

# Persistent Problems After Ankle Sprain

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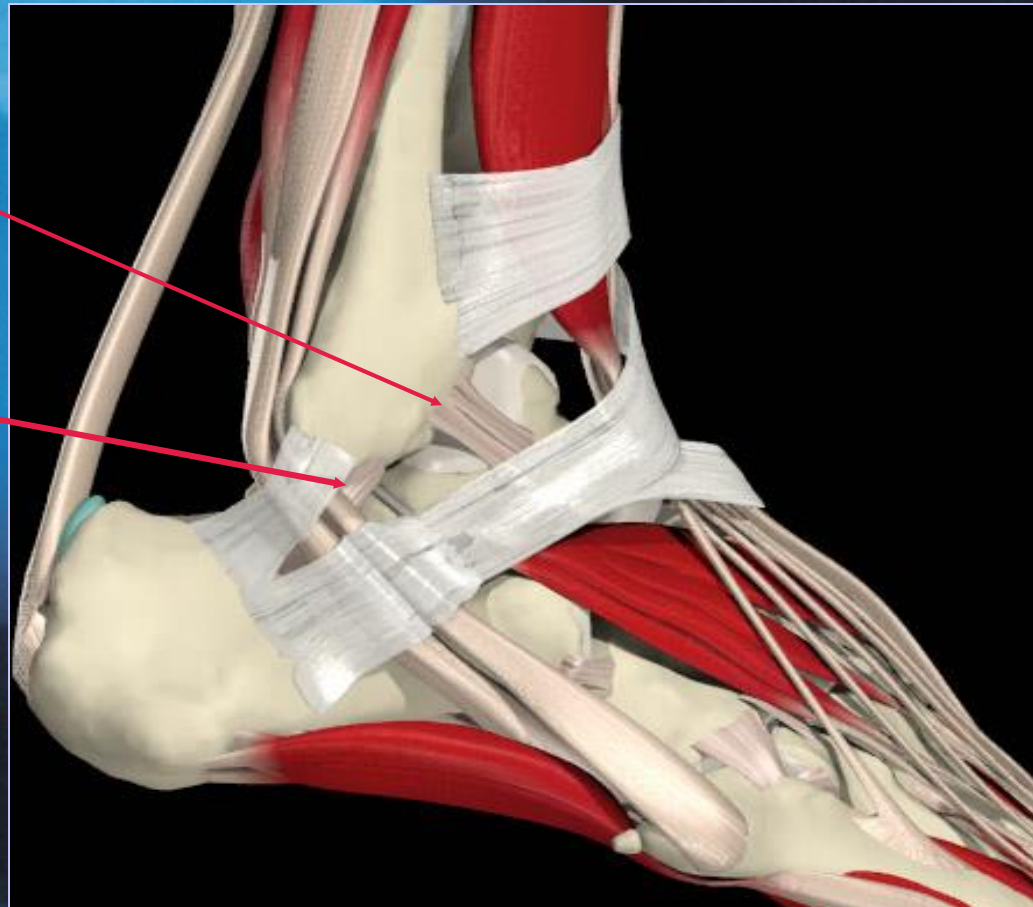
# Outline

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- Ankle Anatomy
- Ankle Sprain Classification
- Current Initial Treatment of Ankle Sprains
- Persistent Instability
- Persistent Pain in the joint
- Persistent Pain outside the joint
- Long Term Implications of Ankle Instability

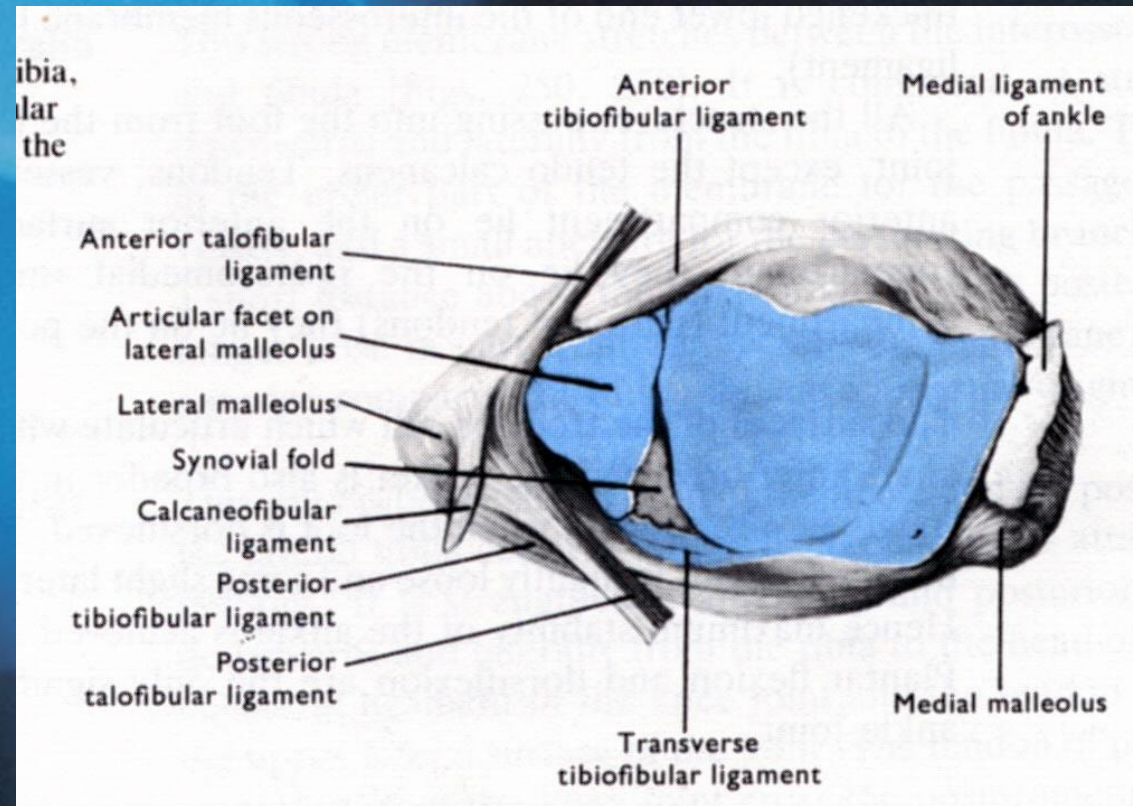
# Lateral Ankle Ligaments

- Anterior talofibular ligament-ATFL
- Calcaneofibular ligaments-CFL



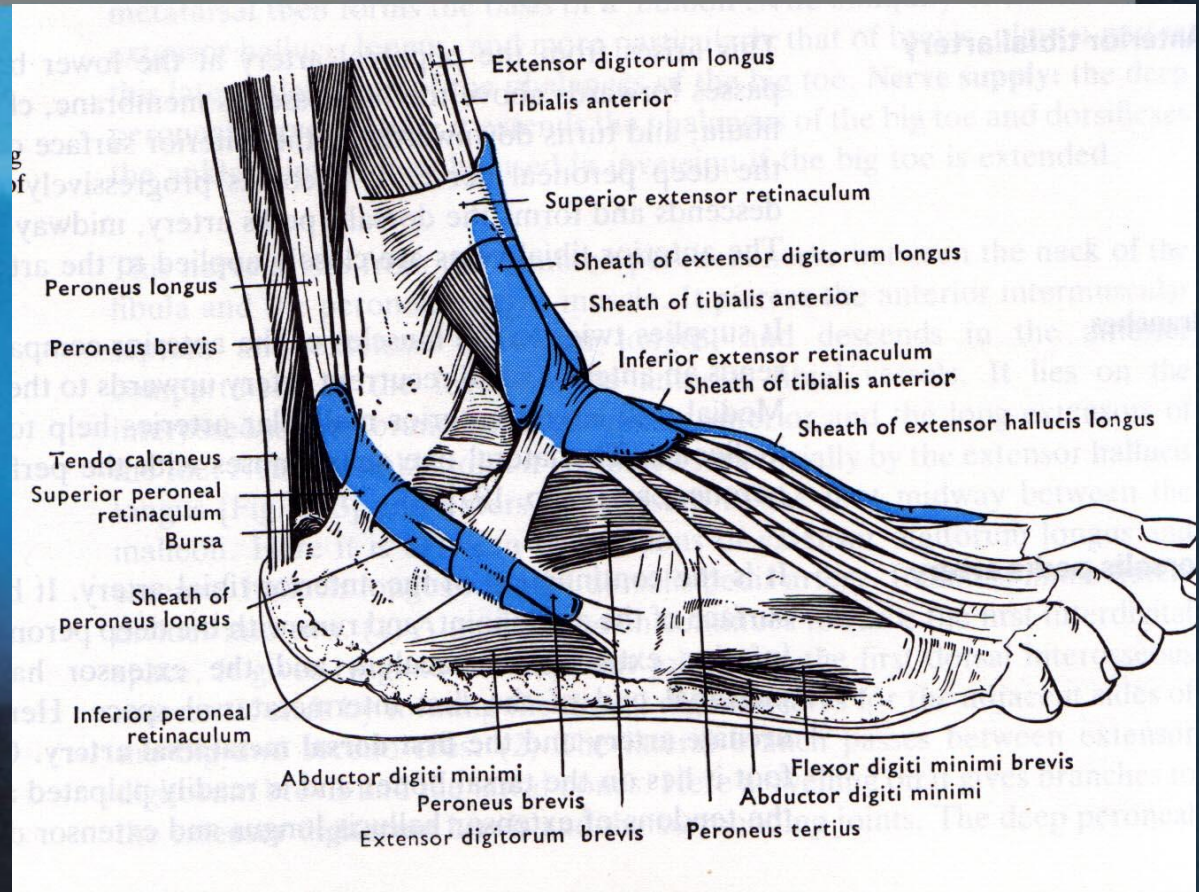
# Axial Ankle Ligaments

- Anterior Tib-fib ligament
- Interosseous membrane
- Transverse Tibiofibular ligament
- Posterior Tibiofibular ligament



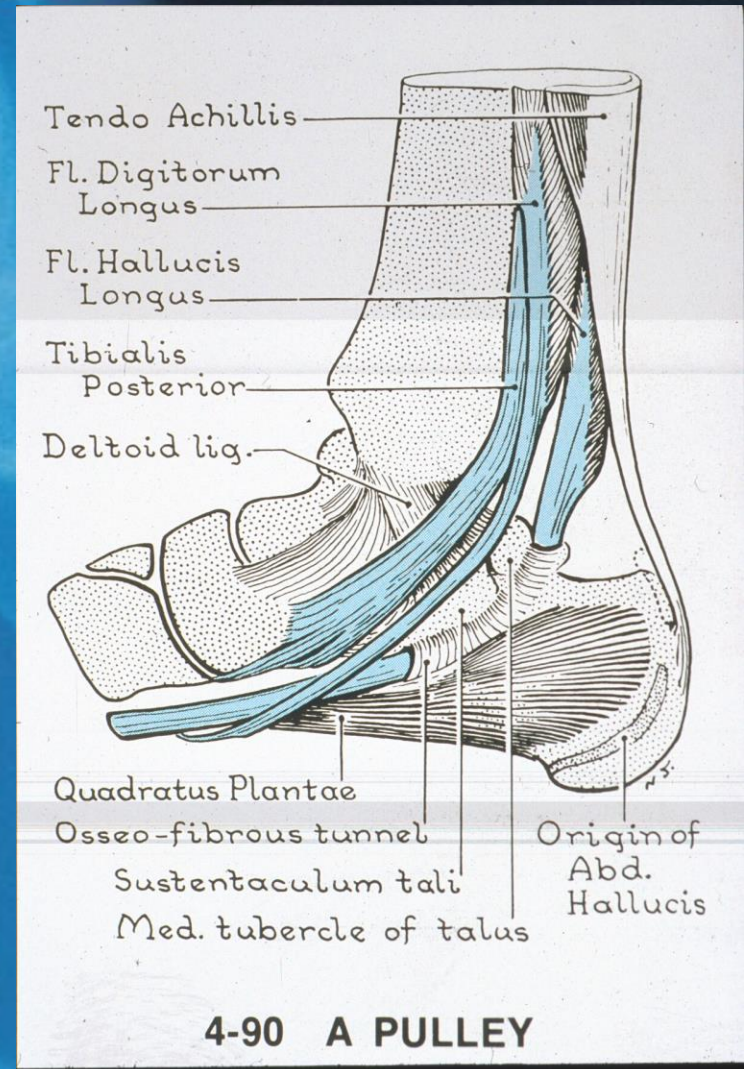
# Lateral Tendons

- Peroneus Brevis
- Peroneus Longus



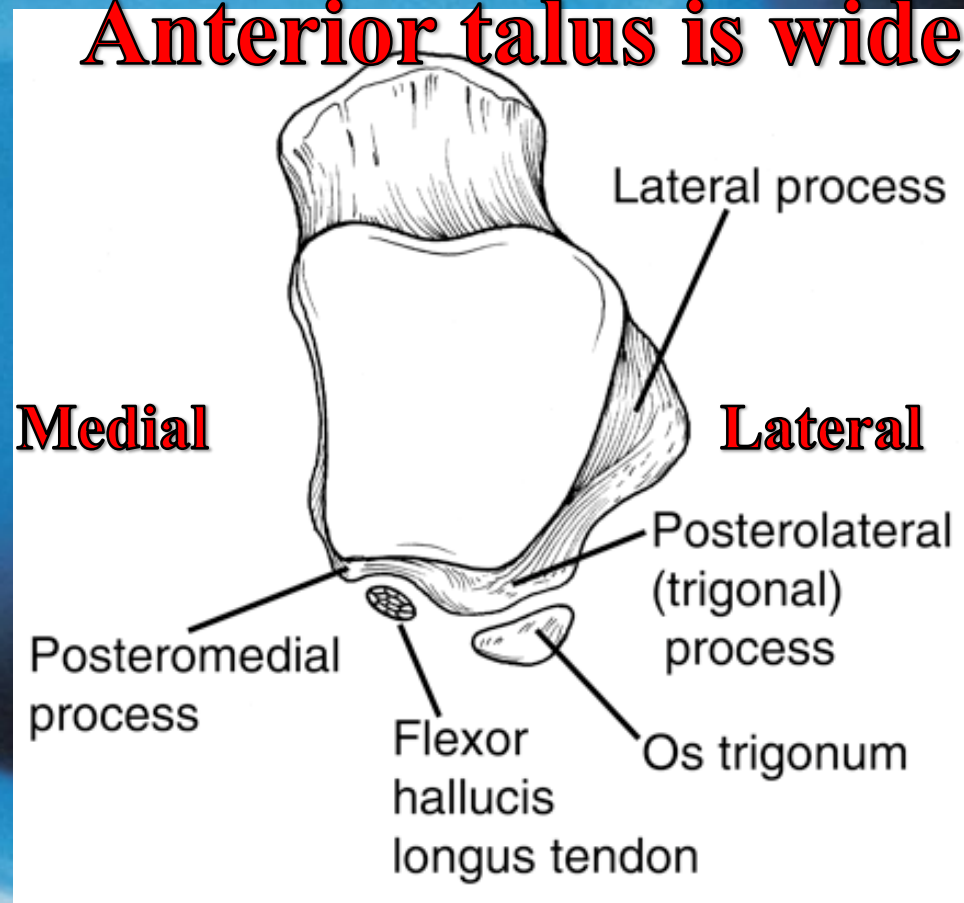
# Medial Tendons

- Posterior tibial tendon
- Flexor hallucis longus tendon
- Flexor digitorum longus tendon



# Tibiotalar Joint

**Anterior talus is wide**



**Posterior Talus is Narrow**

# Ankle Sprains

- 27,000 per day
  - Mizel et al, JBJS Am 2004
- Most common reason for ER visit
- Typically inversion
- Persistent instability can lead to further ankle joint injury-  
**PREVENT RECURRENT SPRAINS**
  - KD Harrington, J Bone Joint Surg Am **61**(3): 354-61, 1979

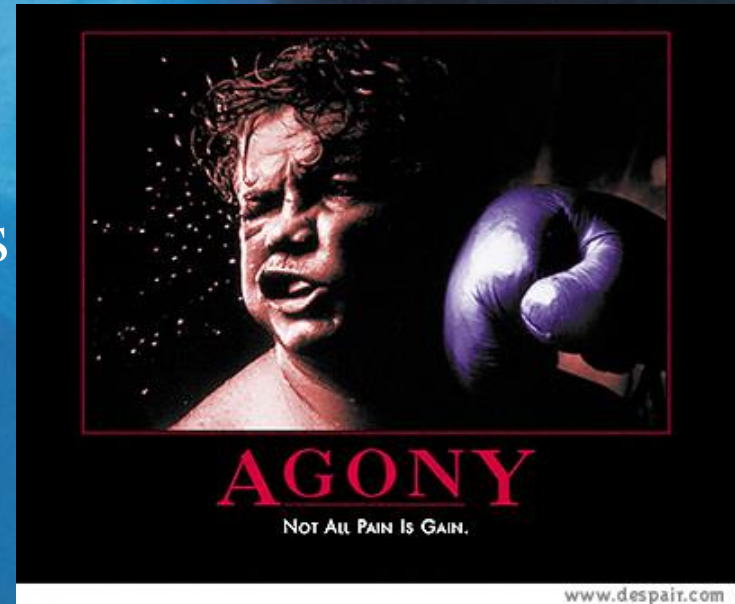




# Ankle Sprain Classification

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- Grade I-ATFL stretch-not disruption
  - TX-RICE
  - Crutches
  - Aircast or Laceup at 90 degrees
  - Advance to WBAT
  - Important to get ankle to 90
  - Return to play one week



# Ankle Sprain Classification

- Grade II Sprain-full disruption of ATFL, partial disruption of CFL
- TX-RICE
- Aircast, then laceup brace
- Crutches
- Advance to WBAT
- Return to play-3 weeks
- Single Limb Hop Test
  - Buchanan,AS, Docherty, CL, Schrader, J. J Athl Train July 2008



# Ankle Sprain Classification

- Grade III-full disruption of ATFL and CFL ligaments
- Balloon like Swelling
- RICE-Crutches
- Aircast or cast boot, then lace up brace
- Return to play-6 weeks
- Takes 6-12 weeks for ligament healing
- **6 wks-One yr. large percentage still have objective and subjective instability**

• Hubbard, Hicks J Athl Train

Ortho NorCal Sept 2008

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# Ankle Sprain Immobilize vs. Rehab

Cochrane Database Syst Rev. 2002;(3):CD003762.

**Immobilisation and functional treatment for acute lateral ankle ligament injuries in adults.**

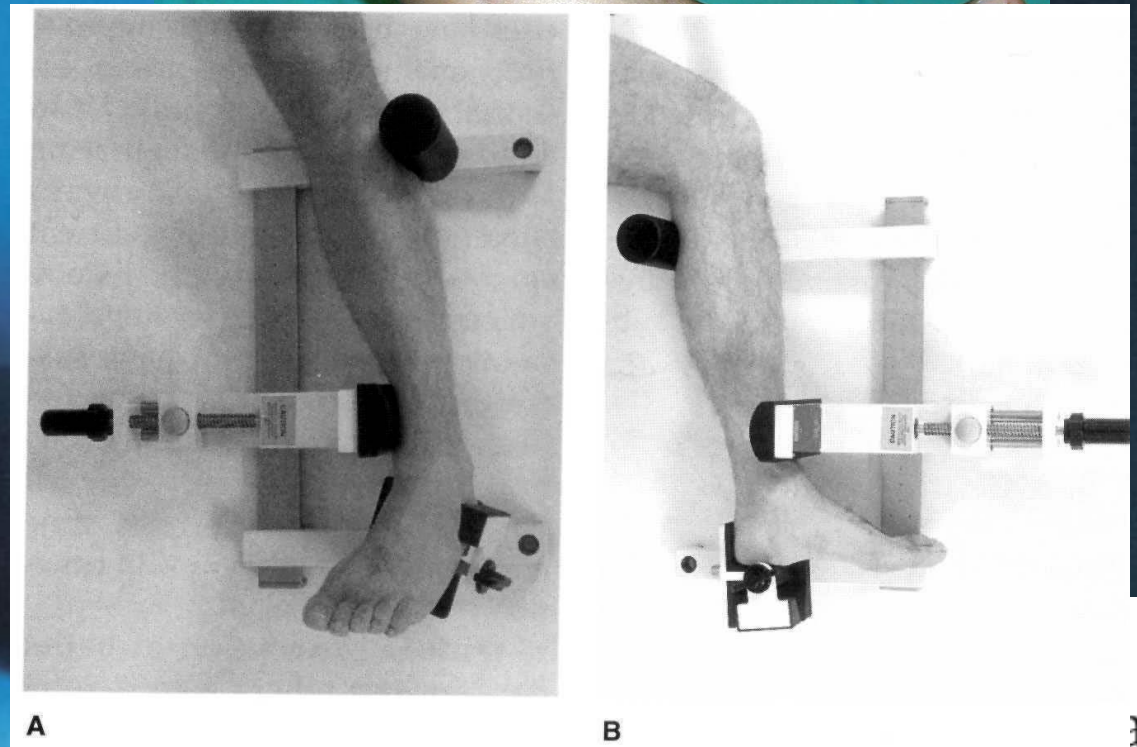
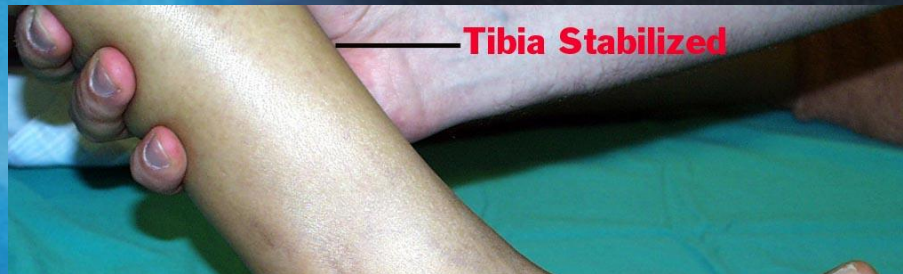
Kerkhoffs GM<sup>1</sup>, Rowe BH, Assendelft WJ, Kelly K, Struijs PA, van Dijk CN.

Bottom Line-Immobilization Alone=Very stiff ankle  
Functional Rehab with Immobilization=Faster Recovery

Caveats-If can't walk on the ankle-Get a CT scan to rule out occult lesion  
A premature MRI will show lots of Talar Bruising

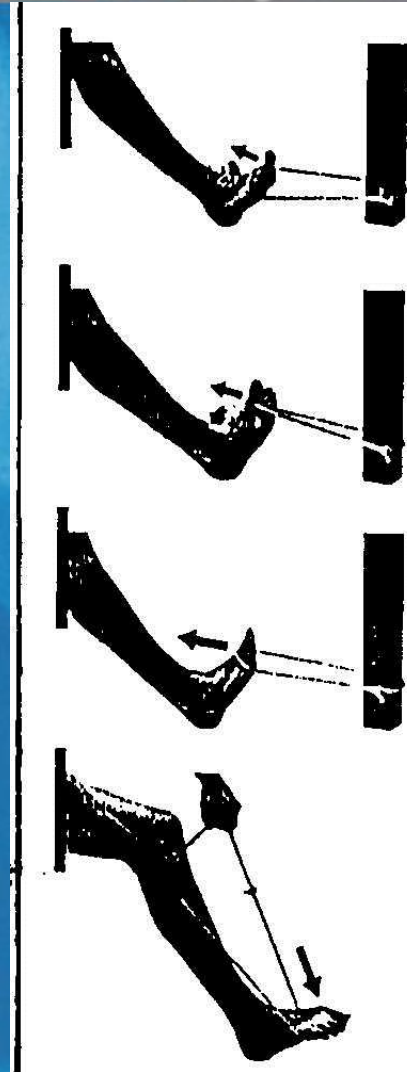
# Ankle Instability Exam

- Testing ankle stability
- Not critical in initial exam, but important once swelling has resolved
- Carefully document nerve injury
- Rule out fracture and tendon injury



# Persistent Instability

- Does it give out?
  - During sports
  - When step on a pebble
- **How often? 34% Resprain rate @ 3 years**
  - Several times per day
  - Several times per week
- Have you been rehabbed?
- How strong are the peroneal tendons?
- Ankle and combined subtalar joint instability?



# Workup Algorithm

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- If fails PT
- Get **weight bearing** plain films of ankle
- Stress radiographs not reliable, don't dictate treatment
  - Frost, SC and Amendola, A-Clin J Sports Med. 1999 Jan
- If have **medial** ankle pain-get MRI to rule out osteochondral defect
- If have pain **outside** the joint get MRI to rule out tendon injury (FHL,PTT,peroneals) vs. fractured posterior process of talus

# EBM Do We Need to Fix These?

Cochrane Database Syst Rev. 2002;(3):CD000380.

## **Surgical versus conservative treatment for acute injuries of the lateral ligament complex of the ankle in adults.**

Kerkhoffs GM<sup>1</sup>, Handoll HH, de Bie R, Rowe BH, Struijs PA.

**REVIEWER'S CONCLUSIONS:** There is insufficient evidence available from randomised controlled trials to determine the relative effectiveness of surgical and conservative treatment for acute injuries of the lateral ligament complex of the ankle. Sufficiently powered, good quality and adequately reported randomised trials of primary surgical repair versus the best available conservative treatment for well-defined injuries are required.

Muscles Ligaments Tendons J. 2015 Feb 5;4(4):455-60.

## **Treatment algorithm for chronic lateral ankle instability.**

Giannini S<sup>1</sup>, Ruffilli A<sup>1</sup>, Pagliuzzi G<sup>1</sup>, Mazzotti A<sup>1</sup>, Evangelisti G<sup>2</sup>, Buda R<sup>1</sup>, Faldini C<sup>3</sup>.

### **Abstract**

**INTRODUCTION:** ankle sprains are a common sports-related injury. A 20% of acute ankle sprains results in chronic ankle instability, requiring surgery. Aim of this paper is to report the results of a series of 38 patients treated for chronic lateral ankle instability with anatomic reconstruction.

**MATERIALS AND METHODS:** thirty-eight patients were enrolled in the study. Seventeen patients underwent a surgical repair using the Brostrom-modified technique, while the remaining underwent anatomic reconstruction with autologous or allogenic graft.

**RESULTS:** at a mean follow-up of 5 years the AOFAS score improved from  $66.1 \pm 5.3$  to  $92.2 \pm 5.6$ .

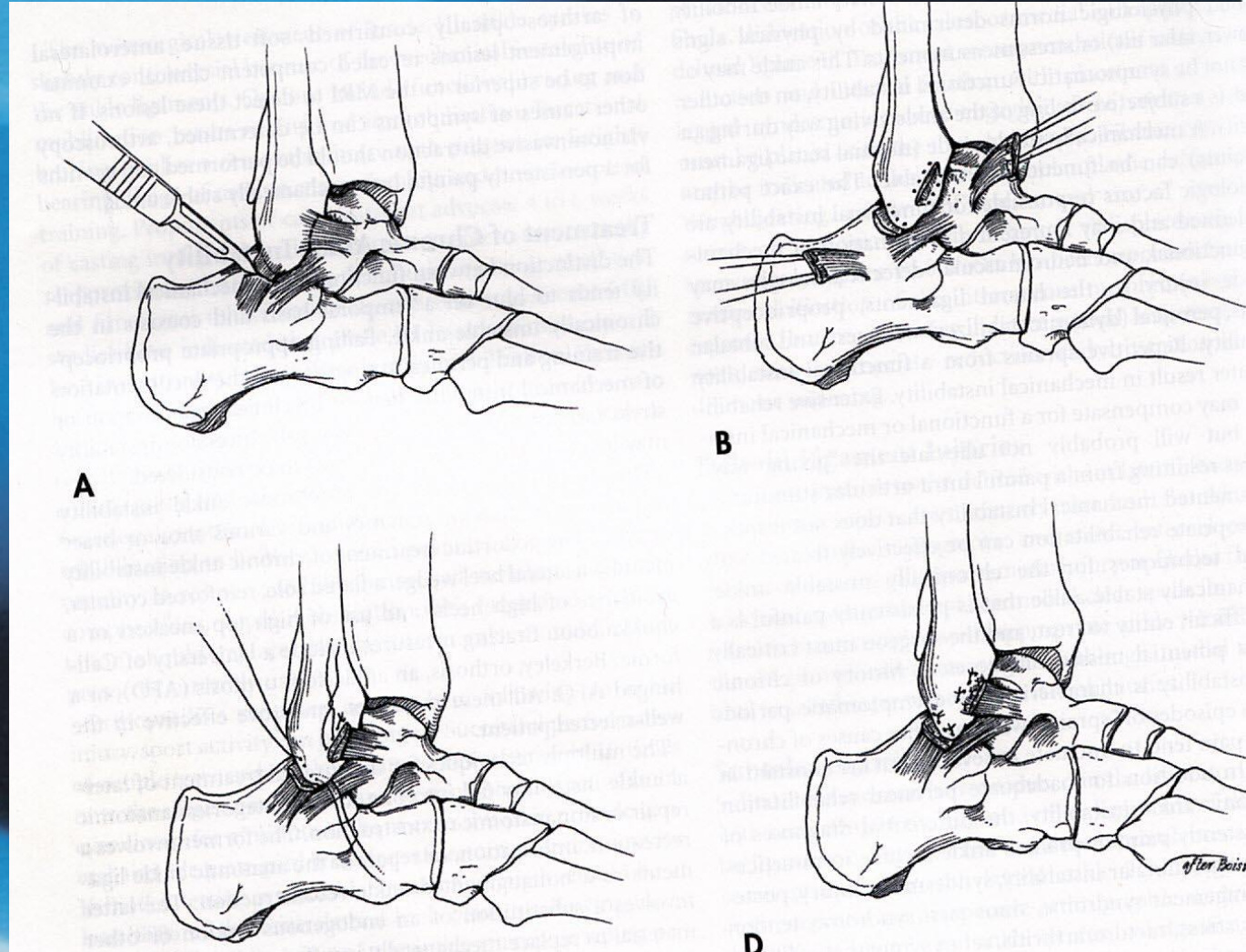
**DISCUSSION:** the findings of this study confirm that anatomic reconstruction is an effective procedure with satisfactory subjective and objective results which persist at long-term follow-up along with a low complication rate. No differences, in term of clinical and functional outcomes, were observed between the Brostrom-modified repair and the anatomic reconstruction technique.

**LEVEL OF EVIDENCE:** level IV.

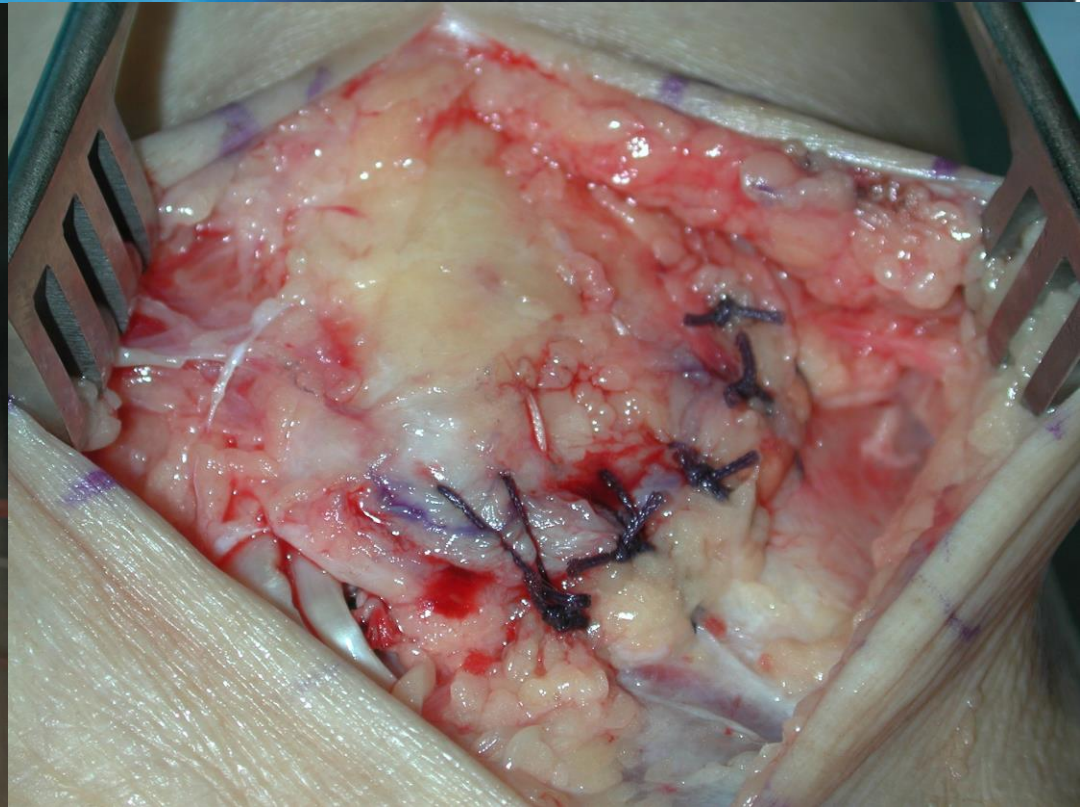
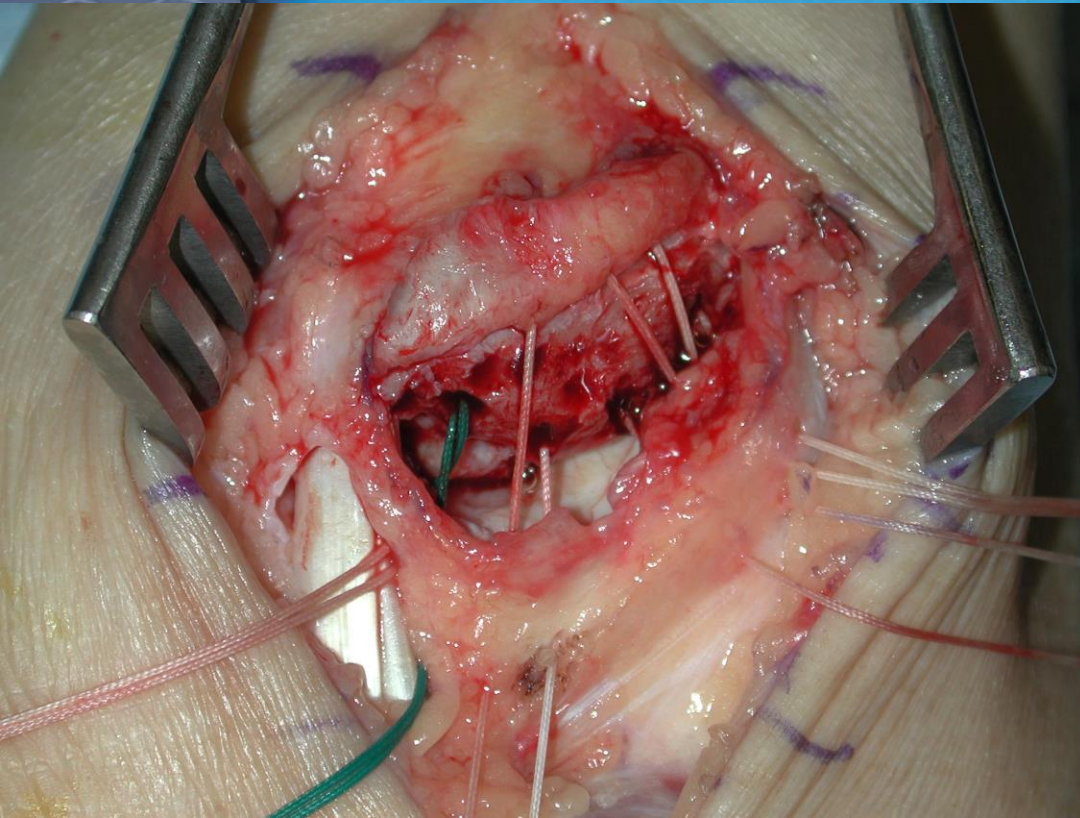


# Reconstruction for Instability

- Brostrum Ankle Ligament Reconstruction
- Gould Modification



# Brostrum



# EBM for Brostrum Gould

Foot Ankle Int. 2013 Apr;34(4):587-92. doi: 10.1177/1071100713477622. Epub 2013 Feb 7.

**Biomechanical analysis of Brostrom versus Brostrom-Gould lateral ankle instability repairs.**

Behrens SB<sup>1</sup>, Drakos M, Lee BJ, Paller D, Hoffman E, Koruprolu S, DiGiovanni CW.

The Gould Modification is not helpful??

Am J Sports Med. 2012 Sep;40(9):2099-104. doi: 10.1177/0363546512454840. Epub 2012 Aug 10.

**The effect of modified Broström-Gould repair for lateral ankle instability on in vivo tibiotalar kinematics.**

Wainright WB<sup>1</sup>, Spritzer CE, Lee JY, Easley ME, DeOrio JK, Nunley JA, DeFrate LE.

The Gould modification is Helpful??

# Problems with Brostrum/Gould

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- Can not reconstruct ligaments effectively after severely attenuated-consistency of wet toilet paper
  - Canadian Surgeons must decide intra-op on quality of tissue-Provinces limit implants
- Greater than 10 yrs of instability
- Ehler's Danlos type syndromes
- High demand athletes can re-injure similar to initial injury-
  - **MOST SERIES HAVE SEVERAL RE-INJURIES**
- Some patients experience re-current instability after three years
- Gould modification is not really anatomic

# Alternatives To Brostrum Gould

Arthrosc Tech. 2014 Sep 22;3(5):e593-8. doi: 10.1016/j.eats.2014.06.018. eCollection 2014.

## **Arthroscopic anatomic reconstruction of the lateral ligaments of the ankle with gracilis autograft.**

Guillo S<sup>1</sup>, Archbold P<sup>2</sup>, Perera A<sup>3</sup>, Bauer T<sup>4</sup>, Sonnery-Cottet B<sup>5</sup>.

ANZ J Surg. 2015 Jan;85(1-2):44-8. doi: 10.1111/ans.12837. Epub 2014 Aug 29.

## **Primary ankle ligament augmentation versus modified Brostrom-Gould procedure: a 2-year randomized controlled trial.**

Porter M<sup>1</sup>, Shadbolt B, Stuart R.

**CONCLUSION:** Primary repair combined with LARS results in better patient-scored clinical outcome, at 2 years post-surgery, than the MBG procedure. Although longer follow-up is required, the LARS procedure may be considered as an alternative, especially in those patients for whom the MBG is relatively contra-indicated.

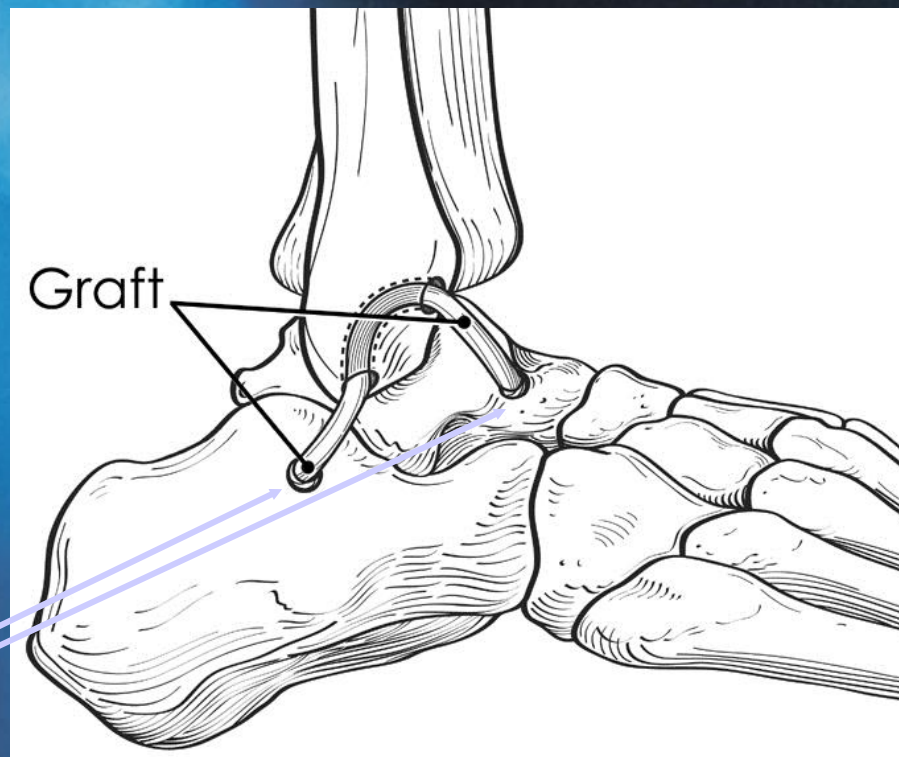
Foot Ankle Clin. 2006 Sep;11(3):597-605.

## **Reconstruction of the lateral ankle ligaments with allograft in patients with chronic ankle instability.**

Caprio A<sup>1</sup>, Oliva F, Treja F, Maffulli N.

# Anatomic Ligament Reconstruction with Tendon

- Split Peroneal Tendon Reconstruction
  - 25 types of tendon repairs
    - “Chrisman Snook”
  - Static, lead to long term osteoarthritis or excessive stiffness sometimes
    - “Evans”
    - “Colville”
  - Now use anatomic reconstruction with tendon graft-interference anchors



# Free Tendon Graft

- Tendon grafts less likely to attenuate with time
- Use of interference anchors permits early range of motion
- Gracilis, ST-have to harvest from knee
  - Coughlin, M. J., R. C. Schenck, Jr., et al. (2004). Foot Ankle Int **25**(4): 231-41.
  - Takao, M., K. Oae, et al. (2005). " Am J of Sports Med (33): 814-823.
  - Boyer, D. S. and A. S. Younger (2006). Foot Ankle Clin **11**(3): 585-95.
- Peroneus brevis-too short
- Peroneus longus strip-ideal tendon length



# Operative Course

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- Same Day procedure
- Under block, spinal, general anesthesia
- Ice and elevate leg for 10 days non-weight bearing
- Weight bearing cast boot 4 weeks
- Wean to lace-up once swelling subsides
- Start rehab at 2 weeks post-op
- Straight line running at 2 months
- Cutting and pivoting bet 3-4 months



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# Materials and Methods

- Analysis of patients with chronic ankle instability
- Functional and demonstrable ankle instability-preop
- MRI evidence of ankle ligament pathology
- Variable demands and patient population
  - High performance military personnel
  - Recreational athletes
- **All Underwent Augmented BG with PL Autograft**

# Results

	Pre-op n=30	Post-op N=23 @ 1 yr	
SF-12 Physical Component	43.8	51.22	50 is avg for general population
SF-12 Mental Component	54.46	53.70	
AAOS Foot Score	31.57	47.48	Normative Scores >50 better than general pop <50 worse than gen pop
AOFAS Foot Score	70.5	89.96	Standardized Mean 0=Most 100=least

# Results

- Incidence of re-injury at 2 years
  - Zero
- Many high functioning athletes @ follow-up
  - Marathon
  - Triathlon
  - Military
- Some patients have incisional numbness
- Some patients had initial stiffness requiring cortisone injection

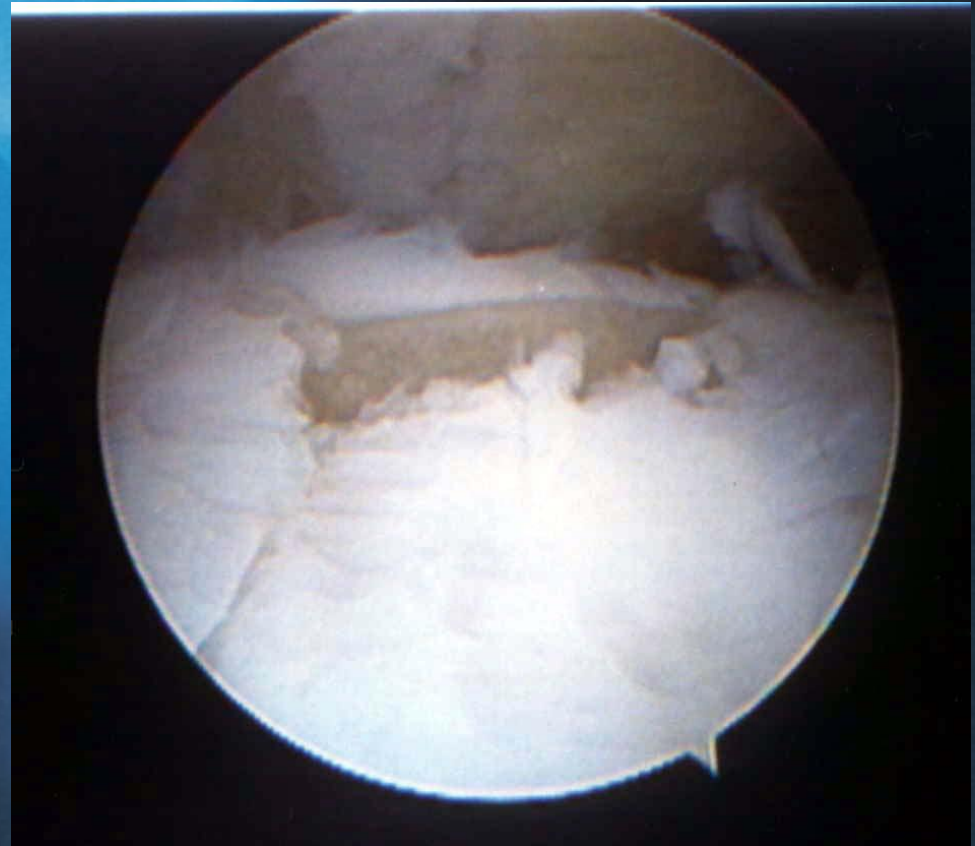


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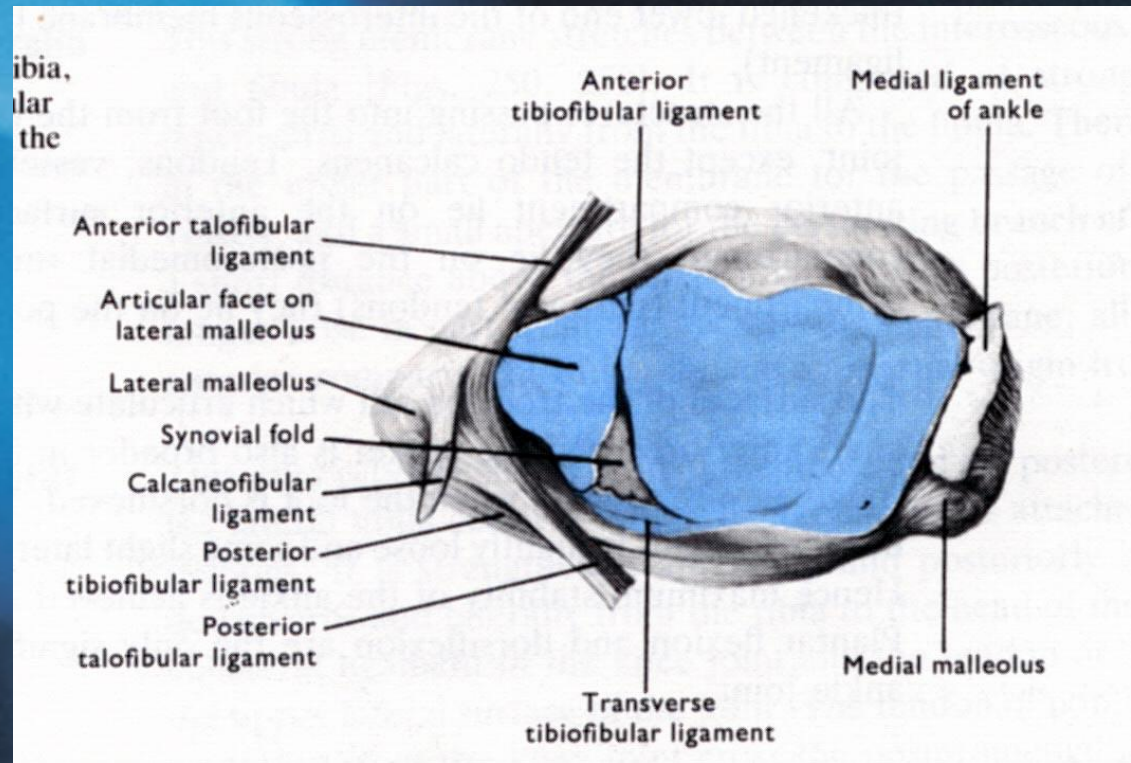
# Persistent Pain In the Ankle Joint

- Rule out soft tissue impingement
- Posterior medial impingement
- Osteochondral Defect
- Loose body
- Persistent instability pivoting on medial aspect of joint



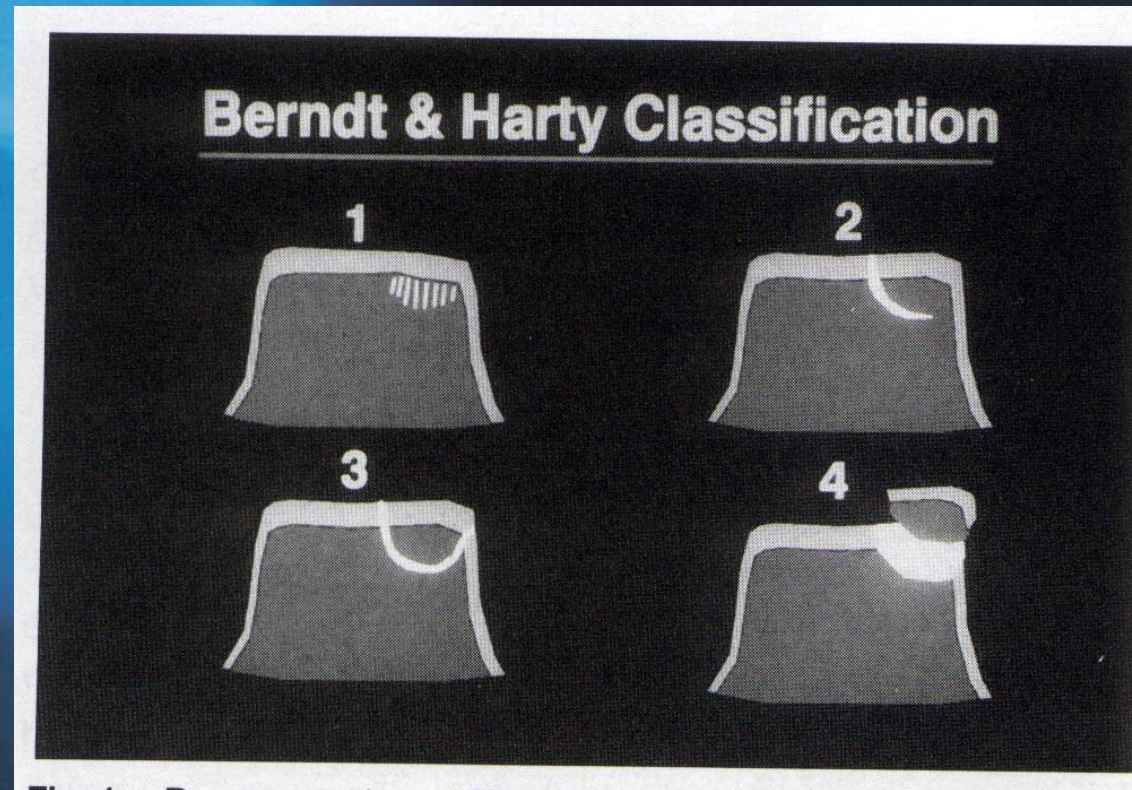
# Anterior Impingement

- Discoid-Ferkel's=ATFL
- Testing
  - MRI-useless for this alone
  - Duckwalk
  - Selective injection
- Scoping
  - avoid destroying ATFL

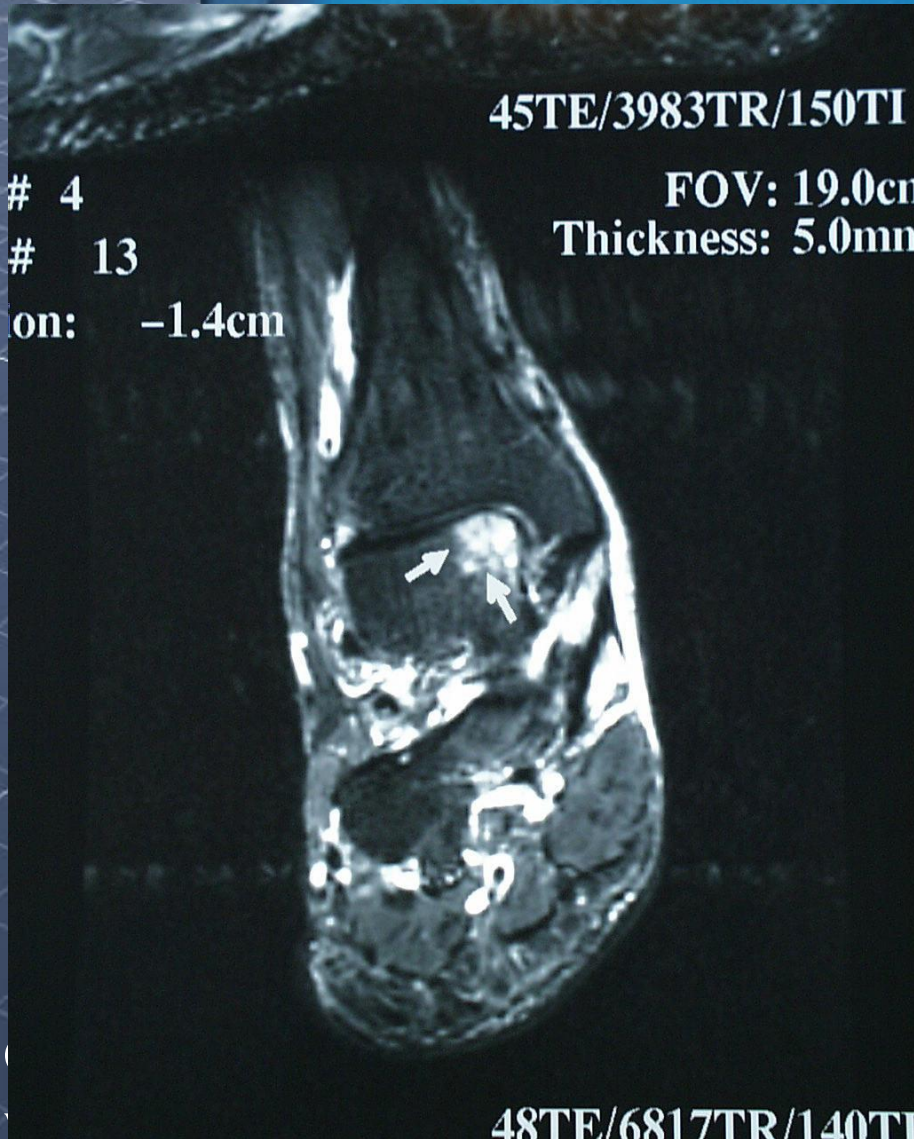


# Osteochondral Talar Lesions

- Post-Medial/Ant-Lateral
- Berndt-Harty
  - Type I-small Bruise
  - Type II-partially detached
  - Type III-Completely detached in situ
  - Type IV-Loose Body
  - Contained Vs.
  - Uncontained Defects



# OLT of Talus





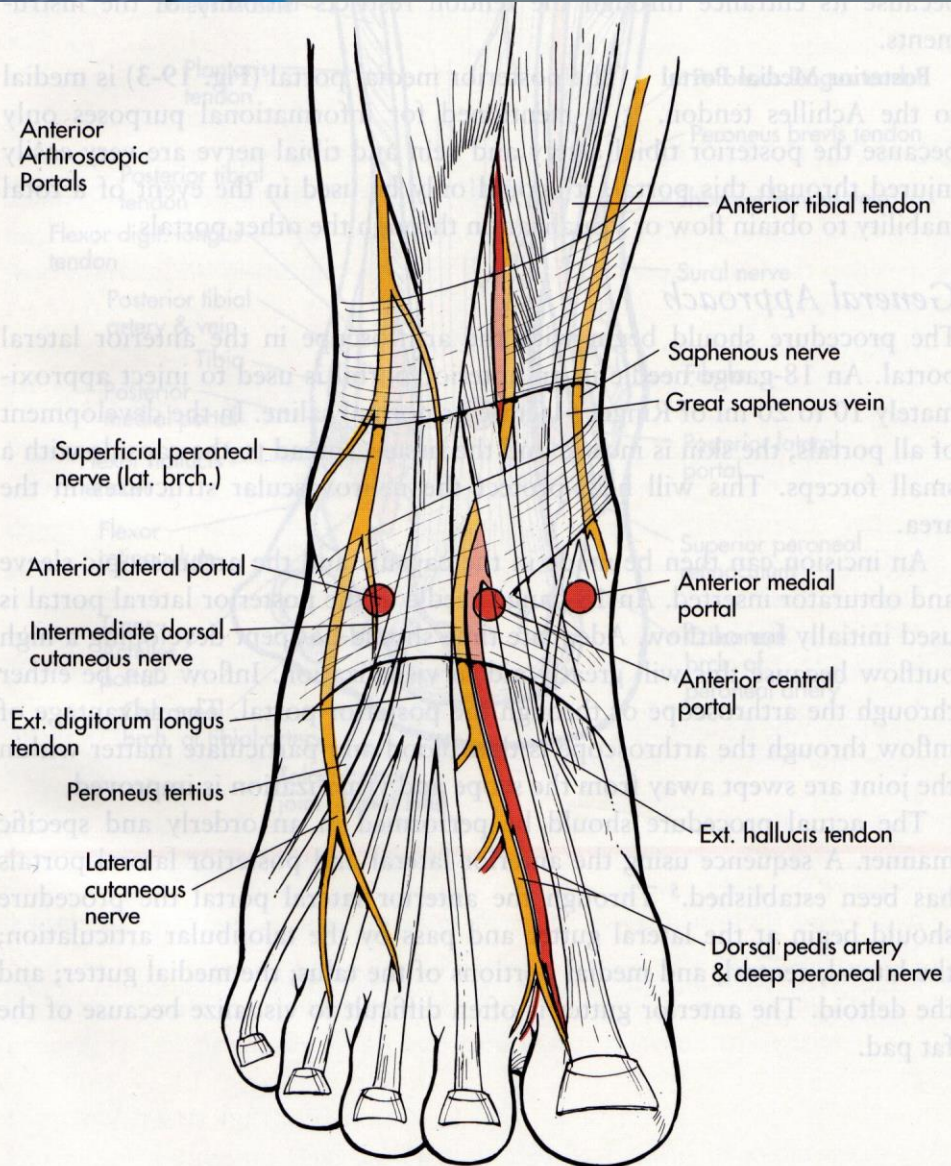
# OLT of Talus

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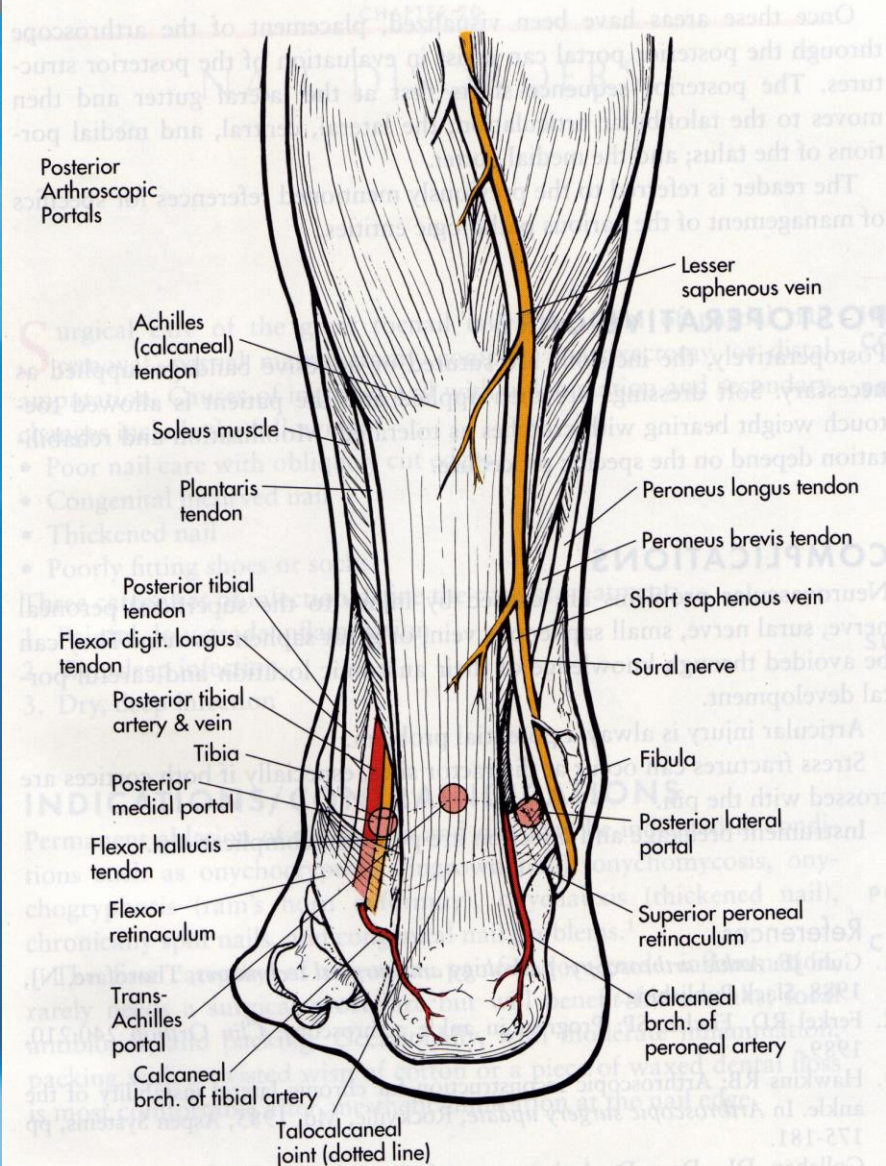
- Type I, II, III, IV-Debride if Symptomatic with Micro Fx-Results in Stable Fibrocartilage
- Failed OCD-retrograde drill/Auto Vs. Allograft
- Failed OCD-osteochondral plug OATS
  - medial malleolar osteotomy
  - autograft from knee

# Arthroscopy Portals

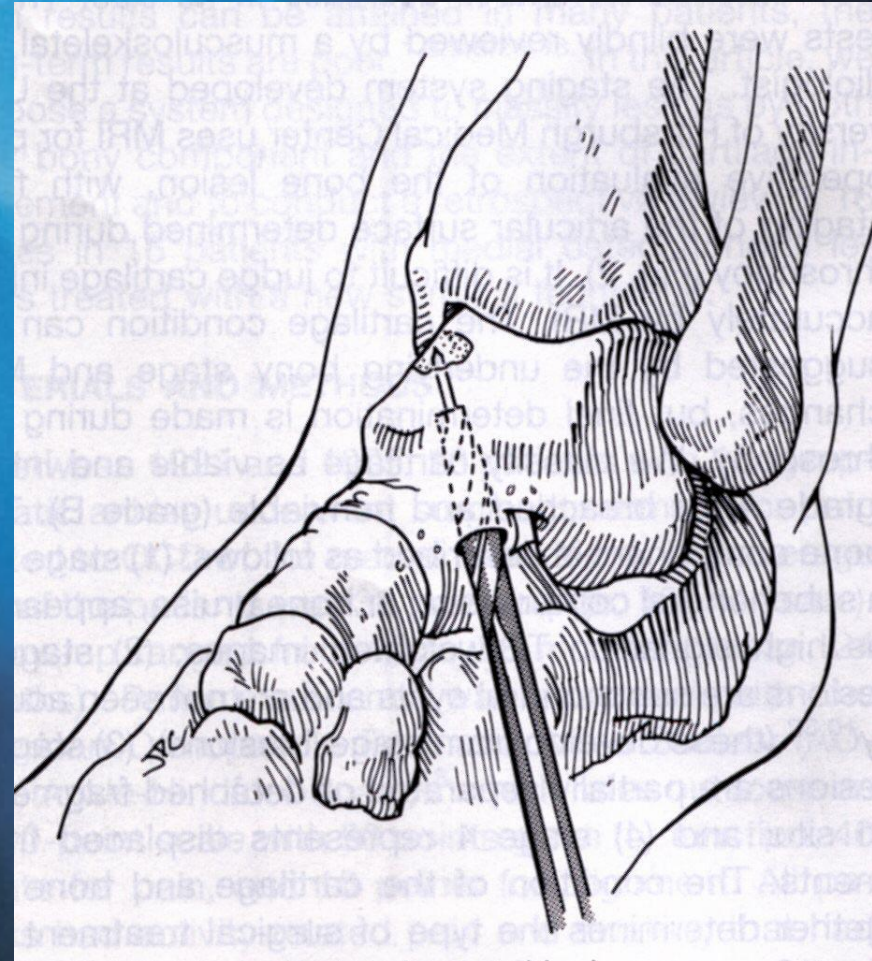
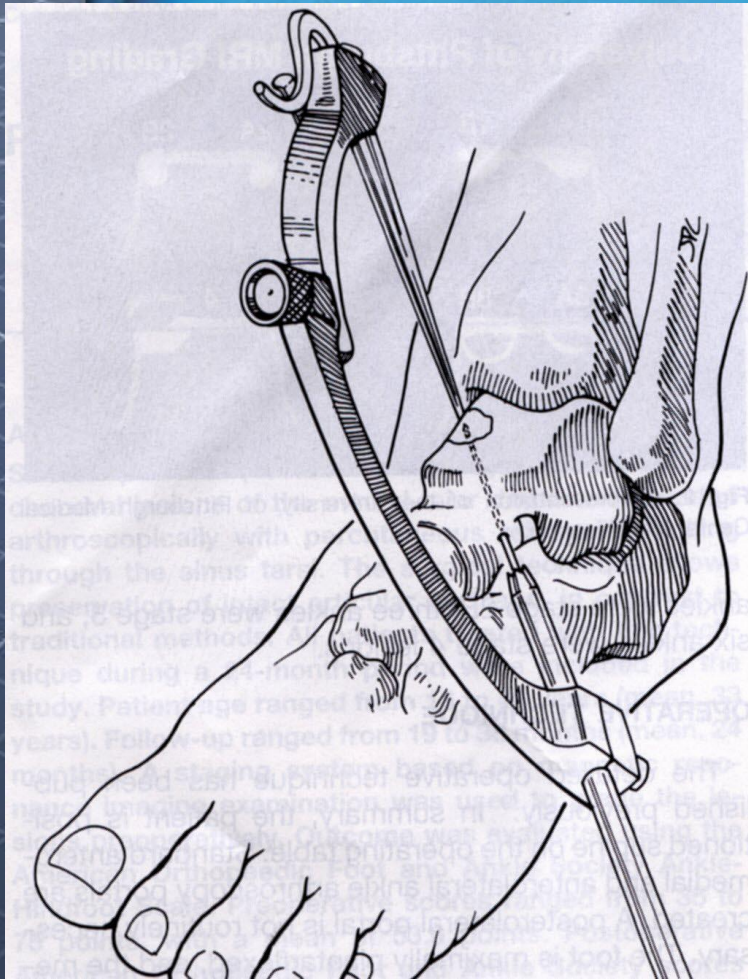
## Anterior Arthroscopic Portals



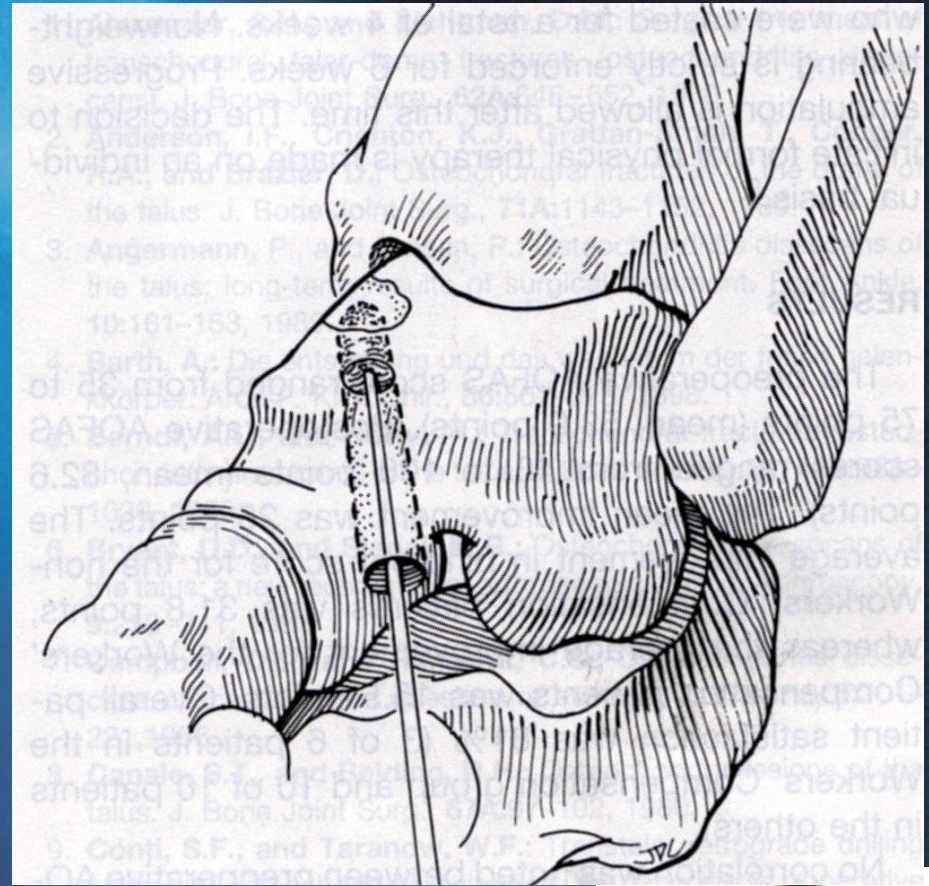
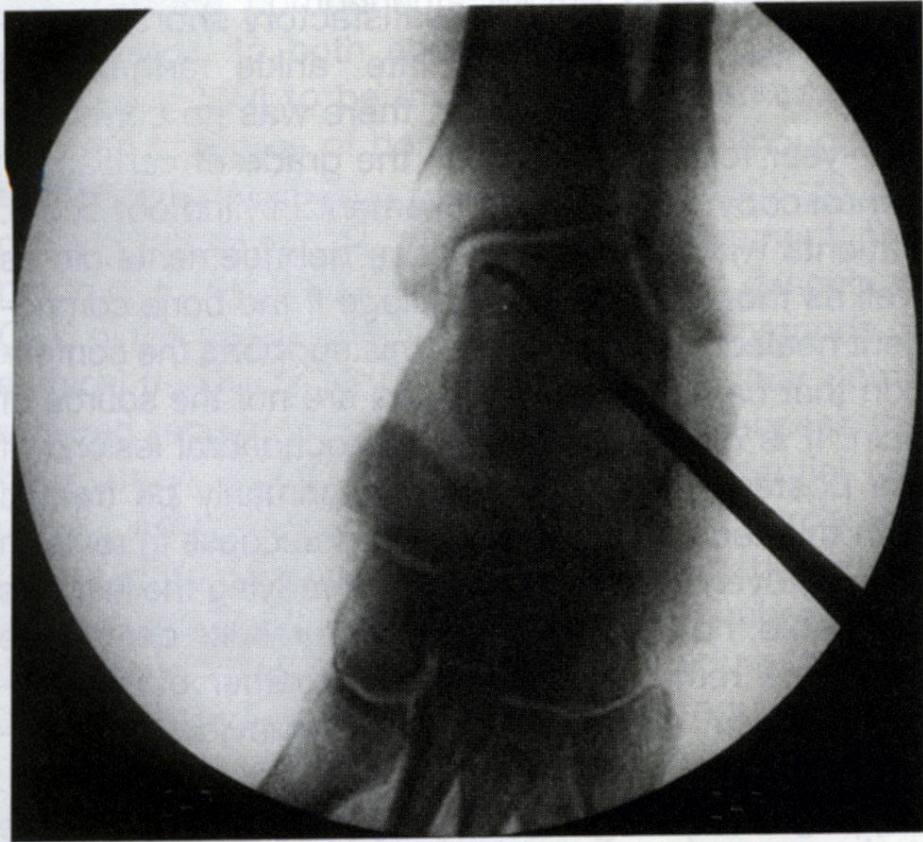
## Posterior Arthroscopic Portals



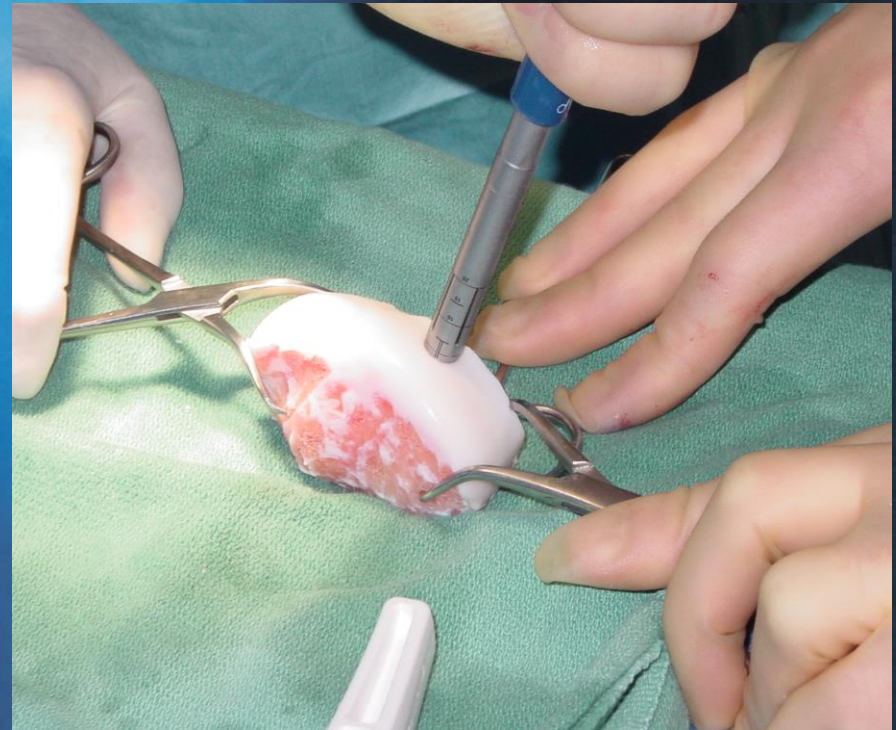
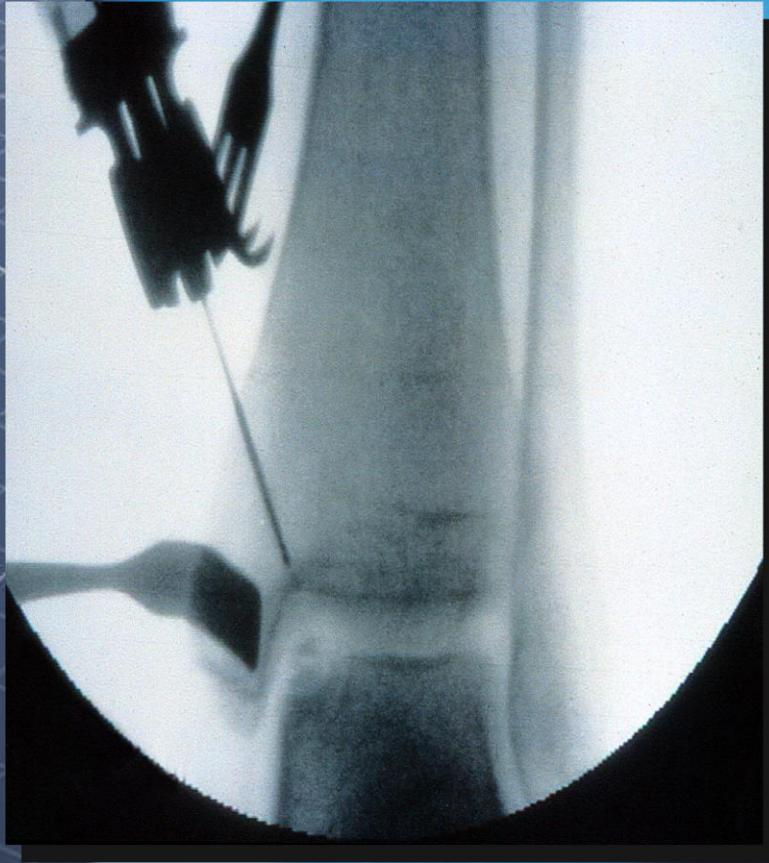
# Retrograde Drilling Technique



# Retrograde Drilling Technique

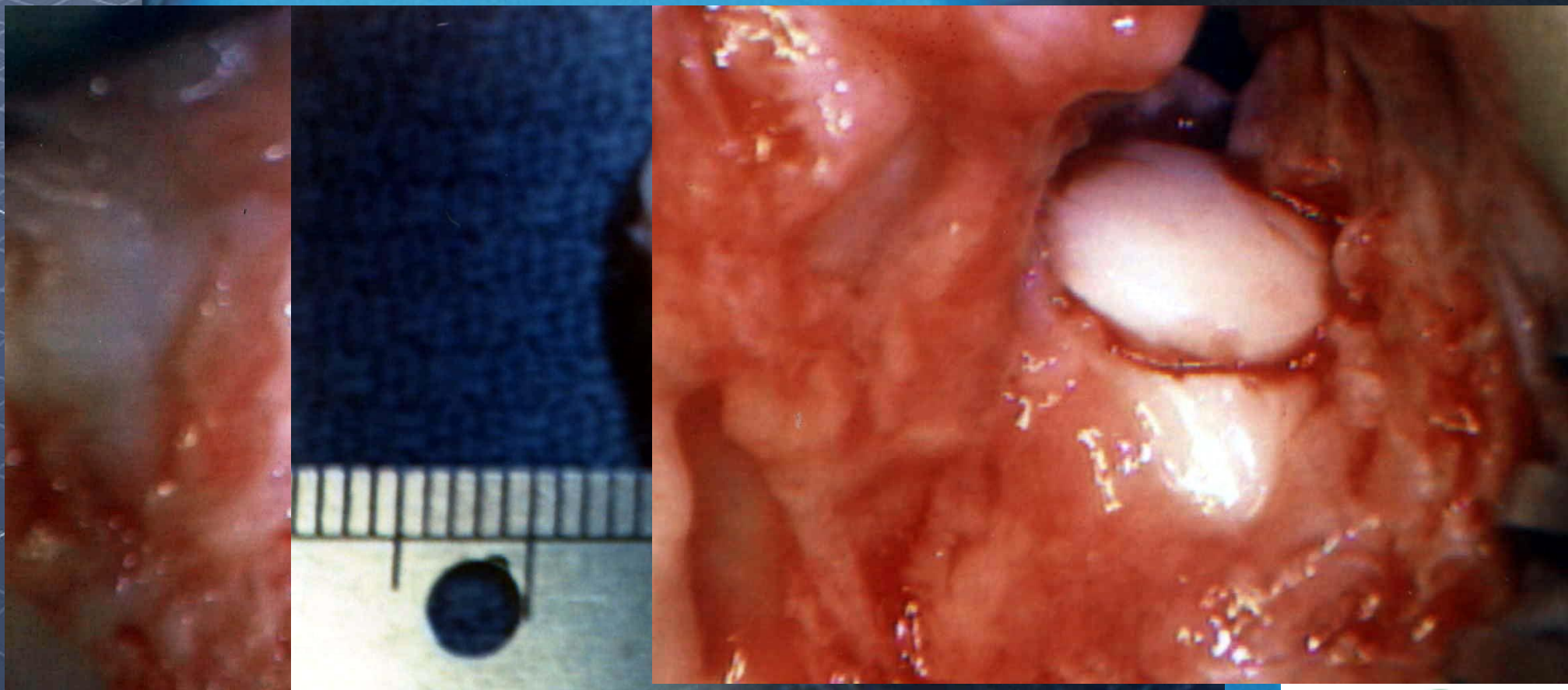


# OATS Technique



# OATS Technique

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# Operative Course

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- Osteochondral Defect
- Goal is to replace bad bone and cartilage
- Allow healing time
- Outpatient procedure
- Non-weight bearing for at least 6 weeks

# EBM for OLT

Foot Ankle Int. 2015 Jan;36(1):24-31. doi: 10.1177/1071100714552480. Epub 2014 Oct 6.

## **Natural history of nonoperatively treated osteochondral lesions of the talus.**

Klammer G<sup>1</sup>, Maquieira GJ<sup>1</sup>, Spahn S<sup>1</sup>, Vigfusson V<sup>1</sup>, Zanetti M<sup>1</sup>, Espinosa N<sup>2</sup>.

**CONCLUSION:** Minimally symptomatic OLTs did not appear to progress or worsen over time when treated nonoperatively.

J Bone Joint Surg Am. 2013 Jun 5;95(11):1045-54. doi: 10.2106/JBJS.L.00773.

## **Operative treatment of osteochondral lesions of the talus.**

Murawski CD<sup>1</sup>, Kennedy JG.

Foot Ankle Int. 2014 Jul 11;35(8):764-770. [Epub ahead of print]

## **Outcomes Following Microfracture in Grade 3 and 4 Articular Cartilage Lesions of the Ankle.**

Clanton TO<sup>1</sup>, Johnson NS<sup>1</sup>, Matheny LM<sup>2</sup>.

Am J Sports Med. 2014 Jun 6;42(8):1896-1903. [Epub ahead of print]

## **Osteochondral Autologous Transplantation Is Superior to Repeat Arthroscopy for the Treatment of Osteochondral Lesions of the Talus After Failed Primary Arthroscopic Treatment.**

Yoon HS<sup>1</sup>, Park YJ<sup>2</sup>, Lee M<sup>2</sup>, Choi WJ<sup>2</sup>, Lee JW<sup>3</sup>.



# Pain Outside the Joint

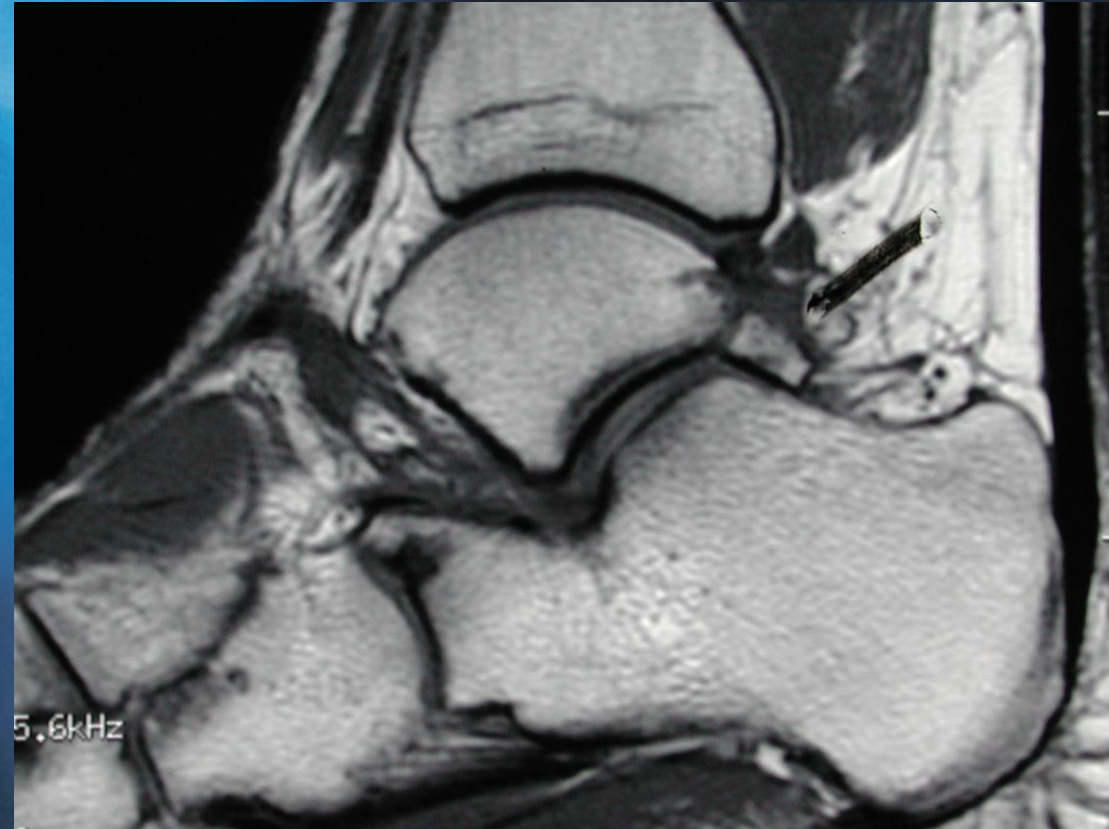
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- Posterior medial ankle impingement
  - FHL stenosing tenosynovitis
  - Posterior process of the talus fracture/Os Trigonum
- Peroneal tendon tear or dislocation
- Neuropraxia
  - Superficial peroneal nerve
  - Sural nerve

# Posterior Ankle Pain

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- FHL
- Posterior Impingement
  - Fx Posterior Process/Os Trigonum
  - FHL
- OCD
- Soleus Syndrome

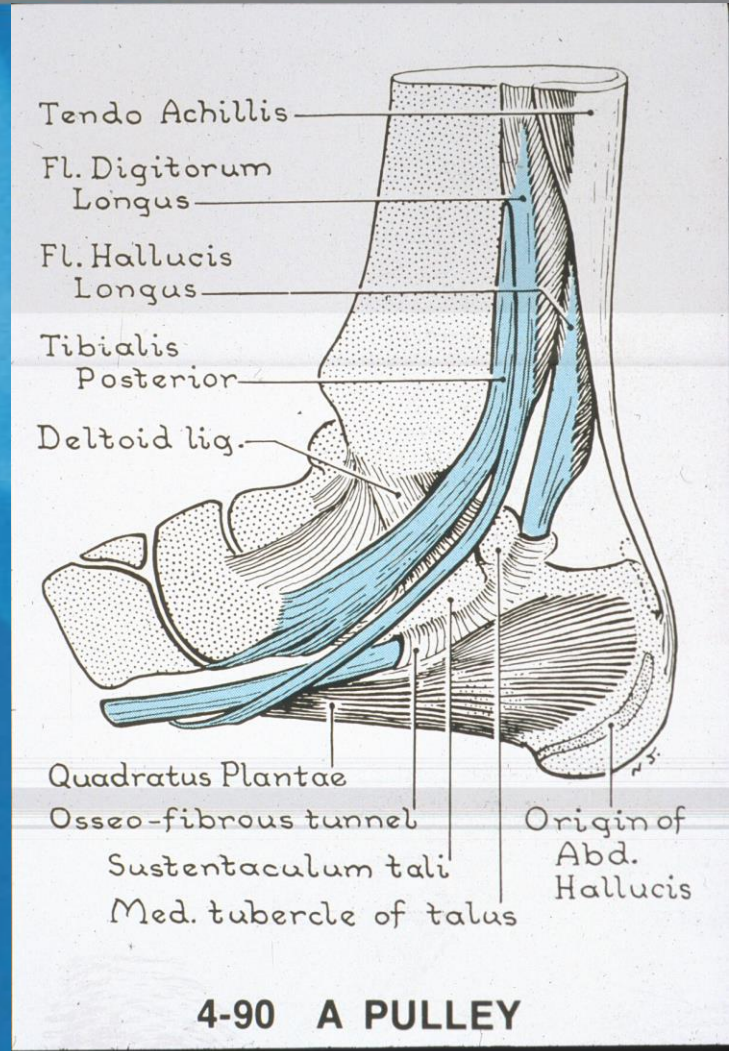
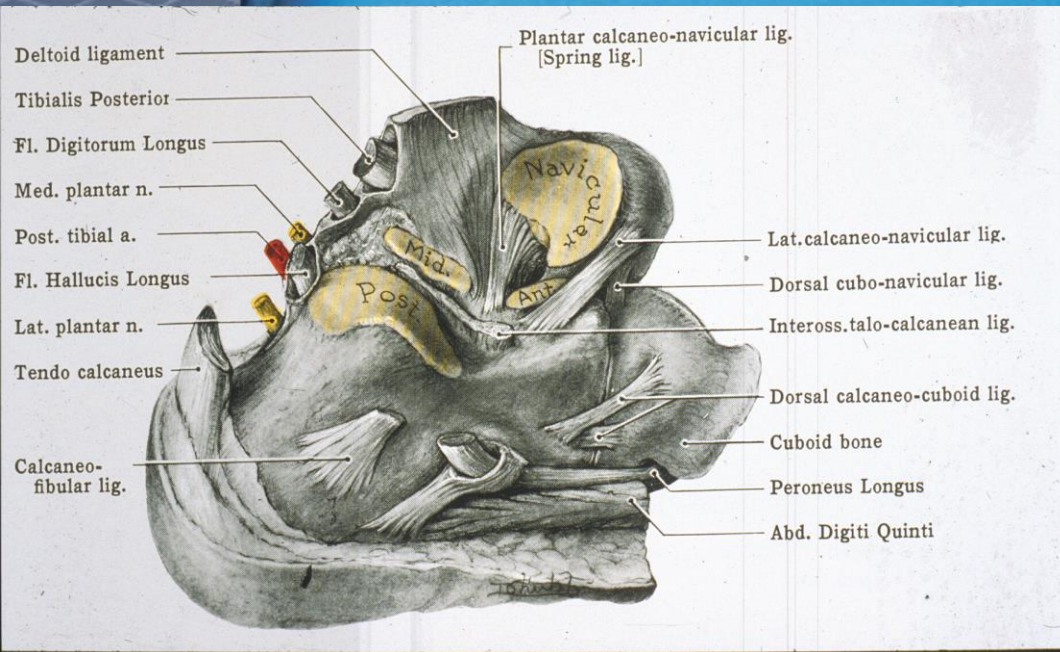


# FHL Tendon

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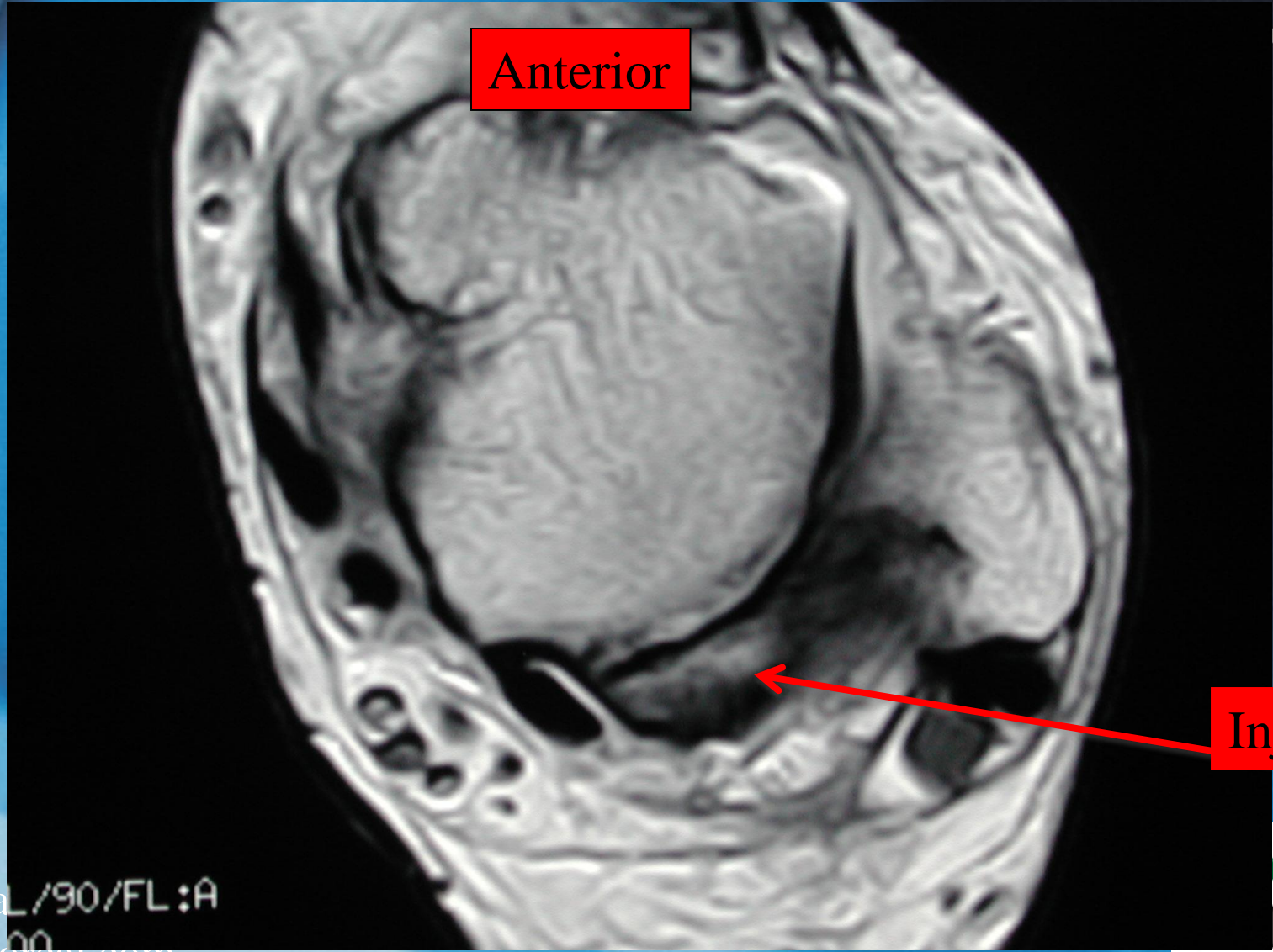
- Tendinitis
- Stenosing Tenosynovitis
- Nodules
- Partial Or Complete Tears

# FHL Anatomy



4-90 A PULLEY

# FHL MRI



Anterior

Medial

Lateral

Inject Here

# FHL

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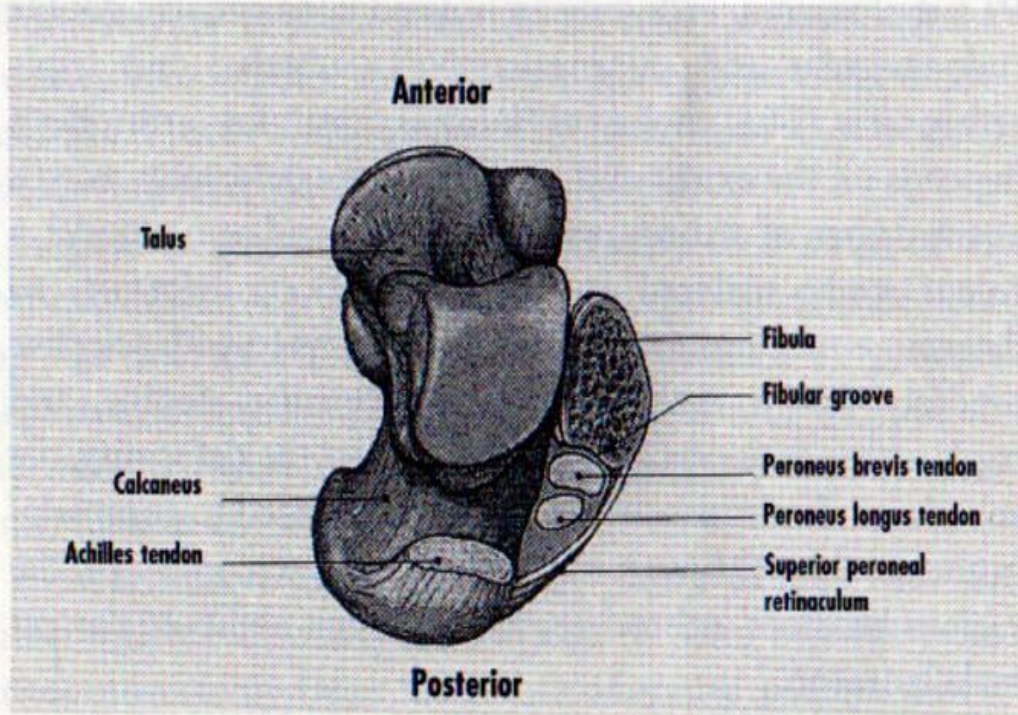
- Dancers/Football Players
- Stenosing Tenosynovitis/FHL Tear
  - palpate posterior ankle
  - DF/PF great toe
  - Marcaine test with depomedrol
- MRI
- PT/Operative Release/Repair

# Peroneal Tendons

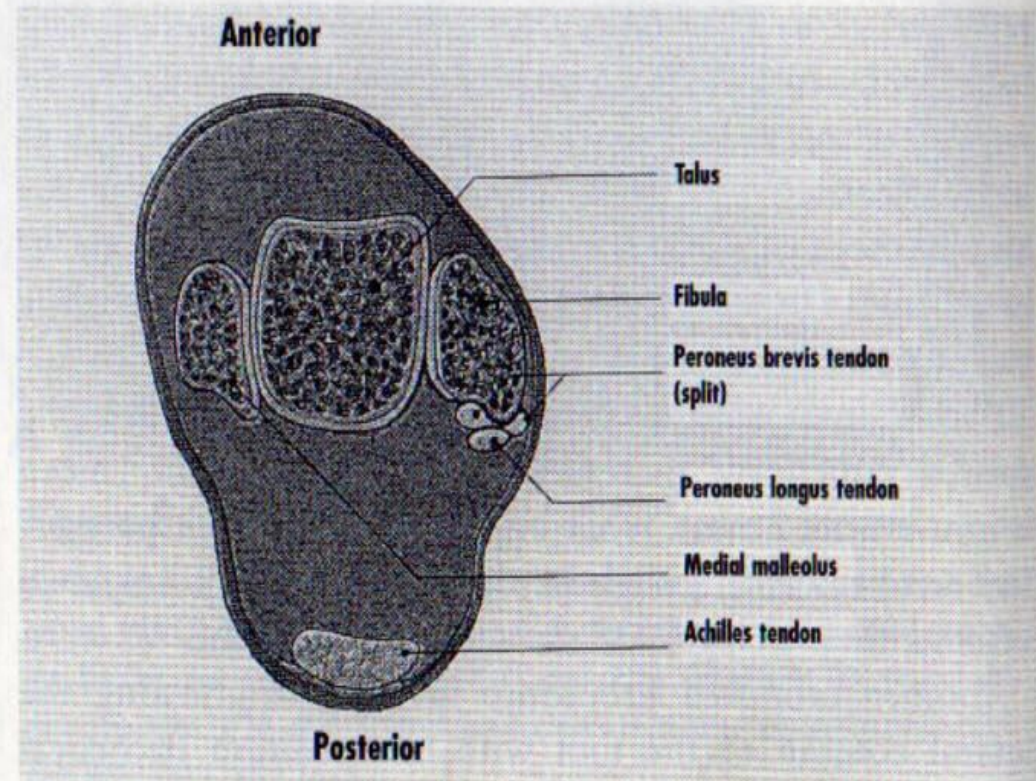
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- Peroneus Brevis-DF/evert
- Peroneus Longus-PF/Evert
  - push off for gait
- Ankle Stability
- Injured-direct trauma
  - inversion injury-severe sprain
  - opposed DF/eversion

# Peroneal Anatomy



A



B



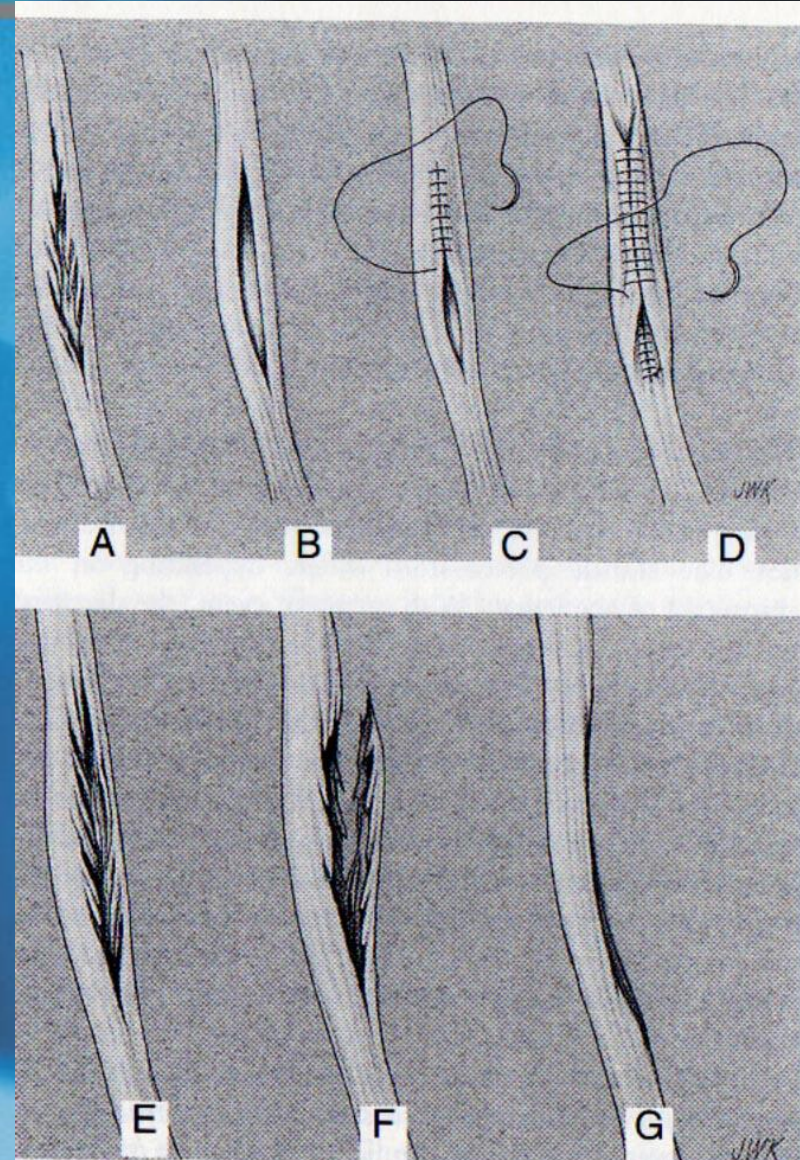
# Peroneal Split Tears/Subluxation

- Peroneal Tear
  - Direct Trauma
  - Inversion
- Peroneal Dislocation
  - Opposed DF/Eversion
  - Skiing



# Peroneal Tx

- Casting/PT if Acute
- Operative  
Exploration/Repair
- May need to repair SPR-  
Deepen Groove



# Long Term Sequelae of Ankle Sprain

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- Develop early arthritis
- Footballer's ankle
- Soccer player's ankle

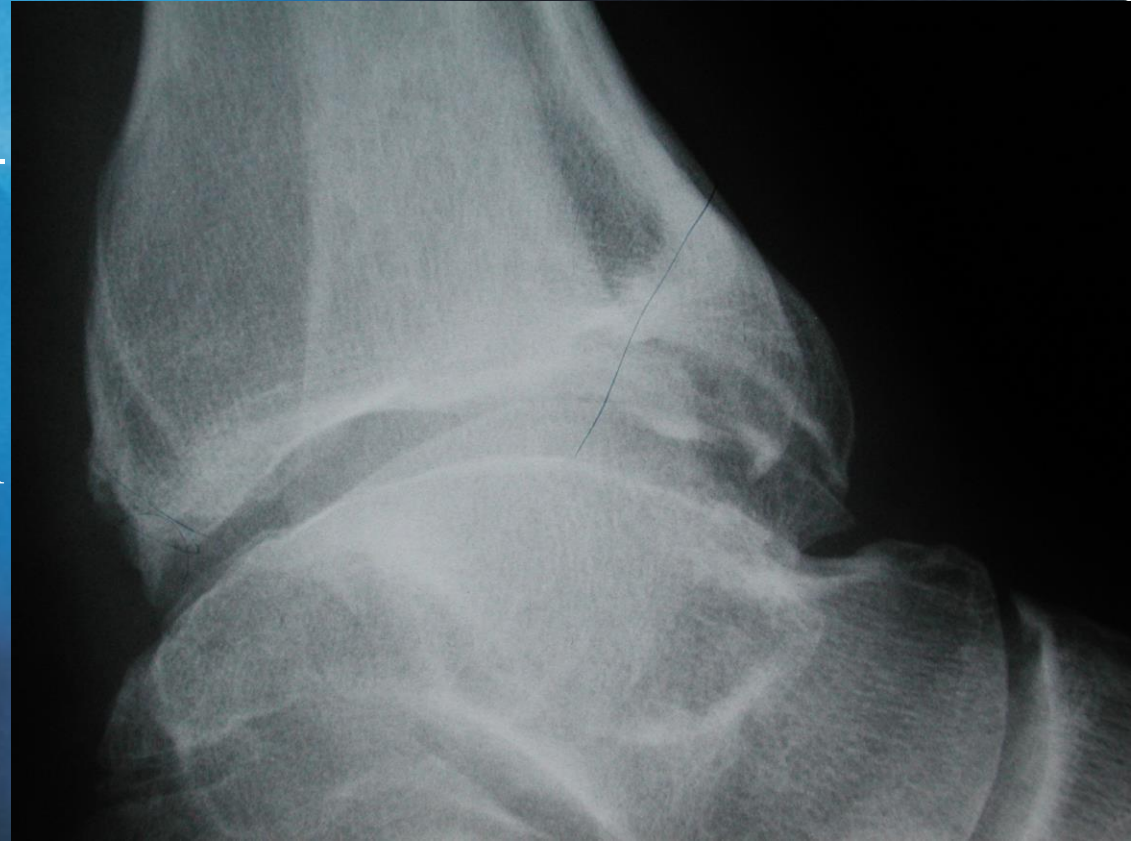
# Anterior Impingement



# Bony Impingement

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- McDermott and Scranton-Classification/Outcome
- Type I-tibial spur  $< 3\text{mm}$
- Type II-tibial spur  $> 3\text{mm}$
- Type III-tibial/talar spurs
- Type IV-Pantalar osteoarthritis



# Summary

- Initial treatment-RICE, brace, functional rehab
- Persistent Instability-native ligament or split tendon
- Persistent Pain in joint-R/O OCD vs. soft tissue
- Persistent pain outside joint-R/O tendon injury, neuropraxia

# Thank You

