



# 2024 SPORTS MEDICINE CONFERENCE

The Webinar will begin shortly.

Breakfast sponsored by:

**Smith+Nephew**

All speakers, Adam Metzler, MD, Aloya Kremer, MD, Nicholas Gates, MD, John Linz, MD, Hannah Stitt, disclosed that they have nothing to disclose. All planners, Holly Groneck, Chase Richards, Courtney Steele, Tony Hyott and Karen Tepe have disclosed that they have nothing to disclose.



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## ANATOMY & PHYSICAL EXAM OF THE ANKLE WITH NON-SURGICAL MANAGEMENT OF LOW ANKLE SPRAINS

**Adam Metzler, MD**

*Orthopaedic Surgeon*

OrthoCincy Orthopaedics & Sports Medicine

# ANATOMY



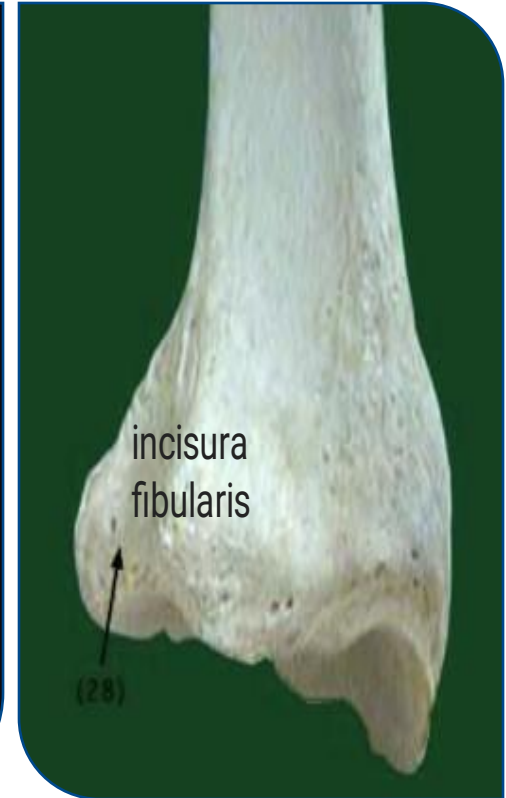
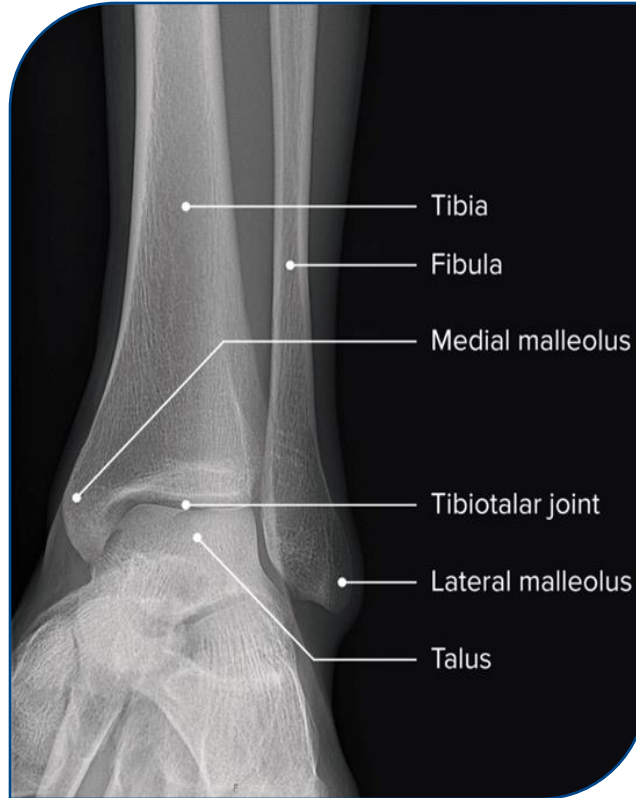
# OSTEOLOGY

## ANKLE JOINT

- Tibial plafond
- Medial malleolus
- Lateral malleolus
- Talus

## DISTAL TIBIOFIBULAR JOINT

- Distal fibula
- Distal lateral tibia



# LIGAMENTS - LATERAL

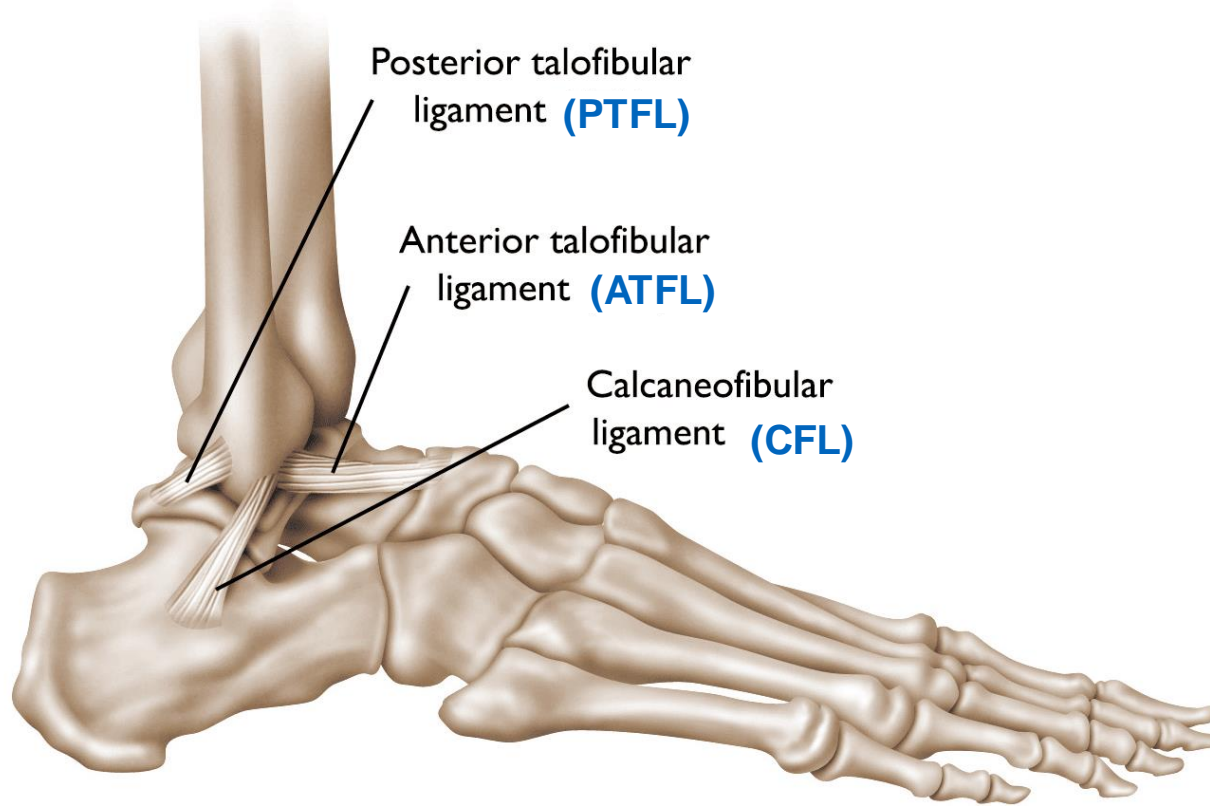
**Anterior Talofibular  
Ligament (ATFL)**

**Posterior Talofibular  
Ligament (PTFL)**

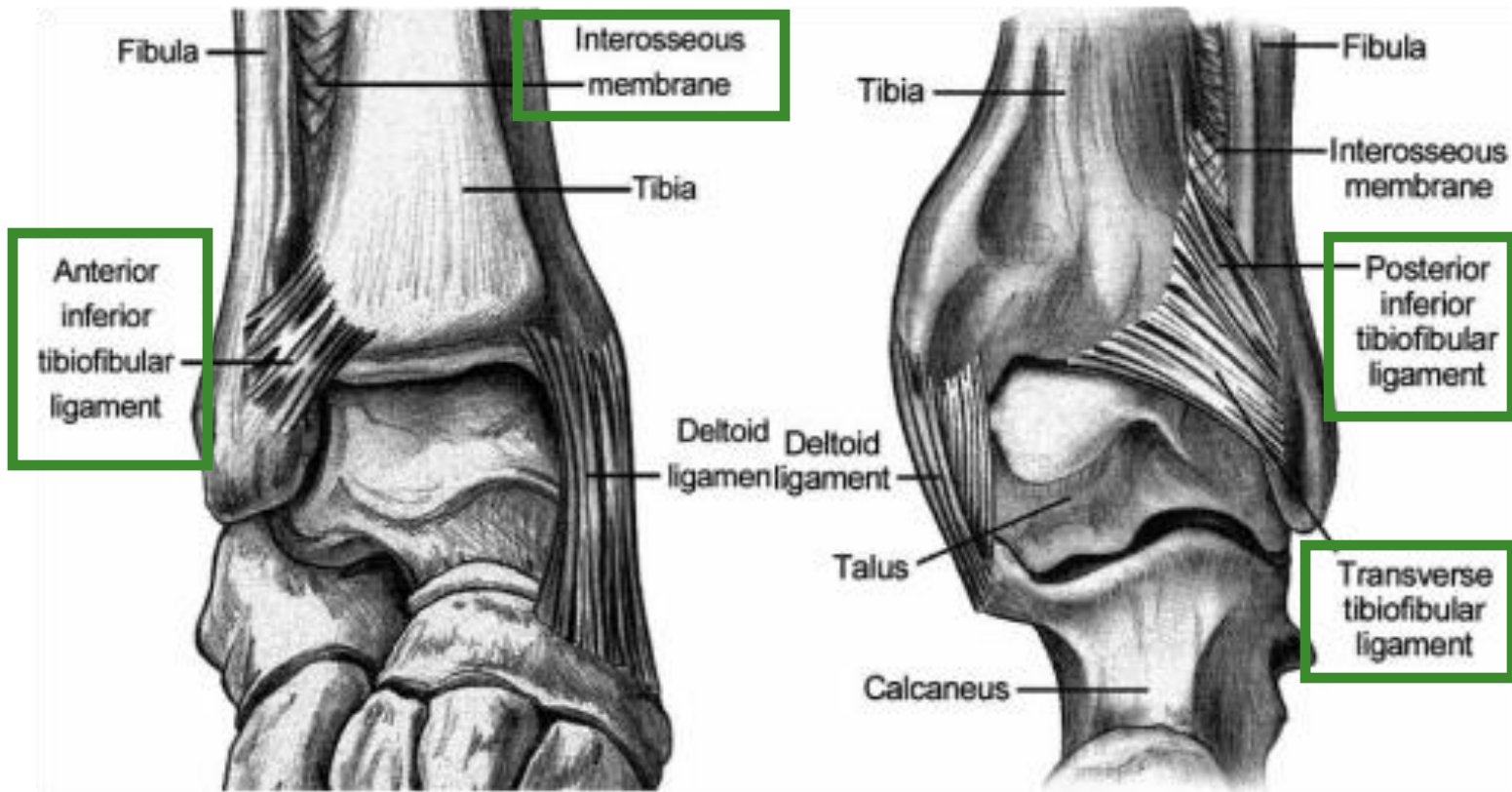
**Calcaneofibular  
Ligament (CFL)**

**Lateral Talocalcaneal  
Ligament (LTCL)**

**Syndesmosis**



**ATFL** is the primary restraint to inversion in PF. **CFL** is the primary restraint to inversion in neutral or DF. **PTFL** is a supplementary stabilizer; limits posterior talar displacement within the mortise.

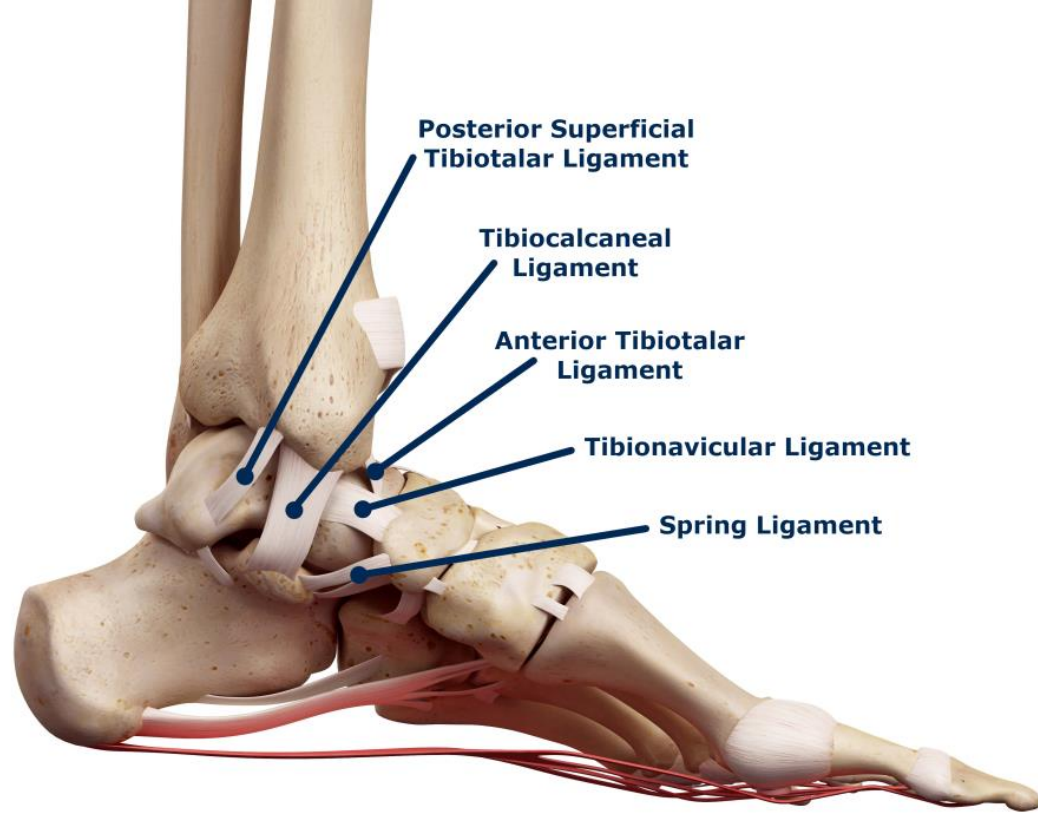


**The syndesmosis maintains the integrity of the ankle mortise and is important for ankle stability.**

# LIGAMENTS - MEDIAL

**Deltoid  
Ligament**

**Calcaneonavicular  
Ligament  
(Spring ligament)**

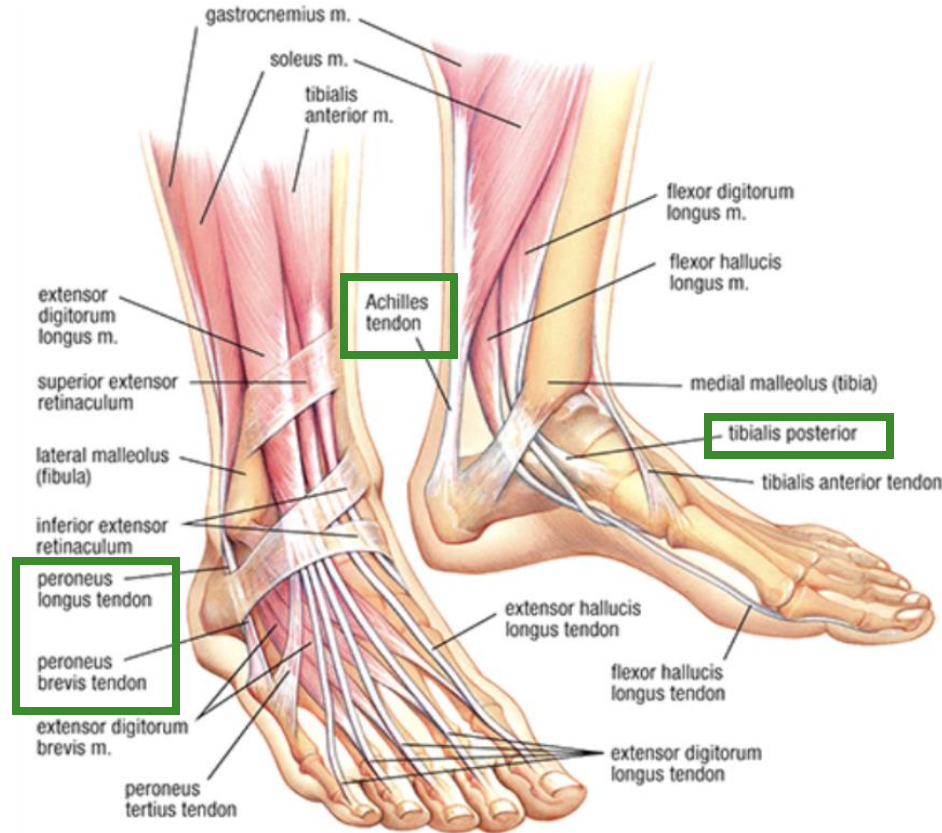


**The deltoid ligament resists hindfoot eversion, stabilizes the talus from valgus tilting. The spring ligament stabilizes the arch.**

# TENDONS

**Achilles  
plantarflexes**

**Peroneal  
tendons evert  
and plantarflex**



**Tibialis posterior  
inverts and  
plantarflexes,  
supports the  
medial arch**

# PHYSICAL EXAM



# ANKLE EXAM

- **Inspection (including gait)**
- **Palpation**
- **ROM**
- **Strength**
- **Stability**
  - i. Anterior drawer (*Sn 32-83%, Sp 38-74%*) - *ATFL, CFL*
  - ii. Talar tilt (*Sn 52-67%, Sp 68-88%*) - *ATFL + CFL*
  - iii. Fibular translation (*Sn 75%, Sp 88%*) - *Syndesmosis*
- **Special tests**
  - i. Thompson test
  - ii. Kleiger's/external rotation test
  - iii. Tinel's at the tarsal tunnel
  - iv. Passive forced plantarflexion and dorsiflexion/squat
  - v. Calcaneal squeeze, percussion

# INSPECTION



# PALPATION

## Ankle Pain Diagram



Lateral Ankle

Medial Ankle



**Lateral ankle sprain (inversion)**  
Lateral malleolus fx, ATFL/CFL/PTFL



**Medial ankle sprain (eversion)**  
Medial malleolus fx, deltoid ligament complex



**Syndesmosis/Tibiofibular joint**  
High ankle sprain



**5<sup>th</sup> Metatarsal**  
Avulsion fracture, Jones fracture  
Iselin's apophysitis (base)



**Calcaneus**  
Sever's apophysitis, stress fracture



**Anterior Tibiotalar Joint**  
Talus OCD, anterior impingement



**Metatarsals**  
Traumatic or stress fractures

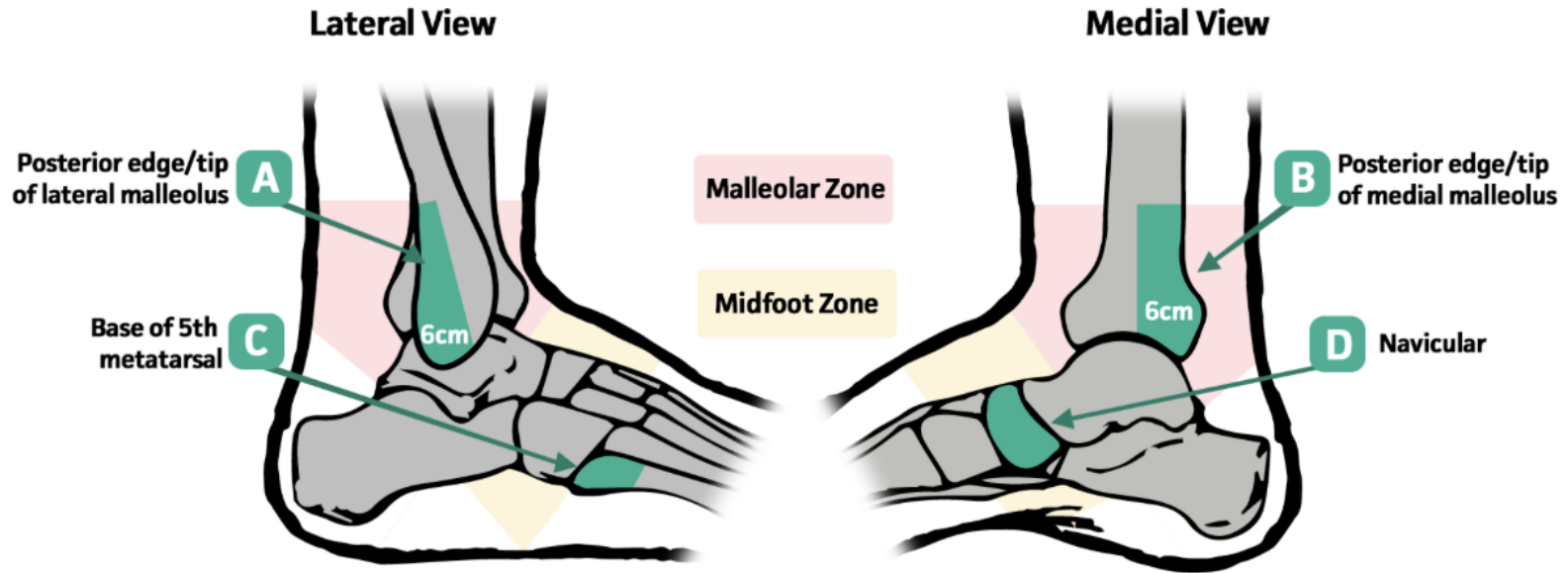


**Peroneal tendons**  
Peroneal tendinitis, tear



**Posterior tibialis**  
Posterior tibialis tendinitis, tear

# OTTAWA ANKLE RULES



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96 - 99% sensitive in ruling out ankle fracture

# RANGE OF MOTION & STRENGTH

## MUSCLE STRENGTH

Grade	Ability to Move
5	The muscle can move the joint it crosses through a full range of motion, against gravity, and against full resistance applied by the examiner.
4	The muscle can move the joint it crosses through a full range of motion against moderate resistance.
3	The muscle can move the joint it crosses through a full range of motion against gravity but without any resistance.
2	The muscle can move the joint it crosses through a full range of motion only if the part is properly positioned so that the force of gravity is eliminated.
1	Muscle contraction is seen or identified with palpation, but it is insufficient to produce joint motion even with elimination of gravity.
0	No muscle contraction is seen or identified with palpation; paralysis.

**DF 0-20°**

**PF 0-50°**

**Inversion 0-35°**

**Eversion 0-20°**

# ANTERIOR DRAWER TEST



# STABILITY & SPECIAL TESTS

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**Anterior drawer:** ATFL best tested in plantarflexion, CFL in dorsiflexion.

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**Talar tilt:** Excessive ankle inversion (> 15 degrees) compared to contralateral side indicates injury to ATFL and CFL.



# LOW ANKLE SPRAIN



# LOW ANKLE SPRAINS



## Epidemiology

- Most common injury causing time out from sports
- >90% are low ankle sprains (ATFL, CFL)
- Basketball, volleyball are highest risk

## Mechanism

- Ankle inversion on a plantarflexed foot

# MANAGEMENT

- **Initial immobilization as needed for pain:  
WBAT in CAM boot**
  - ✓ <10 days
  - ✓ Encourage AROM out of boot
- **NSAIDs PRN pain, swelling**
- **Ice - mixed evidence**
- **Follow up visit in 7-14 days; better assessment**

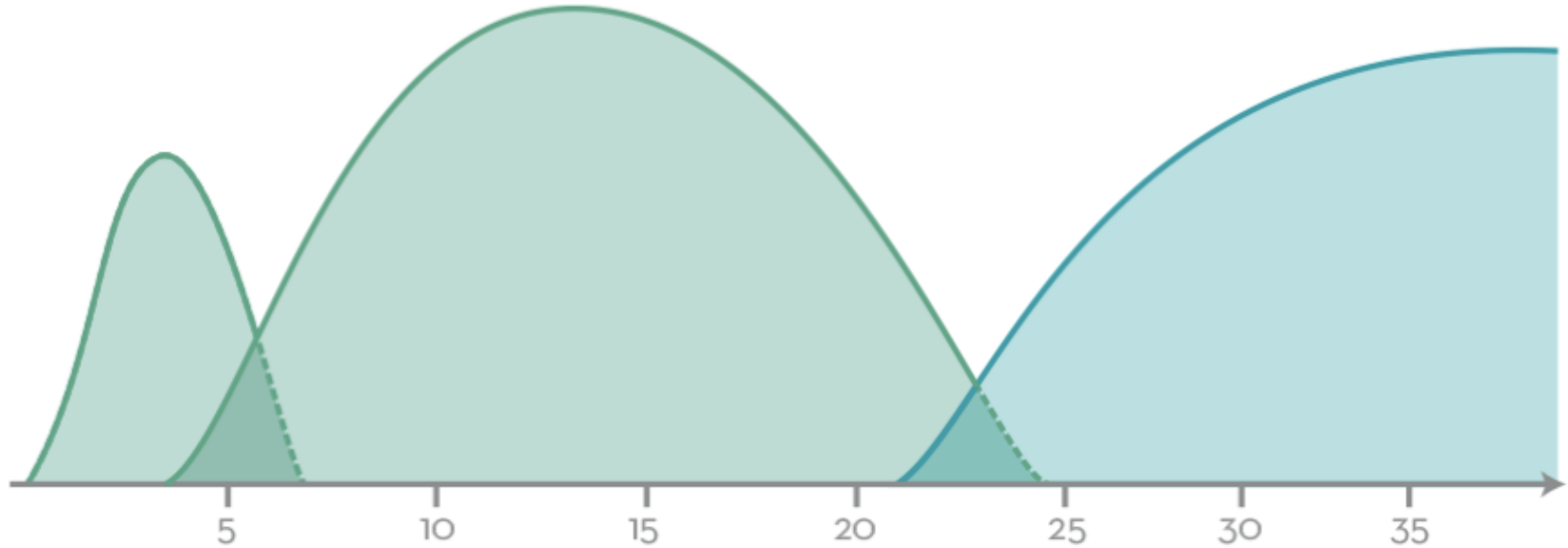


# MANAGEMENT



- **Transition to flexible support**
  - ✓ Lace-up brace as early as tolerated
  - ✓ Early mobilization → better outcomes
- **Physical therapy**
  - ✓ Early phase begins with ROM exercises
  - ✓ Once swelling/pain improve, patient has full AROM, progress to strengthening, proprioception & sport-specific exercises
  - ✓ Early functional rehab → quicker return to physical activity

# TISSUE HEALING



**INFLAMMATION**  
(4–6 days)

**PROLIFERATION**  
(4–24 days)

**REMODELING**  
(21 days–2 years)

# RISK REDUCTION

Ankle sprain → ~3.5 times greater risk of sustaining another ankle sprain

Proprioceptive exercise programs reduce the risk of acute ankle sprains

- 6-yr prospective analysis of balance-training program (n=55): Acute ankle sprains reduced 81%
- RCT of multi-station proprioceptive exercise program (n=232): 65% reduction in odds of ankle sprain. NNT = 7 athletes to prevent 1 acute ankle injury



# RISK REDUCTION

**WARM UP:** Sport-specific stretching, strengthening & balance exercises

**FIFA 11+ injury-prevention protocol studied in elite male basketball athletes → lower rate of lower extremity injuries**

**(0.68 versus 1.4 injuries/1,000 AEs;  $P = .022$ )**





# FIFA 11+

## PART 1 RUNNING EXERCISES · 8 MINUTES



### 1 RUNNING STRAIGHT AHEAD

The course is made up of 6 to 10 pairs of parallel cones, approx. 5-6 metres apart. Two players start at the same time from the first pair of cones. **Jog together** all the way to the last pair of cones. On the way back, you can increase your speed progressively as you warm up. **2 sets**



### 4 RUNNING CIRCLING PARTNER

Run forwards as a pair to the first set of cones. Shuffle sideways by 90 degrees to meet in the middle. **Shuffle an entire circle around one other** and then return back to the cones. Repeat for each pair of cones. Remember to stay on your toes and keep your centre of gravity low by bending your hips and knees. **2 sets.**



### 2 RUNNING HIP OUT

Walk or jog easily, stopping at each pair of cones to lift your knee and **rotate your hip outwards**. Alternate between left and right legs at successive cones. **2 sets.**



### 5 RUNNING SHOULDER CONTACT

Run forwards in pairs to the first pair of cones. Shuffle sideways by 90 degrees to meet in the middle then **jump sideways towards each other to make shoulder-to-shoulder contact**.

Note: Make sure you land on both feet with your hips and knees bent. Do not let your knees buckle inwards. Make it a full jump and synchronize your timing with your team-mate as you jump and land. **2 sets**



### 3 RUNNING HIP IN

Walk or jog easily, stopping at each pair of cones to lift your knee and **rotate your hip inwards**. Alternate between left and right legs at successive cones. **2 sets.**



### 6 RUNNING QUICK FORWARDS & BACKWARDS

As a pair, run quickly to the second set of cones then run **backwards quickly to the first pair of cones keeping your hips and knees slightly bent**. Keep repeating the drill, running two cones forwards and one cone backwards. Remember to take small, quick steps. **2 sets.**

# PART 2 PLYOMETRICS · BALANCE · 10 MINUTES

## LEVEL 1

### 7 THE BENCH STATIC



**Starting position:** Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.  
**Exercise:** Lift your body up, supported on your forearms, pull your stomach in, and hold the position for 20-30 sec. Your body should be in a straight line. Try not to sway or arch your back. **3 sets.**

### 8 SIDEWAYS BENCH STATIC



**Starting position:** Lie on your side with the knee of your lowermost leg bent to 90 degrees. Support your upper body by resting on your forearm and knee. The elbow of your supporting arm should be directly under your shoulder.  
**Exercise:** Lift your uppermost leg and hips until your shoulder, hip and knee are in a straight line. Hold the position for 20-30 sec. Take a short break, change sides and repeat. **3 sets on each side.**

### 9 HAMSTRINGS BEGINNER



**Starting position:** Kneel on a soft surface. Ask your partner to hold your ankles down firmly.  
**Exercise:** Your body should be completely straight from the shoulder to the knee throughout the exercise. Lean forward as far as you can, controlling the movement with your hamstrings and your gluteal muscles. When you can no longer hold the position, gently take your weight on your hands, falling into a push-up position. Complete a minimum of 3-5 repetitions and/or 60 sec. **1 set.**

### 10 SINGLE-LEG STANCE HOLD THE BALL



**Starting position:** Stand on one leg.  
**Exercise:** Balance on one leg whilst holding the ball with both hands. Keep your body weight on the ball of your foot. Remember: try not to let your knees buckle inwards. Hold for 30 sec. Change legs and repeat. The exercise can be made more difficult by passing the ball around your waist and/or under your other knee. **2 sets.**

### 11 SQUATS WITH TOE RAISE



**Starting position:** Stand with your feet hip-width apart. Place your hands on your hips if you like.  
**Exercise:** Imagine that you are about to sit down on a chair. Perform squats by bending your hips and knees to 90 degrees. Do not let your knees buckle inwards. Descend slowly then straighten up more quickly. When your legs are completely straight, stand up on your toes then slowly lower down again. Repeat the exercise for 30 sec. **2 sets.**

### 12 JUMPING VERTICAL JUMPS



**Starting position:** Stand with your feet hip-width apart. Place your hands on your hips if you like.  
**Exercise:** Imagine that you are about to sit down on a chair. Bend your legs slowly until your knees are flexed to approx 90 degrees, and hold for 2 sec. Do not let your knees buckle inwards. From the squat position, jump up as high as you can. Land softly on the balls of your feet with your hips and knees slightly bent. Repeat the exercise for 30 sec. **2 sets.**

## LEVEL 2

### 7 THE BENCH ALTERNATE LEGS



**Starting position:** Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.  
**Exercise:** Lift your body up, supported on your forearms, and pull your stomach in. Lift each leg in turn, holding for a count of 2 sec. Continue for 40-60 sec. Your body should be in a straight line. Try not to sway or arch your back. **3 sets.**

### 8 SIDEWAYS BENCH RAISE & LOWER HIP



**Starting position:** Lie on your side with both legs straight. Lean on your forearm and the side of your foot so that your body is in a straight line from shoulder to foot. The elbow of your supporting arm should be directly beneath your shoulder.  
**Exercise:** Lower your hip to the ground and raise it back up again. Repeat for 20-30 sec. Take a short break, change sides and repeat. **3 sets on each side.**

### 9 HAMSTRINGS INTERMEDIATE



**Starting position:** Kneel on a soft surface. Ask your partner to hold your ankles down firmly.  
**Exercise:** Your body should be completely straight from the shoulder to the knee throughout the exercise. Lean forward as far as you can, controlling the movement with your hamstrings and your gluteal muscles. When you can no longer hold the position, gently take your weight on your hands, falling into a push-up position. Complete a minimum of 7-10 repetitions and/or 60 sec. **1 set.**

### 10 SINGLE-LEG STANCE THROWING BALL WITH PARTNER



**Starting position:** Stand 2-3 m apart with your partner, with each of you standing on one leg.  
**Exercise:** Keeping your balance, and with your stomach held in, throw the ball to one another. Keep your weight on the ball of your foot. Remember: keep your knee just slightly flexed and try not to let it buckle inwards. Keep going for 30 sec. Change legs and repeat. **2 sets.**

### 11 SQUATS WALKING LUNGES



**Starting position:** Stand with your feet hip-width apart. Place your hands on your hips if you like.  
**Exercise:** Lunge forward slowly at an even pace. As you lunge, bend your leading leg until your hip and knee are flexed to 90 degrees. Do not let your knee buckle inwards. Try to keep your upper body and hips steady. Lunge your way across the pitch (approx. 10 times on each leg) and then jog back. **2 sets.**

### 12 JUMPING LATERAL JUMPS



**Starting position:** Stand on one leg with your upper body bent slightly forwards from the waist, with knees and hips slightly bent.  
**Exercise:** Jump approx. 1 m sideways from the supporting leg on to the free leg. Land gently on the ball of your foot. Bend your hips and knees slightly as you land and do not let your knee buckle inward. Maintain your balance with each jump. Repeat the exercise for 30 sec. **2 sets.**

## LEVEL 3

### 7 THE BENCH ONE LEG LIFT AND HOLD



**Starting position:** Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.  
**Exercise:** Lift your body up, supported on your forearms, and pull your stomach in. Lift one leg about 10-15 centimetres off the ground, and hold the position for 20-30 sec. Your body should be straight. Do not let your opposite hip dip down and do not sway or arch your lower back. Take a short break, change legs and repeat. **3 sets.**

### 8 SIDEWAYS BENCH WITH LEG LIFT



**Starting position:** Lie on your side with both legs straight. Lean on your forearm and the side of your foot so that your body is in a straight line from shoulder to foot. The elbow of your supporting arm should be directly beneath your shoulder.  
**Exercise:** Lift your uppermost leg up and slowly lower it down again. Repeat for 20-30 sec. Take a short break, change sides and repeat. **3 sets on each side.**

### 9 HAMSTRINGS ADVANCED



**Starting position:** Kneel on a soft surface. Ask your partner to hold your ankles down firmly.  
**Exercise:** Your body should be completely straight from the shoulder to the knee throughout the exercise. Lean forward as far as you can, controlling the movement with your hamstrings and your gluteal muscles. When you can no longer hold the position, gently take your weight on your hands, falling into a push-up position. Complete a minimum of 12-15 repetitions and/or 60 sec. **1 set.**

### 10 SINGLE-LEG STANCE TEST YOUR PARTNER



**Starting position:** Stand on one leg opposite your partner and at arms' length apart.  
**Exercise:** Whilst you both try to keep your balance, each of you in turn tries to push the other off balance in different directions. Try to keep your weight on the ball of your foot and prevent your knee from buckling inwards. Continue for 30 sec. Change legs. **2 sets.**

### 11 SQUATS ONE-LEG SQUATS



**Starting position:** Stand on one leg, loosely holding onto your partner.  
**Exercise:** Slowly bend your knee as far as you can manage. Concentrate on preventing the knee from buckling inwards. Bend your knee slowly then straighten it slightly more quickly, keeping your hips and upper body in line. Repeat the exercise 10 times on each leg. **2 sets.**

### 12 JUMPING BOX JUMPS



**Starting position:** Stand with your feet hip-width apart. Imagine that there is a cross marked on the ground and you are standing in the middle of it.  
**Exercise:** Alternate between jumping forwards and backwards, from side to side, and diagonally across the cross. Jump as quickly and explosively as possible. Your knees and hips should be slightly bent. Land softly on the balls of your feet. Do not let your knees buckle inwards. Repeat the exercise for 30 sec. **2 sets.**



# FIFA 11+

## PART 3 RUNNING EXERCISES • 2 MINUTES



### 13 RUNNING ACROSS THE PITCH

Run across the pitch, from one side to the other, at 75-80% maximum pace. **2 sets.**



### 14 RUNNING BOUNDING

Run with high bounding steps with a high knee lift, landing gently on the ball of your foot. Use an exaggerated arm swing for each step (opposite arm and leg). Try not to let your leading leg cross the midline of your body or let your knees buckle inwards. Repeat the exercise until you reach the other side of the pitch, then jog back to recover. **2 sets.**



### 15 RUNNING PLANT & CUT

Jog 4-5 steps, then plant on the outside leg and cut to change direction. Accelerate and sprint 5-7 steps at high speed (80-90% maximum pace) before you decelerate and do a new plant & cut. Do not let your knee buckle inwards. Repeat the exercise until you reach the other side, then jog back. **2 sets.**

# RISK REDUCTION



**Ankle braces & tape are effective in the prevention of ankle sprains**



- Risk of recurrent sprain decreased 50-70%
- Wear for sports through remodeling phase

# THANK YOU!



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## CHRONIC PAIN AFTER ANKLE SPRAIN

**Nick Gates, MD**

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OrthoCincy Orthopaedics & Sports Medicine

# ANKLE SPRAINS THAT DON'T GET BETTER ...

Why does it happen?

What is “Chronic Ankle Impingement”?

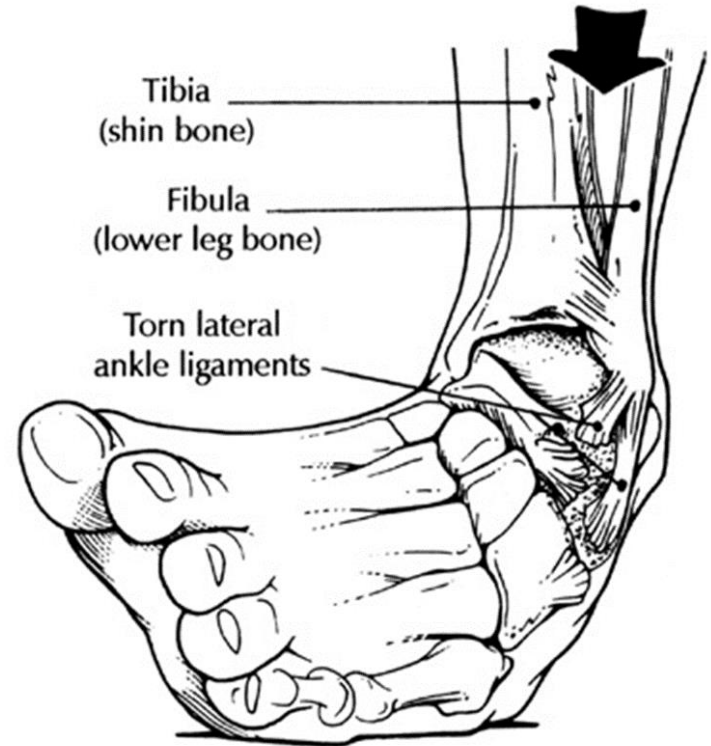
Why/when/how do we perform *ankle arthroscopy*?



# ACUTE ANKLE INVERSION INJURY

## DIFFERENTIAL DIAGNOSIS

- **Midfoot LisFranc injury**
  - ✓ stable sprain
  - ✓ unstable tear
- **High ankle sprain/syndesmosis injury**
  - ✓ stable sprain
  - ✓ unstable tear
- **Peroneal tendon dislocation**
- **Talar neck/talus process fracture**
- **Anterior process calcaneus fracture**
- **Achilles tendon tear**
- **Fifth metatarsal fracture**



# LISFRANC INJURY

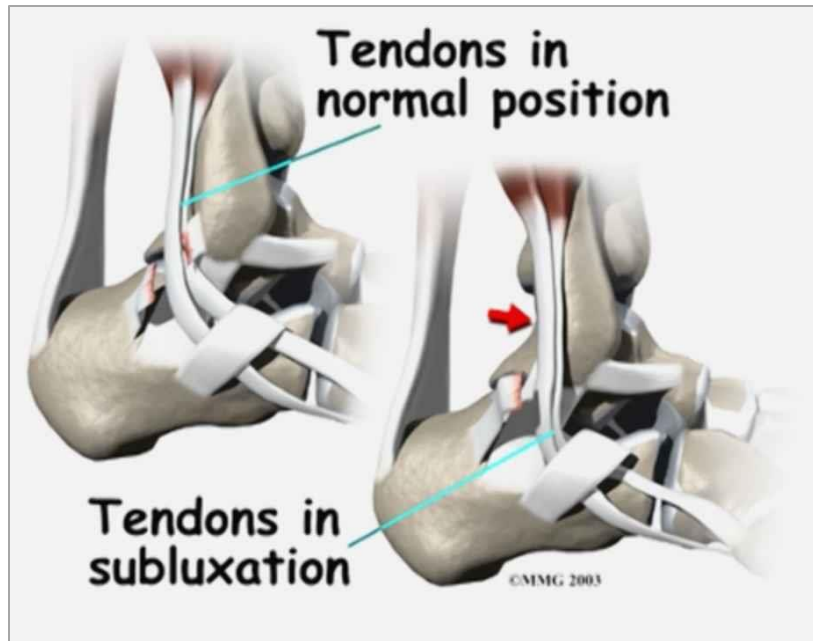




# SYNDESMOSIS TEAR (HIGH ANKLE SPRAIN)



# PERONEAL TENDON DISLOCATION



# PERONEAL TENDON DISLOCATION



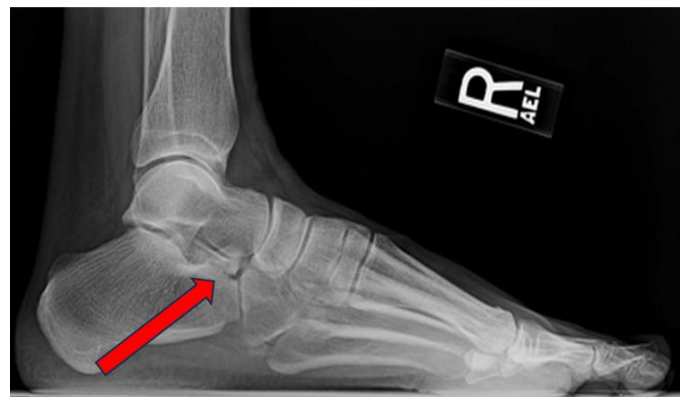
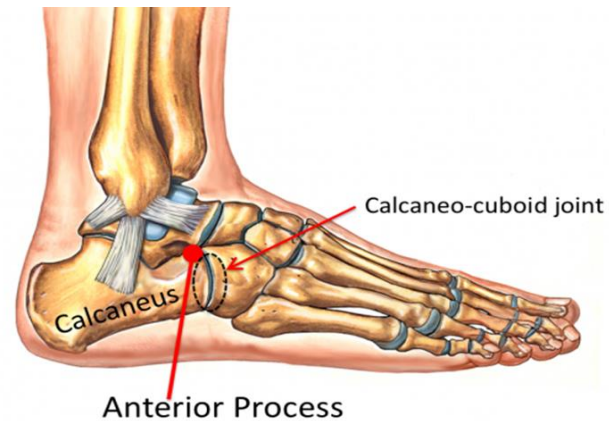
Resting

Eversion and Dorsiflexion

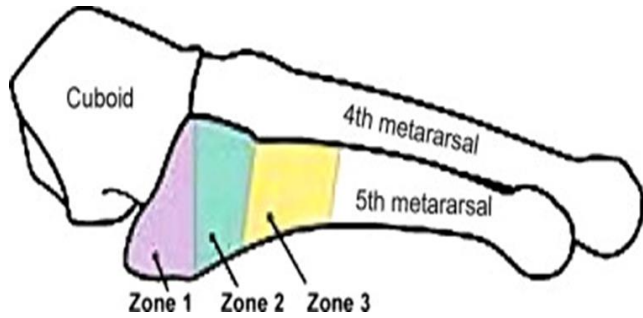
# LATERAL TALUS PROCESS FRACTURE



# ANTERIOR PROCESS CALCANEUS FRACTURE



# FIFTH METATARSAL FRACTURE



Jones Fracture = Proximal Diaphyseal Fracture



Base Fracture

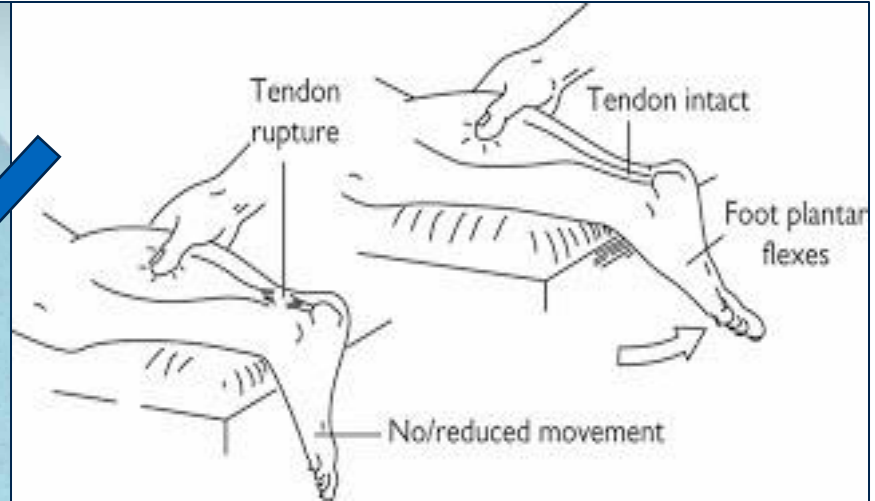


# ACHILLES TENDON TEAR

Palpable Gap



Thompson Test



**MRI NOT Necessary For Diagnosis**



# ACHILLES TENDON TEAR

Normal Resting Plantarflexion



Lack of Resting Plantarflexion

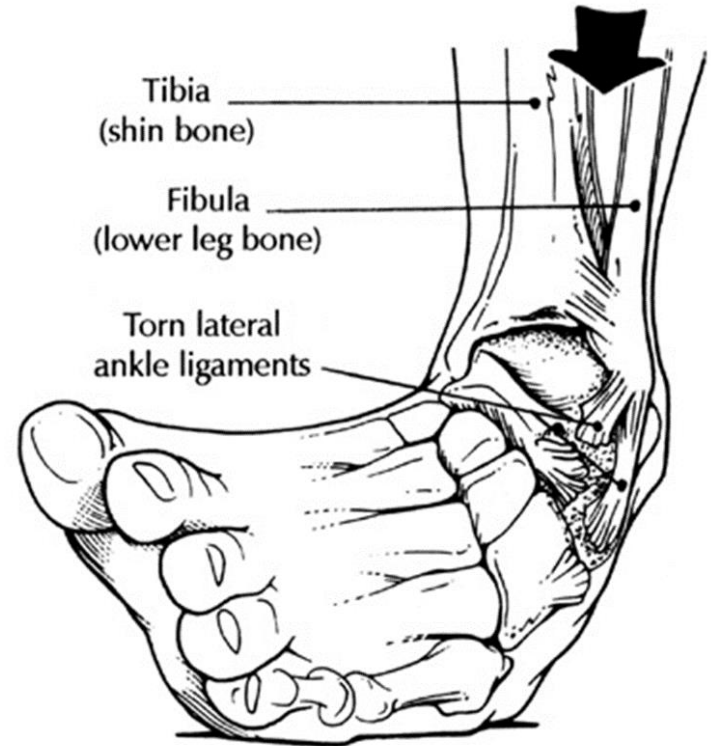


**MRI NOT Necessary For Diagnosis**

# CHRONIC ANKLE PAIN AFTER ANKLE SPRAIN

## DIFFERENTIAL DIAGNOSIS

- **Midfoot LisFranc injury**
  - ✓ stable sprain
  - ✓ unstable tear
- **High ankle sprain/syndesmosis injury**
  - ✓ stable sprain
  - ✓ unstable tear
- **Peroneal tendon dislocation**
- **Talar neck/talus process fracture**
- **Anterior process calcaneus fracture**
- **Achilles tendon tear**
- **Fifth metatarsal fracture**





# PERSISTENTLY PAINFUL ANKLE SPRAIN

## ACUTE

- **Midfoot LisFranc injury**
  - ✓ **stable sprain / unstable tear**
- **High ankle sprain/syndesmosis injury**
  - ✓ **stable sprain / unstable tear**
- **Peroneal tendon dislocation**
- **Talar neck/talus process fracture**
- **Anterior process calcaneus fracture**
- **Achilles tendon tear**

## CHRONIC

- **Navicular stress fracture**
- **Tarsal Coalition**
- **Os Trigonum Syndrome**
- **Impingement**

# OFFICE APPROACH: 3 P'S OF "MY ANKLE STILL HURTS"

**POINT**

**PROVOKE**

**PROVE**

## OFFICE APPROACH: 3 P'S

**POINT**  
History

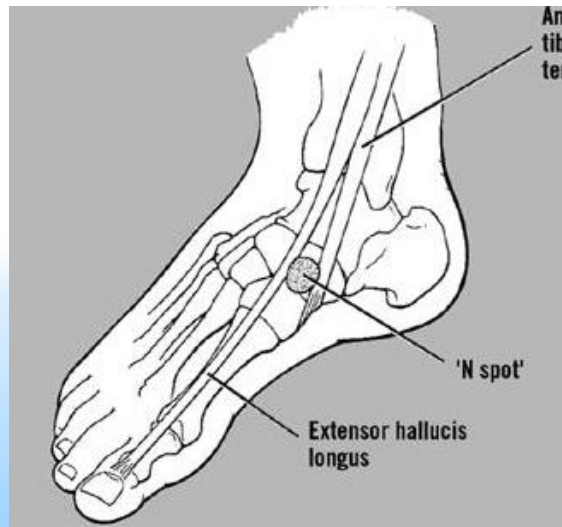
**PROVOKE**  
Physical Exam

**PROVE**  
Xray, MRI, CT

# POINT



# PROVOKE



# PROVE

- **X-Ray**
  - ✓ All initial ankle sprains
  - ✓ Careful review of original
- **Repeat X-Ray**
  - ✓ Best first test for persistent pain
  - ✓ Occult fracture lateral malleolus, talar neck, ant process, lateral process
- **Standing X-Ray**
  - ✓ Subtle LisFranc injury
- **MRI**
  - ✓ LisFranc
  - ✓ Occult fracture midfoot, lateral malleolus, talar neck
  - ✓ Os trigonum, suspected navicular fracture
- **CT Scan**
  - ✓ Better picture of a known fracture, surgical planning

# CHRONIC ANKLE IMPINGEMENT

## CHRONICALLY PAINFUL ANKLE SECONDARY TO AN INTRARTICULAR OSSEOUS OR SOFT TISSUE ABNORMALITY

- **Antero-lateral soft tissue**
  - ✓ “Meniscoid”
  - ✓ Bassett’s ligament (AITFL)
- **Anterior Osteophyte**
- **Loose body**
  - ✓ Sub-acute
  - ✓ Chronic
- **Antero-medial Impingement**
  - ✓ Deltoid avulsion
- **Os Trigonum Syndrome (posterior impingement)**

# RISK FACTORS



- **Repeated sprains**
  - ✓ **“Functional” instability**
  - ✓ **“Anatomic” instability**
- **Treatment delay/avoidance: “play through it”**
- **Prolonged immobilization**



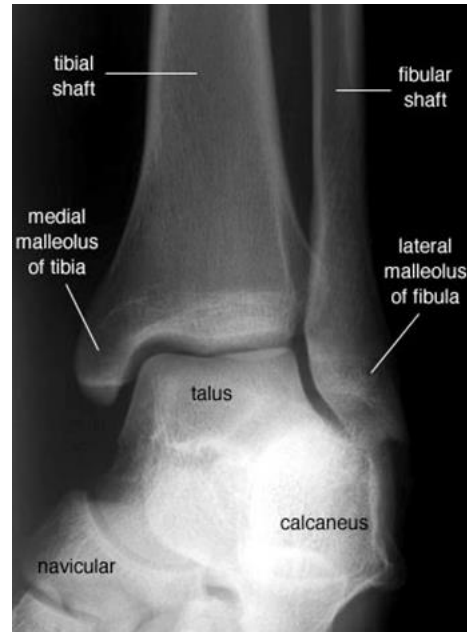
# ANTERIOR ANKLE IMPINGEMENT

## PHYSICAL EXAM

- **Point tender**
  - ✓ Ant-lateral joint
  - ✓ Medial gutter
- **+/- Mild effusion**
- **Negative anterior drawer**

## X-RAY

- **Often normal**
- **Possible anterior osteophyte**
- **Possible avulsion medial or lateral**
- **Loose body**



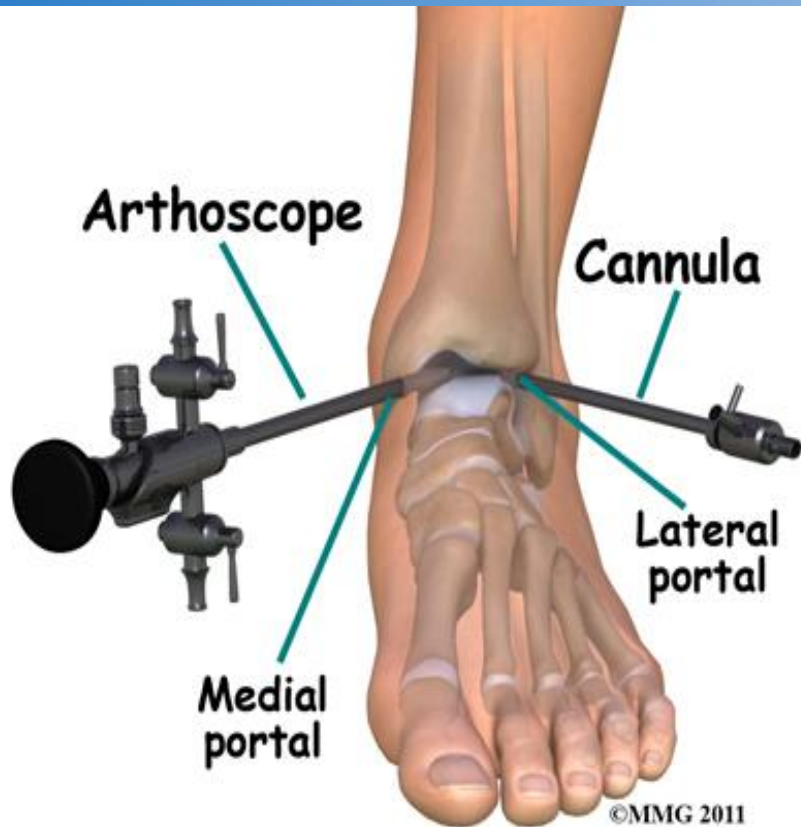
# ANTERIOR ANKLE IMPINGEMENT



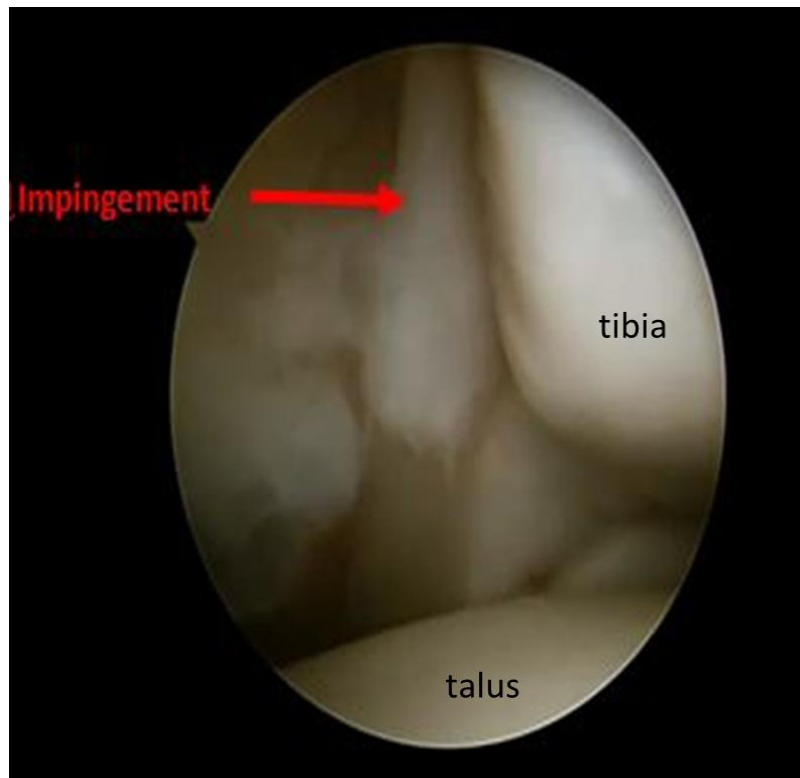
## MRI

- Previous ATFL tear
- “Normal”
- Anterior osteophyte
- Lateral or medial “meniscoid”
- Loose body

# ANTERIOR ANKLE ARTHROSCOPY



# ANTERIOR ANKLE ARTHROSCOPY



# ANTERIOR ANKLE ARTHROSCOPY





# POSTERIOR ANKLE IMPINGEMENT

## PHYSICAL EXAM

- “Points” posterior
- Tender deep posterior
- Non tender achilles
- Non tender anterior
- Passive PF sign

## X-RAY

- Os trigonum
- Posterior subtalar osteophyte



# POSTERIOR ANKLE IMPINGEMENT

## MRI



# POSTERIOR ANKLE ARTHROSCOPY

## POSITION

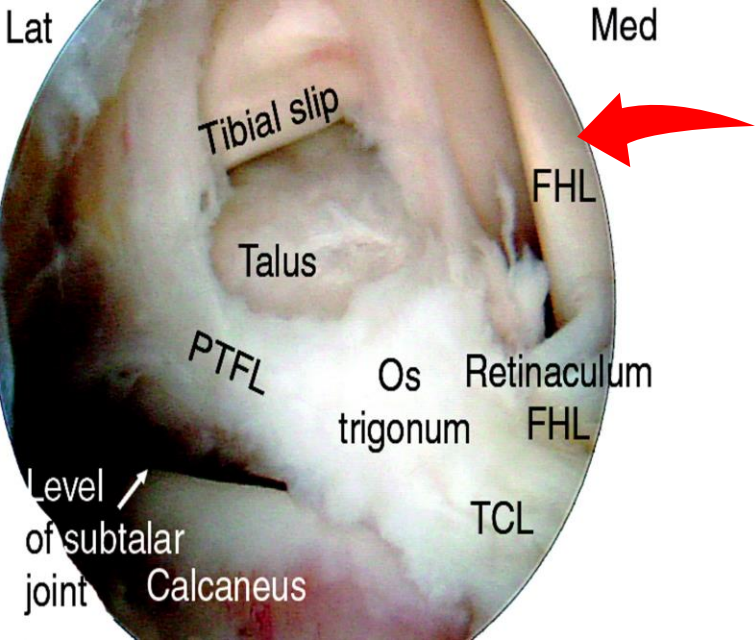


## PORTALS

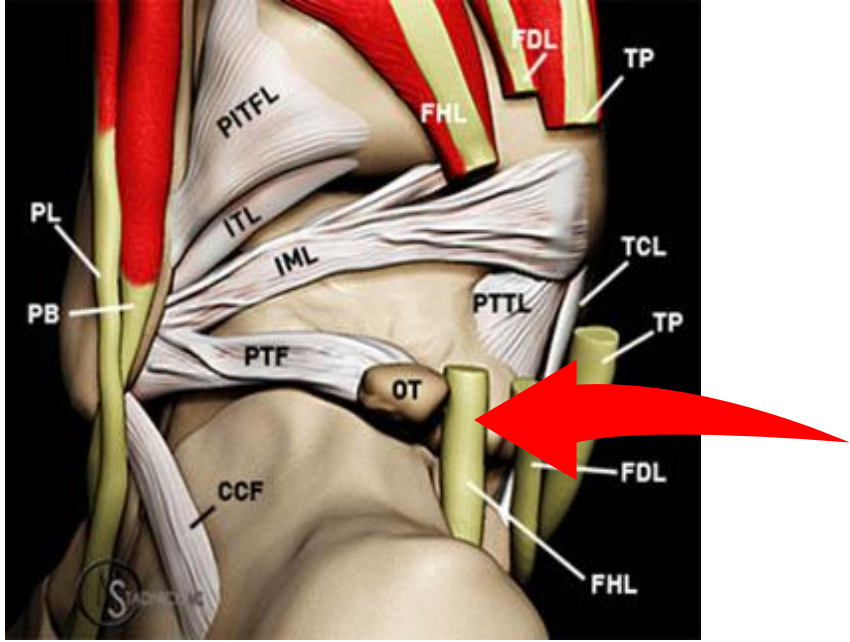




# POSTERIOR ANKLE ARTHROSCOPY



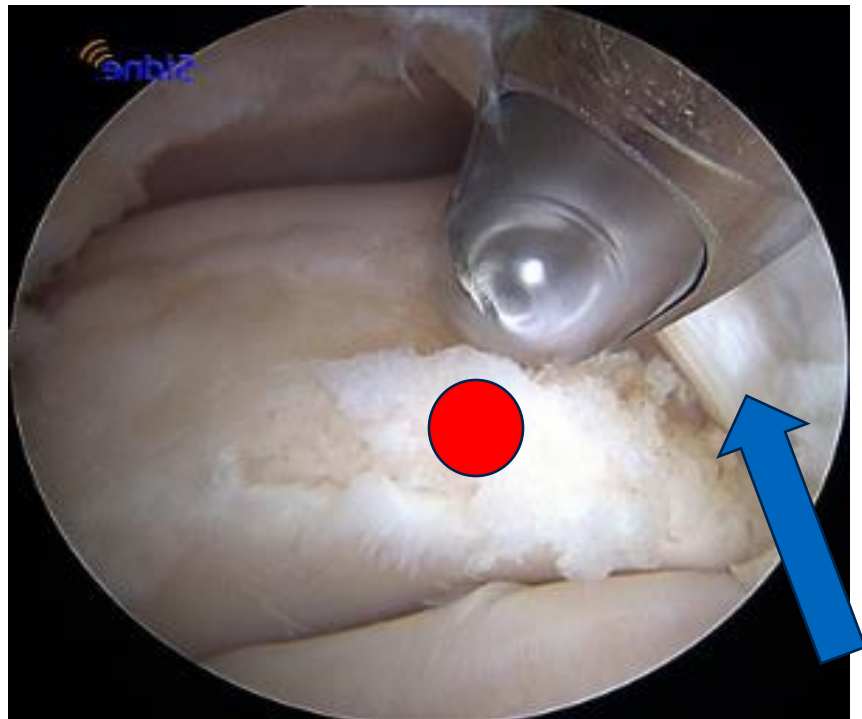
**ANATOMY**



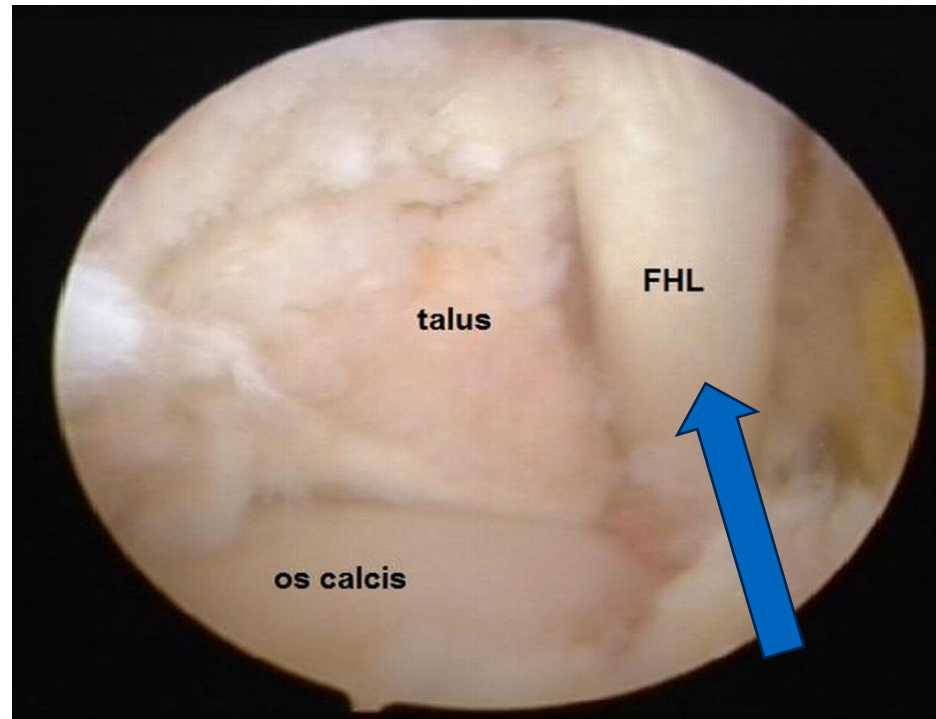
**STAY LATERAL TO FHL!**

# POSTERIOR ANKLE ARTHROSCOPY

BEFORE



AFTER



# THANK YOU!





St. Elizabeth  
PHYSICIANS



St. Elizabeth  
HEALTHCARE

## MANAGEMENT OF PLANTAR FASCIITIS

**John C. Linz, MD**

*Orthopaedic Foot and Ankle Surgeon*

**OrthoCincy Orthopaedics & Sports Medicine**

# MANAGEMENT OF PLANTAR FASCIITIS

## MYTHS

### 1. Caused by flat feet

- Can increase the risk but not a cause

### 2. Caused by heel spurs

- Close to the PF attachment
- Where the FDB attaches
- Can fracture and cause heel pain



# MANAGEMENT OF PLANTAR FASCIITIS

## MYTHS

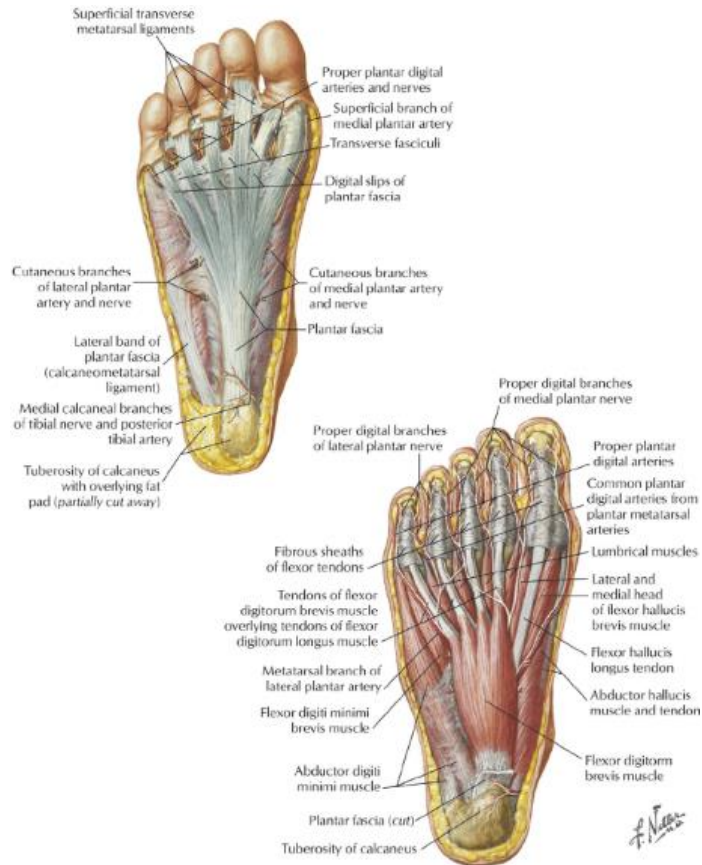
### 3. Requires a big surgery

- **Surgery usually not required**
- **2-3/day and operate on 2-3/year**
- **Success rate 70 - 90%**  
**(overall satisfaction 48%)**





# MANAGEMENT OF PLANTAR FASCIITIS



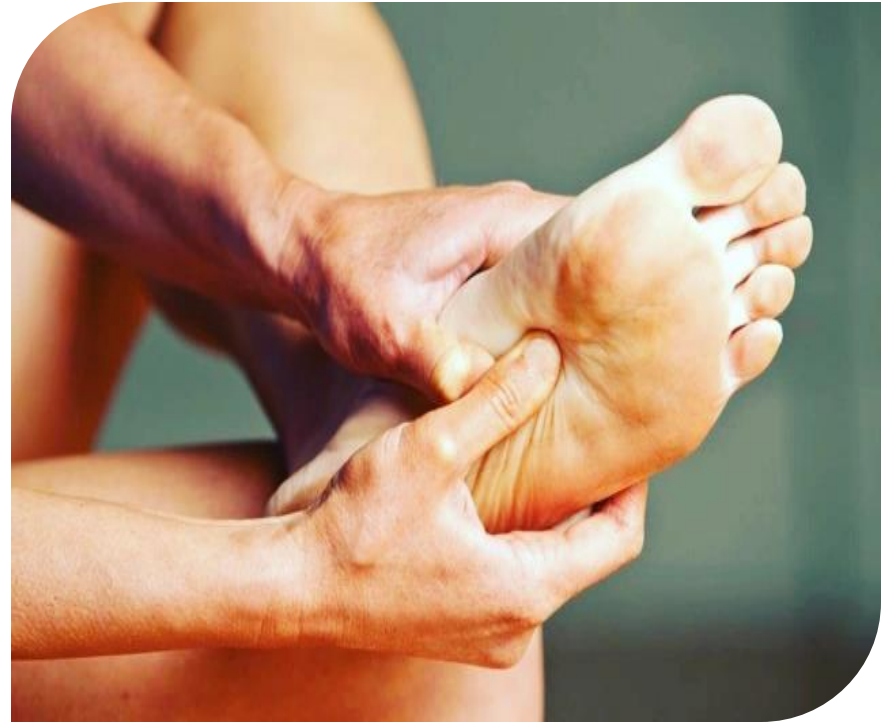
## INTRODUCTION

- **Thick band of connective tissue**
  - ✓ **Similar to a ligament**
  - ✓ **Plantar aponeurosis**
- **Runs from heel to base of toes**
- **Supports the arch & absorbs shock**
- **“Plantar Fasciosis”**
  - ✓ **Degenerative tears without inflammation**

# MANAGEMENT OF PLANTAR FASCIITIS

## Demographics

- 40 - 60 years old
- 2:1 Female:Male
- 10% general population
- Accounts for 1 million visits/year
- Most common cause of heel pain

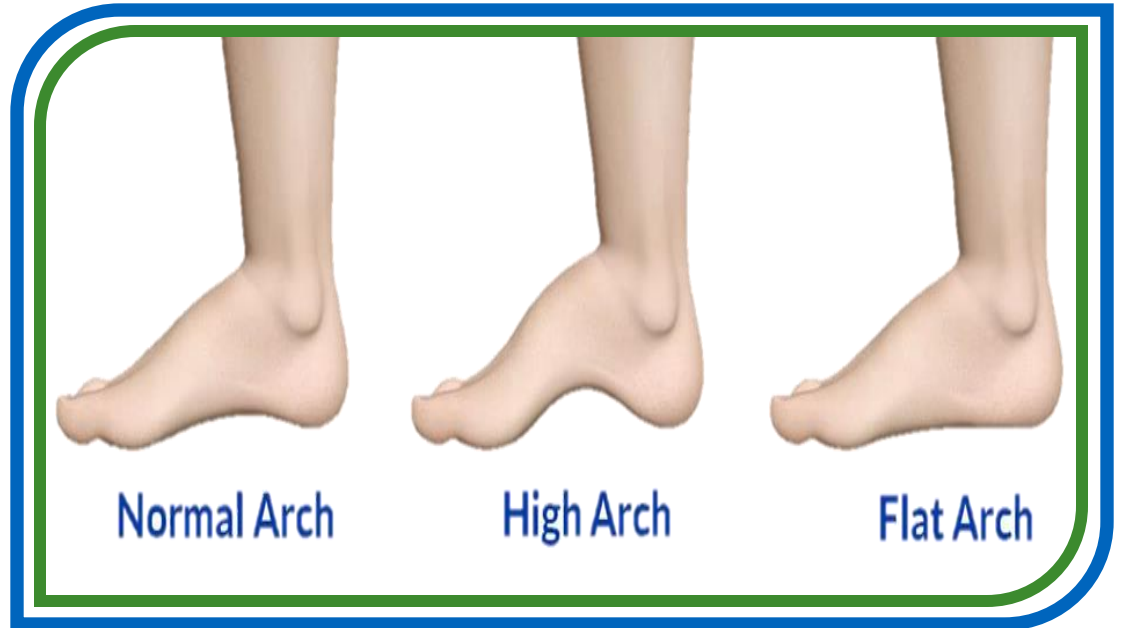




# MANAGEMENT OF PLANTAR FASCIITIS

## CAUSES / RISK FACTORS

- **Tight achilles**
- **Foot mechanics**
- **Obesity**
- **Prolonged standing**



# MANAGEMENT OF PLANTAR FASCIITIS



## CAUSES / RISK FACTORS

- **Exercise**
  - ✓ Change in activities
- **Trauma**
- **Shoes**
  - ✓ Flip flops
  - ✓ High heels
  - ✓ Running shoes (>300 miles lose 50% of shock absorption)

# MANAGEMENT OF PLANTAR FASCIITIS

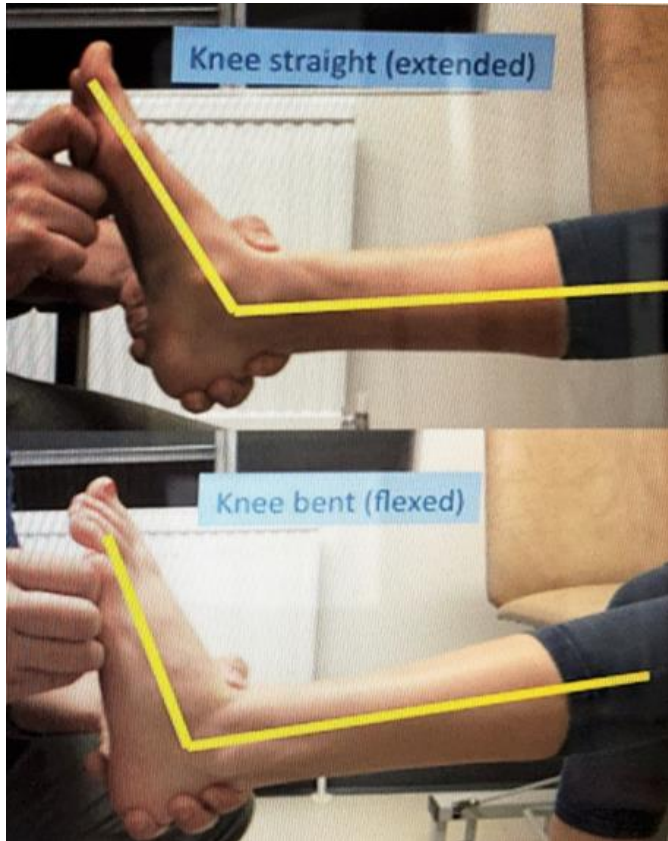
## DIAGNOSIS

### History

- Gradual onset plantar medial heel pain
- Positive for first step pain
- Better with activity then worsens later
- Increased pain when barefoot & with stairs



# MANAGEMENT OF PLANTAR FASCIITIS



## DIAGNOSIS

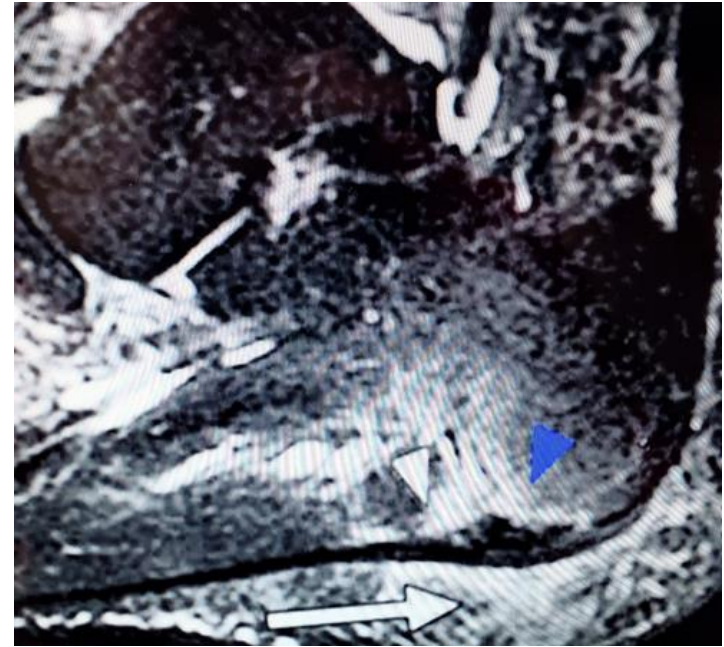
- **Physical Exam**
  - ✓ Pain with palpation PM heel and arch but can be other areas
- **Tight achilles**
  - ✓ Silverskiold
- **Pain medial lateral heel**
- **Compression of Baxter's nerve**

# MANAGEMENT OF PLANTAR FASCIITIS

## DIAGNOSIS

Imaging – often unnecessary unless refractory

- X-Ray
- MRI
  - ✓ Gold standard
  - ✓ Don't order a test that isn't going to change what you are going to do
- Ultrasound
- Blood work



# MANAGEMENT OF PLANTAR FASCIITIS

## TREATMENT

- **80-90% will resolve within 12 months regardless of treatment**
- **Activity modification**
  - ✓ Rest
  - ✓ No running, pickleball etc.
  - ✓ Swim, bike & elliptical - with NO incline
  - ✓ Yoga
  - ✓ Pilates





# MANAGEMENT OF PLANTAR FASCIITIS



## TREATMENT

- **Immobilization / Unloading**
  - ✓ Boot / Cast
  - ✓ Crutches, walker, rollabout
- **Support**
  - ✓ Shoes
    - Hokas, Sketchers or Altras
  - ✓ Inserts
  - ✓ Don't go barefoot!  
(common sense is NOT so common)

# MANAGEMENT OF PLANTAR FASCIITIS

## TREATMENT

- **Support**

- ✓ Don't go barefoot
- ✓ Runners change your footwear
- ✓ Taping

- **Medicines**

- ✓ **NSAIDS**
  - Ibuprofen
  - Mobic
  - Prednisone
- ✓ **MVI**





# MANAGEMENT OF PLANTAR FASCIITIS



## TREATMENT

- **Topicals**
  - ✓ Ice / Heat
  - ✓ Ointments
- **Weight reduction**
- **Night brace**

# MANAGEMENT OF PLANTAR FASCIITIS

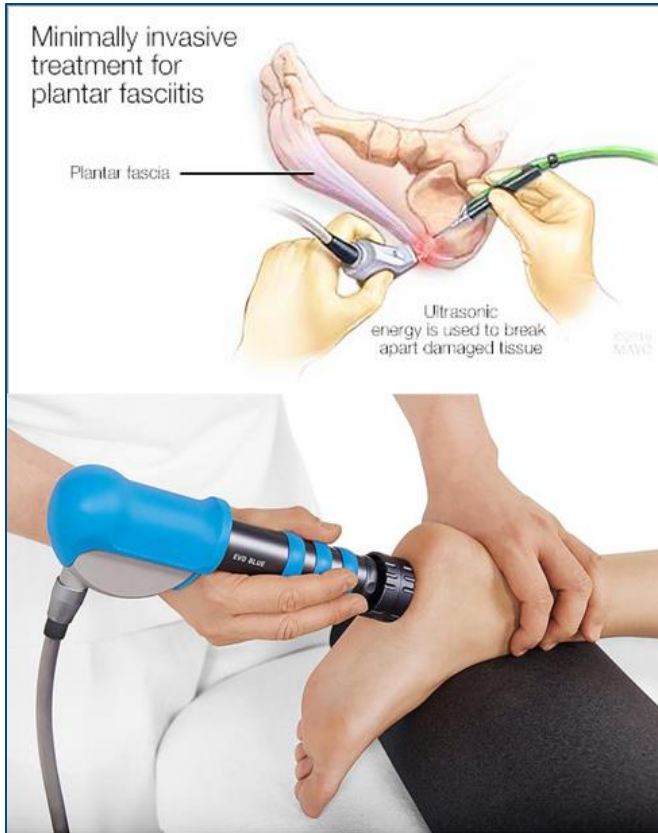
## TREATMENT

### Physical Therapy

- **STRETCHING!!**
- **Strengthening**
- **Taping**
- **Modalities**
  - ✓ **US**
  - ✓ **Dry needling**
  - ✓ **Iontophoresis**
  - ✓ **Graston**



# MANAGEMENT OF PLANTAR FASCIITIS



## TREATMENT

- **Injections**

- ✓ Steroids
- ✓ Platelet Rich Plasma PRP
- ✓ Bone Marrow Aspirate Concentrate (BMAC)
- ✓ Botox

- **Non-Mainstream**

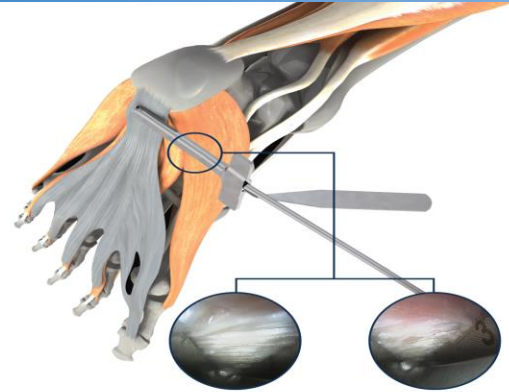
- ✓ Acupuncture
- ✓ TENX
- ✓ Red laser
- ✓ Extracorporeal shock wave

# MANAGEMENT OF PLANTAR FASCIITIS

## TREATMENT

### Operative

- **Failure** of 6 to 12 months of non-operative treatment
- **Gastroc recession**
- **Plantar fascial release**
  - ✓ **Endoscopic**
  - ✓ **Open**
- **Release of Baxter's nerve**



# THANK YOU!



# **BREAK**

**NEXT SESSION WILL  
BEGIN AT 11 A.M.**



# 2024 SPORTS MEDICINE CONFERENCE

All speakers, Adam Metzler, MD, Aloja Kremer, MD, Nicholas Gates, MD, John Linz, MD, Hannah Stitt, disclosed that they have nothing to disclose. All planners, Holly Groneck, Chase Richards, Courtney Steele, Tony Hyott and Karen Tepe have disclosed that they have nothing to disclose.





St. Elizabeth  
PHYSICIANS



St. Elizabeth  
HEALTHCARE

## LIGAMENT RECONSTRUCTION FOR CHRONIC ANKLE INSTABILITY

**Nick Gates, MD**

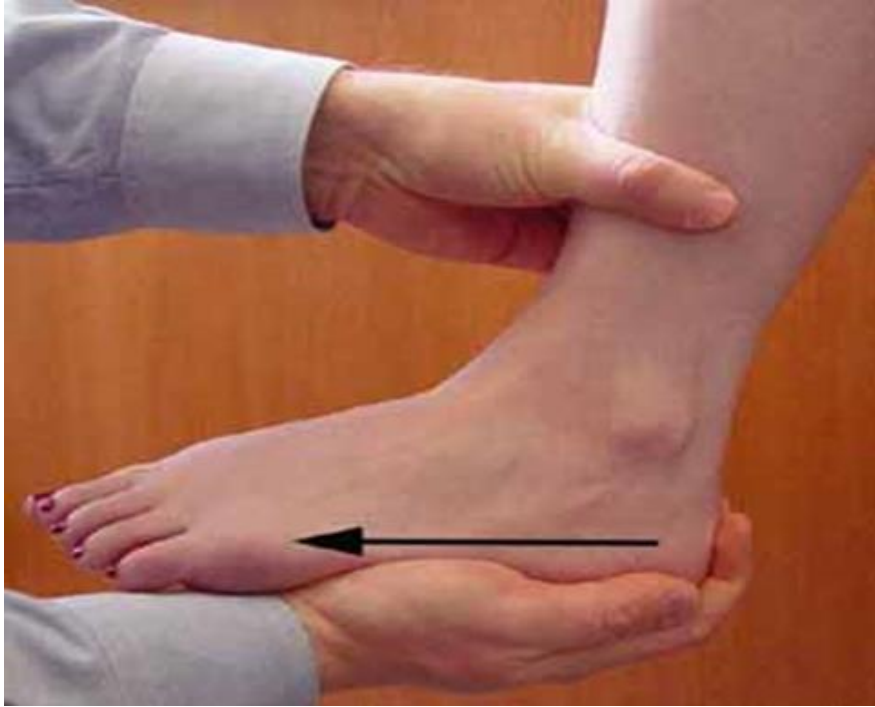
*Orthopaedic Foot and Ankle Surgeon*

OrthoCincy Orthopaedics & Sports Medicine

# EPIDEMIOLOGY: ACUTE ANKLE SPRAIN

- Up to 70% may develop residual physical disability, including chronic ankle instability
- 30% or more of Gr III ankle sprains develop chronic instability
- High rates across all levels of sports & other active populations, however half of all ankle sprains treated in US did NOT occur during sports activity
- Evidence suggests strong link between prior ankle sprains and increased risk for future ankle sprain
- Continued study into link between chronic ankle instability & development of posttraumatic osteoarthritis is needed

# CHRONIC ANKLE INSTABILITY

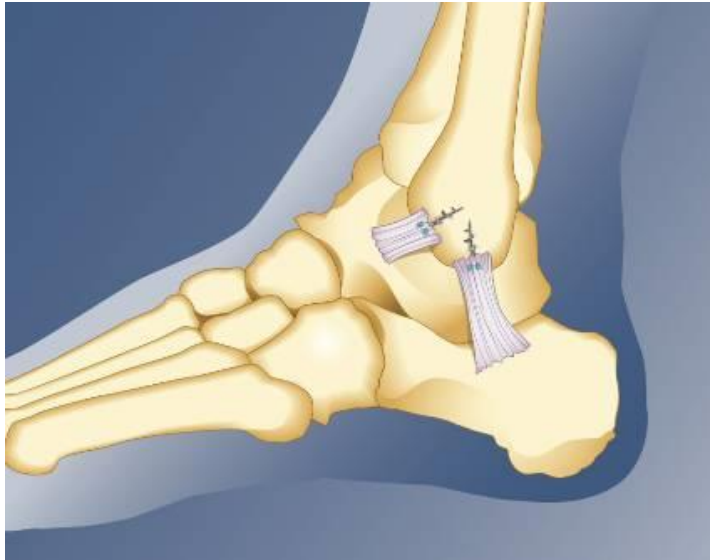


- Chronic, recurring “giving way” episodes, with or without persistent pain
- Chronic, recurring pain episodes, with or without distinct “giving way” history
- Positive anterior drawer
- Previous ankle sprains

# ANKLE INSTABILITY SURGERY

**Anatomic reconstruction: native tissue**

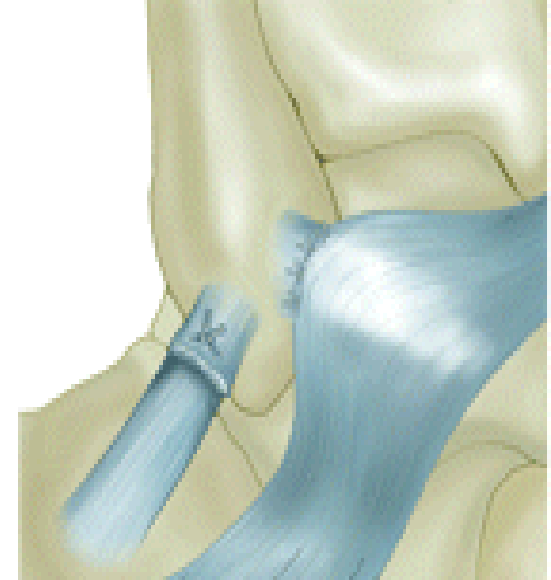
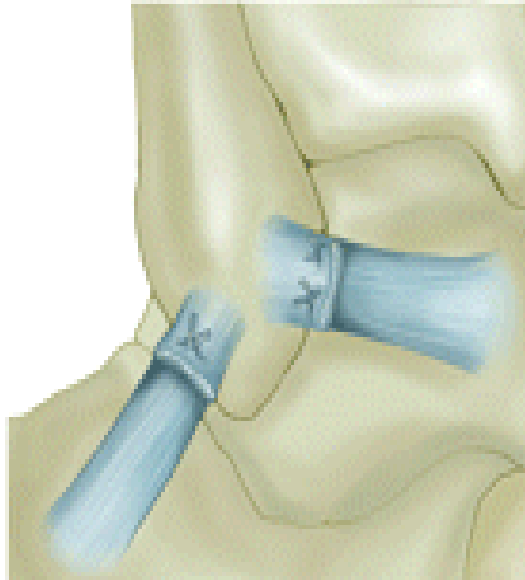
**Anatomic reconstruction: allograft tendon**



# ANATOMIC RECONSTRUCTION

## MODIFIED BROSTROM-GOULD

- Reconstruct native tissue
- Imbricate lateral capsule
- Augment with extensor retinaculum



# MODIFIED BROSTROM-GOULD RECONSTRUCTION



## ISSUES

- **Poor capsular tissue**
- **Poor retinacular tissue**
- **Inconsistent repair**
- **Prolonged immobilization**
- **Prolonged return to sports**

# POST OP PROTOCOL (PRE INTERNAL BRACE)

- **First 5-6 weeks splint/boot**
- **6 weeks start ROM with restrictions**
- **At 8 weeks start strength/proprioception**
- **4-6 months play sports**





# Isolated Anterior Talofibular Ligament Broström Repair for Chronic Lateral Ankle Instability

## 9-Year Follow-up

Nicola Maffulli,<sup>\*\*</sup> MS, MD, PhD, FRCS (Orth), Angelo Del Buono,<sup>‡</sup> MD, Gayle D. Maffulli,<sup>\*</sup> MD, Francesco Oliva,<sup>§</sup> MD, PhD, Vittorino Testa,<sup>||</sup> MD, Giovanni Capasso,<sup>¶</sup> MD, and Vincenzo Denaro,<sup>‡</sup> MD  
*Investigation performed at Barts and The London School of Medicine and Dentistry, London, United Kingdom*

*“All my Broström repairs do well”*

Of those participating in sports preop (58%):

16% had decreased their level of activity  
26% had abandoned *all* athletic activity

*“I’m confident I can move my Broström early”*

## **ATFL Elongation after Brostrom Procedure: A Biomechanical Investigation**

Kevin L. Kirk, MAJ, MC, USA; John T. Campbell, MD; Gregory P. Guyton, MD; Brent G. Parks, MSc; Lew C. Schon, MD  
Baltimore, MD

Unprotected motion was associated with significant lengthening consistent with failure of the Broström repair.

Traditional Broström is significantly weaker than the native ATFL and...

*“As a result, it is necessary to sufficiently protect the repair to avoid premature failure.”*

## **Anatomic Suture Anchor Versus the Broström Technique for Anterior Talofibular Ligament Repair**

### **A Biomechanical Comparison**

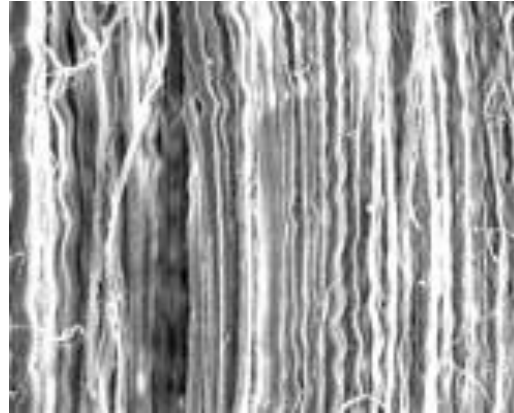
Norman E. Waldrop III,<sup>\*†</sup> MD, Coen A. Wijdicks,<sup>\*</sup> PhD, Kyle S. Jansson,<sup>\*</sup> BS, Robert F. LaPrade,<sup>†</sup> MD, PhD, and Thomas O. Clanton,<sup>††</sup> MD  
Investigation performed at the Department of BioMedical Engineering of the Steadman Philippon Research Institute, Vail, Colorado

# BASIC SCIENCE: COLLAGEN HEALING

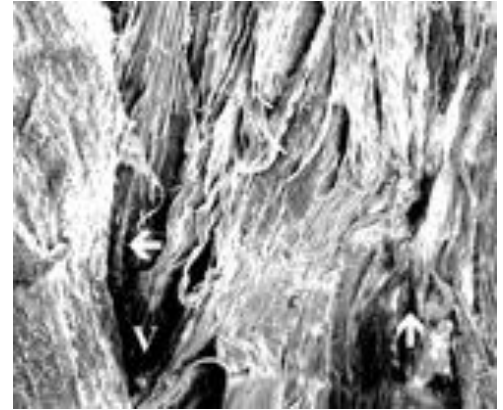
ambulatory



control



suspended



# DIRECT EFFECTS OF IMMOBILIZATION

- **Muscular atrophy**
- **Osteoporosis**
- **Loss of proprioception**
- **Cartilage atrophy/ulceration**
- **Ligament degeneration**



# HOW CAN WE DO BETTER?

**WE KNOW...**

**Immobilization is detrimental to joints**

**Early stress elongates the Brostrom repair**



**BUT...**

**Early motion improves outcomes**

**Early stress optimizes collagen quality**

Provenzano PP et al *J Appl Phys* 2003

Maffulli et al *AJSM* 2013

Kirk K et al *FAI* 2009

Waldrop N et al *AJSM* 2012

Akeson et al *CORR* 1987

# HOW DID WE GET HERE?

- **Innovative idea: Professor Gordon Mackay**
- **Cadaver lab, Biomechanical testing**
- **Initial technique development**
- **Careful clinical application**
- **Teaching, feedback, experience**
- **Technique refinement**
- **Cadaver lab, Biomechanical testing**
- **Expanded clinical application**
- **Clinical research and outcome studies**
- **SOLUTION: *Internal/Brace***

# HOW DID WE GET HERE?

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- **Clinical research and outcome studies**
- **SOLUTION: *InternalBrace***



## HOW DID WE GET HERE?

2012: Arthrex R&D, IB early technique **at least as strong as native**

2014: Gates and Arthrex R&D, IB strength **well above native** in all variations

2014: Viens, Clanton, et al, AJSM, IB augment 250N vs intact ATFL 154N

2015: Liebler, Waldrop and Arthrex R&D, 244N talus to fibula (3.5mm to 4.75mm)

2018: Coetzee, et al, F&A, 6-24 mth f/u, sports 12 weeks with early rehab

2019: Porter, et al, AJSM, single center RCT, **better outcomes at 5 years**

2021: Kadakia and Arthrex R&D, collagen coating tenocyte viability/adherence

2021: Martin, et al, F&A, 93 pts safe accelerated rehab w/o failure

2021: Kulwin, Watson, Vora, et al, F&A, return to activity **4 weeks faster**

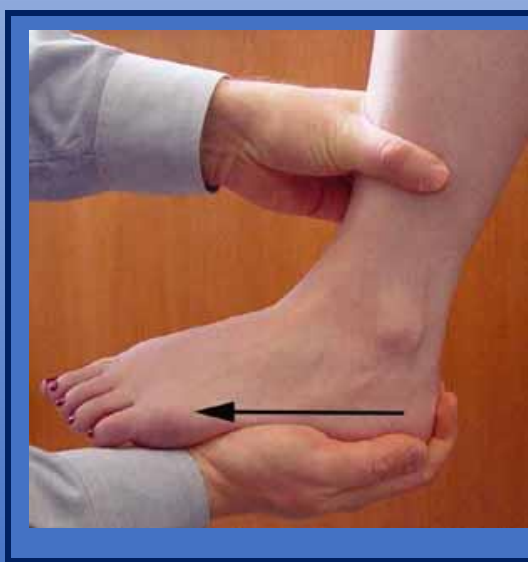
## “SEATBELT” CONCEPT OF THE *INTERNAL BRACE*

Placing the *Internal Brace* at the recommended anatomic site, tension & position provides a positive checkrein of the repaired and now augmented ATFL, providing greater strength than the native ATFL,... this allows accelerated rehab, without elongation & excellent clinical results.



## PROBLEM

- Slow recovery
- Ligament elongation
- Recurrence



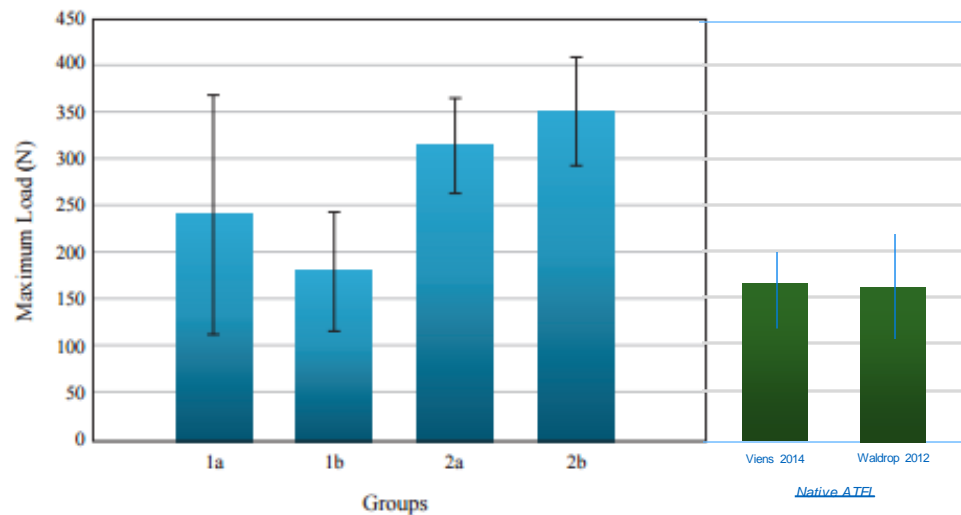
## SOLUTION

- Reconstruction with *Internal Brace* augmentation

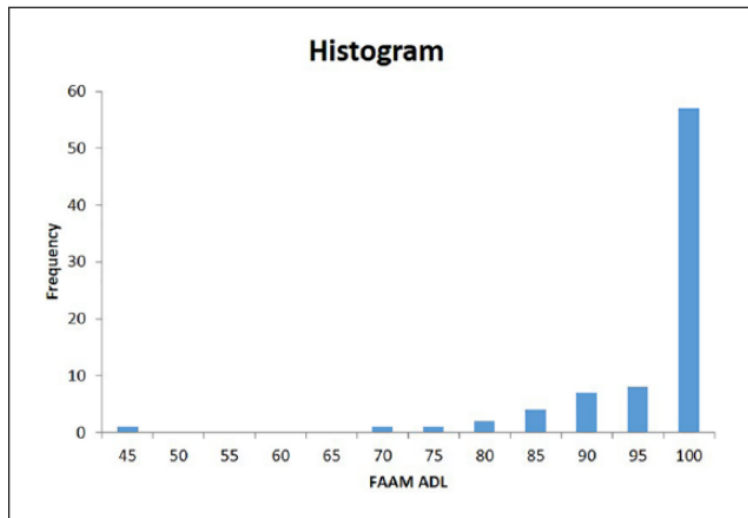


# ATFL VS *INTERNAL BRACE*

Figure 2: Average Maximum Load per Group



Load-to-failure testing suggests the Broström with  
*InternalBrace* is  
double the native ATFL under ideal circumstances



**Figure 3.** Foot and Ankle Ability Measure (FAAM) ADL subscale scores shown in a histogram to indicate where the majority of the cohort fell at the time of report.

## Functional Results of Open Broström Ankle Ligament Repair Augmented With a Suture Tape

J. Chris Coetzee, MD<sup>1</sup>, J. Kent Ellington, MD<sup>2</sup>, James A. Ronan, BS<sup>3</sup>, and Rebecca M. Stone, MS, ATC<sup>1</sup>

### 81 Patient Retrospective

6 - 24 months postop

Average return to sport: 84.1 days

AOFAS: 94.3

Single-Leg Hop: 86.4% @normal/near-normal function

# CLINICAL

TABLE 3  
FAOS Results for LARS and MBG Groups<sup>a</sup>

FAOS Subscale: - Time	Group		Comparison, P Value	
	(IB)	(no IB)	Intragroup	Intergroup
<b>Pain</b>				
Baseline	71.4 ± 5.8	64.6 ± 6.6		—
1 y	89.7 ± 6.1	75.3 ± 2.6	<.001	.10
2 y	91.0 ± 5.7	78.4 ± 5.0	<.001	.15
5 y	89.8 ± 6.6	77.4 ± 5.1	<.001	.45
<b>Symptoms</b>				
Baseline	69.6 ± 5.3	65.7 ± 6.7		—
1 y	91.4 ± 5.3	78.0 ± 6.1	<.001	<.001
2 y	95.1 ± 4.5	78.1 ± 6.3	<.001	<.001
5 y	93.2 ± 4.5	73.9 ± 6.4	<.001	<.001
<b>ADLs</b>				
Baseline	69.3 ± 13.2	62.3 ± 4.8		—
1 y	94.2 ± 3.4	79.4 ± 6.1	<.001	.018
2 y	94.5 ± 4.2	80.1 ± 8.2	<.001	.015
5 y	96.1 ± 4.1	78.4 ± 7.9	<.001	.007
<b>Sport</b>				
Baseline	61.8 ± 6.0	57.4 ± 4.7		—
1 y	94.6 ± 3.9	78.1 ± 4.8	<.001	<.001
2 y	94.9 ± 4.0	74.6 ± 6.5	<.001	<.001
5 y	96.0 ± 5.0	69.0 ± 6.2	<.001	<.001
<b>Quality of life</b>				
Baseline	62.4 ± 9.8	61.0 ± 7.0		—
1 y	92.2 ± 3.3	80.0 ± 5.3	<.001	.004
2 y	94.3 ± 3.6	79.0 ± 5.6	<.001	<.001
5 y	94.6 ± 4.4	75.6 ± 4.3	<.001	<.001
<b>Total</b>				
Baseline	66.9 ± 3.9	62.2 ± 3.5		—
1 y	92.4 ± 2.5	78.2 ± 3.4	<.001	.005
2 y	94.0 ± 3.0	78.0 ± 5.2	<.001	.003
5 y	93.7 ± 6.0	75.1 ± 5.5	<.001	.002

Significant  
difference

at 5 years

in both

FAOS  
&  
Tegner

## Ankle Lateral Ligament Augmentation Versus the Modified Broström-Gould Procedure

### A 5-Year Randomized Controlled Trial

Mark Porter,<sup>\*†</sup> FACSP, FRACS (Orth), DSc, Bruce Shadbolt,<sup>‡</sup> PhD, Xuan Ye,<sup>§</sup> MBBS, and Robert Stuart,<sup>||</sup> MBBS  
Investigation performed at Barton Private Hospital, Barton, Australia

### Single-Center RCT w 5Y Follow Up

47 patients

Primary repair with *InternalBrace*<sup>™</sup>  
surgical repair  
v.  
Modified Broström-Gould repair

## Multicenter prospective randomized study *Brostrom vs IB augmented Brostrom*

- Both groups accelerated rehab protocol
- IB return to preinjury activity 4.2 weeks faster

DOI: 10.1177/1071100720976071 • Corpus ID: 263517975

## Traditional Modified Broström vs Suture Tape Ligament Augmentation

R. Kulwin, Troy S. Watson, +2 authors Anand Vora • Published in [Foot & ankle international](#) 23 January 2021 • Medicine



# ***INTERNALBRACE***



## **LITERATURE NOW SHOWS ...**

- **Recommended anatomic site(s), tension & ankle position**
- **Enhanced stability and effects a positive checkrein of the now augmented native ATFL ligament**
- **Accelerated rehab and excellent clinical results, improved over Brostrom alone**
- **Cost effective**

# POST-OP PROTOCOL

## Without IB

Gates 2012

- **First 5-6 weeks splint/boot**
- **6 weeks start ROM with restrictions**
- **At 8 weeks start strength/proprioception**
- **4-6 months play sports**

## WITH IB

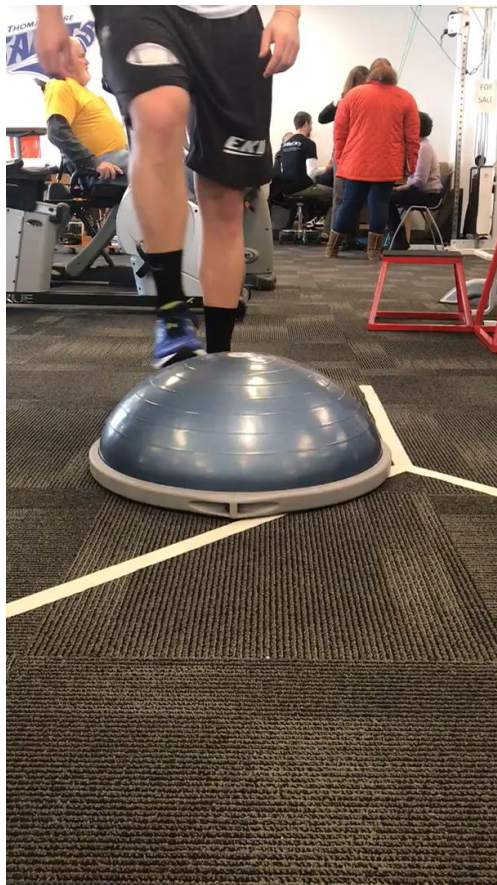
Gates 2022

- **Immediate WBAT in boot**
- **2-3 days start ROM w/o restriction**
- **2 weeks start strength/proprioception**
- **4-5 weeks remove boot and start agility**
- **6-8 weeks sports specific training**
- **10-12 weeks play sports**

# 6 WEEKS



# 8 WEEKS

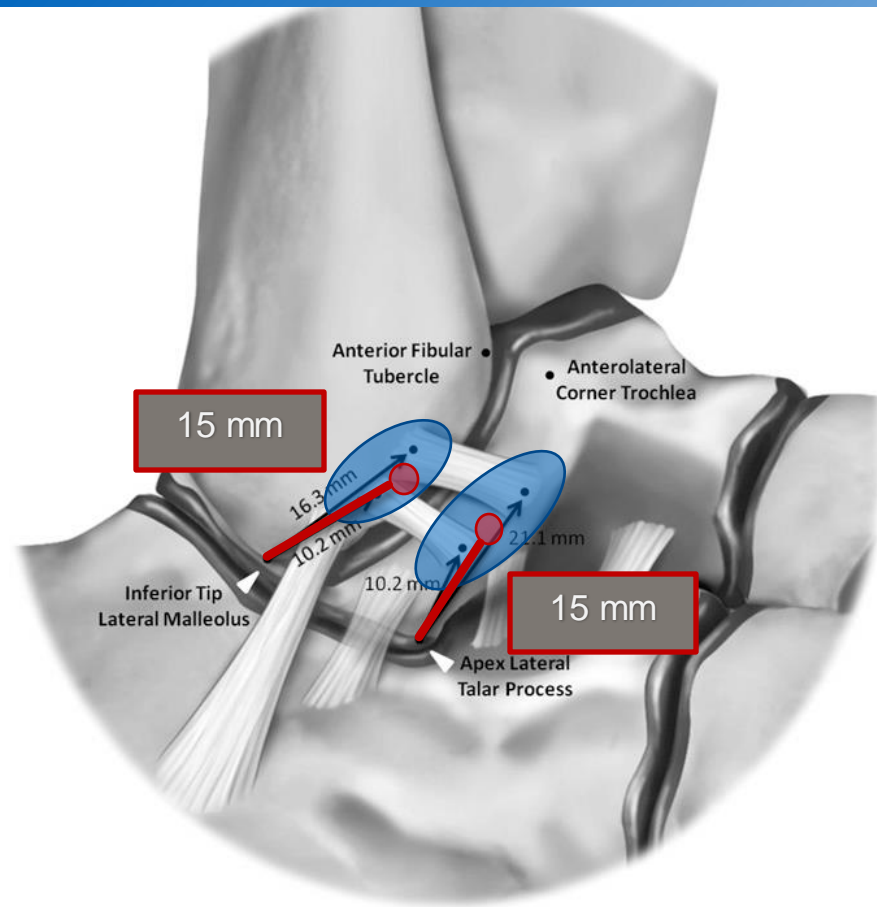


# TECHNIQUE

- Arthroscopy
- Open Brostrom suture anchors
- Internal Brace



# ATFL LANDMARKS





**1<sup>st</sup> FiberTak**

**1 cm from distal  
tip of fibula**

**2<sup>nd</sup> FiberTak**

**1 cm proximal  
from 1<sup>st</sup> anchor**

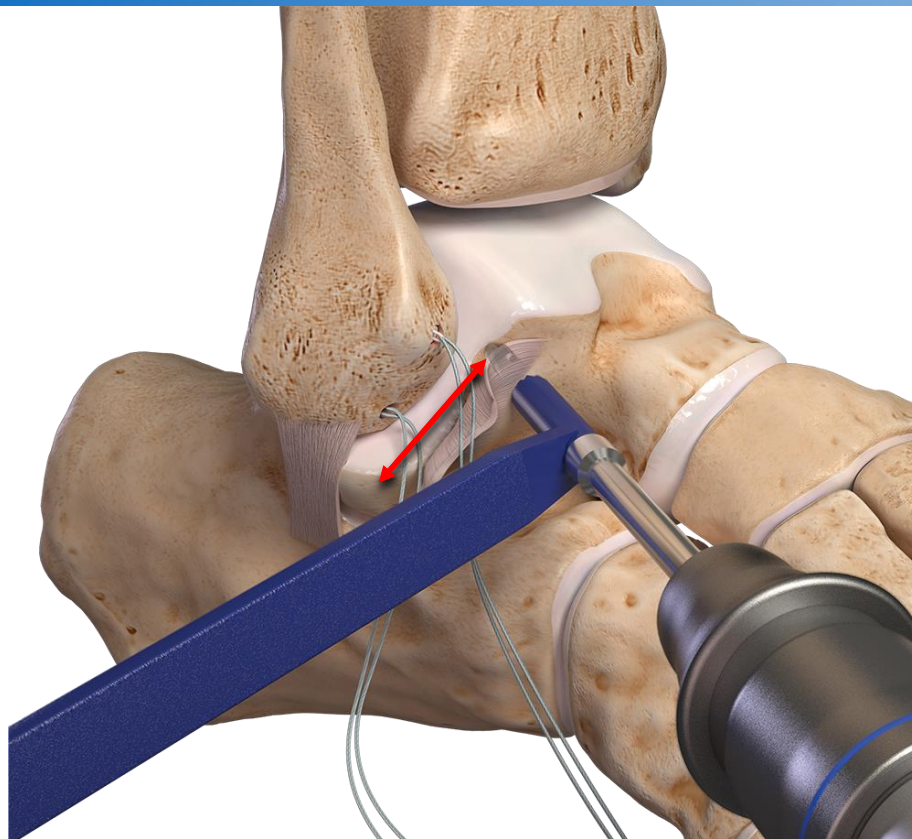
**Ensure adequate bone  
bridge between  
FiberTaks**

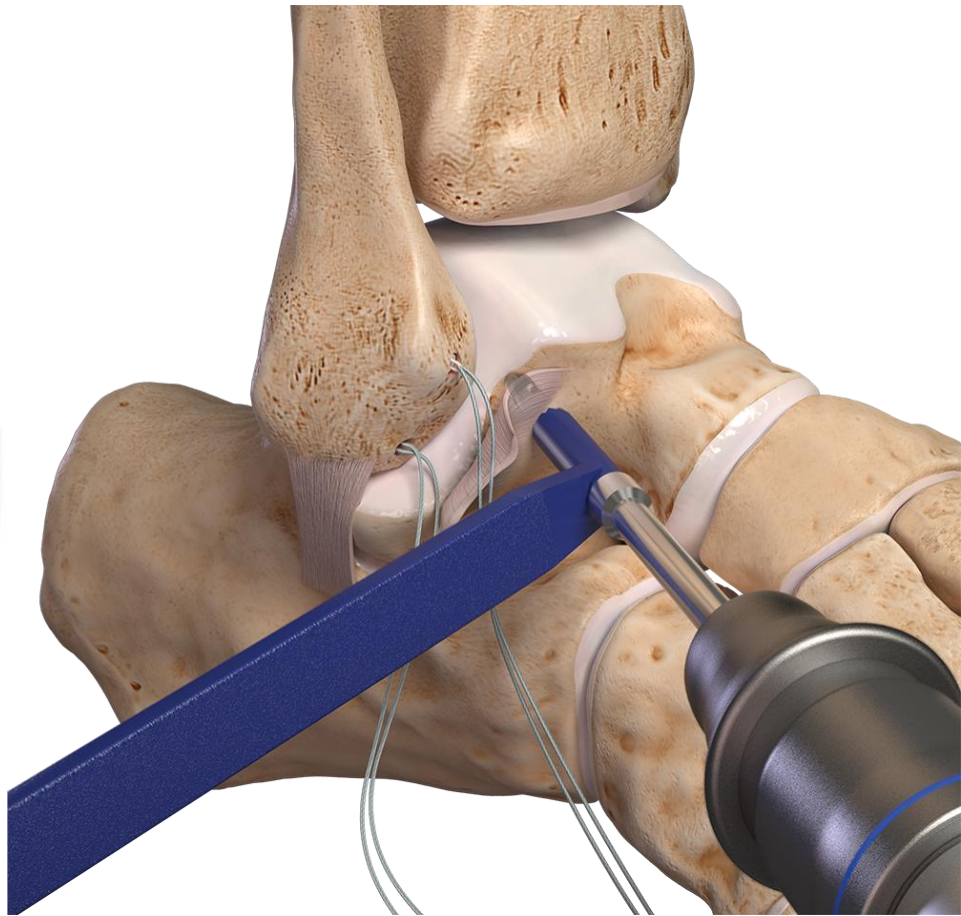
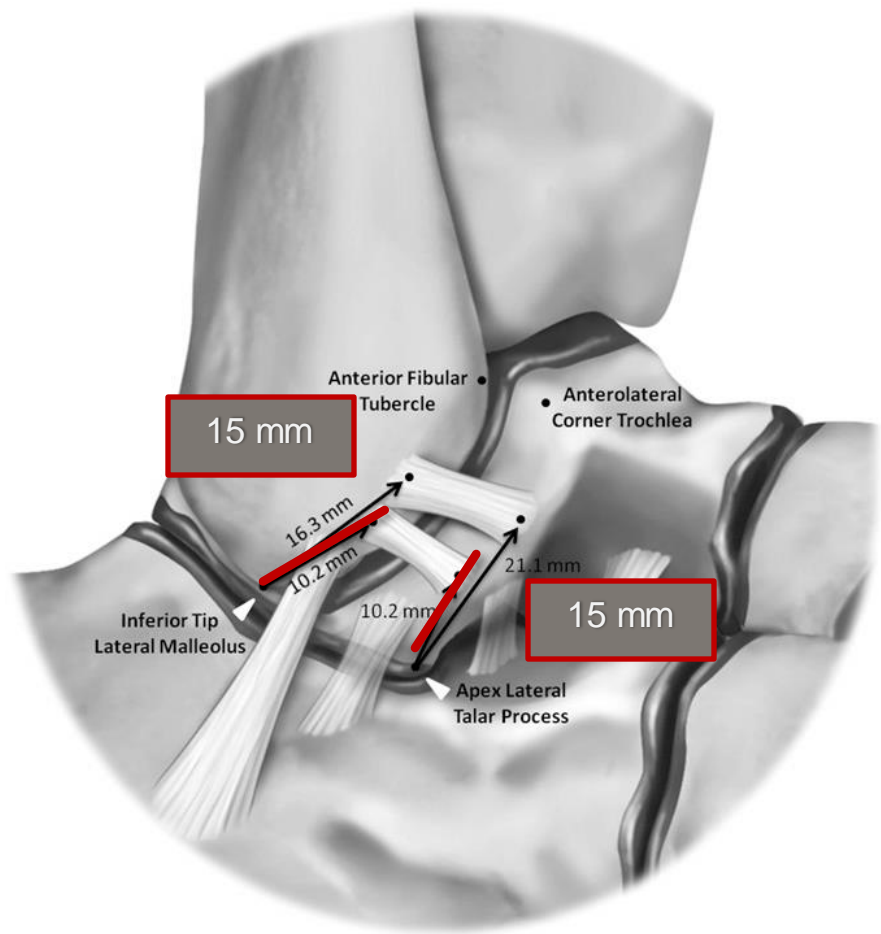


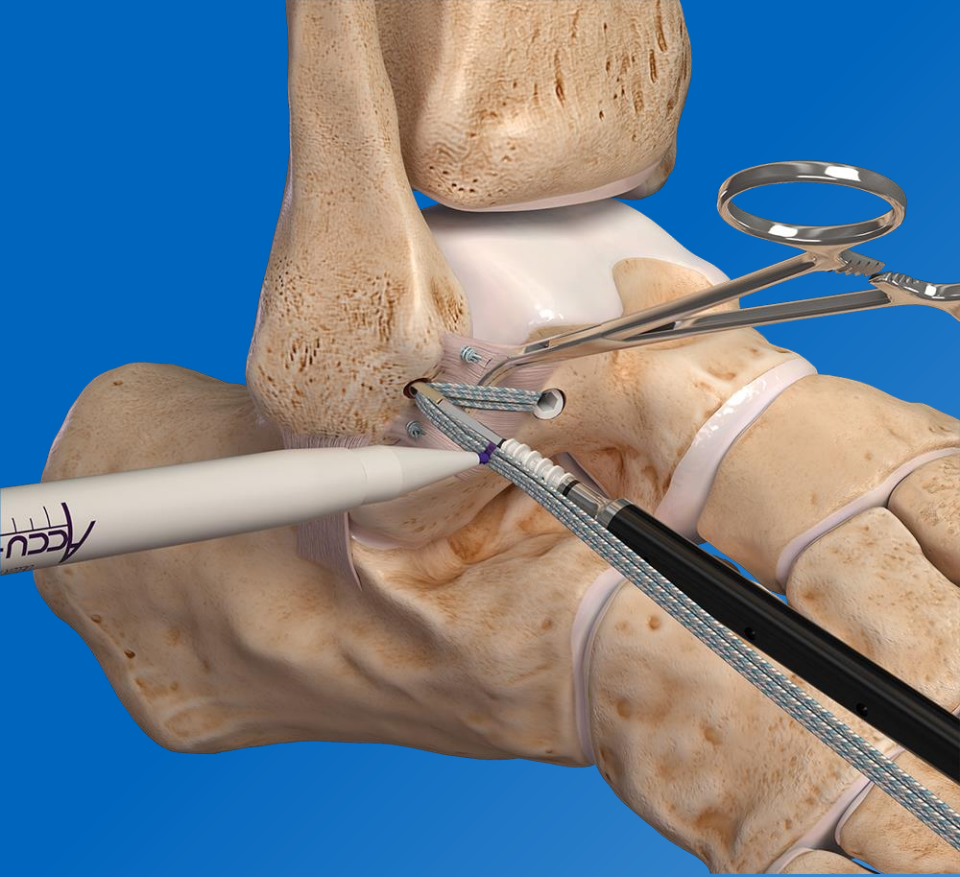


# TALAR SWIVELOCK

15 mm from  
lateral process  
of talus



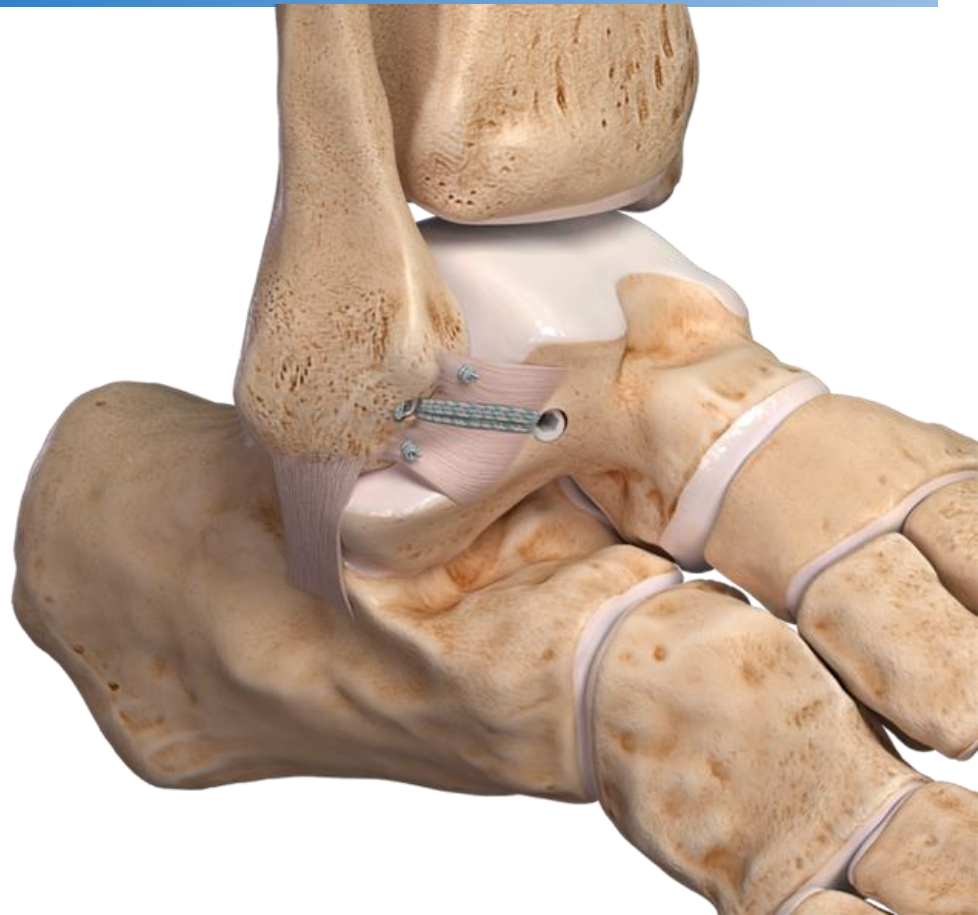






# INTERNAL BRACE – FINAL CONSTRUCT

Why do I do it.....?



# INNOVATION THAT SOLVES PROBLEMS

- **Poor capsule or retinaculum:**  
**solved**
- **Post-op ATFL elongation:**  
**solved**
- **Detrimental effects of immobilization:**  
**solved**
- **Prolonged recovery:**  
**solved**



# 430 CASES

- Increased physical therapist satisfaction
- Increased ATC satisfaction
- Increased surgeon satisfaction
- Increased patient satisfaction
- Better patient outcomes
- Faster return to sport
- All primary cases  Internal Brace

# THANK YOU!







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PHYSICIANS



St. Elizabeth  
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## PHYSICAL THERAPY FOR NON-SURGICAL & SURGICAL MANAGEMENT OF LOW ANKLE SPRAINS

**Hannah Stitt, PT, DPT, OCS**

*Physical Therapist*

St. Elizabeth Healthcare

# WHAT IS A LOW ANKLE SPRAIN?

## GENERAL

- **Most common orthopaedic injury in Emergency Departments**
  - ✓ Standardized protocols for management not established
  - ✓ Cost per ankle sprain in US is ~ \$1,029
- **Most common musculoskeletal disorder of the lower extremity**
- **70% of patients develop chronic ankle instability**
  - ✓ Ankle instability = increased recurrence rate
  - ✓ Especially 3-12 months after sprain

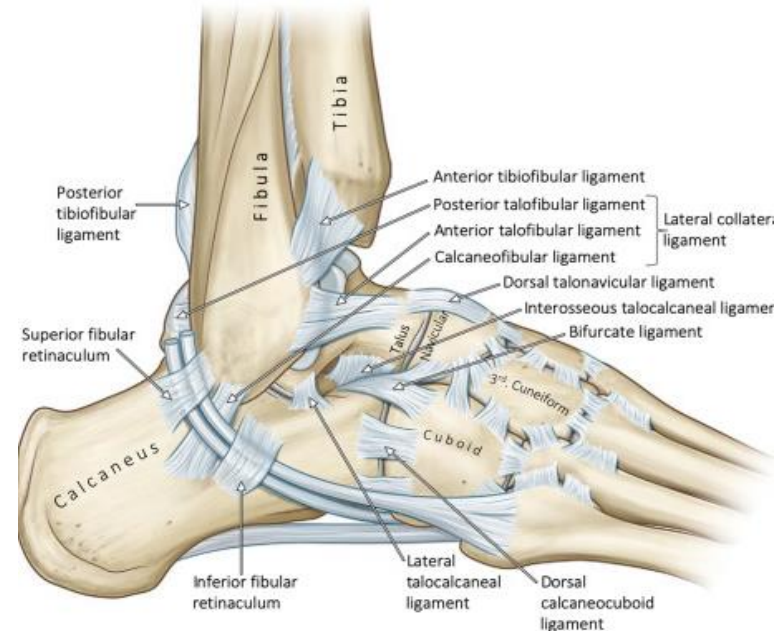


# WHAT IS A LOW ANKLE SPRAIN?

## INVERSION SPRAIN

- **Most common**
- **Inversion and adduction with plantar flexion (supination)**
- **Injures the lateral ligaments**
  - ✓ **Anterior Talofibular Ligament (ATFL)**
  - ✓ **Calcaneofibular Ligament (CFL)**
  - ✓ **Posterior Talofibular Ligament (PTFL)**
  - ✓ **Lateral Talocalcaneal Interosseous (LTCIL)**
  - ✓ **ATFL & CFL most commonly involved**
- **Concurrent fractures can occur distally**

Named based on the direction of the ankle roll

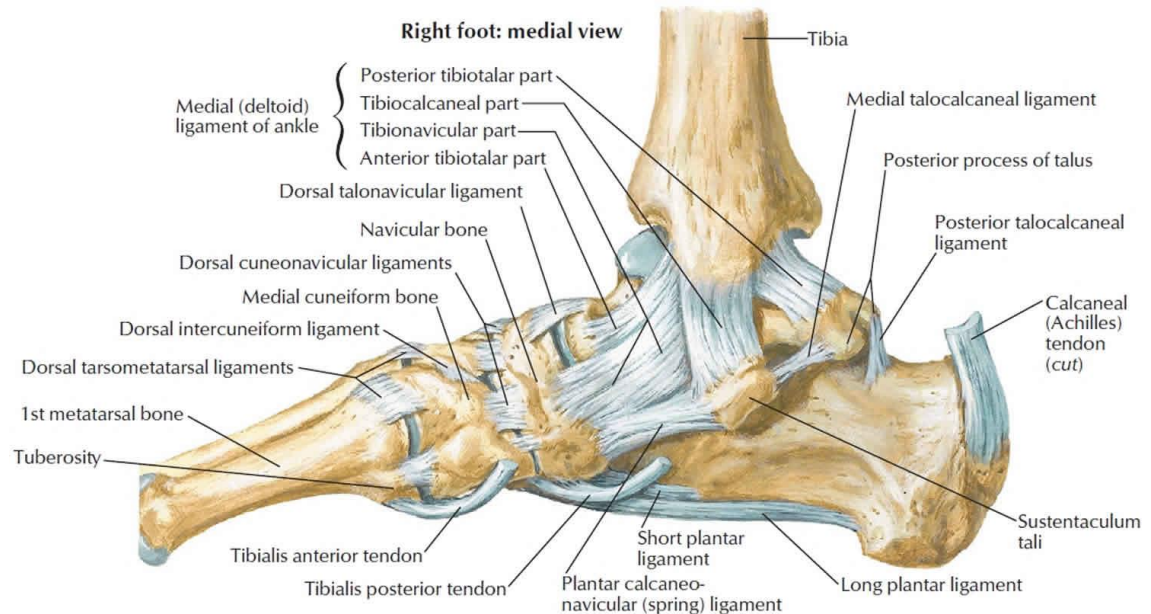


# WHAT IS A LOW ANKLE SPRAIN?

## EVERSION SPRAIN

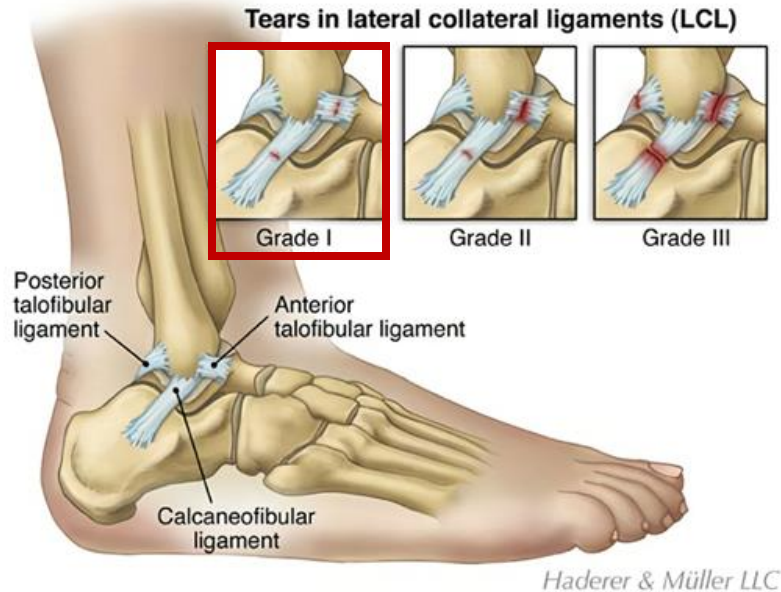
- Eversion
- Injures medial ligaments
  - ✓ Deltoid ligaments
- Concurrent fractures can occur distally

Named based on the direction of the ankle roll



# WHAT IS A LOW ANKLE SPRAIN?

## GRADES



## GRADE 1 (MILD) - D'Hooghe et al, & AAOS

- Treated **conservatively**
- Ligament fiber stretch w microscopic tearing ligament fibers
- Minor swelling, palpatory tenderness, hardly any functional loss & no increased instability
- No pain with weightbearing (**typically**)

# WHAT IS A LOW ANKLE SPRAIN?

## GRADES



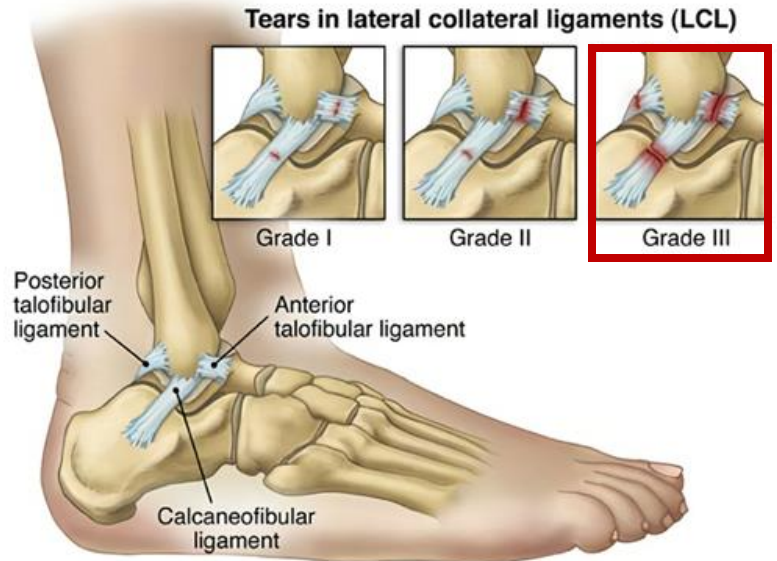
Haderer & Müller LLC

## GRADE 2 (MODERATE) - D'Hooghe et al, & AAOS

- Treated **conservatively**
- Partial ligament tear w moderate pain
- Bruising, moderate swelling, palpatory tenderness, mild - moderate instability, & moderate functional disability
- **Mild pain** with weightbearing

# WHAT IS A LOW ANKLE SPRAIN?

## GRADES



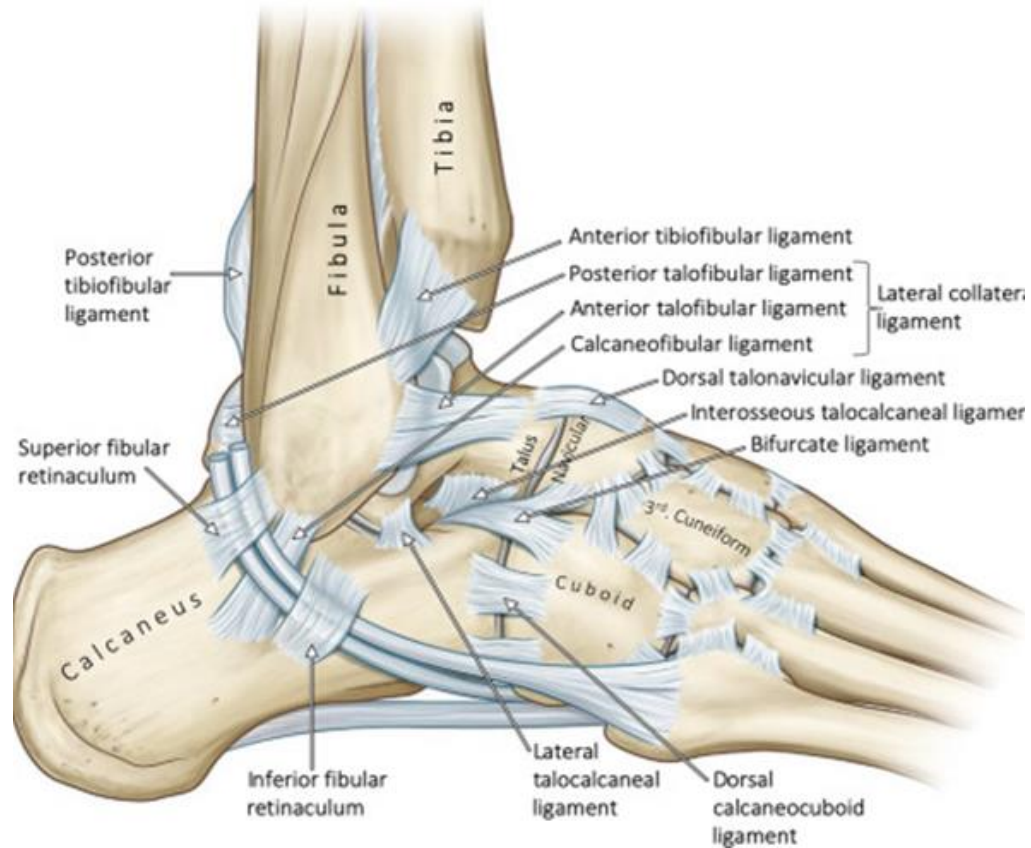
Haderer & Müller LLC

## GRADE 3 (SEVERE) - D'Hooghe et al, & AAOS

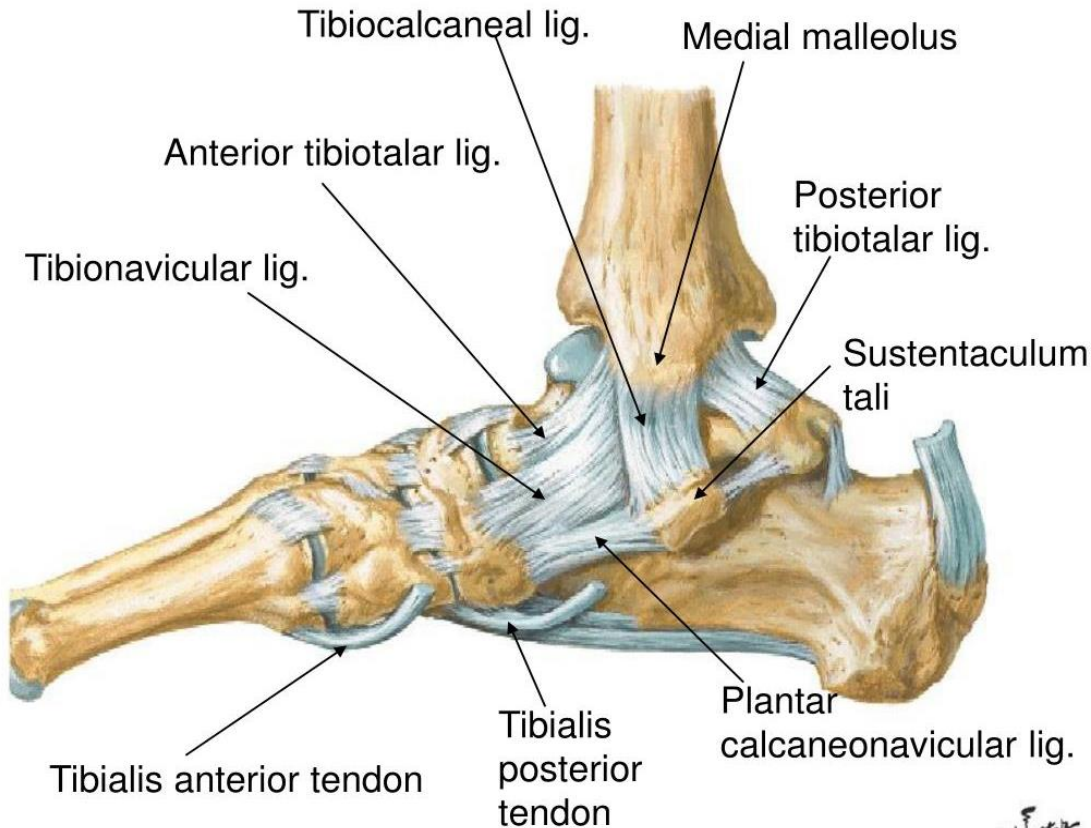
- Treated **surgically** (usually) but can be conservative
- Complete tear of ligament, joint capsule rupture & **severe** bruising/swelling/pain
- Loss of function & **increased** instability
- **Unable** to bear weight or walk normal



# ANKLE ANATOMY - Laterally



# ANKLE ANATOMY - MEDIALY



# DIFFERENTIAL DIAGNOSIS LIST



Lateral ankle  
sprain

Medial ankle  
sprain

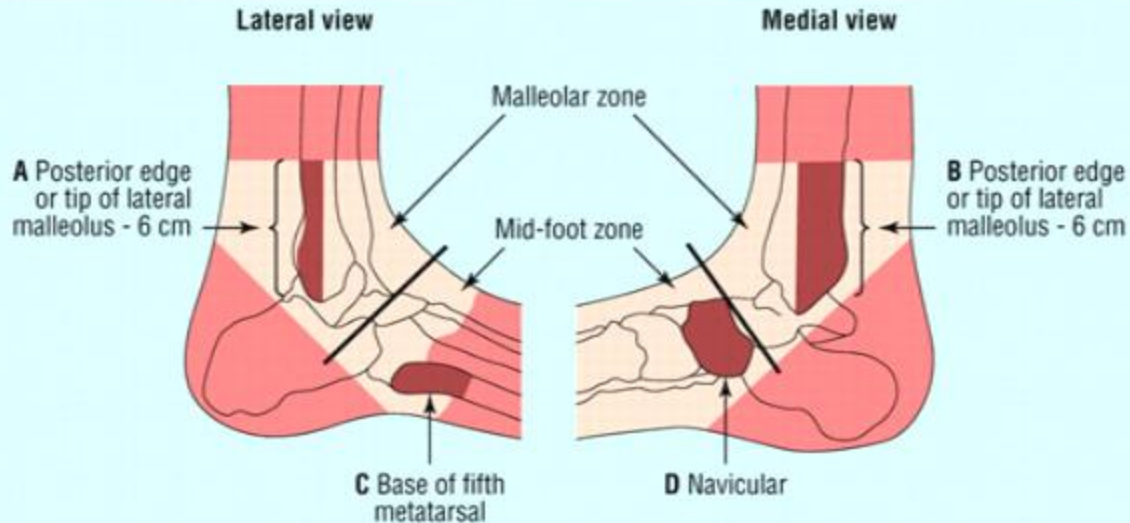
Impingement

Fracture

Stress  
fracture

High ankle  
sprain

# OTTAWA ANKLE RULES



A series of ankle x ray films is required only if there is any pain in malleolar zone and any of these findings:

- Bone tenderness at **A**
- Bone tenderness at **B**
- Inability to bear weight both immediately and in emergency department

A series of ankle x ray films is required only if there is any pain in mid-foot zone and any of these findings:

- Bone tenderness at **C**
- Bone tenderness at **D**
- Inability to bear weight both immediately and in emergency department

# OTTAWA ANKLE RULES

**MNEMONIC** – Gravel et al.

**44-55-66PM**

**Patients only an x-ray if:**

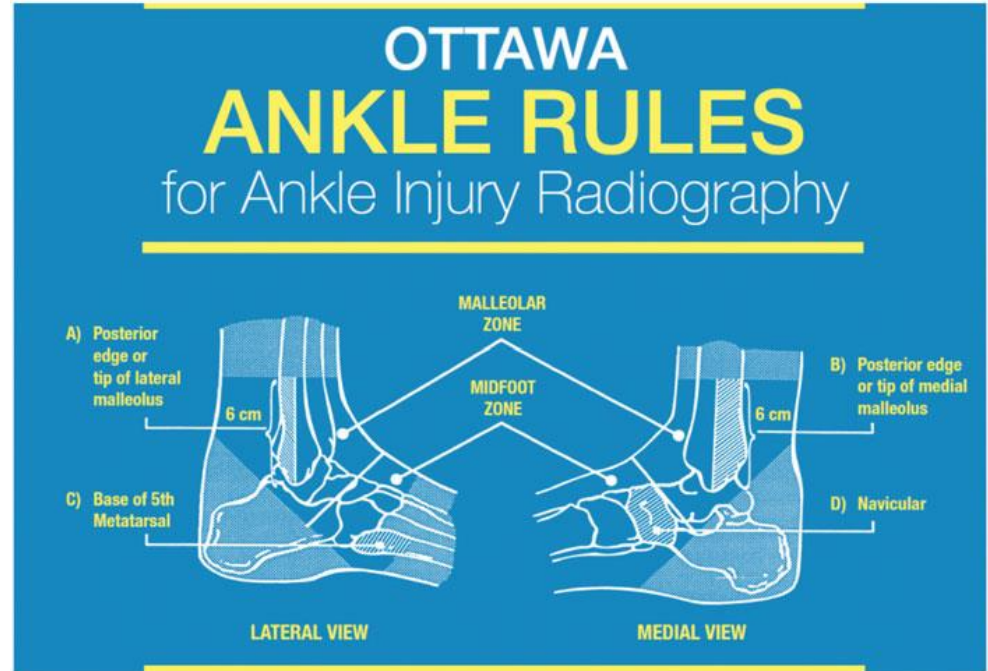
- ✓ 4 Unable to do 4 steps immediately **AND**
- ✓ 4 Unable to do 4 steps in ED

**OR**

- ✓ 5 Has pain at basr of 5<sup>th</sup> metatarsal
- ✓ 5 Has pain at 5caphoid (Navicular)

**OR**

- ✓ 6 Tenderness in 6 cm posterior edge of lateral Malleolus
- ✓ 6 Tenderness in 6 cm posterior edge of medial Malleolus



**OAR knowledge improved for all medical students & residents with mnemonic use**

# SUBJECTIVE COMPLAINTS

## MECHANISM OF INJURY

- Inversion stress
- Eversion stress
- Instability
- Acute/Chronic

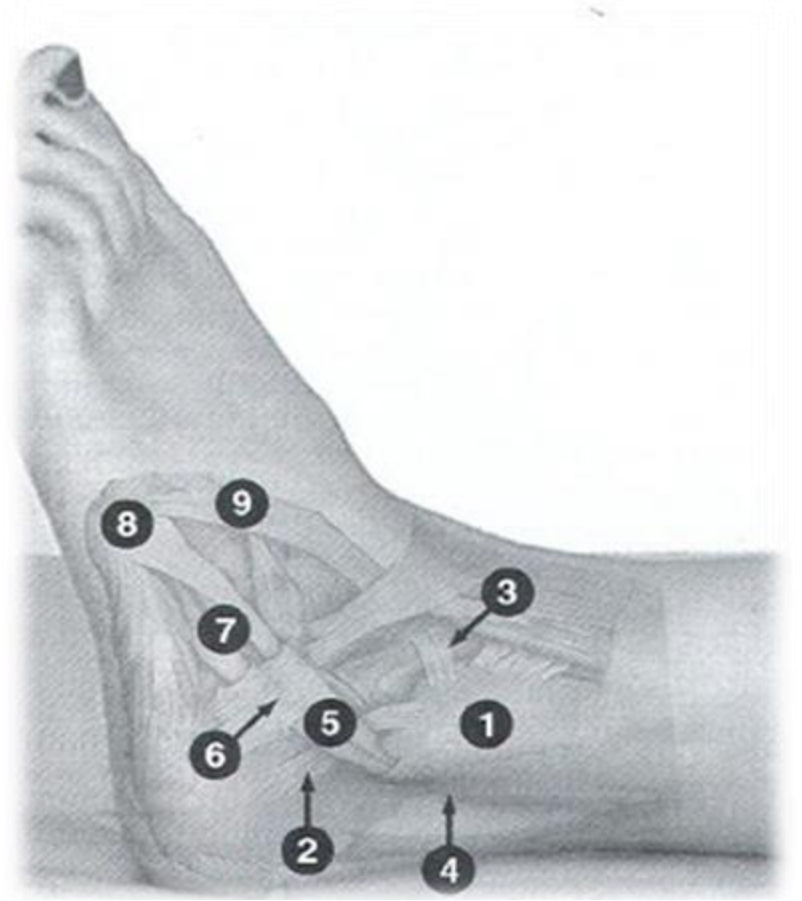
## PAIN WITH THE FOLLOWING:

- Walking
- Moving the joint
- Mobility
- Can feel like a tearing/searing sensation

# PALPATION

## LANDMARKS Laterally

1. Lateral malleolus
2. Calcaneofibular ligament
3. Anterior talofibular ligament
4. Posterior talofibular ligament
5. Peroneal retinaculum
6. Peroneal tubercle
7. Cuboid
8. Base of fifth metatarsal
9. Peroneus tertius

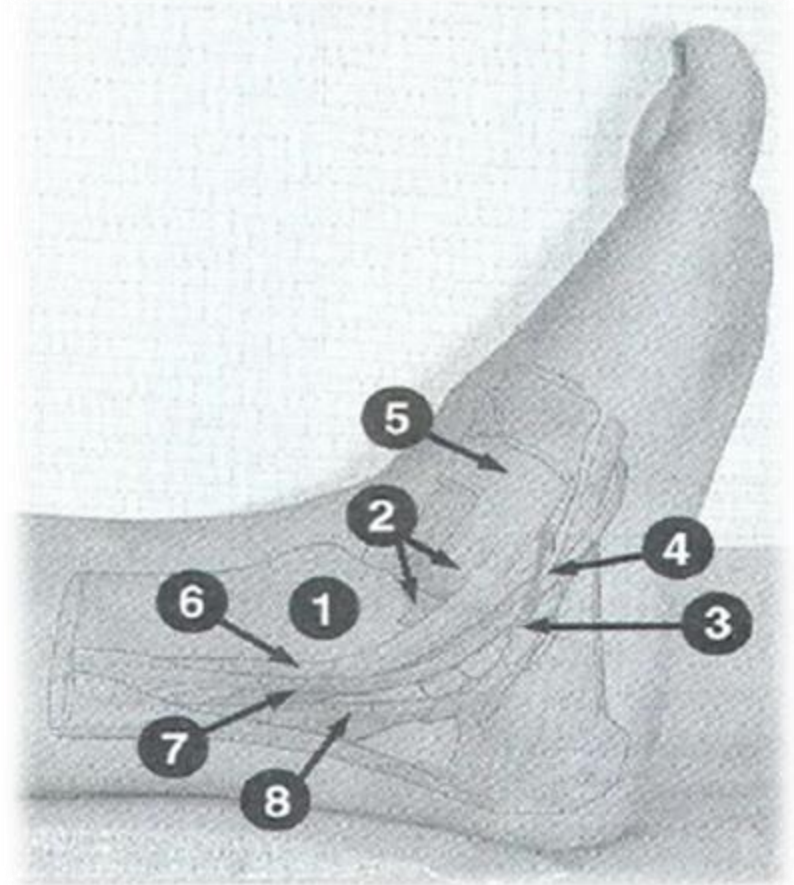




# PALPATION

## LANDMARKS MEDIALY

1. "Medial malleolus
2. Deltoid ligament
3. Sustentaculum tali
4. Spring ligament
5. Navicular and navicular tuberosity
6. Tibialis posterior
7. Flexor digitorum longus
8. Flexor hallucis longus"



# OBSERVATION



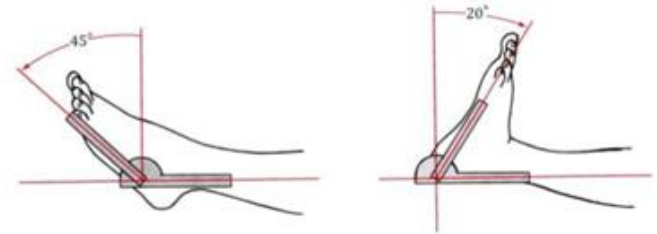
## ITEMS TO NOTE:

- **Girth**
  - ✓ Figure 8, Metatarsal circumference
- **Body Composition**
  - ✓ Ectomorphic, Mesomorphic, Endomorphic
- **Assistive Devices**
  - ✓ Brace, AFO Lace-up, Walking Boot, Crutches/AD
- **Skin integrity**
  - ✓ Ecchymosis, Abrasions
- **Posture/Gait**
  - ✓ Heel Strike
  - ✓ Mid-STANCE
  - ✓ Swing Phase

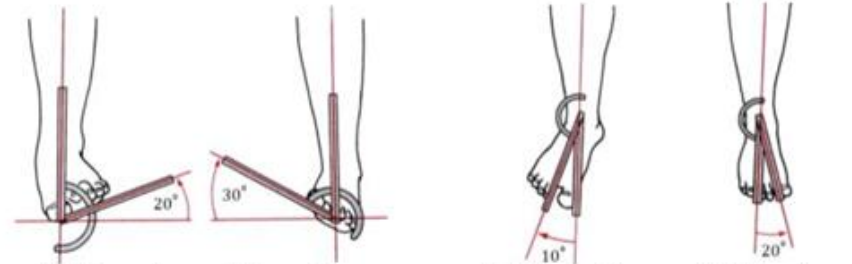
# ANKLE RANGE OF MOTION (ROM)

## ACTIVE & PASSIVE ROM

- Plantar flexion (0-45°)
- Dorsiflexion (0-10° to 20°)
  - ✓ AROM
  - ✓ PROM in Subtalar joint neutral prone
    - Gastroc vs Soleus length
      - Gastroc: knee straight
      - Soleus: knee bent
- Inversion WITH plantar flexion (0-35°)
- Eversion WITH plantar flexion (0-25°)



(a) Plantar flexion and Dorsiflexion



(b) Eversion and Inversion

(c) Abduction and Adduction

Figure 1. Conventional ROM measurement method of the ankle joint.

# ANKLE MANUAL MUSCLE TESTING

## MANUAL MUSCLE TESTING GRADES

Grade	Description
0	No visible or palpable contraction
1	Visible or palpable contraction without motion
2	Full range of motion, gravity eliminated
3	Full range of motion against gravity
4	Full range of motion against gravity, moderate resistance
5	Full range of motion against gravity, maximal resistance

## MANUAL MUSCLE TESTING (MMT)

- **Plantar flexion: Standing heel raise x25**
  - ✓ **Gastrocnemius & Soleus**
    - Knee STRAIGHT
  - ✓ **Soleus ONLY**
    - Knee BENT
- **Dorsiflexion WITH Inversion**
  - ✓ **Tibialis Anterior**
- **Inversion WITH plantarflexion**
  - ✓ **Tibialis Posterior**
- **Eversion WITH plantarflexion**
  - ✓ **Peroneus longus and Peroneus brevis**

# MUSCLE STRENGTH

## MANUAL MUSCLE TESTING

- Ankle weakness
- Hip abduction weakness
- Hip ER weakness
- Hip extension weakness

“In athletes, manual muscle testing does not consistently detect muscle strength deficits. Thus, functional testing may be preferred.”



# MUSCLE STRENGTH

## FUNCTIONAL TESTING

- Step down / Tap down
- Single leg press
- Bilateral squat
- Heel raise
- Single leg heel raise
- Single leg hop for distance
- Single leg 3 hop for distance
- Balance and reach

### Y-Balance

- ✓ Anterior
- ✓ Posterior medial
- ✓ Posterior lateral

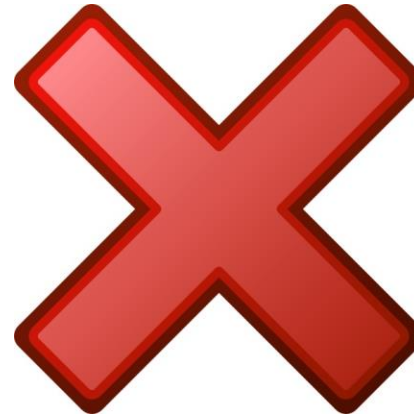


# SPECIAL TESTS

Talar Tilt  
(Plantarflexion/Inversion  
Stress Test)

Anterior Drawer Test  
(Anterior TC Glide)

Ankle  
Impingement Test







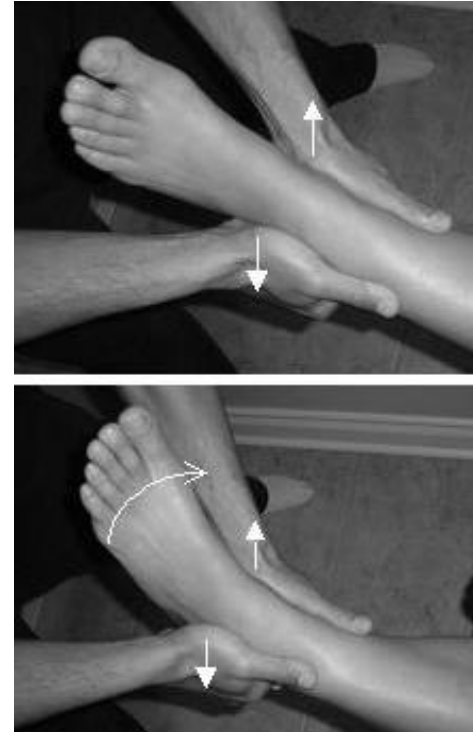
# ANTERIOR DRAWER TEST



# ANKLE IMPINGEMENT

## "Test" or Treatment

- Patient complains of pain with Inversion (initially)
- Posterior glide of fibular head
  - ✓ What happens to pain?
- Add inversion **ACTIVELY**
  - ✓ What happens to pain?
- If pain is abolished, "Test" is positive
  - ✓ Distal Tibiofibular MWM or Distal Fibular Posterior Mobs will likely be effective treatment



# NERVE INVOLVEMENT

## STRAIGHT LEG RAISE

### Tibial nerve bias

- "TED"
  - ✓ Tibial Nerve: Eversion/Dorsiflexion
  - ✓ Clinician Guided: Knee extended, Ankle Dorsiflexed and Everted, Hip Flexion

### Plantar nerve bias

- "PIP"
  - ✓ Plantar Nerve: Inversion/Plantar flexion
  - ✓ Clinician Guided: Knee extended, Ankle Plantar flexed and Inverted, Hip Flexion

# RETURN TO SPORT (RTS)

## CONSIDERATIONS: Gaddi et al

- 2 weeks to 9 weeks - depending on severity
- RTS decision should include:
  - ✓ Balance, proprioception, strength, ROM, agility tests & psychological stress

## OBJECTIVE TESTING

- Y balance testing
- Tap down test
- Jump testing
  - ✓ Single hop for distance
  - ✓ 3 hop for distance
  - ✓ Timed 3 box hop



# EXERCISE / FUNCTIONAL TRAINING

## EXERCISE THERAPY

- **AROM/PROM: Ankle**
  - ✓ Key goals of rehab, loss of ROM is risk factor for reinjury/chronic ankle instability
- **Strengthening: Ankle/hip/core**
  - ✓ Motor control: specifically with TB exercises
- **Balance/Proprioception**
- **Stretching: ankle/calf/hamstrings/hips**

## FUNCTIONAL TRAINING

- **Movement pattern retraining: i.e. decreasing valgus/foot control**
- **CKC exercises to replicate function**
- **Running/Dancing/Sport specific activities**

# EXERCISE / FUNCTIONAL TRAINING

## EXERCISE THERAPY



- **FIRE**
  - ✓ Foot Intensive Rehabilitation
- **Demonstrated increases:**
  - ✓ Muscle activation
  - ✓ Toe flexion strength
  - ✓ Somatosensation
  - ✓ Balance and function



# CHRONIC ANKLE INSTABILITY

## CARE POINTS - Laleve'e et al

**Consider both mechanical instability & functional impairment**

**PT to address neuromuscular dysfunction**

**Mechanical risk factors addressed**  
(Ex: hindfoot varus, lack of dorsiflexion)



# EXERCISES TO BEGIN - ROM FIRST

## Long Sitting Ankle Eversion with Resistance



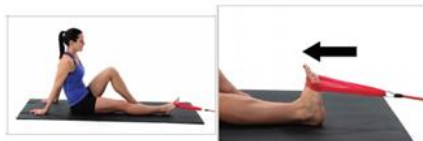
REPS: 10

SETS: 3

DAILY: 1

WEEKLY: 7

## Long Sitting Ankle Dorsiflexion with Anchored Resistance



REPS: 10

SETS: 3

DAILY: 1

WEEKLY: 7

## Long Sitting Ankle Plantar Flexion with Resistance



REPS: 10

SETS: 3

DAILY: 1

WEEKLY: 7

## Long Sitting Ankle Inversion with Resistance



REPS: 10

SETS: 3

DAILY: 1

WEEKLY: 7

## Toe Spreading



REPS: 10

SETS: 3

DAILY: 1

WEEKLY: 7

## Seated Toe Curl



REPS: 10

SETS: 3

DAILY: 1

WEEKLY: 7

# PHYSICAL THERAPY EDUCATION

- **Patients understand multiple factors**
  - ✓ Condition & treatment options
  - ✓ Manage expectations: strengthening 6-8 wks
- **Activity modification**
  - ✓ Do they tie their shoes?
  - ✓ Do they sit with feet up under them?
  - ✓ Biomechanics that **MAY** contribute to increased load
  - ✓ Avoiding valgus collapse at knee
- **Home exercise program importance**
  - ✓ 3-4 exercises to aid in compliance
- **Importance of active rehab**
- **Load management vs body-weight**



# MANUAL THERAPY

## WHEN IMPLEMENTED EARLY:

- Improved/restored ankle ROM
- Decrease in pain

## TECHNIQUES TO CONSIDER:

- Distal Fibular Head Glides – depending on impairment
  - ✓ A-P
  - ✓ P-A
- Distal Tibiofibular MWM
- Talar Posterior Glide
- Talar Posterior Glide MWM
- Standing Ankle Dorsiflexion MWM
- Talar Anterior Glide
- Ankle Plantarflexion MWM
- Foot Joint Mobilizations



# BRACING / TAPING / ORTHOTICS

## TAPING

- Athletic Tape – ankle taping
- McConnell/Leuko Taping
  - ✓ Navicular lift/arch lift
  - ✓ Fibular head posterior glide
  - ✓ Fat pad assist
- Kinesiotaping/Dynamic taping
  - ✓ "Significantly improved balance & coordination on stable surfaces" Pawik et al
- To assist with exercise therapy



## BRACING

- Splint/walking boot
- Lace up brace (tends to be most favorable, more high-level evidence needed)

## ORTHOTICS

Consider for pain reduction/excessive pronation

# MODALITIES



## BIOFEEDBACK

- Mirrors/videos to improve exercise quality
- "Try to get rid of the shaking" for control

## CRYOTHERAPY

- Vasopneumatic device
- Ice

# SURGICAL CONSIDERATIONS

## GOOD TO KNOW:

- Return to sport was 75% - median time 6 months
- 55% resumed main sport **at same or higher level** within 12 months of surgery

## AFTER SURGERY:

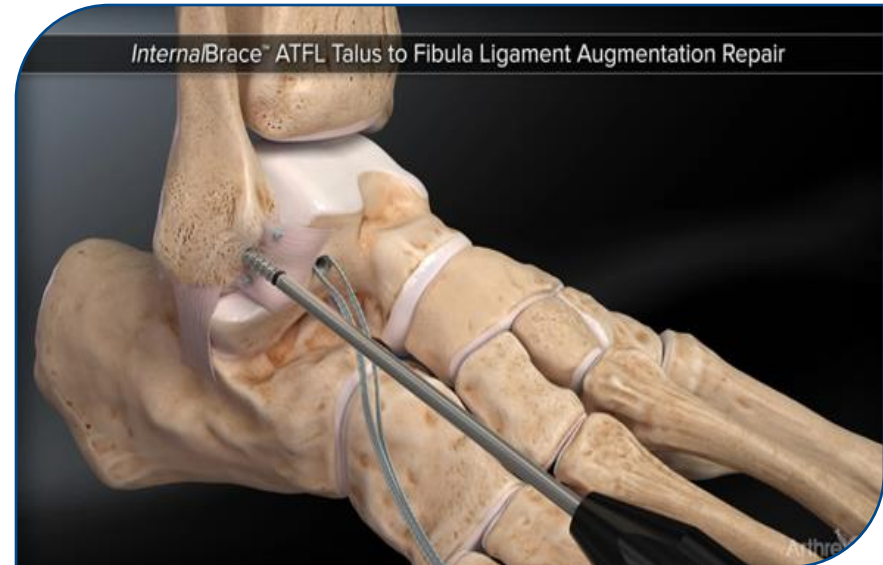
- Lower leg cast 1-2 wks
- 2-4 wks in walking boot & active rehabilitation protocol with use of ankle support
- **Return to sport:** SLB, star excursion, y balance test, agility t test (minimal score of 90% of contralateral side)
- Case series of pro athletes RTS was 77 days median for ligament injuries & 105 days with concomitant injuries



# SURGICAL PROTOCOLS

## LATERAL LIGAMENT RECONSTRUCTION WITH INTERNAL BRACING

- PWB day of surgery
- WBAT to Full WB in walking boot for 4-6 wks
  - ✓ Normalize gait
- Gradual wean from boot starting at home
- Normalize ROM/strength/proprioception
  - ✓ AVOID INVERSION/EVERSION STRESSES
- Plyometric & jumping activities, JUMP before you RUN
- Estimated return to sport week 12
- Functional bracing for 3 months back to sport



# CONCLUSIONS

## SYSTEMATIC REVIEWS

- P.R.I.C.E, modalities prn, inf tib/fib mobs, proprioceptive training, calf strengthening, functional strengthening.
- Short term mobilization, complete immobilization, Ice packs, local or systemic non-steroidal anti-inflammatory drugs, PT, ESTIM. (Ortega-avila et al)
- Developing exercise interventions that better incorporate multidirectional movements, flight phases and single limb landings, would present a more progressive task-specific approach to rehabilitation, cumulating in a greater reduction in re-injury risk. (Wagemans et al)
- External ankle brace is usually advocated vs tape. Exercise with progressive WB. Early ROM exercises followed by strengthening/proprioceptive training/functional exercises. Grade III lateral ligament ankle injury remains controversial. Functional treatment is preferred over surgery in most cases, however, surgical treatment may be beneficial on an individual basis in elite athletes. (D'Hooghe et al)
- Post surgery: resting the joint. Strengthen muscles (in particular peroneal muscles), proprioception/balance tasks. Prophylactic ankle bracing. Dynamic balance training has been shown to reduce time to return to sport and is associated with increased functional performance. (Dias et al)

# CONCLUSIONS



DO ALL  
The  
THINGS!

## COMBINED INTERVENTION

- **Conservative treatment preferred**
  - ✓ Surgery considered with persistent symptoms/CAI/Non-responsive
- **Functional treatment > immobilization**
- **Exercise with: manual therapy, stretching, bracing**
  - ✓ **RESTORE DORSIFLEXION**
- **Reduces risk of recurrent ankle sprain 40%**

# CONCLUSIONS

## MY FOCUS

- **Restore ROM FIRST**
- **Control TB exercises**
- **Restore normal gait mechanics**
  - ✓ **If limping, convince me an assistive device is not needed**
- **Avoiding knee valgus with all functional/sport specific tasks**
  - ✓ **Will change ankle mechanics too**
- **Taping/Bracing to aid in pain-free exercise**
  - ✓ **Tape to assist function**
  - ✓ **Brace to assist in return to sport/decrease reinjury**
- **Restore proprioception/balance**
- **Agility**
- **Jumping leads to running**
- **Return to sport activities**



# THANK YOU!



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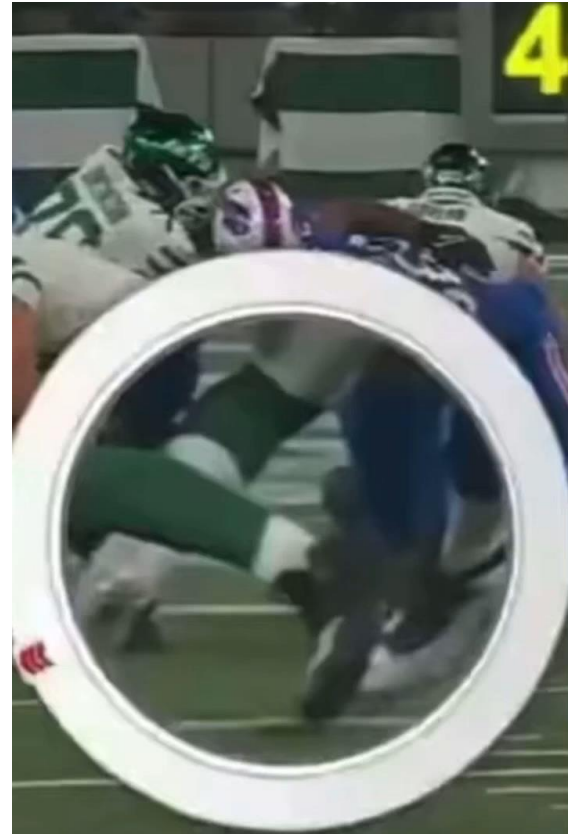
## ACHILLES RUPTURES

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OrthoCincy Orthopaedics & Sports Medicine

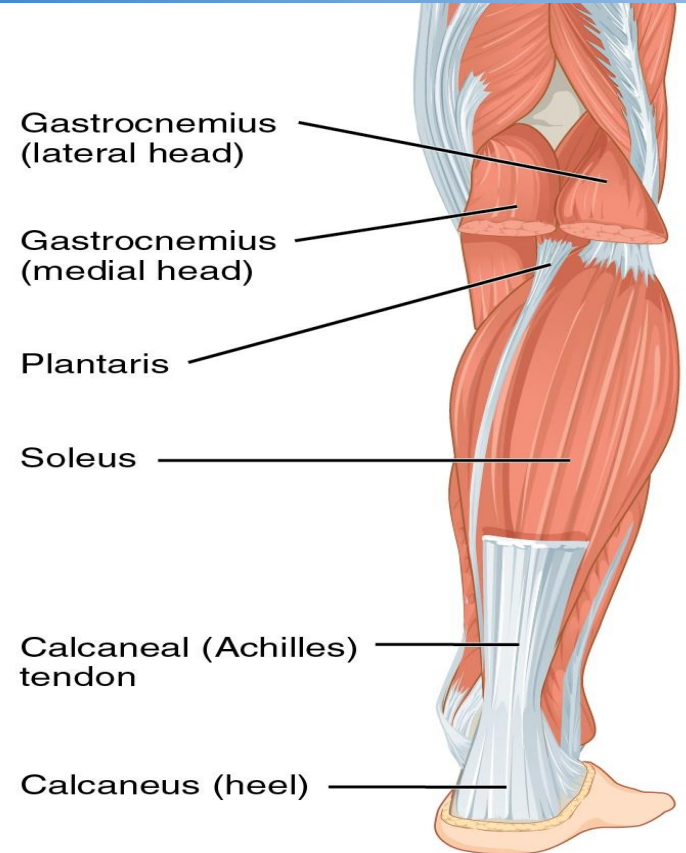




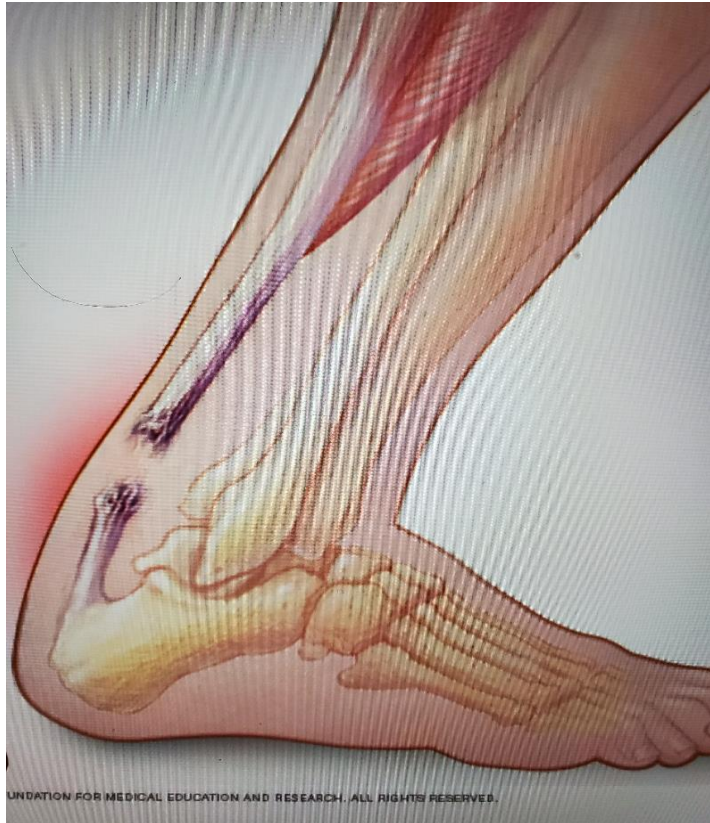
# ACHILLES RUPTURES

## ANATOMY

- **Fibrous cord that connects your calf to your heel**
- **Largest tendon in the body**
- **Helps to point your foot down, rise up on toes and push off**



# ACHILLES RUPTURES



## DEMOGRAPHICS

- Most common tendon rupture in the lower extremity
- 30 - 50 years old
- 75% male
- 40 out of every 100,000 annually

# ACHILLES RUPTURES

## Demographics

- Affects 1 million athletes / year
- 70% occur during sports

FEMALE		MALE	
Volleyball	15.2%	Basketball	46.9%
Basketball	14.8%	Soccer	10.6%
Track	9.8%	Football	9.0%
Gymnastics	8.9%	Tennis	7.4%
Running/Hiking	8.5%	Running/Hiking	5.4%





# ACHILLES RUPTURES



## CAUSES / RISK FACTORS

- **Tight achilles**
- **“Weekend warrior”**
- **New sport**
- **History of tendinosis**
- **Poor conditioning**

# ACHILLES RUPTURES

## CAUSES / RISK FACTORS

- **Diabetes Mellitis**
- **End Stage Renal Disease**
- **Fluoroquinolones**
- **Steroid injections**



# ACHILLES RUPTURES

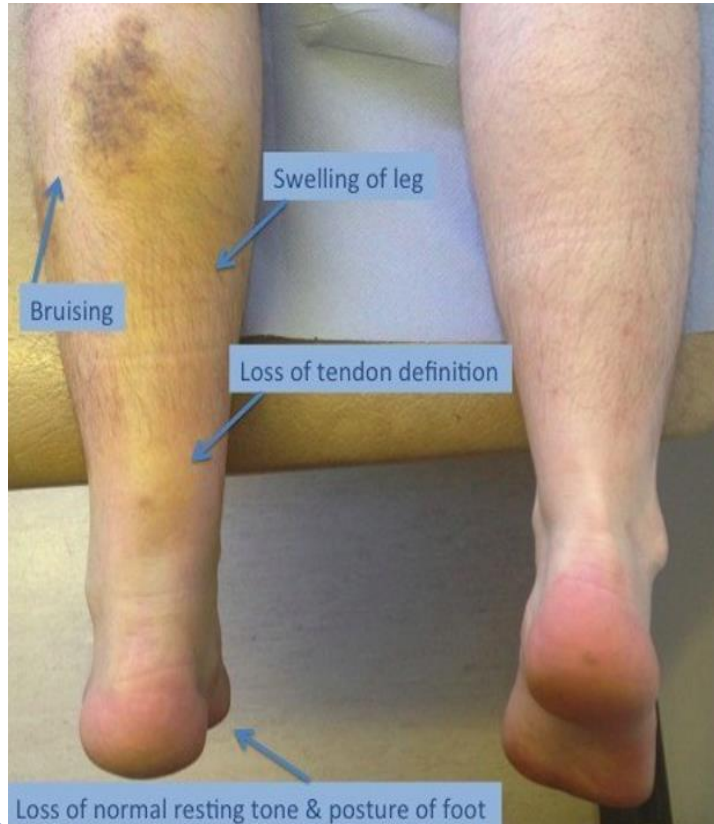
## CAUSES / RISK FACTORS

- Inflammatory arthritis
- Hyperparathyroidism
- Obesity
- Fall from a height





# ACHILLES RUPTURES



## DIAGNOSIS

Usually made on Physical Exam

- **History**

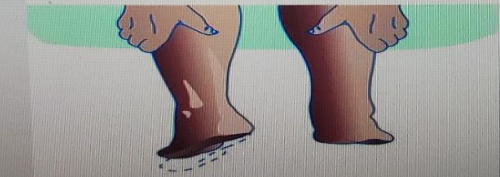
- ✓ Sudden push off and feel a pop followed by pain in the calf & ankle
- ✓ Feel like kicked or hit with something
- ✓ Swelling and bruising
- ✓ Difficulty walking

# ACHILLES RUPTURES

## DIAGNOSIS

### Physical Exam

- Divot in the tendon
- Positive Thompson test
- Positive STAMP test
- Stand and maintain PF
- Difficulty walking



# ACHILLES RUPTURES



## DIAGNOSIS

Imaging – often unnecessary

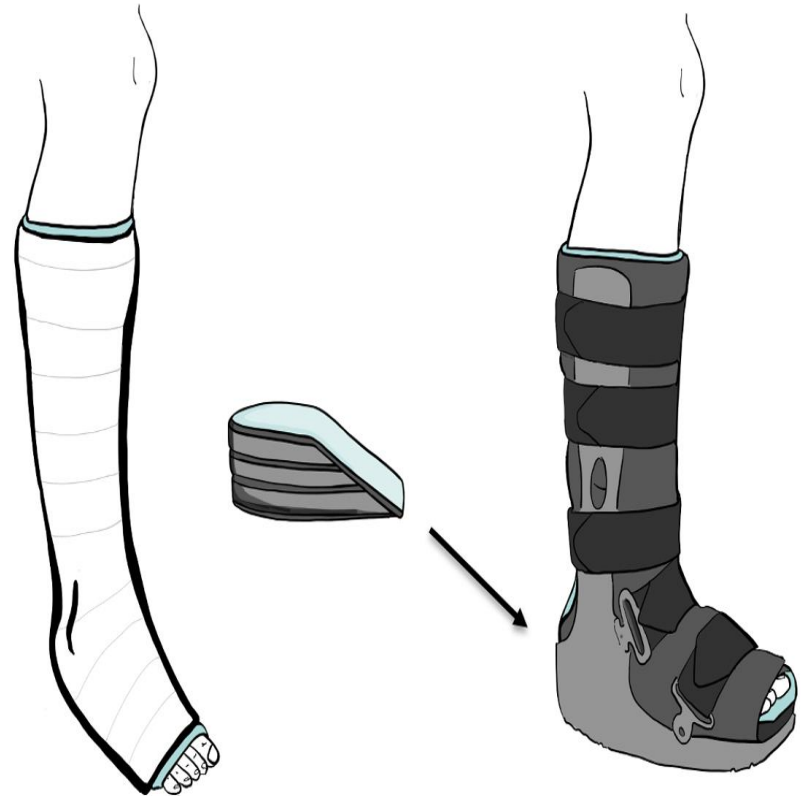
- X-Ray – Avulsion fractures
- MRI - if unusual presentation
- Ultrasound
- Blood work

# ACHILLES RUPTURES

## TREATMENT

### Non-Operative

- **Cast or boot in PF**
  - ✓ Approximate the torn ends
- **Indications**
  - ✓ Less active
  - ✓ Diagnosed quickly
  - ✓ Older
  - ✓ Comorbidities



# ACHILLES RUPTURES



## TREATMENT

### Non-Operative

- **Pros:**
  - ✓ No surgery
  - ✓ Early weight bearing
- **Cons:**
  - ✓ Risks of surgery
  - ✓ Increased risk of re-rupture 1-5% vs 8-12%
  - ✓ Decreased push off strength
  - ✓ Need for strict compliance

# ACHILLES RUPTURES

## TREATMENT

### Operative

- Open +/- augmentation
- Mini-incision ( PARS )
  
- Indications
  - ✓ Athlete
  - ✓ Active
  - ✓ Young
  - ✓ Healthy
  - ✓ Delayed diagnosis





# ACHILLES RUPTURES

## TREATMENT

### Operative

- **Pros**
  - ✓ Decrease risk of re-rupture
  - ✓ Increased push off strength
    - HIH - operative: 1.7-5.6 % deficit
    - - non-op: 11.7-20.8 %
  - ✓ Rapid return to activity
- **Cons**
  - ✓ Surgical risks





# ACHILLES RUPTURES



## PREVENTION

- **Stretching**
- **Vary your exercise**
- **Increase training intensity slowly**
- **Keep weight down**
- **Listen to your body**

# ACHILLES RUPTURES

## REHABILITATION

### Non-operative

- Cast / boot with heel lifts
- WBAT immediately or 2 wks
- Remove heel lifts - foot flat by 7-8 wks
- Regular shoe with heel pads 8-10 wks
- Physical Therapy
  - ✓ Isometric PF at 2 wks
  - ✓ Cross training at 8 wks



- ✓ Walk for exercise at 10-12 weeks
- ✓ Run at 6-12 months

# ACHILLES RUPTURES



## REHABILITATION

### Operative

- Splint for 10 days
- WBAT with 2 heel lifts at 2 wks
- Foot flat with heel pads by 6 wks
- Physical Therapy
  - ✓ Isometric PF at 2 wks
  - ✓ Active DF to -15 deg from neutral till FF
  - ✓ Cross training at 6 wks
  - ✓ Walk for exercise at 8 wks
  - ✓ Run at 3-6 months (if athlete)

# ACHILLES RUPTURES

## REHABILITATION

### Literature

- Avg recovery 6-12 months for athletes
- Often decreased strength/endurance up to 2 years (operative or non-operative)
- 39% NBA players treated surgically unable to return to play
- 25% soccer players decide not to play after surgery
- 30-40% NFL players never return
- 2021 study showed 24% of NFL, NBA, MLB & soccer players were unable to return to play



# THANK YOU!



# Q&A PANEL



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