

Forefoot Deformities: Use of Metatarsal Osteotomies and Soft Tissue Procedures for Treatment

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Disclosures

- Arthrex

Objectives

- Provide treatment protocol for plantar foot pain
- Review advances in surgical treatment
- Review techniques in surgical treatment

Clinical workup

- Presents with forefoot pain
- PMH-consider occupation, prior injuries, deformity
- Evaluate forefoot alignment
- Evaluate hindfoot alignment-effects on forefoot
 - “dishtowel effect”

Clinical Workup

- Metatarsus primus elevatus
- Tailors bunion
- HAV
- Brachymetatarsia
- Plantar plate pathology
- Malunion

Considerations

- X ray evaluation
- MRI evaluation
- Failed conservative measures
- Develop plan for surgery

- METATARSAL PARABOLA
 - 126 degrees
 - 5th metatarsal to 1st metatarsal articular surfaces

Conservative Treatment

- Orthotics
 - Trilaminare
 - Metatarsal Padding
 - Metatarsal Bar
- Darco Toe Realignment Splint
- Injection

Metatarsal Pain

- Medial Column Pathology
- Lesser Metatarsal Pain

Forefoot Pressure

- Evaluate Equinus
 - Gastrocnemius Recession
 - TAL

Medial Column Pathology

- Wounds Sub 1st metatarsal head
- Sesmoiditis
- Stress Fracture/Avascular Sesmooids
- Cavus Foot

Wounds Sub 1st Metatarsal Head

- Fusion
 - 1st MPJ
 - 1st MCJ
- Dorsiflexory Wedge Osteotomy
- Excision of Sesmoids with EHL lengthening



Time 50.0

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Stress Fractures/Avascular Sesmoid

- Due to vascularity, many stress fractures will lead to AVN
- May need excision of sesmoid
- Remaining sesmoid will have increased pressure and risk of fracture



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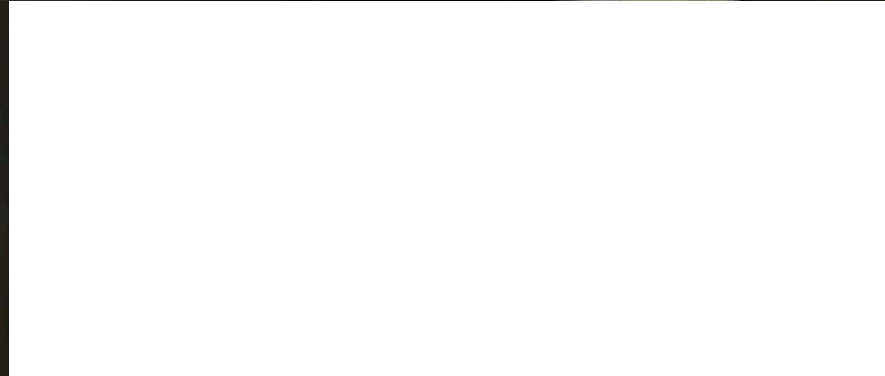


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Cavus Foot

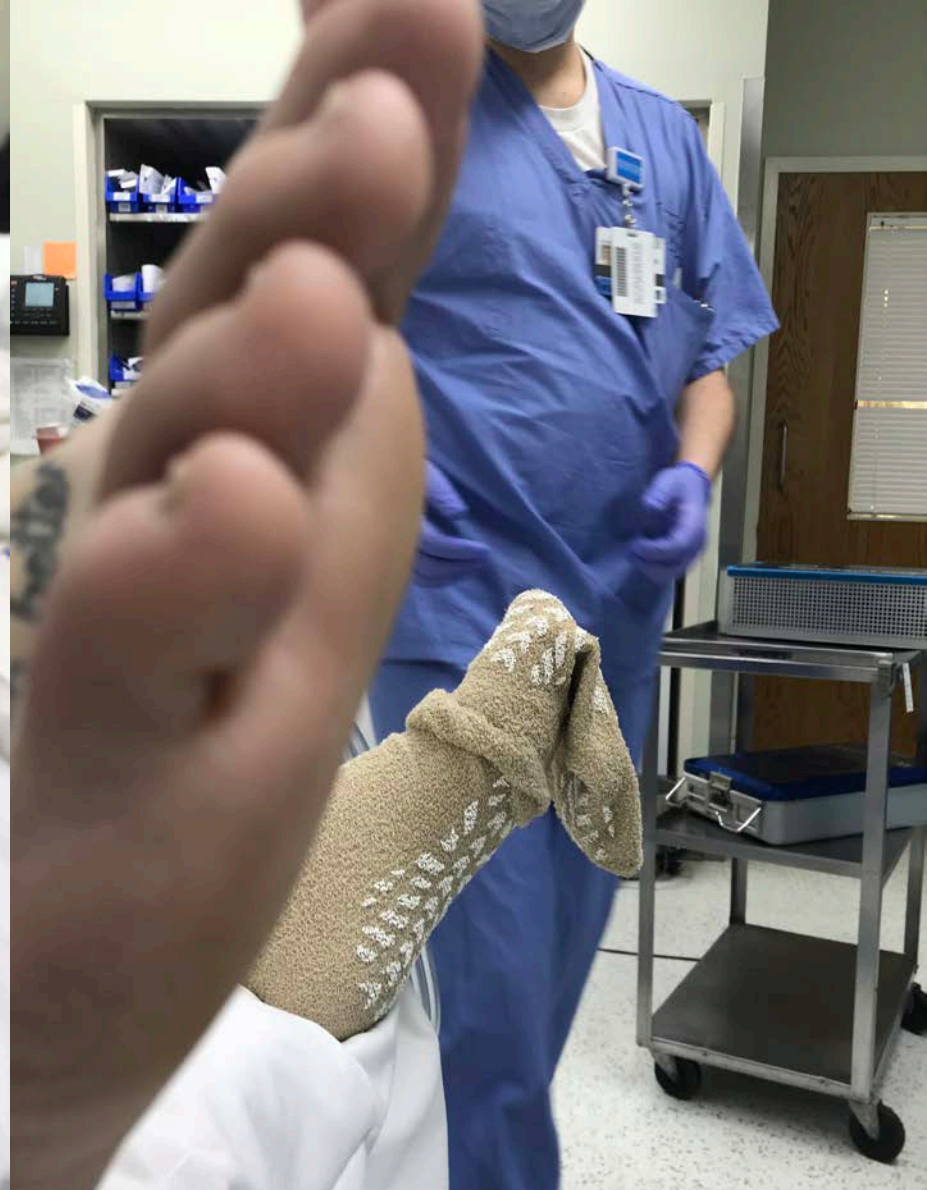
- Increased plantar foot pressure due to biomechanical imbalance
- DFWO
- Jones Tenosuspension



Lesser Metatarsal Pain

- Painful Callus
- Pre dislocation Syndrome
- Plantar plate tear
- Often associated with hammertoe contractures

Painful Callus





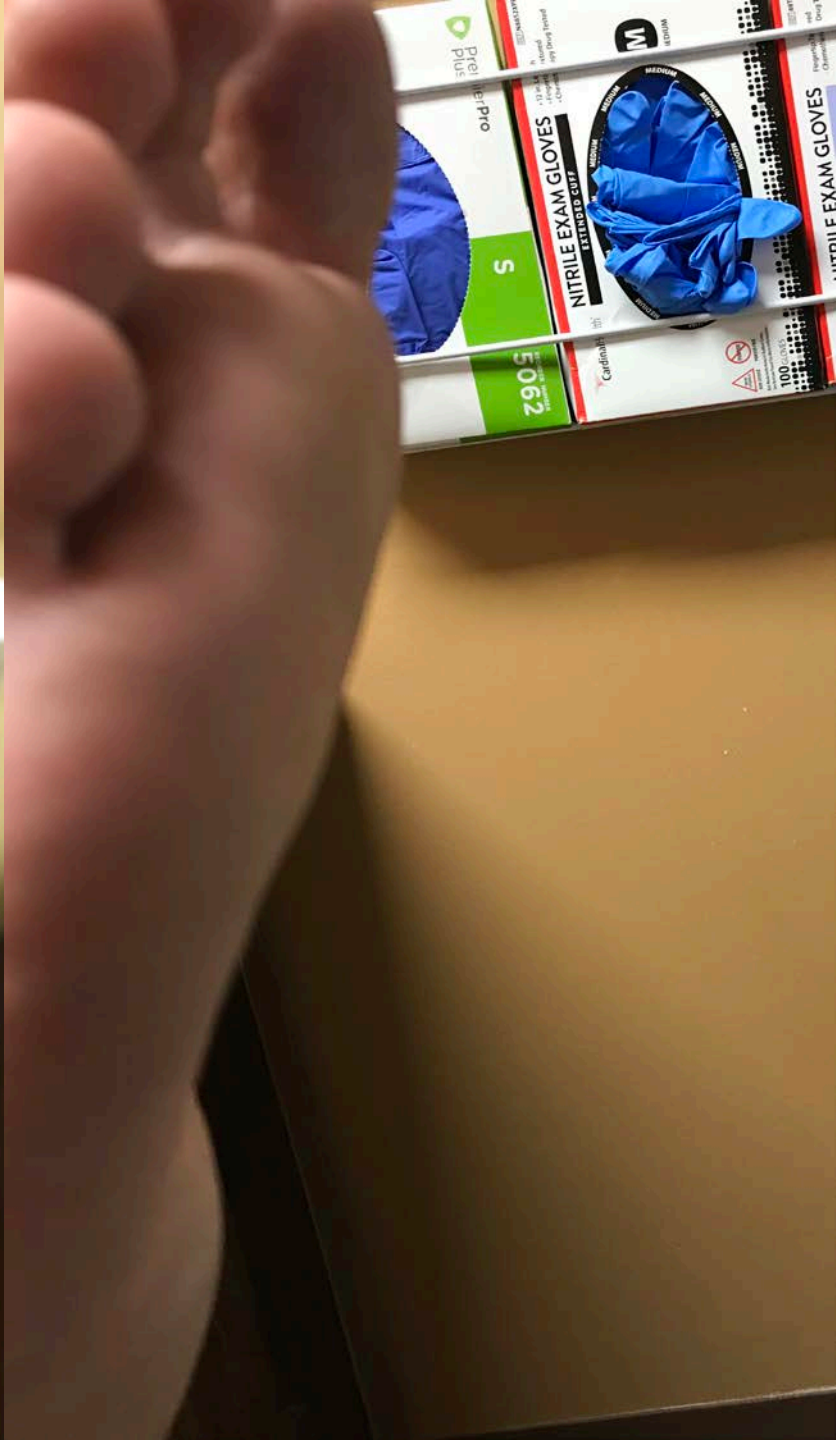
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Pre Dislocation Syndrome/Plantar plate tear



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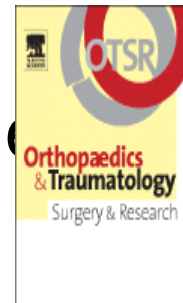


Literature

- [Foot Ankle Int.](#) 2000 May;21(5):370-4.
- **The Weil osteotomy of the lesser metatarsals: a clinical and pedobarographic follow-up study.**
- [Vandeputte G¹](#), [Dereymaeker G](#), [Steenwerckx A](#), [Peeraer L](#).

Literature

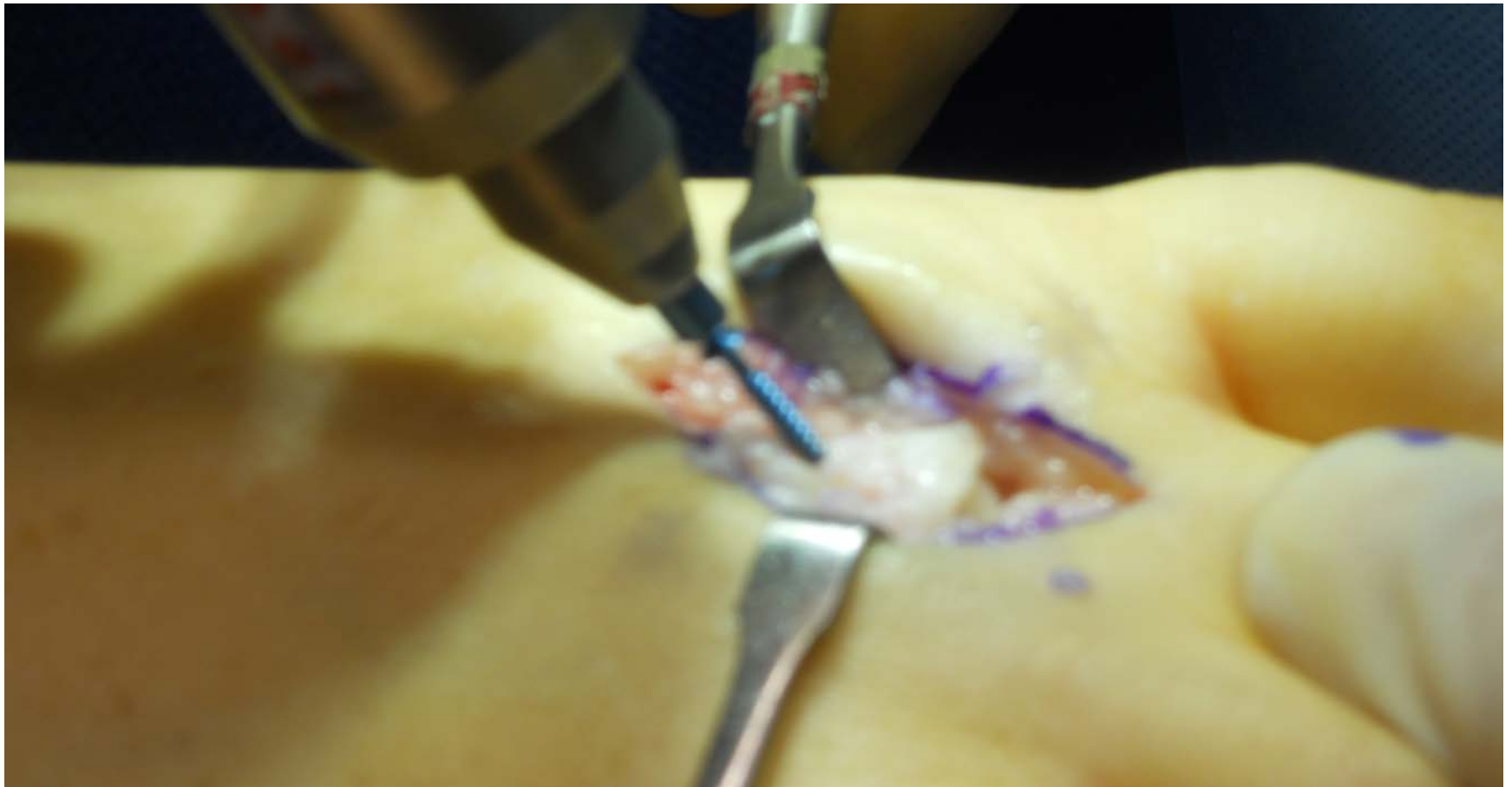
- [Orthopaedics & Traumatology: Surgery & Research](#)
- [Volume 97, Issue 6, Supplement](#), October 2011, Pages S57-S65
- Original article
- **Distal osteotomy of the lateral metatarsals: A series of 72 cases comparing the Weil osteotomy and the DMMO percutaneous osteotomy**



Weil Osteotomy



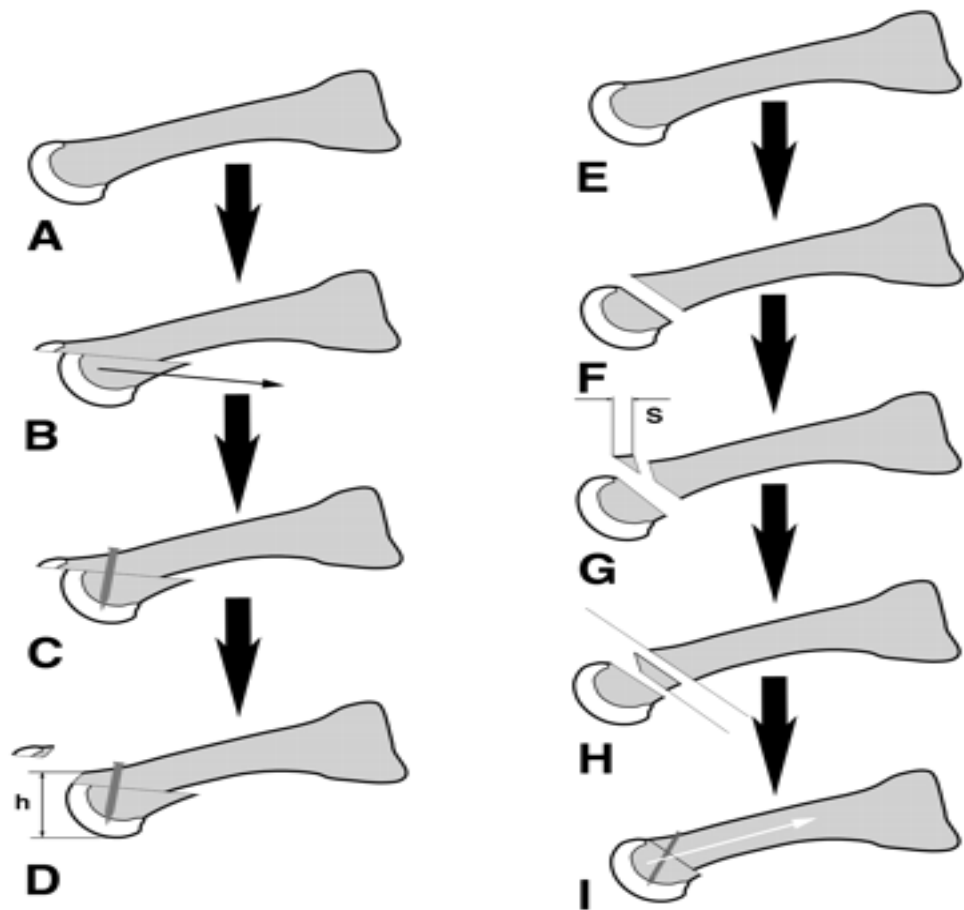
2.0 Snapoff Screw for Fixation



Keys to Avoid Floating Toe

- Angle of Weil Osteotomy
- V to Y if needed
- Post op dressing splintage in plantar position

Think About the Intrinsic



Dorsiflexion Contracture After the Weil Osteotomy: Results of Cadaver Study and Three Dimensional Analysis

- Four different angles of the Weil osteotomy were used at angles 25, 30, 35, 40 degrees.
- 25 degrees=3.03 mm depression, 5.03mm shortening
- 30 degrees=3.2mm depression, 4.59mm shortening
- 35 degrees=3.5mm depression, 4.27mm shortening
- 40 degrees=4.2mm depression, 3.65mm shortening

Dorsiflexion Contracture After the Weil Osteotomy: Results of Cadaver Study and Three Dimensional Analysis

- Conclusion:
 - The depression of the weil osteotomy changes the center of rotation of the MTP joint, and the interosseous muscles then act more as dorsiflexors than plantarflexors.

Trnka, H et al. Foot and Ankle International. 22. 47-50. 2001.

Think About the Intrinsic



Problem with JUST the Weil

- We move the callus/pain further proximal
- How to do we solve this....

Weil Osteotomy with Wedge

- Take a wedge of bone to decompress the metatarsal head and dorsiflex off of the plantar plate
- 1-2 mm wedge
- Can be used for metatarsals 2-5











WB



Plantar Plate Pathology

- Instability of the MPJ
- Causes hammertoe contracture

Pathomechanics

- 2nd MPJ Instability/Plantar Plate Tear
 - Lateral capsular and collateral ligament disruption
 - Acute trauma
 - Repetitive microtrauma
 - gradual stretching or disruption of the lateral ligament, joint capsule, and plantar plate
 - Chronic hyperextension or transverse plane forces at MTPJ
 - Long metatarsal and abnormal parabola

Pathomechanics

- 2nd MPJ Instability/Plantar Plate Tear
 - Biomechanical Aspects
 - Long or Short metatarsals
 - Hx of stress fractures
 - Inflammatory synovitis
 - Deep transverse Intermetatarsal ligament
 - Abnormal pull of the plate and structures adapt
 - Flexor tendon follows plate
 - Dorsal interosseous and lumbrical gain advantage

Pathomechanics

- 2nd MPJ Instability/Plantar Plate Tear
 - HAV
 - 1st Metatarsal displaced medially
 - Tension to sesamoid apparatus
 - Applies abnormal tension to deep transverse ligament
 - Plantar plate adapts and flexor tendon shifts

Crossover 2nd Toe Deformity

■ Plantar Plate Documented

- **1998** - Ford, LA; Collins, KB; Christensen, JC: Stabilization of the subluxed second metatarsophalangeal joint: flexor tendon transfer versus primary repair of the plantar plate. The Journal of foot and ankle surgery : official publication of the American College of Foot and Ankle Surgeons. **37**: 217-222, 1998.
- **2000** - Deland, JT; Sung, IH: The medial crossover toe: a cadaveric dissection. Foot & ankle international / American Orthopaedic Foot and Ankle Society [and] Swiss Foot and Ankle Society. **21**: 375-378, 2000.
- **2007** - Gregg, J; Silberstein, M; Clark, C; T., S: Plantar plate repair and Weil osteotomy for metatarsophalangeal joint instability. Foot Ankle Surg. **13**: 116-121, 2007.
- **2011** - Coughlin, MJ; Baumfeld, DS; Nery, C: Second MTP joint instability: grading of the deformity and description of surgical repair of capsular insufficiency. Phys Sportsmed. **39**: 132-141, 2011
- **2012** - Coughlin, MJ; Schutt, SA; Hirose, CB, et al.: Metatarsophalangeal joint pathology in crossover second toe deformity: a cadaveric study. Foot & ankle international / American Orthopaedic Foot and Ankle Society [and] Swiss Foot and Ankle Society. **33**: 133-140, 2012.

Plantar Plate Tear



Plantar Plate Tear



Plantar Plate Tear/MTPJ Instability



Plantar Plate Tear/MTPJ Instability



Plantar Plate Tear/MTPJ Instability



Plantar Plate Tear/MTPJ Instability

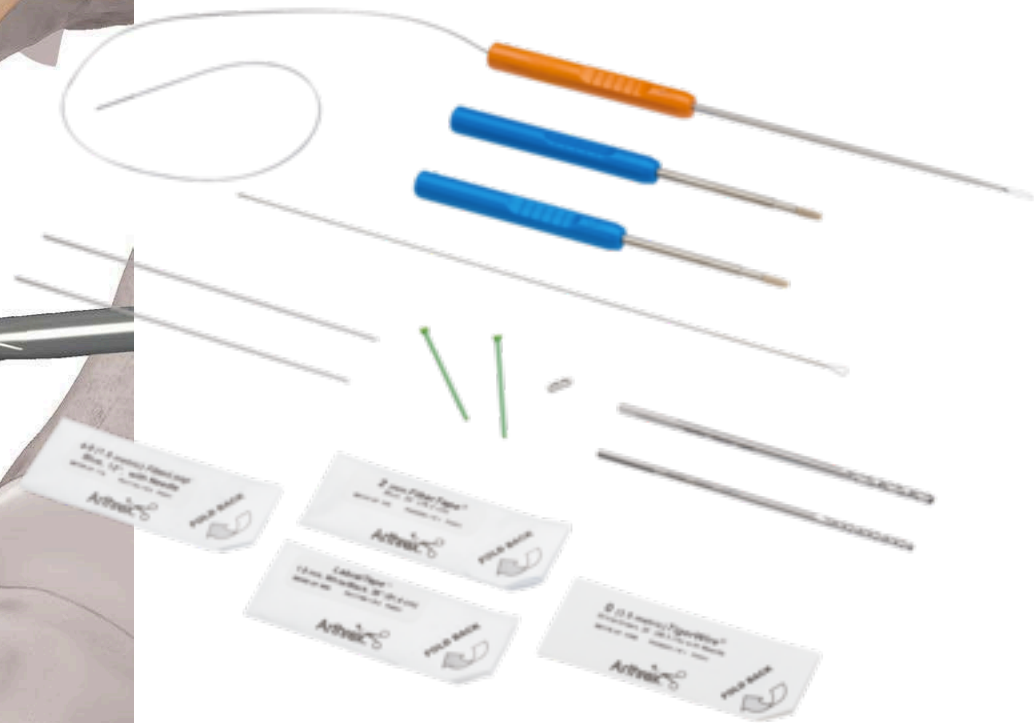
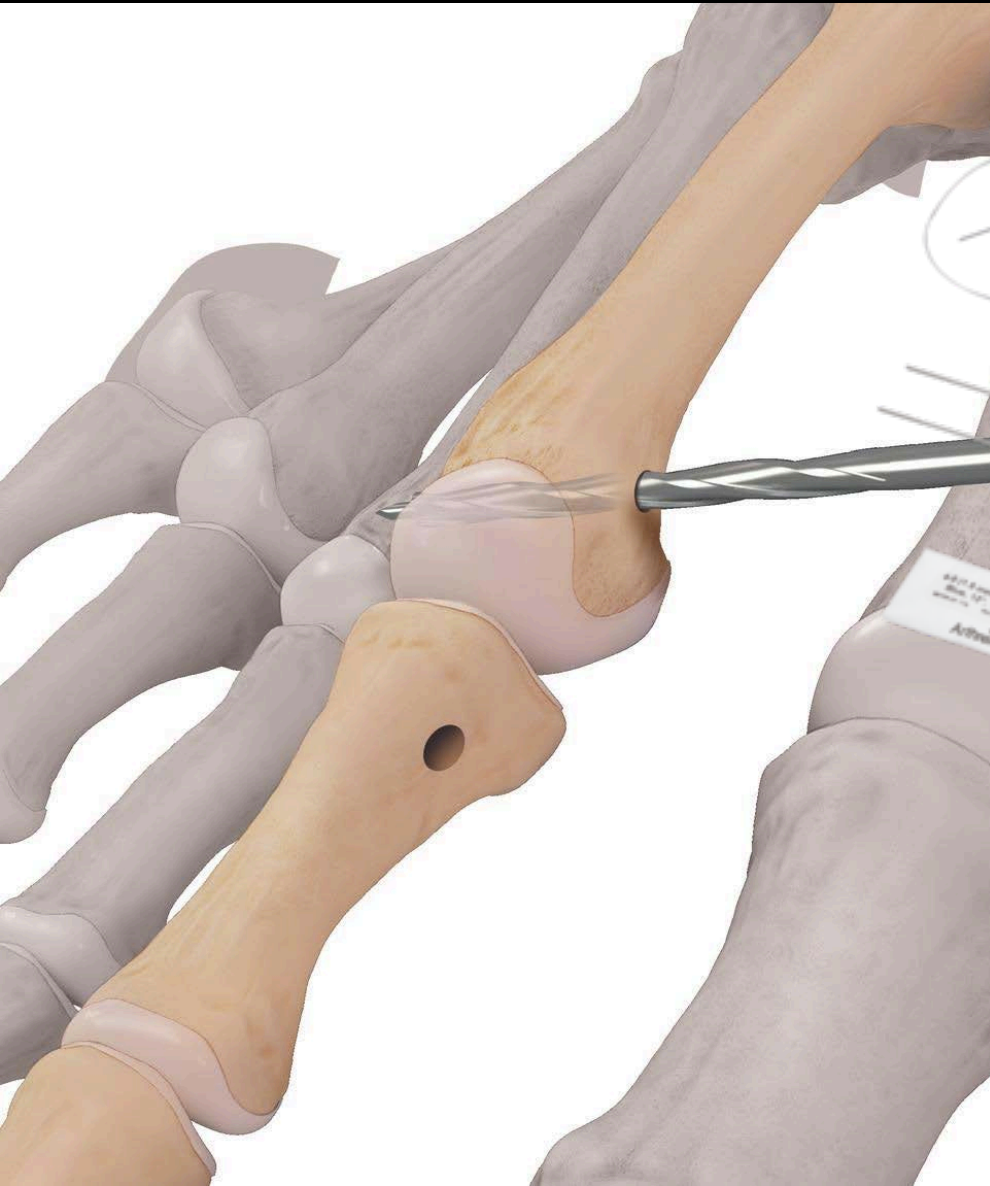


Plantar Plate Tear/MTPJ Instability

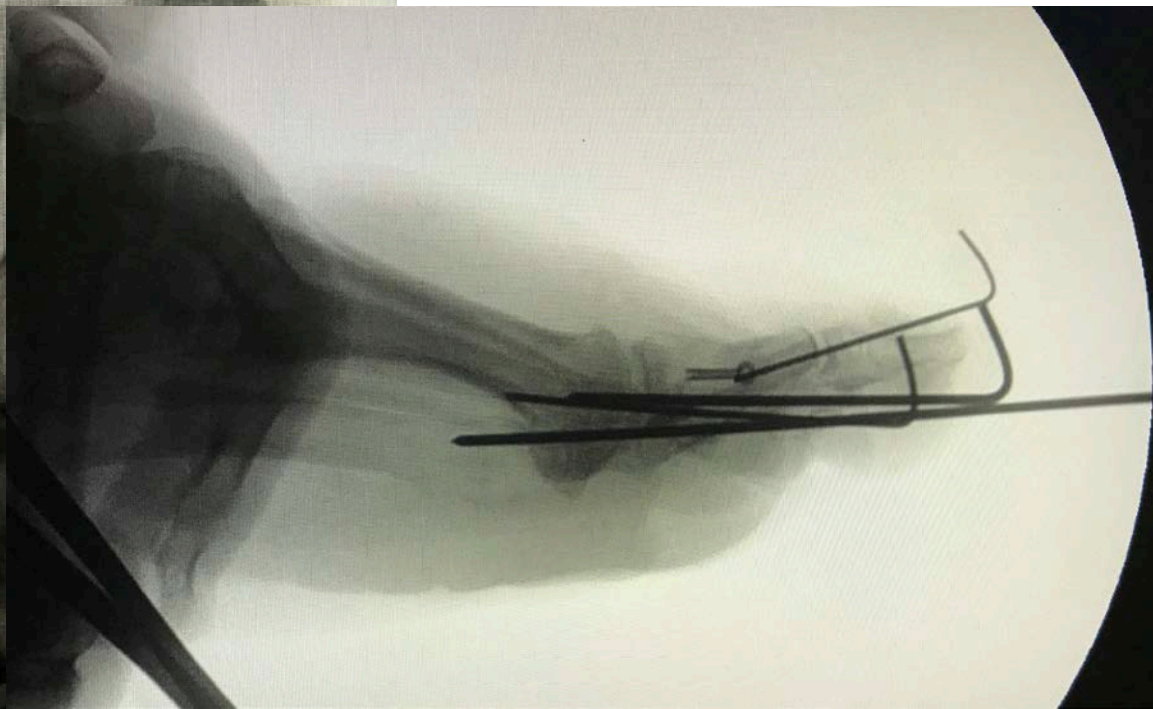
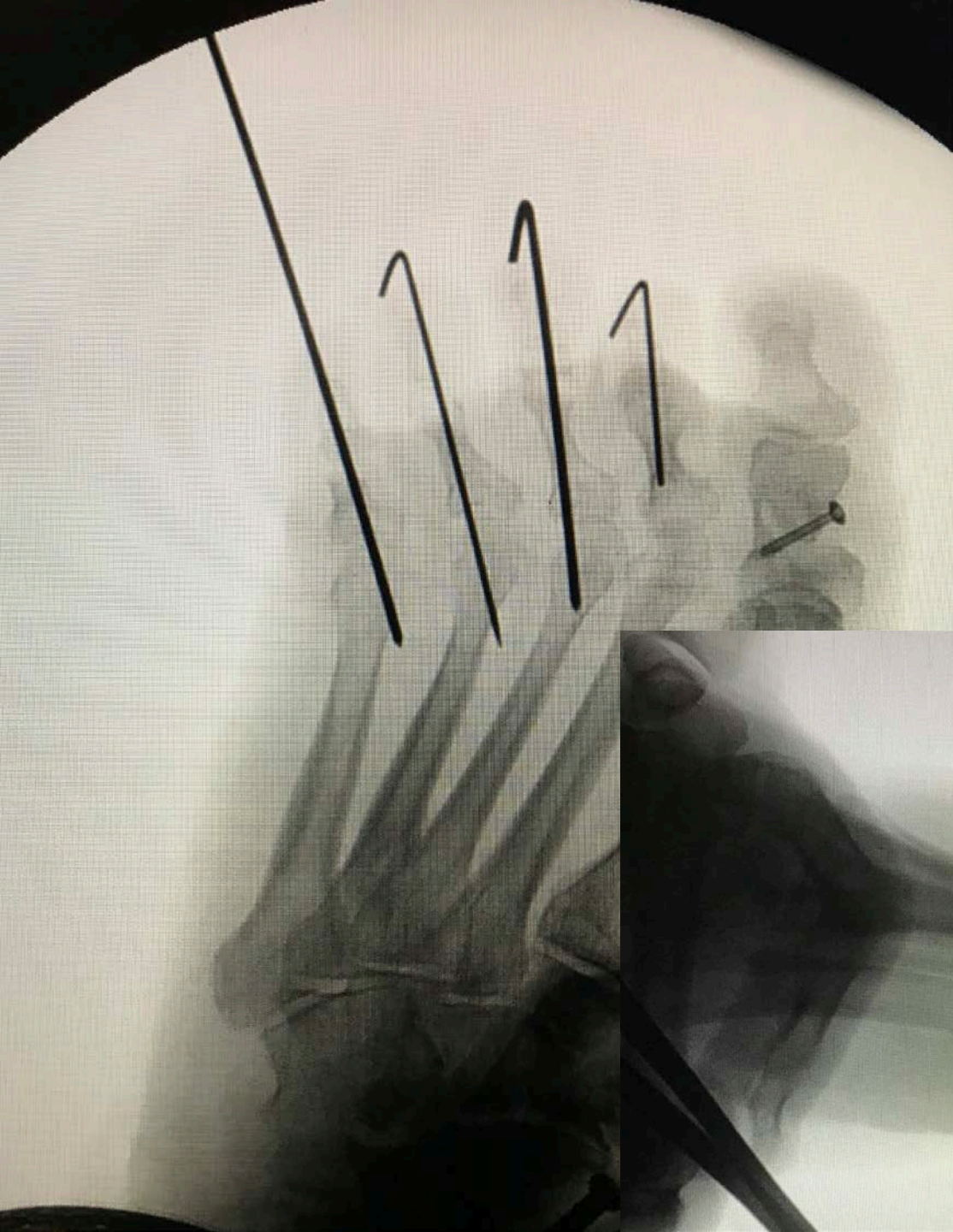




Internal Brace







Lesser Metatarsal Base Ostoeomties

- Can dorsiflex the metatarsal if prior surgery has been performed
- Can be useful if prior infection was/is present
- More power due to larger lever arm

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NOT RIGHT AP AND LATERAL



5th Metatarsal Pathology

Sub 5th MPJ callus/capsulitis

Pain associated with tailors bunion

Offload the metatarsal head pressure and prevent any reoccurrence

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MB



L

WB



WB



TKA
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L
TKA

WB





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TKA

WB

Conclusion

- Evaluate the plantar plate
- Use metatarsal osteotomies to decrease pressure on plantar structures. Use Wedge.
- Reduce deformity and maintain metatarsal parabola
- Use adjunctive procedures to offload forefoot pressure and pathology

Thank You

