

Lisfranc

Fractures



INJURIES TO THE

TARSOMETATARSAL JOINTS

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AAOS Disclosure



I have received support from the following companies:

Etex Corporation
Smith and Nephew
Synthes
Depuy
Stryker
Medtronic

I have/ done consulting work for the following companies:

Etex Corporation
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Etex Corporation
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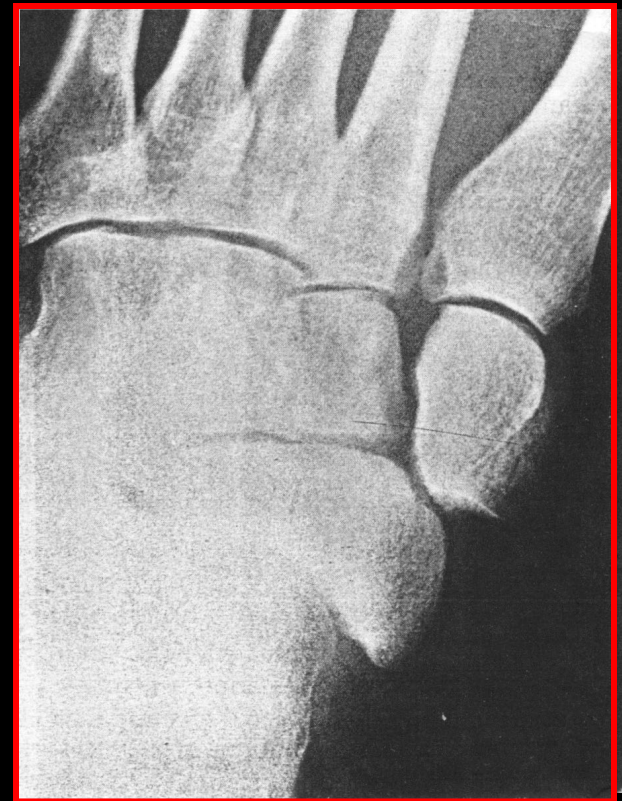
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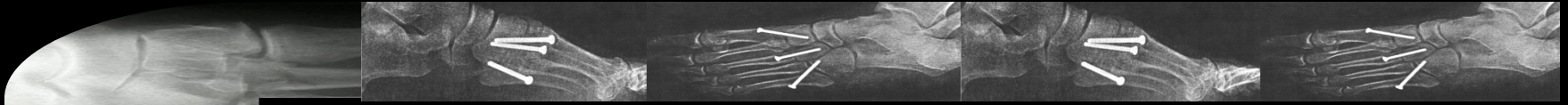


LISFRANC'S FRACTURE DISLOCATION

--treatment options

- Very rare, 2%
- 20 cases out of 100,000 reviewed
- Very small series
- Usually the result of high energy trauma
- Early recognition is essential





ANATOMY

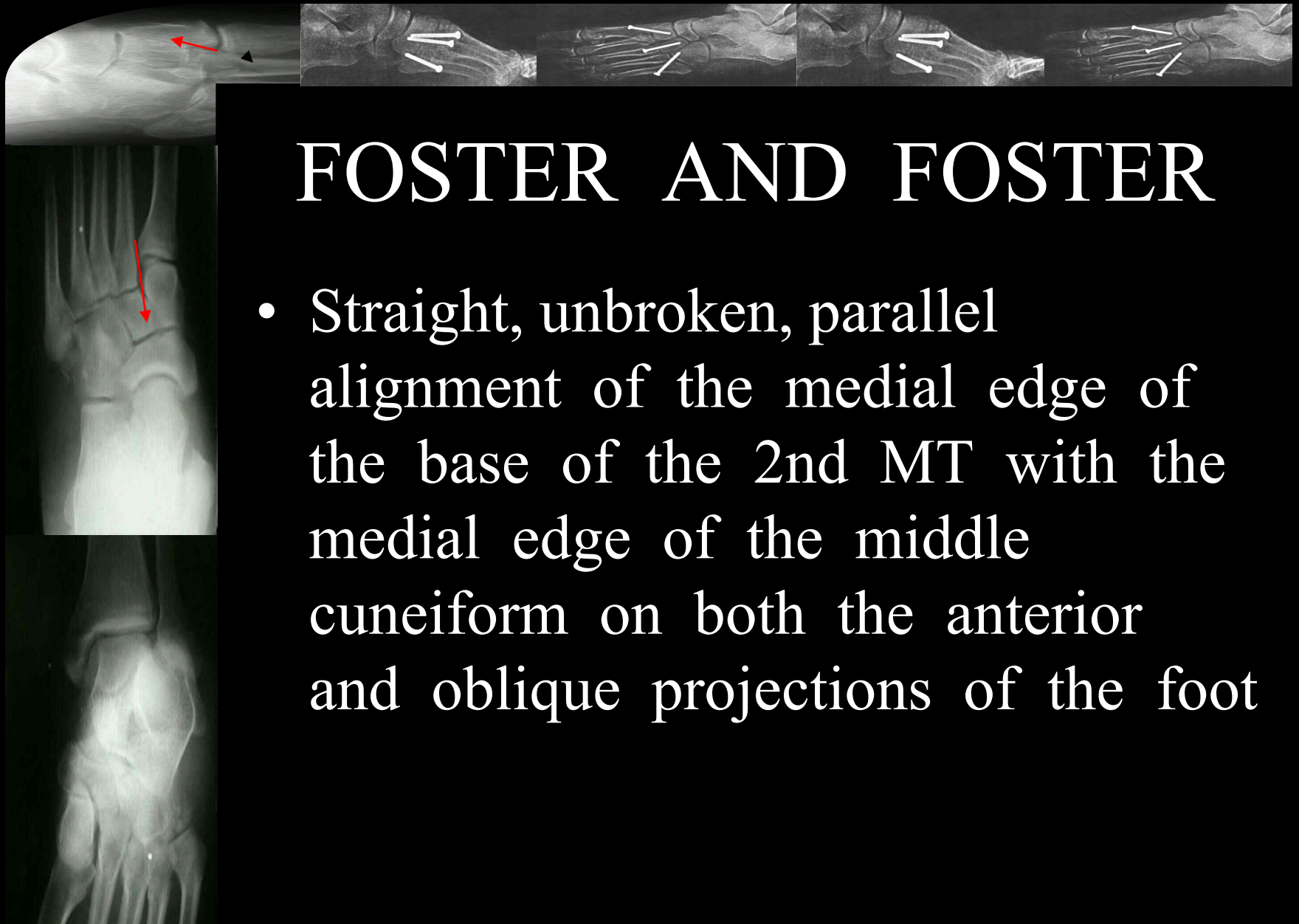
Epidemiology

Incidence

Mechanism -etc

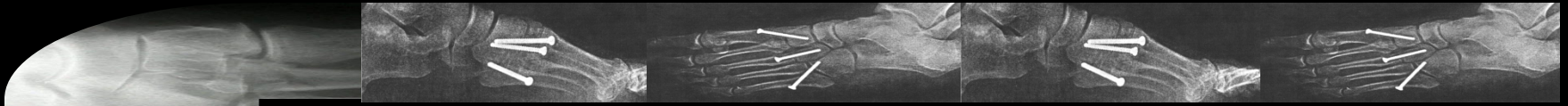
This will not be covered
fully at this time





FOSTER AND FOSTER

- Straight, unbroken, parallel alignment of the medial edge of the base of the 2nd MT with the medial edge of the middle cuneiform on both the anterior and oblique projections of the foot

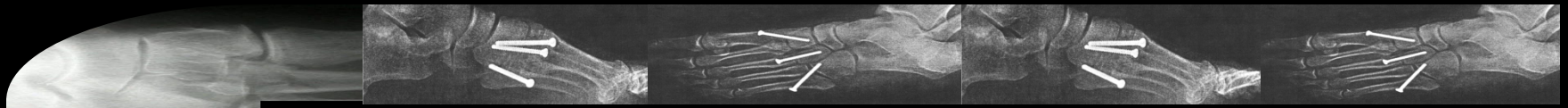


ALIGNMENT

- Medial aspect of the 4th MT is in line with the medial edge of the cuboid
- A step off of 1 to 2 mm may be a normal variant
- In The Lateral Projection

A MT is never more dorsal than it's respective tarsal bone but could be slightly plantar





CLASSIFICATION

QUENU and KUSS

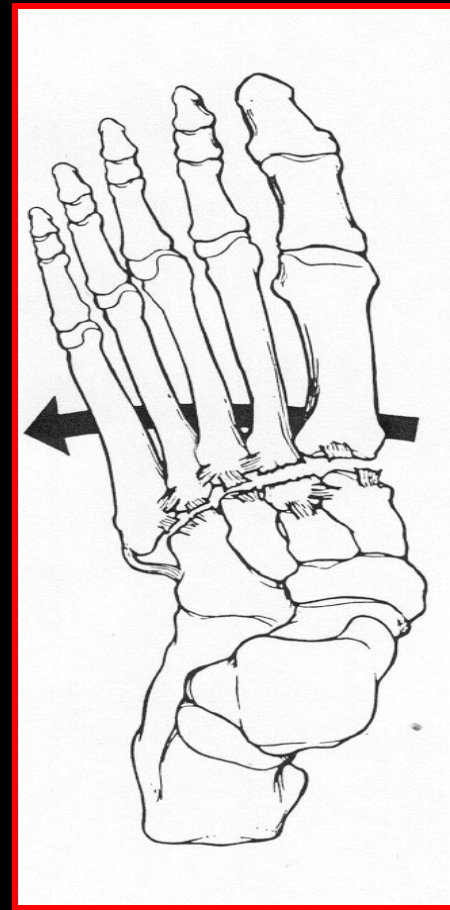
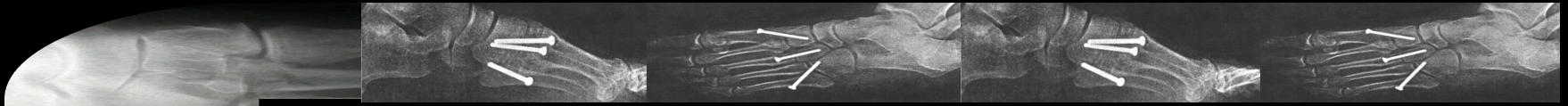
3 types :

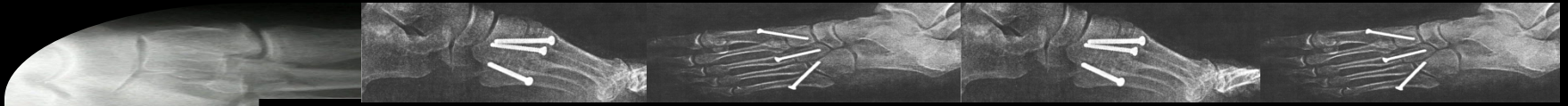
1. Homolateral
2. Isolated
3. Divergent



HOMOLATERAL

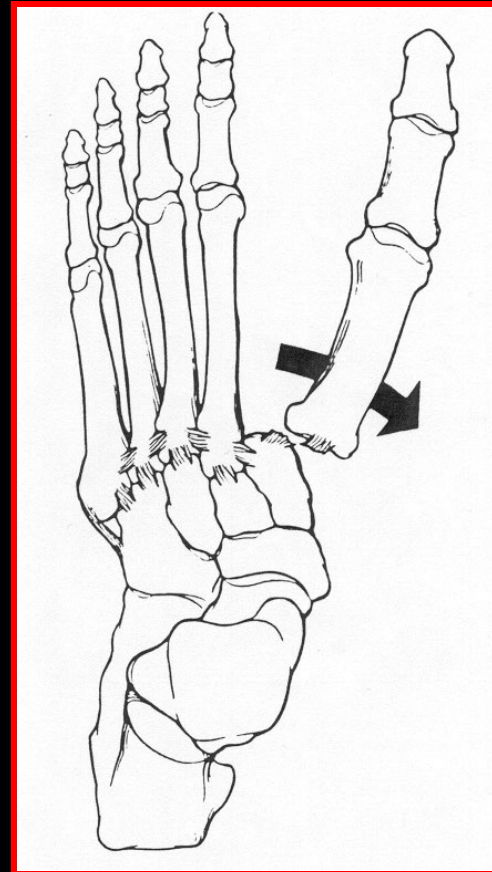
5 MT displaced
the same direction

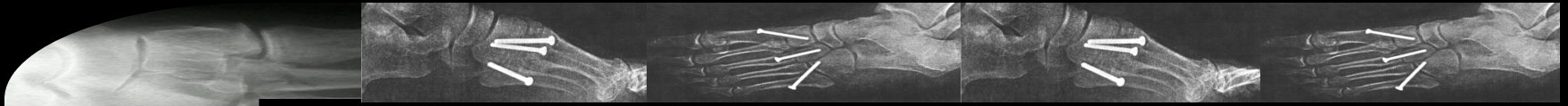




ISOLATED

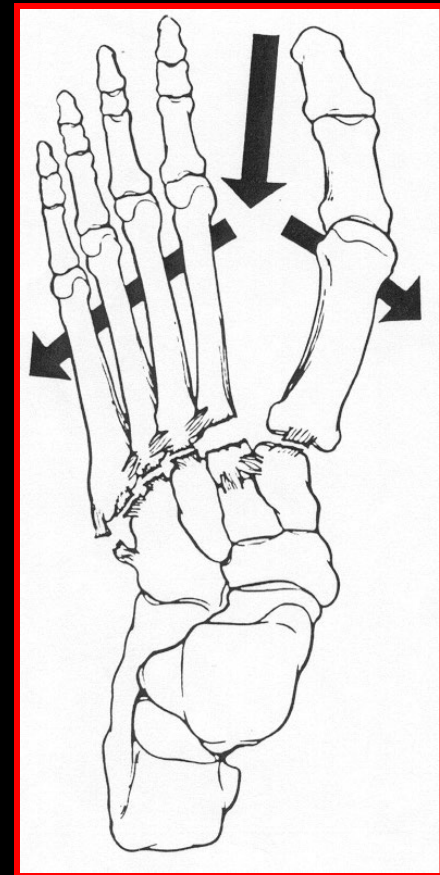
- 1st OR 2nd MT displaced from the others





DIVERGENT

- Displacement of the MT's in both the sagittal and coronal planes





OBLIQUE X-RAY

- OPENS UP the base of the lateral MT's
- Misalignment of the 1st MT is seen best on this view



Significant pain and swelling



Stress view

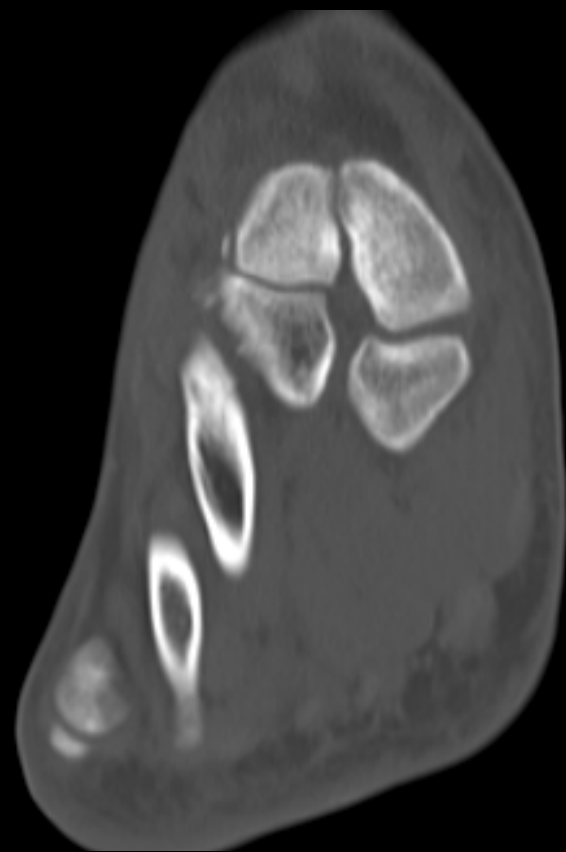
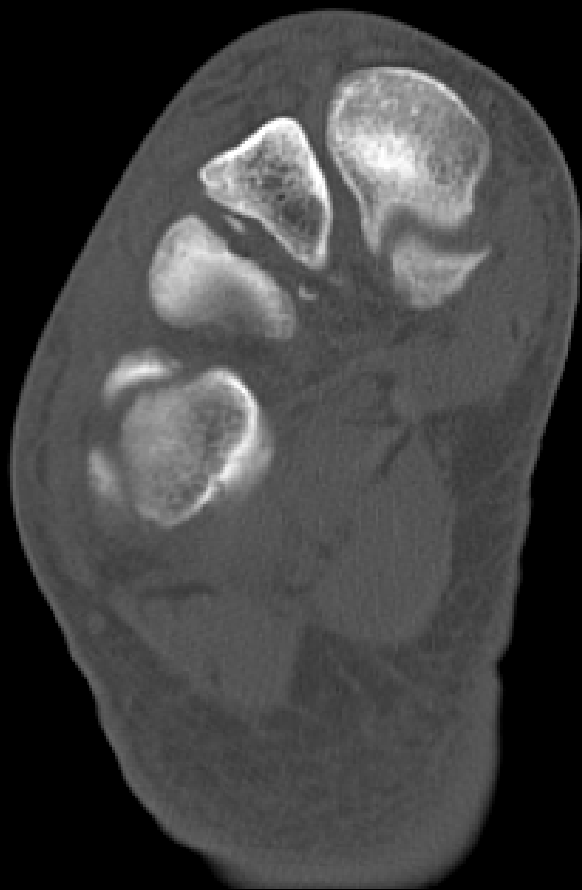






Coss, Manos, Buoncristiani, Mills, Foot Ankle Int 1998



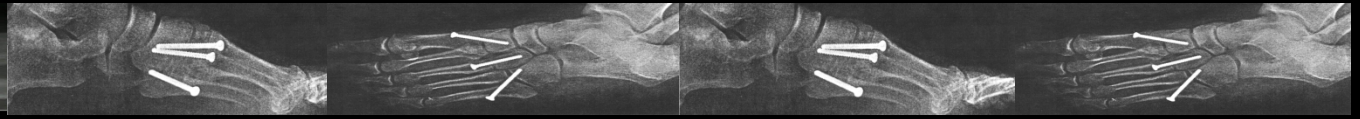




Mulier, Ryanders, Broos Belgium

“Primary arthrodesis , demonstrated no advantage in our series although partial arthrodesis in severely comminuted fractures in the medial column may be necessary in the rare case”

Any displacement in the plantar position
“Multiplanar instability”- is considered a reason for fusion by most!!



Primary Fusion is a good option in primary ligamentous global instability

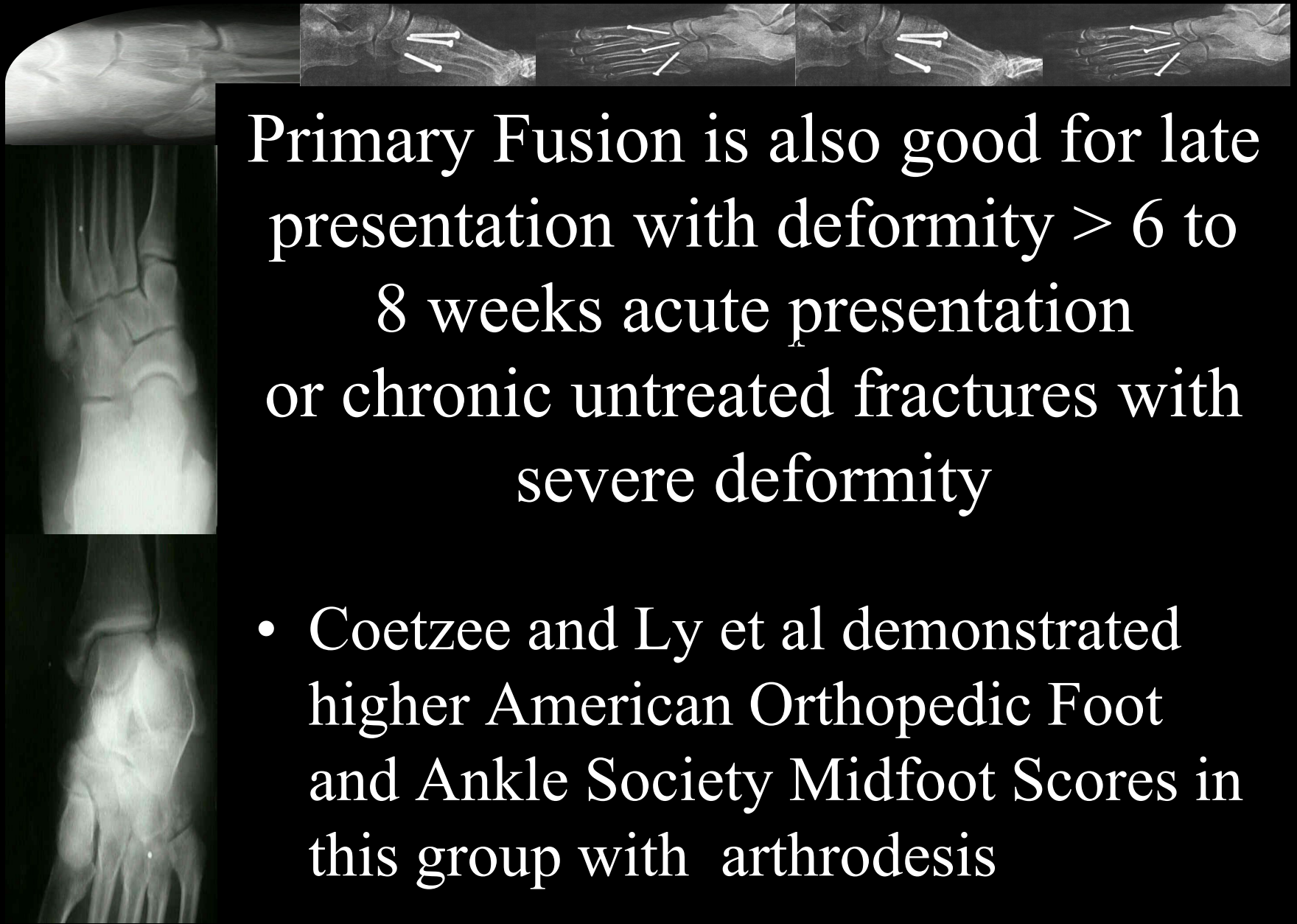
- Several authors, including Henning, Ly and Coetzee have done short term studies comparing primary arthrodesis versus open reduction and internal fixation of this purely ligamentous subgroup
- It is very difficult to get level one evidence in this rare subgroup!!



Primary Fusion studies— Henning et al and Coetzee et al

With respect to Henning et al where they looked at open reduction internal fixation vs primary arthrodesis for Lisfranc injuries

They demonstrated improved outcomes in the primary arthrodesis group based on a short musculoskeletal functional analysis.



Primary Fusion is also good for late presentation with deformity > 6 to 8 weeks acute presentation or chronic untreated fractures with severe deformity

- Coetzee and Ly et al demonstrated higher American Orthopedic Foot and Ankle Society Midfoot Scores in this group with arthrodesis

Mike Myerson

- Argues for non conservative treatment and feels ORIF enhances the result while preserving important motion particularly in the lateral column

- **Primary open reduction and fixation compared with delayed corrective arthrodesis in the treatment of tarsometatarsal (Lisfranc) fracture dislocation**
- S. Rammelt, MD, PhD, Attending Trauma and Orthopaedic Surgeon₁;
- W. Schneiders, MD, Trauma Surgeon₁;
- H. Schikore, MD, Trauma Surgeon₂

- The mean American Orthopaedic Foot and Ankle Society midfoot score at 36 months was 81.4 (62 to 100) after primary treatment and 71.8 (35 to 88) after corrective arthrodesis (t-test; $p = 0.031$).
- We conclude that primary treatment by open reduction and internal fixation of tarsometatarsal fracture-dislocations leads to improved functional results, earlier return to work and greater patient satisfaction than secondary corrective arthrodesis, which remains a useful salvage procedure providing significant relief of pain and improvement in function

Surgical Management of Acute Tarsometatarsal Fracture Dislocation in the Adult

Buzzard, B. M. MSc; Briggs, P. J. BSc, MD, FRCS

Section Editor(s): Rodríguez-Merchán, E. Carlos MD, PhD

Despite the infrequency of this serious injury, they have the potential for chronic disability and require prompt, accurate diagnosis and precise anatomic reduction to minimize long term disability. A review of the literature shows that opinions differ as to the most appropriate method of treatment for these injuries, be ORIF plus fusion or ORIF alone , but **most authors agree that it is imperative to achieve precise anatomic reduction**

59 y o firefighter



K-wires removal at 6-8 weeks

Non weight bearing for 12 weeks



9 months post op



18 y o male, s/p fall



L

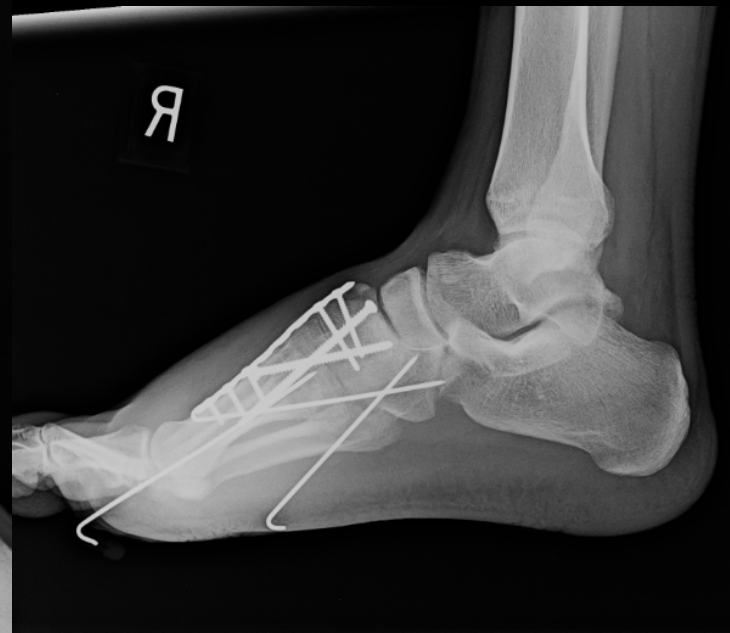


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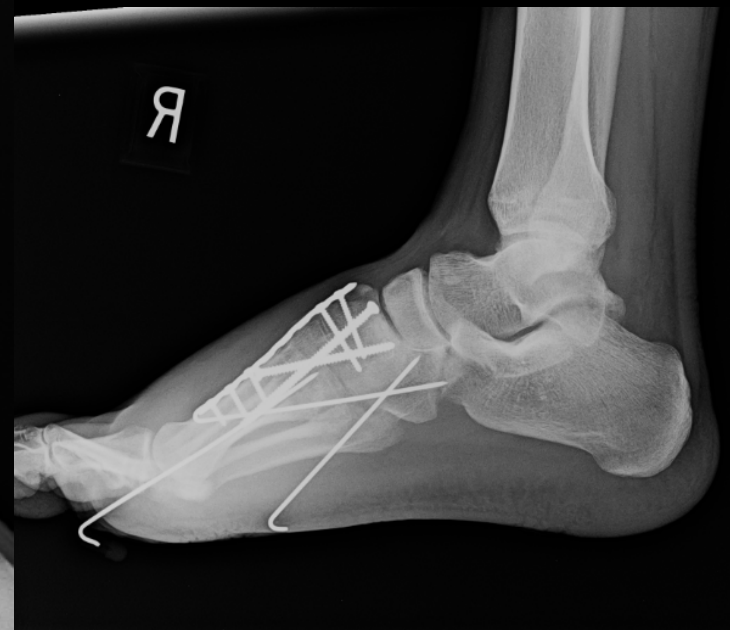


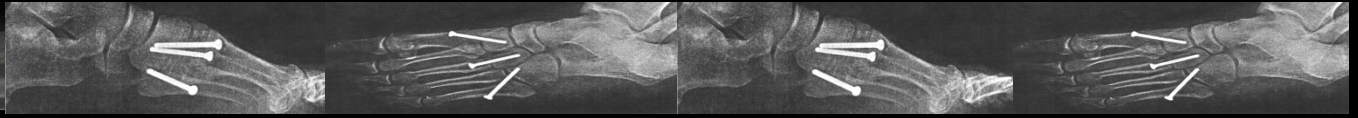
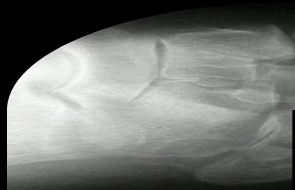
ESS

EFT



6 week follow up





OPEN REDUCTION

- Old Guideline- 2012
 - 2mm of residual displacement or more than 15 degree of persistent tarso-metatarsal angulation---
 - “this recommendation is conservative today”

2024-We really want anatomic reduction



Suggested Operating Room Setup

Patient should be slid down to the end of the table

- Flex the knee
- C-arm on ipsilateral side
- Make sure you can obtain the views you want to evaluate the reduction





DORSAL INCISIONS

Incisions should be over the second ray or just medial to it
And the lateral incision over the fourth ray

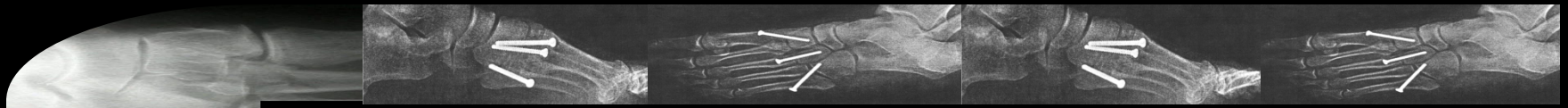


SURGICAL APPROACH

- Use a longitudinal dorsal incision over the second ray or between the first and second ray
- This provides access to the base of the 2nd MT : the usual site of obstruction!! As well as the first MT
- Do not hesitate to use a second incision over the 4th ray to open the area over the 4th and 5th MT base if needed
- Confirm reduction on plain films

Accurate anatomic joint reduction is essential

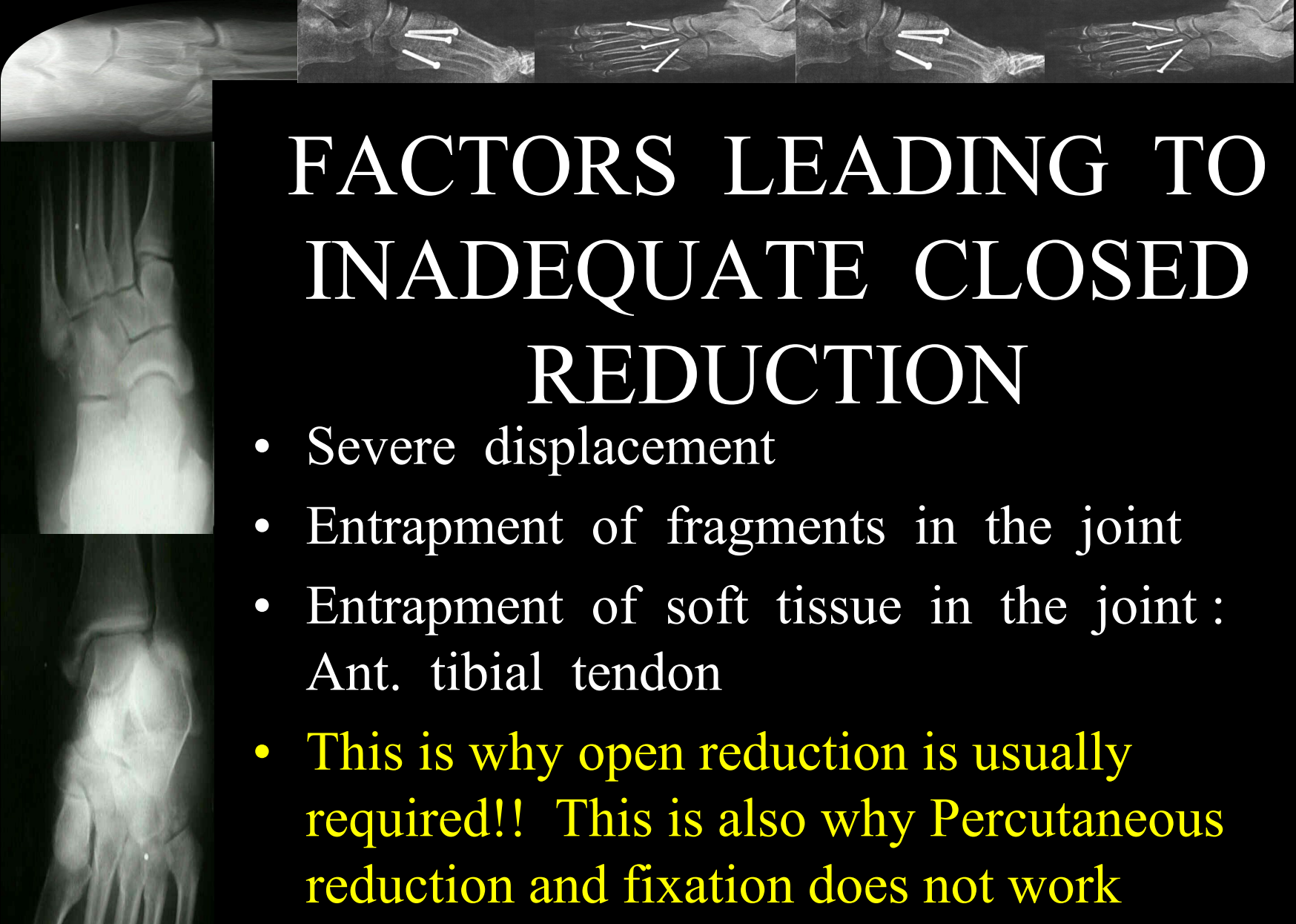




SCREW FIXATION

- Provisional wire fixation
- The unstable MT's are then fixed to the tarsus with 4.0 or 3.5mm screws
- Placed via a notch in the cortex of the MT and into the tarsus
- Wires are usually used in the lateral column






FACTORS LEADING TO INADEQUATE CLOSED REDUCTION

- Severe displacement
- Entrapment of fragments in the joint
- Entrapment of soft tissue in the joint :
Ant. tibial tendon
- This is why open reduction is usually required!! This is also why Percutaneous reduction and fixation does not work reliably



Arntz and Hansen

- Found K-wires to be unreliable and recommended ORIF with temporary AO screw fixation for both stable and unstable fracture-dislocations
 - **They recommended removal of these screws once stable!!**
 - Resch and Stenstrom also found better results with aggressive anatomical reduction
- 

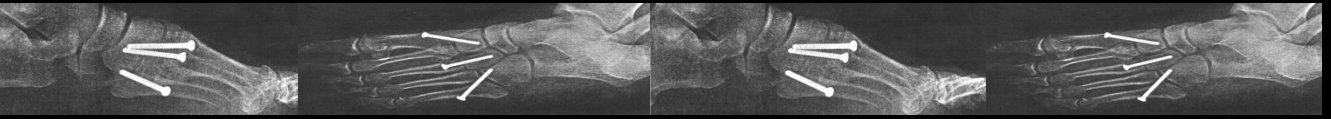




FIRM Study -COTS

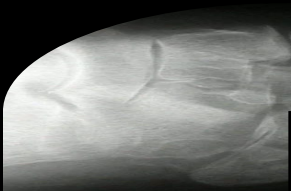
- Will be completed this year -2024
- Randomized prospective study comparing leaving the medial column screws in at 6 months(for the long term) or removing them at 6 months
- Final follow up will be at 2 years
- So ---we do not know this answer Yet –but we will!!





Lateral Column Fixation

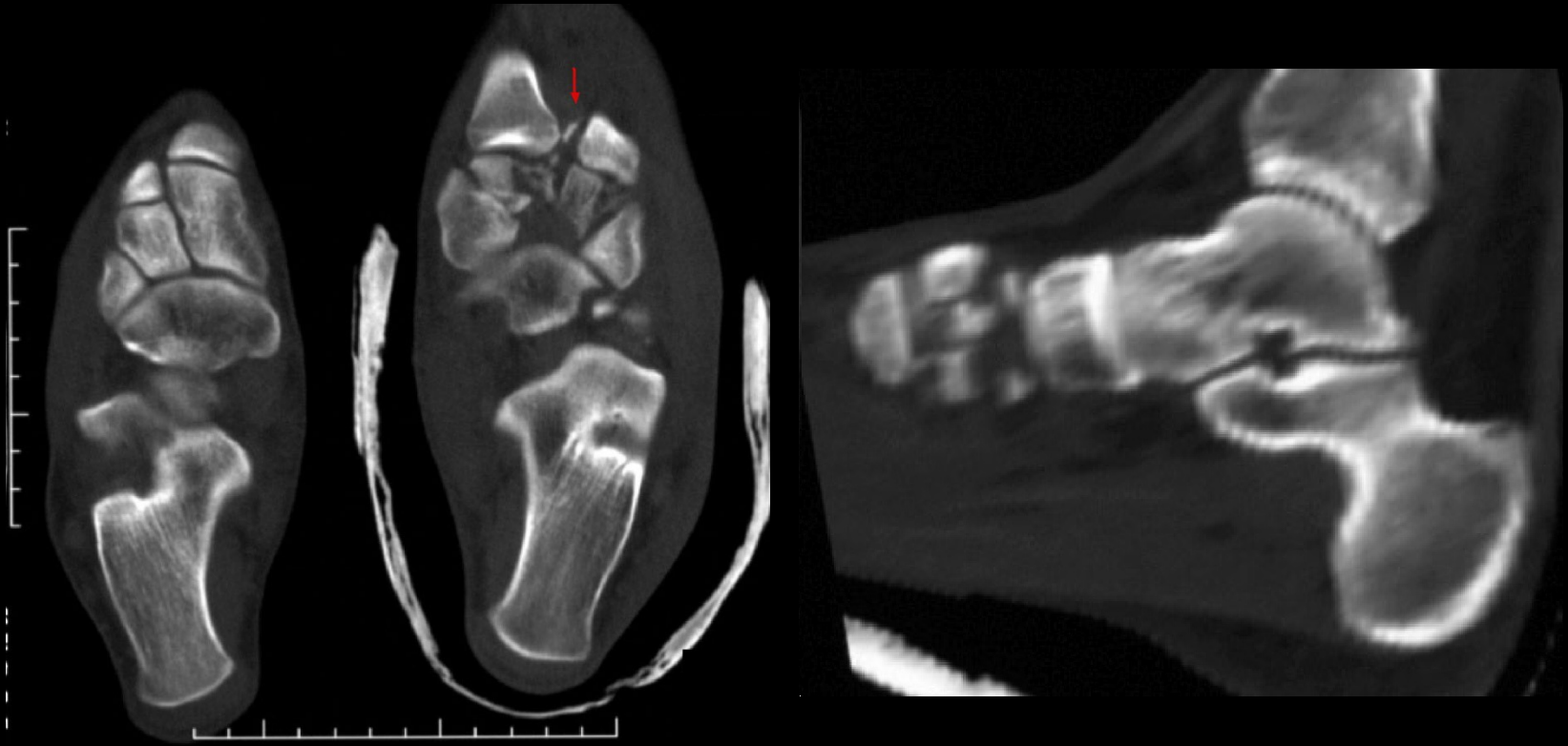
- Over the last ten years, K-wires laterally with removal in clinic at 6 to 8 weeks is the standard
- The lateral column of the foot was felt to be too rigid with screw fixation
- So rigid fixation of the lateral column is a bad thing long term



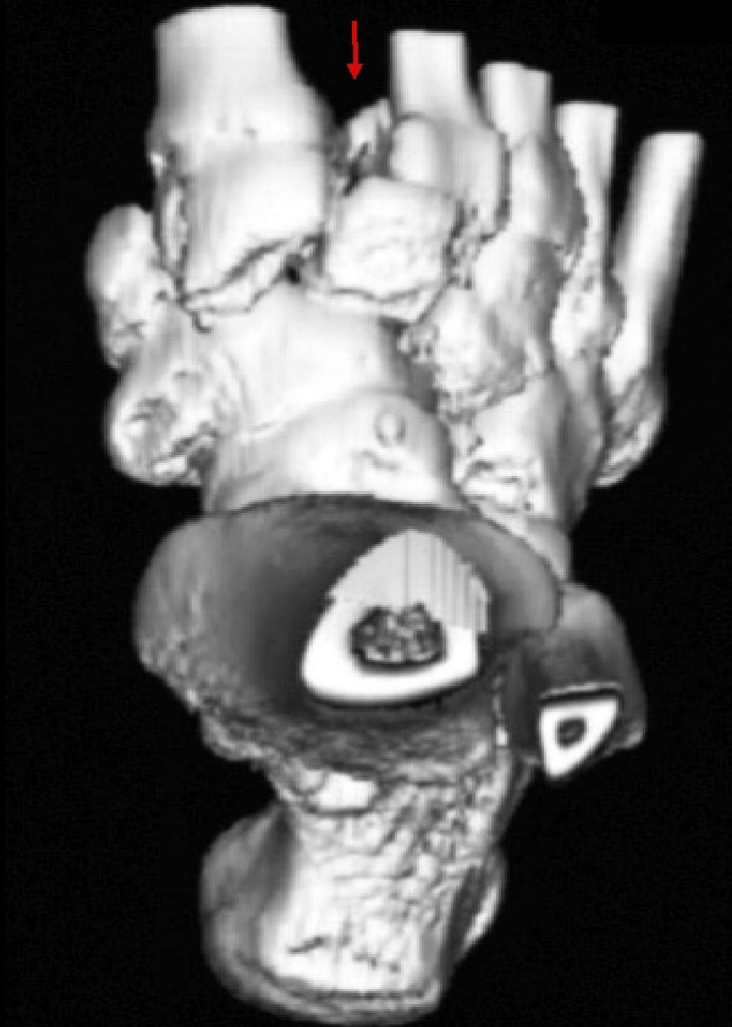
21 y o male hurt right foot in a high speed accident



Investigation with advanced imaging
—not required but does help display
injury



3 D is always nice—
Treatment plans??



Fixation

- Medial---?
- Lisfranc joint---?
- Lateral---?



ORIF Completed.....
Now How should we rehab?
Fixation removal?



Post op treatment- at six months



At 18 months



41 Y O female following an MVA



CT reconstruction

HUGO Geneva University Hospital
http://www.chsmage.com

F



IMAGE 6
Series 659310

HUGO Geneva University Hospital
http://www.chsmage.com

F



IMAGE 8
Series 659310

Thickness 0
14:00

25.12.02

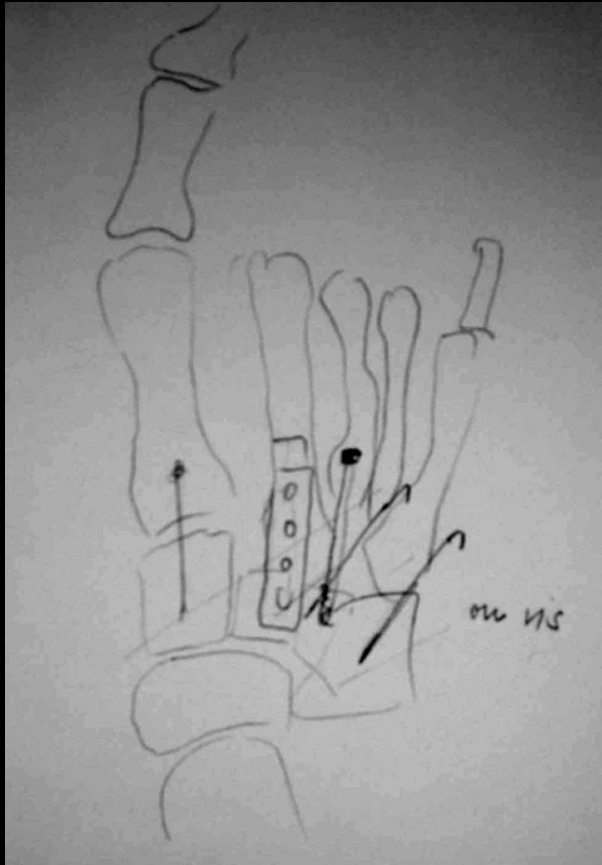
W 1424 L 642

Thickness 0
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W 1424 L 642

Pre-Op Planning

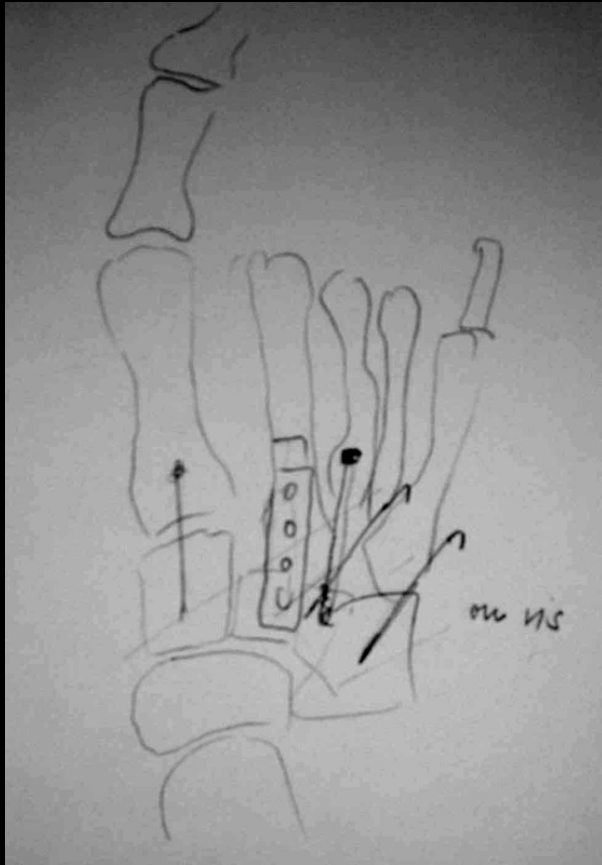


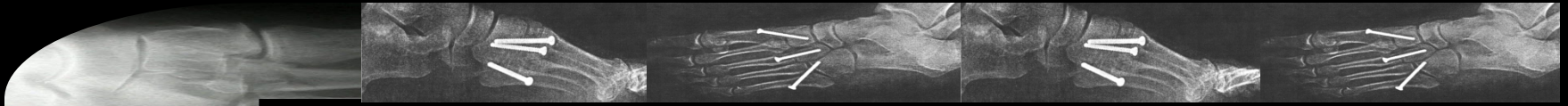
- Try to plan what is needed to stabilize the fracture dislocation

Post op view at 8 weeks



Compare





POST OP CARE

- Post OP compression cast for 1-2 weeks
- Non weight bearing in a cast continues until 6 weeks
- Weight bearing cast at 6-8 weeks
- This reduces soft tissue irritation and decreases the strain on the unstable joint
- At 8-10 weeks the cast comes off and the lateral screw and wire is removed and progressive weight bearing is allowed while ranging the ankle and foot.

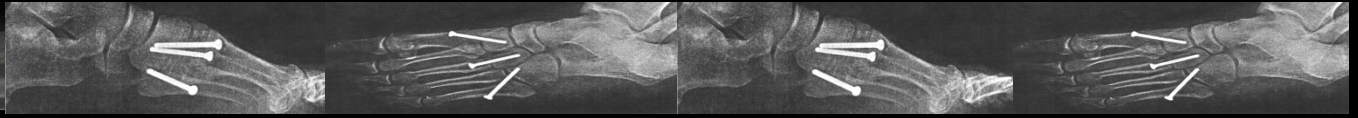




PHYSIOTHERAPY

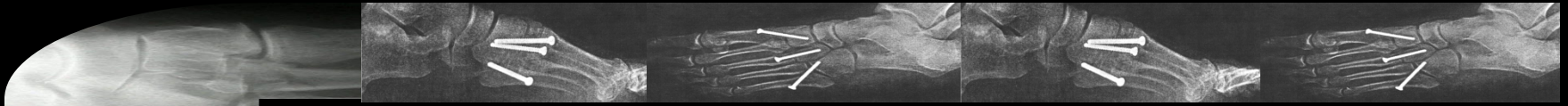
- A below the knee T.E.D. Stocking is utilized after the cast to reduce swelling over the next 6 weeks.
- **plus removal of medial column fixation at 6 months --? See if the firm study agrees**





PROGNOSIS

- Brunet and Wiley noted more unsatisfactory results when the medial column was disrupted
- Wilson : late x-ray signs of degeneration even with anatomic reductions were a bad prognostic indicator
- Residual foot stiffness particularly if lateral column rigidly fixed permanently



Arntz and Hansen et al

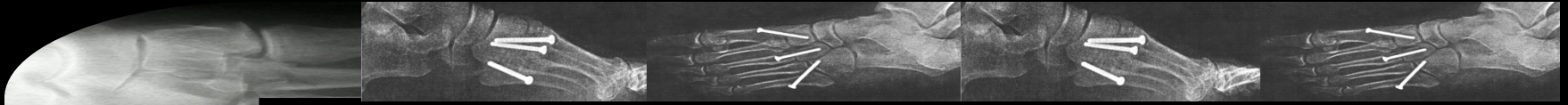
- Reported 28 of 30 excellent results in patients with anatomic reduction with associated screw removal at 4 to 6 months
- Others agree-- reporting no excellent results if NOT anatomic reduction





WILPPULA et al

- 2 to 10 year follow up
{average 5 yrs }
- In general a good anatomic result provided a good functional result
- Arthrosis (mild) occurred in 15 of 26 with the most severe changes occurring in those with residual deformity



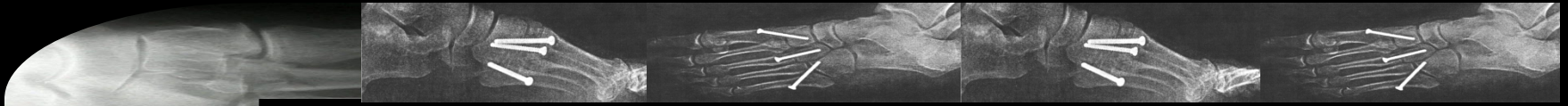
Conclusions

- Therefore, at this stage the conclusive evidence from the literature would indicate that open reduction internal fixation should be done with rigid fixation of the first to the third metatarsal and
- fixation that can be removed relatively early (6-8 weeks) in the fourth and the fifth metatarsal.



FIRM Study

- May help us decide to remove or leave in the medial column fixation in our younger patients
- Definitely leave the medial column fixation in if you do a primary fusion



Complications

- Late presentation
 - try reduction (ORIF) up to 6 weeks post injury
 - Primary reduction and fusion in the very late presentations
- Residual pain
 - orthotics to support the arch
 - arthrodesis of Lisfranc's joint. 70% good results (Johnson et al)



Thank - You for your attention

Many Thanks to:

Ted Miclau and Amir
Matityahu and the
San Francisco
Orthopedic Group
for this invitation
to be involved in
this wonderful
event.

**The Key
To Success**



THANK YOU

The Host of the Tall Ships



Halifax Waterfront

San Francisco 2024

Capital Health District
Orthopaedic Department

