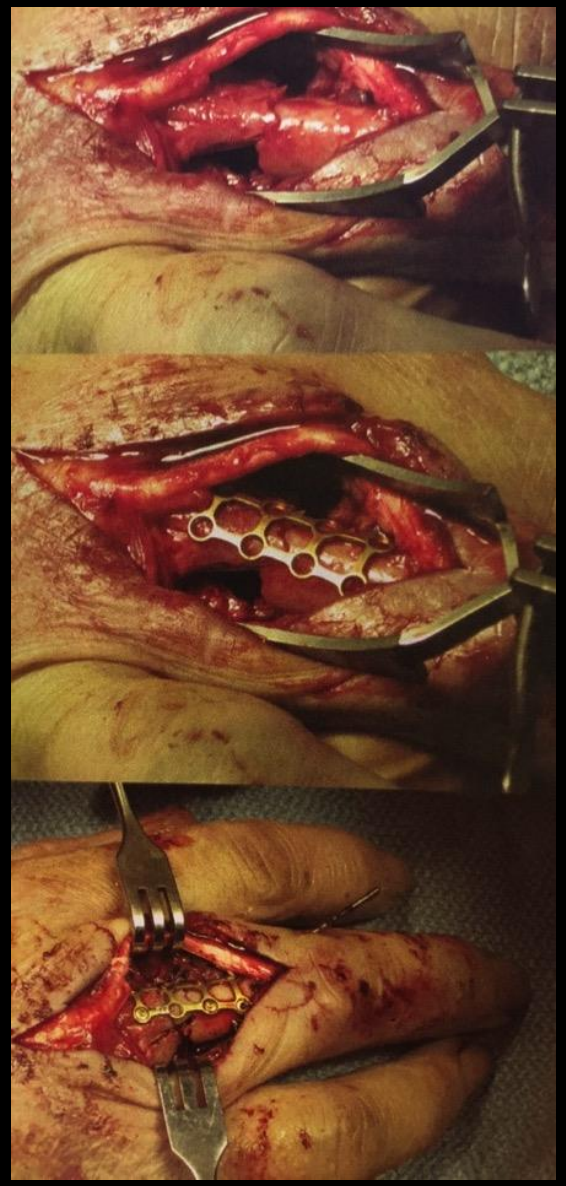
Proximal phalanx exposure

- Mid-lateral or dorsal tendon splitting
- Adhesions common
- ? Less adhesions with mid-lateral
- Early motion critical



Slade, Hand Surgery update 2007



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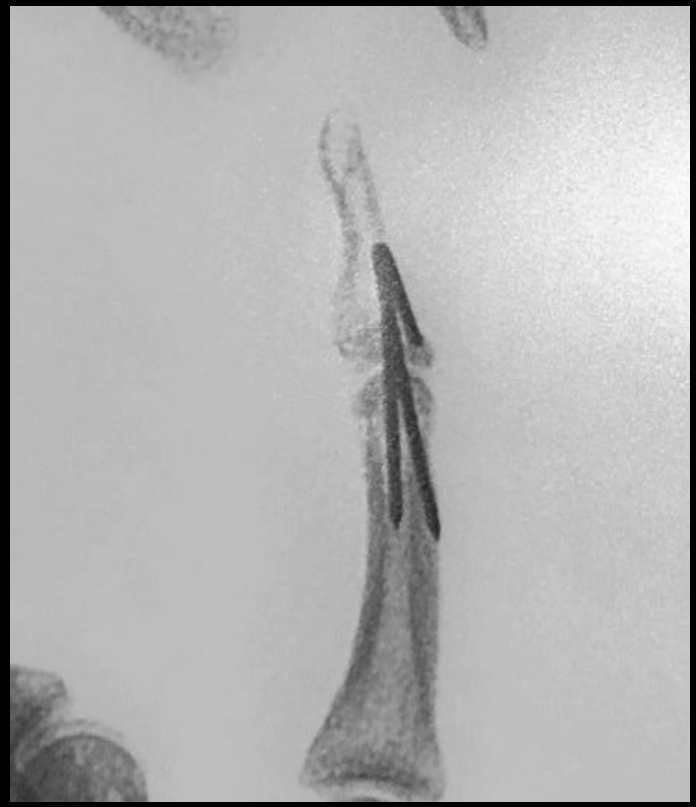
Middle Phalangeal Neck Fractures – Quick Tip

Pinning very distal neck fractures can be challenging



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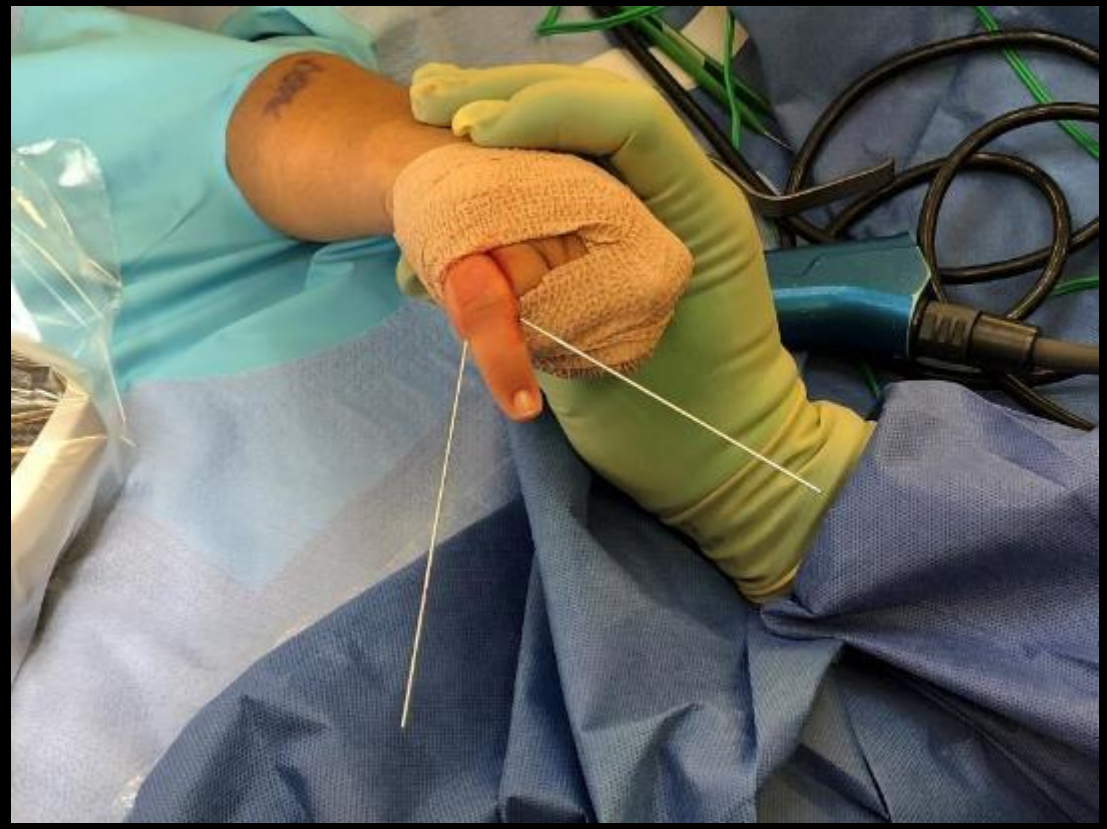

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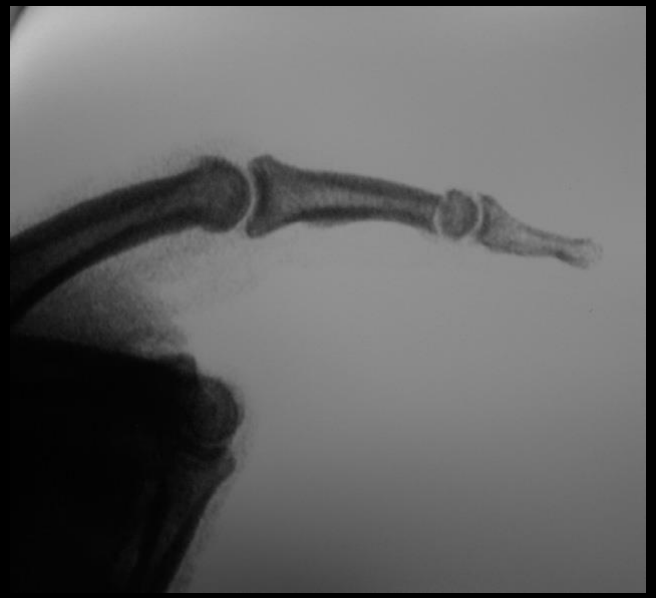
Middle Phalangeal neck fracture

SURGICAL TECHNIQUE

Percutaneous Pinning of Middle Phalangeal Neck Fractures: Surgical Technique

Nader Paksima, DO, MPH, Julie Johnson, BA, Adam Brown, MFA, Michael Cohn, MD



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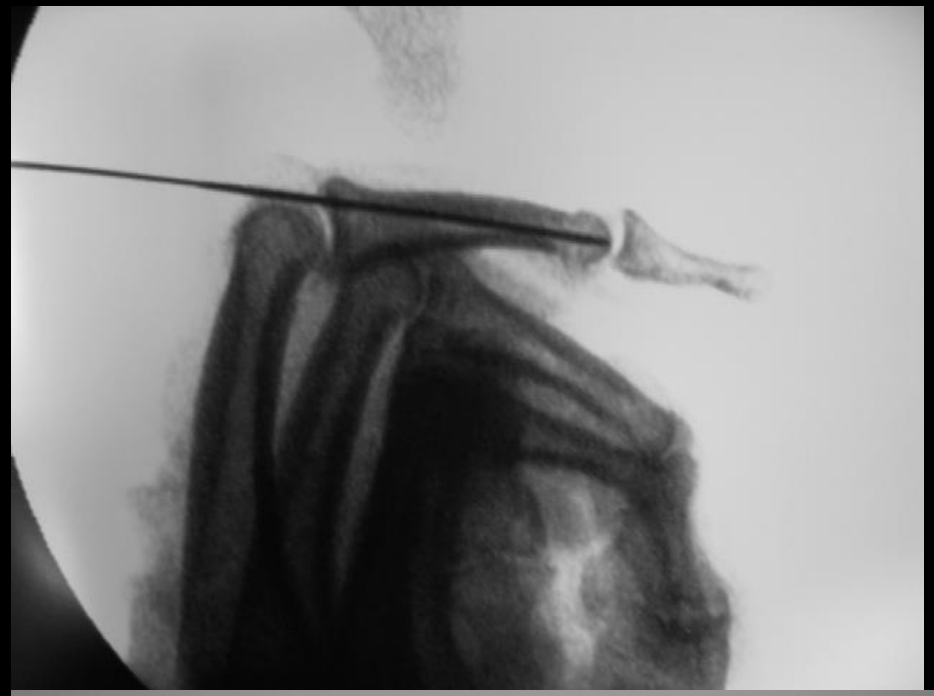

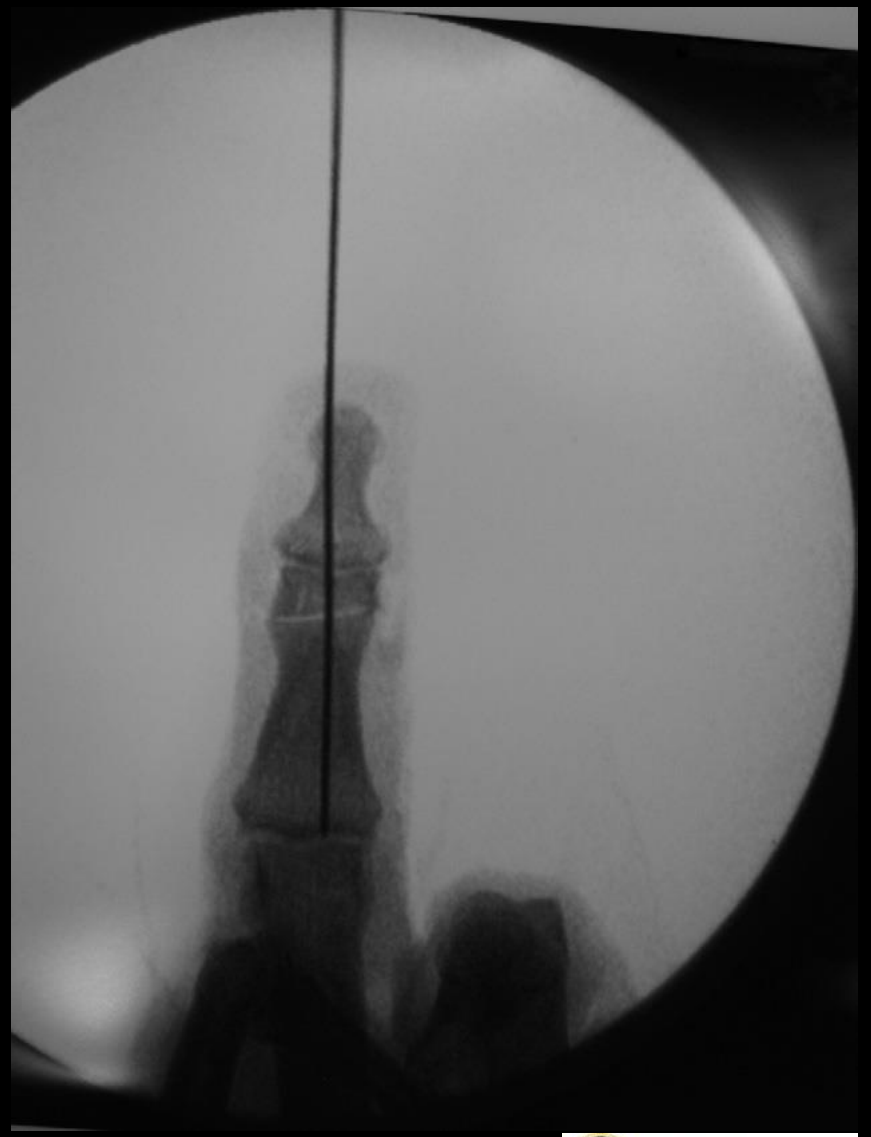

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Lag Screw Fixation

- 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.

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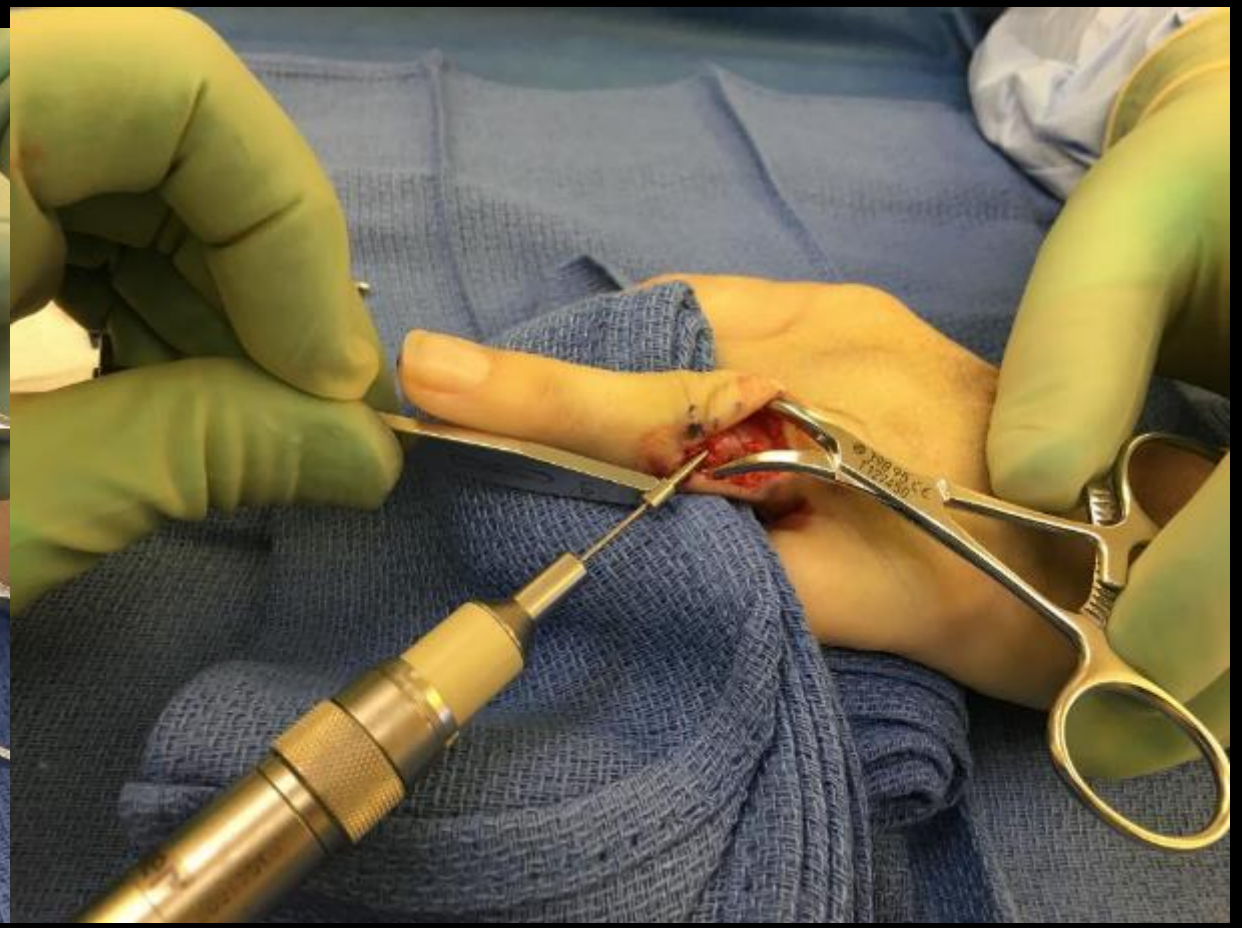

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LATERAL

OBLIQUE

PA

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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!

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Beware of **adhesions** with plates and tendon splinting approach!
****PIP contracture and extensor lag***




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SCIENTIFIC ARTICLE

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

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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

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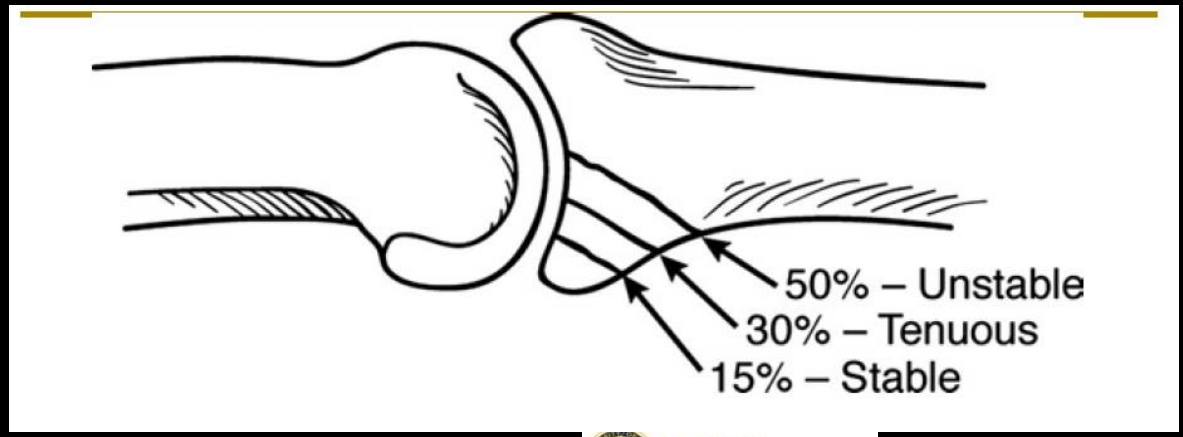
PIP fracture dislocation

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



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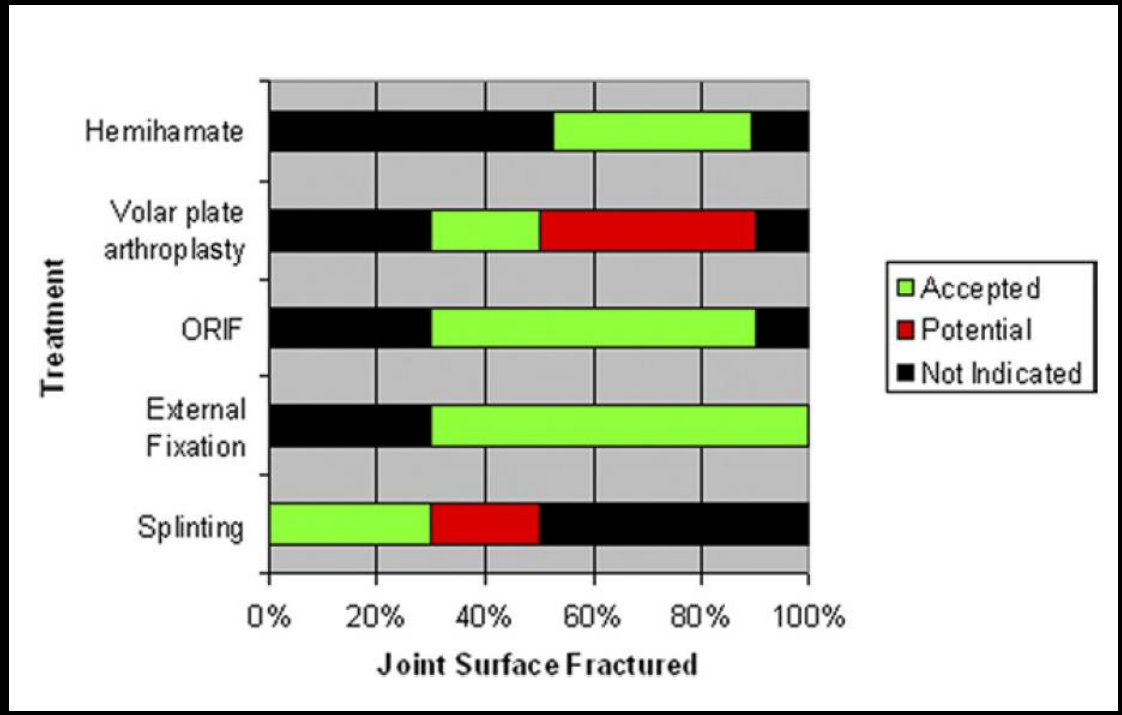
PIP fracture dislocation

- 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



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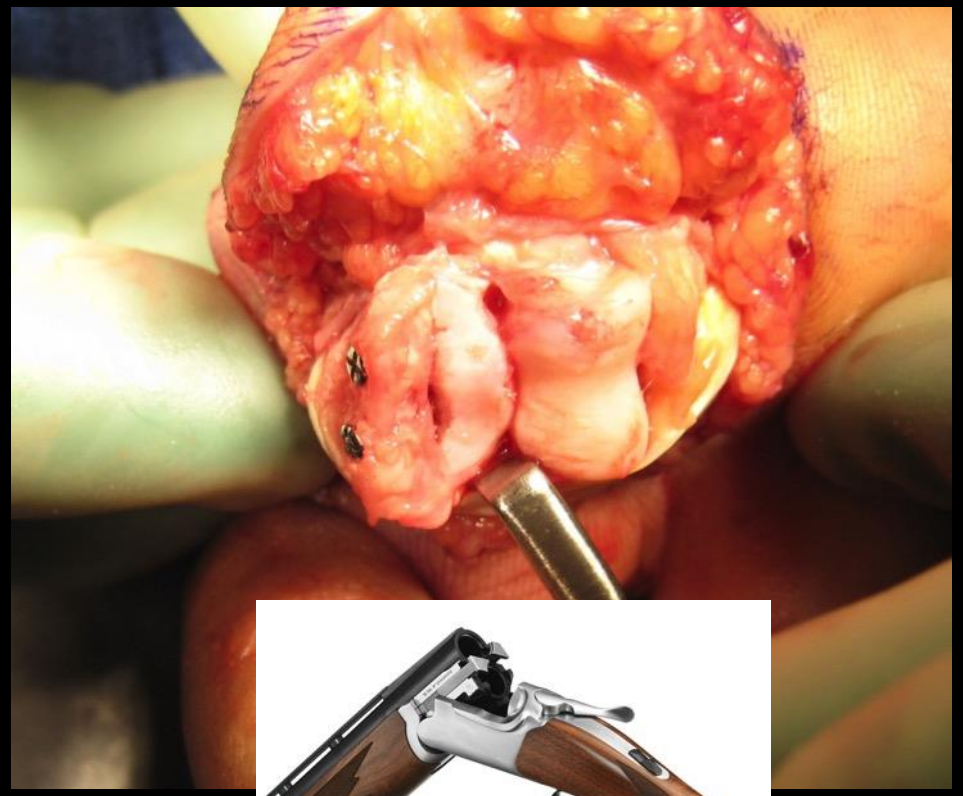
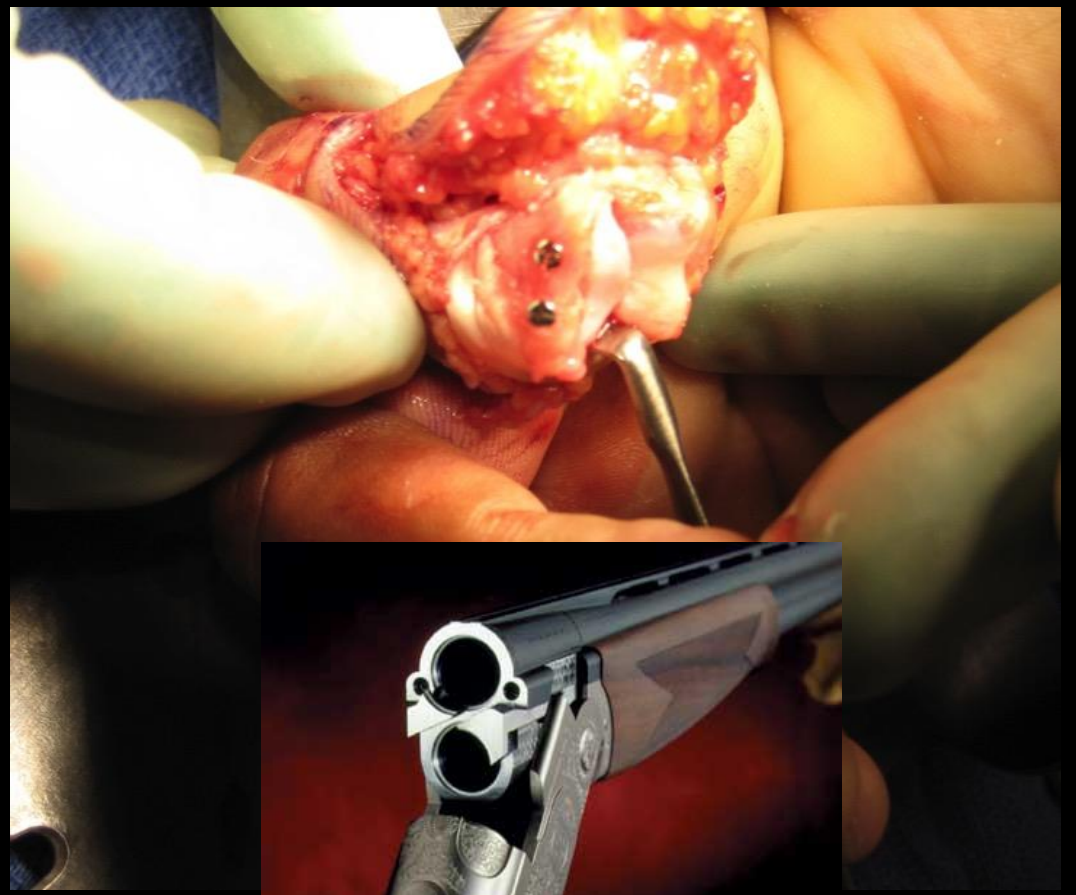
Shotgun approach





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PIP fracture dislocation

- ORIF

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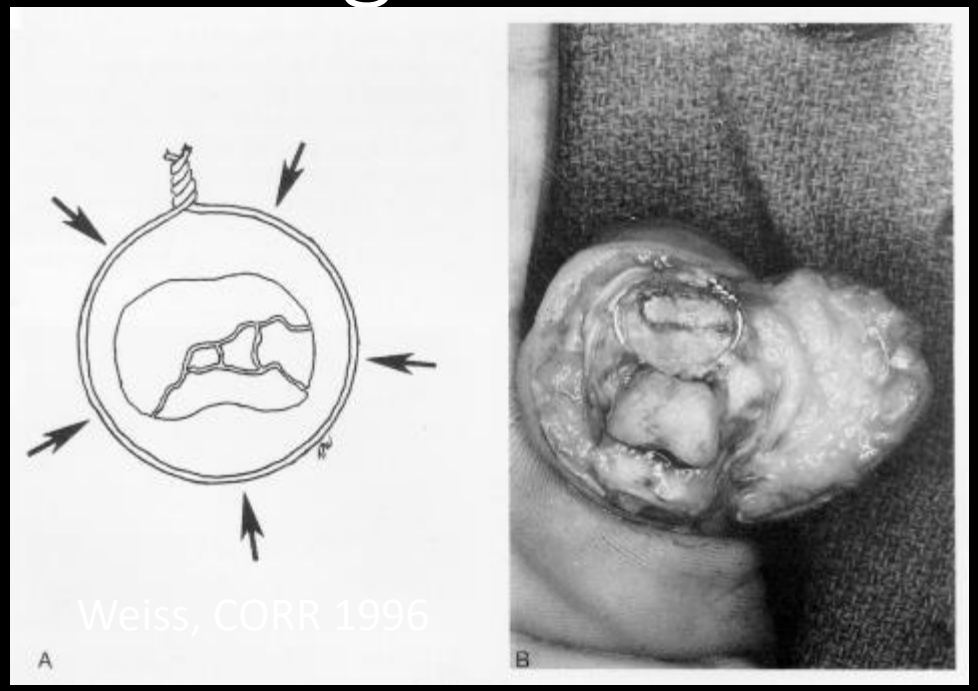
Cerclage wire



Weiss, CORR 1996

Post traumatic OA

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

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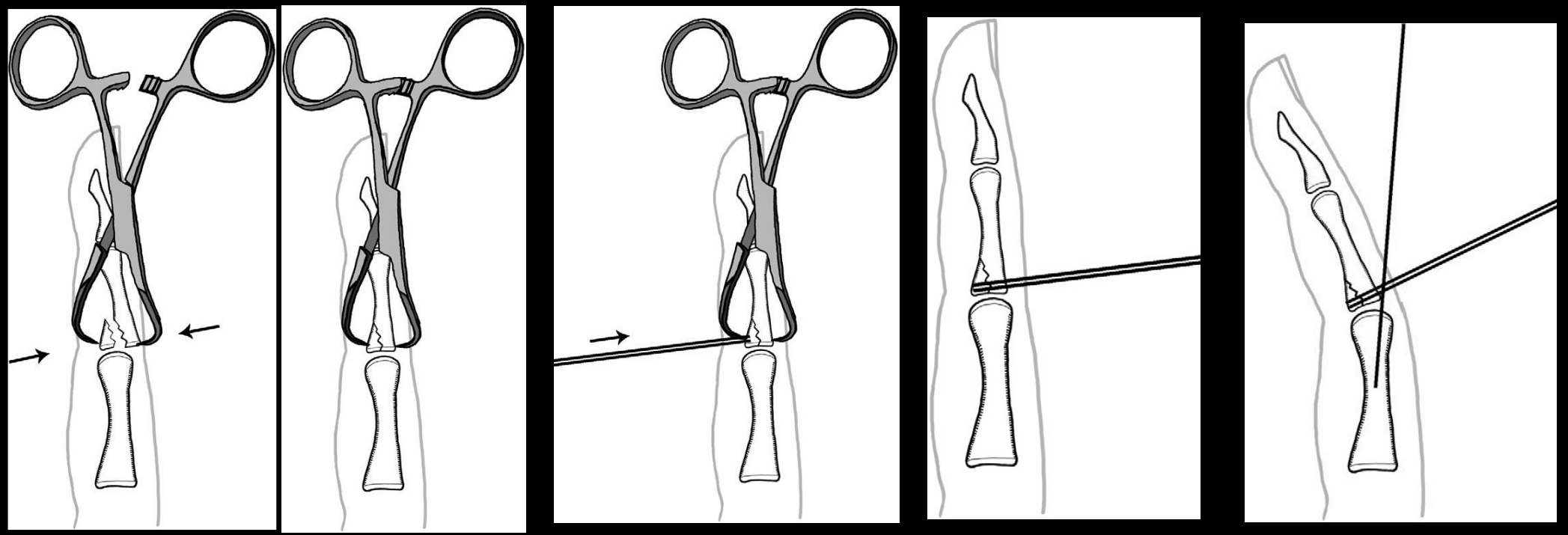
SCIENTIFIC ARTICLE

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



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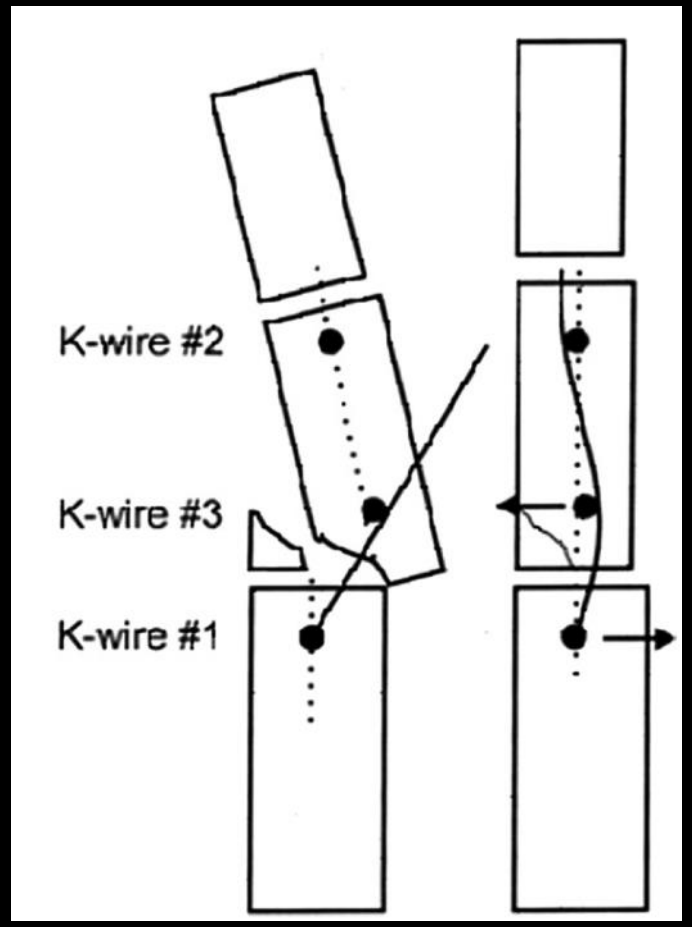
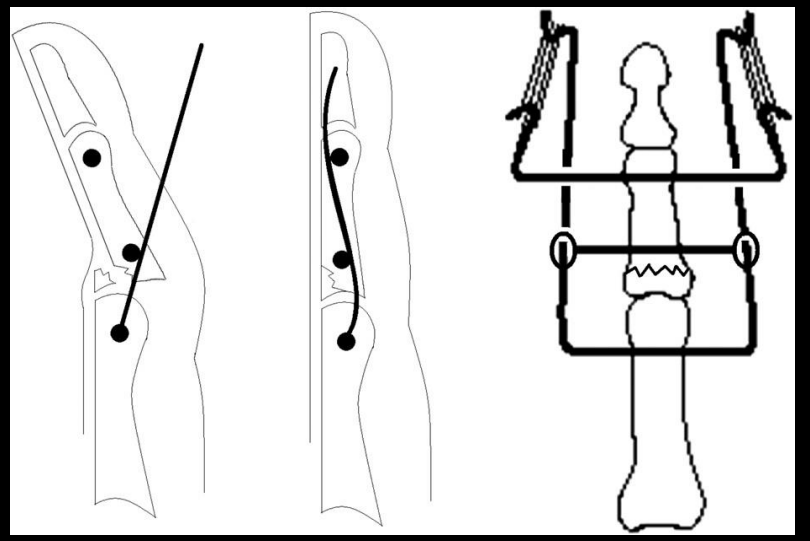
External fixator



- Ruland, JHS 2008
- Dynamic traction device
- K wires block the middle phalanx from subluxing dorsally



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Tips and Tricks

Unicondylar/Bicondylar fractures

- Unstable
- ORIF versus CRPP?

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Unicondylar/Bicondylar fractures

- Excellent reduction and alignment of joint surface
- Patient had severe tendon adhesions
- Underwent tenolysis but never regained DIP motion

Unicondylar fractures

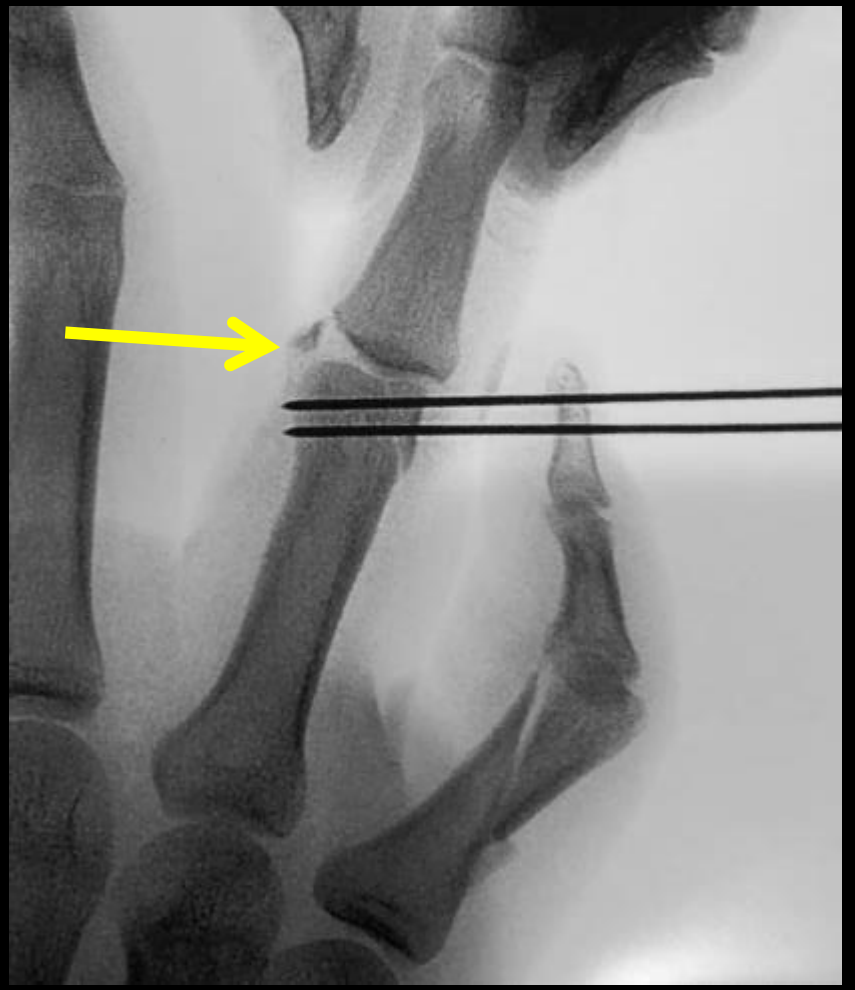

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Figure of 8 – tension band

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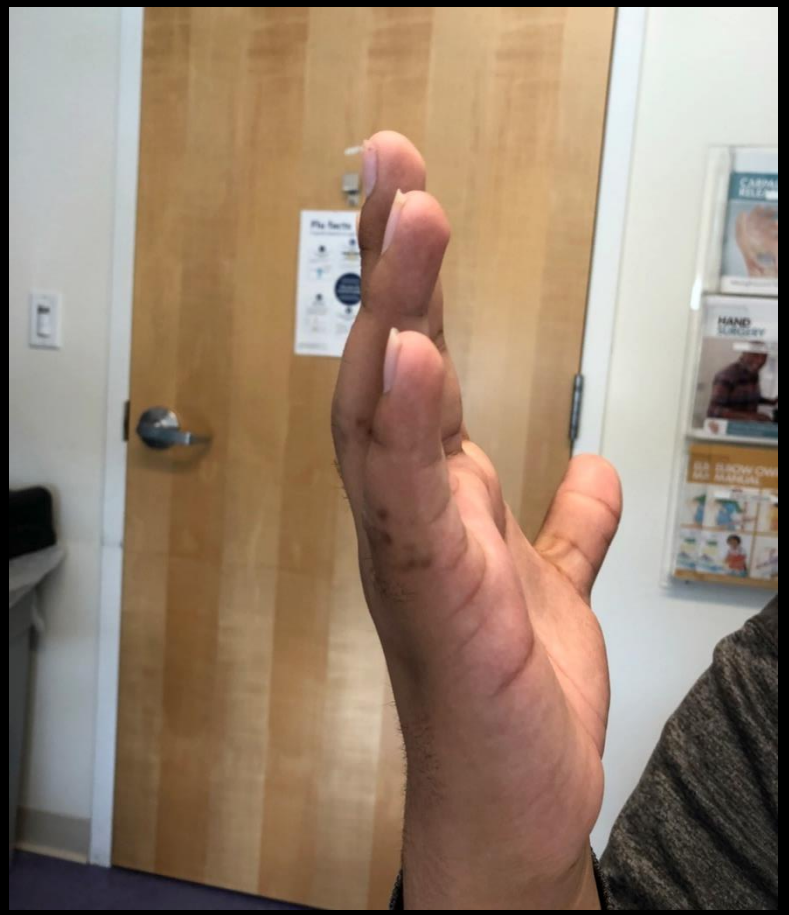
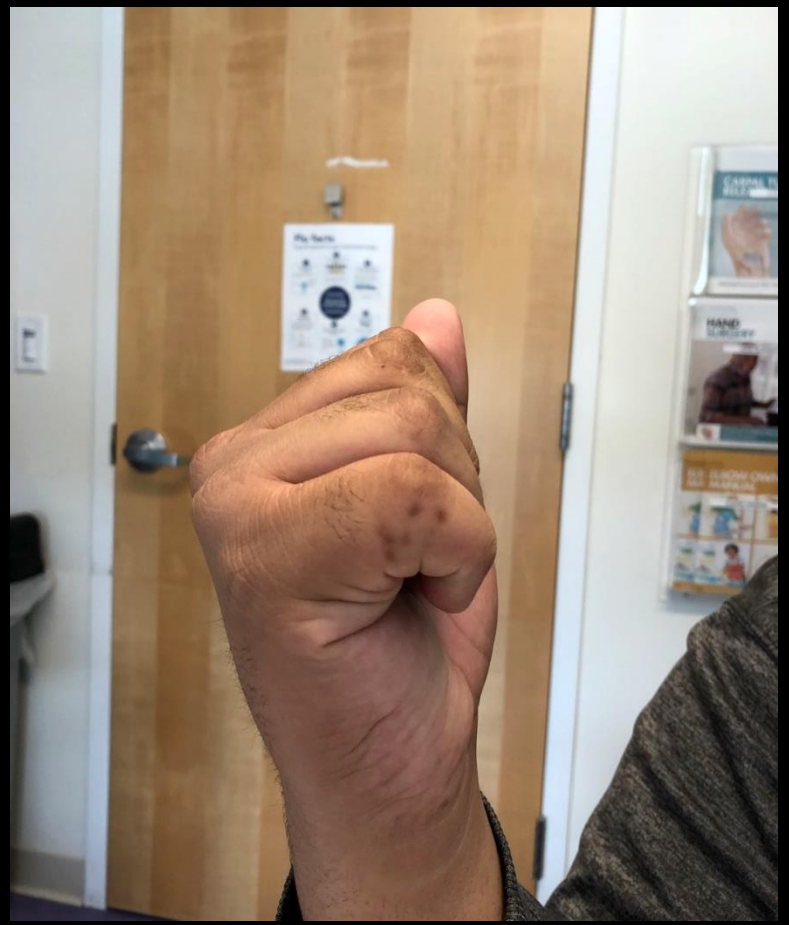
6 week follow up





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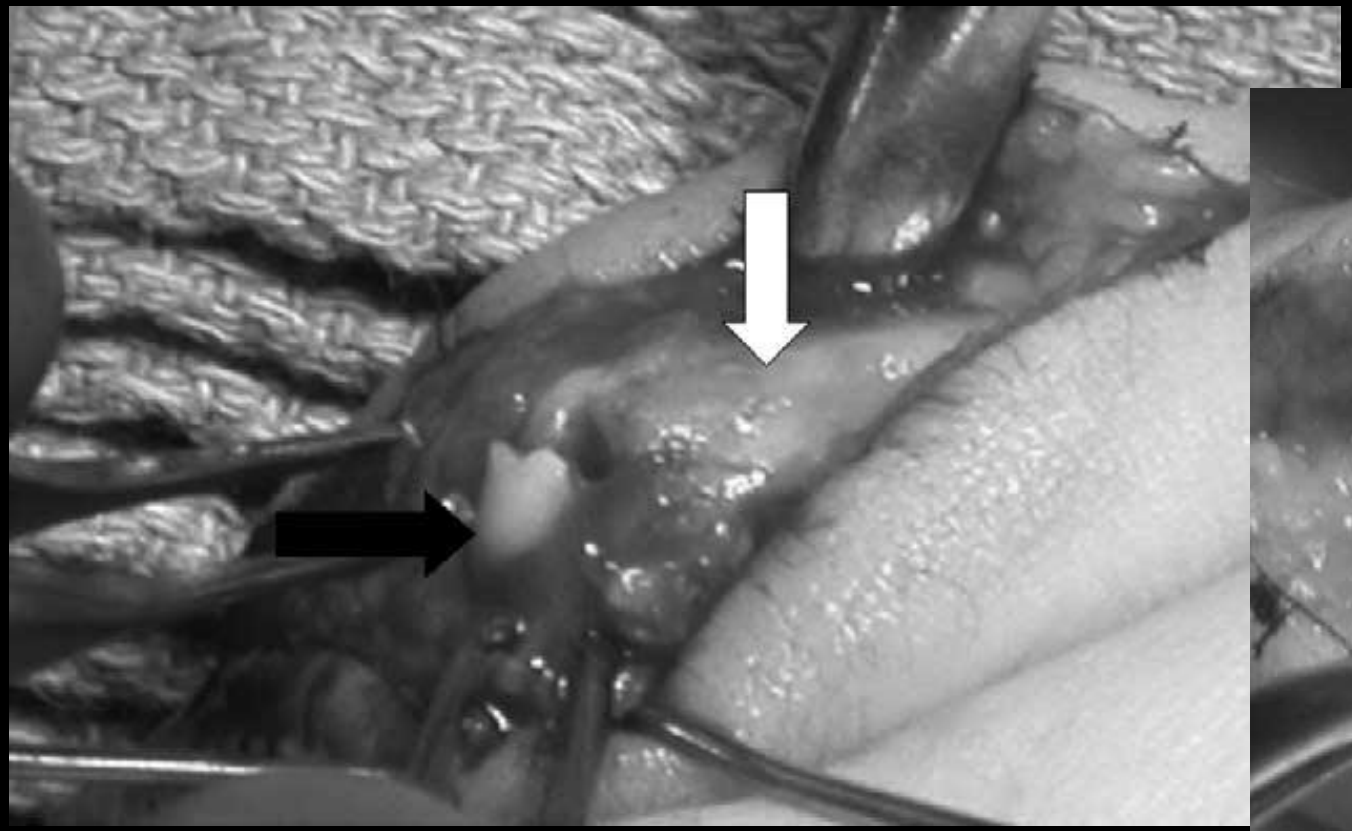
Tips and Tricks

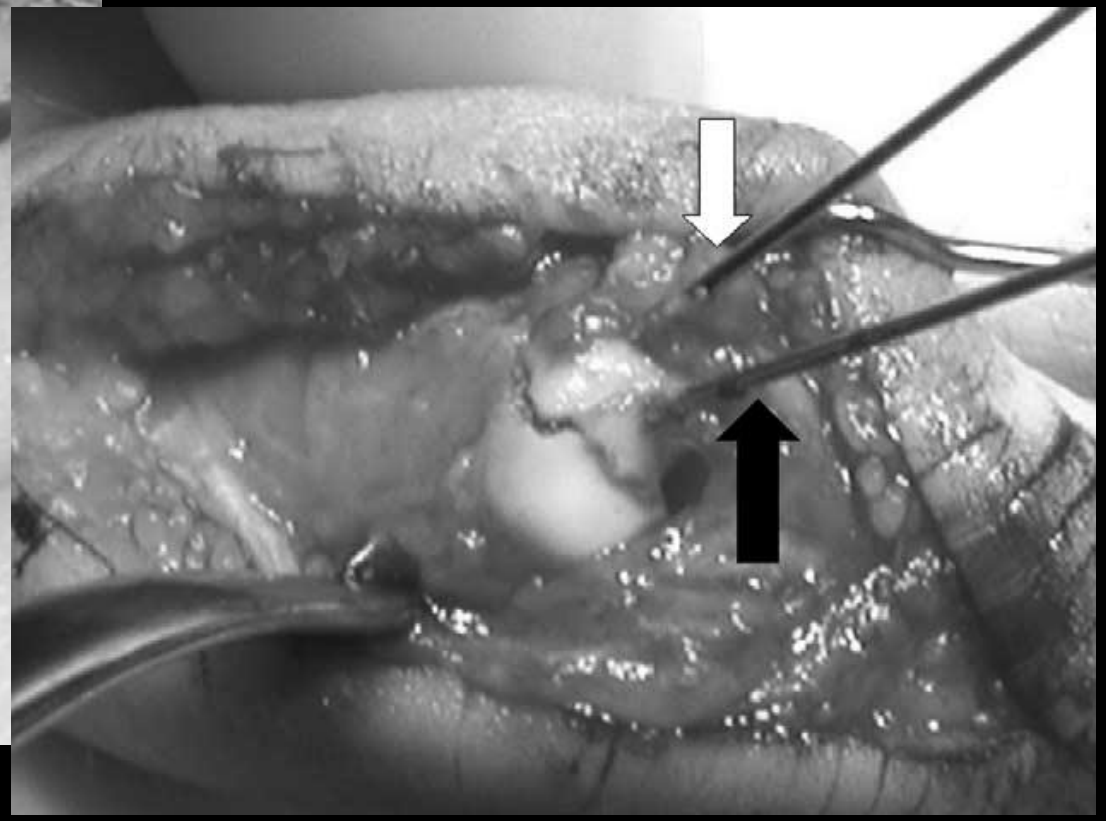
Ostechondral shearing fracture

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





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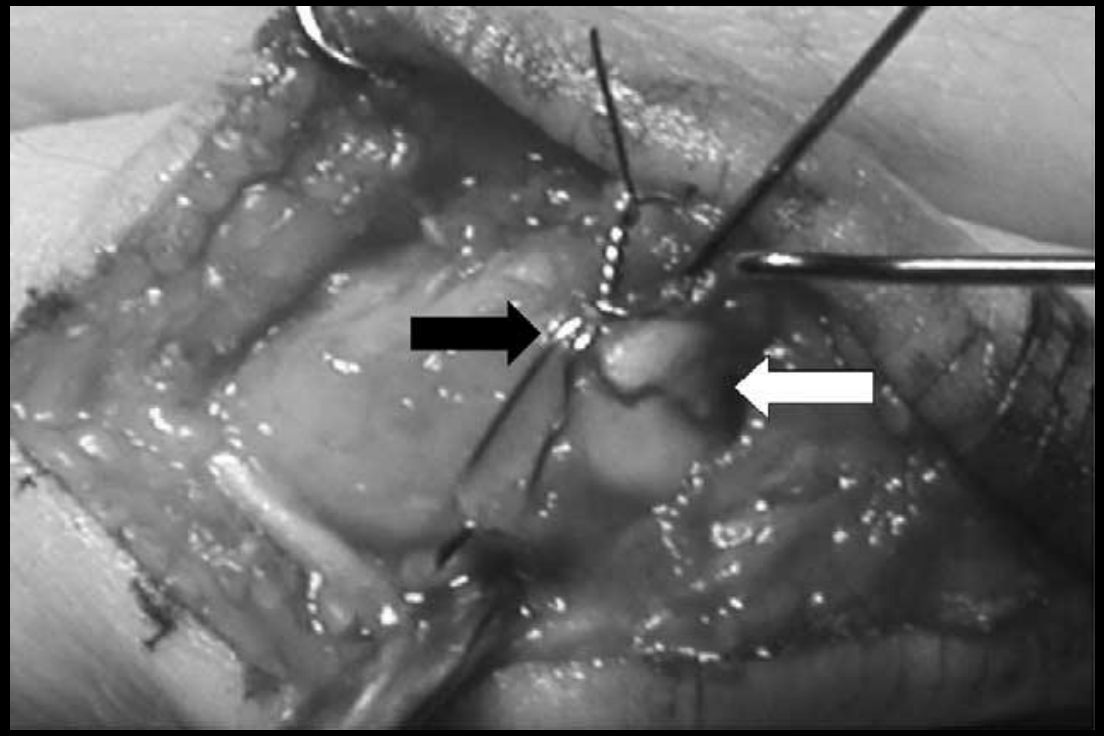

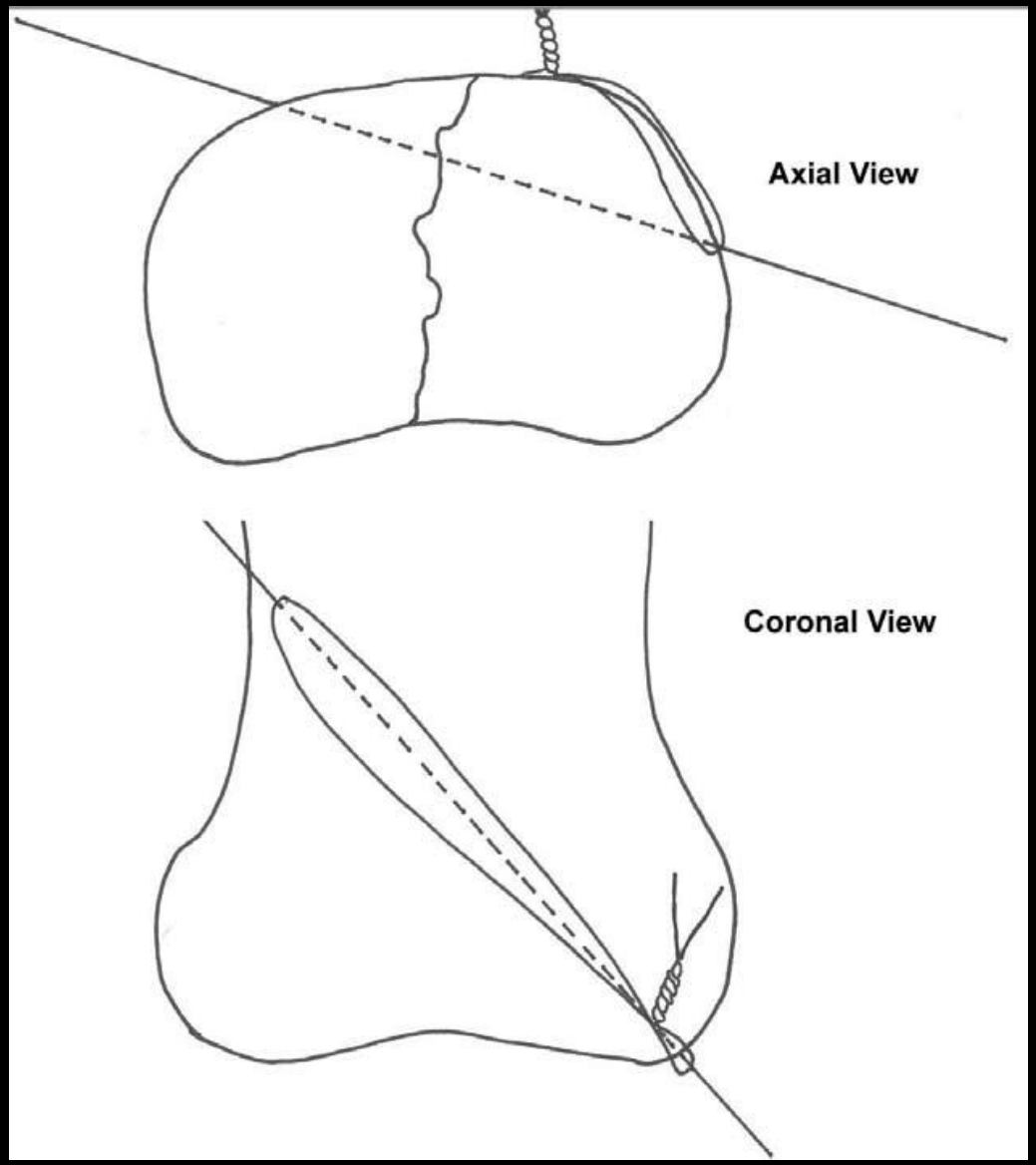

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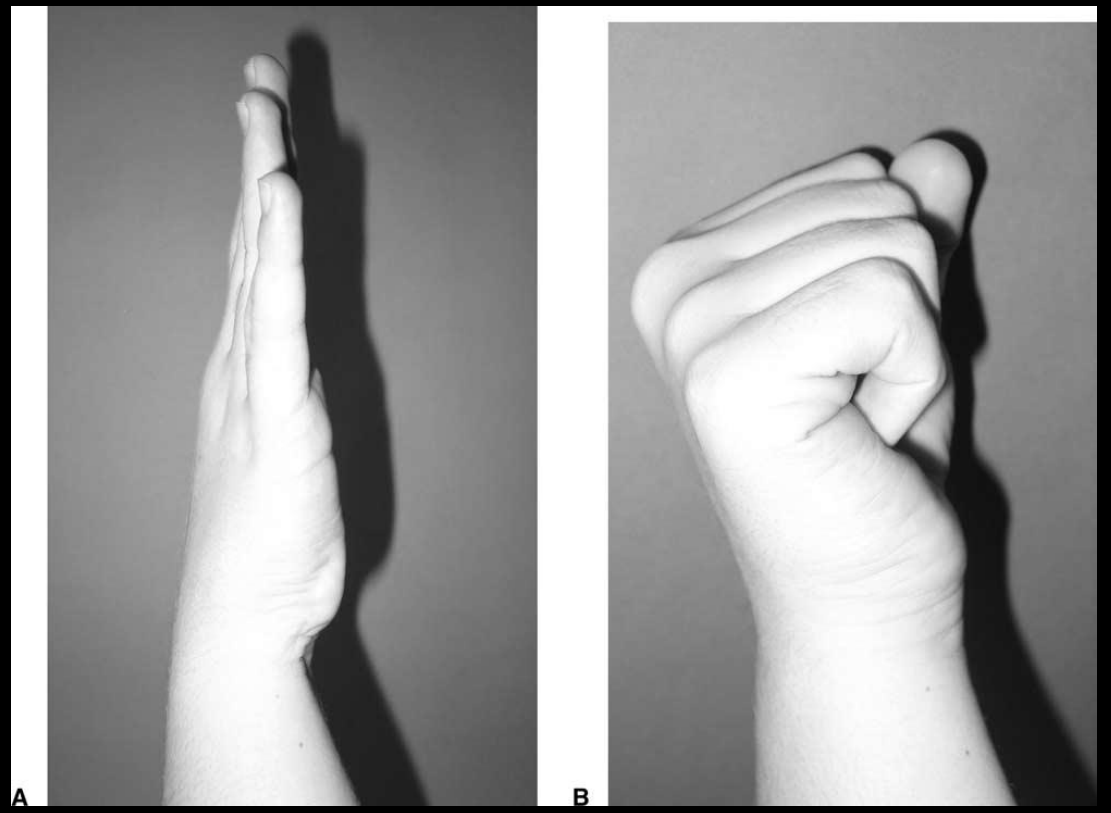

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Metacarpal fractures

- 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

Non-locking

Locking

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Metacarpal fractures

- IM fixation – Best for fractures in the mid-diaphysis, transverse and non-comminuted
- Implant designed with proximal locking pin
- Must be removed

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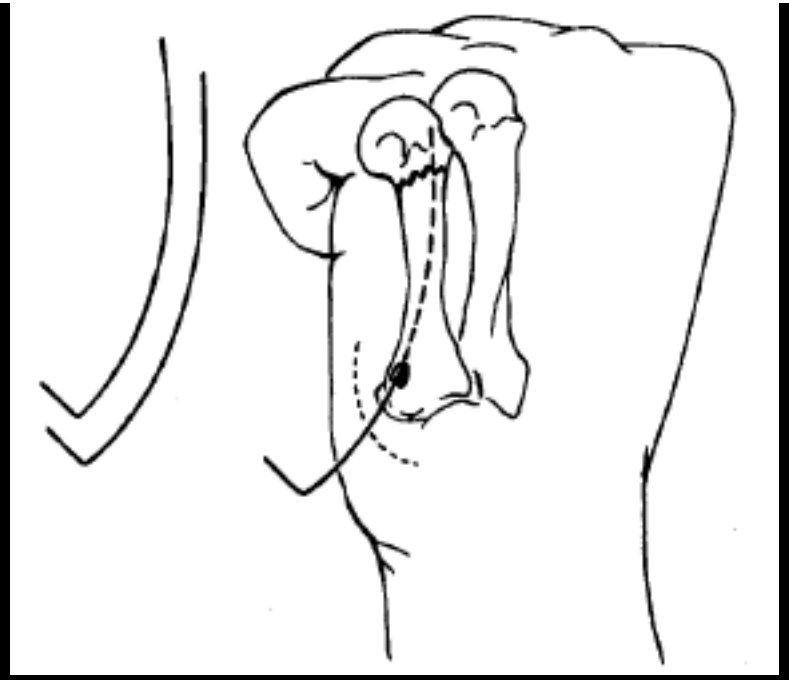
"Bouquet" Osteosynthesis in Metacarpal Neck Fractures: A Series of 66 Patients

Guy Foucher, MD, Strasbourg, France



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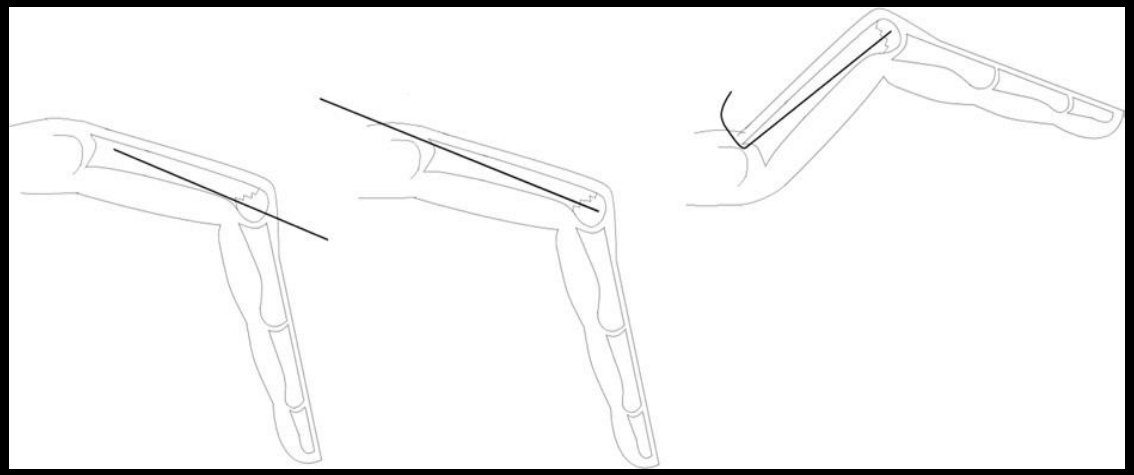

Ben-Amotz, Plast. Reconstr. Surg. 136: 370e, 2015.

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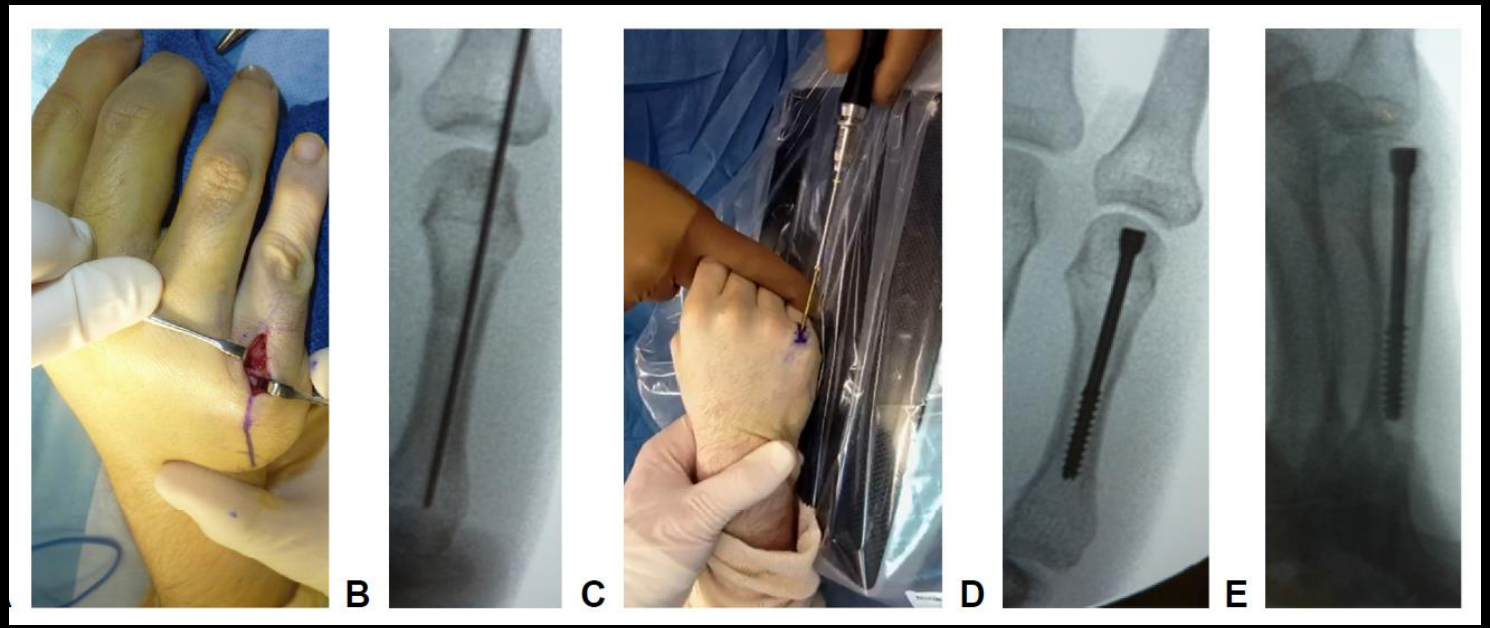
SCIENTIFIC ARTICLE

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



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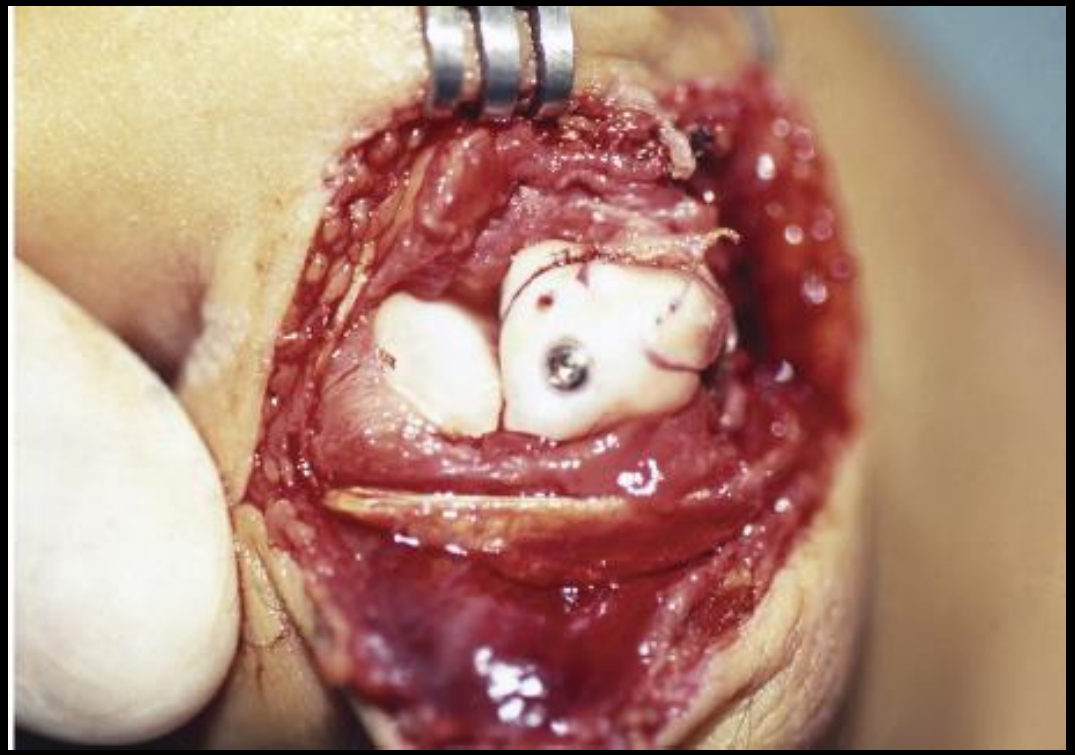
SCIENTIFIC ARTICLE

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



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Metacarpal head fracture

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Tips and Tricks

Malunion

Unicondylar malunion

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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!

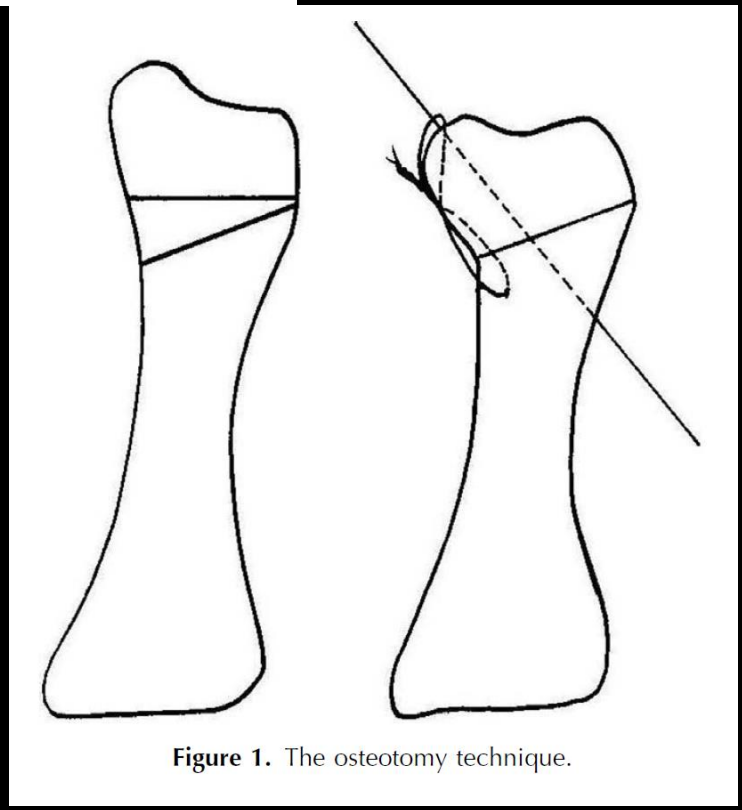

Figure 1. The osteotomy technique.

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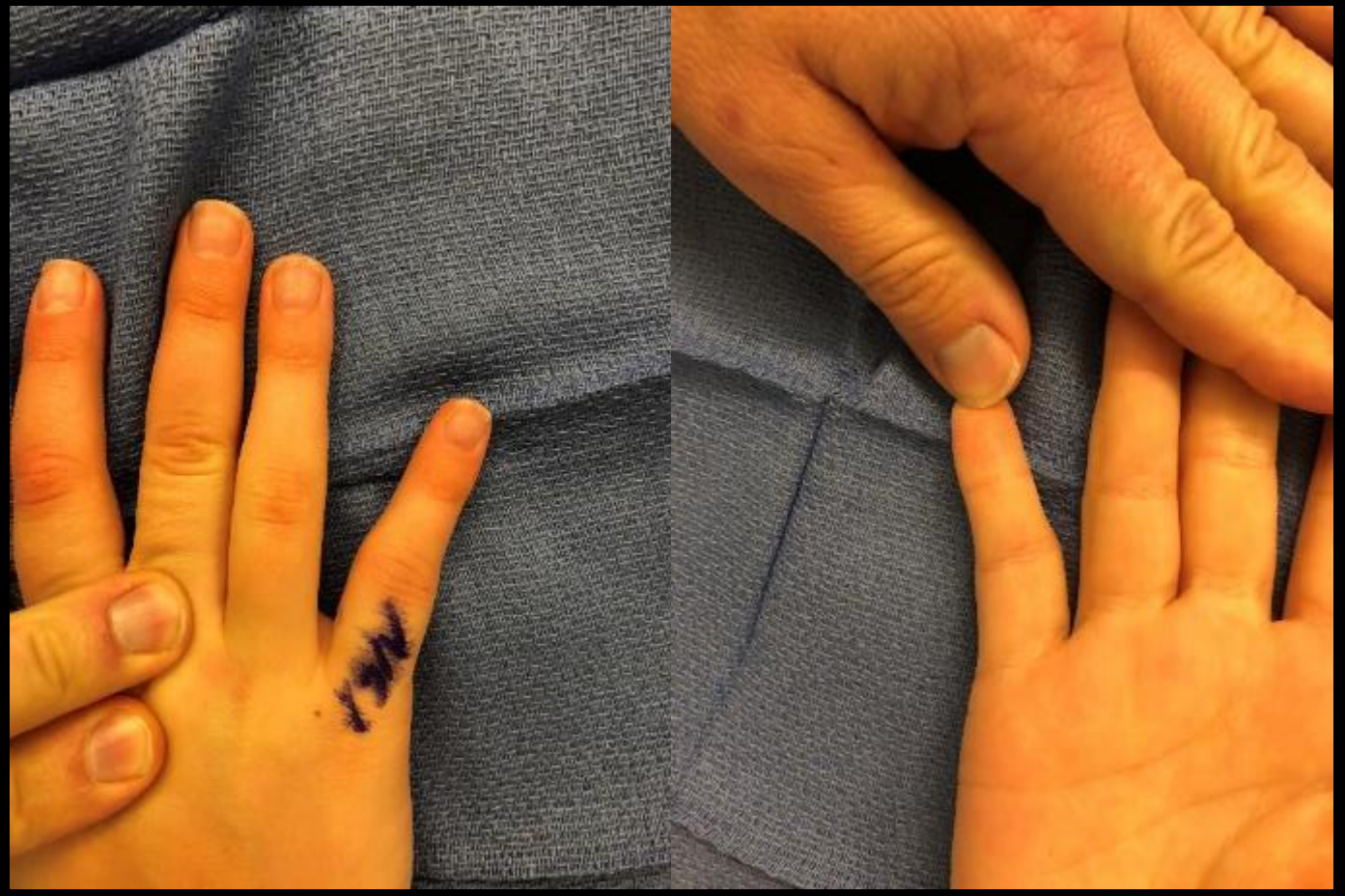
Unicondylar malunion



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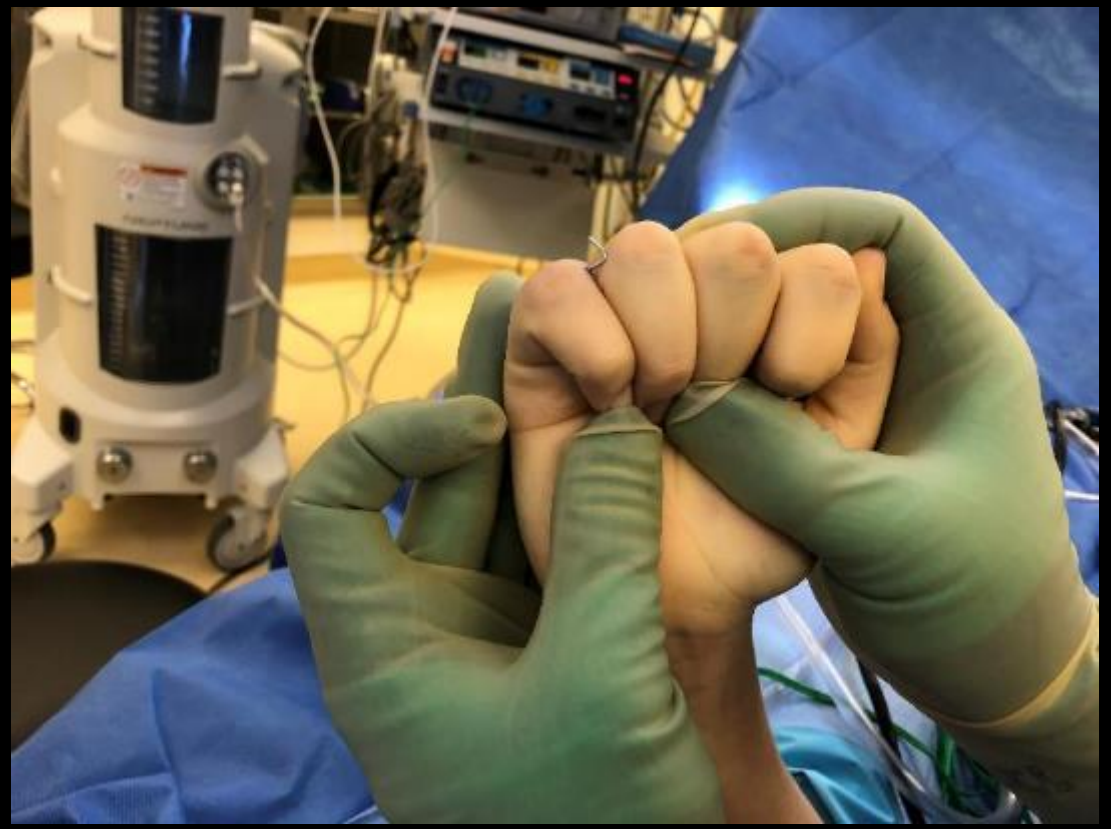

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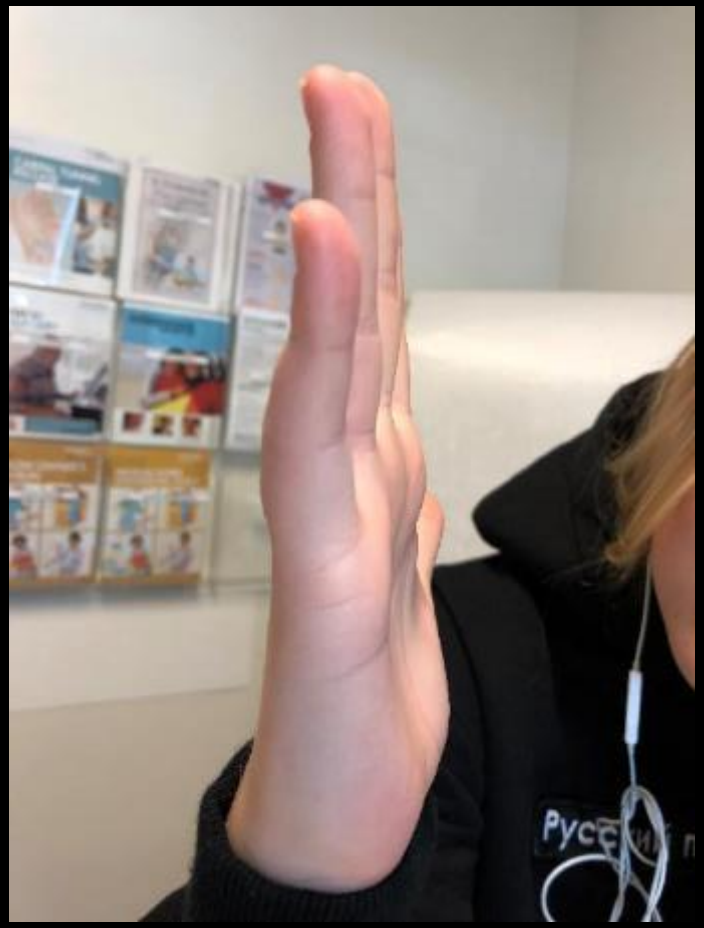
6 weeks postop



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Complications

- Loss of motion
  - Most common
- Malunion
  - Malrotation, angulation, shortening
- Nonunion
  - Uncommon

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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

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Thank You

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