Evolution in the Management of Syndesmosis Injuries

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Chief Medical Officer, Duke Athletics
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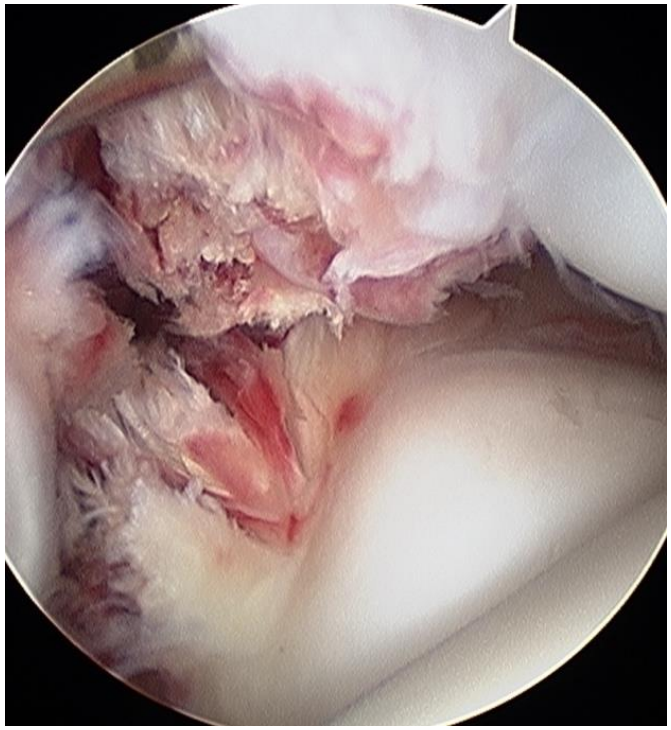
Disclosures

- Arthrex: consultant and royalties
- Bone Solutions Inc : SAB/ Stock
- Arc Techtonics: Stock
- Miach : Stock
- Rubber City Bracing: Stock
- WolterKluwer: royalties
- Springer: royalties

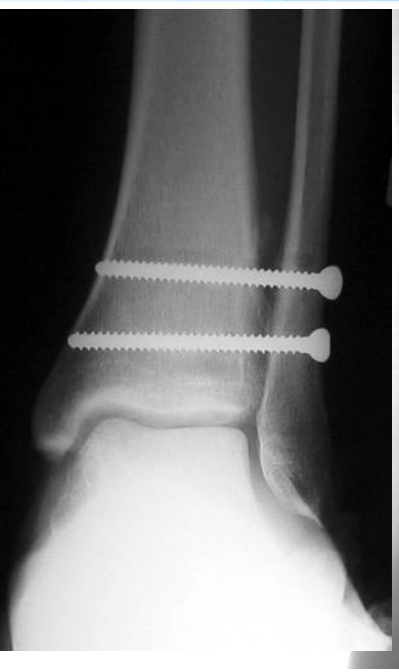
Syndesmotic Fixation: Where are we going ?

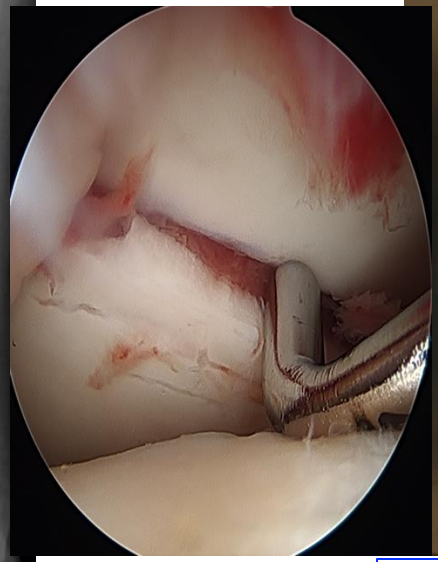
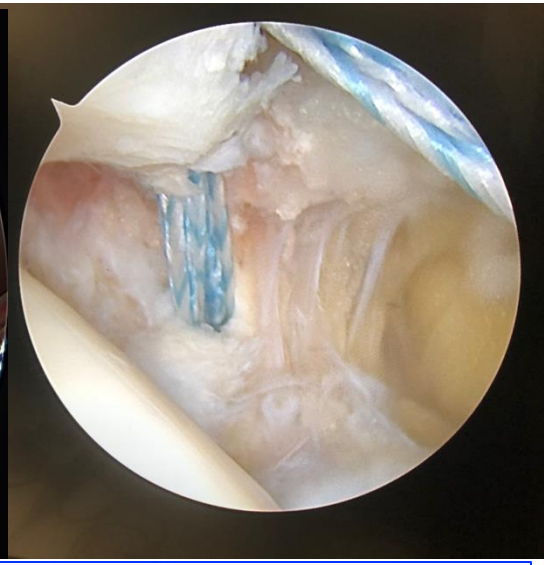
Fractures

Sprains



Syndesmotic Fixation:: Where are we going ?



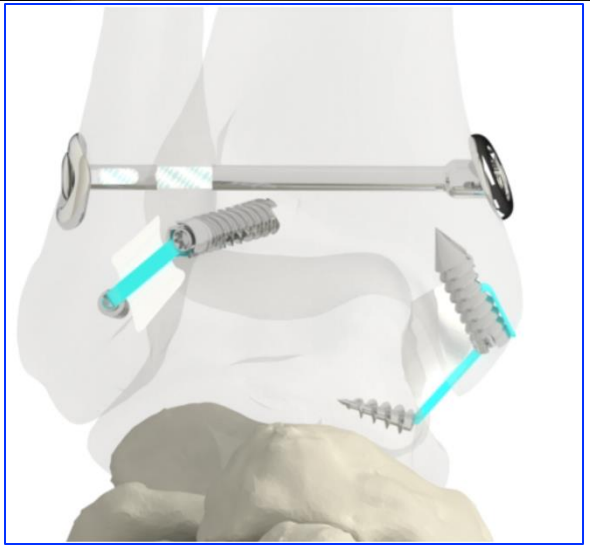
Common Questions :

How to ensure anatomic reduction?

Rigid (screws) vs Flexible fixation (suture button(s))

Anatomic (repair ligament injury) vs non-anatomic

- **Deltoid repair?**
- **AITFL repair**
- **Posterior malleolar fracture**



Deltoid Repair?

Contents lists available at ScienceDirect

Foot and Ankle Surgery

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

Early radiographic outcomes following deltoid ligament repair in bimalleolar equivalent ankle fractures

Olawale A. Sogbein[a], Jun Yi[b], David W. Sanders[a], Abdel-Rahman Lawendy[a], Mark MacLeod[a], Christopher Del Balso[a,*]

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[b] Schulich School of Medicine & Dentistry, Western University, 1151 Richmond [illegible] N6A5C1, Canada

Table 2
Preoperative radiographic outcome measures in deltoid repair (DR, n = 46) and no repair groups (NR, n = 101).

	Deltoid repair, DR (N = 46)	No deltoid repair, NR (N = 101)
MCS (mm)	6.75 ± 2.2	6.13 ± 1.52
TCS (mm)	4.74 ± 1.79	5.2 ± 1.42
TTA (degrees)	1.75 ± 1.7	2.15 ± 1.84
LTS (mm)	2.0 ± 1.04	1.86 ± 0.85

Medial clear space (MCS), tibiofibular clear space (TCS), tibiotalar angle (TTA), and lateral talar station (LTS) in DR and NR. There were no significant differences between groups. Data are presented as mean ± SD.

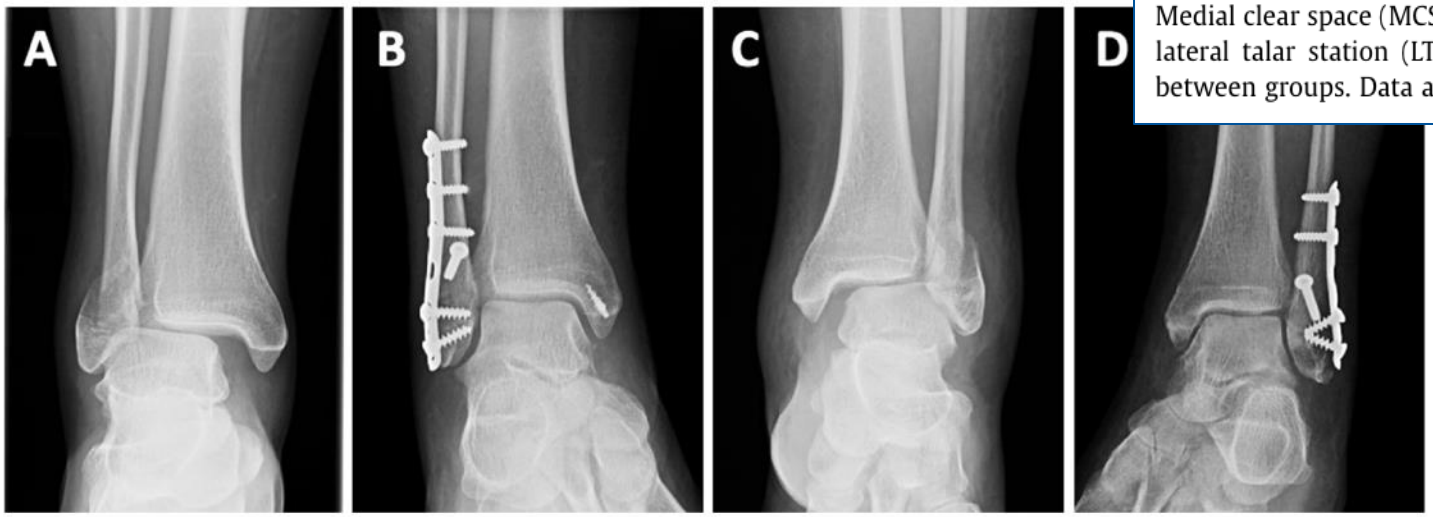

Fig. 3. Preoperative and three-month postoperative mortise radiographs in a DR patient (A, B); NR patient (C, D).

Outcome of suture button vs screws in fractures

- Similar outcomes
- Decreased rate of mal-union with flexible fixation
- Hardware complications/removal

Fixation

Comparis
Screw Fix

Gohar A. Naqvi
Bernadette Lyn
and Nasir Awar
Investigation pe
Our Lady of Lo

International Orthopaedics (SICOT) (2012) 36:1199–1206
DOI 10.1007/s00264-012-1500-2

REVIEW

Acute
review

International Orthopaedics (SICOT) (2013) 37:1755–1763
DOI 10.1007/s00264-013-1999-x

REVIEW ARTICLE

Interna
a syste

Chen Wang

The Effect of Suture-Button Fixation on Simulated Syndesmotic Malreduction: A

J Orthop Trauma. 2015 May;29(5):216-23. doi: 10.1097/BOT.0000

A prospective randomized multicente
surgically with a static or dynamic im

Laflamme M[1], Belzile EL, Bédard L, van den Bekerom MP, G

Article

AMERICAN ORTHOPAEDIC FOOT & ANKLE SOCIETY

Biomechanical Comparison of Syndesmotic Repair Techniques During External Rotation Stress

Foot & Ankle International
1–10
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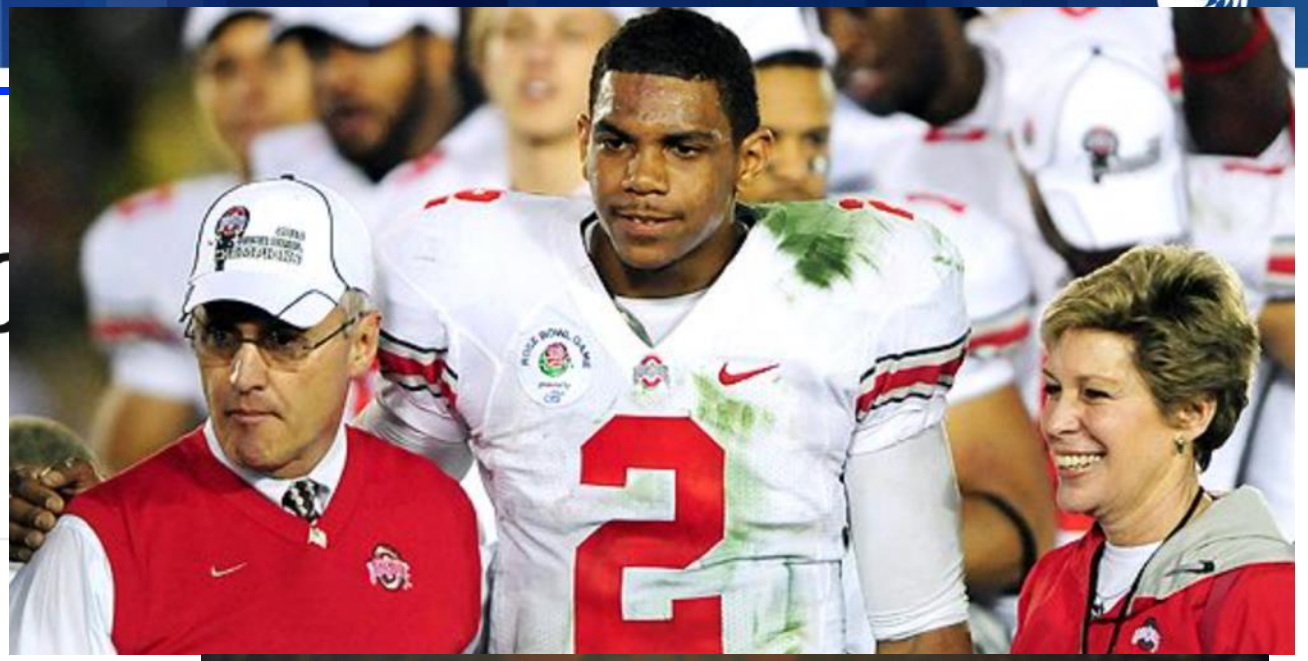
Jessica E. Goetz, PhD[1], Nathan P. Davidson, BS[2], M. James Rudert, PhD[1], Nicole Szabo, BS[1], Matthew D. Karam, MD[1], and Phinit Phisitkul, MD[1]

NO. 10 OHIO STATE 27, NO. 15 IOWA 24

Ohio State Holds C
Trip to Rose Bowl



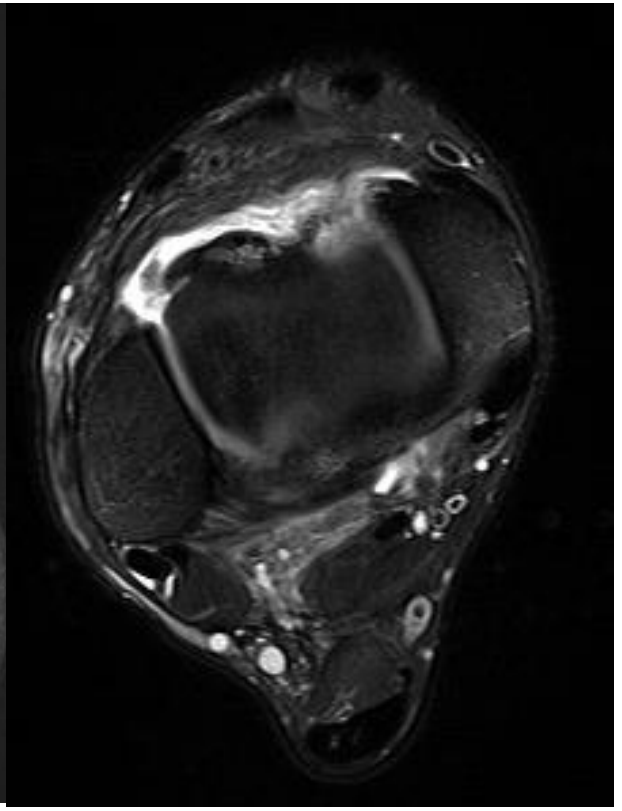
By The Associated Press

Nov. 14, 2009

COLUMBUS, Ohio (AP) The backup k
a 39-yard field goal in overtime to give N
victory over No. 15 Iowa and send the Bu
for the first time in 13 years.

Case 4 high ankle sprain 2009

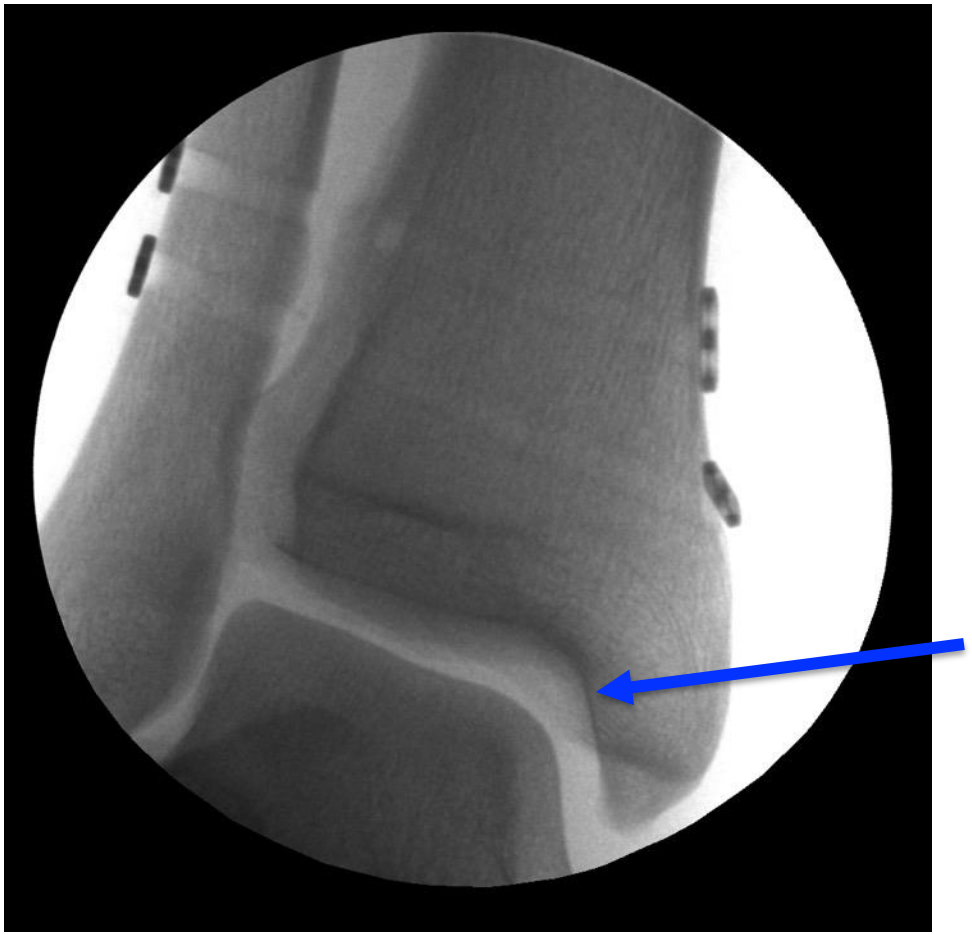
Case 4
unstable high ankle sprain



Case 4
unstable high ankle sprain

Case 4

unstable high ankle sprain, ***now stable ??***

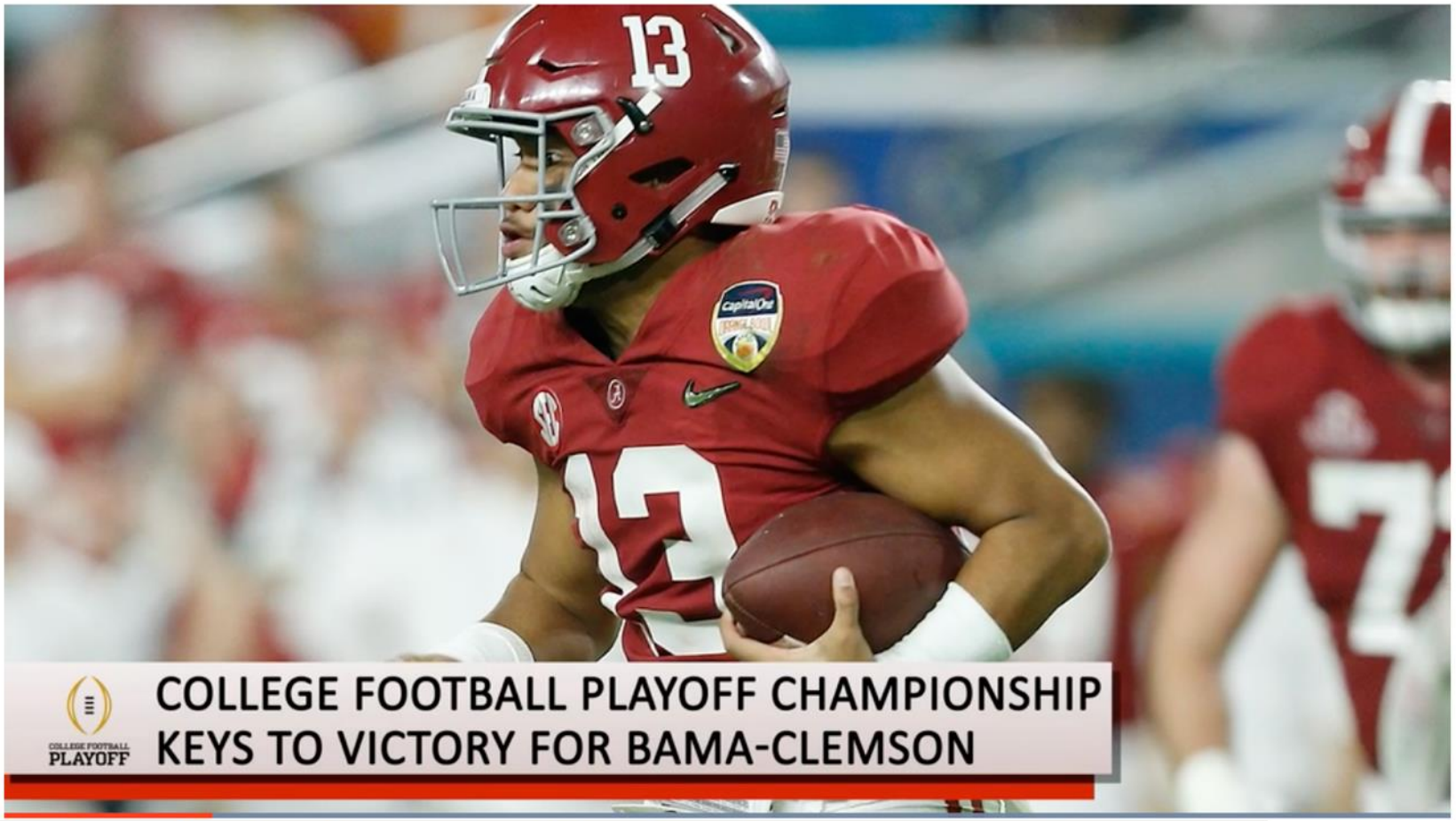


Post op

5 weeks Orange Bowl MVP

COLLEGE FOOTBALL

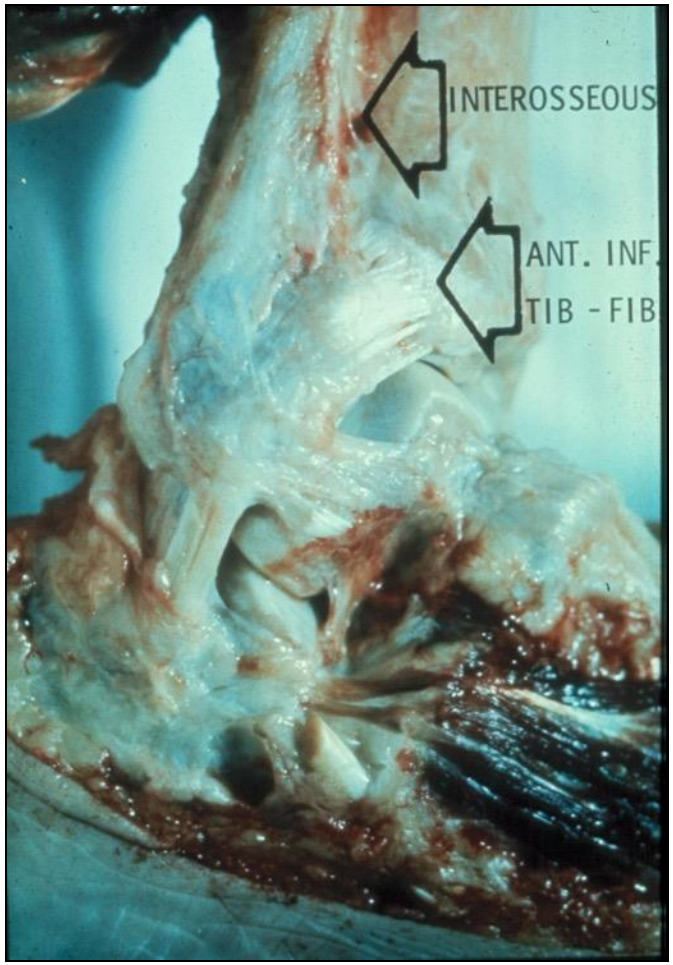
The Surgical Innovation That Got Tua Tagovailoa Back on the Field for Alabama's Title Push



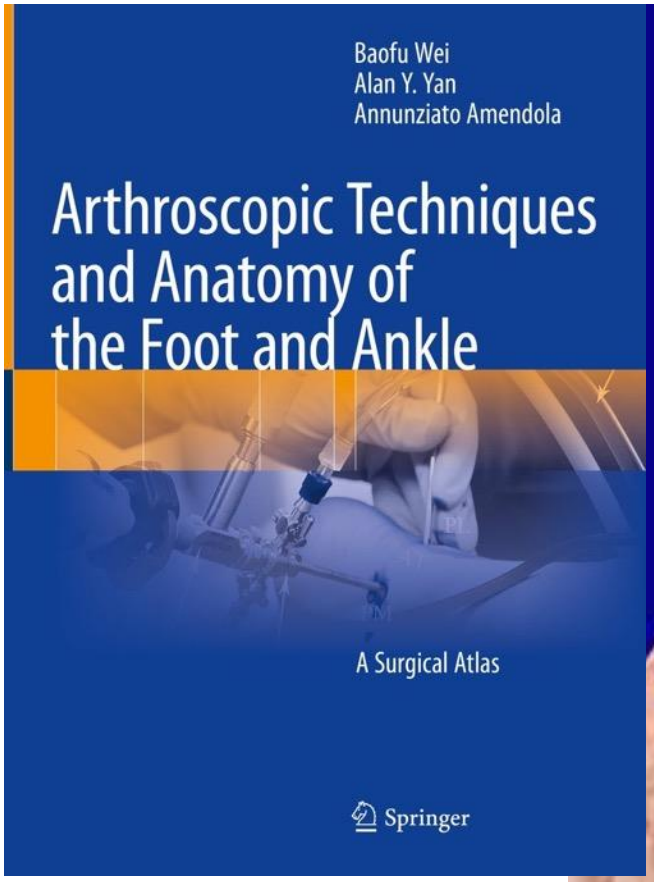
Tagovailoa. (Photo via Associated Press)

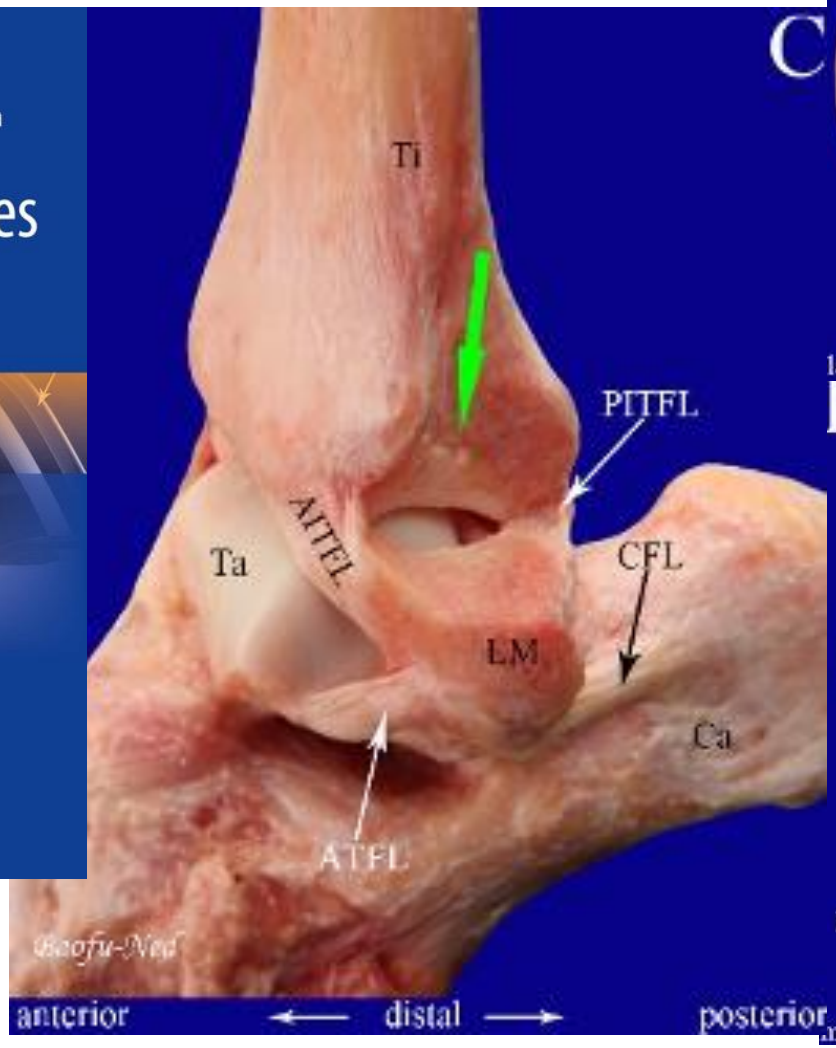
Intro : Syndesmosis Injuries

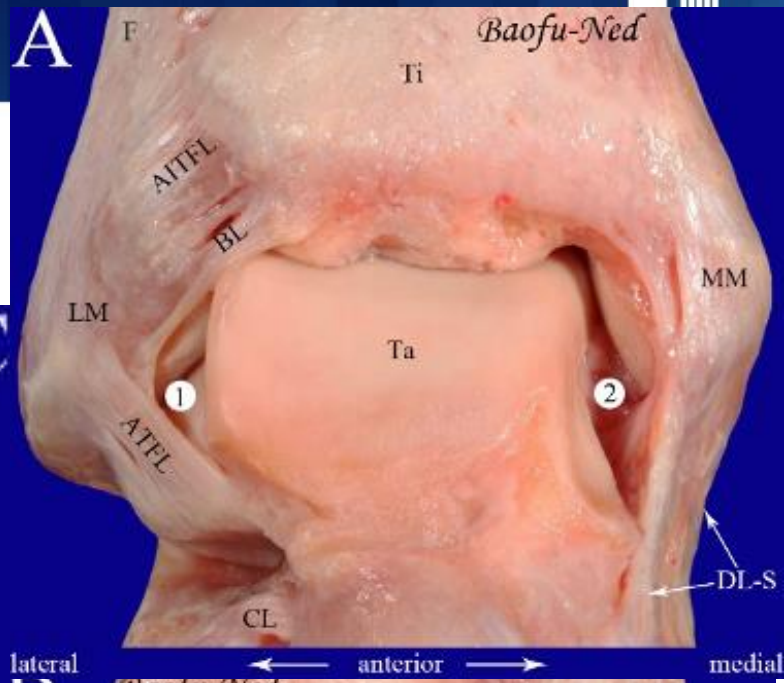
- Common injury
- Often misdiagnosed
- Cause of chronic Ankle dysfunction
- No direct diagnostic test
- Spectrum of severity

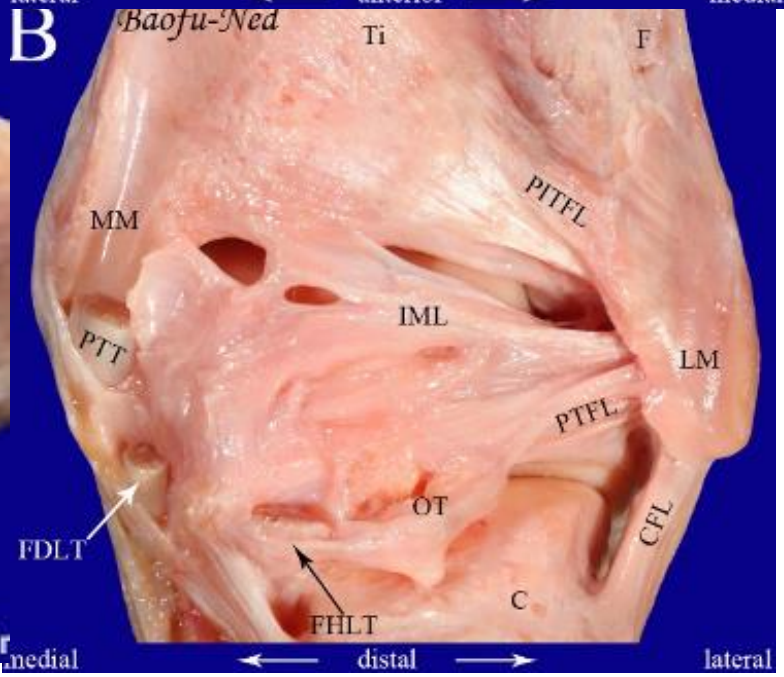


Syndesmotic anatomy



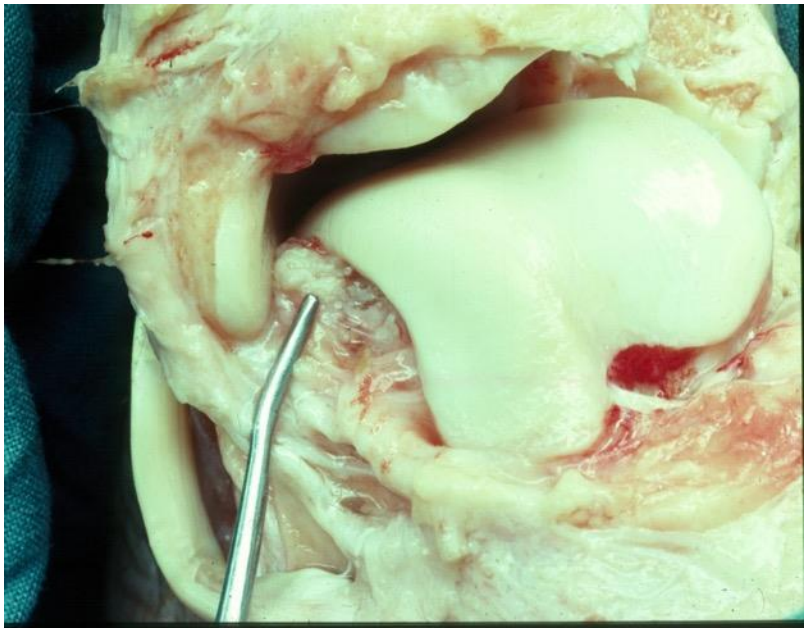






Ankle Syndesmosis: Function

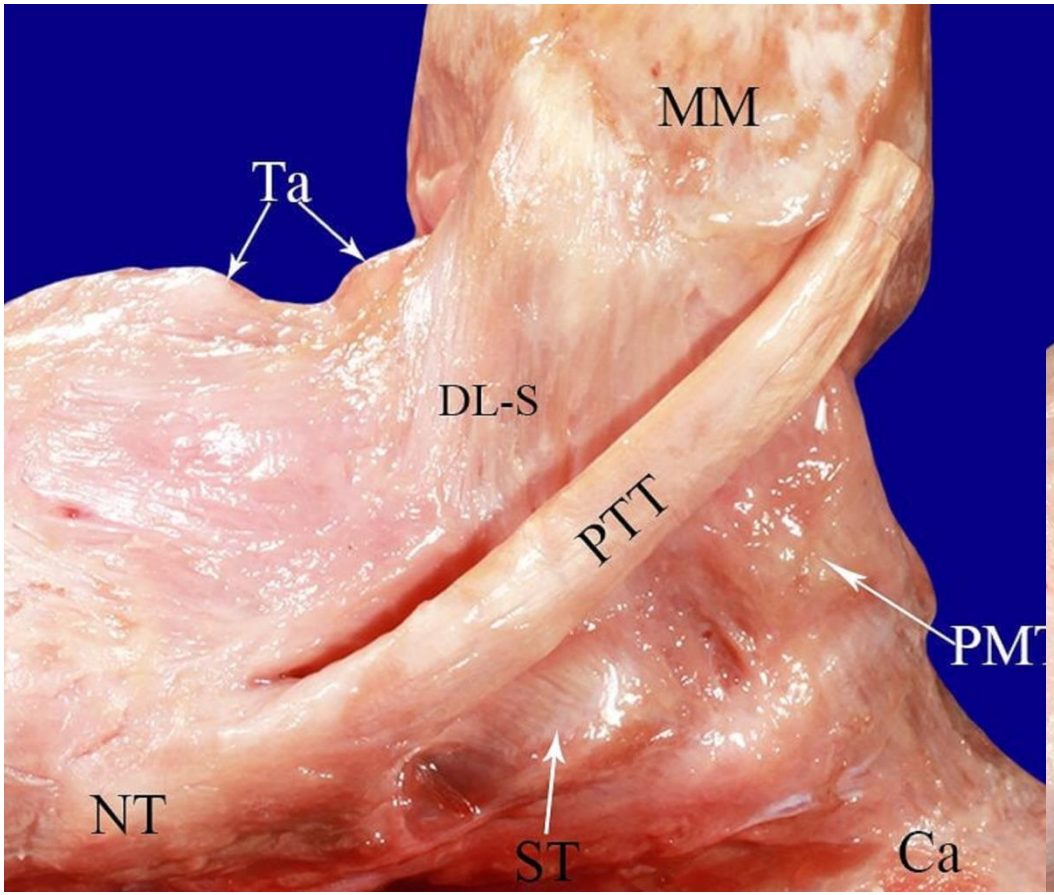
- Stability : syndesmosis /deltoid
- Weight transmission
- Accommodate talar motion

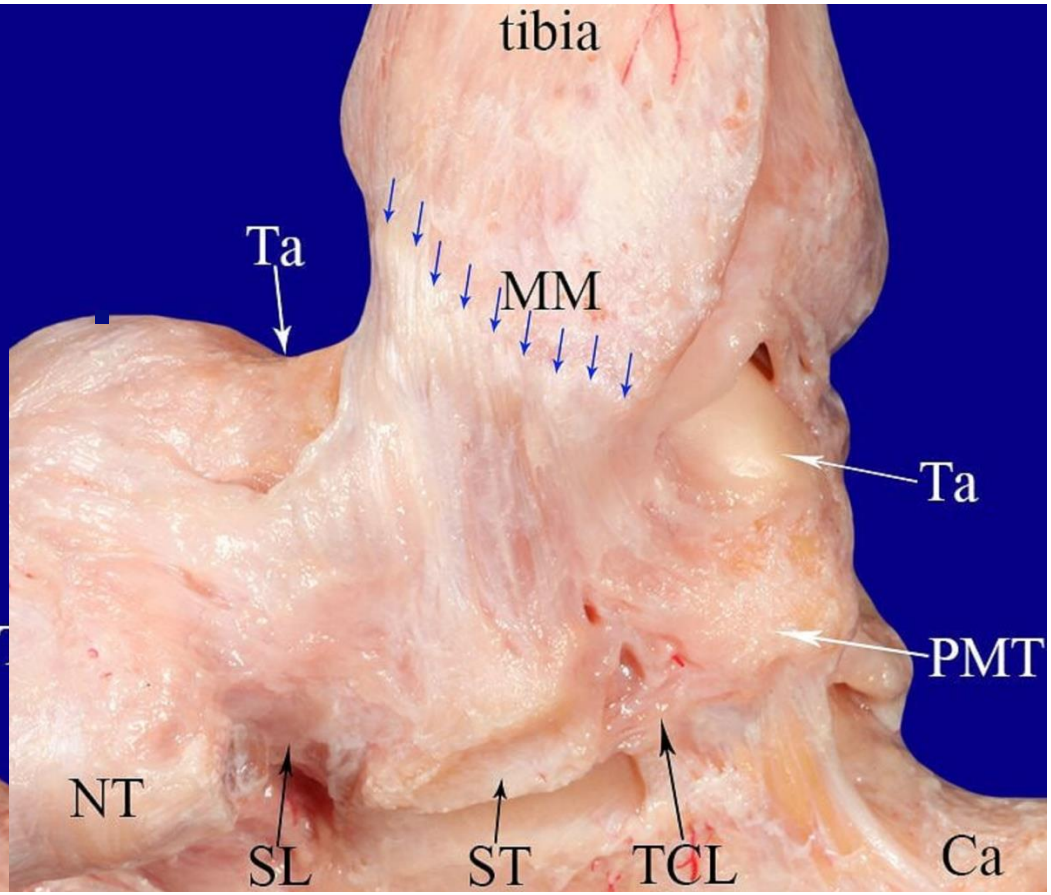


Normal Anatomy

Medial Ligaments

Superficial Deltoid



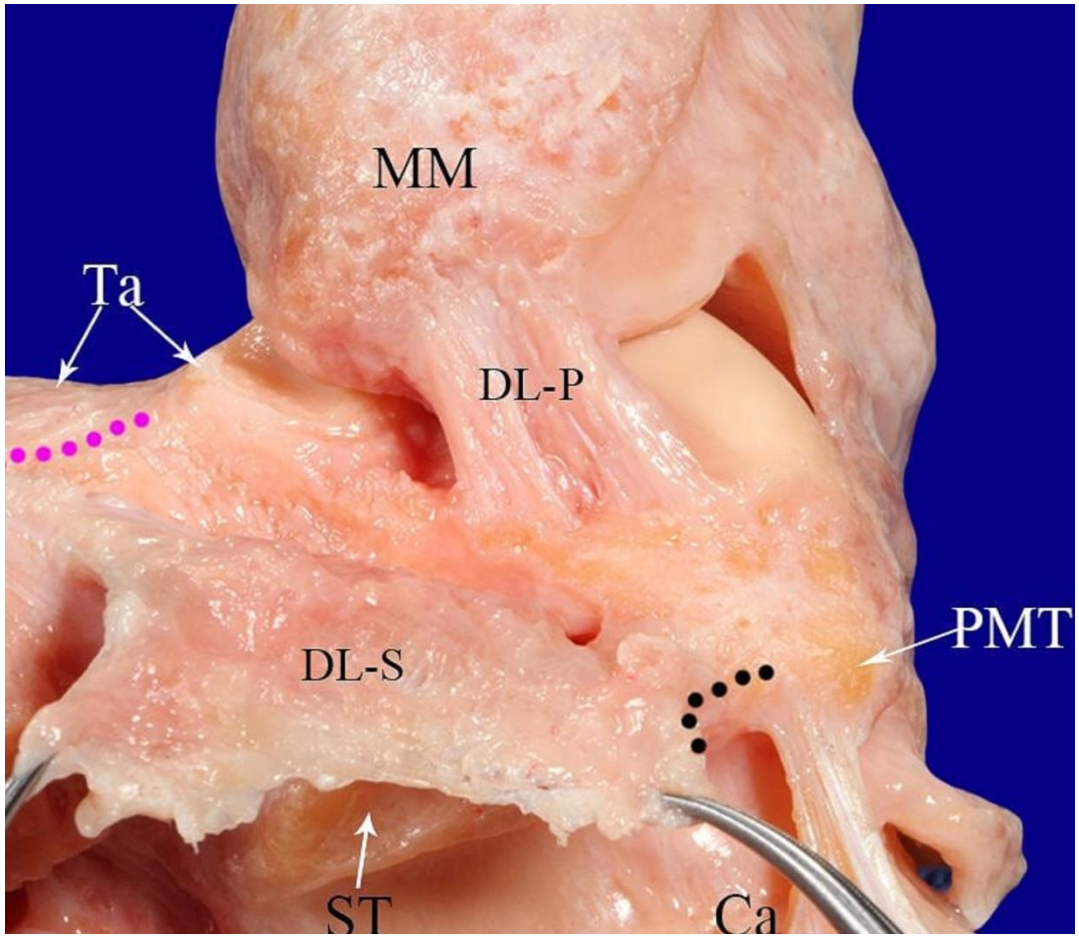


C of Baofu Wei

Normal Anatomy

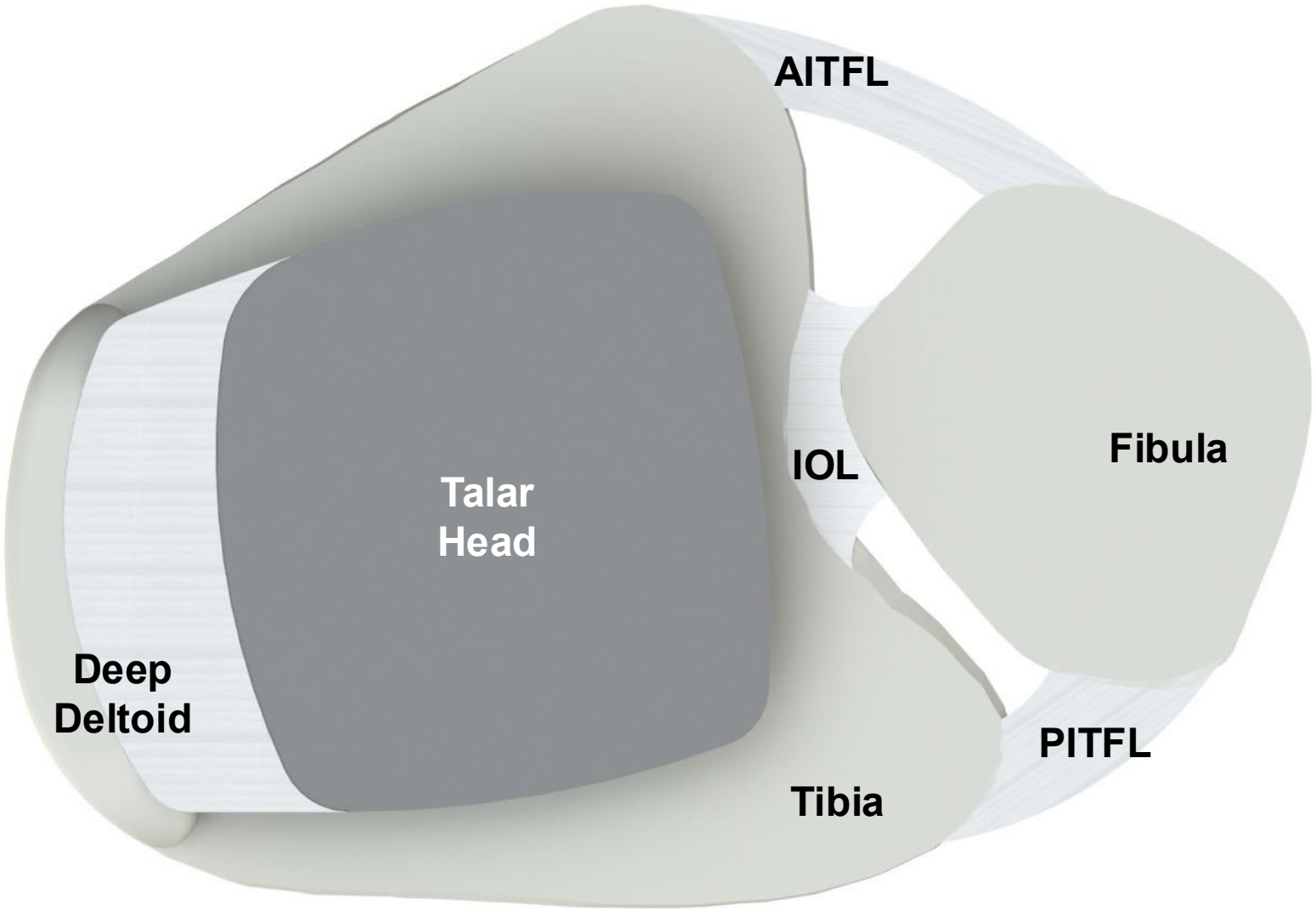
Medial Ligaments

Deep Deltoid

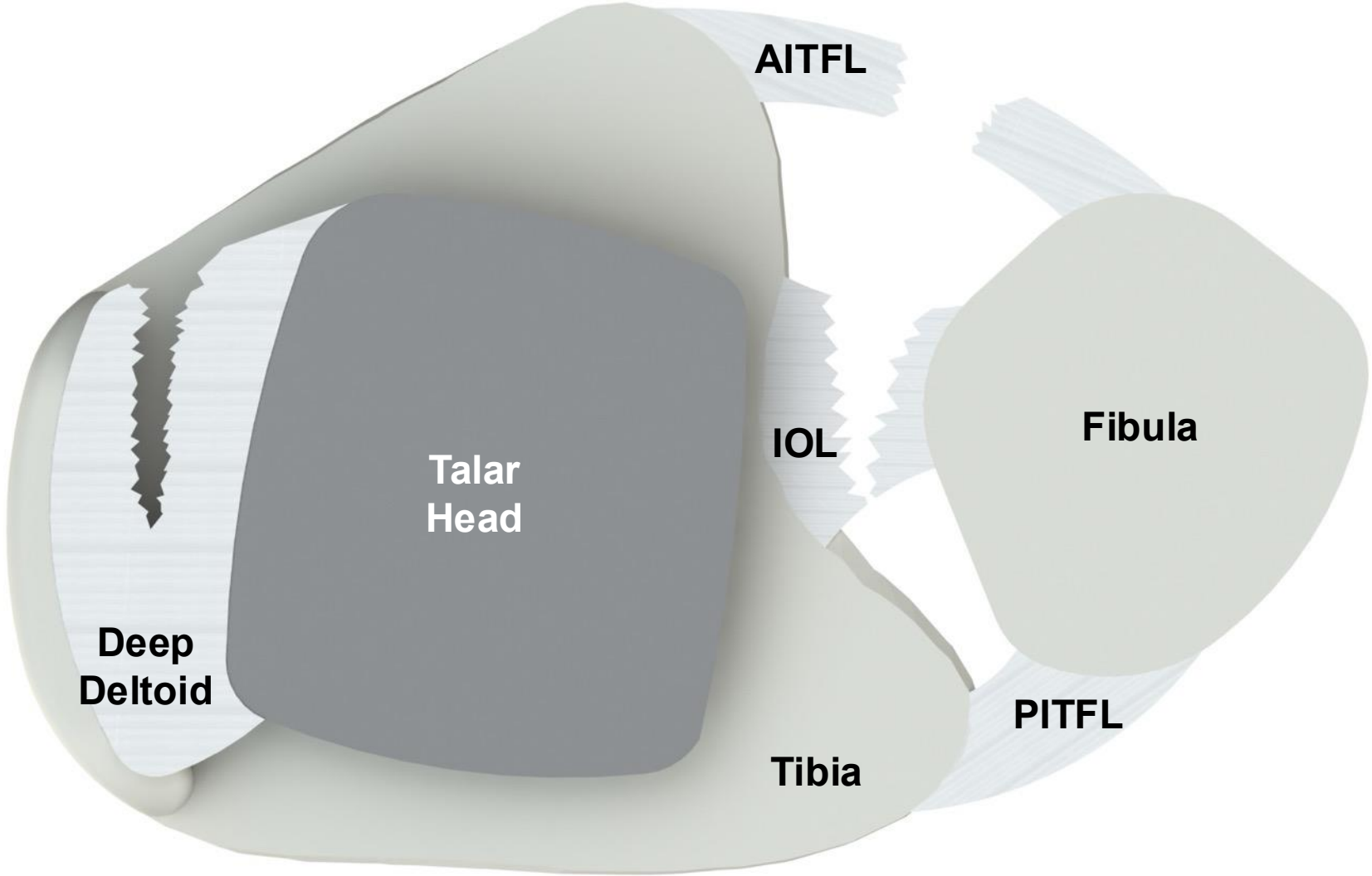


C of Baofu Wei

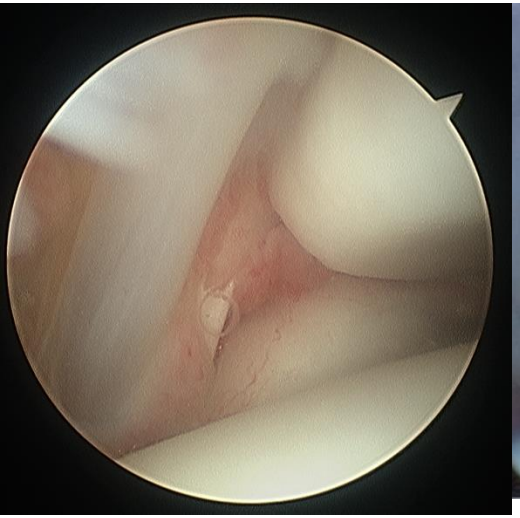
Normal Anatomy



Pronation - External Rotation Injury

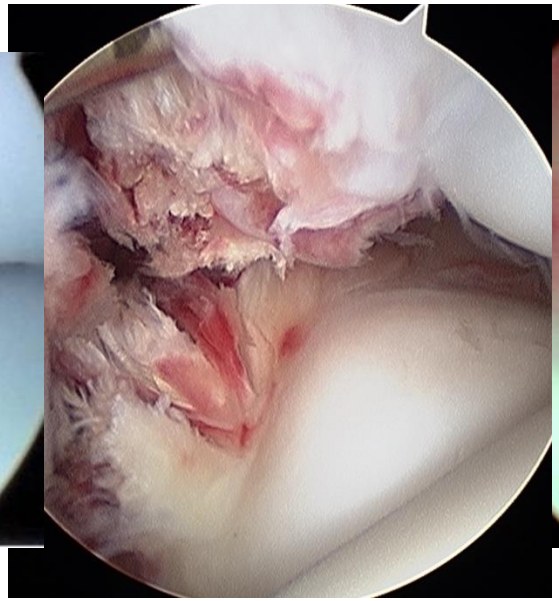


Spectrum of Injury

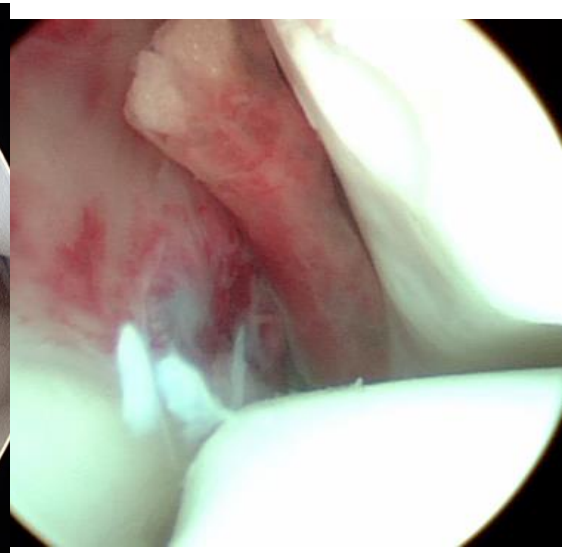


Normal

No instability



Mild

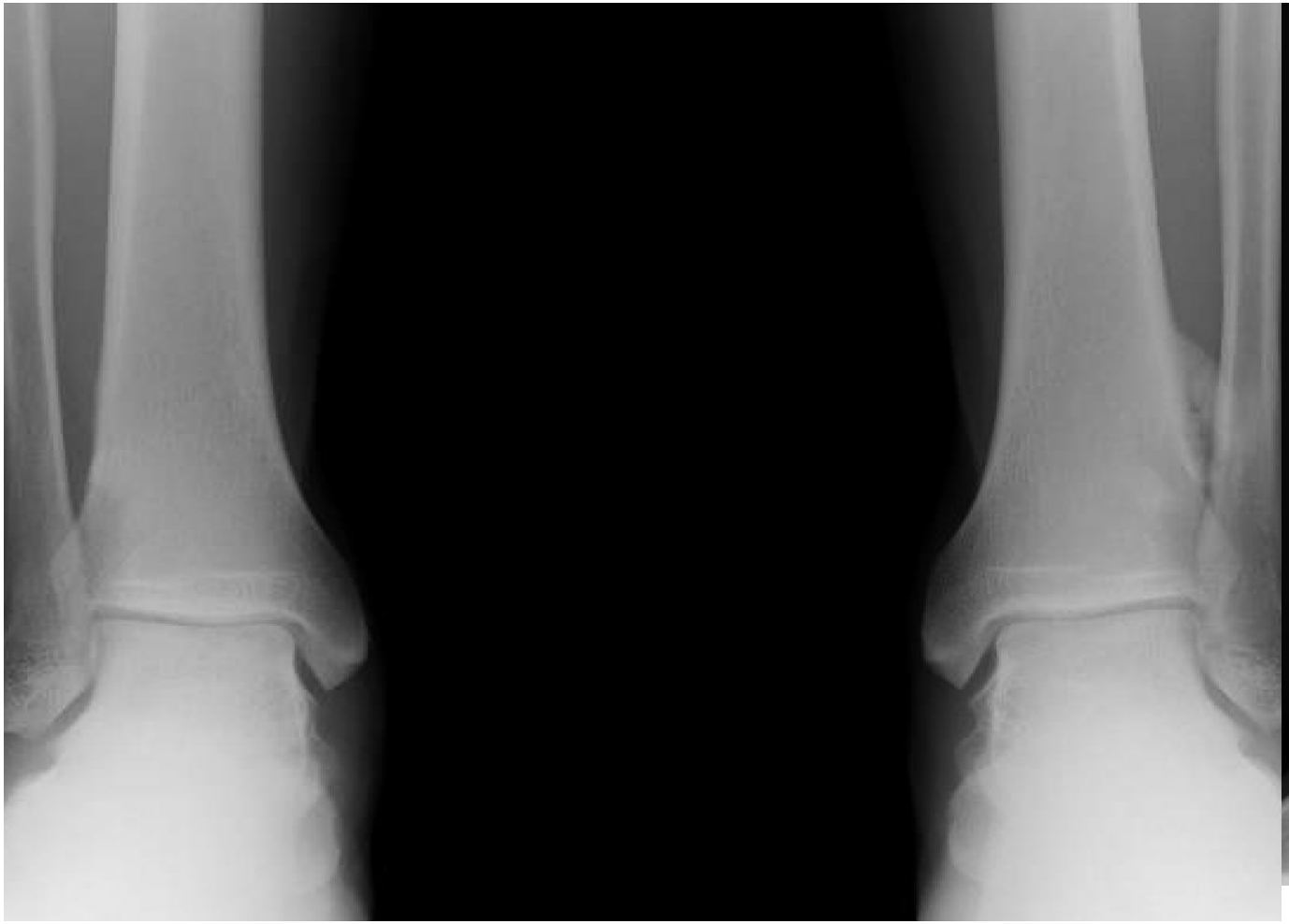


Complete

Case 5 chronic sprain

- 18 yo freshman DL recruit
- Senior year HS sprained ankle in August
  - Played all games
  - Never reached 100%
  - January : felt he was 80%
  - Could not push off , pivot
- Exam
  - mild swelling
  - Tender
  - ++ ER stress/ stabilization test

Case 5 chronic sprain



Case 5 chronic sprain

Case 5 chronic sprain

Case 5 chronic sprain

Syndesmosis Injuries

- In cases **without radiographic widening** , we **do not** have a correlative test / imaging study to tell us exactly the severity of the injury !!

  - Injury mechanism
  - Exam and re-exam
  - Imaging / MRI / stress x-rays
  - Functional progression

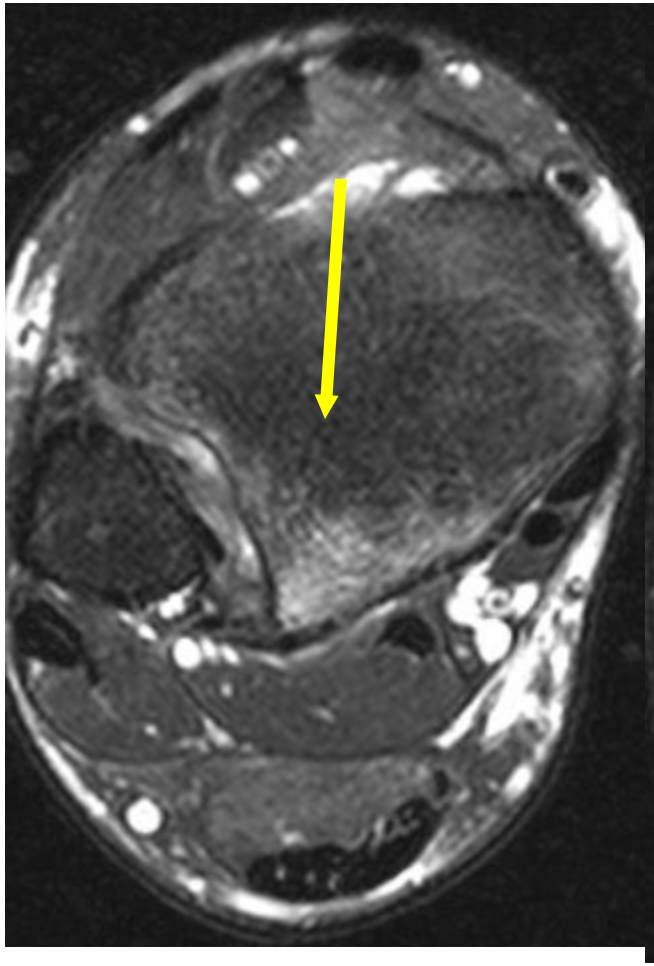
Syndesmosis Injuries

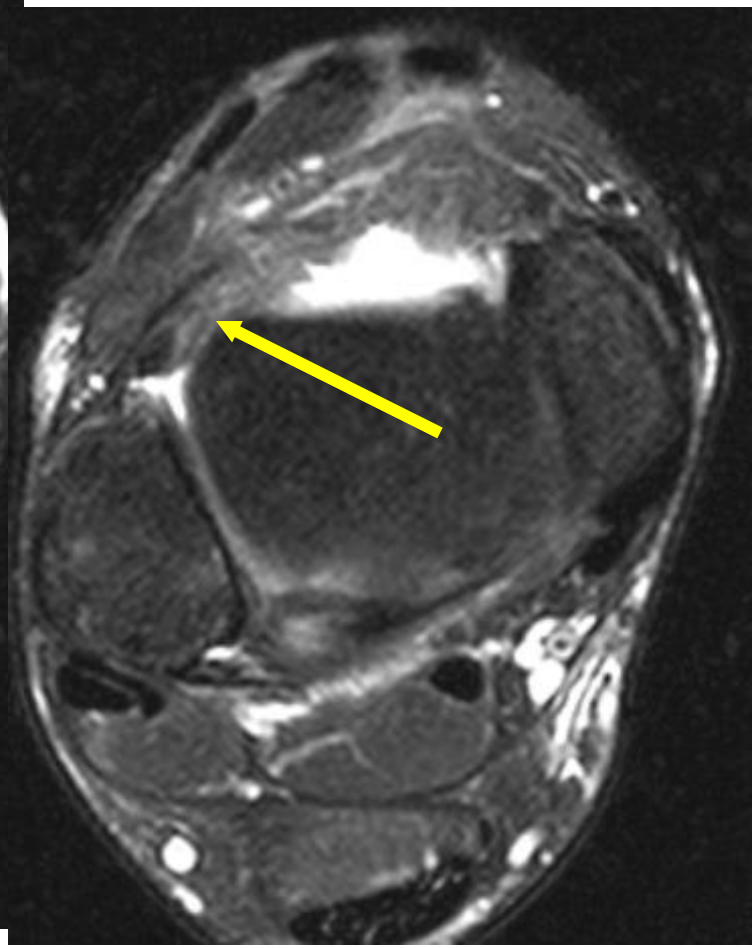
Physical Exam

- Tenderness
- External rotation stress test
- Squeeze test
- Stability test

Syndesmosis Injuries : Exam

MRI findings
lineman still painful after 5 games





Syndesmosis Injury: Imaging

Initial xray

6 wks later

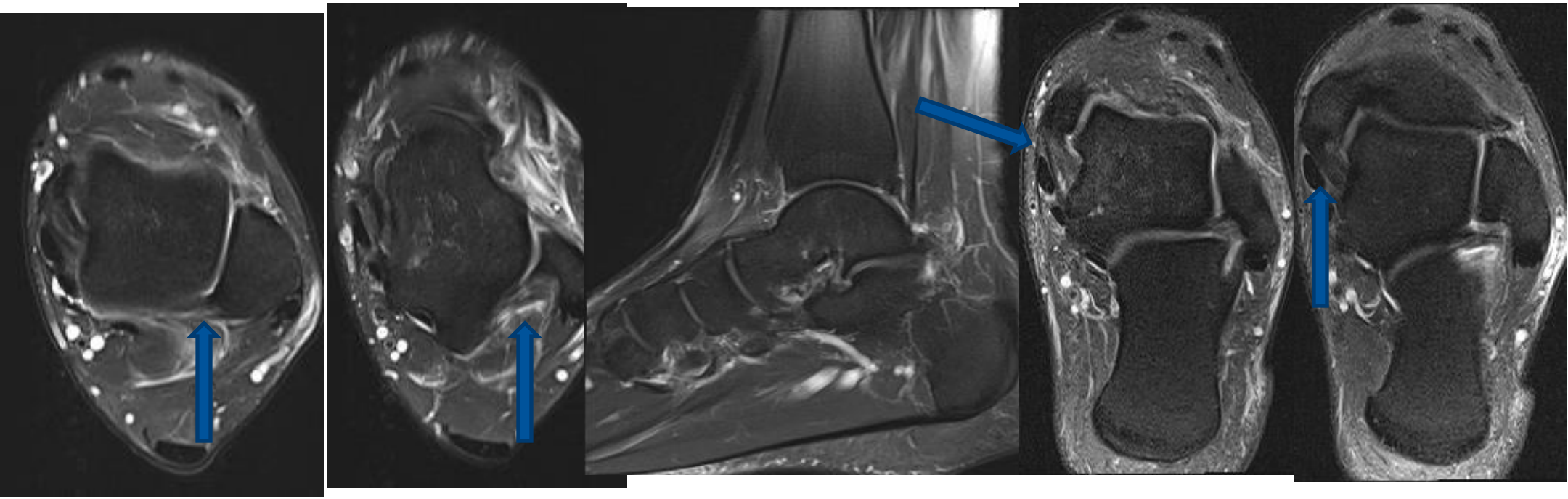
Case Presentation

- 21 yo OL (C) 6’3’ 325 lbs
- Sprained ankle 4th game
- Completed the game
- c/o pain after the game , lateral ankle
- ? Syndesmosis sprain

Physical Exam

- Mild swelling
- Tender laterally, above the ankle , AITFL , distal tib fib
- No medial tenderness
- Pain with DF, ER stress

- Normal fluoroscopic images
- Normal xrays
- MRI below



History

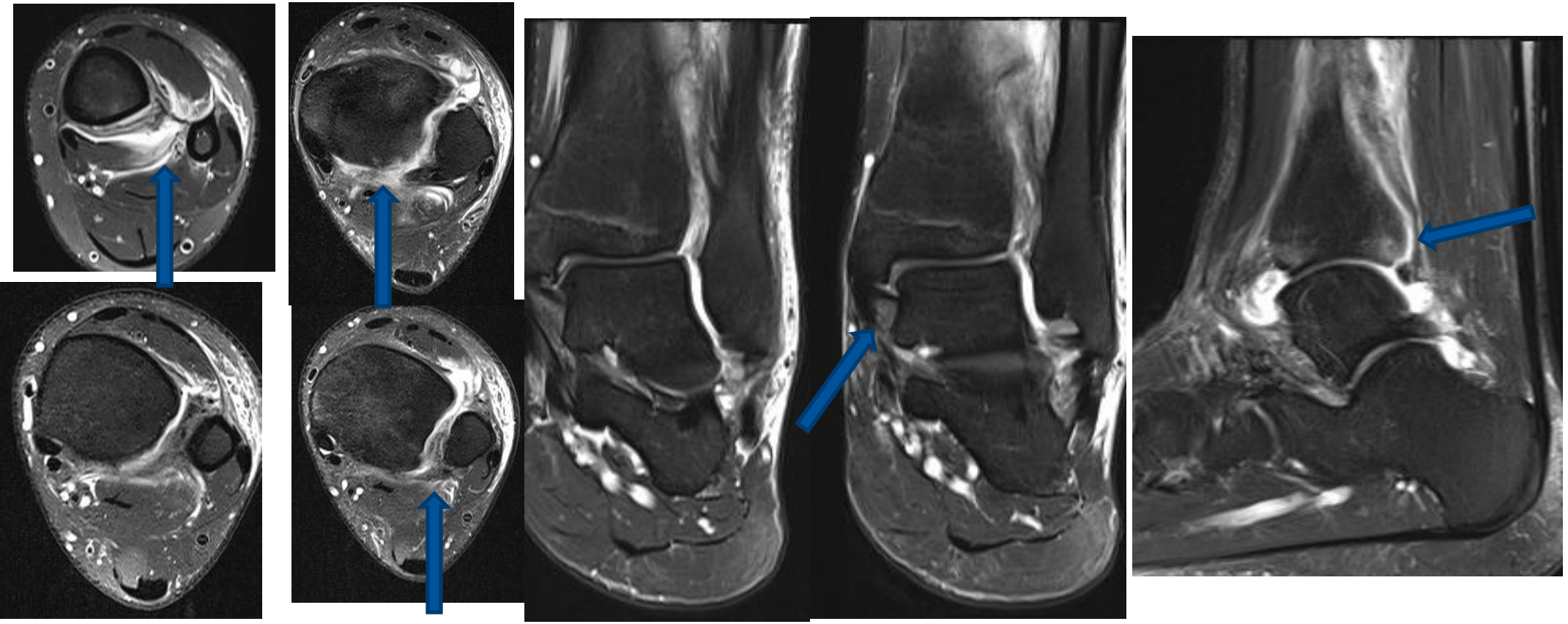
- Played 5 games at 80-90%
- Re-injured at the end of game 5
- Difficulty WB ; could not continue playing

Physical Exam

- more swelling
- Diffuse tenderness laterally
- No medial tenderness
- Significant Pain with DF, ER stress

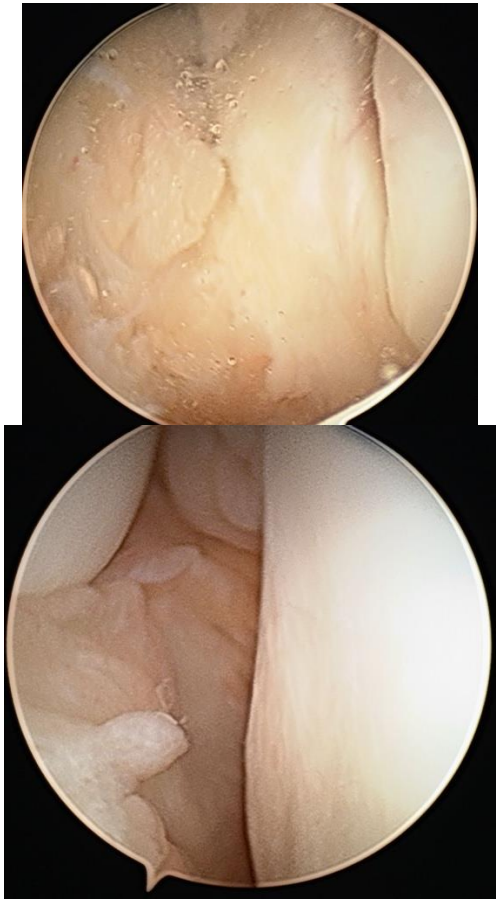
- **Repeat xrays**

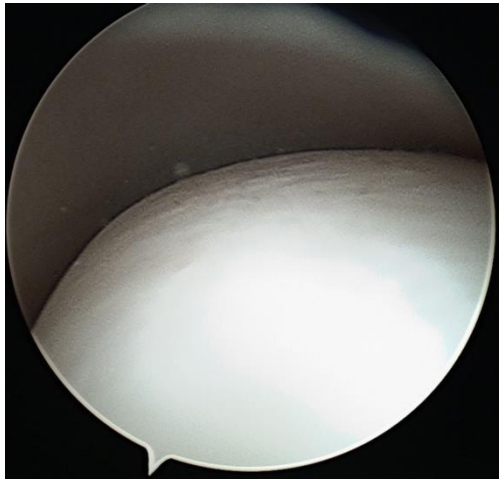
- **Repeat MRI below**

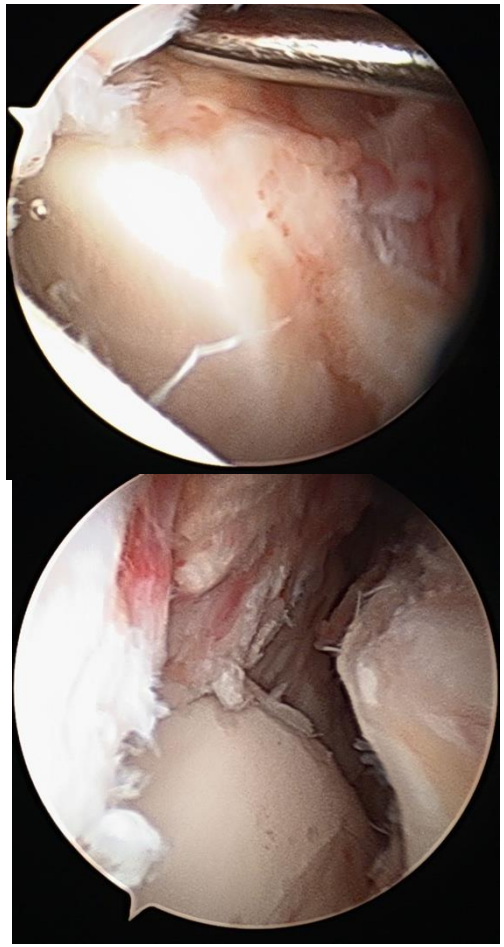


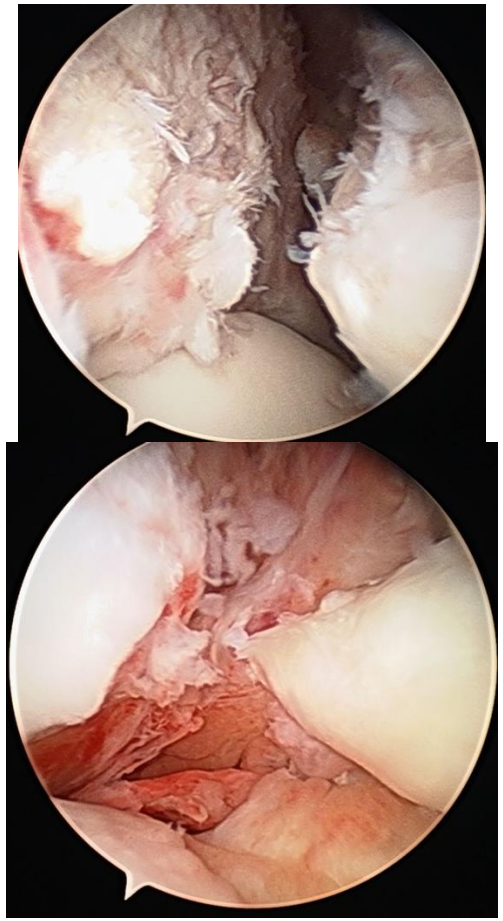
Diagnosis and Treatment

- Surgical Images



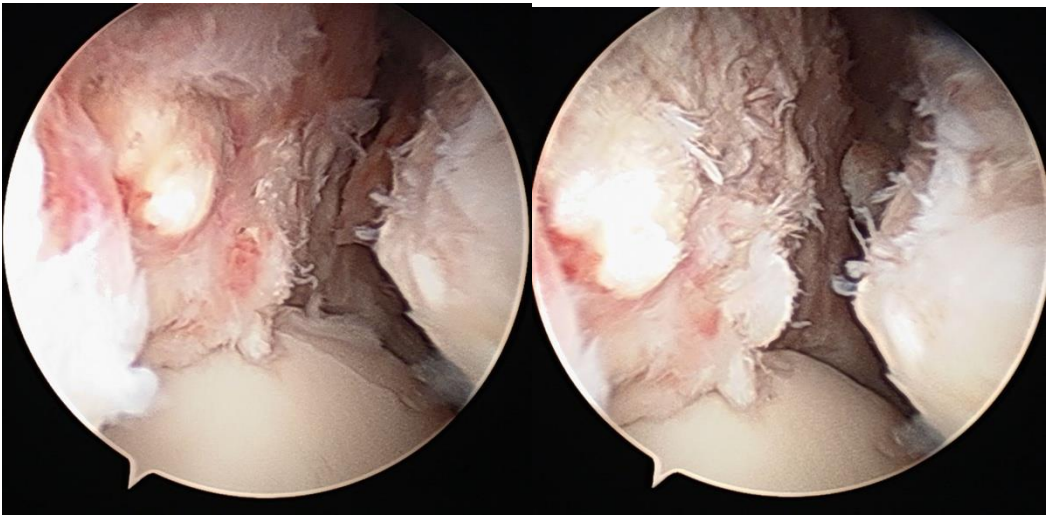




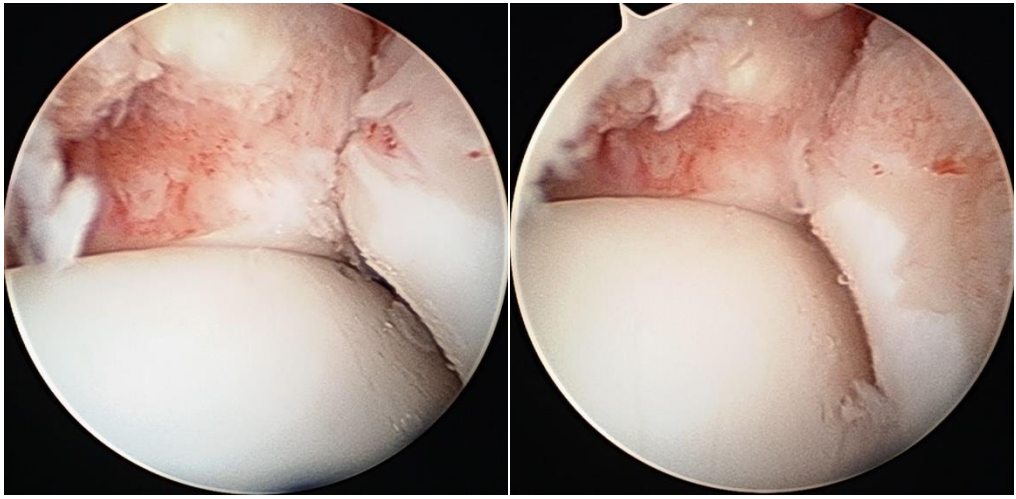


Diagnosis and Treatment

- Surgical Images



Pre- Reduction



Post- Reduction

Diagnosis and Treatment

- Surgical Images

Pre- Reduction

Post- Reduction

Diagnosis and Treatment

- Surgical Images

Deltoid and Syndesmosis disruption

CASE 1
17 yo football player ,
ER injury
No fracture

Deltoid and Syndesmosis disruption

- arthroscopy

Deltoid and Syndesmosis disruption

- Syndesmosis stabilization

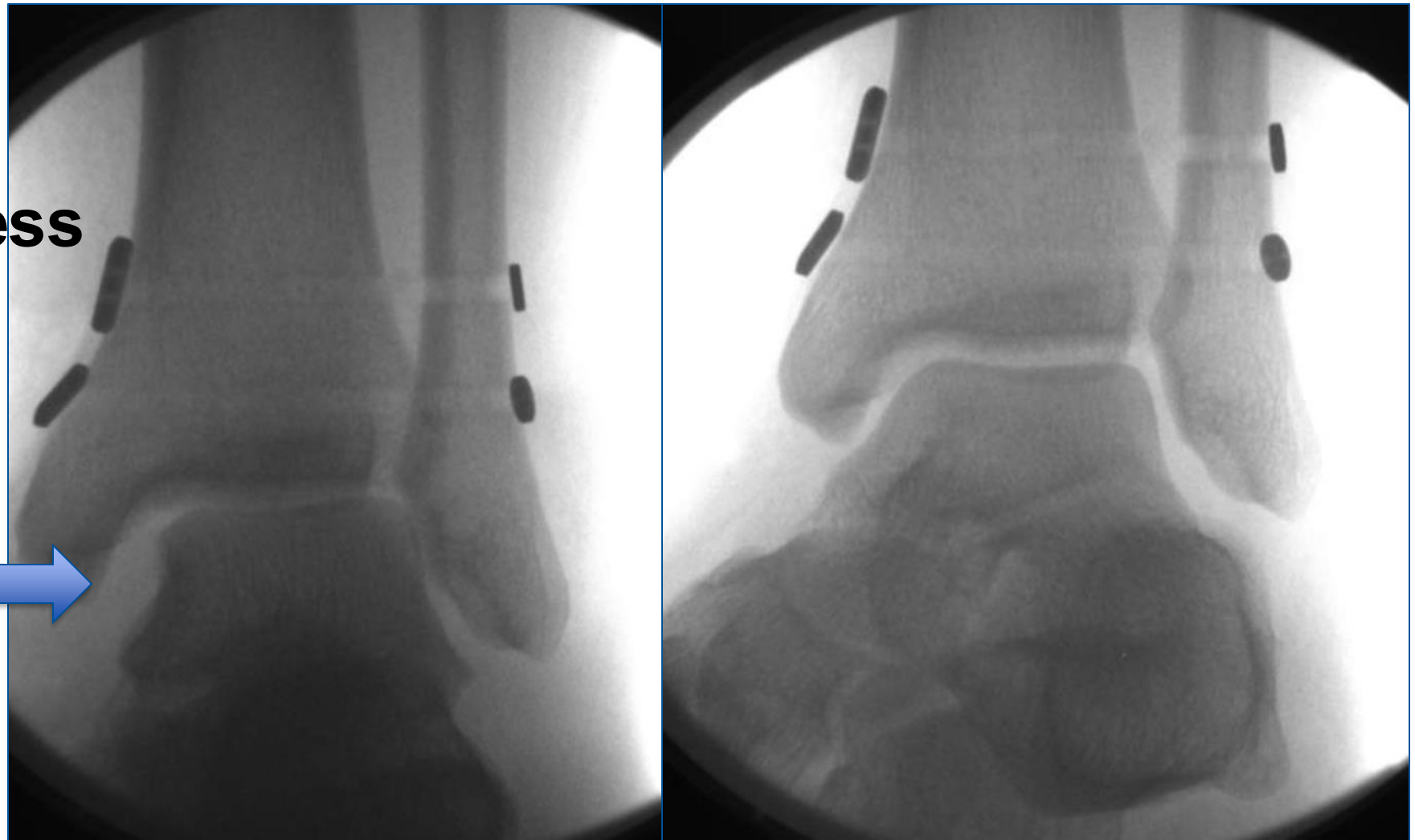
No stress

Deltoid and Syndesmosis disruption

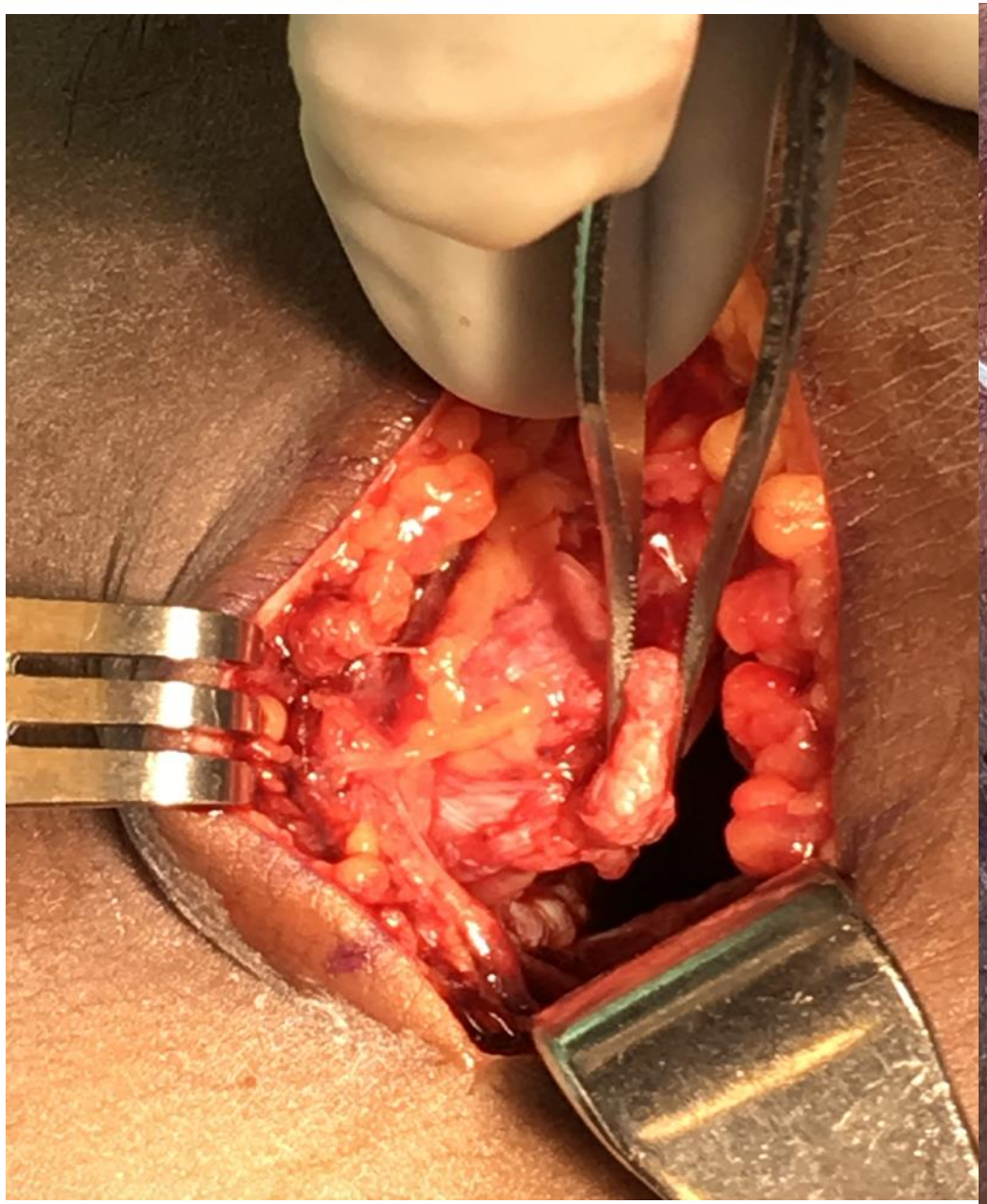
- Deltoid stabilization

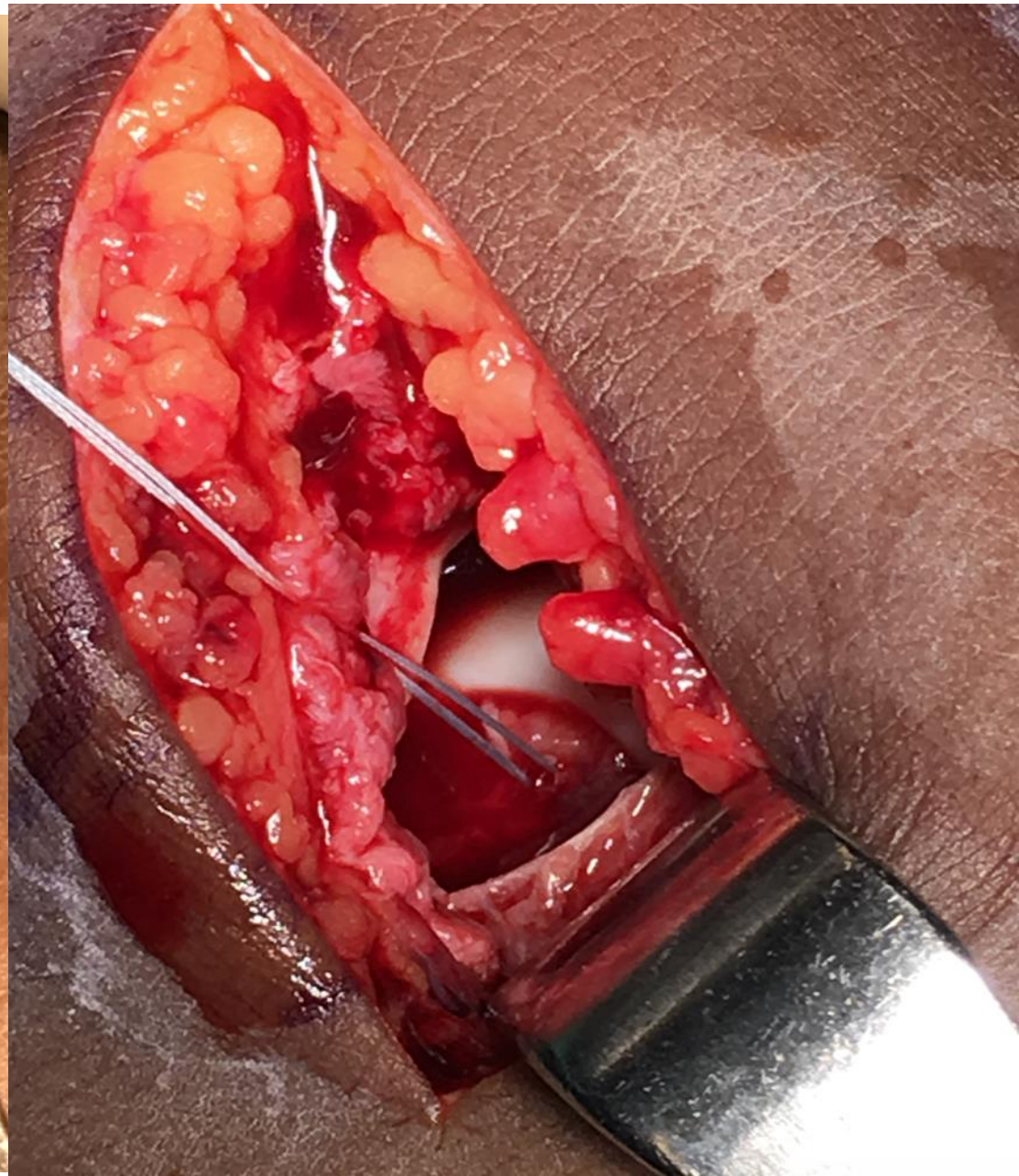
Stress post deltoid repair

stress



Deltoid and Syndesmosis disruption



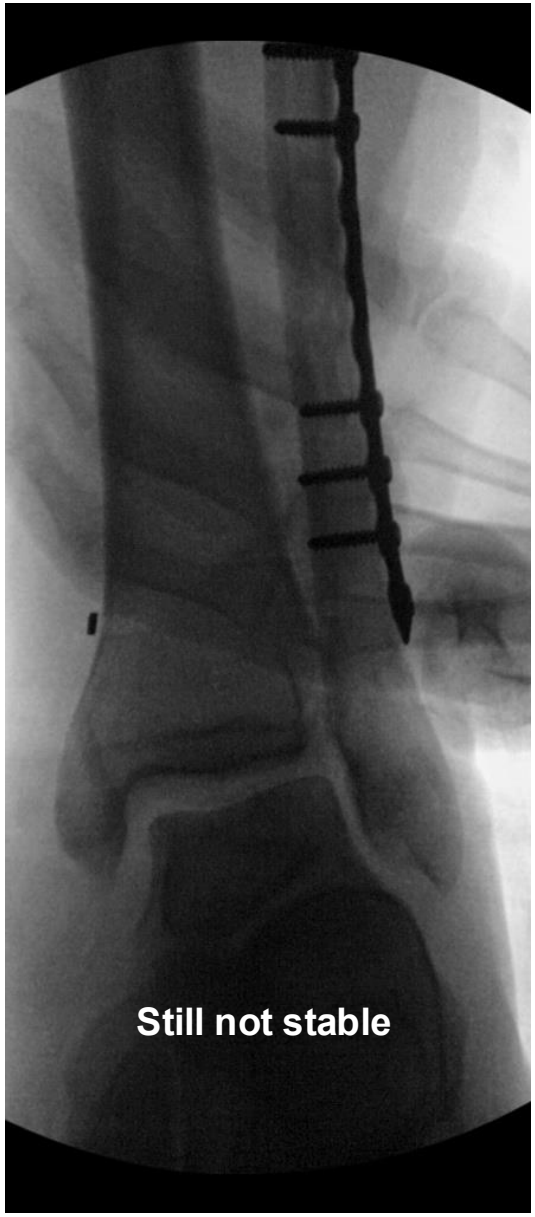


Case 3: high fibular fracture

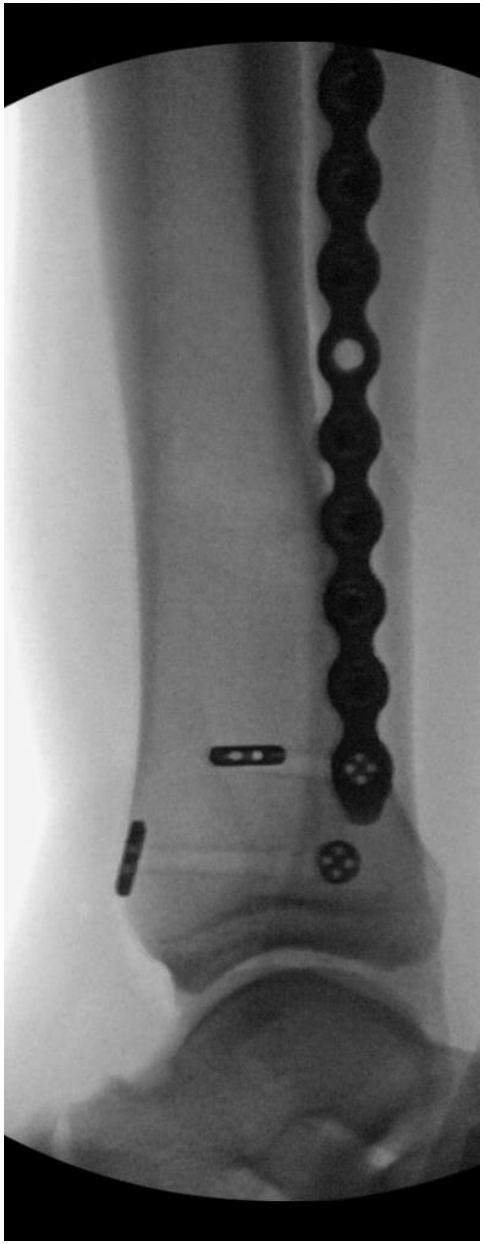
- 20 yo lineman rolled up during pass protection



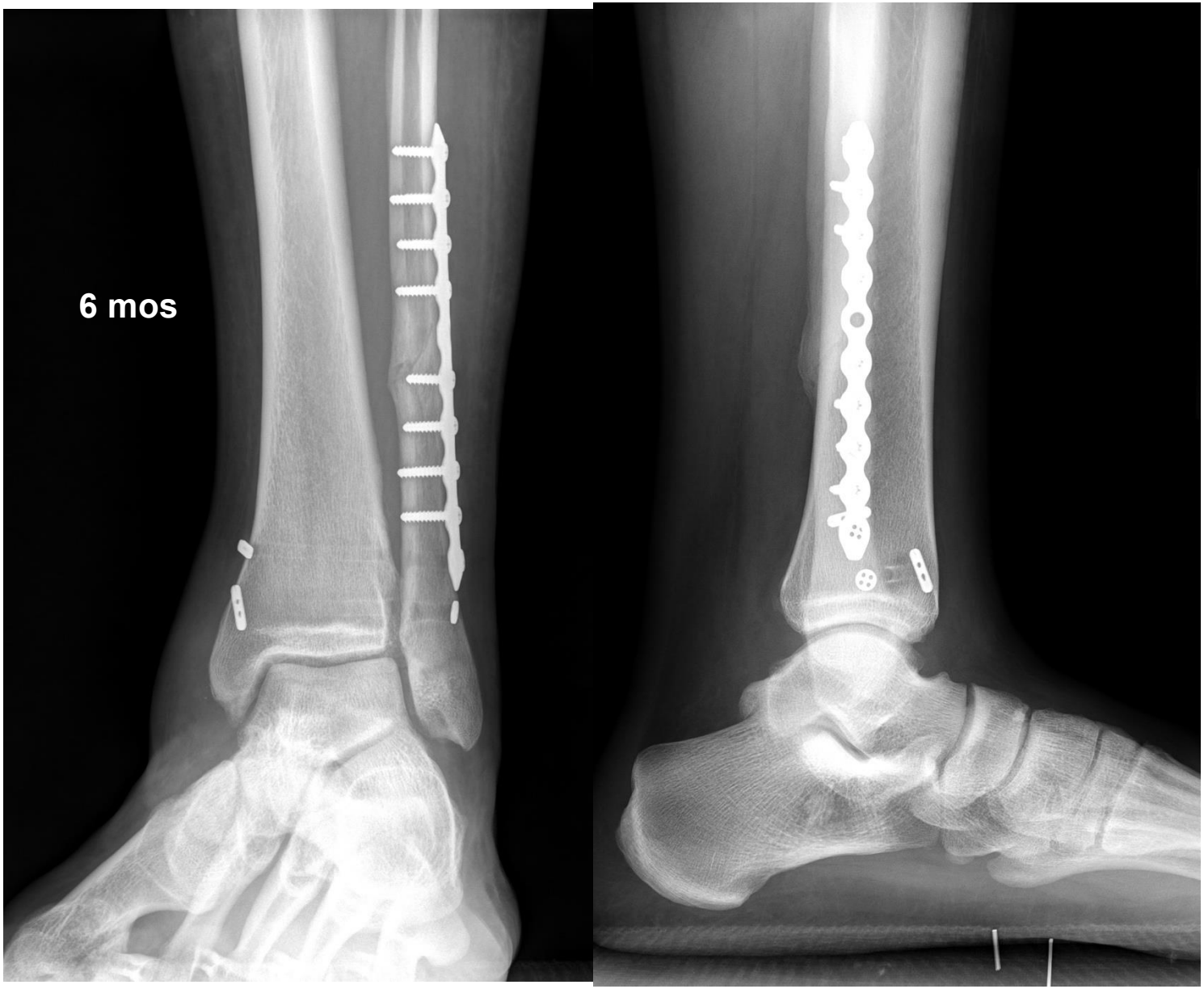
Case 3: high fibular fracture



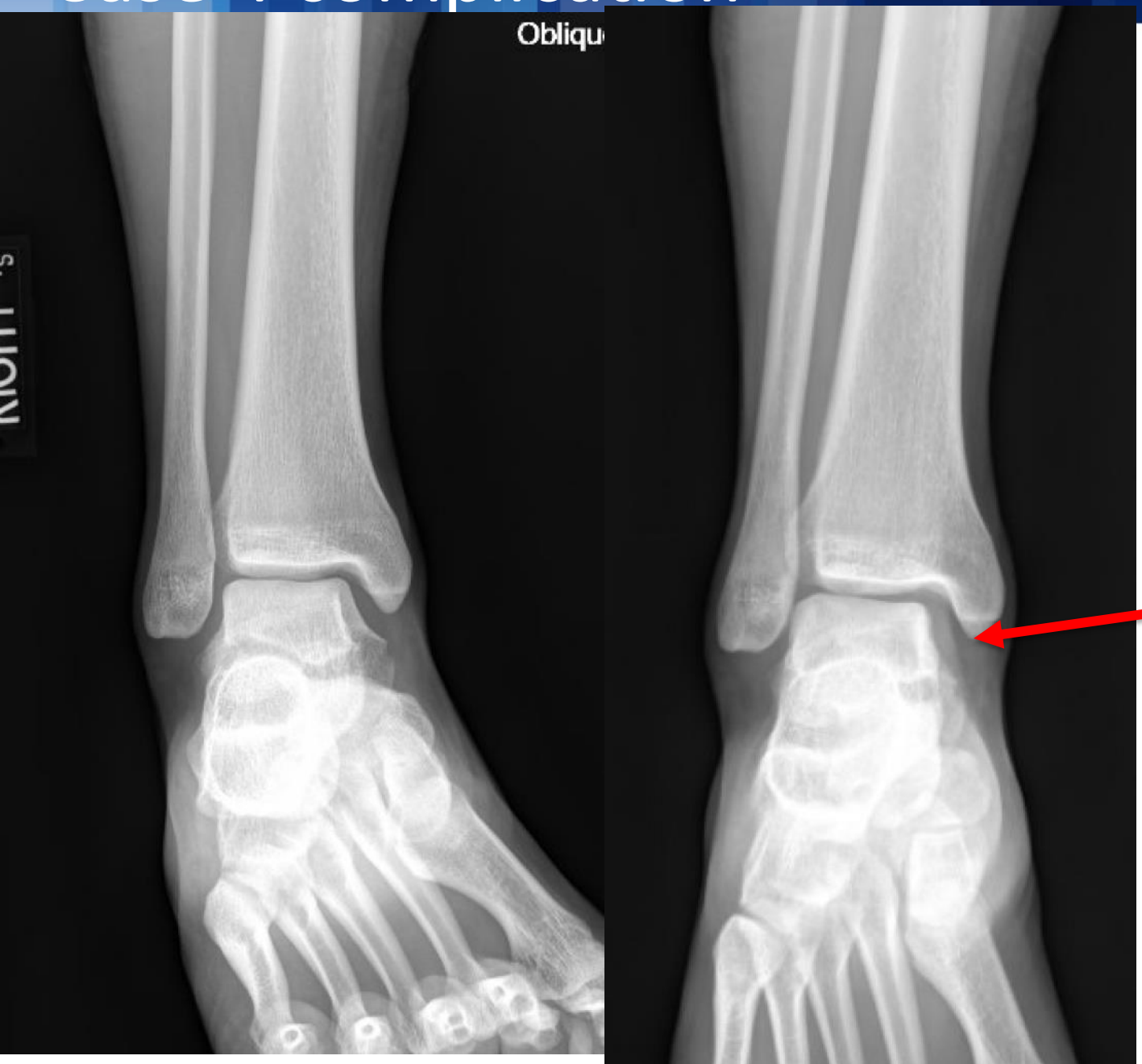
Case 3: high fibular fracture



Case 3: high fibular fracture

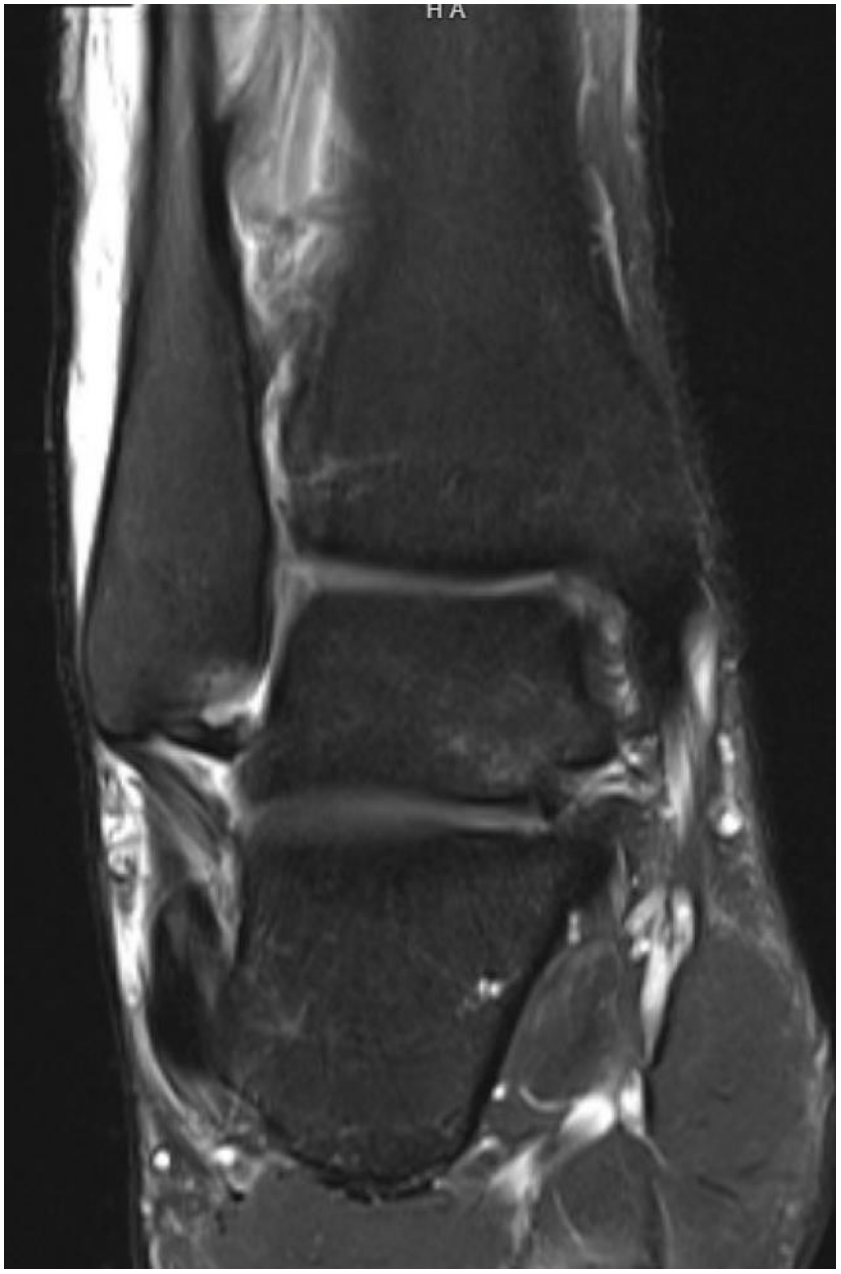


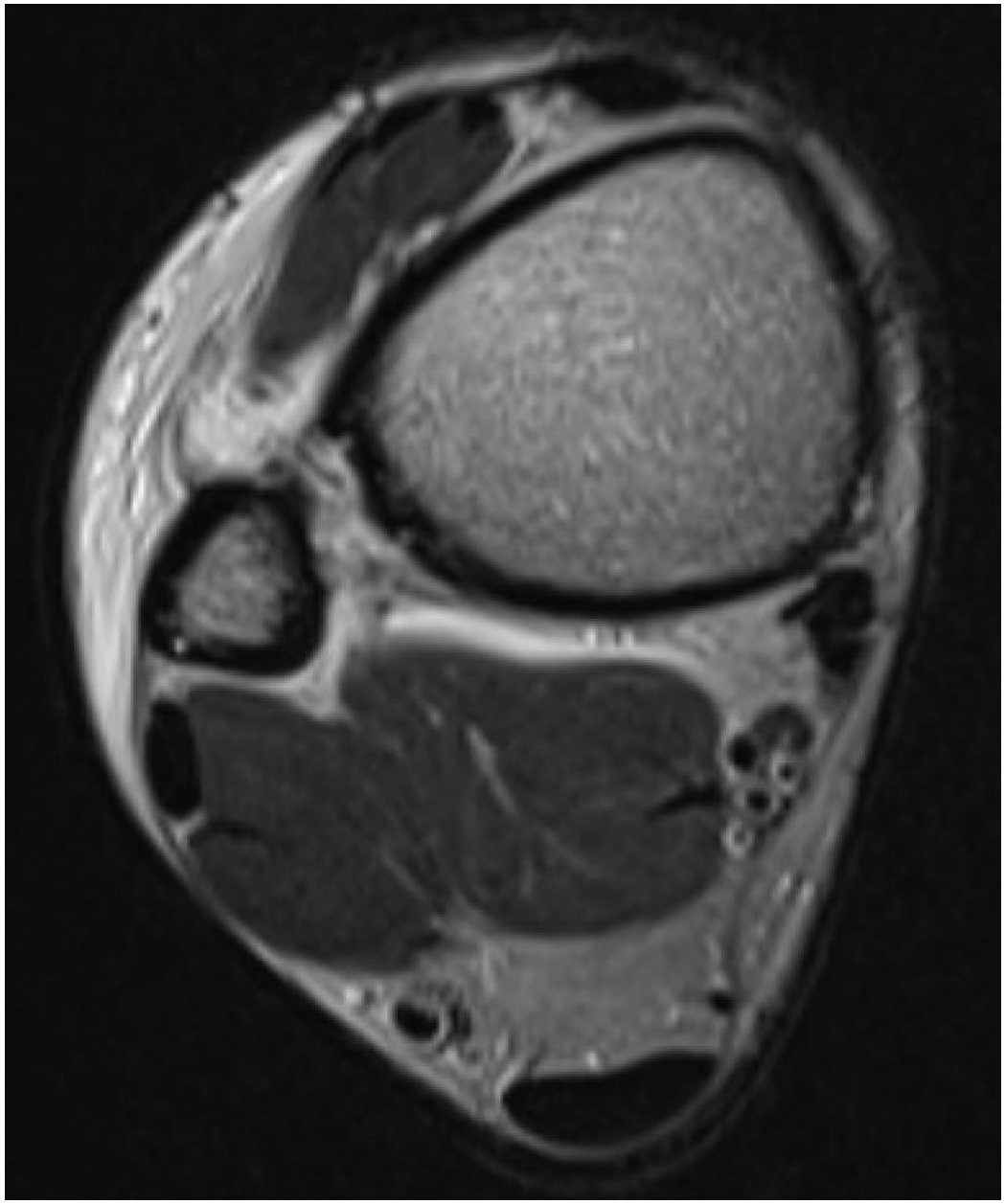
Case 4 complication



Stress view with widening

Case 4 complication





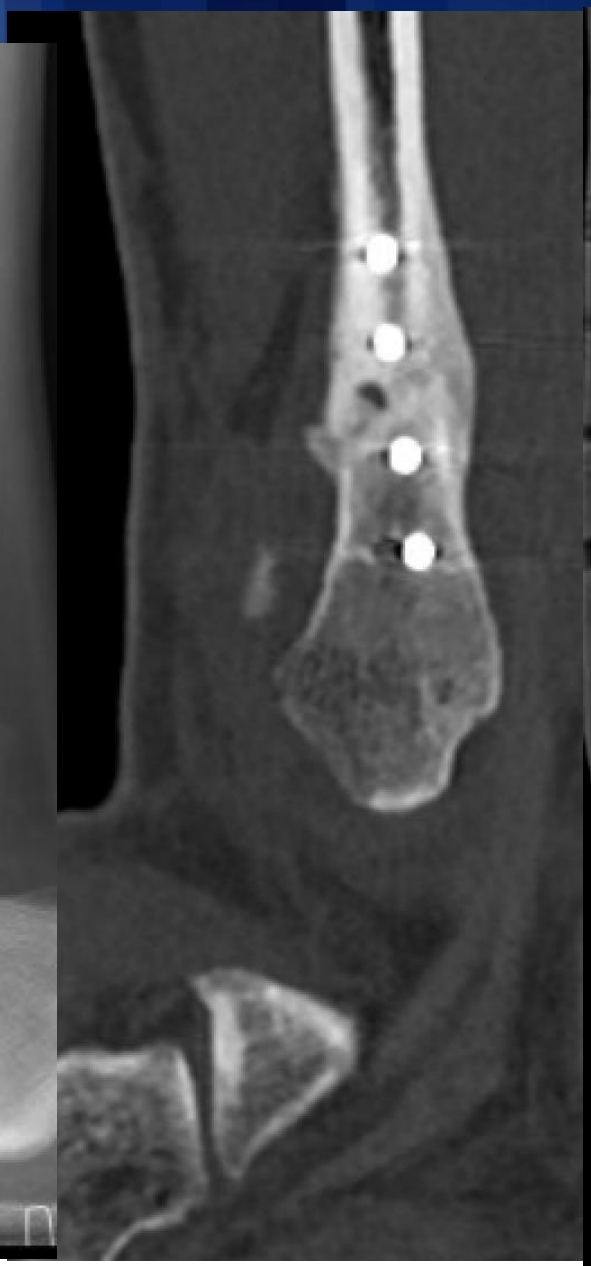
Case 4 complication

Syndesmosis stabilization and deltoid repair

Case 4 complication

Case 4 complicat

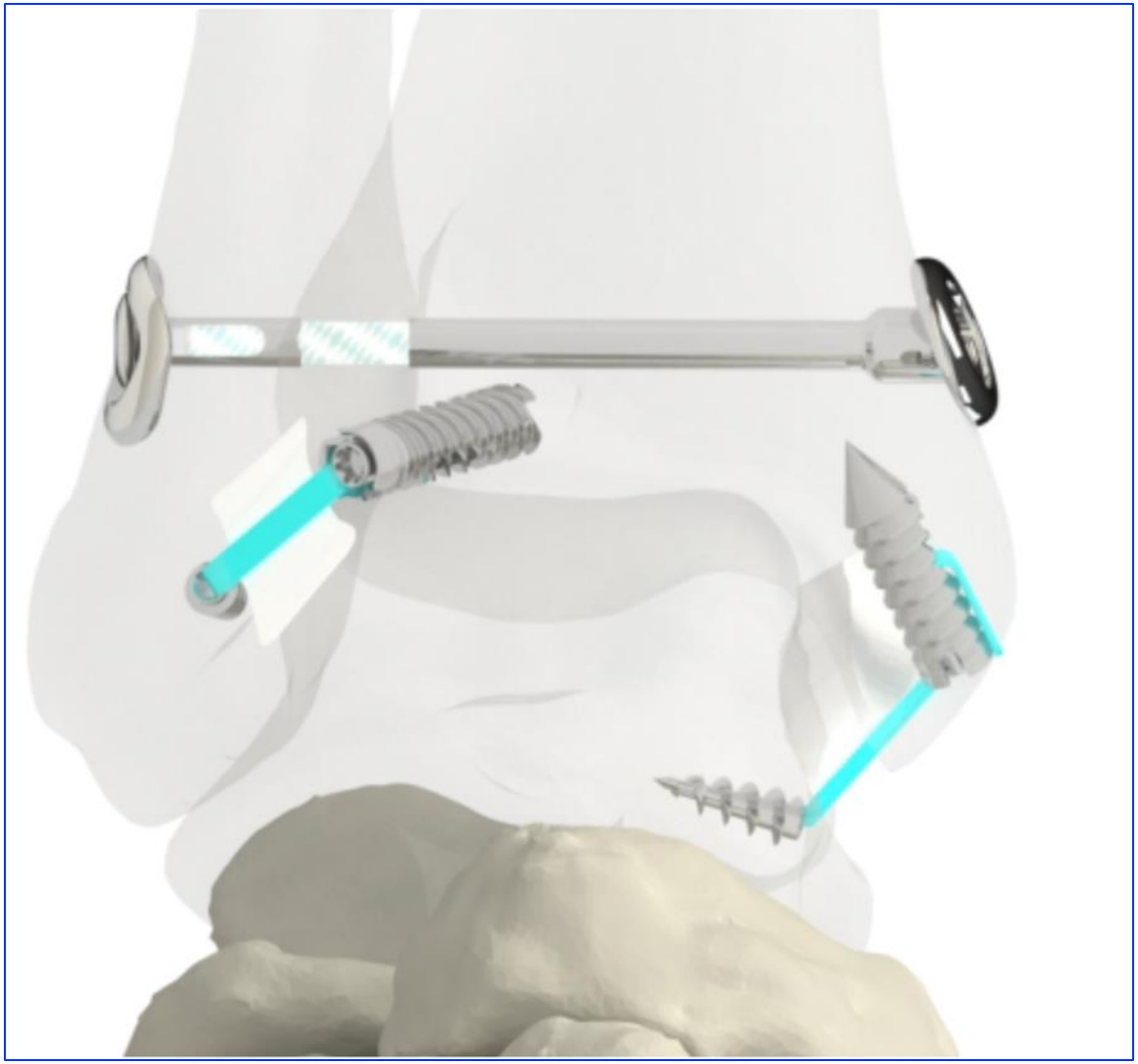
Case 4 complication



Future?

Complete Syndesmotic stabilization

- Syndesmosis
- AITFL
- Deltoid



Syndesmosis Fixation

Dynamic Stabilization of Syndesmosis Injuries Reduces Complications and Reoperations as Compared With Screw Fixation

AJSM 2020

A Meta-analysis of Randomized Controlled Trials

Alberto Grassi,*† MD, Kristian Samuelsson,‡ MD, PhD, Pieter D'Hooghe,§ MD, Matteo Romagnoli,† MD, Massimiliano Mosca,† MD, Stefano Zaffagnini,†‖ MD, Prof., and Annunziato Amendola,¶ MD
Investigation performed at Rizzoli Orthopaedic Institute, Bologna, Italy

JBJS 2014

The Effect of Suture-Button Fixation on Simulated Syndesmotic Malreduction: A Cadaveric Study

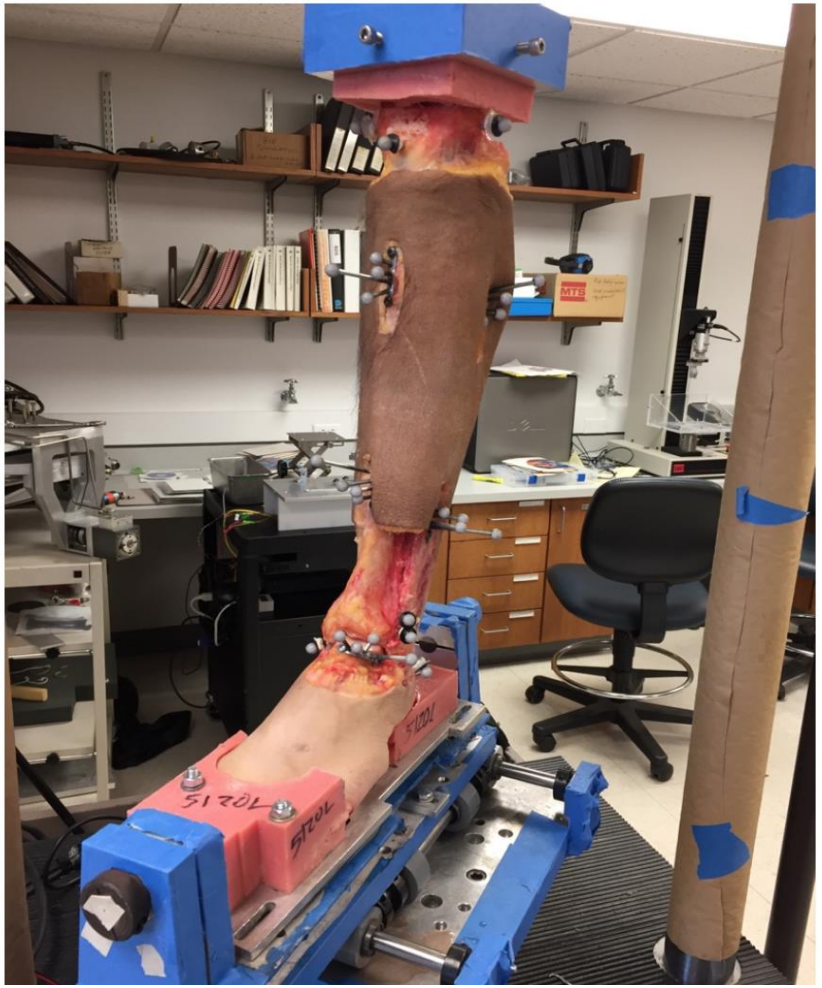
Westermann, Robert W. MD[1]; Rungprai, Chamnanni MD[1]; Goetz, Jessica E. PhD[1]; Femino, John MD[1]; Amendola, Annunziato MD[1]; Phisitkul, Phinit MD[1] **Author Information**

Comparative Study

Cadaveric Biomechanical Study

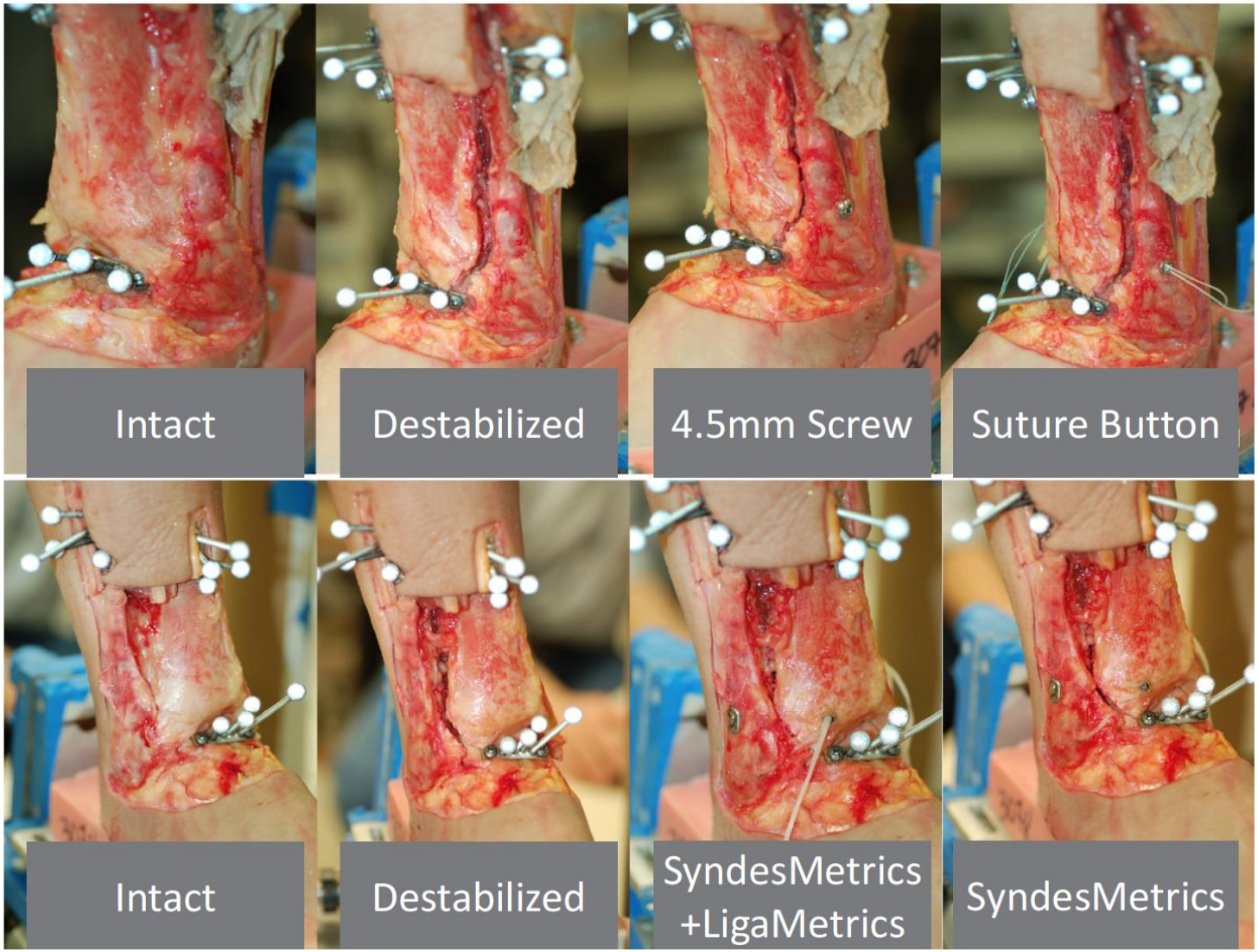
University of Iowa Health Care

- 10 matched pair fresh frozen specimens
- 750 N compressive axial load
- 7.5 N-m external rotation load applied to proximal tibia
- Ankle fixed in neutral position
- 100 cycles of preconditioning
- 6 axis tibiofibular motion recorded
- 6 axis tibiotalar motion recorded
- Destabilized = resected ligaments:
  - AITFL
  - Syndesmosis ligament
  - Deep deltoid & superficial deltoid



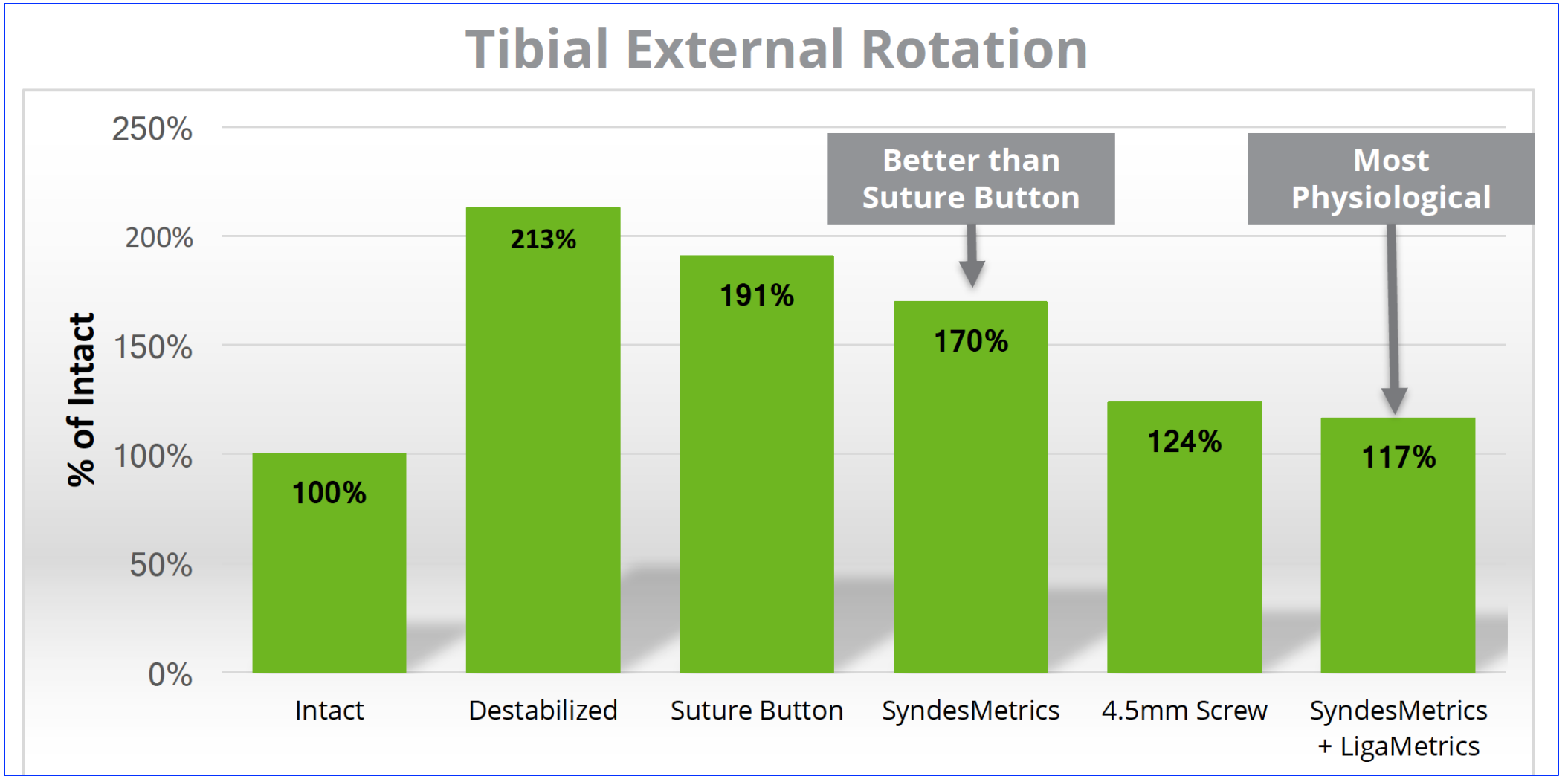
Goetz, et al, FAI, 2018

Comparative Study



Goetz, et al, FAI, 2018

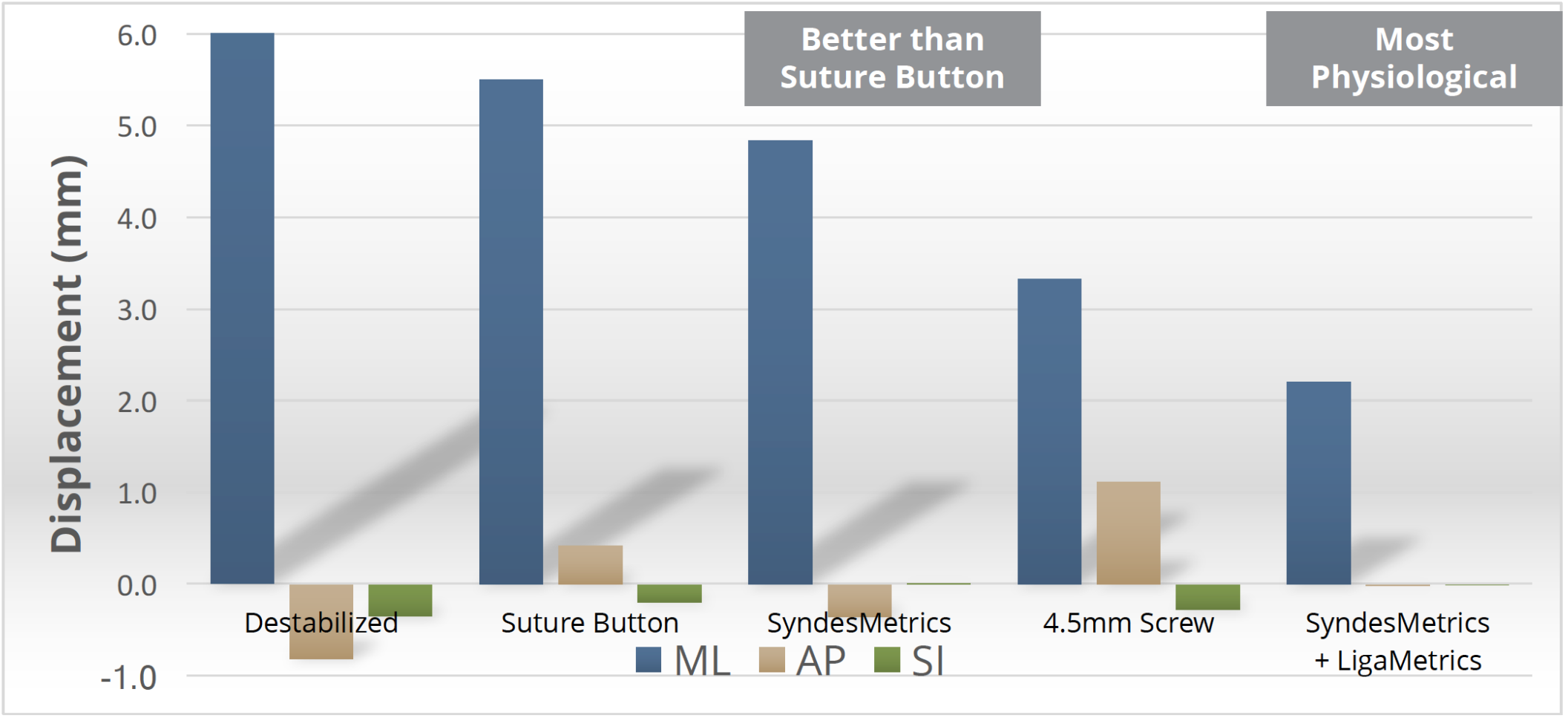
Comparative Study



Goetz, et al, FAI, 2018

Comparative Study

Tibiotalar Displacement from Intact Condition

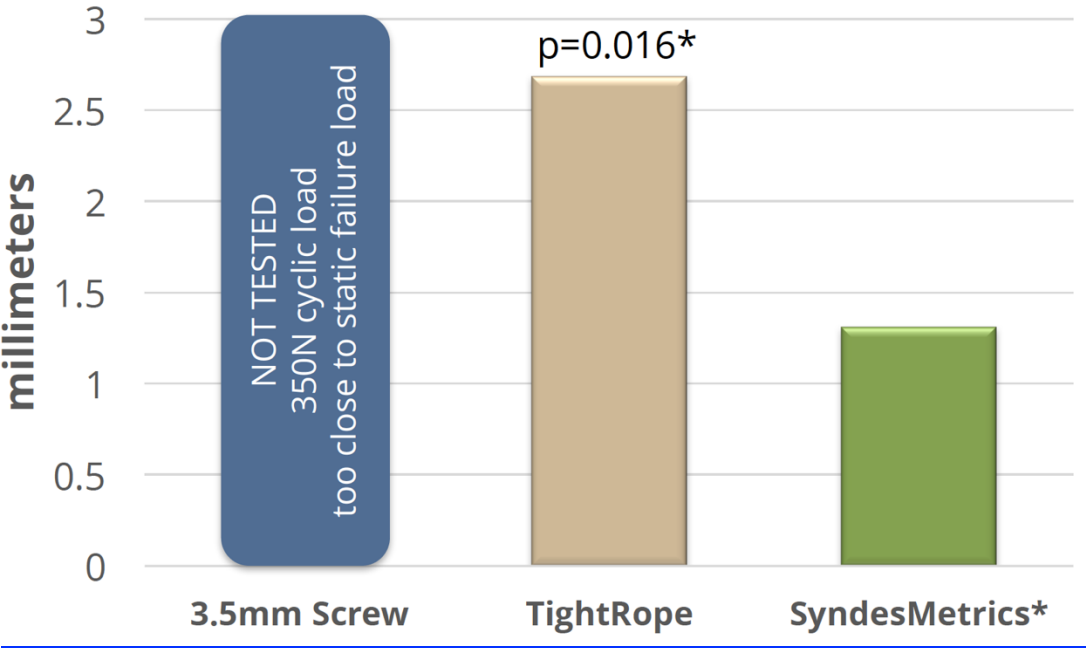


Goetz, et al, FAI, 2018

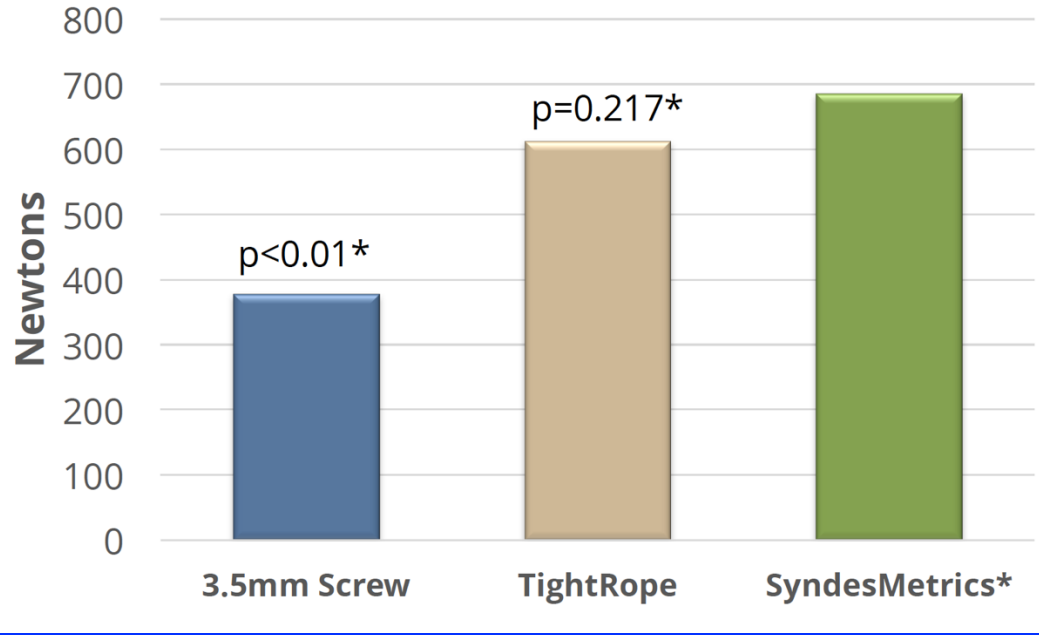
Comparative Study

Gap Formation

100 cycles at 350 N



Static Strength



Goetz, et al, FAI, 2018

Summary

- Syndesmosis injury is a spectrum from sprains to fractures
- The evaluation and treatment of syndesmotic injury continues to evolve
- Anatomic reduction and stabilization is essential
- Synthetic anatomic augmentation allows maintenance of reduction and early mobilization


Thank you