Potential Problems of Metatarsal Fractures and How to Avoid Them

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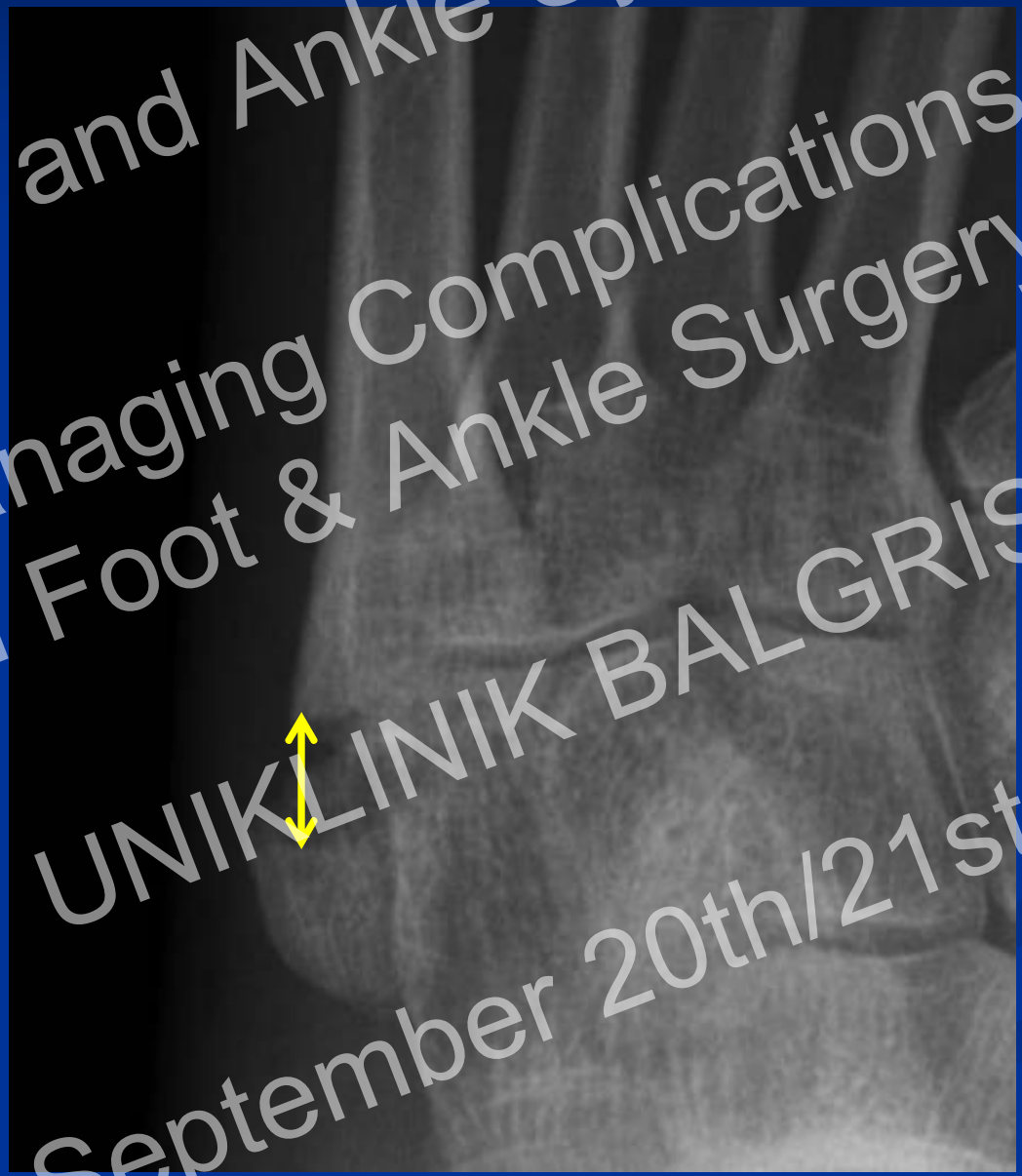
5th Metatarsal

- Tuberosity
  - All they all benign?
  - NO
    - >30% of the articular surface
    - >2m articular step off
      - Questionable
        - Slight displacement
      - No question
        - Joint facing lateral skin
    - Prominent under skin
  - 5th TMT DJD
    - Difficult and annoying to treat
  - Nonunion excision
    - Effective, but does not recreate normal anatomy

Case Example



Case Example

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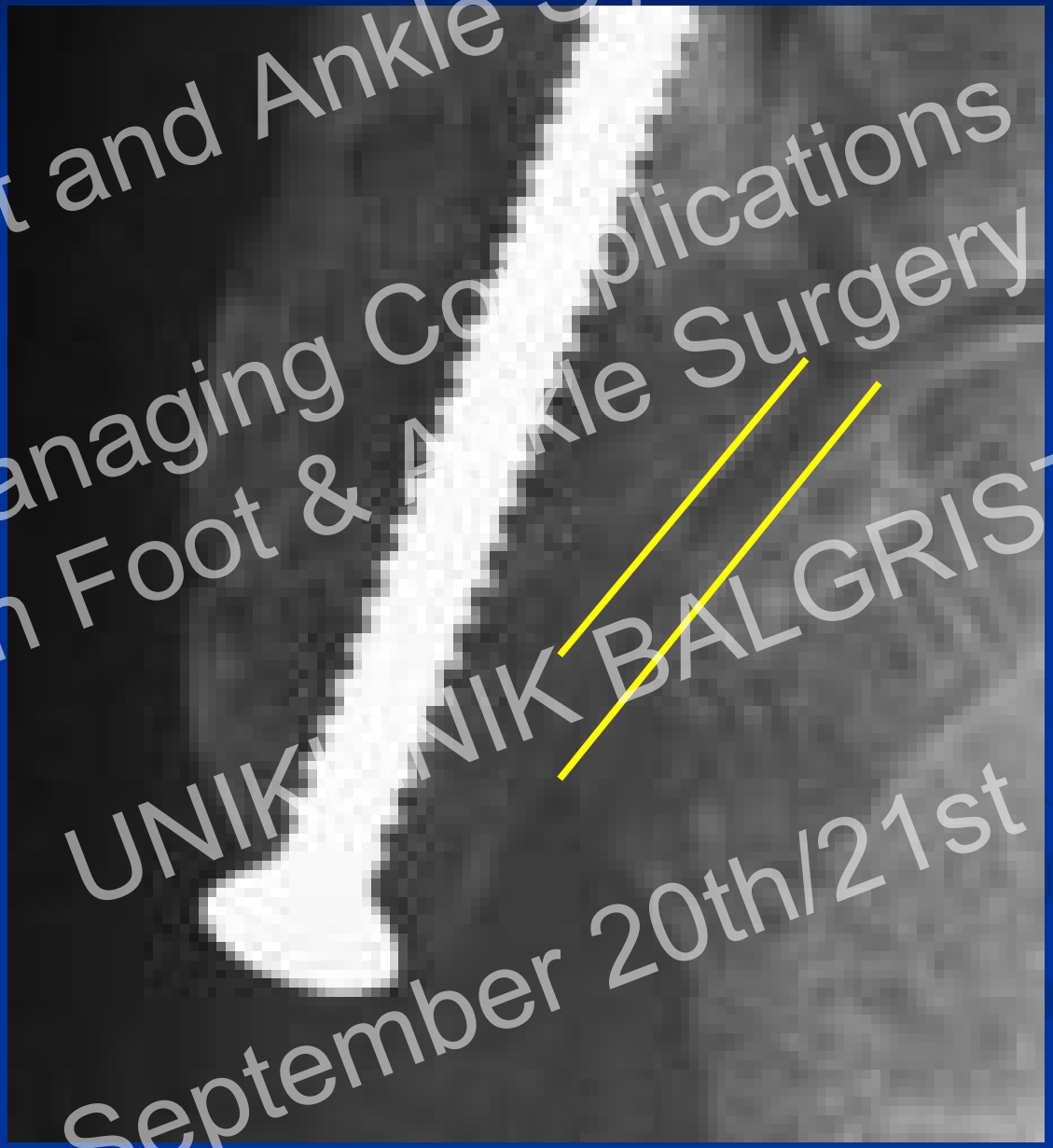

5th Metatarsal

- Zone II
  - Nonop is reasonable
    - 7-28% nonunion rate
- Beware of high risk
  - Cavus – subtle/obvious
    - Subtle
      - Orthotic PO
    - Obvious
      - Correct Deformity
  - High level athlete
  - Obese
  - Non-compliant
  - Metatarsal adductus
- ORIF
  - Zone III and High Risk Zone II

Not Likely to Heal Nonop

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Case Example

Jones Fracture – ORIF Technique

- Plates are NOT ideal
  - Thin plate offers minimal structural support
  - Thick plate is prominent
    - Removal carries risk of refracture
  - Larger exposure required
- IM screw fixation - Superior
  - Cannulated vs. Solid
    - Biomechanical answer is obvious
  - Size
    - Bigger is better?
      - NO - Risk metatarsal fracture secondary hoop stress
    - Longer is better?
      - NO - Lateral bow of 5th metatarsal
        - Create varus stress if engage distal medial cortex
  - Prominent head can irritate joint

Zone II/III - ORIF

- Screw Choice
  - Solid preferred
    - Failure of cannulated more likely related to early return to play
      - Clinical results do not demonstrate superiority
      - Biomechanical results do
  - 5.5mm most common screw
    - Be careful if choosing 6.5mm
      - Longitudinal fracture – will not be visible on xray
- Screw Length
  - Enough to have threads cross fracture- no more
  - Minimizes varus thrust
- Screw Placement
  - Reverse drill
    - Minimizes risk of cortex perforation
  - Bury Head slightly
    - Prevent irritation of 5th TMT

Technique tips

Surgical treatment

- Entry site extremely important
- Start “high and inside”

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Surgical treatment

- Entry site extremely important
- Start “high and inside”

Jones Fracture

- Surgical treatment
  - Failure to start "high and inside"
    - Prominent screw head
    - Perforation of medial cortex→stress riser

Just Cross Fracture Site

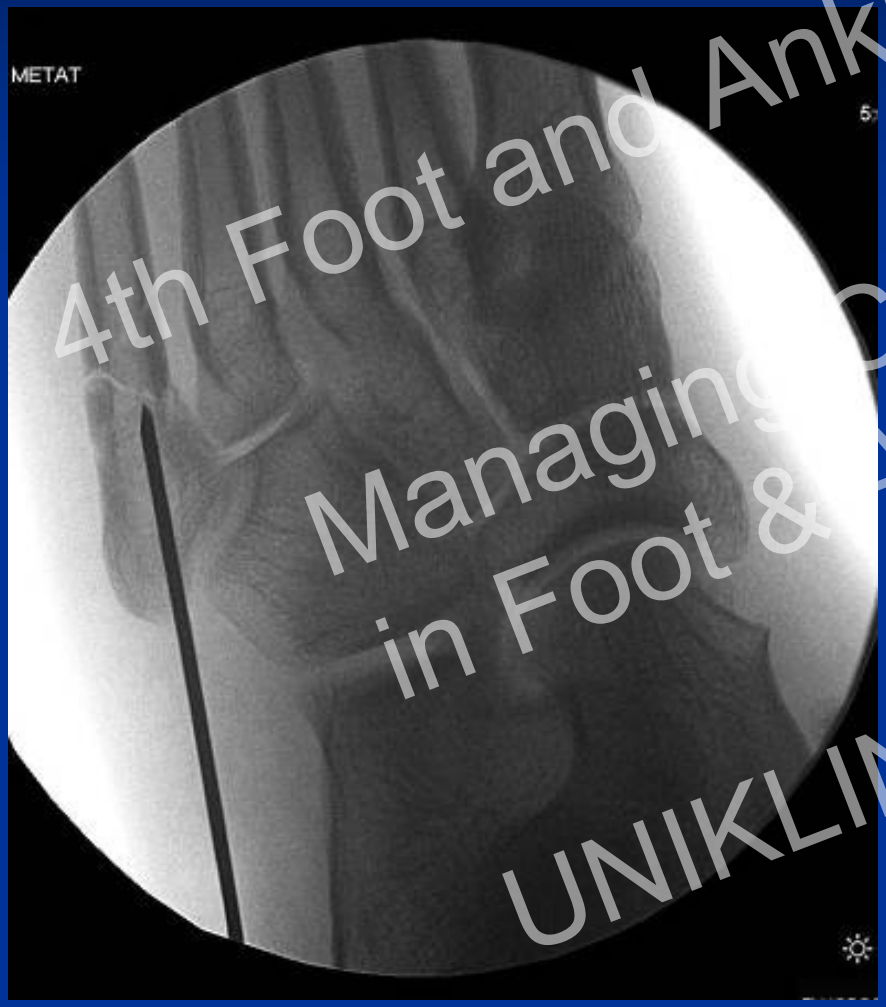
No need to go all the way down canal

Screw Selection?

- Beware of cannulated devices
  – 5th MT not a straight bone
    - Wire will bend to fit canal
    - Screw will not

Lateral Position

Slowly Advance Wire

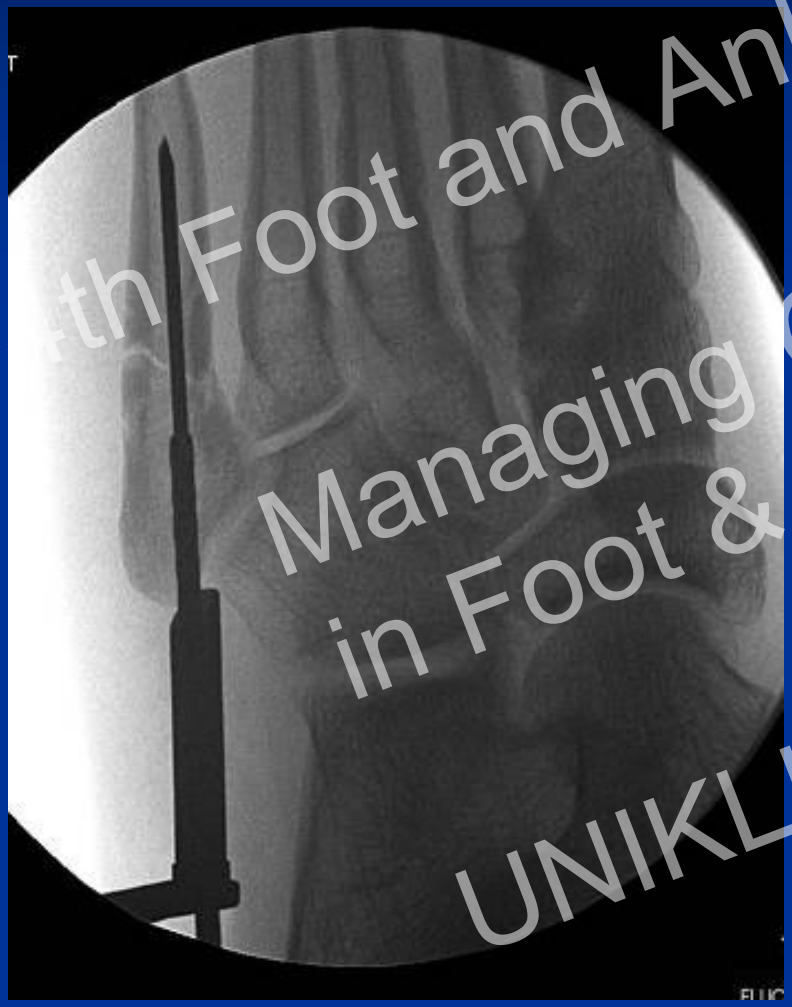


Oblique view

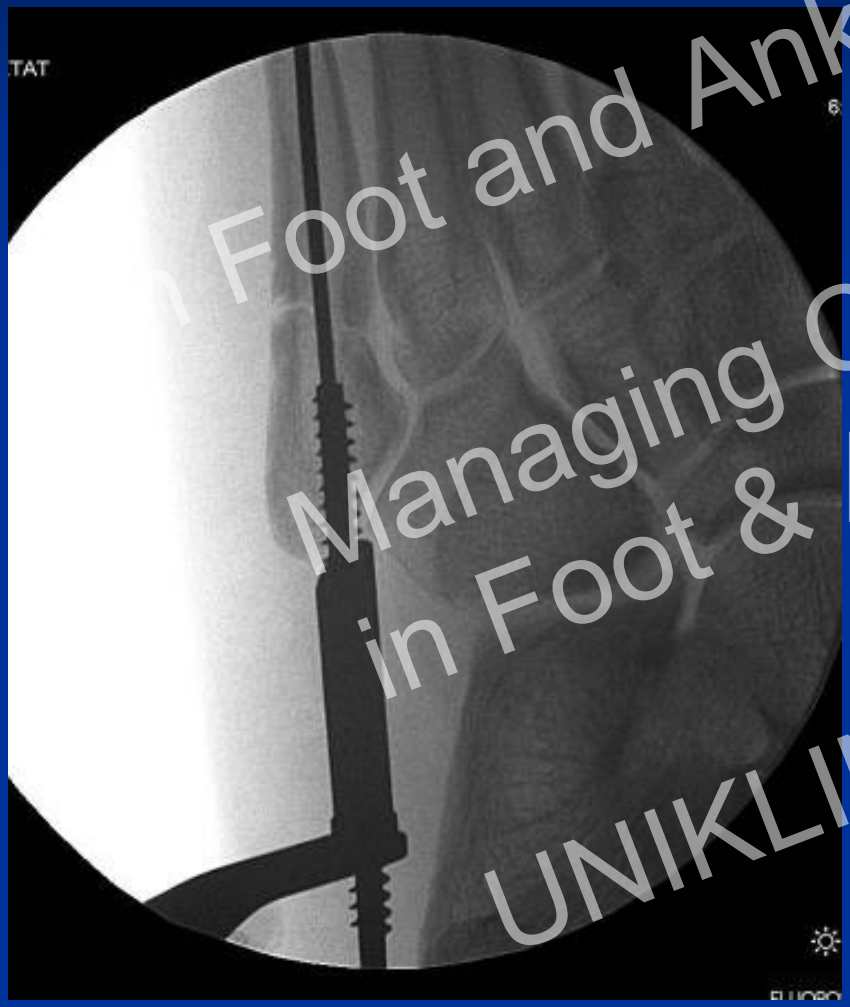
Lateral

Advance wire farther than screw

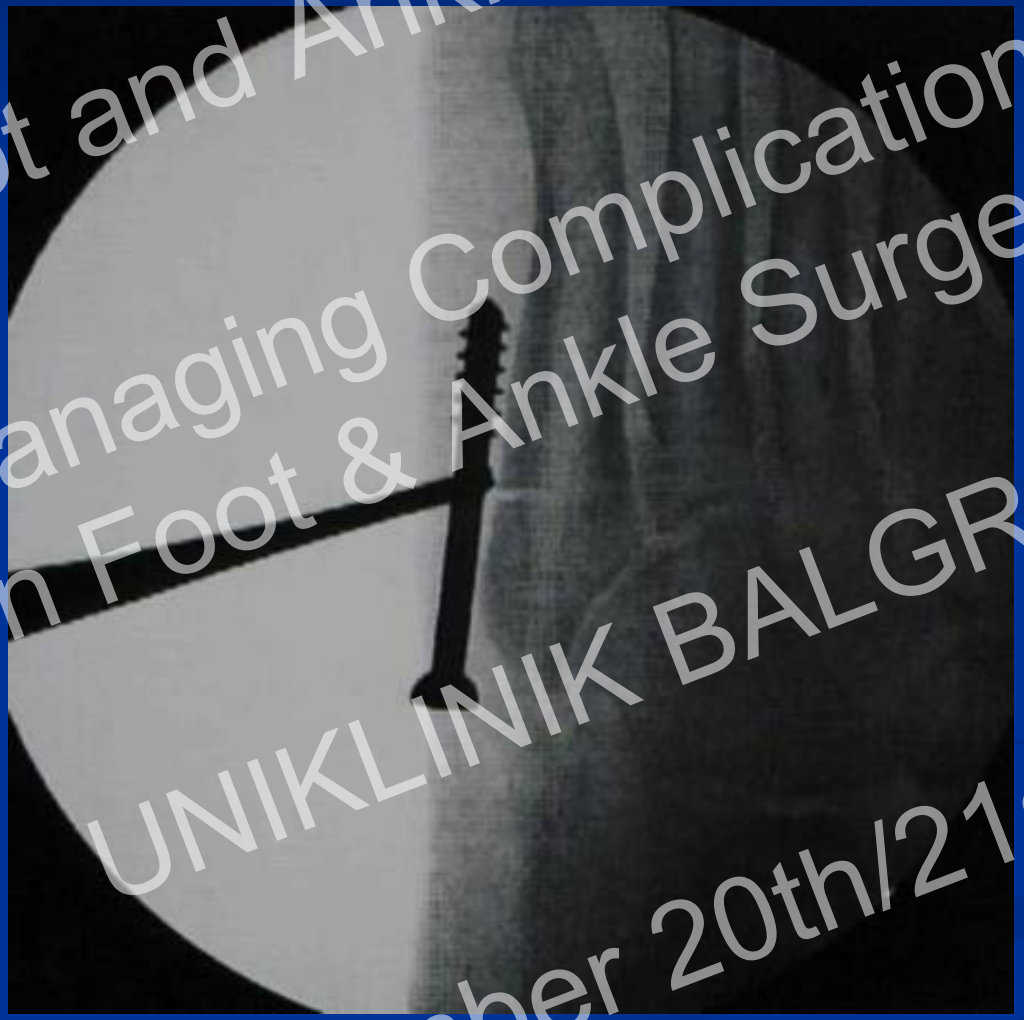
Reverse drill distally to prevent fx



Tap to assess width – "like a nail"



Just long enough to have all threads across fx



Compress and bury

Distal 5th Metatarsal Fracture

- Distal 5th MT Fracture
  - "Dancer's Fracture"
  - Nonoperative tx for all?

Just Doesn't Feel Right

- No Clinical Article to answer this question
  - Clinical deformity of 5th phalanx
  - 100% displacement
    - Possible nonunion
  - Dorsal Angulation
    - Met head prominent
  - Abuts 4th metatarsal
    - Possible impingement of interdigital nerve
  - How difficult to correct if malunion?
    - Simple – nonop ok
    - Difficult
      - ORIF

Case Example

Case Example

Case Example

Case Example

Temporary K-wire fixation

Lag screw and plate fixation

Case Example

Anatomy restored

Looks better on xray

Near Normal Anatomy

Neutral Angulation

Normal IM space restored

Lesser Metatarsal Shaft

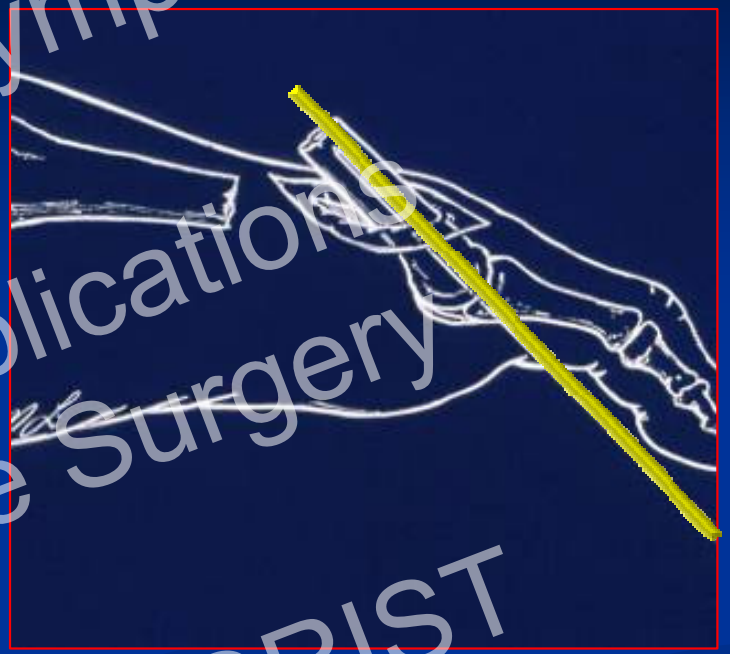
- Isolated Fractures
  - Generally Stable
    - Intermetatarsal ligaments maintain length and provide stability
  - Multiple
    - Instability
      - Progressive deformity
      - Shortening
  - Displacement
    - Post-traumatic neuroma
  - Angulation
    - 10 degrees?
      - NO data to support this
        - References refer to a book
  - Translation
    - 4mm?
      - Same as above

Lesser Metatarsal Shaft

- How to avoid trouble
  - If heals in current position
    - No deformity
    - Adequate intermetatarsal space
      - Minimize risk of symptomatic neuritis/neuroma
    - Minimal dorsal angulation
      - Prevent metatarsalgia
    - Minimal Shortening ($2^{nd}/3^{rd}$)
      - Prevent transfer metatarsalgia

Fixation

- Dorsiflexion of MTP bring distal fragment dorsal
  - 0.062 K-wire
    - Dorsally angulate fx
      - Antegrade placement (dorsiflexion of MTP avoids Plantar Plate)
    - Reduce the fracture
      - Relaxing MTP joint allows reduction
      - Retrograde placement of wire until contact proximal cortex
      - Similar to IM nail
        - Center of shaft distally will ensure reduction as enter proximal shaft



Case Example

Wires are Plantar to Phalanges

Case Example

Obliteration of 3rd and 4th IM Space

Only Fixed 4th - Mistake

What to learn

Shortening – Counsel Patient
– Difficult to Correct

Decrease in 4th IM Space –
Residual Pain

If you are gonna fix it – Fix it perfectly

Case Example

4th Shaft

5th Neck - Distal

Distal Fracture – Neck/Head

- Limited bone stock
  - Retrograde placement of K-wire through phalanx
    - "Artificially" lengthen distal fragment
    - Must ensure within center of metatarsal head to prevent malreduction

Case Example

5th Placed through phalanx

Engage Proximal Cortex

2 week PO

5 week PO – Pin Removal

1st Metatarsal

- Bears 50% of the Weight
- DF malunion => transfer metatarsalgia
- PF malunion => sesamoiditis
- Avoid Complications
  - Fix them all
    - Rigid plate fixation

Thank You

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