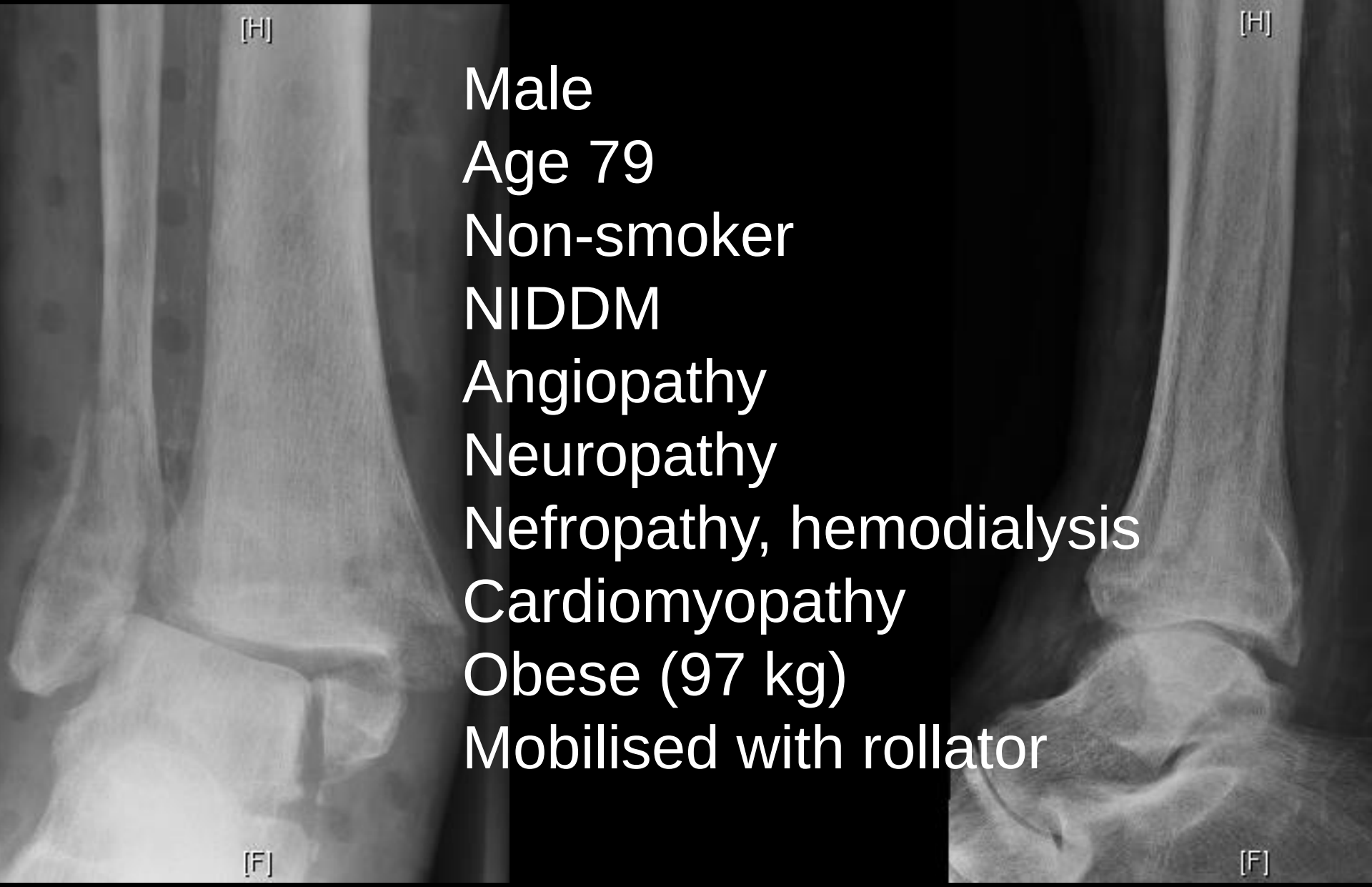
The complicated ankle fracture


[F]

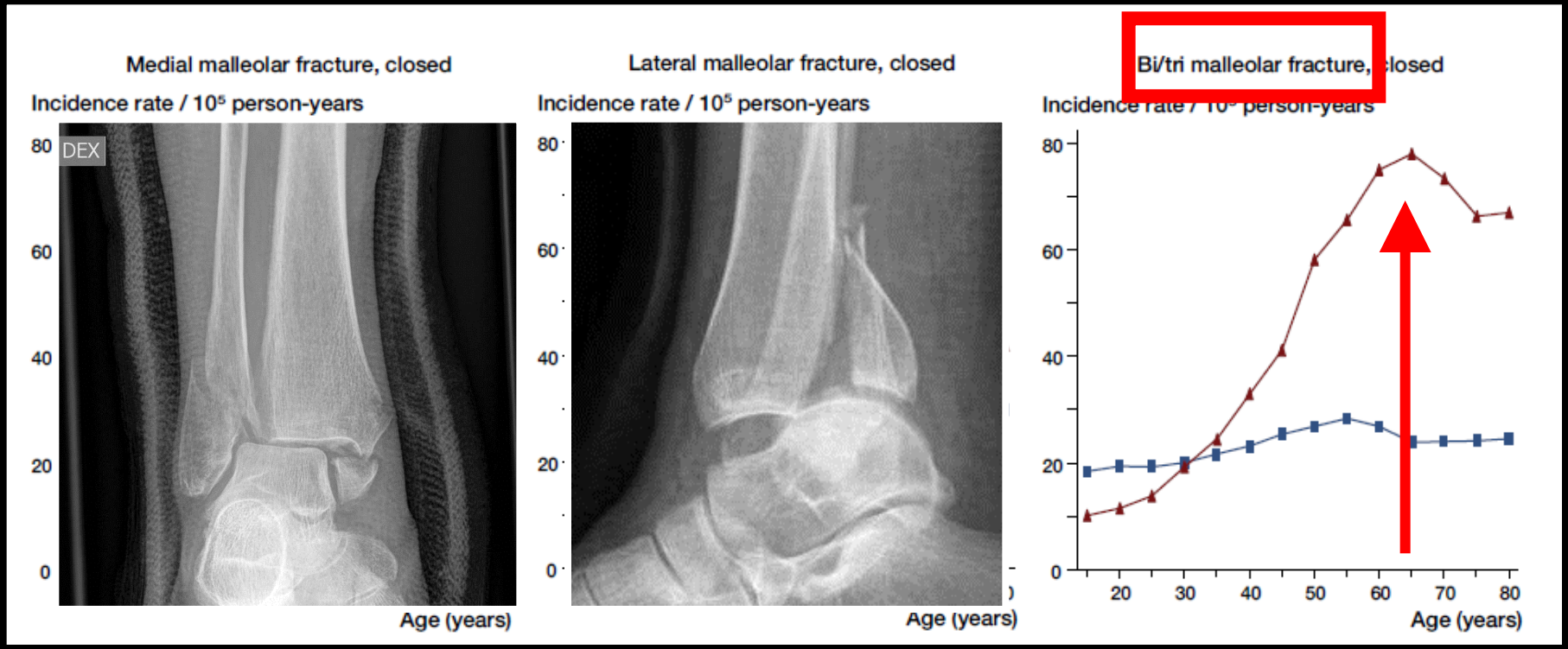
[F]



Male
Age 79
Non-smoker
NIDDM
Angiopathy
Neuropathy
Nefropathy, hemodialysis
Cardiomyopathy
Obese (97 kg)
Mobilised with rollator


HØ

7 weeks later



Thur et al. Acta Orthop 2012

Red flags

- Geriatric patient (poor bone quality)
- Diabetes
- Smoking
- Alcohol abuse
- Obesity
- Compromised soft tissue

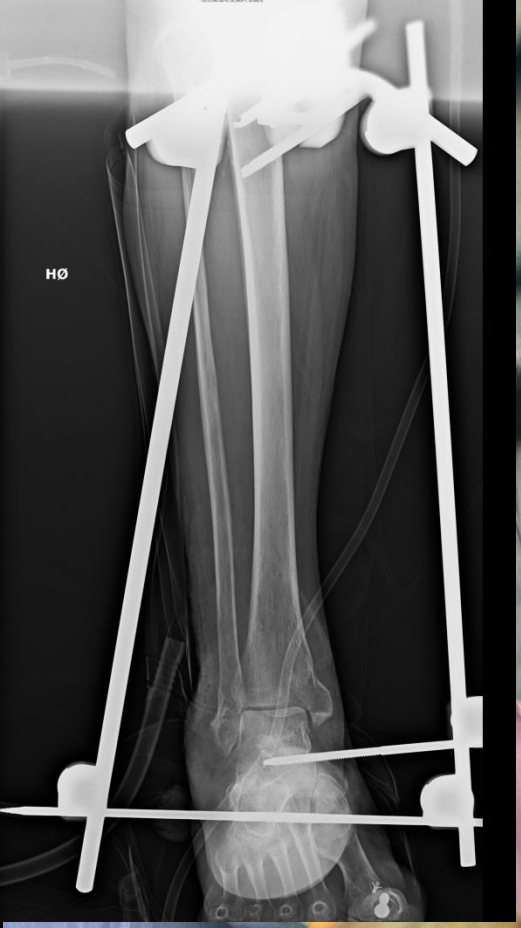
The Bovill Award Paper
Best Paper 2010 OTA Annual Meeting

Operative Versus Nonoperative Treatment of Unstable Lateral Malleolar Fractures: A Randomized Multicenter Trial

David W. Sanders, MD, MSc, FRCSC, Christina Tieszer, MSc, CCRP,* and Bradley Corbett, PhD,† on behalf of the Canadian Orthopedic Trauma Society*

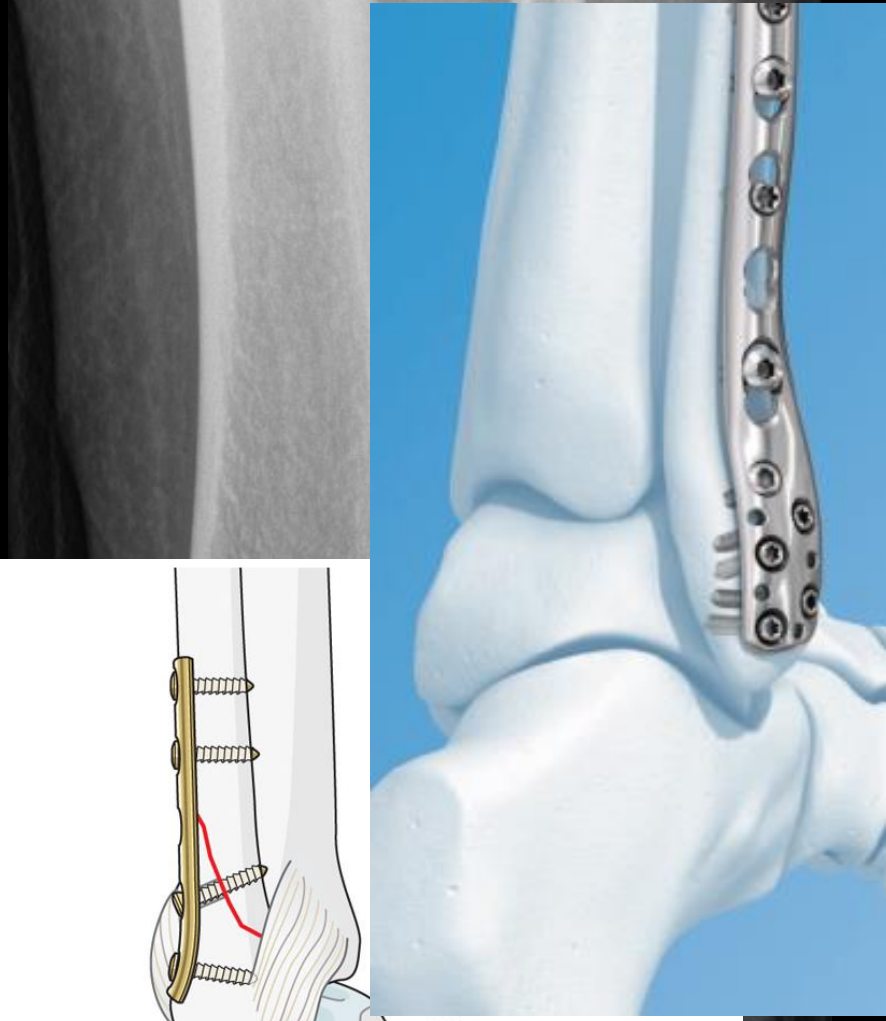
Based on our results, demonstrating equivalent functional outcomes with operative and nonoperative care, older and less active individuals are likely to be safely treated with immobilization. In younger patients, the observed risk of misalignment supports a consideration of operative intervention.

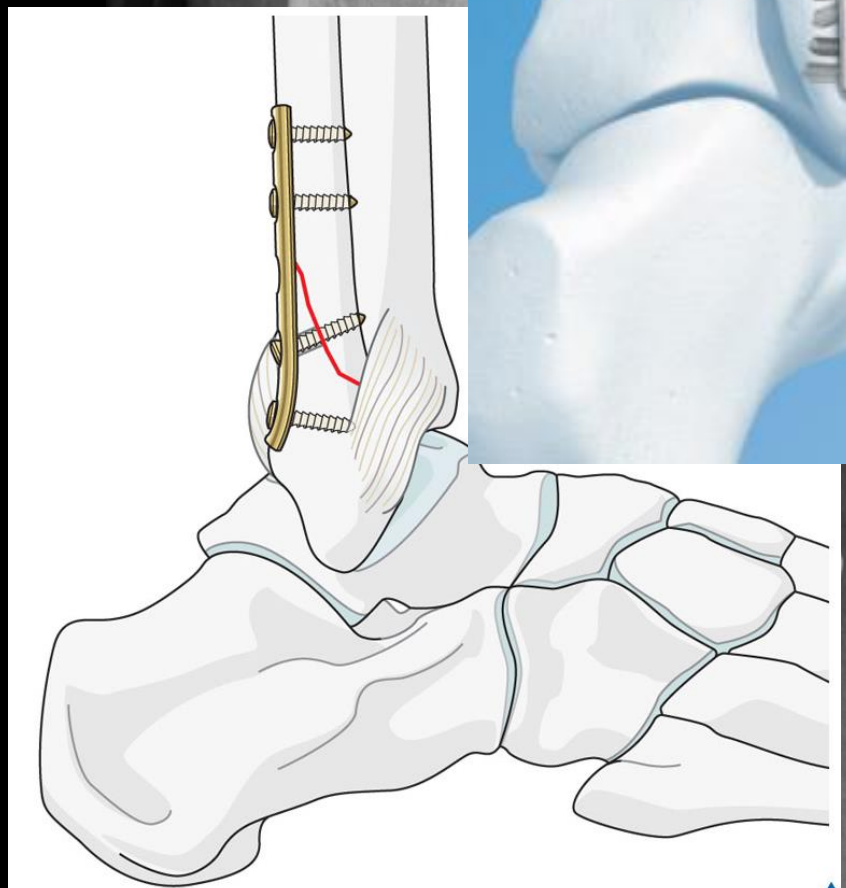
Primum non nocere

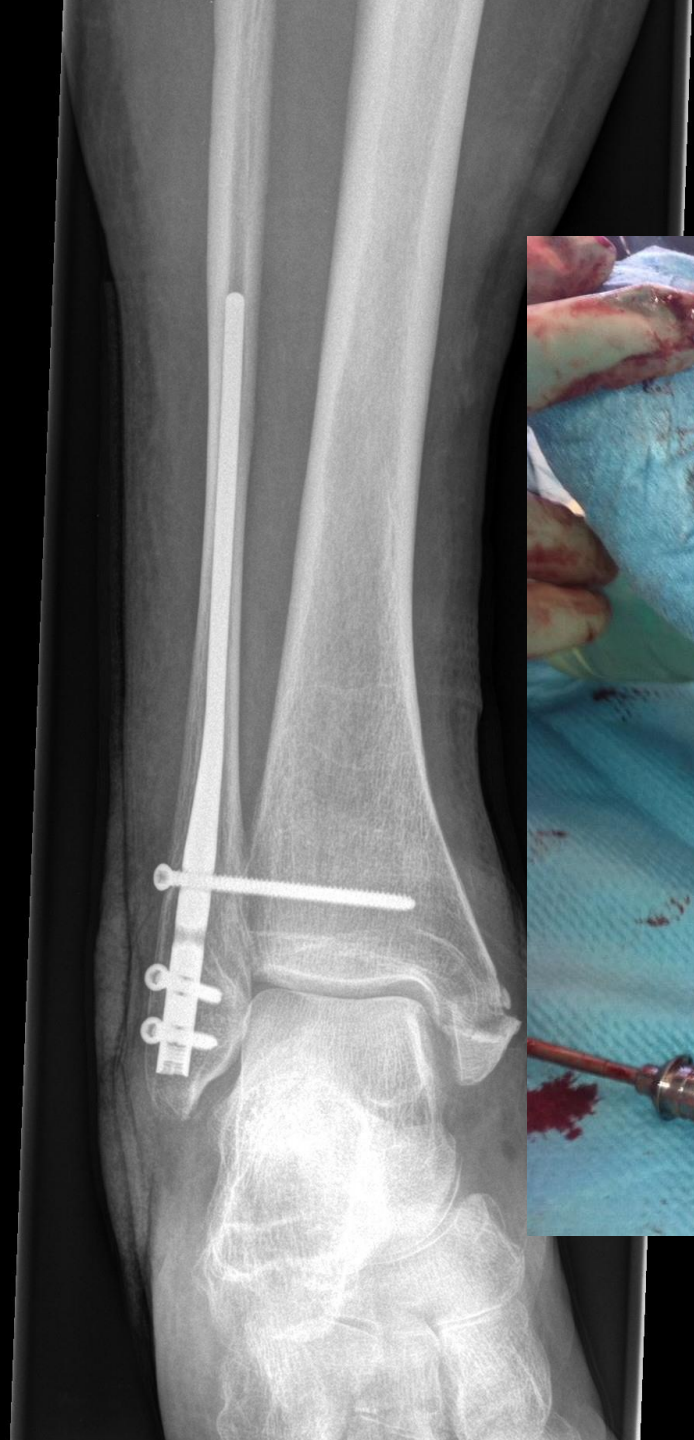

HØ



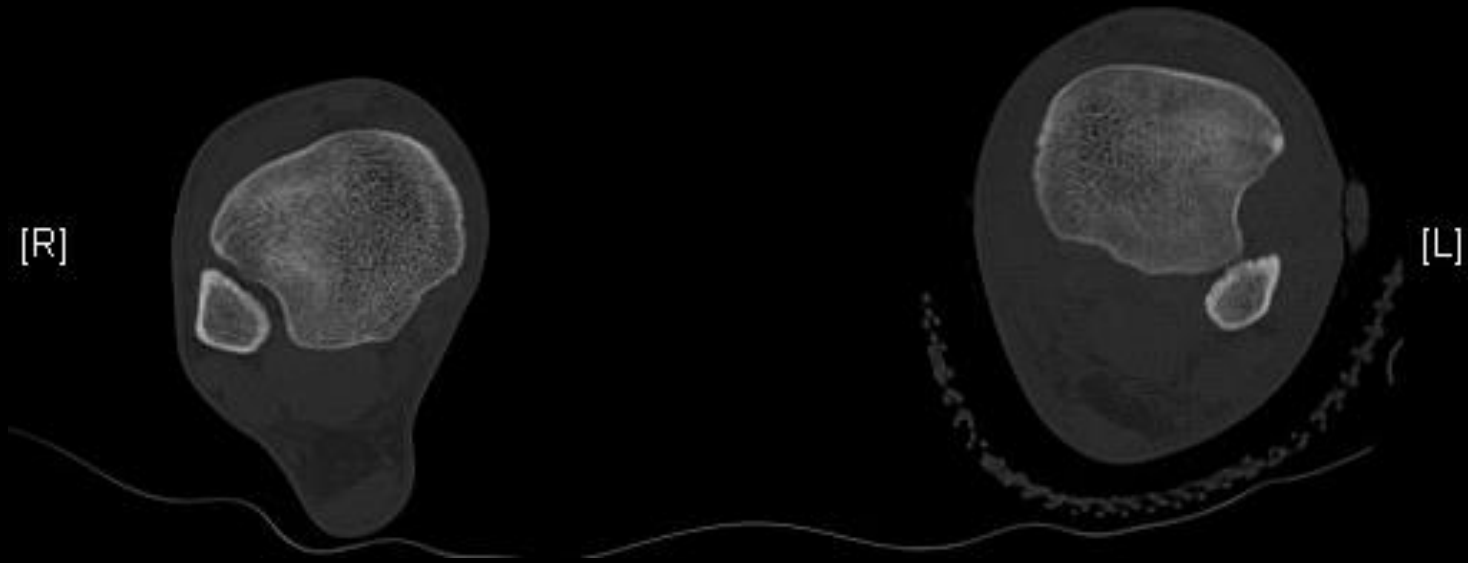
NOT in osteoporotic bone



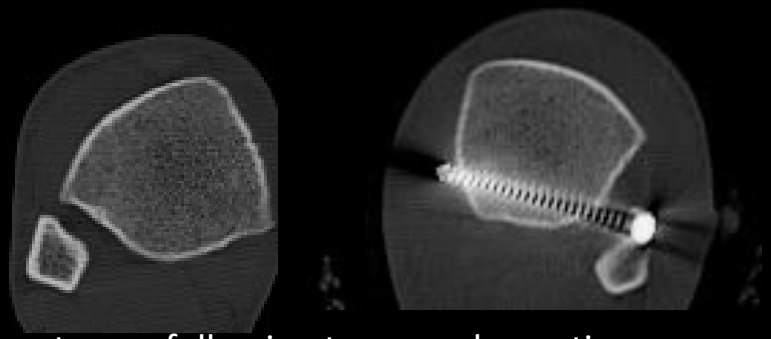




Syndesmotic injury
Tips and tricks



The syndesmosis Malreduction



- Weening B, Bhandari M: Predictors of functional outcome following transsyndesmotic screw fixation of ankle fractures. J Orthop Trauma 2005;19(2): 102-108.

  16%

- Sagi HC, Shah AR, Sanders RW: The functional consequence of syndesmotic joint malreduction at a minimum 2-year follow-up. J Orthop Trauma 2012;26(7): 439-443.

  39%

- Gardner MJ, Demetrakopoulos D, Briggs SM, Helfet DL, Lorich DG: Malreduction of the tibiofibular syndesmosis in ankle fractures. Foot Ankle Int 2006;27(10):788-792

  52%

- FrankeJ,vonRecumJ,SudaAJ,GrütznerPA, Wendl K: Intraoperative three-dimensional imaging in the treatment of acute unstable syndesmotic injuries. J Bone Joint Surg Am 2012;94(15):1386-1390.

  25,5%

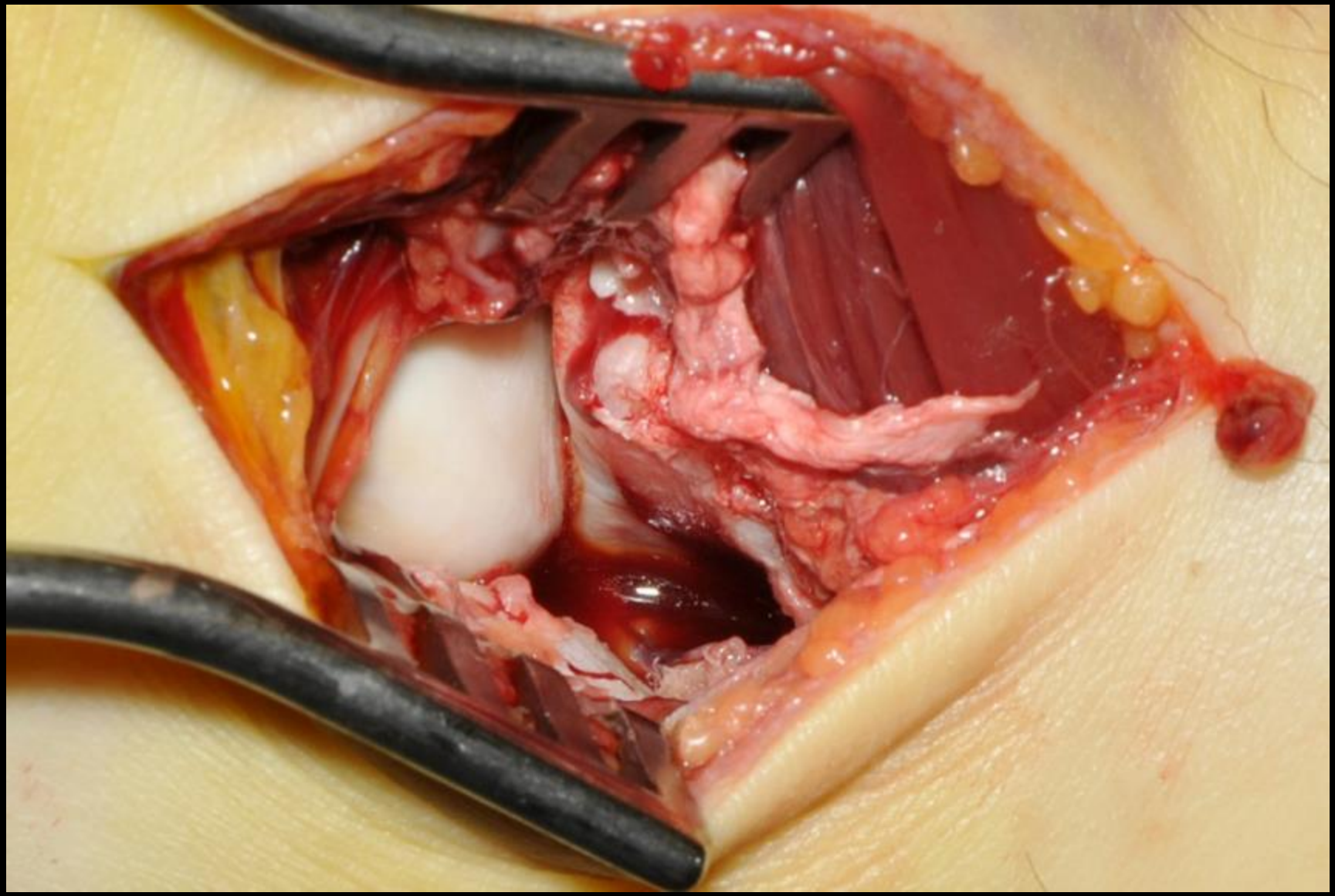
Accurrate reduction of the syndesmosis is a major factor in the resulting outcome

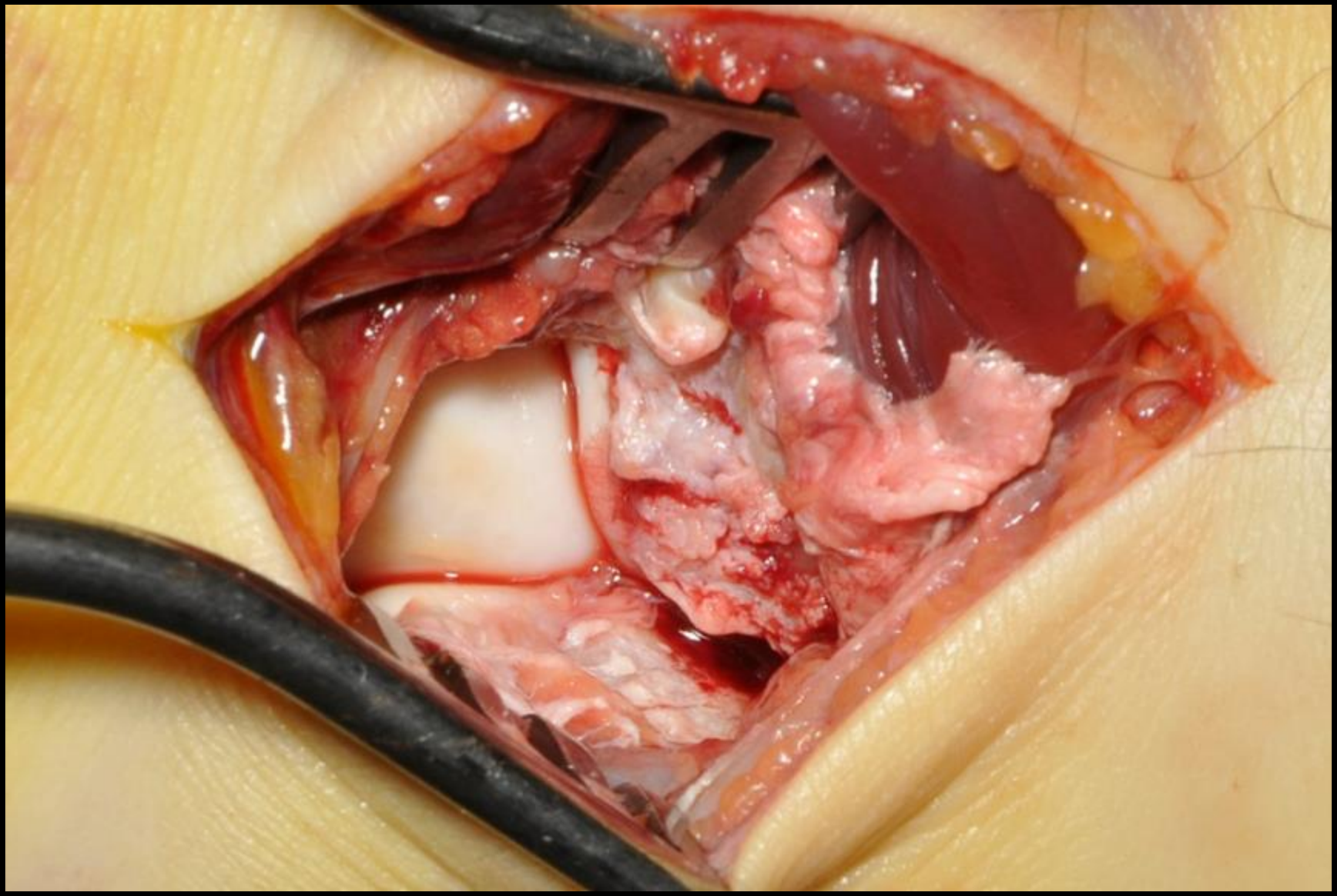
What to do???

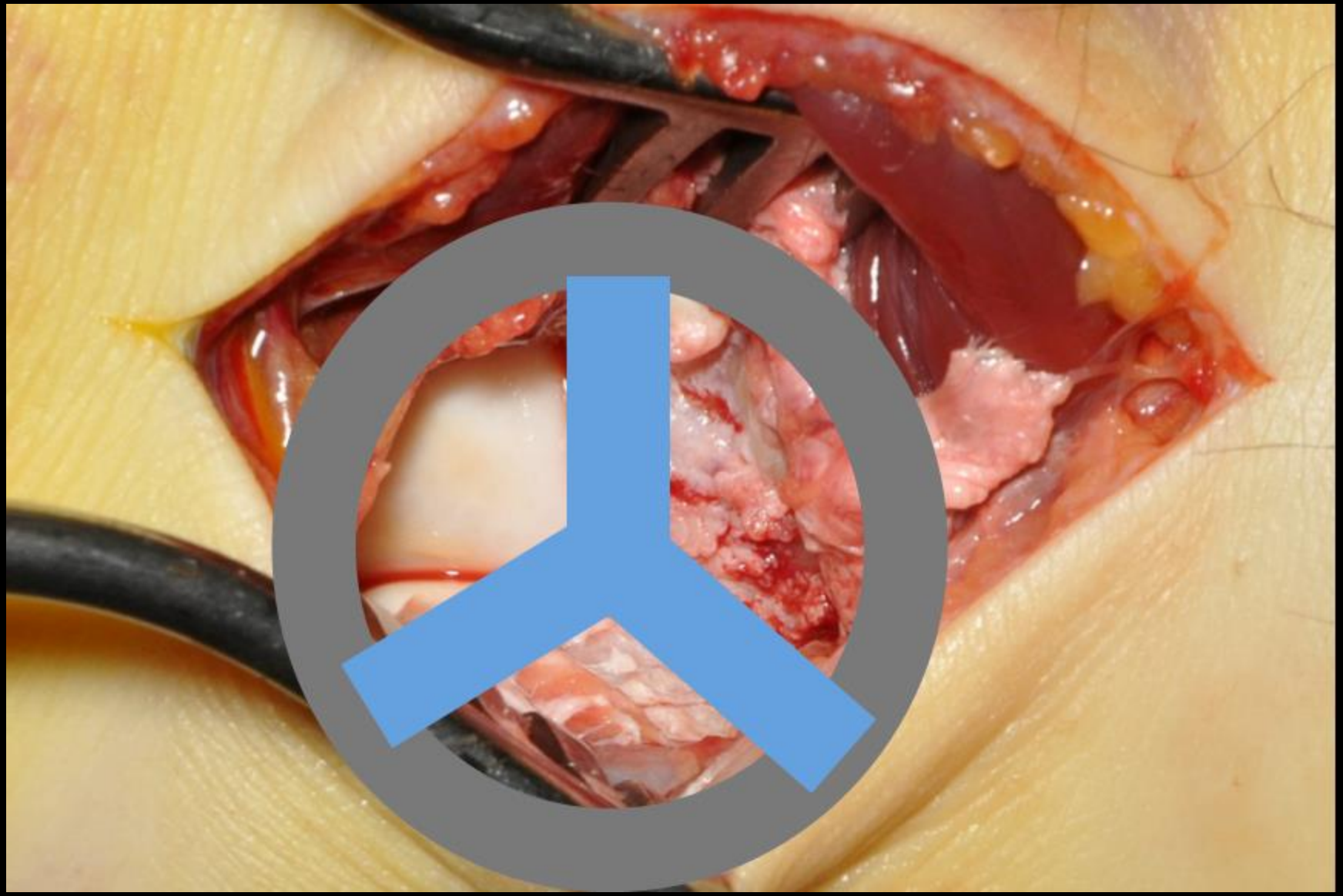
- Consider strongly anatomic fibular reduction whenever possible
- Direct visualization
  - Anterior
  - Posterior (reduction and fixation of posterior malleolar fracture)
- X-ray evaluation

  Mortise + TRUE LATERAL
- Arthroscopic evaluation

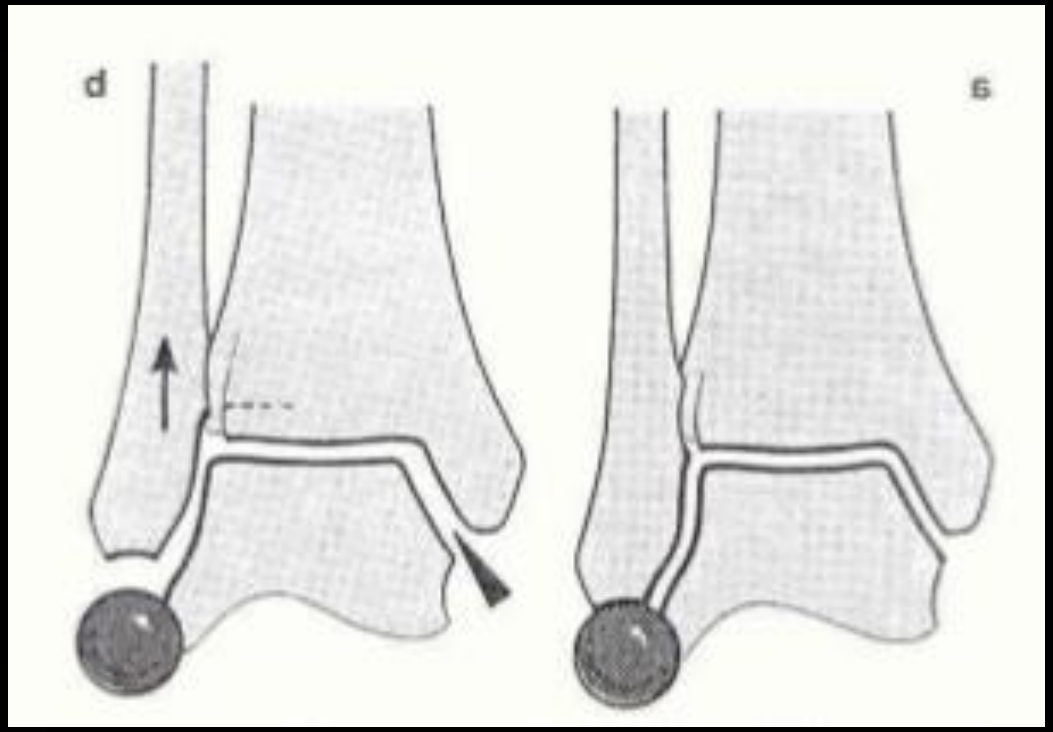
Direct visualization Anterior







Mortise view

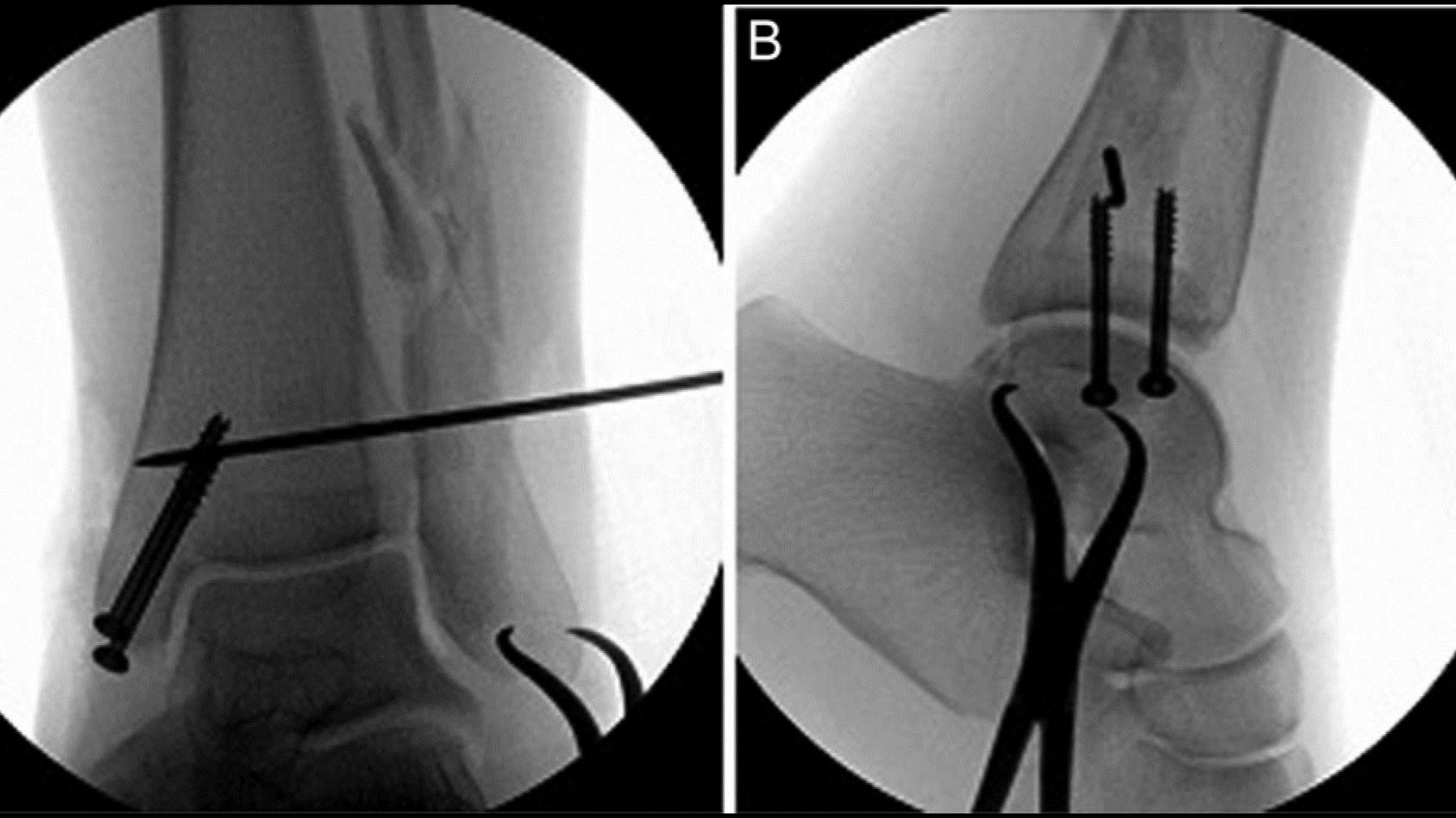


True Lateral view

J Am Acad Orthop Surg. 2015 Aug;23(8):510-8. doi: 10.5435/JAAOS-D-14-00233.

Technical Considerations in the Treatment of Syndesmotic Injuries Associated With Ankle Fractures.

Gardner MJ, Graves ML, Higgins TF, Nork SE.



$$\frac{(6{,}81-3{,}19)+(8{,}58-4{,}31)}{2} = 3{,}94$$

Mean difference in anterior displacement and posterior displacement

MAX 2 mm

Contents lists available at ScienceDirect

Injury

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Malreduction of syndesmosis—Are we considering the anatomical variation?

S. Mukhopadhyay [a,*], A. Metcalfe [a], A.R. Guha [a], K. Mohanty [a], S. Hemmadi [a], K. Lyons [b], D. O'Doherty [a]

[a] Department of Orthopaedics, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW, UK
[b] Department of radiology, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW, UK

Review Article

Technical Considerations in the Treatment of Syndesmotic Injuries Associated With Ankle Fractures

Michael J. Gardner, MD
Matthew L. Graves, MD
Thomas F. Higgins, MD
Sean E. Nork, MD

Abstract

Malleolar ankle fractures associated with syndesmotic injuries are common. Diagnosis of the syndesmotic injury can be difficult and often requires intraoperative fluoroscopic stress testing. Anatomic reduction and stable fixation of the syndesmosis are critical for maximizing patient outcomes. Recent literature has demonstrated that the unstable syndesmosis is particularly prone to iatrogenic malreduction. Multiple types of malreduction can occur, including translational, rotational, and overcompression. Knowledge of the technical details regarding intraoperative reduction methods and reduction assessment can minimize the risk of syndesmotic malreduction and improve patient outcomes.

The syndesmosis is a complex of ligaments that joins the distal fibula to the distal tibia at the level of the ankle joint. Four main ligaments contribute to the syndesmotic complex: the anterior inferior tibiofibular ligament (AITFL), the posterior inferior tibiofibular ligament (PITFL), the transverse ligament, and the interosseous ligament. The AITFL is situated obliquely between the anterolateral tibial (Chaput) tubercle and the anteromedial distal fibula. The PITFL connects the posterolateral tibial (Volkmann) tubercle to the posteromedial distal fibula. The transverse ligament represents a deep, thickened zone of the distal-most portion of the PITFL and functions like a labrum, deepening and stabilizing the tibiotalar joint. The PITFL and associated transverse ligament provide nearly half of the overall syndesmotic strength.[1] The interosseous ligament is the distal aspect of the tibiofibular interosseous membrane and joins the tibia to the fibula several centimeters above the articular surface.

A concavity of variable depth and shape known as the incisura fibularis is located at the posterolateral aspect of the distal tibia.[3] The distal fibula articulates to this structure, which provides a small amount of bony support to the ankle mortise. However, without the ligamentous stability provided by the syndesmosis, the articulation is rendered unstable to physiologic stresses.

In the normal ankle, the stabilizing ligaments of the syndesmosis provide a small amount of elasticity, allowing physiologic motion at the distal tibiofibular joint. With ankle dorsiflexion, the wider anterior talar body translates into the mortise, requiring posterolateral fibular displacement translation of the fibula, as well as external rotation.[4] Overall fibular displacement is normally approximately 1 to 2 mm through the entire ankle range of motion.

The position of the fibula within the incisura and its relative stability are critical for maintenance of ankle mortise congruity and normal distribution

From the Department of Orthopaedic Surgery, Washington University School of Medicine, St. Louis, MO (Dr. Gardner), the Department of Orthopaedic Surgery, University of Mississippi Medical Center, Jackson, MS (Dr. Graves), the Department of Orthopaedic Surgery, University of Utah, Salt Lake City, UT (Dr. Higgins), and the Department of Orthopaedic Surgery, University of Washington, Seattle, WA (Dr. Nork).

J Am Acad Orthop Surg 2015;23: 510-518

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Foot and Ankle Surgery 23 (2017) 135–141

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Foot and Ankle Surgery

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Review

Acute syndesmotic instability in ankle fractures: A review

W.J. van Zuuren MD[a,*], T. Schepers MD, PhD[b], A. Beumer MD, PhD[c], I. Sierevelt, A. van Noort MD, PhD[a], M.P.J. van den Bekerom MD[d]

[a] Department of Orthopaedic Surgery, Spaarne Ziekenhuis Hoofddorp, The Netherlands
[b] Trauma Unit, Department of Surgery, Academic Medical Center, Amsterdam, The Netherlands
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[d] Department of Orthopaedics and Traumatology, Onze Lieve Vrouwe Gasthuis, Amsterdam, The Netherlands

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ABSTRACT

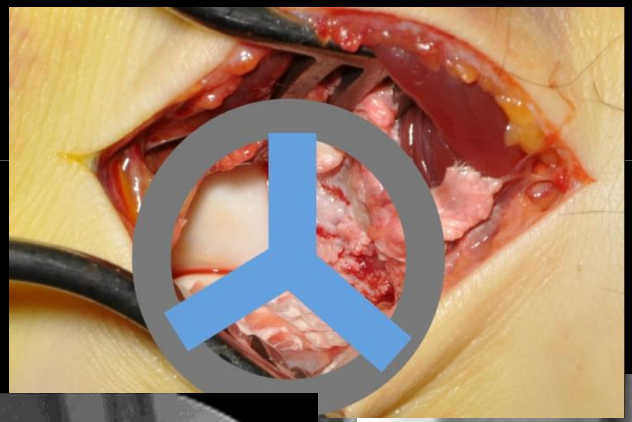
Ankle fractures are among the most common fracture types, and 10% of all ankle fractures lead to accessory syndesmotic injury. An injury that is not in every respect is syndesmotic instability. Since the range of diagnostic techniques and therapeutic options is extensive, it still is a controversial subject, despite the abundance of literature. This review aims to summarize the current knowledge on syndesmotic instability in ankle fractures and to formulate clear recommendations for clinical practice. Chronic instability and the operative osseous treatment of [illegible] fractures are not part of this review.

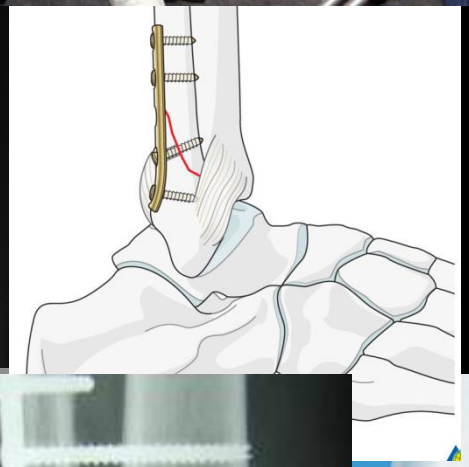
Contents

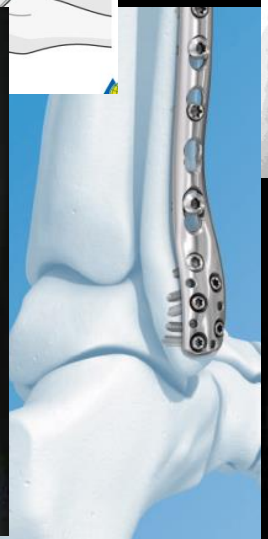
* Corresponding author at: Spaarne Ziekenhuis, Spaarnepoort 1, 2134 TM Hoofddorp, The Netherlands. Tel: +31 6 [illegible]4342.
E-mail address: vanzuuren@hotmail.com (W.J. van Zuuren).

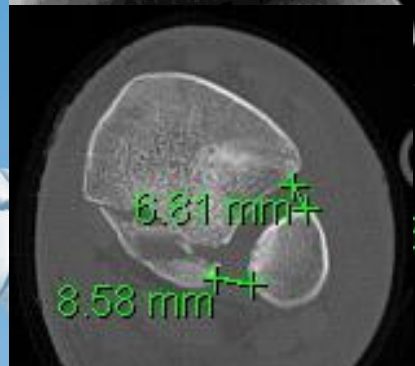
http://dx.doi.org/10.1016/j.fas.2016.04.001
1268-7731/

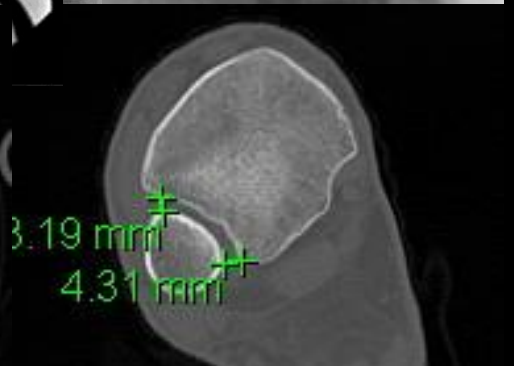
The complicated ankle fracture







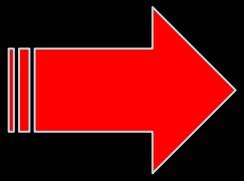





Ankle fracture *success*

AIM

- To place the talus under the plafond
- To hold it there until union



90% do well, regaining 90% function

Calcaneo-talo-tibial nail

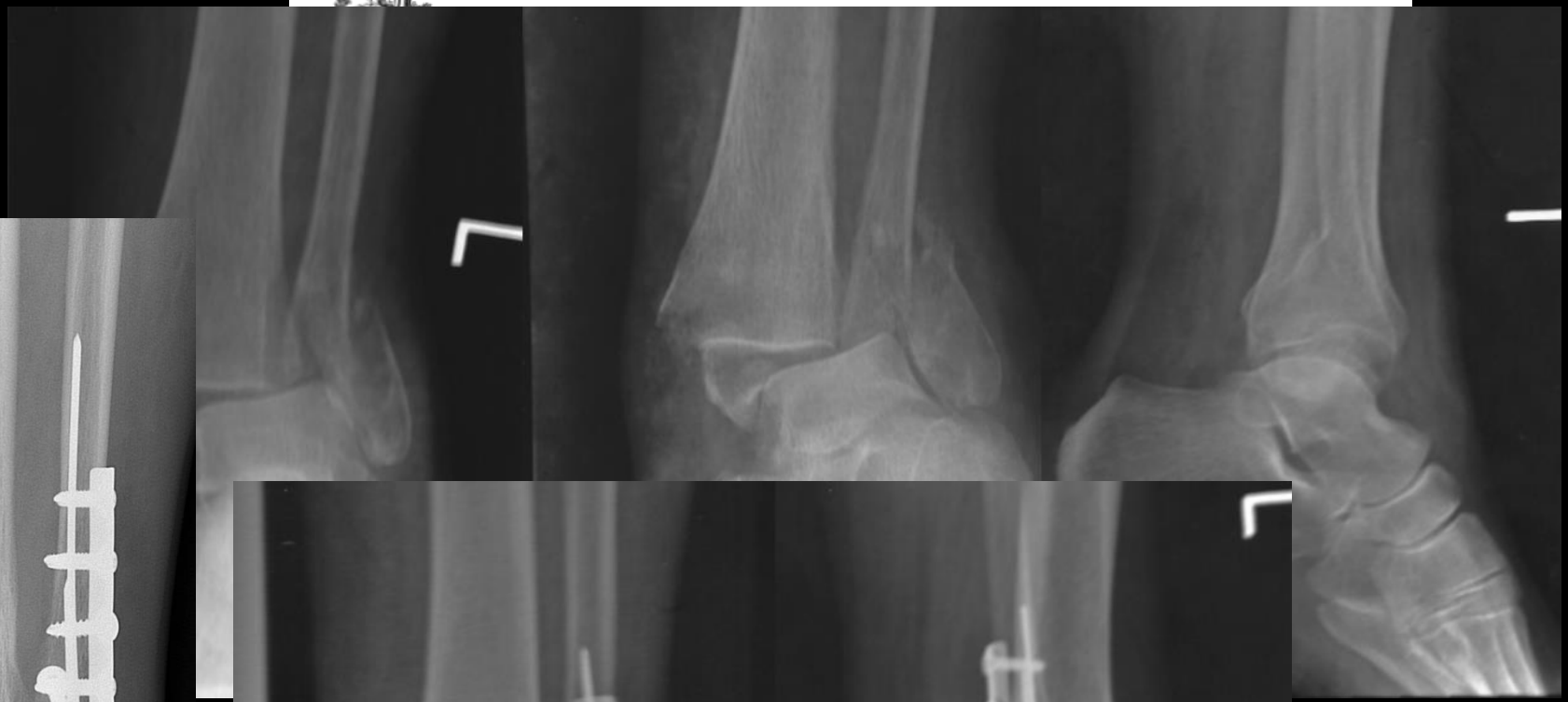


R
[F]


Operation samme aften (efter 14 timer)
Anklen meget hævet – især medialt

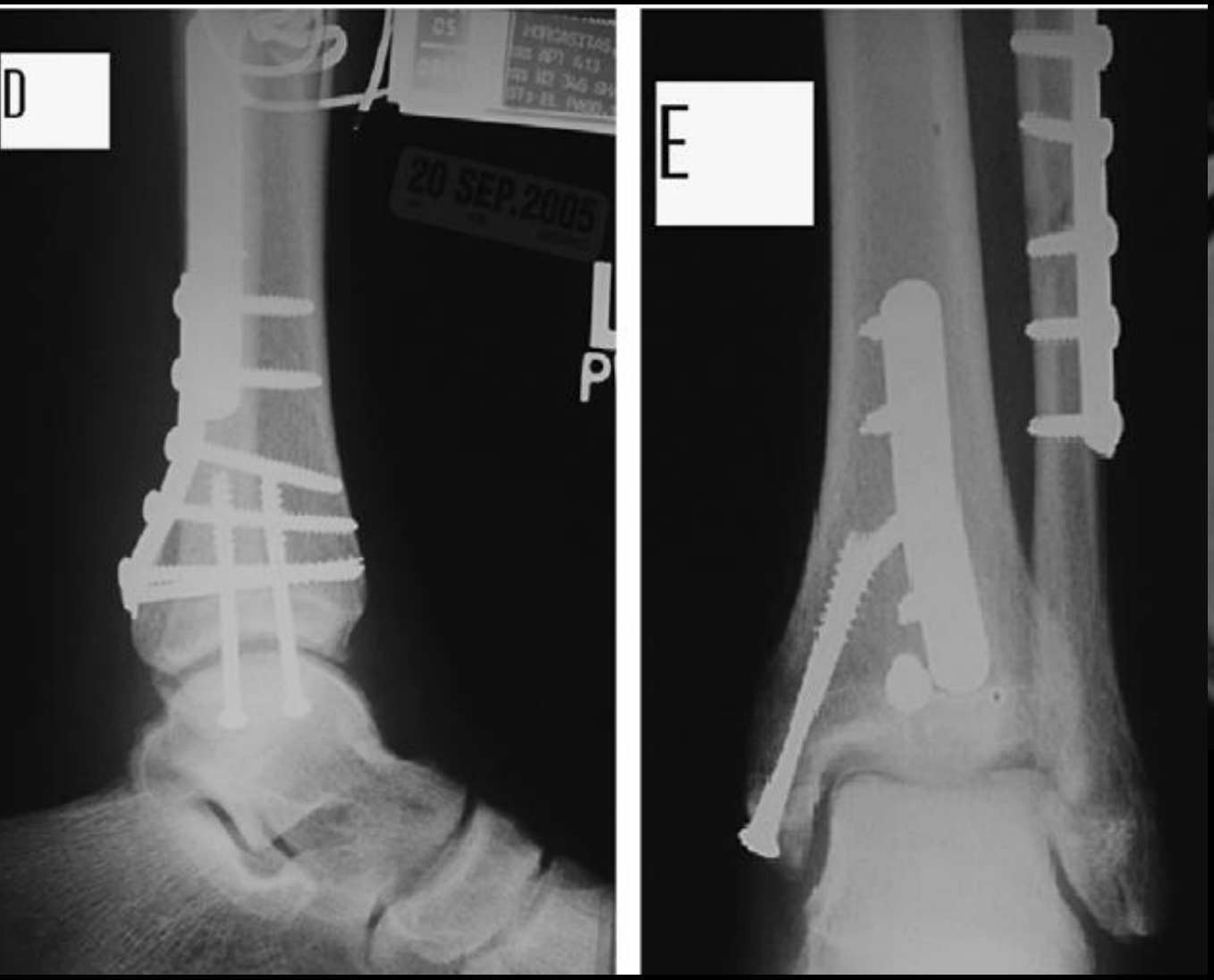
Injury, Int. J. Care Injured (2007) 38S3, S2–S9

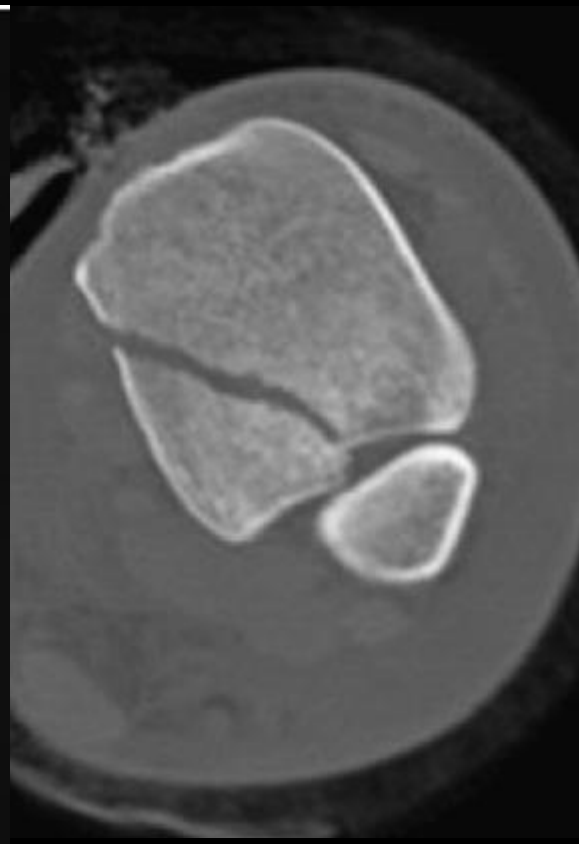
INJURY
INTERNATIONAL JOURNAL OF THE CARE OF THE INJURED

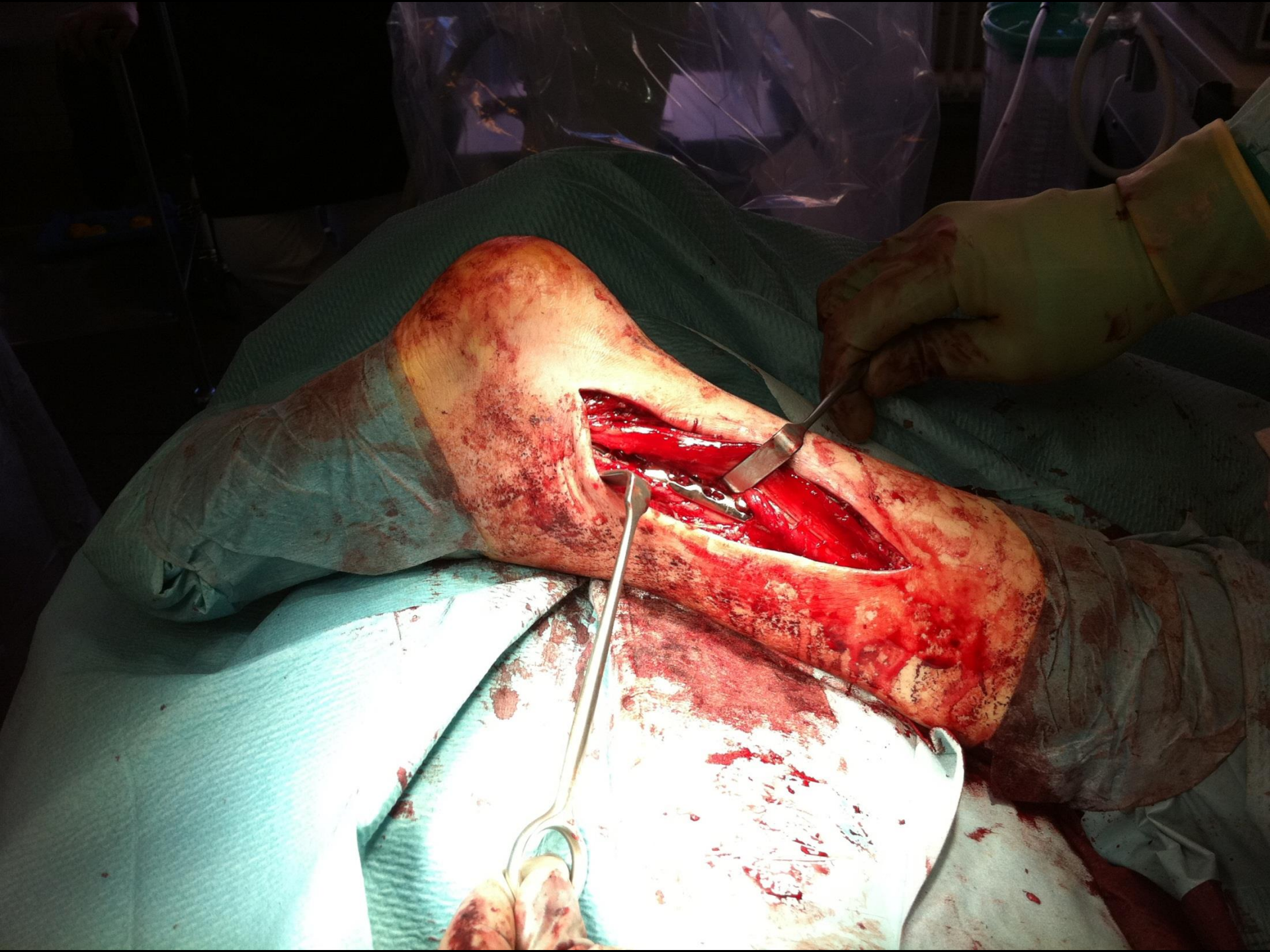


9 dage senere
Kommer til at træde på foden ved et uheld

Bagkanten







Medial Malleolar Fractures: A Biomechanical Study of Fixation Techniques

T. Ty Fowler, MD; Kevin J. Pugh, MD; Alan S. Litsky, MD, ScD; Benjamin C. Taylor, MD; Bruce G. French, MD

abstract

Full article available online at ORTHOSuperSite.com. Search: 20110627-09

Fracture fixation of the medial malleolus in rotationally unstable ankle fractures typically results in healing with current fixation methods. However, when failure occurs, pullout of the screws from tension, compression, and rotational forces is predictable. We sought to biomechanically test a relatively new technique of bicortical screw fixation for medial malleoli fractures. Also, the AO group recommends tension-band fixation of small avulsion type fractures of the medial malleolus that are unacceptable for screw fixation. A well-documented complication of this technique is prominent symptomatic implants and secondary surgery for implant removal. Replacing stainless steel 18-gauge wire with FiberWire suture could theoretically decrease symptomatic implants. Therefore, a second goal was to biomechanically compare these 2 tension-band constructs.

Using a tibial Sawbones model, 2 bicortical screws were compared with 2 unicortical cancellous screws on a servohydraulic test frame in offset axial, transverse, and tension loading. Second, tension-band fixation using stainless steel wire was compared with FiberWire under tensile loads. Bicortical screw fixation was statistically the stiffest construct under tension loading conditions compared to unicortical screw fixation and tension-band techniques with FiberWire or stainless steel wire. In fact, unicortical screw fixation had only 10% of the stiffness as demonstrated in the bicortical technique. In a direct comparison, tension-band fixation using stainless steel wire was statistically stiffer than the FiberWire construct.

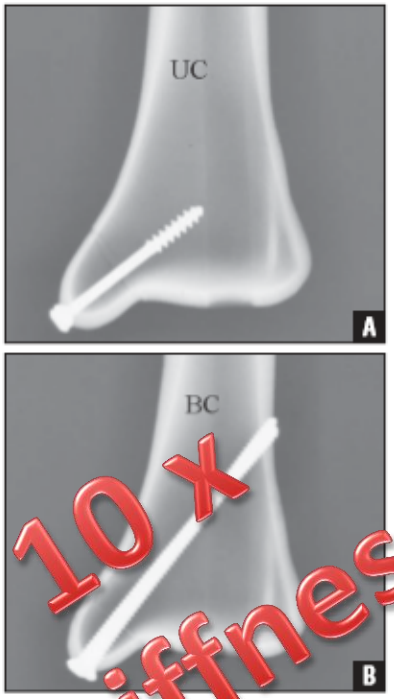


Figure: A radiograph of fourth-generation tibial Sawbones demonstrating unicortical (A) and bicortical (B) screw fixation. Abbreviations: BC, bicortical; UC, unicortical screws.

Drs Fowler and Taylor are from the Department of Orthopedic Surgery, Mount Carmel Medical Center, Drs Pugh and French are from the Department of Orthopedic Surgery, Grant Medical Center, and Dr Litsky is from the Departments of Orthopedics and Biomedical Engineering, Ohio State University, Columbus, Ohio.

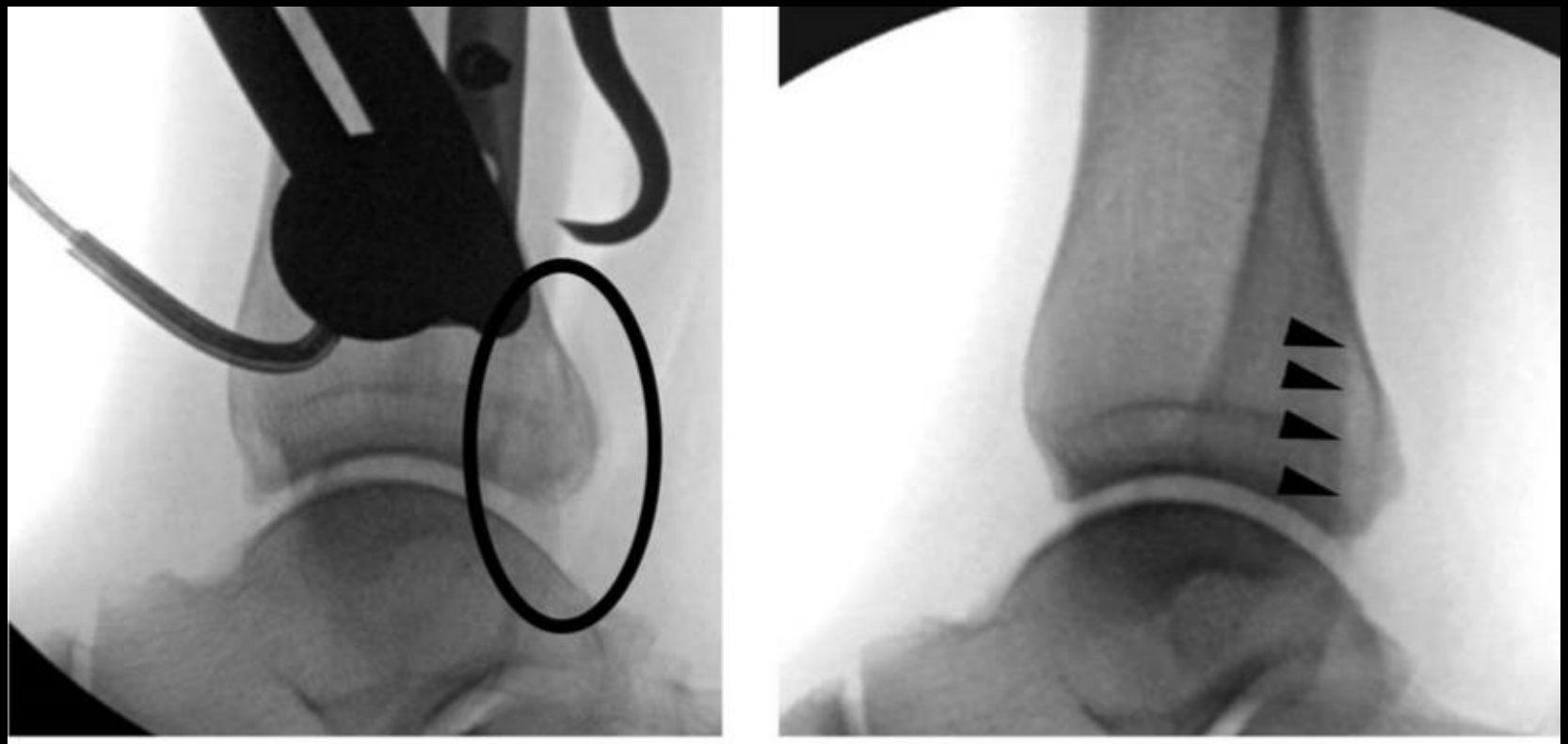
Drs Fowler, Litsky, and Taylor have no relevant financial relationships to disclose. Dr Pugh is a consultant for Smith & Nephew. Dr French is a consultant for Biomet. The authors' institution has received implant and product donation from Synthes for the sole purpose of this study.

Supported by a Foundation for Orthopaedic Trauma grant from the Orthopaedic Trauma Association. This investigation was performed at Mount Carmel Medical Center.

Correspondence should be addressed to: T. Ty Fowler, MD, 793 W State St, MSB 3rd Floor, Columbus, OH 43222 (ty_fowler@hotmail.com).

doi: 10.3928/01477447-20110627-09

True lateral



A, True lateral fluoroscopic image of the talar dome demonstrating the profile of the posterior malleolus posterior to the fibula (oval). This fluoroscopic view can then be compared with the preoperative true lateral image of the contralateral ankle (**B**), focusing on the amount of posterior malleolus visible behind the fibular cortex (arrowheads).

J Am Acad Orthop Surg. 2015 Aug;23(8):510-8. doi: 10.5435/JAAOS-D-14-00233.

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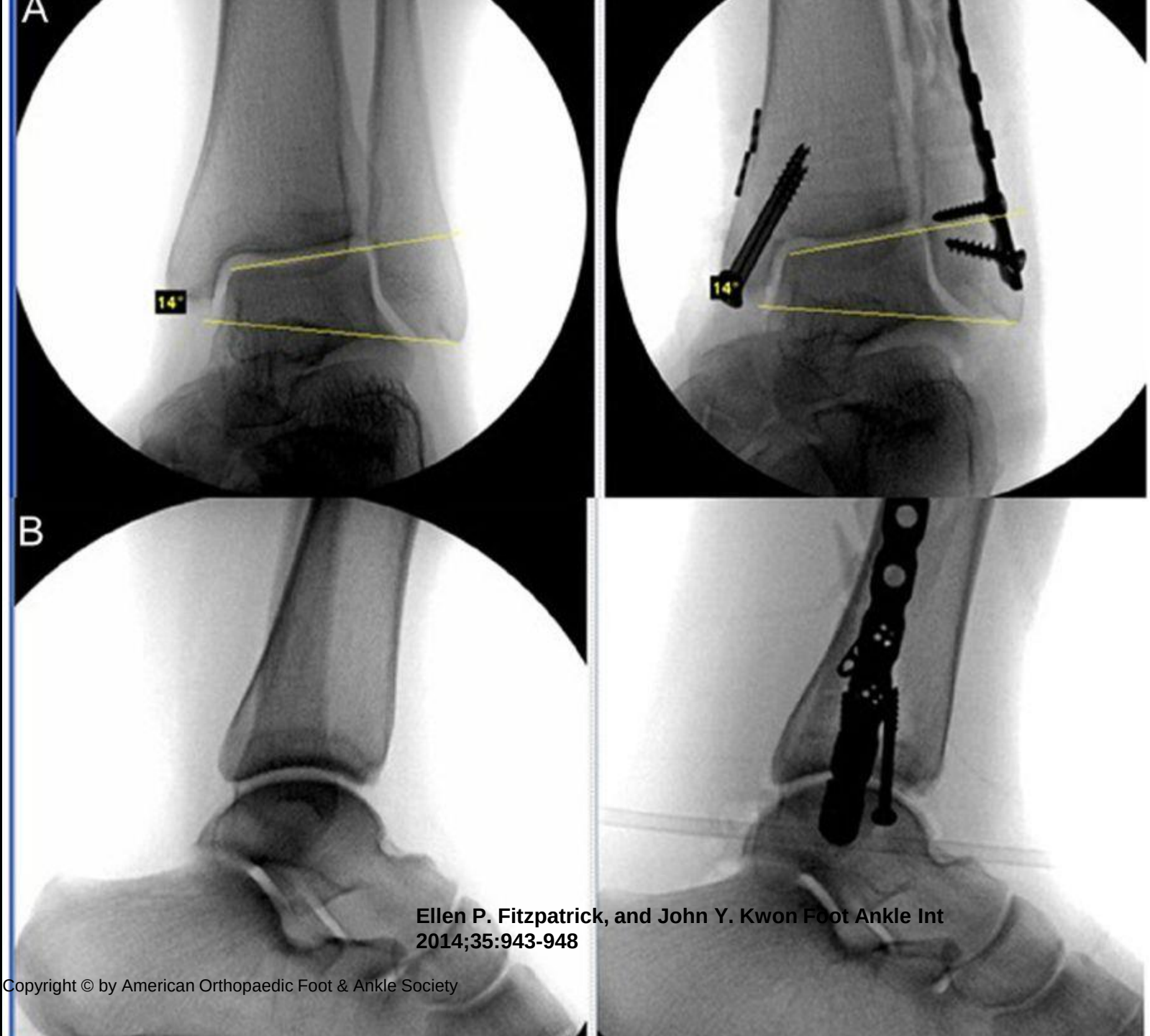
Gardner MJ, Graves ML, Higgins TF, Nork SE.

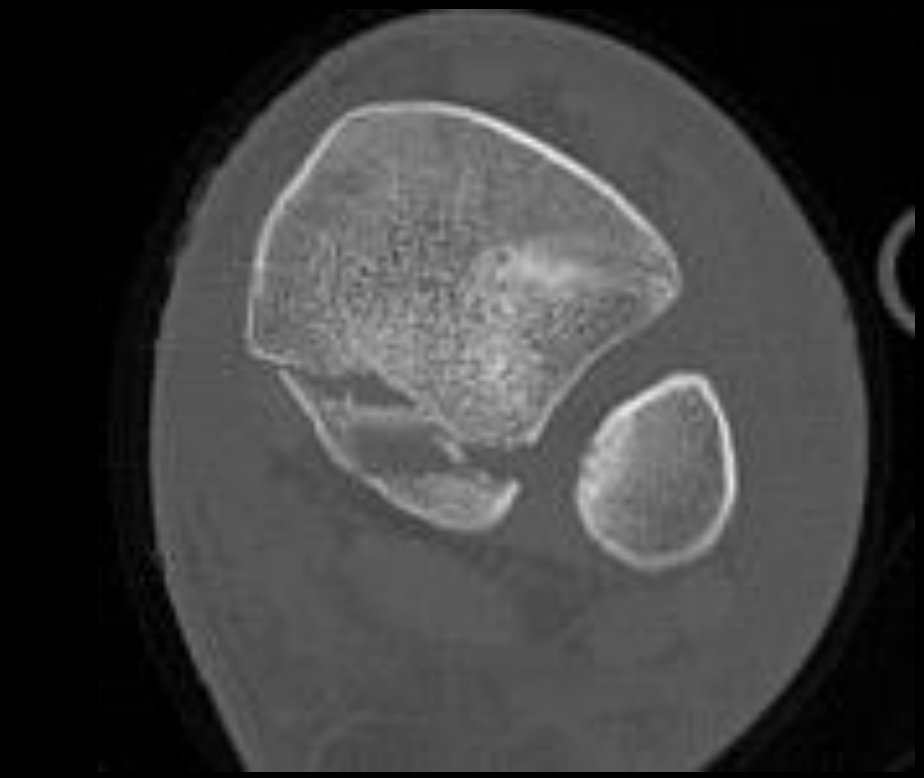
Ellen P. Fitzpatrick, and John Y. Kwon Foot Ankle Int

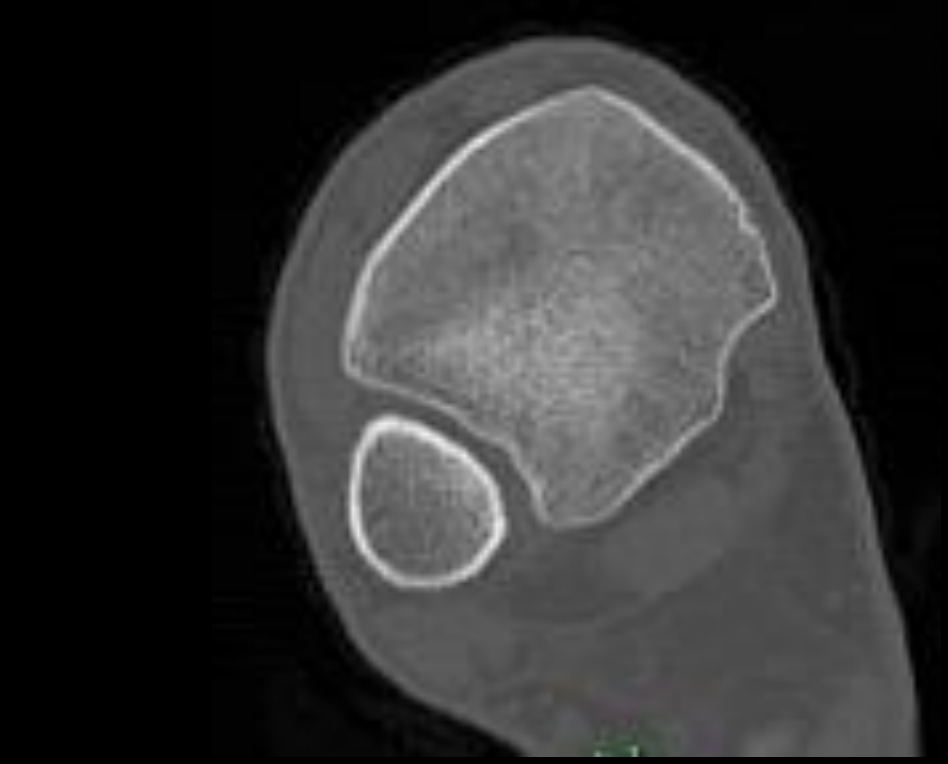


Ellen P. Fitzpatrick, and John Y. Kwon Foot Ankle Int 2014;35:943-948

6 weeks later

Lasse Bayer Hillerød Hospital 2012





Mean difference in anterior displacement and posterior displacement
MAX 2 mm

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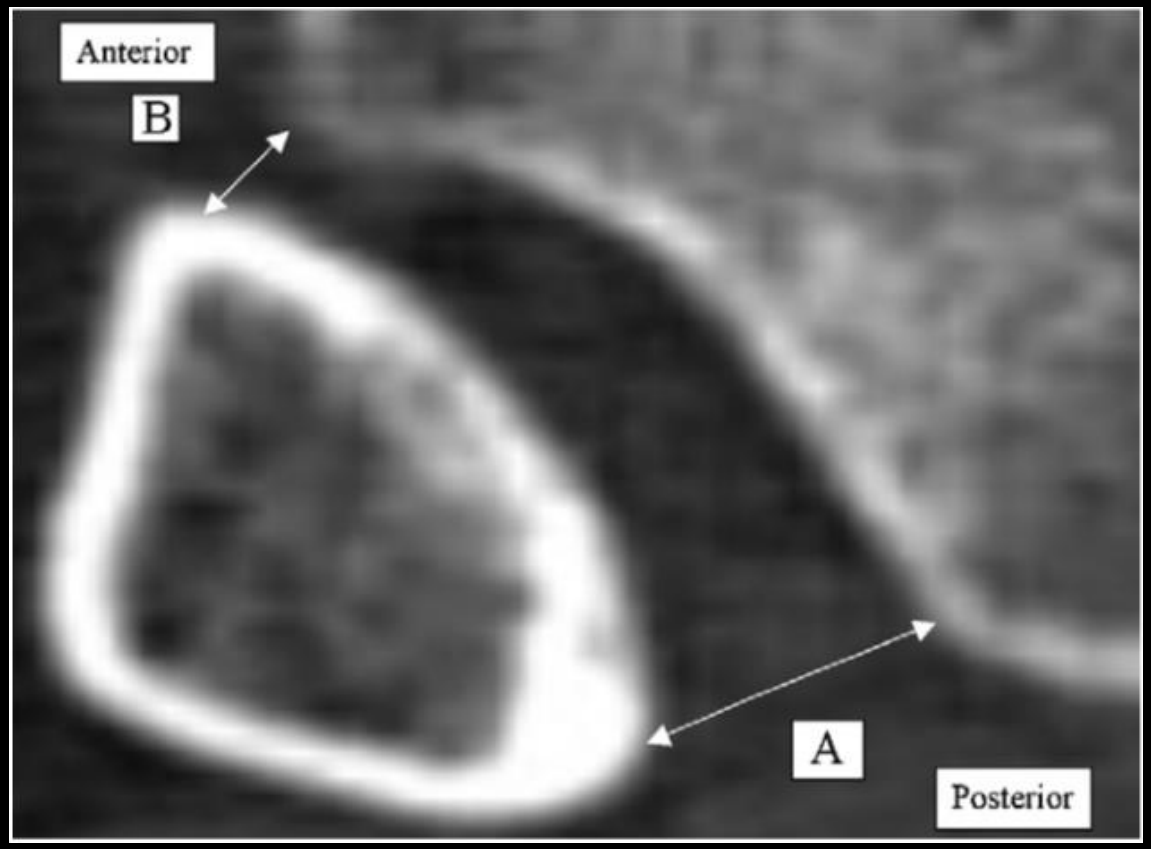
[a] Department of Orthopaedics, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW, UK
[b] Department of radiology, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW, UK

Postoperative evaluation



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$$\frac{(6{,}81-3{,}19)+(8{,}58-4{,}31)}{2} = 3{,}94$$

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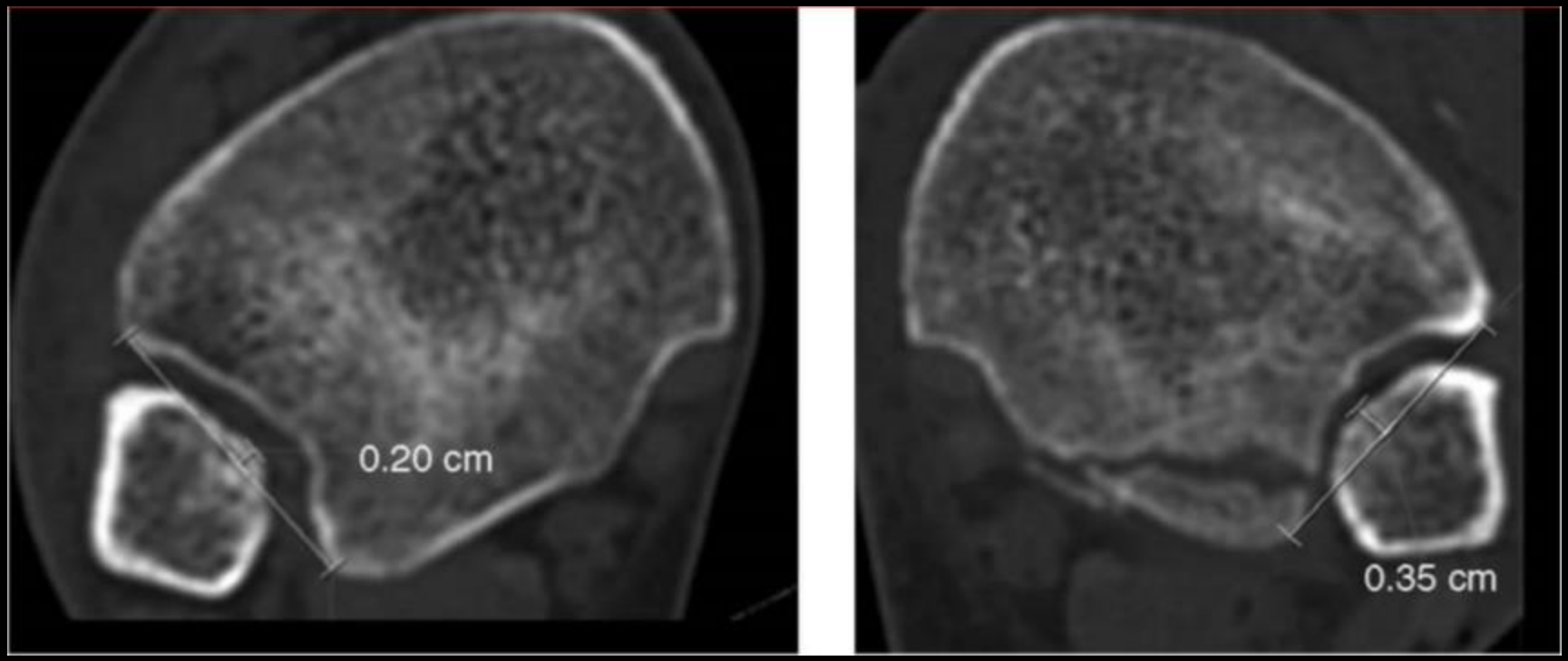
[b] Department of radiology, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW, UK

Overcompression?



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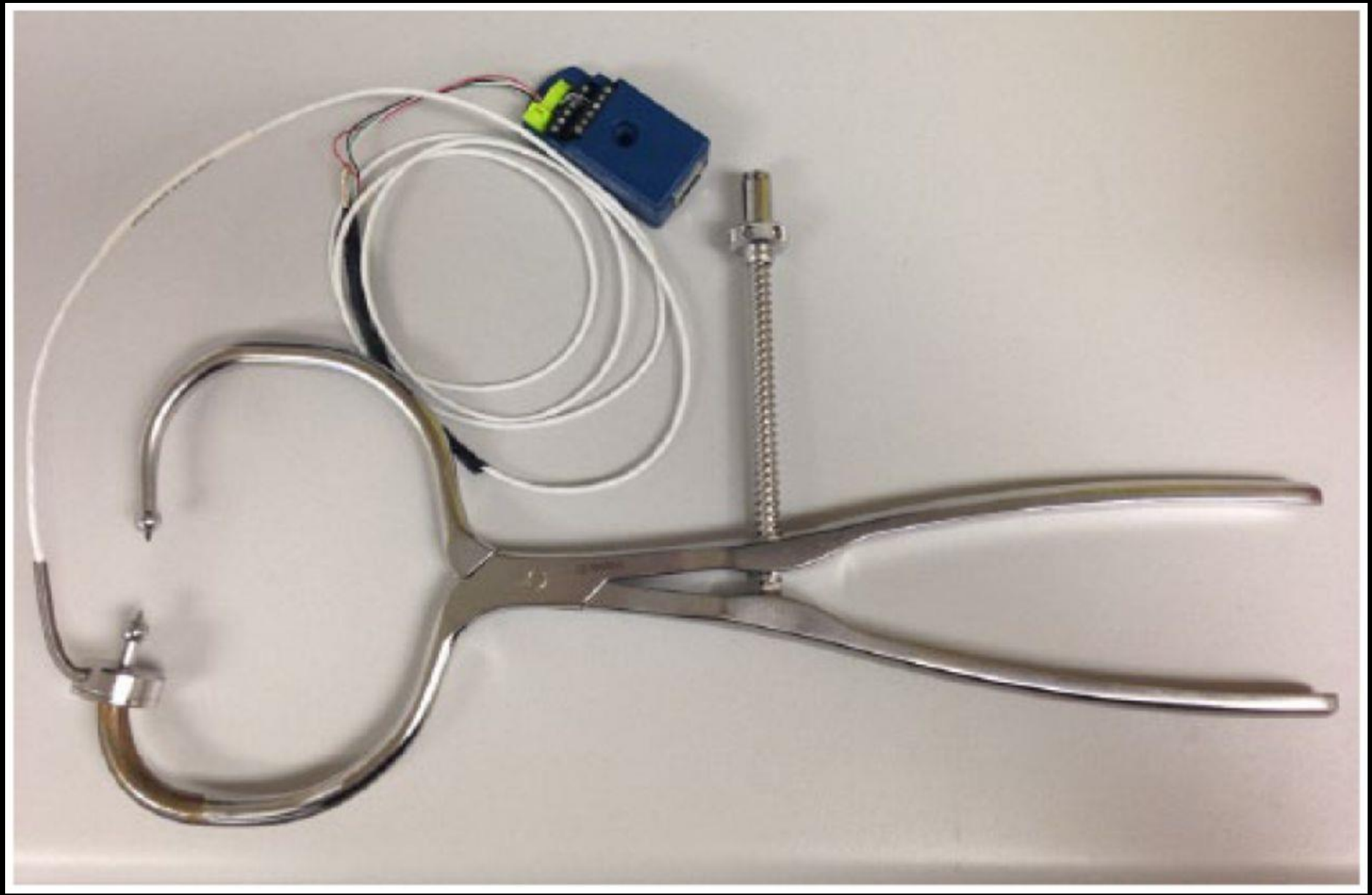


Foot Ankle Int. 2016 Feb 25. pii: 1071100716634791. [Epub ahead of print]

Increased Reduction Clamp Force Associated With Syndesmotic Overcompression.

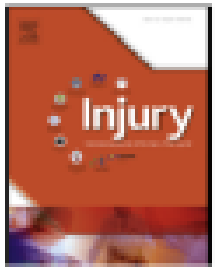
Haynes J[1], Cherney S[1], Spraggs-Hughes A[1], McAndrew CM[1], Ricci WM[1], Gardner MJ[2].

Injury, Int. J. Care Injured 45 (2014) 1262–1267

Contents lists available at ScienceDirect

Injury

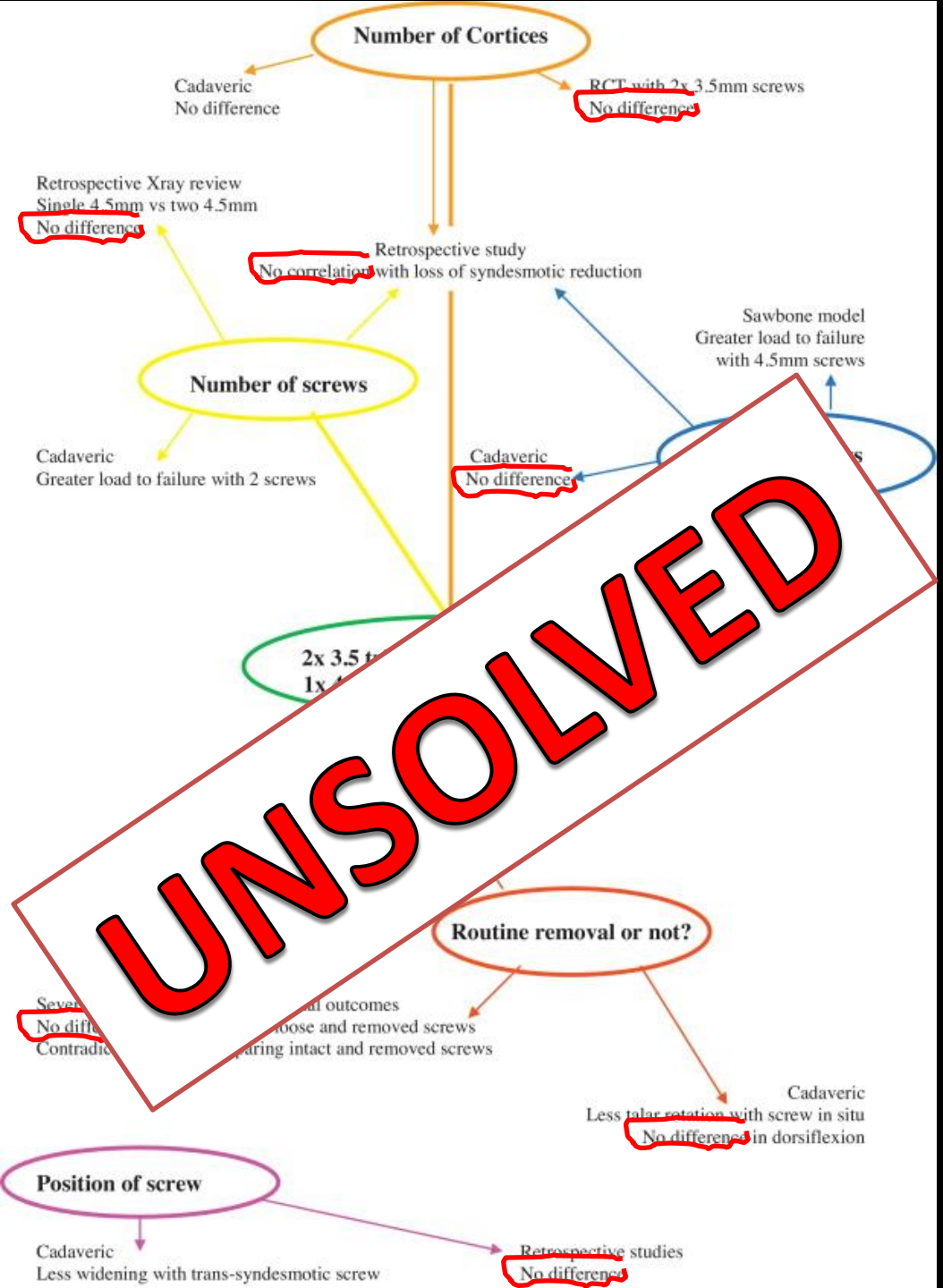
journal homepage: www.elsevier.com/locate/injury



Syndesmosis screws: How many, what diameter, where and should they be removed? A literature review

A.C. Peek *, C.E. Fitzgerald, C. Charalambides

Whittington Hospital, London, UK

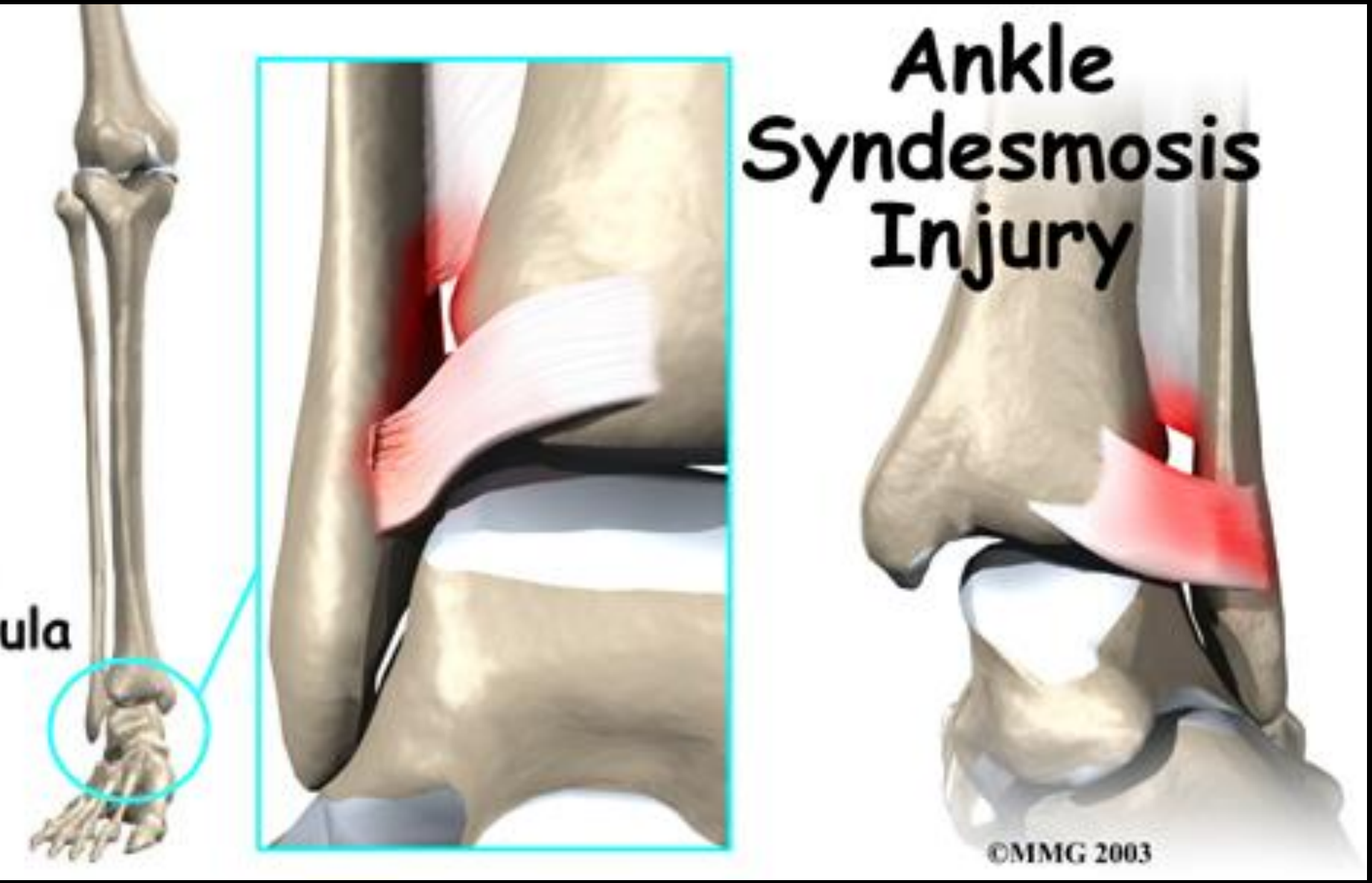

Number of Cortices
Cadaveric
No difference
RCT with 2x 3.5mm screws
No difference
Retrospective Xray review
Single 4.5mm vs two 4.5mm
No difference
Retrospective study
No correlation with loss of syndesmotic reduction
Sawbone model
Greater load to failure
with 4.5mm screws
Number of screws
Cadaveric
Greater load to failure with 2 screws
Cadaveric
No difference
UNSOLVED
Routine removal or not?
Cadaveric
Less talar rotation with screw in situ
No difference in dorsiflexion
Position of screw
Cadaveric
Less widening with trans-syndesmotic screw
Retrospective studies
No difference

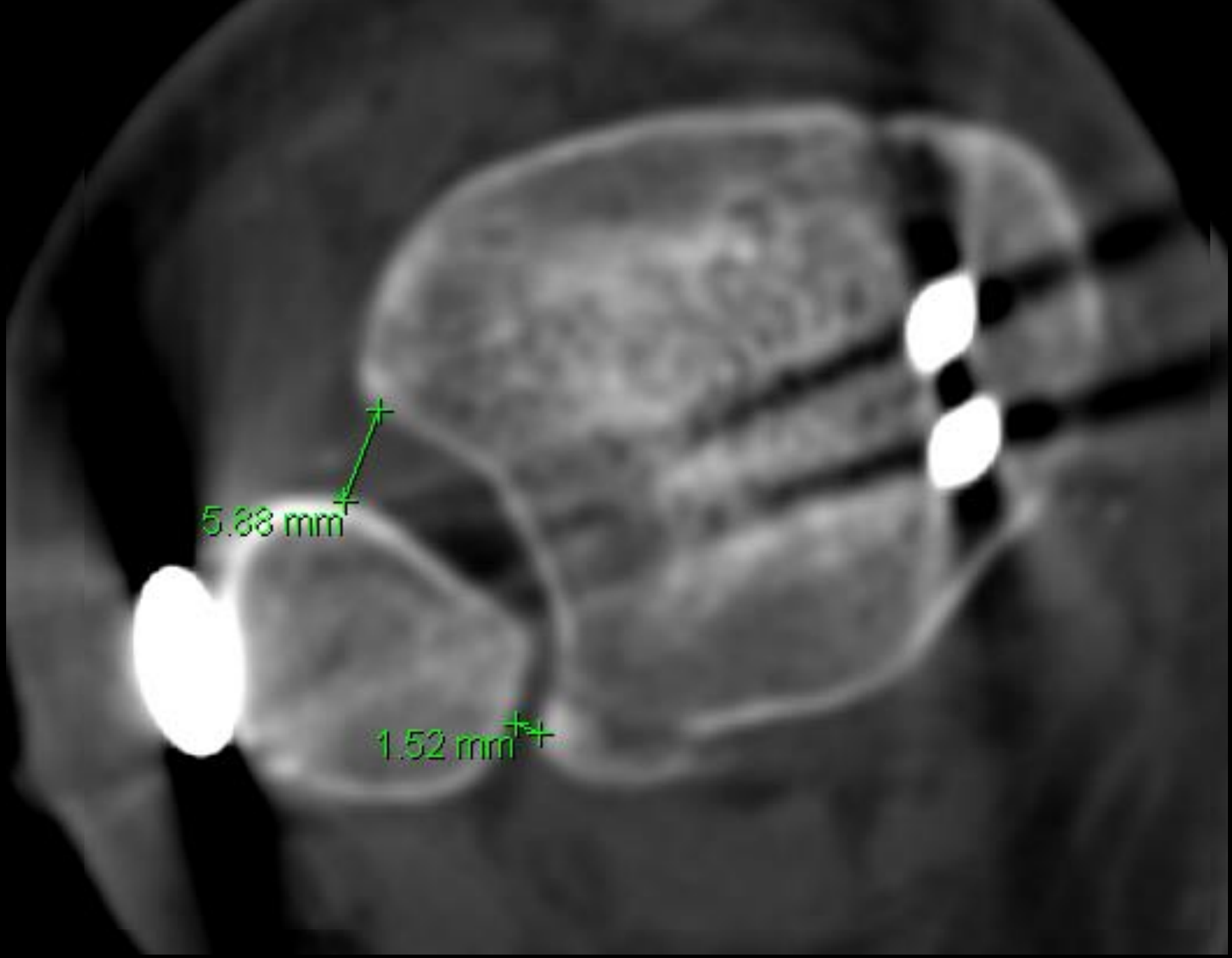
Spørgsmål?


ARRIVALS
CARTOONSTOCK .com
Search ID: jgrn264
"HE DOES IT EVERY YEAR — WE CALL IT HIS WINTER BREAK!

Spørgsmål?


www.4allfree.com
ER
GASPIRTZ
Well, the good news is that
we were able to save his leg.


ula
Ankle
Syndesmosis
Injury
©MMG 2003


5.88 mm
1.52 mm

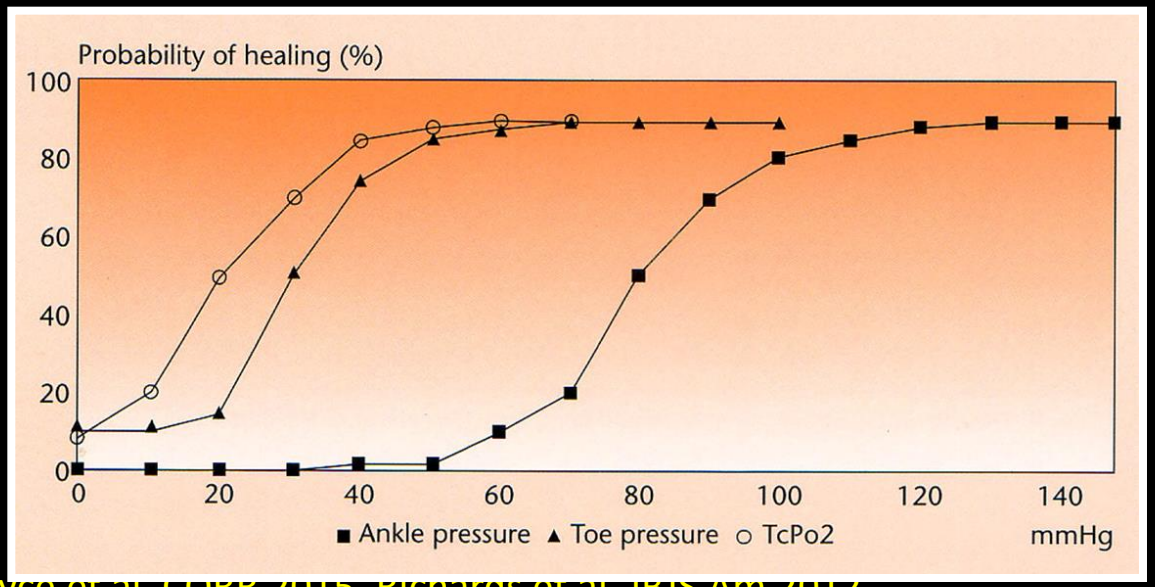
- Smoking
  - 6 x risk for infection
  - Dose-response relatioship

  Ovaska et al. JBJS Am 2013, Nåsell et al. JOT 2011

- Alcoholism

  Ovaska et al. JBJS Am 2013, Höiness et al. Injury 2003

- Diabetes / Hyperglycemia
  - Factors predisposing to infections:
    - Angio-/neuropathy
    - Impaired wound healing
    - Dalayed fracture healing



Bryce et al. CORR 2015; Richards et al. JBJS Am 2012