

# Adolescent Sports Ankle Injuries



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## Burden on Australian society

Sports injuries, particularly joint injuries, place a great burden on Australian society because of the need for acute serious medical attention, reduced on-going sports participation and then leading to greater incidence of osteoarthritis. In recent years there has been a number of international, national and state-based studies undertaken that outline the facts around the incidence and costs of sports related injuries:

Almost 2/3<sup>rd</sup> of Australians aged 15 years & over participated in physical activities for recreation, exercise or sport at some time during 2011-12 <sup>1</sup>

36,000 people aged 15 years and over: were hospitalised in 2011/12 as the result of an injury sustained while playing sport, and spent a total of 79,000 days in hospital.<sup>2</sup>

**Almost half of all hospitalised injuries for young people:** (49% or 19,171 hospitalisations) occurred while engaged in sporting/leisure activities (2008). Of these, team ball sports injuries resulted in 9,820 cases (about half).<sup>4</sup>

526,000 Australians aged 15 years and over: had a current long-term condition that was a result of a sporting or exercise injury in 2007-08.

30% to 40%: the estimated percentage of participants experiencing a major sports-related injury that will discontinue playing sport and/or will significantly reduce their physical activity levels.<sup>2</sup>

**6% growth:** the estimated annual growth in Victorian hospital emergency department presentations relating to sports injury (meanwhile road related injuries have stabilised).<sup>2</sup>

**Four times greater:** the cost of sports related injuries in children under 15 to Victorian hospitals when compared with road traffic injury costs.<sup>3</sup>

\$1.8 billion: the estimated annual sport injury health cost estimated by a 2004 study (Medibank Private 2004).<sup>8</sup>

**20,000:** the estimated number of participants per year dropping out of sport in Victoria in 2020 due to a sports-related injury.<sup>2</sup>

**545,000:** the number of Australians reported to have a long-term health condition caused by a sport or exercise-related injury.<sup>2</sup>

Highest ACL Injury Rate : Australia has one of the highest CL Injury rates and subsequent reconstruction in the world.<sup>8</sup>

\$1.65 billion and up to \$2 billion: some recent estimates of the total burden each year of all sports injuries in Australia.<sup>2</sup>

From AOA Joint Action Youth Injury Prevention Program – Feb 2015

# Overuse injuries

- Majority of youth sports injuries are related to overuse
- Most can be avoided by careful management of training regimens
- Need to assess general conditioning of athlete as well as role of strength and conditioning as well as sport specific skills



# The prevalence of overuse injuries in Australian non-elite netballers

This article was published in the following Dove Press journal:  
Open Access Journal of Sports Medicine

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Peter Lorentzos<sup>1,2</sup>

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**Purpose:** The aim of this study was to investigate the prevalence of overuse injuries in non-elite netballers and whether these increase over a typical competitive season and to establish if player age, experience, training, and use of bracing are related to overuse injuries.

**Patients and methods:** A prospective study was conducted over a 12-week period, using a recently developed questionnaire. Data were collected on overuse injuries in the knee, ankle, and shoulder areas every week.

12-week period

52.7% with ankle

21.2% knee problems

5.5% shoulder problems

- Ankle injuries increased over the study period, while knee and shoulder problems decreased

# 14≠14



Larger players have a counterintuitively increased risk of injury due to size in sports such as gymnastics where as injured footy players were shown to have smaller weight and BMI by age than their non injured counterparts

# Case 1

- 12yr boy sustains a significant ankle inversion injury
- Large swelling unable to examine ankle
- Unable to weight bear





# Salter Harris 1 Fracture

- Sprain is diagnosis of exclusion for paed ankle injuries
- Growth arrest
  - Presents 6-18months after injury



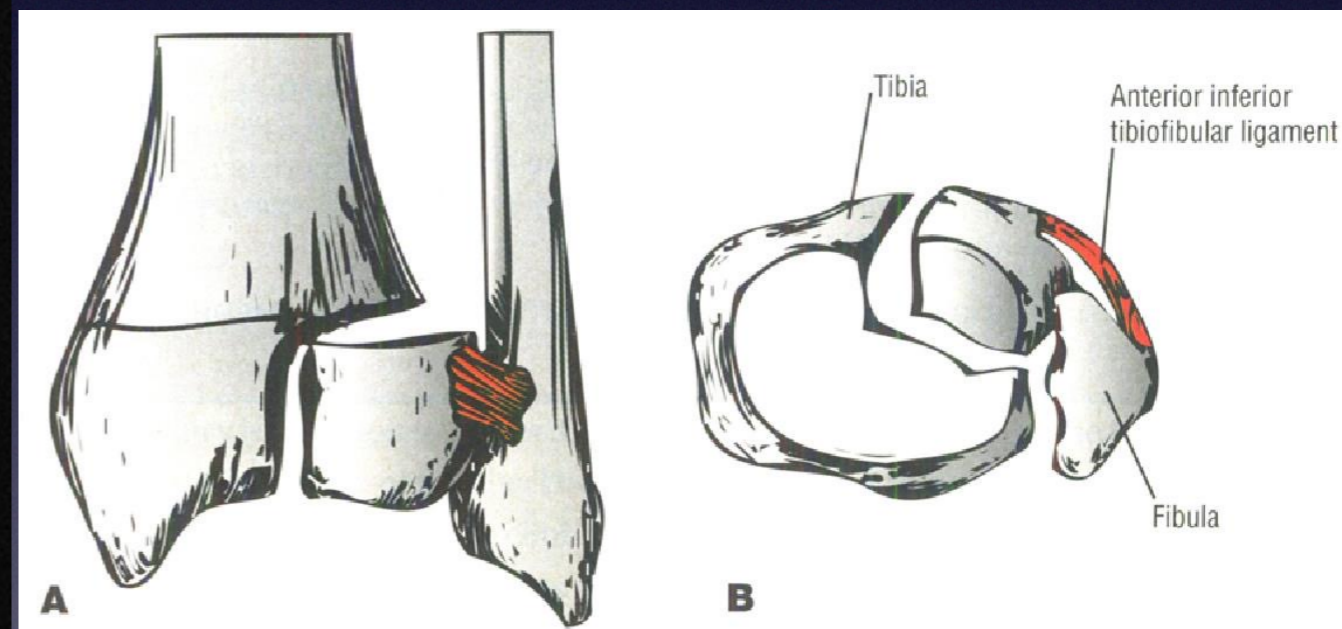
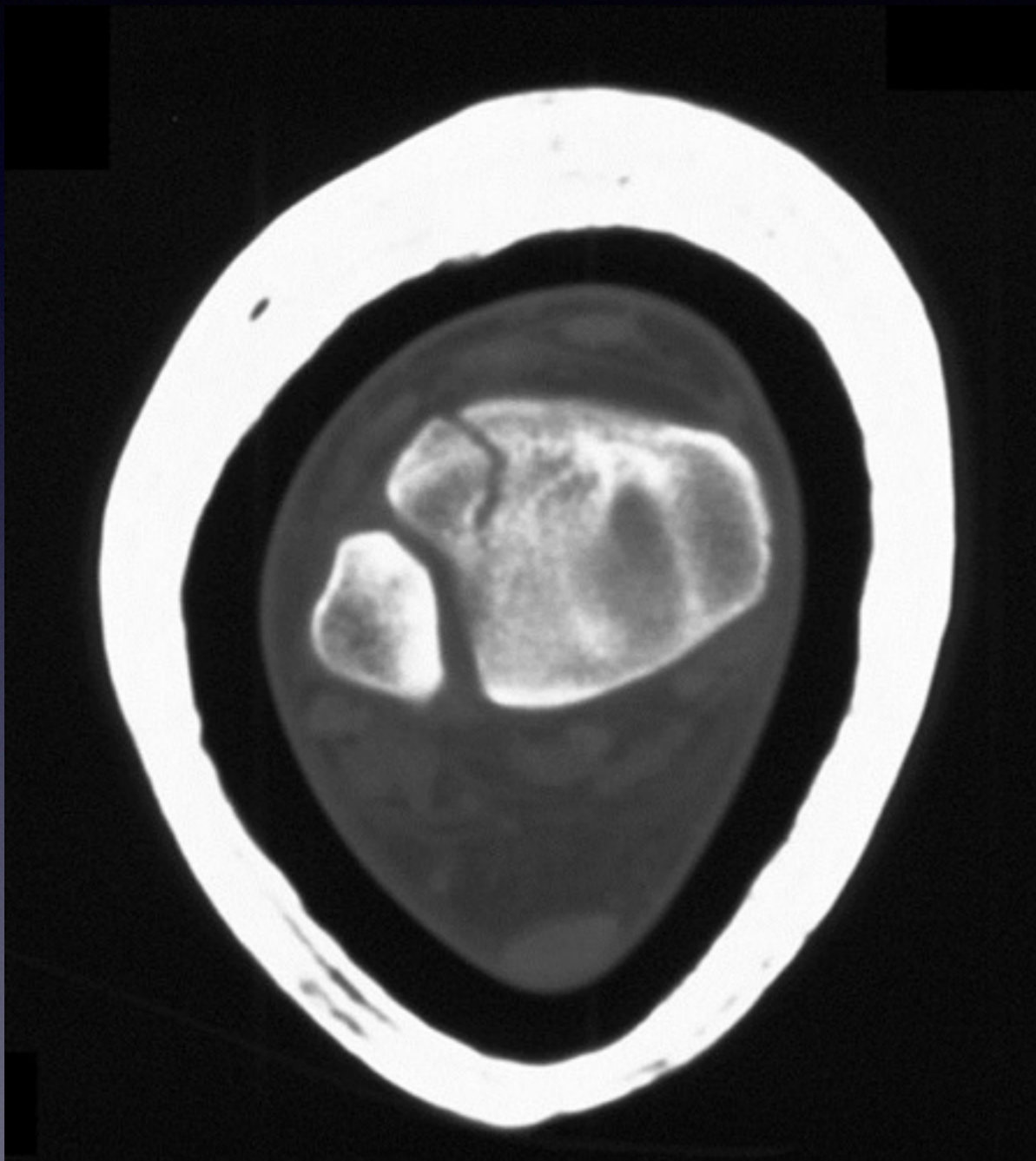




# Transitional fracture



# Tillaux fracture



Typically 12 yr females

# Case 2

- Playing basketball, felt a “pop”

# Early mobilisation with functional bracing

## Theoretically

- Early loading leads to improves biological healing
- Improved vascularity
- Faster healing
- Prevent muscle atrophy
- Less stiffness
- Less adhesions
- Less DVT
- Patient satisfaction

27.5% of the patients are not compliant

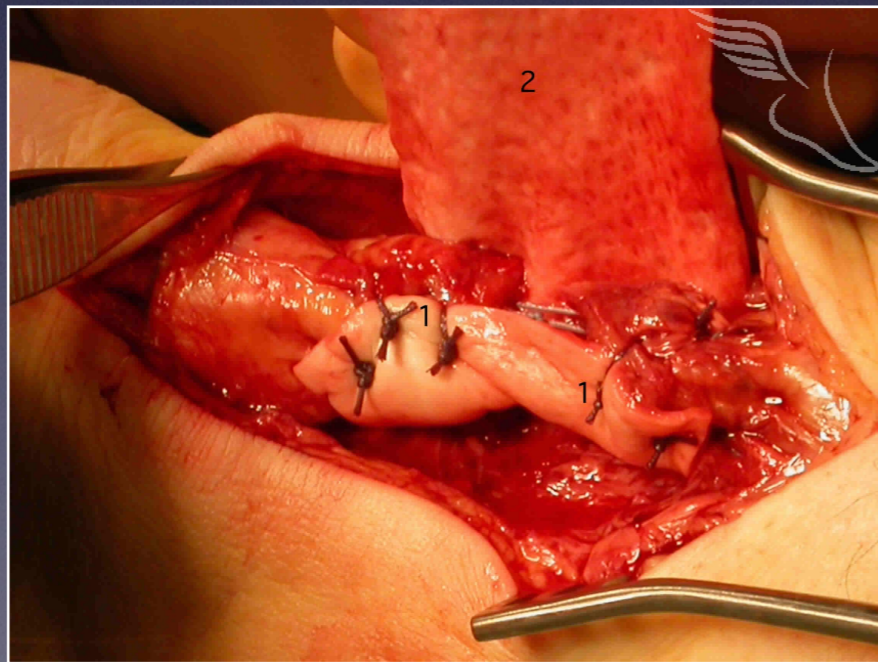
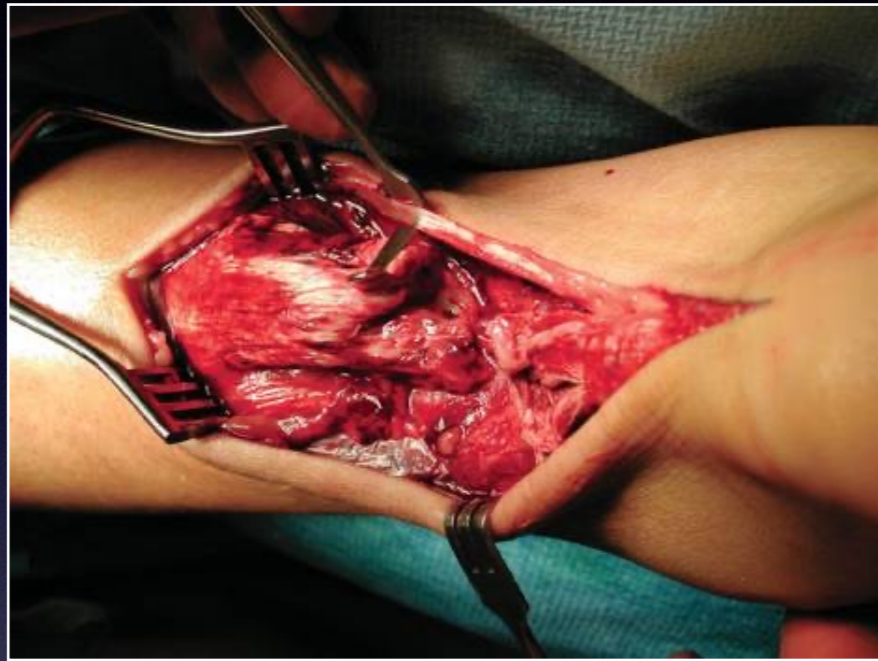
Chiodo CP, Macaulay AA, Palms DA, Smith JT, Bluman EM.  
Patient compliance with postoperative lower-extremity non-  
weight-bearing restrictions. J Bone Joint Surg Am  
2016;98:1563–7.

# Symons / Thompson's test



- Patient lies prone with foot over end of bed.
- Firmly squeeze the calf muscles.
- Normal response is reflex plantar flexion of the foot.
- If TA ruptured, there is no reflex plantar flexion.

# Ruptured TA - treatment



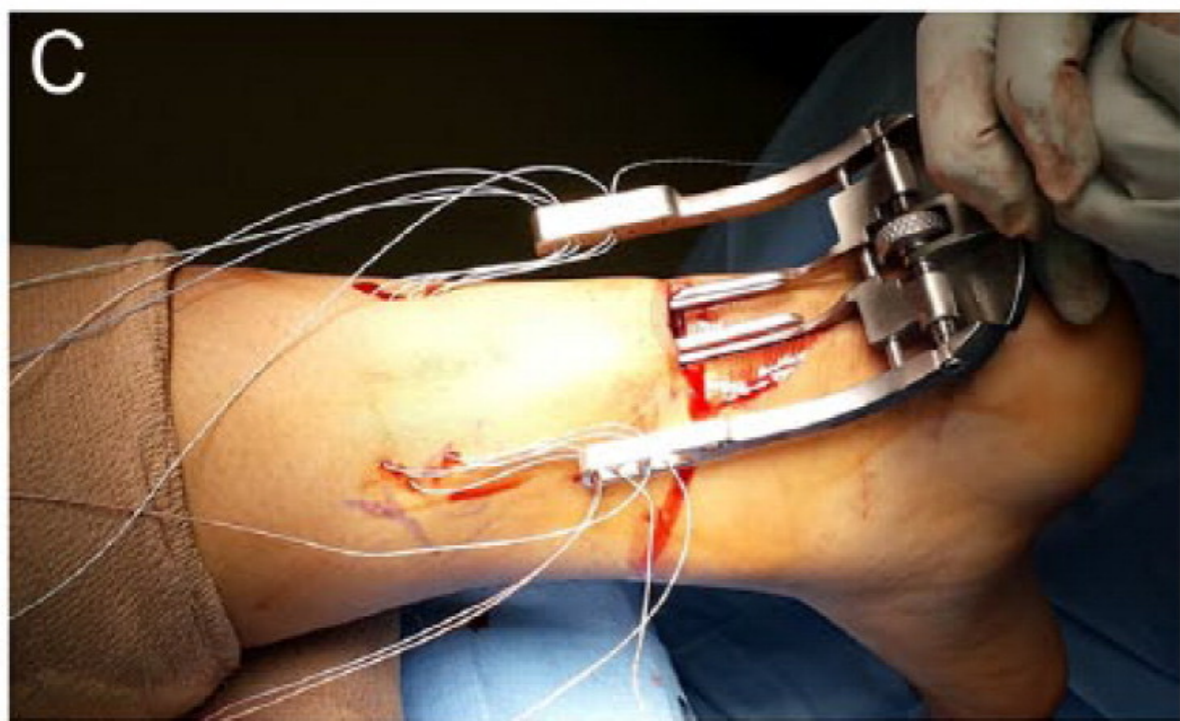
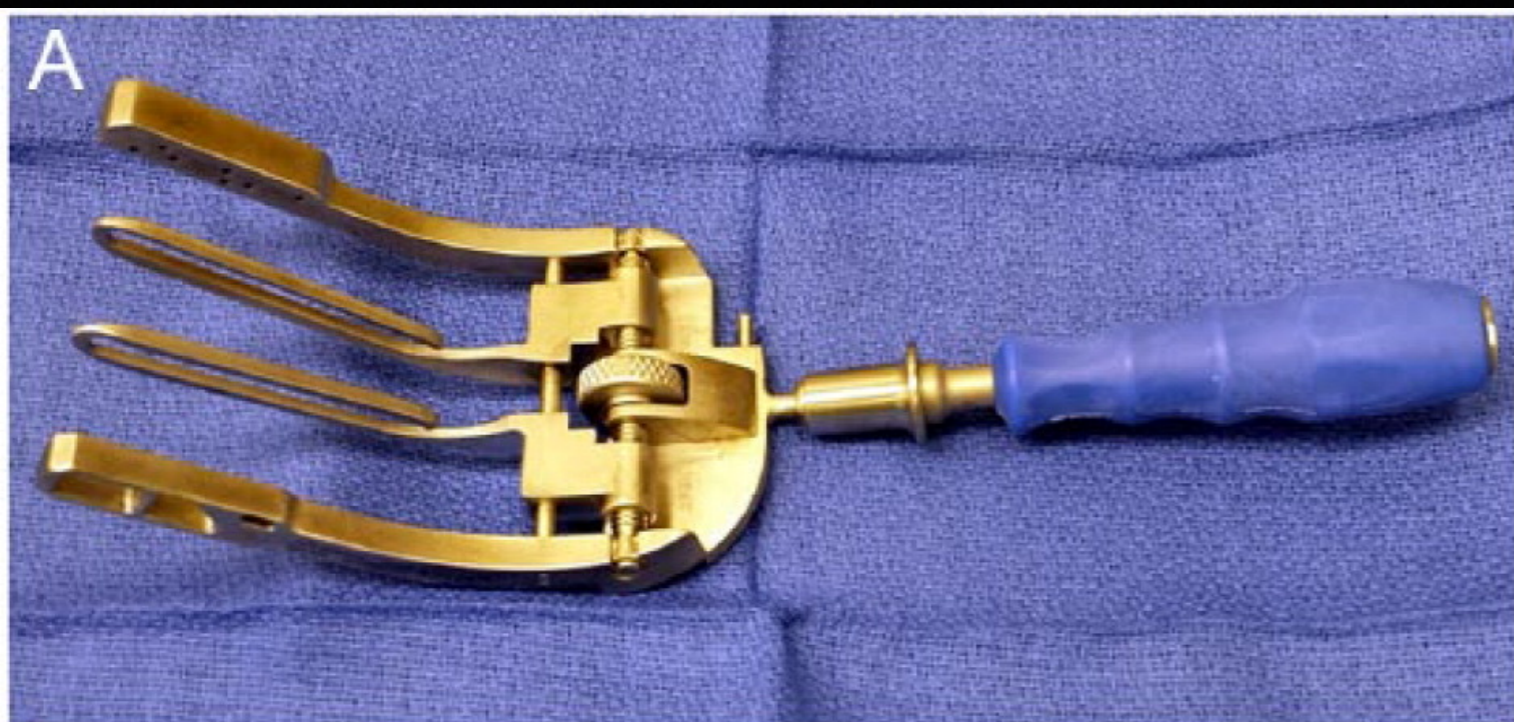
- Non-operative:
  - The weight bearing with heel raise on shoe.
- Surgery:
  - Repair
  - Outcome is quicker but only marginally better.



# Ruptured TA - Complications



- General:
  - Re-rupture
  - Weakness during toe-off when walking
- Surgery:
  - Scar sensitivity
  - Wound dehiscence
  - Infection
  - Stiffness of ankle



# Rate of DVT

DVT in lower limb immobilisation = 11%  
90% clinically silent

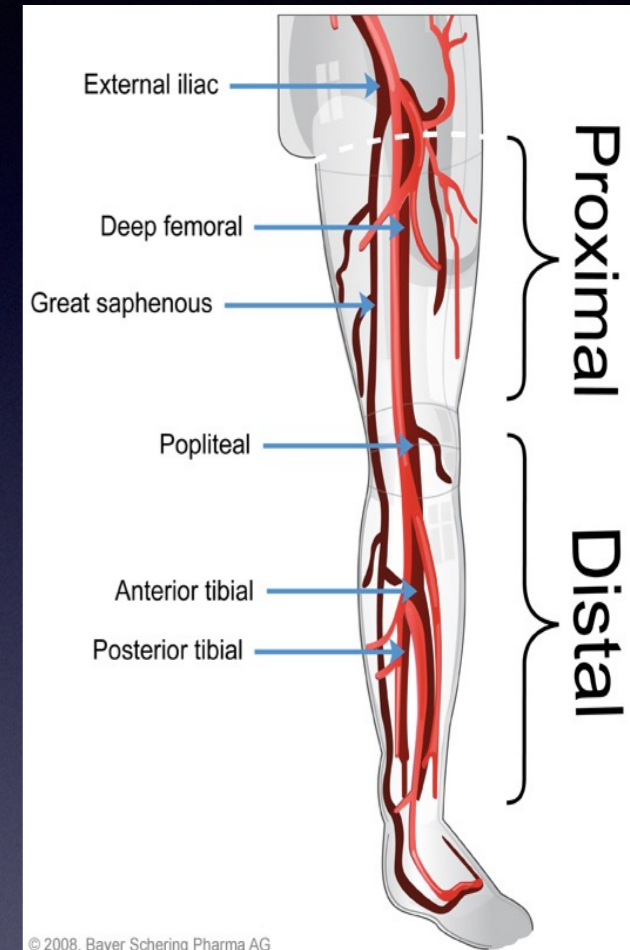
Low risk for post thrombotic syndrome (10%)

Rate of DVT for achilles rupture = 36%  
(regardless of surgical or non surgical treatment)

4% propagate to PDVT  
(previously reported as 15%)

DVT rate decreased from 17.95 to 9.6%  
With prophylaxis (LMWH)

0.8% (0.4-3%) PE



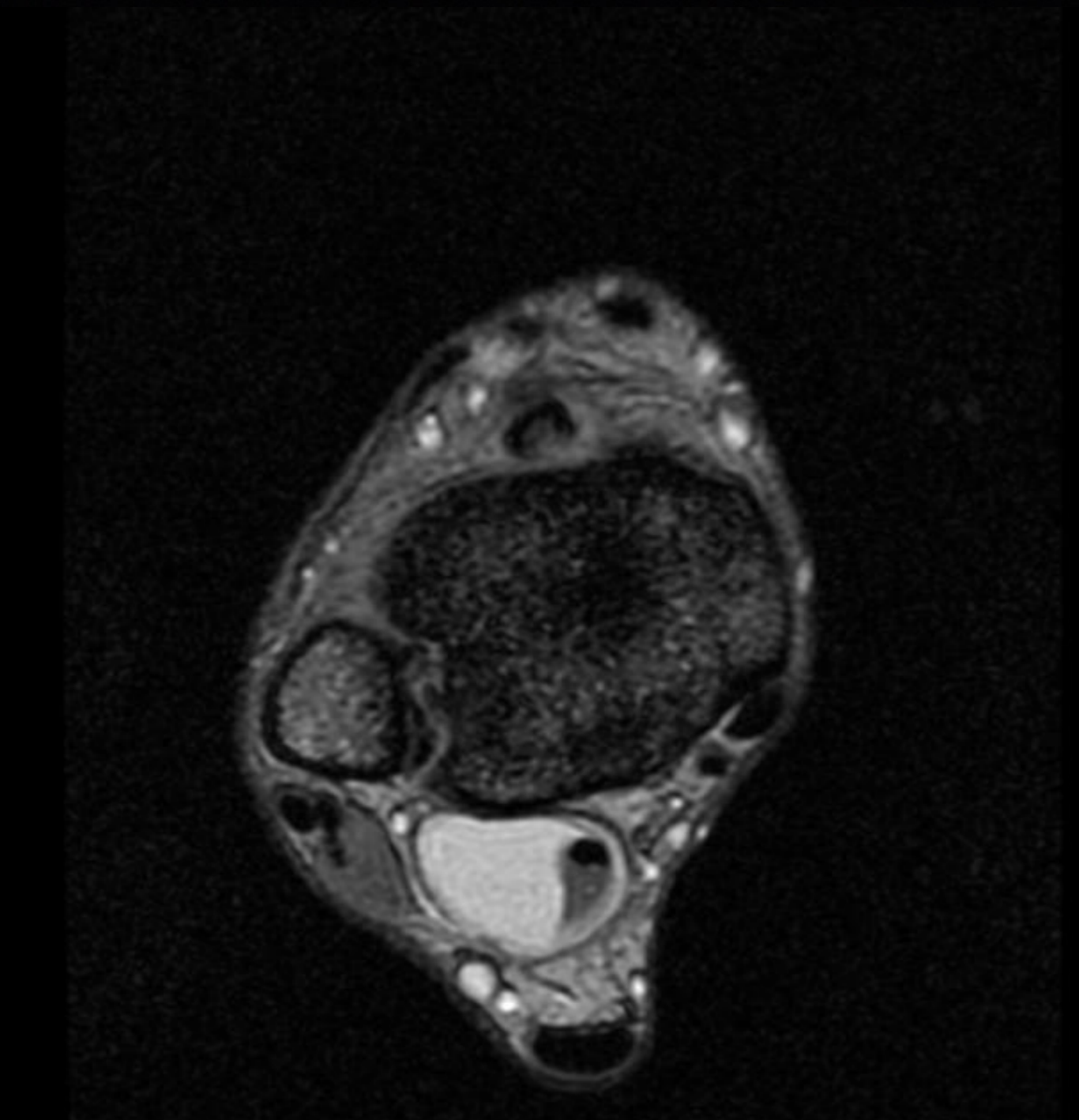
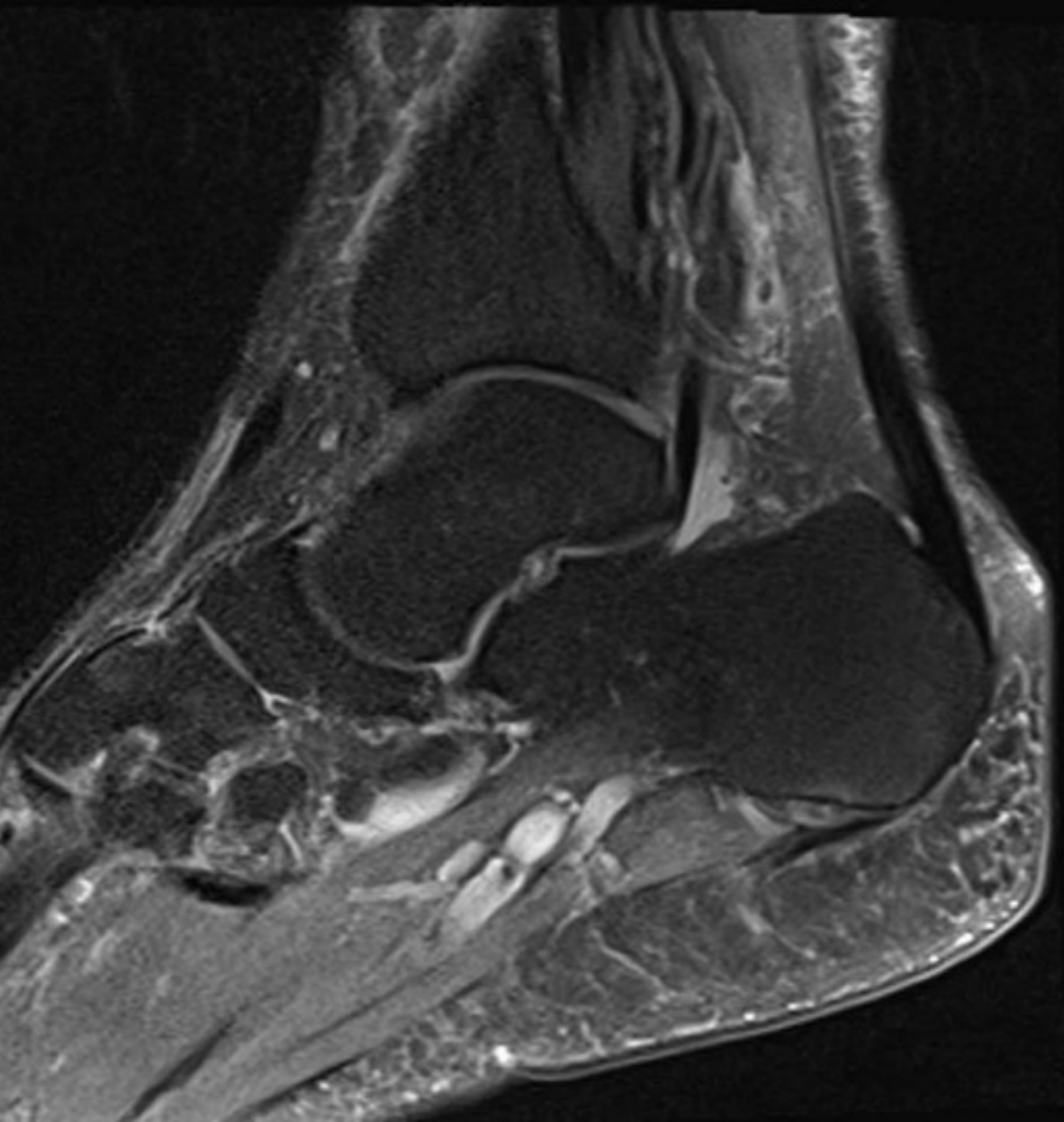
[Int J Angiol. 2017 Mar; 26\(1\): Prevalence of Acute Deep Vein Thrombosis in Patients with Ankle and Foot Fractures Treated with Nonoperative Management—A Pilot Study](#)

Ettema HB, Kollen BJ, Verheyen CC, Buller HR. Prevention of venous thromboembolism in patients with immobilization of the lower extremities: a meta-analysis of randomized controlled trials. Journal of thrombosis and haemostasis : JTH. 2008 Jul;6(7):1093-8. DOI: 10.1111/j.1538-7836.2008.02984.x.

# Case 3

- 22 yo avid ballet dancer
- Presents with posterior ankle pain and catching of her great toe





# FHL Tendonitis

- Treatment

## Nonoperative

- Rest/ activity modification, NSAIDs
  - Arch support
  - Physical therapy

## Operative

- Release of the FHL from the fibro-osseous tunnel, tenosynovectomy, possible tendinous repair
  - Recalcitrant symptoms
  - In athletes when symptoms persist despite rest

# Open release



# Case 4

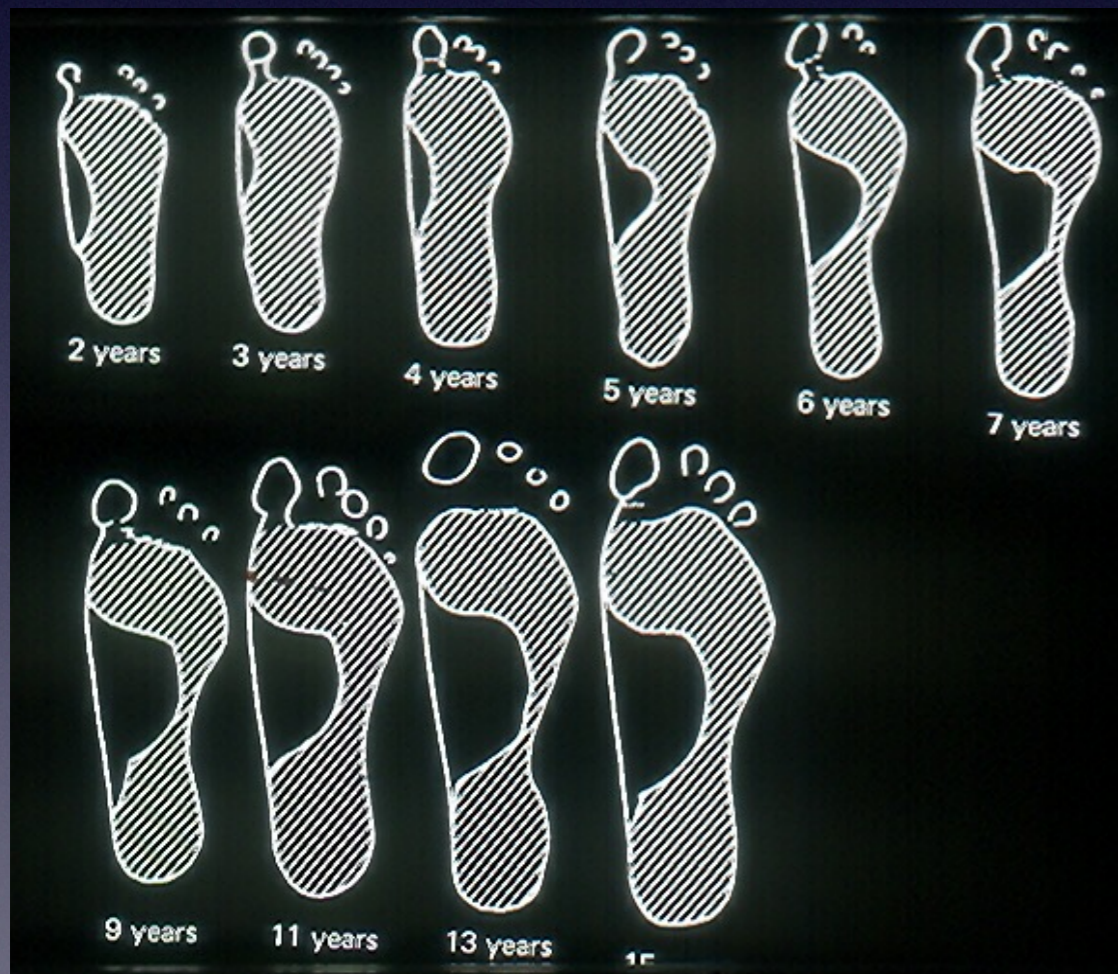
Mum worried about 4 years old sons foot shape

Says falls more than other kids





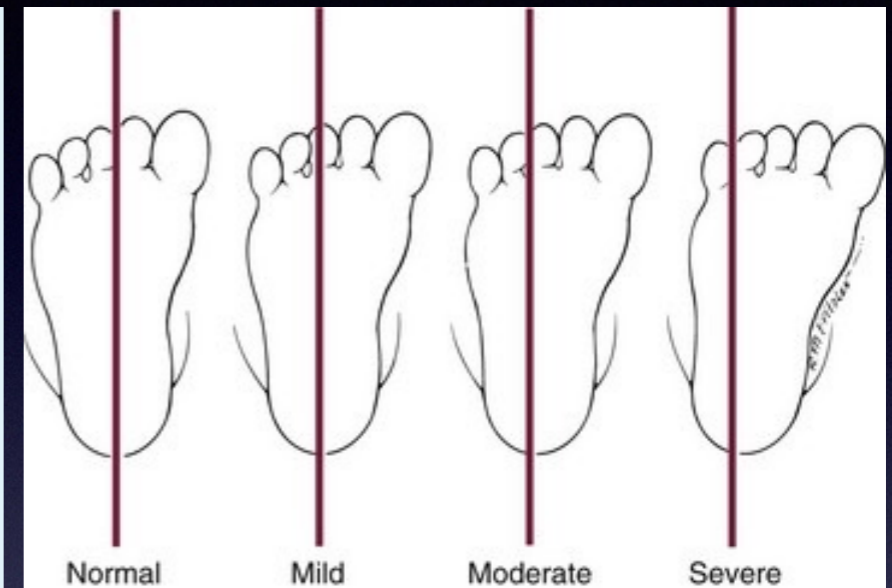
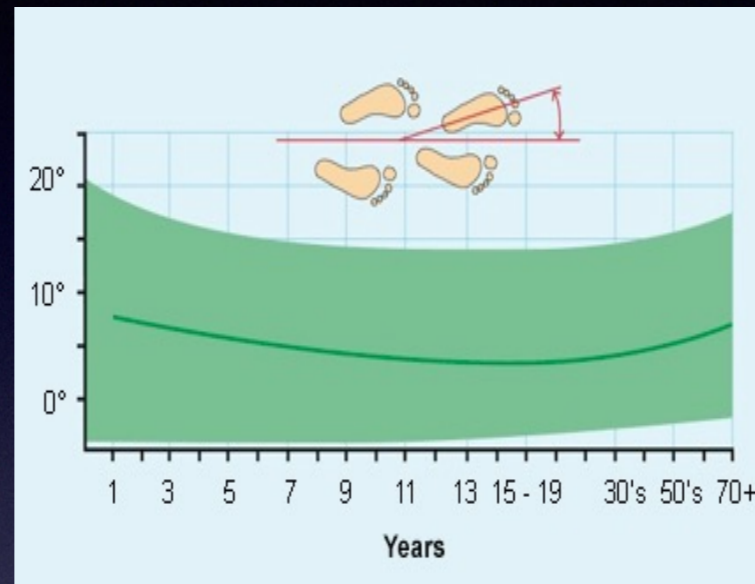
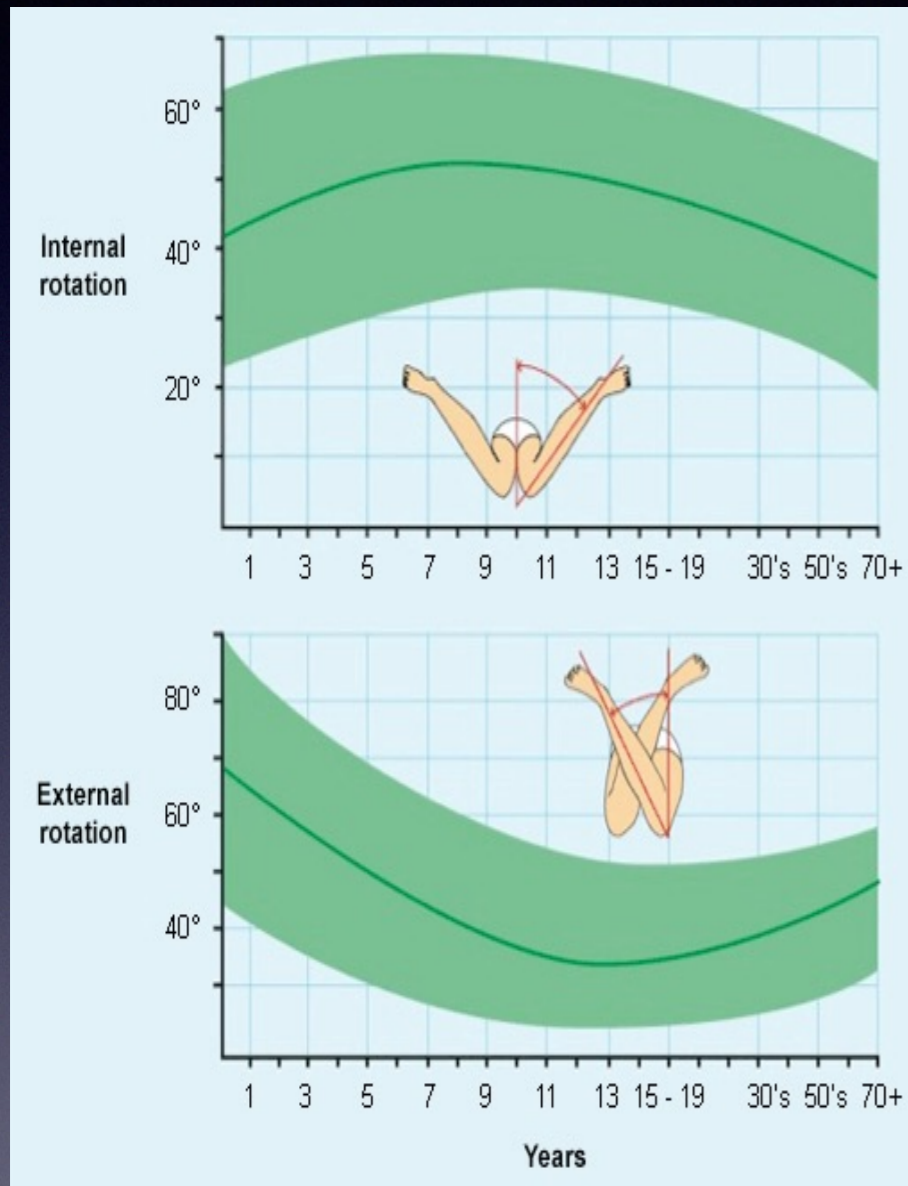
95% + resolve by 10 yrs. Insoles make no difference







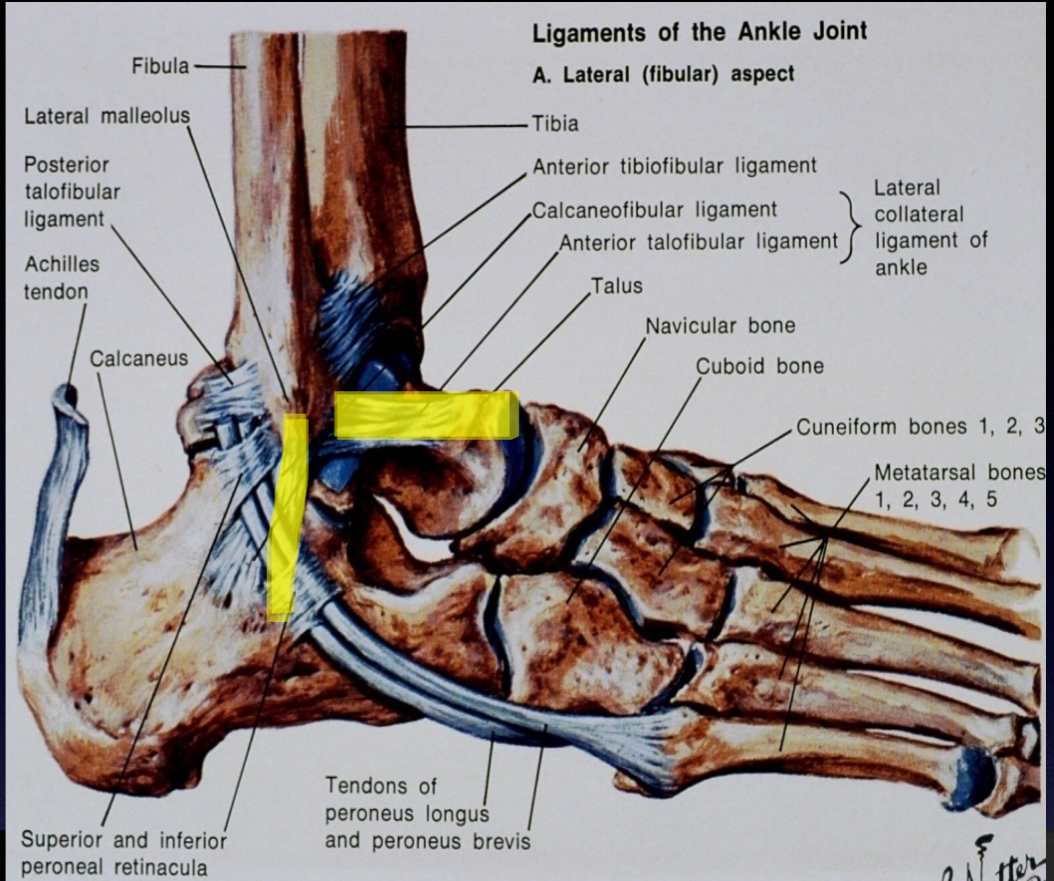
# Rotational profile



Metatarsus adductus  
90% spontaneously resolve by 5 yrs

# Case 5

- 27 year old social soccer player
- Isolated left ankle 'giving way' for 5 years
- Medically well. Non smoker

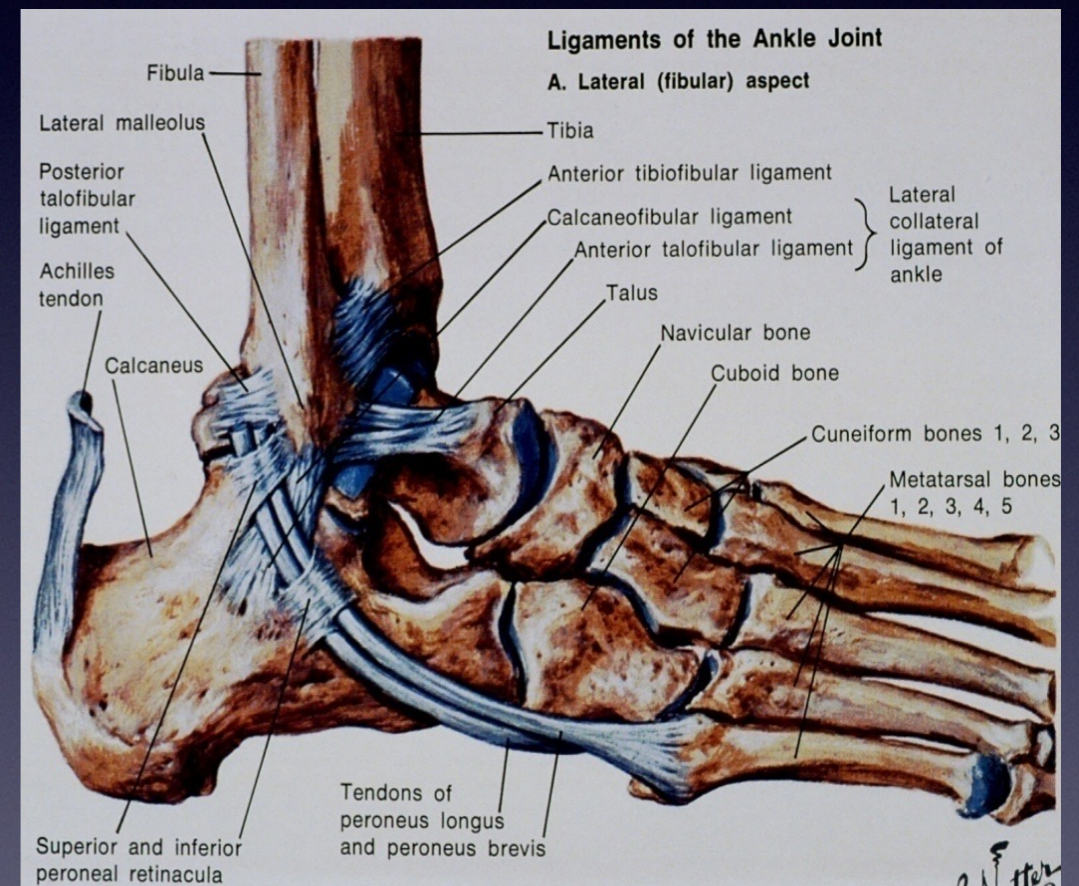


What are these x-rays testing?

# The Lateral Ligament

The ATFL is the main talar stabiliser and the CFL acts as a secondary restraint

- The AFTL is injured in 65% and combined injuries of the AFTL and CFL occur in 20%
- The CFL is a major stabiliser of the subtalar joint



# Anterior Drawer Test

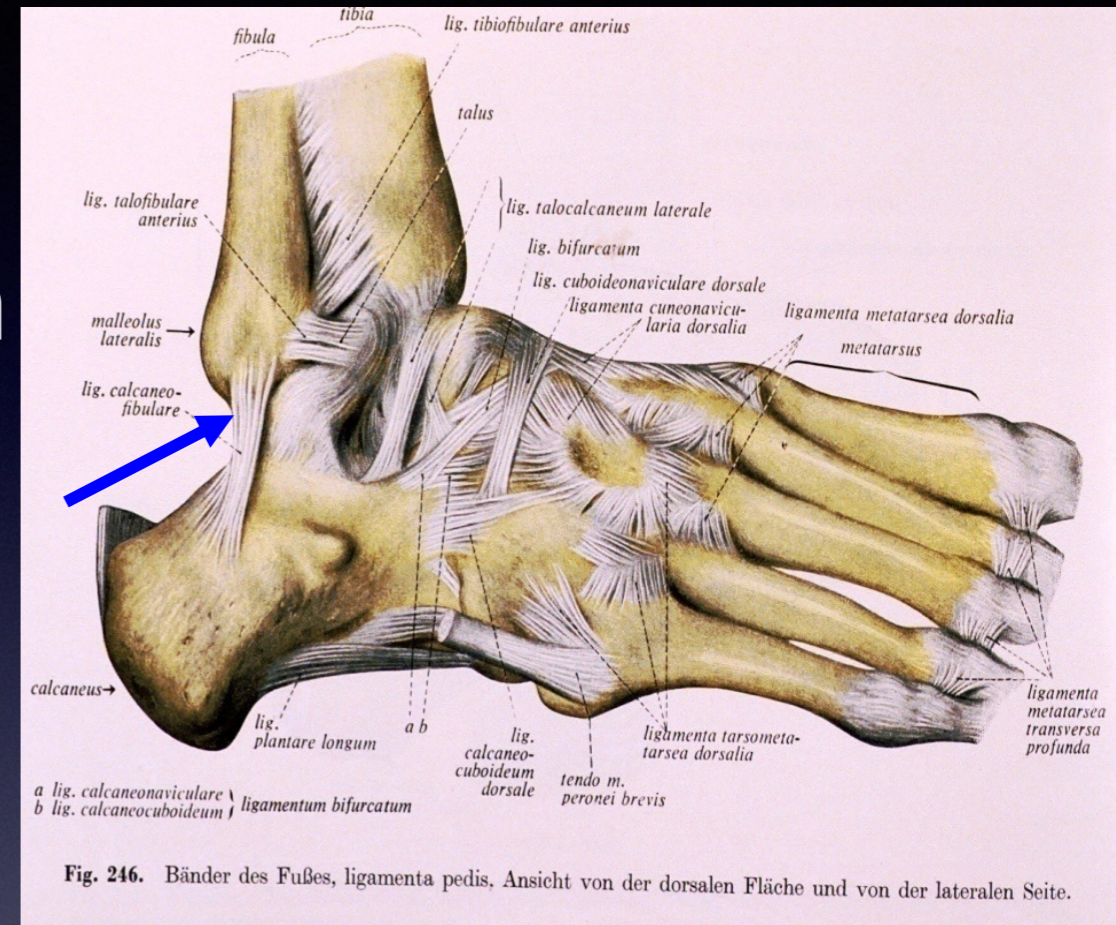


- stabilises the lower leg of the patient with one hand while the other hand cups the heel.
- An anterior force is applied to the heel attempting to move the talus anteriorly in the ankle mortise.
- Both ankles are tested for comparison.



# Talar Tilt Test

- CFL long rounded 20-25 mm long, 6-8 mm in diameter
- It contains the most elastic tissue
- Stabilises ankle and subtalar joint



# Management

## Non-operative

- Proprioceptive training to strengthen peroneals
- In acute injuries can consider brace that allows some DF & PF but no eversion/inversion. This has better outcomes than immobilization
- Strapping/bracing during sport
- Failure of this after 3 months, or recurrent instability is an indication for surgical management

*Article - Foot, Ankle, and Leg*

## **Recovery From a First-Time Lateral Ankle Sprain and the Predictors of Chronic Ankle Instability: A Prospective Cohort Analysis**

**Cailbhe Doherty, PhD<sup>\*,†</sup>, Chris Bleakley, BSc(Hons), PhD<sup>‡</sup>, Jay Hertel, PhD, ATC<sup>§</sup>, Brian Caulfield, PhD<sup>†</sup>, John Ryan, FCEM, FRCSEd, FFSEM, DCH, DipSportsMed<sup>¶</sup>, and Eamonn Delahunt, PhD<sup>†,¶</sup>**

Level 2 evidence


40% of first time ankle sprains go on to chronic ankle instability

RESEARCH

Open Access



# Current ankle sprain prevention and management strategies of netball athletes: a scoping review of the literature and comparison with best-practice recommendations

Patrick L. Rowe , Adam L. Bryant and Kade L. Paterson\*

84% increase in the number of ankle sprains in the 10–14 year age group over 10 years

64% go on to have chronic moderate-severe ankle instability

# Management

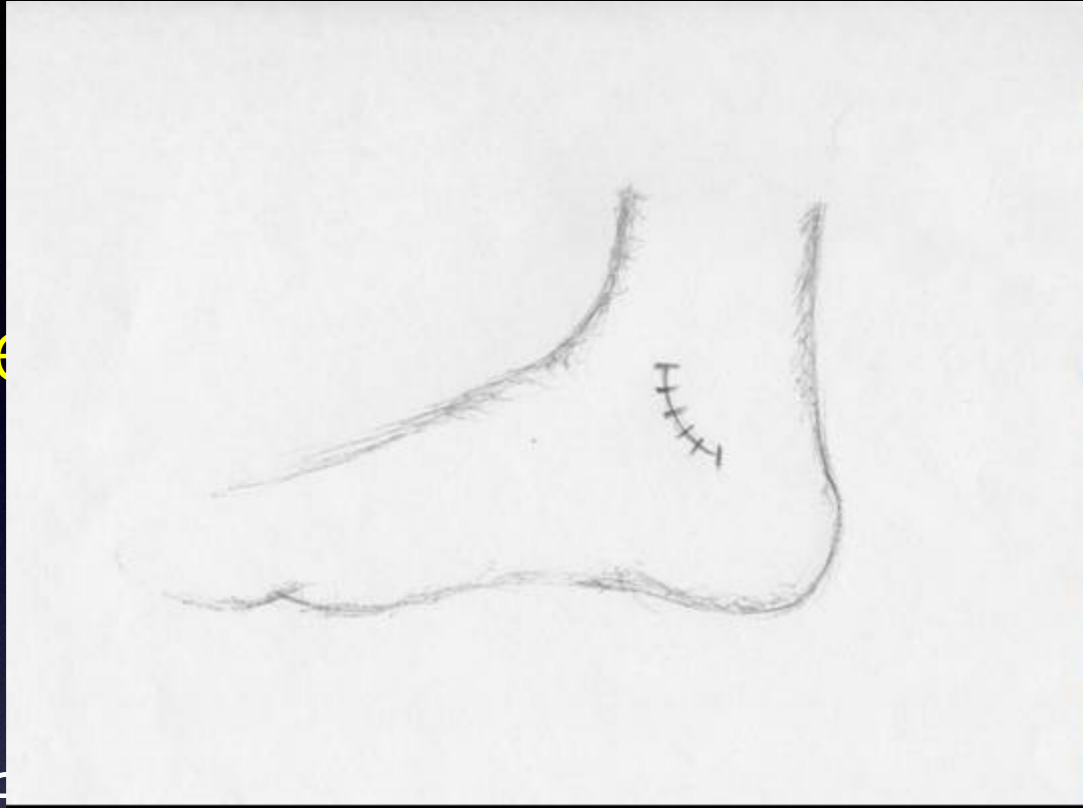
## Operative

Direct late repair (Brostrum)

+/- Gould modification (incorporation of extensor retinaculum)

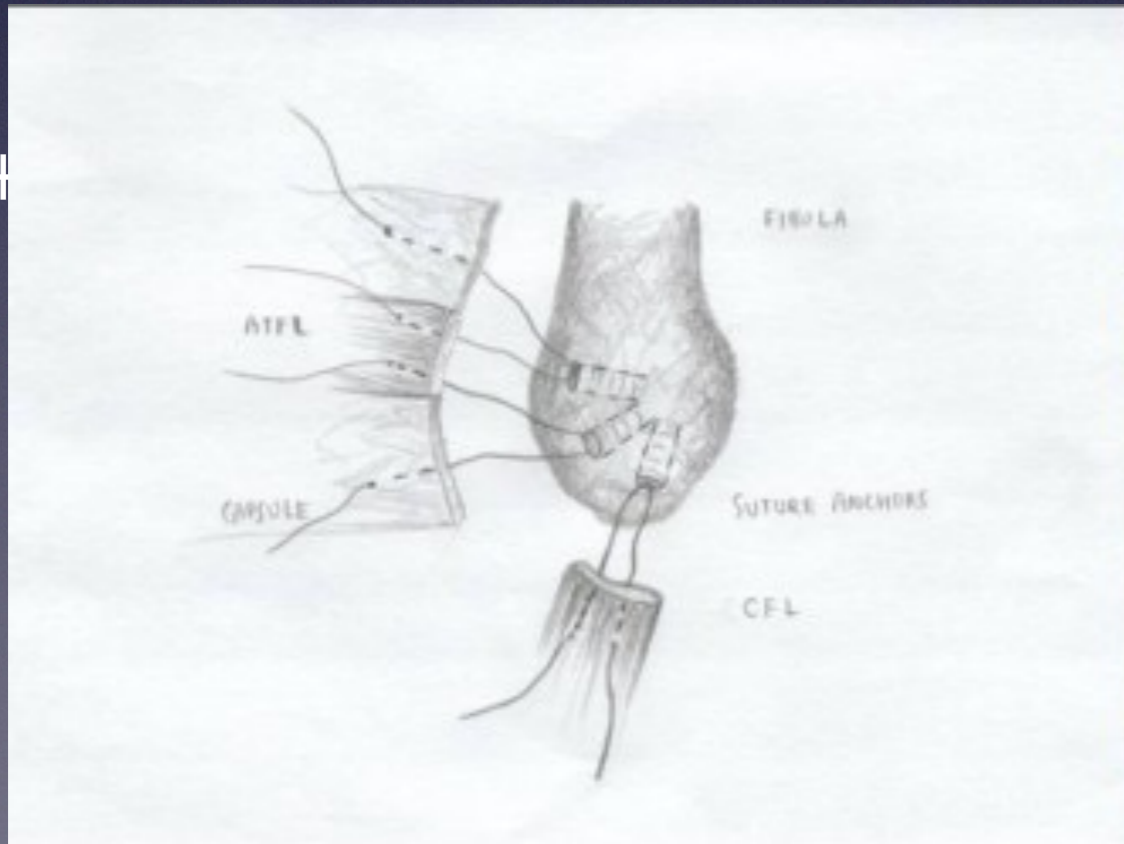
# Management

Open

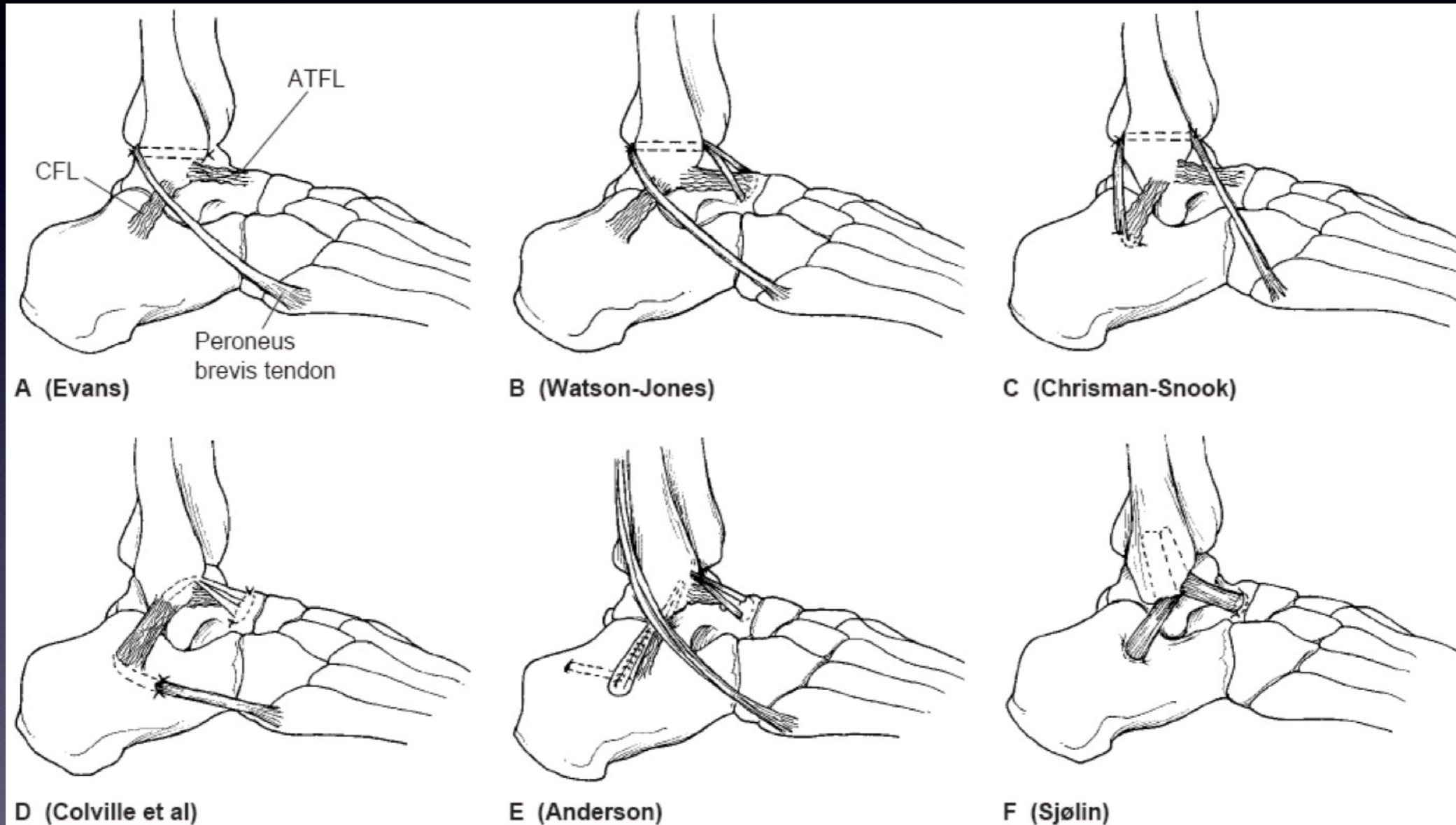


Direct rate repair (Direct repair)

+



# Augmented Options



**Fig. 6** Augmented reconstructions. **A**, The Evans reconstruction utilizes a tenodesis of the peroneus brevis tendon to the fibula. **B**, The Watson-Jones procedure reconstructs the ATFL in addition to tenodesis of the peroneus brevis tendon. **C**, The Chrisman-Snook procedure uses a split peroneus brevis tendon to reconstruct the ATFL and CFL. **D**, The procedure developed by Colville et al<sup>5</sup> also uses a split peroneus brevis tendon to reconstruct the ATFL and CFL in an anatomic fashion without limiting subtalar motion. **E**, The Anderson procedure utilizes the plantaris tendon to anatomically reconstruct both lateral ligaments without limiting subtalar motion. **F**, The Sjölin technique uses periosteal flaps to augment an anatomic repair.

# Rehabilitation

- POP back slab NWB for 2 weeks
- Then into removable walking AFO
- Ankle ROM allowed but no inversion 6 weeks
- Focus on proprioception and strengthening
- 6 weeks post op lace up ankle orthosis
- Progress to training/cutting by 3 months
- Return to sport 6 months with brace/strapping
- 85% good to excellent results, independent of procedure



# Case 6

- 15 yo male
- Pain limiting activities
- Midfoot pain when walking >10min



Clinically

-flatfoot

-rigid, doesn't correct with toes raise

-reduced subtalar ROM

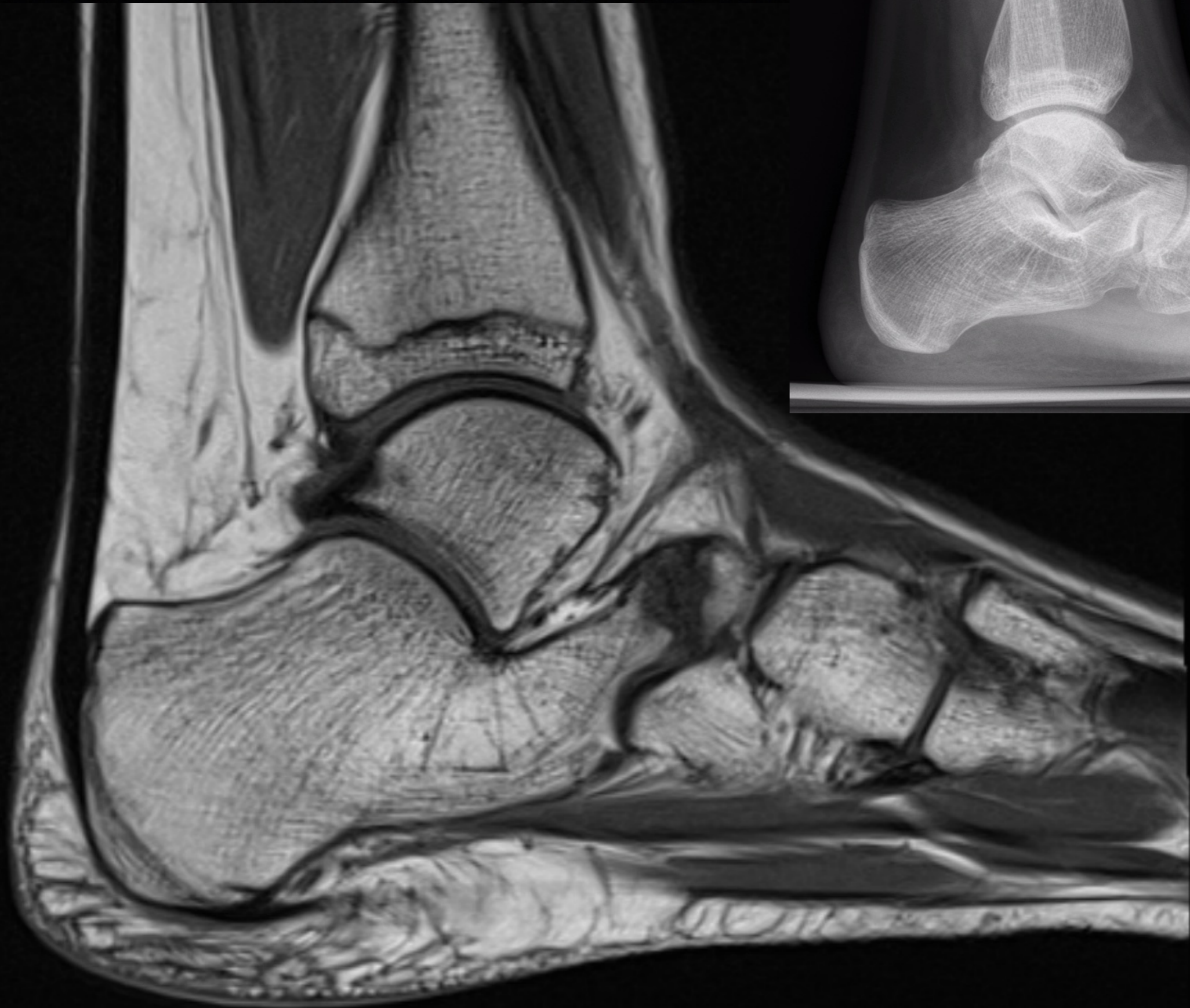
-evidence of recurrent ankle sprains





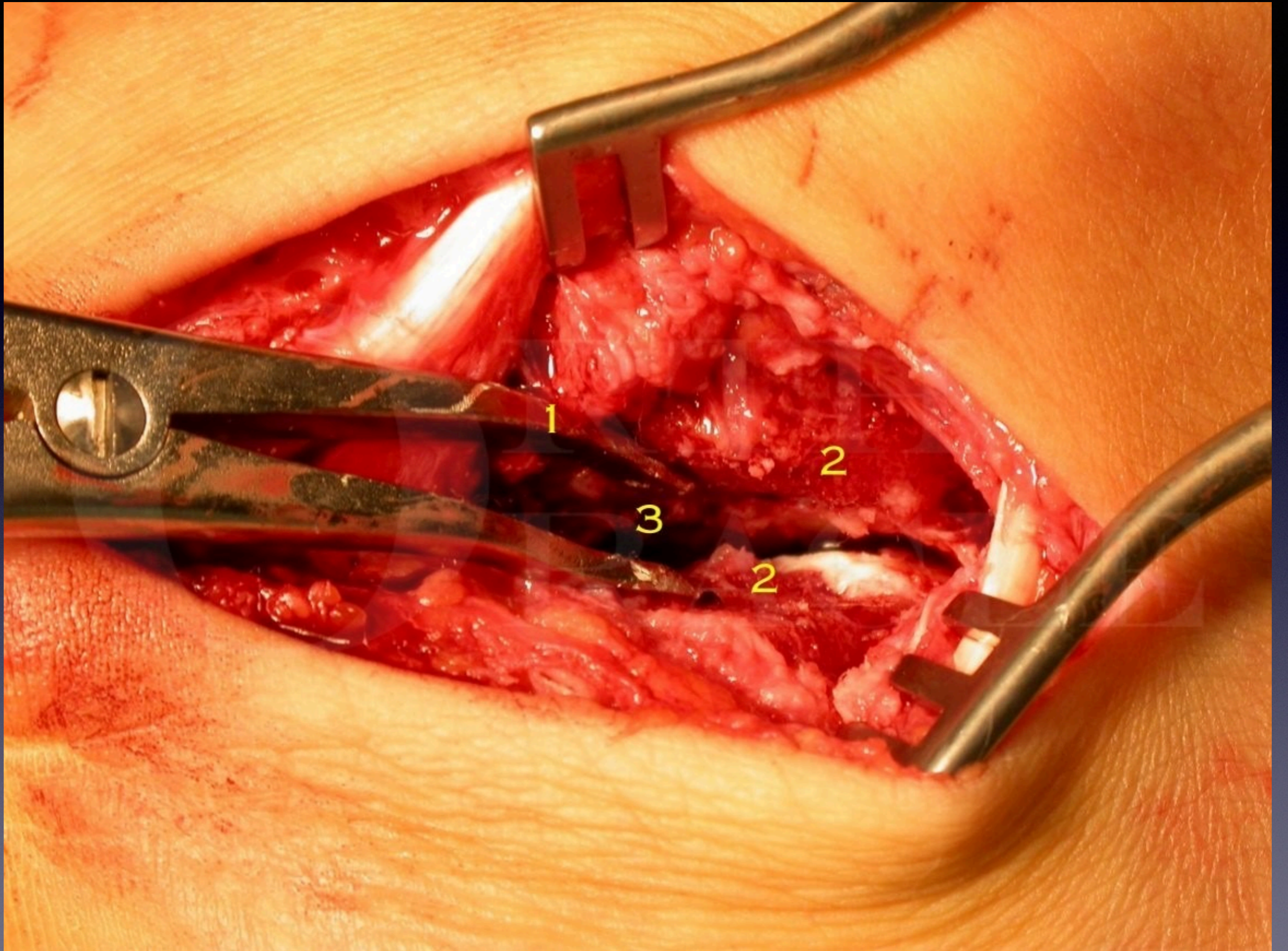
Weight Bearing





# Tarsal coalition

- Congenital union between two tarsal bones (failure of segmentation)
- 50% bilateral
- 10-20% have multiple coalitions in same foot
- Probably present from birth but only become symptomatic with increasing weight and skeletal maturity (young children have flexible cartilage)
- Symptoms usually occur when the bar ossifies
- Calcaneonavicular, TC



# Case 7

21 y/o female brought in by mother

Difficulty wearing shoes on right foot only past two years

Thinks it is getting worse





Pes cavus

Cavo-varus foot

TABLE 21-1

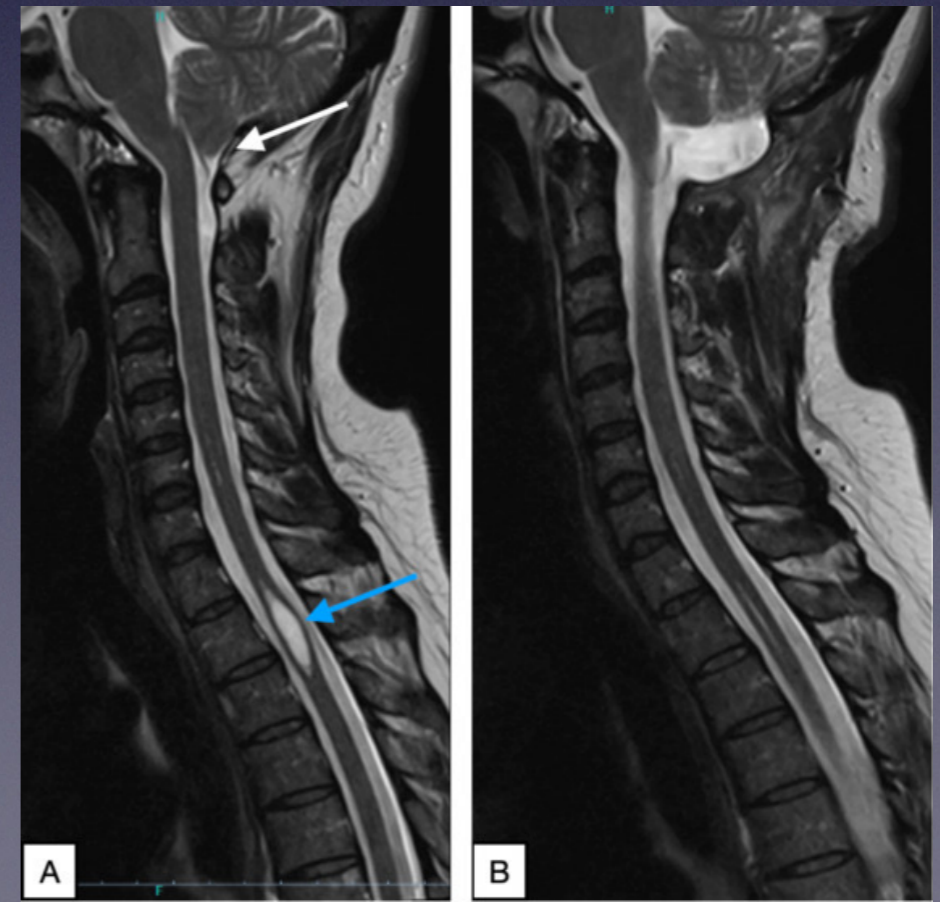
Etiology of Pes Cavus

Classification	Specific Etiology
I. Neuromuscular	
A. Muscle disease	Muscular dystrophy
B. Afflictions of peripheral nerves and lumbosacral spinal nerve roots	Charcot-Marie-Tooth disease Spinal dysraphism Polyneuritis Intraspinal tumor
C. Anterior horn cell disease of spinal cord	Poliomyelitis Spinal dysraphism Diastematomyelia Syringomyelia Spinal cord tumors Spinal musculature atrophy
D. Long tract and central disease	Friedreich's ataxia Roussy-Lévy syndrome Primary cerebellar disease Cerebral palsy
II. Congenital	Idiopathic cavus foot Residual of clubfoot
III. Traumatic	Arthrogryposis Residuals of compartment syndrome Crush injury to lower extremity Severe burn Malunion of fractured foot

Modified from Ibrahim K. In: Evarts CM (ed): Surgery of the Musculoskeletal System. Philadelphia, PA, 1991

## History:

- Family hx (CMT, high arches)
- Birth and developmental history
- Any spine issues or operations?
- How long?
- Unilateral or bilateral?
- Any sensory / motor changes?
- Bladder and bowel function
- Functional history



Non-operative:

Is it fixed or rigid?

Activity modification

Wide toe box

Metatarsal domes

UCLB



- Plantar fascia release
- Tendo-achilles lengthening
- Calcaneal osteotomy
- First ray / midfoot dorsal closing wedge osteotomy
- Peroneus longus to brevis transfer

# Case 8

- 20yr male
- Multiple inversion injuries playing indoor soccer
- Last injury 2 years ago
- Ongoing pain medially and also deep seated pain
- Limiting sports & mobility > 30mins
- Clicking



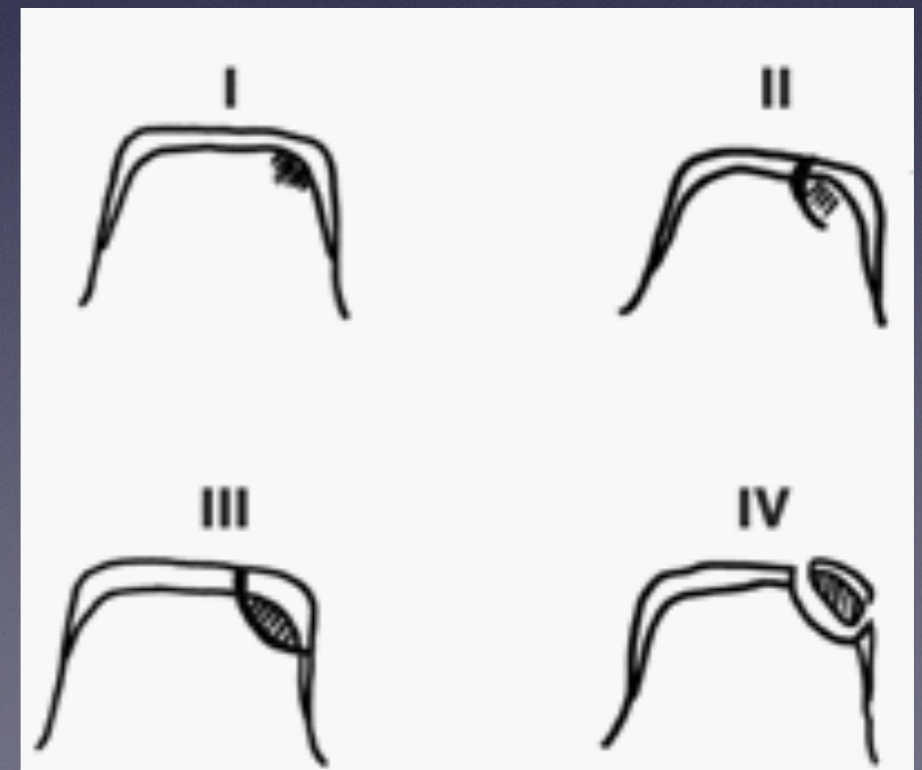
Begin as acute fracture

- May revascularise and unite
- May go on to AVN and non-union
- Overlying cartilage may degenerate
- Cyst may develop under fragment

# Factoids

- 6% of ankle sprains have an OCD
- **Causes of non-recovering ankle sprain (PISS OFFF)**
  - Peroneal subluxation
  - Instability
  - Sinus tarsi
  - Syndesmotic injury
  - OCD
  - Fracture base 5<sup>th</sup> MT
  - Fracture talus
  - Fracture calcaneum

- Posteromedial
  - 55% (more common)
  - Often **atraumatic** (around 70%) (can be proper osteochondritide) – more chronic
  - Better prognosis







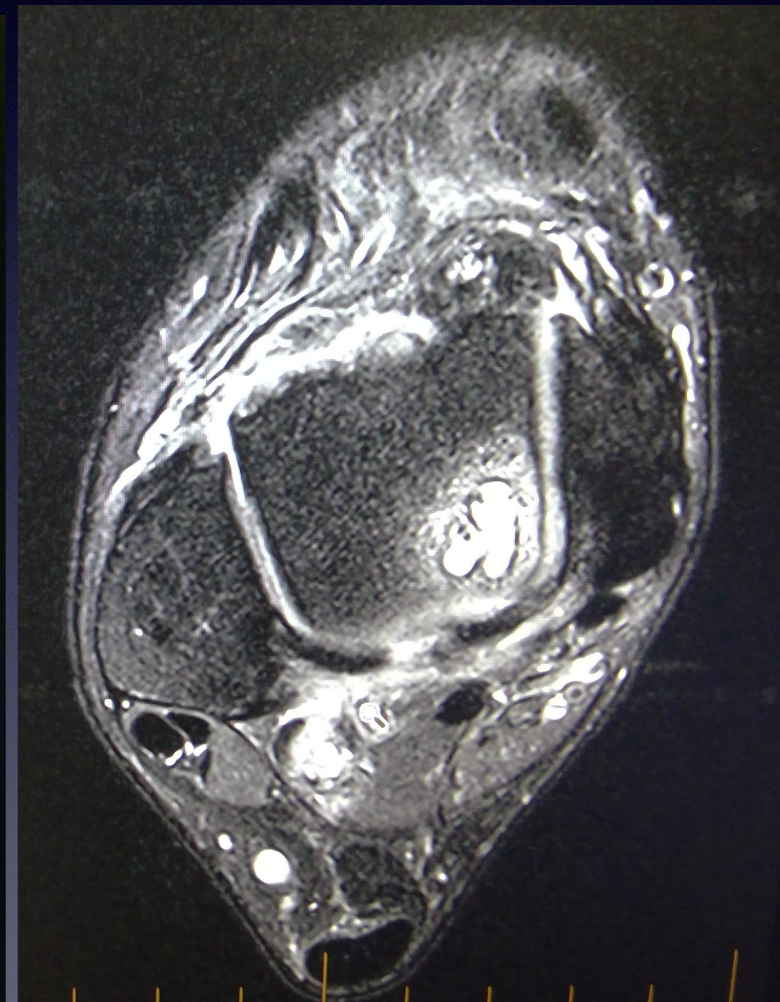
## Anterolateral

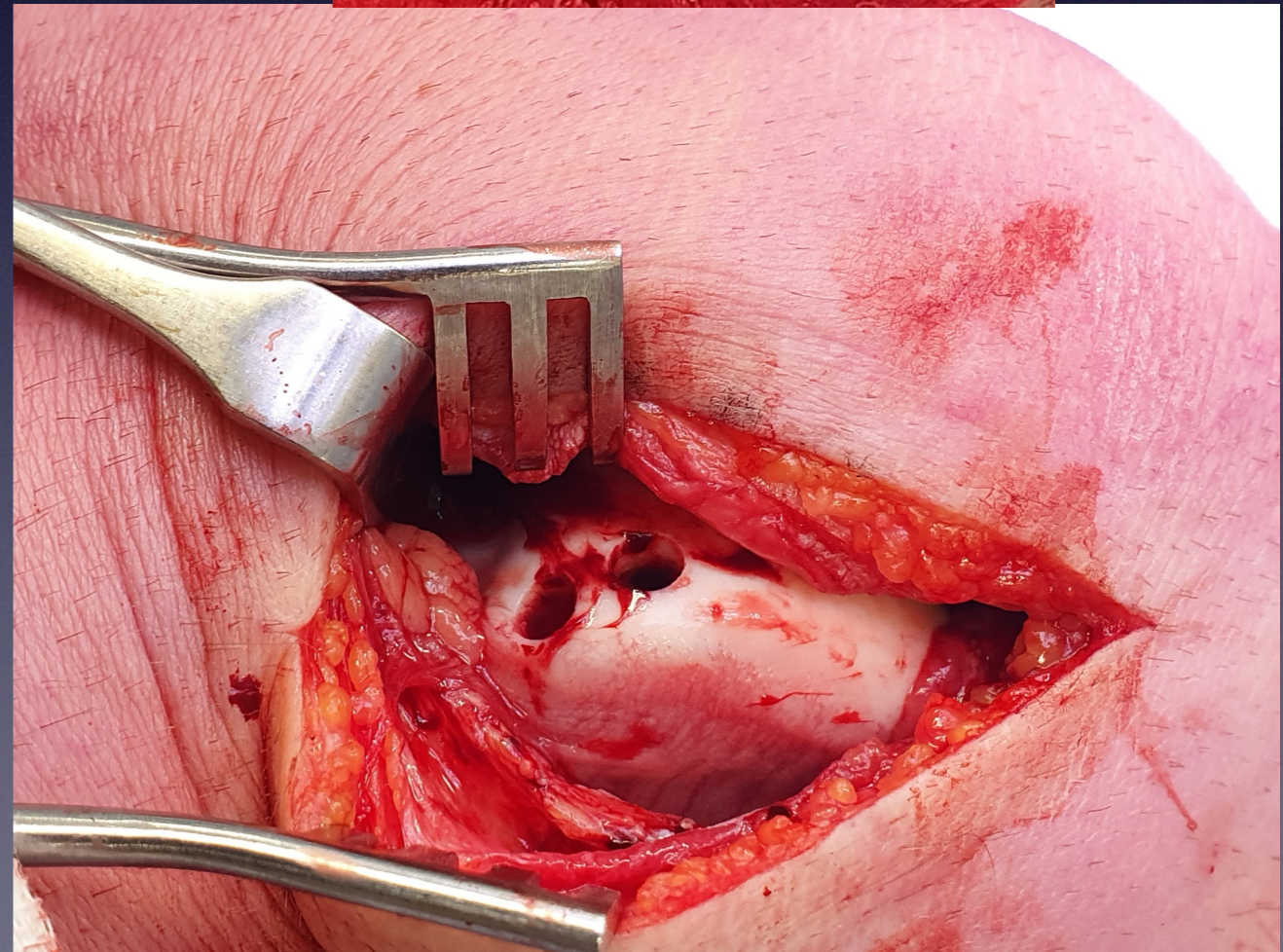
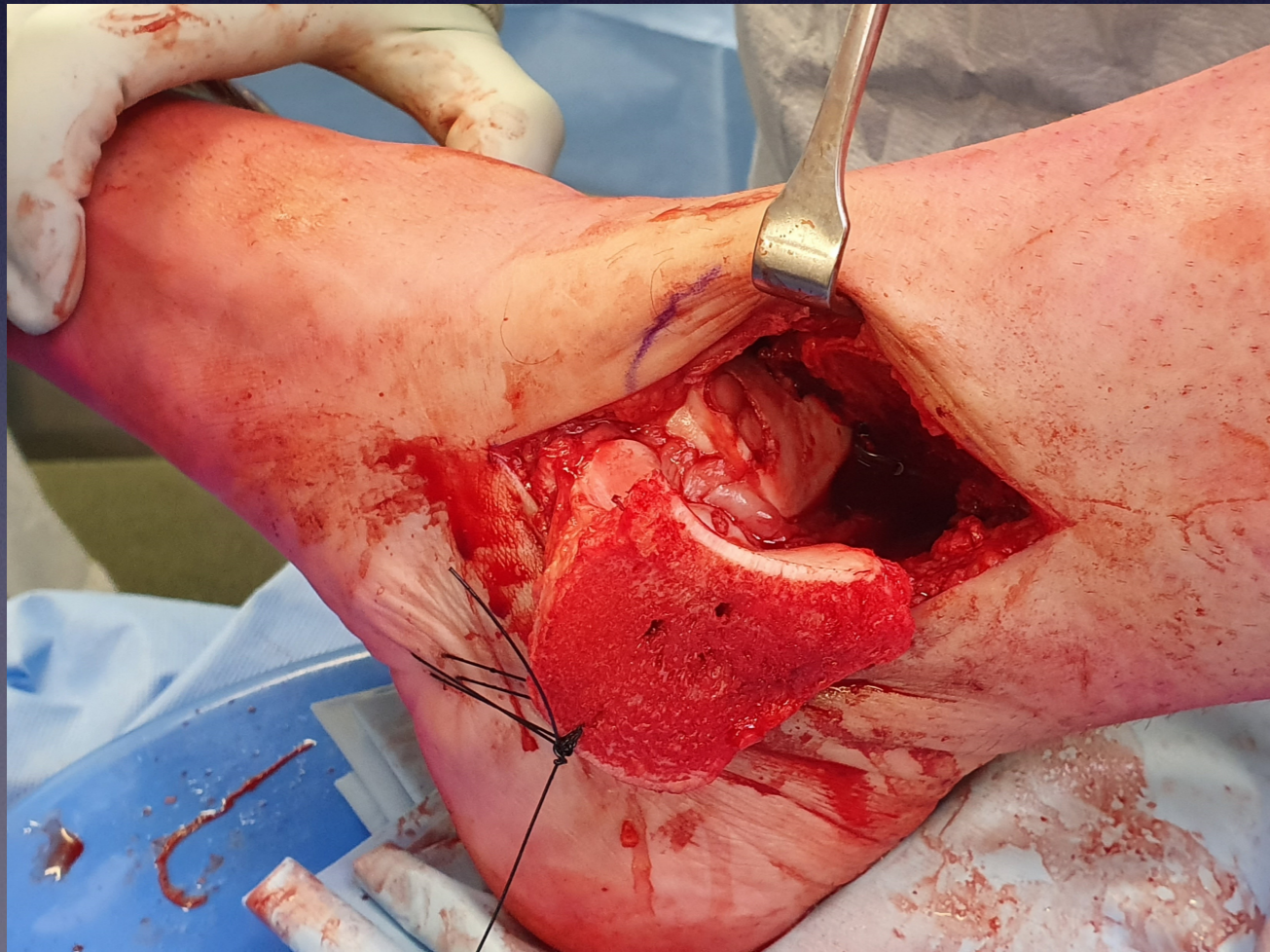
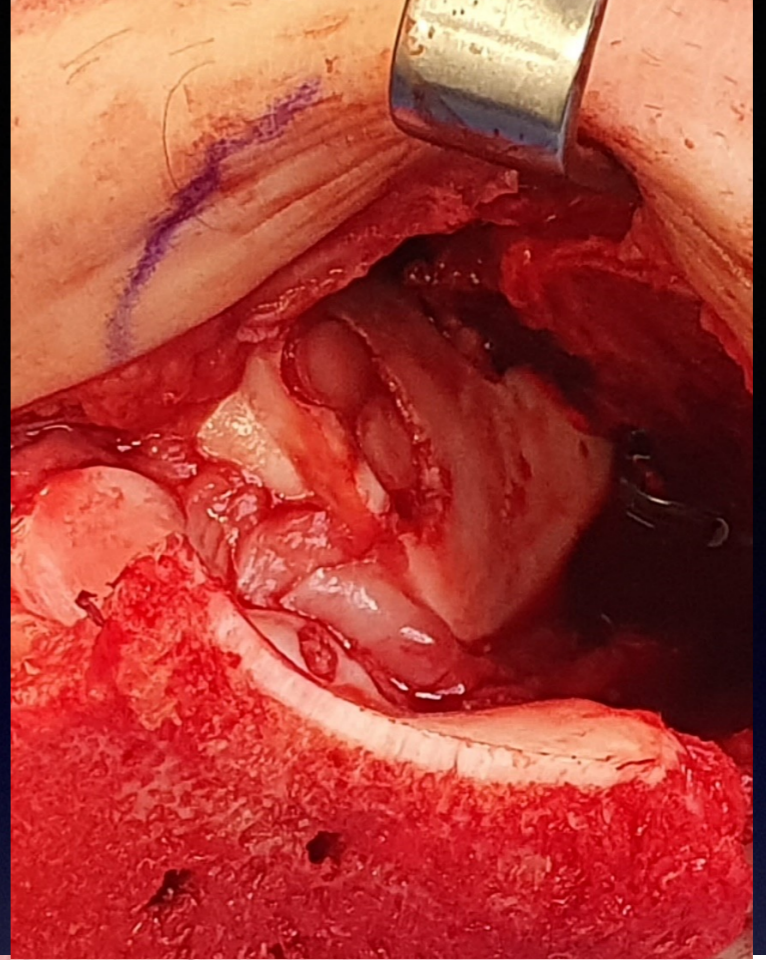
- 45%
- Traumatic – acute
- Often smaller, shallower than medial
- Worst prognosis



# Management

- Size dependent
- <1cm – excise and drill
- >1cm, cartilage cap intact – drill
- >1cm + displaced – ORIF vs osteochondral grafting (or microfracture)
  
- OATS, mosaicoplasty, ACI and MACI are gaining popularity but no real evidence
  
- OA in 25% (75% stage 3 and 4)





# Common Injuries

- Growth plate fractures
- Achilles rupture
- Normal variants
- Skew foot
- Chronic ankle instability
- Tarsal coalitions
- Cavovarus foot
- Talus OCD

# THANK YOU

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