

Mechanical Treatment with Taping and Orthosis for Sports Injuries of Ankle and Foot

高國峰

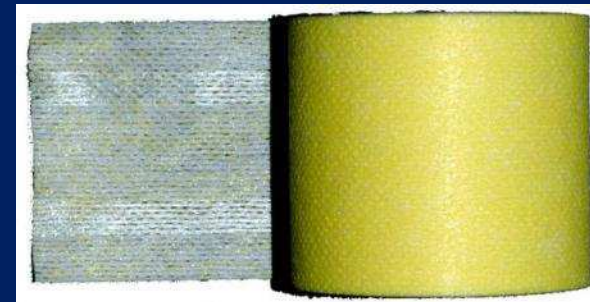
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Foot and Ankle Soft –Tissue Injuries

- Foot and ankle injuries are the most common injuries sustained by athletes and seen by sports medicine physicians.
- Studies of sports related injuries in running and jumping sports have suggested an incidence of injuries of **10% to 15 % for the ankle** and of **3 % to 15 % for the foot**.

Tape Feature

- Elastic adhesive tape
 - Kinesio[®] Tape
- Directional elastic adhesive tape
 - Ez Peel[®] Tape
- Nonelastic adhesive tape
 - 白貼



Orthoses

An **externally applied device** used to modify the structural or functional characteristics of the neuromuscular skeletal system.

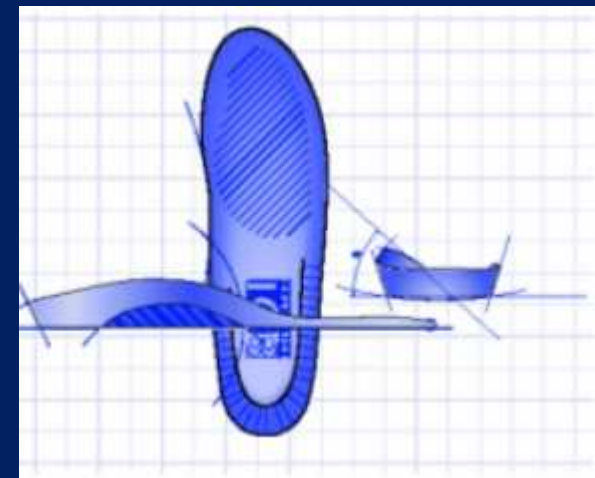
Foot Orthoses (Fos)

- Prefabricated

1. Off-load specific area of the foot
2. Cushion the foot from impact
3. Support the medial longitudinal arch
4. Provide biomechanical control of hindfoot movements

- Custom

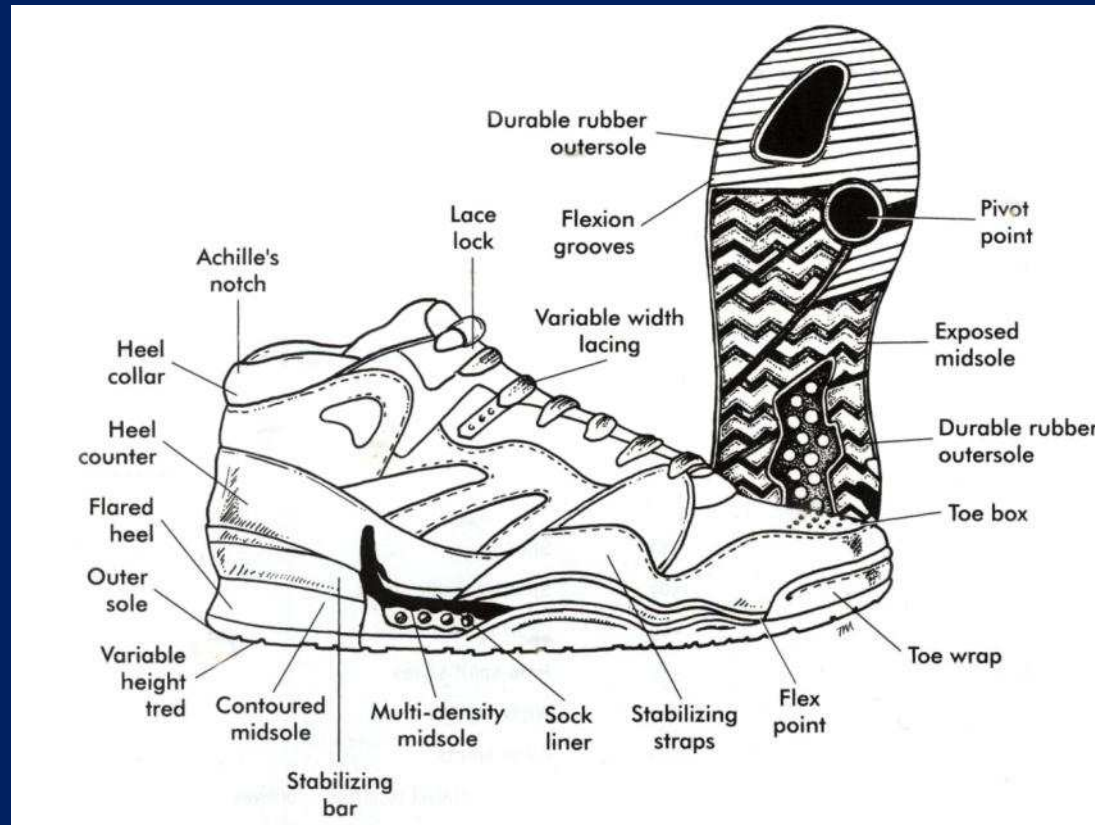
1. Accommodative
 - Used in more rigid deformities
 - Relieve pressure under bony prominence
2. Functional
 - Flexible feet



Foot Orthoses (Fos)

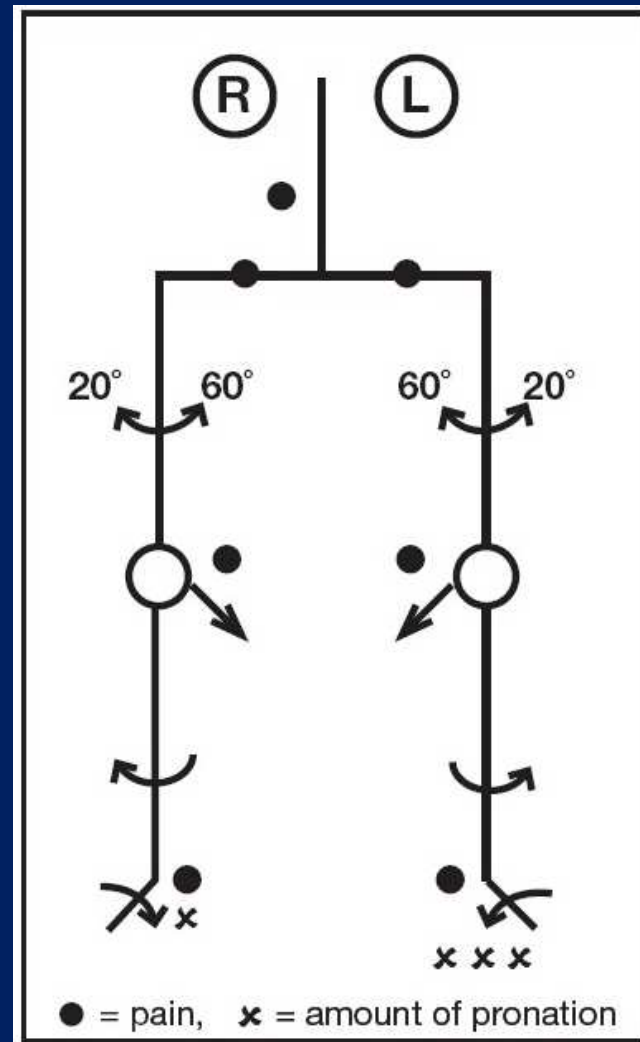
- Confined to the **foot** only
- Not include the ankle
- An **in-shoe brace** (inside a close shoe)
 - to correct for abnormal foot and lower extremity function
 - abnormal foot pronation
- Complete evaluation of all aspects of foot function will improve overall outcome
- **Shoe wear** is a central component of the general function of the foot orthosis .

Athletic shoe



Lower Limb Biomechanics

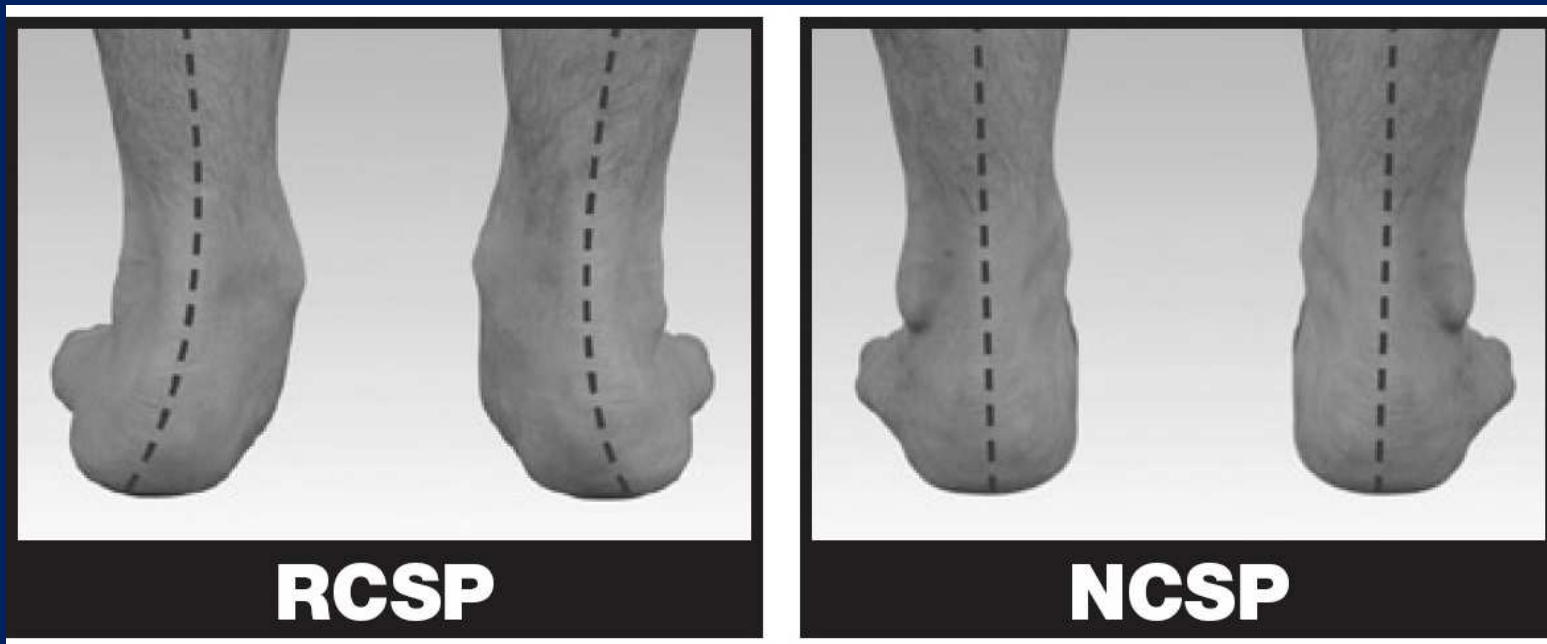
- Hip rotation
- Tibial torsion
- Leg length



Lower Limb Biomechanics

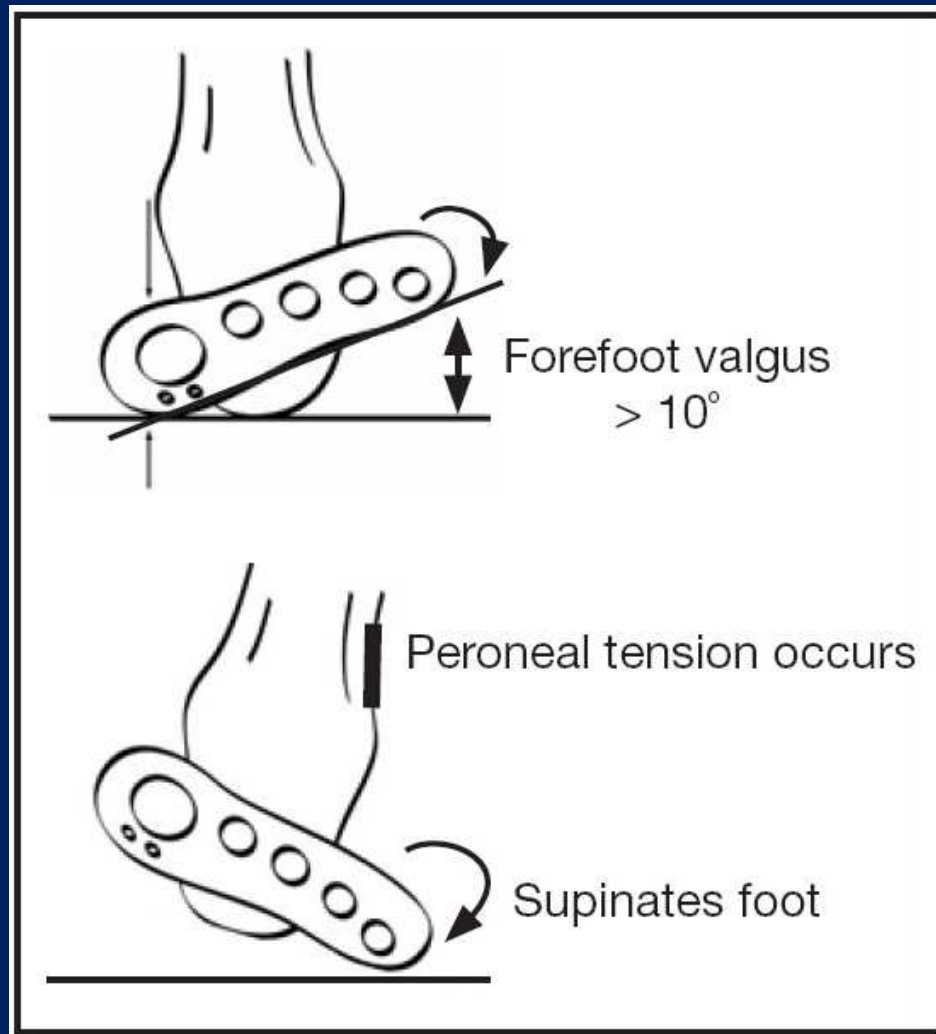
- Subtalar motion

- **RCSP**: Resting Calcaneal Stance Position
- **NCSP**: Neutral Calcaneal Stance Position



Lower Limb Biomechanics

- Forefoot motion
 - Valgus
 - Varus



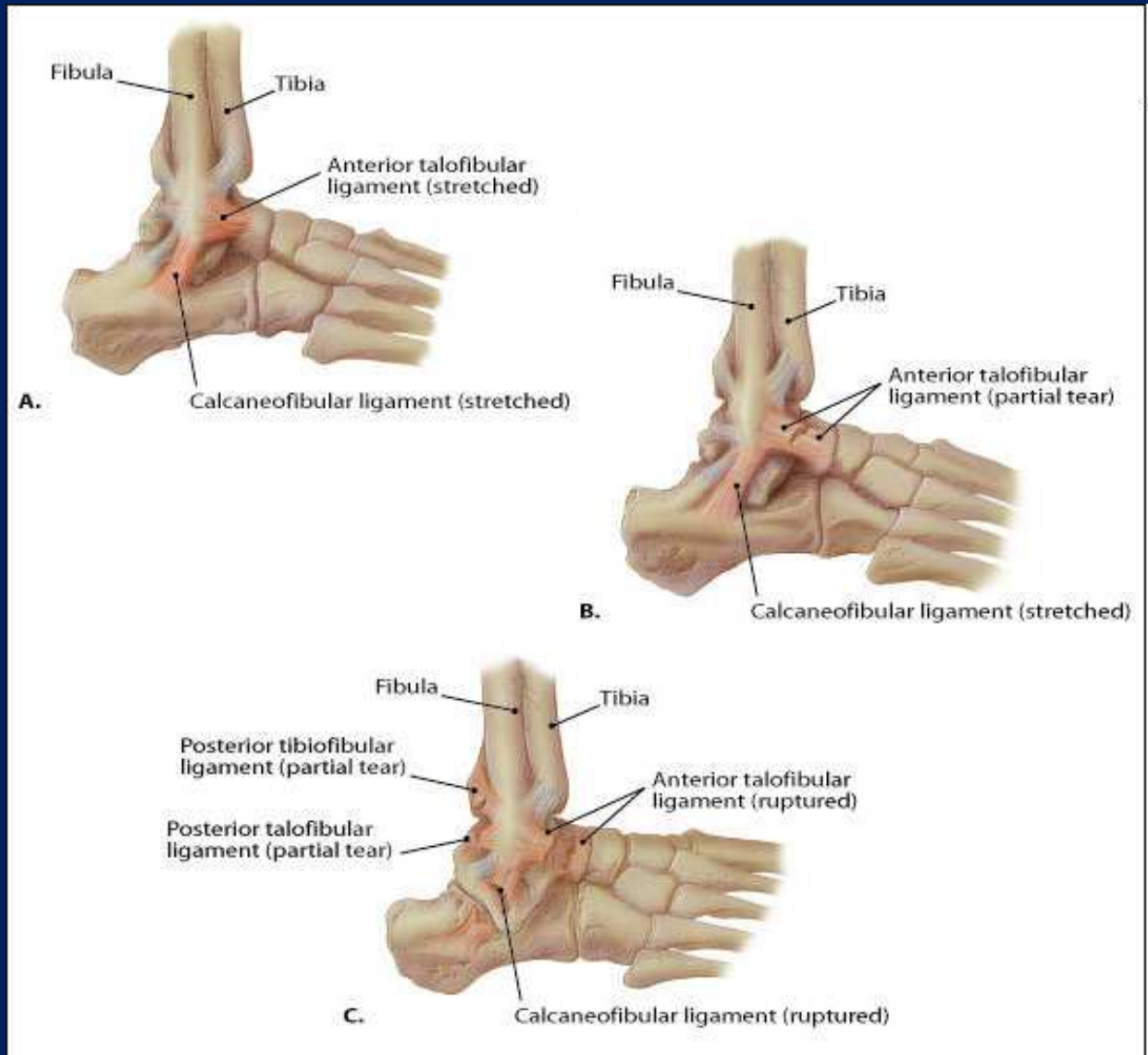


- **Ankle sprain**
 - Inversion ankle sprain
 - Eversion ankle sprain
- **Plantar heel pain**
 - Plantar fasciitis
 - Plantar fasciosis,
 - Heel spur syndrome
- **Achilles heel injuries**
 - Insertional achilles pain, retrocalcaneal bursitis, insertional achilles enthesopathy, hunglund's deformity
- **Sever's disease(calcaneal apophysitis)**
- **Bunion, Hallux valgus**
- **Metatarsalgia**
- **Interdigital neuroma(morton's neuroma)**
- **Turf toe**

Ankle Sprains

- **Lateral** Ankle Sprain (**Inversion**)
 - 85% of ankle sprains
 - Landing on an inverted and plantarflex ankle
- **Medial** Ankle Sprain (**Everson**)
 - Occur during eversion, pronation

Lateral ankle ligaments

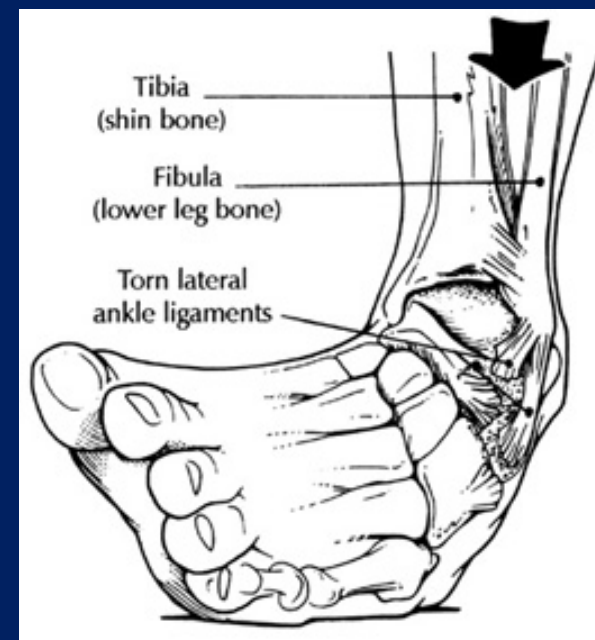


Medial Ankle ligaments



Inversion Ankle sprain

- Simple strain of lateral ankle ligaments
- Avulsion fracture
- Fracture dislocation

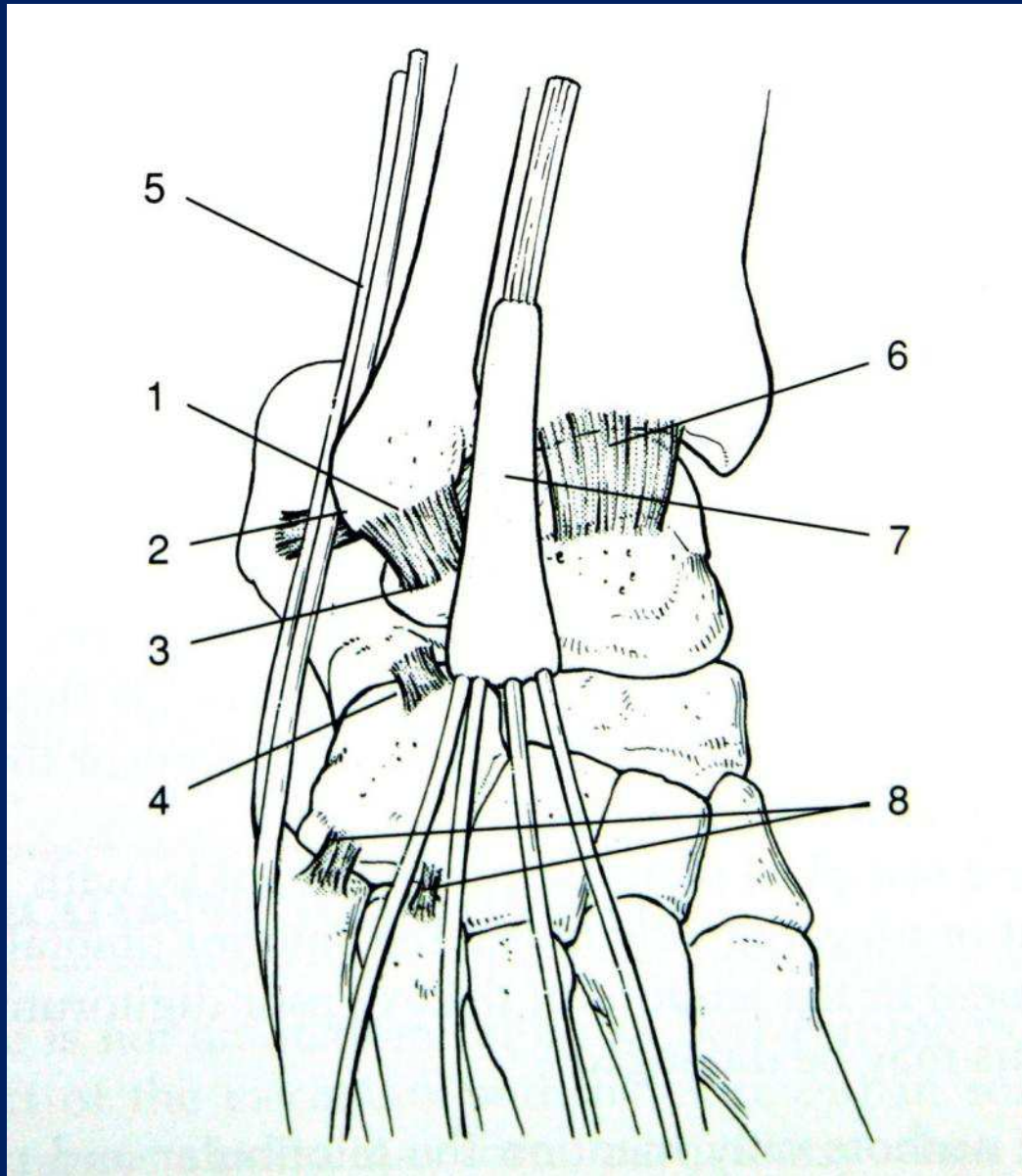




Lateral Ankle Sprains

- Initial management(PRICE MM)
 - Protection
 - Rest
 - Ice
 - Compression
 - Elevation
 - Medication
 - Modalities
- Functional rehabilitation

Sites of Inversion Ankle Sprain



1. ATFL , fibular origin
2. CFL, fibular origin
3. ATFL, talar insertion
4. Calcaneocuboid ligament
5. Peroneal tendons
6. Anterior tibiotalar ligament
7. Extensor digitorum longus tendon
8. Cuboid 5th & 4th metatarsal joint ligaments

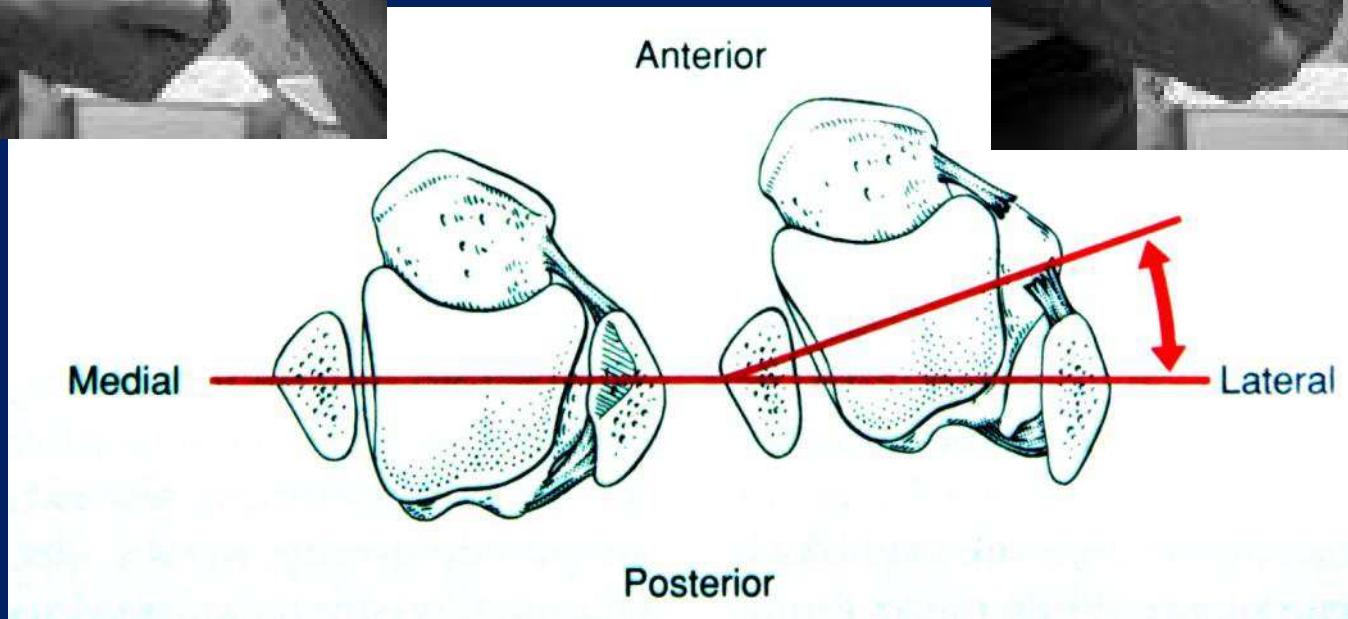
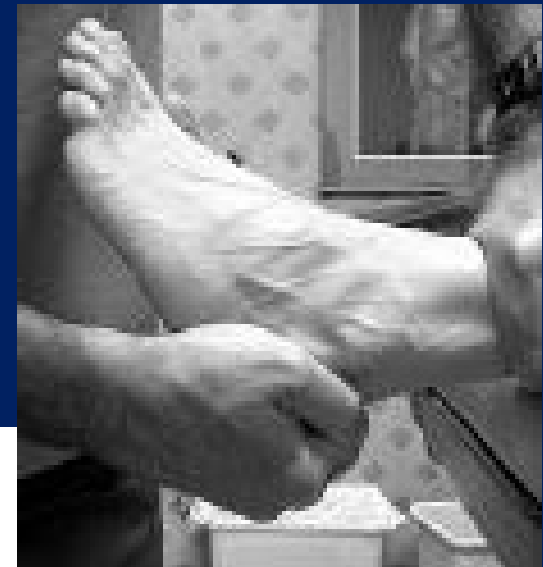
Acute Lateral Ankle Sprain

- The most common mechanism :
 1. Excessive inversion
 2. internal rotation of the hindfoot
- Maximal strain on the lateral ankle ligaments

Clinical examination

- ATFL laxity
 - the amount of anterior displacement of the talus from the ankle mortise on the injured versus the uninjured ankle.
 - The anterior drawer test: the ATFL is the primary restraint to anterior talar displacement
- CFL laxity
 - The inversion test

Anterior drawer test



The talar tilt test

The talar tilt test assesses the ankle mortise to inversion and eversion comparing the ankle joint with opening of the lateral and medial complexes

Greater opening on one side versus the other indicates a positive test



Classification of Acute Lateral Ankle Sprains

Grade	Ligament injury
I	The ATFL is stretched and some of the ligament fibers are torn. No frank ligamentous disruption is present
II	Moderate injury to the lateral ligamentous complex, frequently with a complete tear of the ATFL ± partial tear of the CFL
III	Complete disruption of the ATFL and the CFL ± capsular tear ± PTFL tear

Treatment

- **Grade III** lateral ligament sprains may be managed with cast immobilization, functional rehabilitation, or surgical anatomic repair
- Limited immobilization (not exceeding 3 wk) followed by functional rehabilitation, in the low-demand patient unable to bear weight after a severe sprain.

Not acceptable for some people

Functional rehabilitation

- Begin as soon as acute pain and swelling subside
- Early mobilization
- External support
- RICE : a protocol of Rest, Ice, Compression, and Elevation
- **Proprioception training**
 - Recovery of balance and postural control
 - Taping

A higher rate of satisfaction
(vs Cast immobilization)

外踝扭傷 Ankle sprain

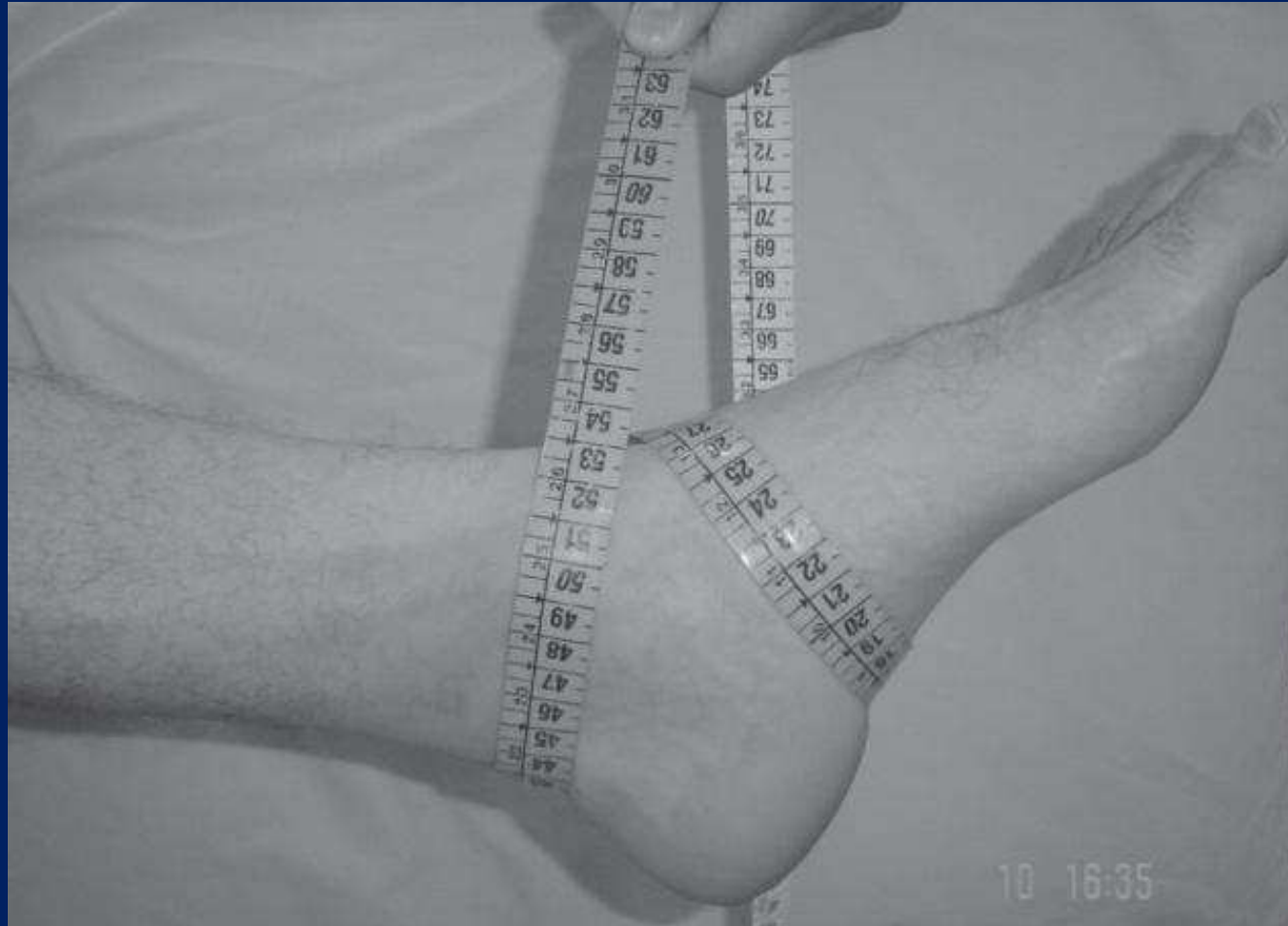
FOR 2 DAYS

L'T FIGURE OF 8: 56CM

R'T: 51CM

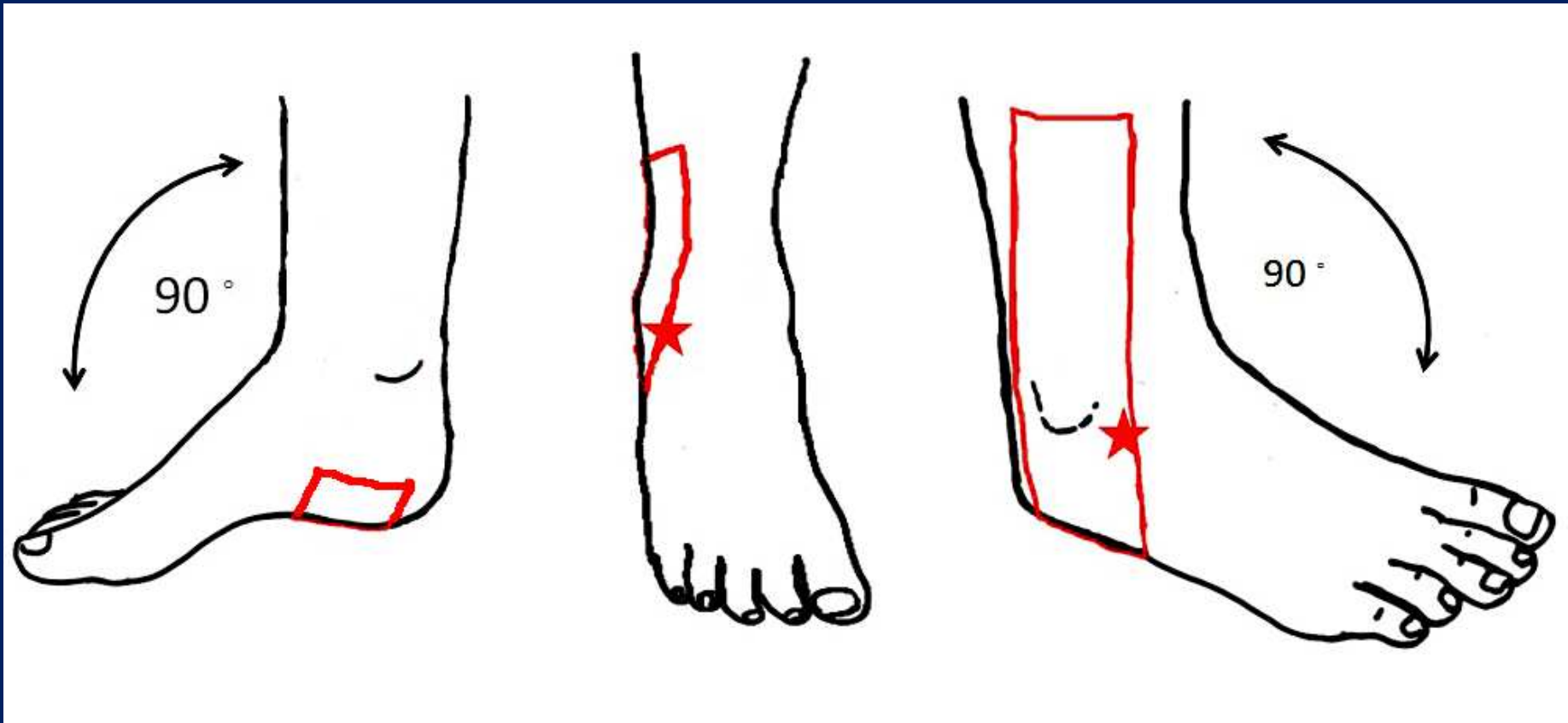


Measurement of ankle joint swelling Figure-of-Eight method

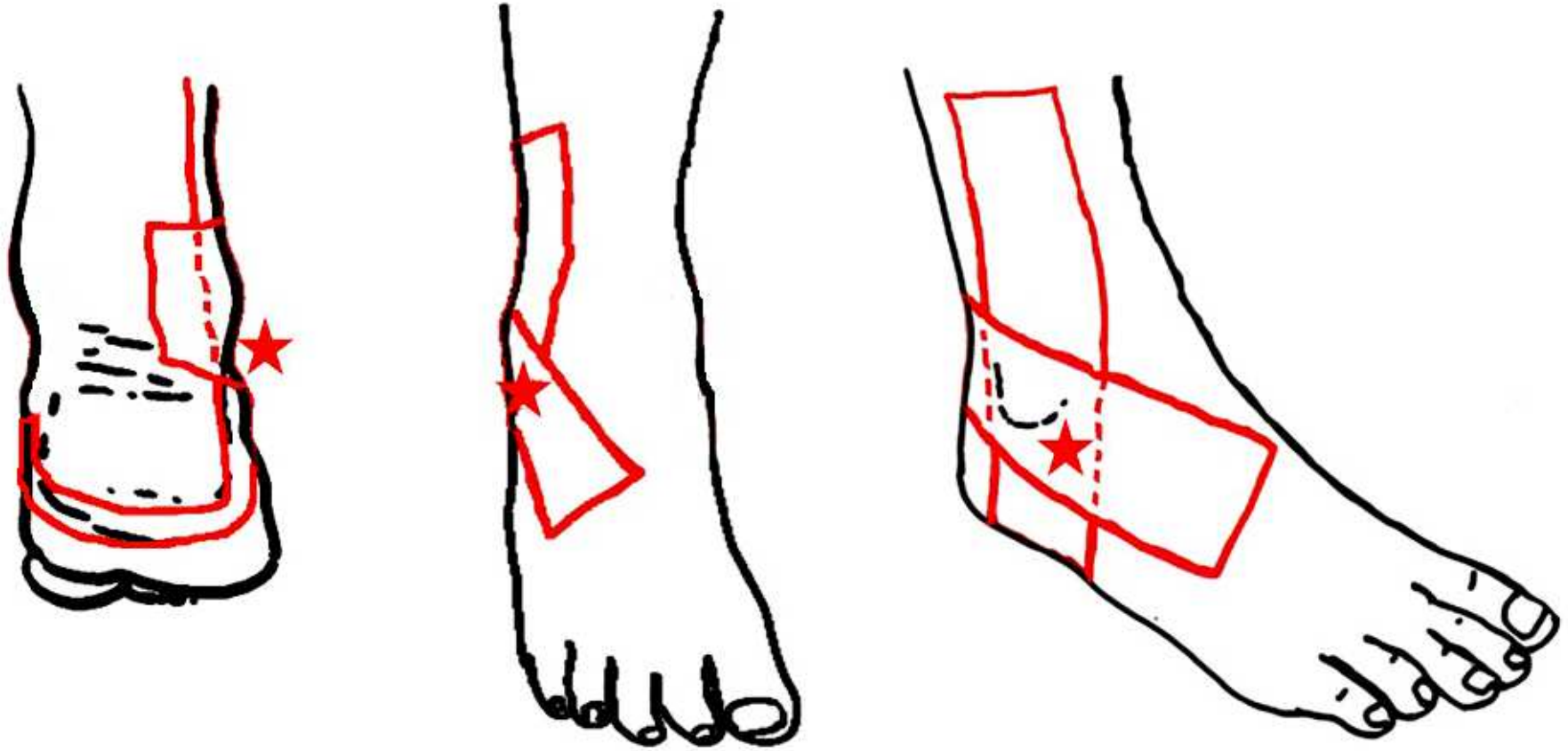


Esterson PS.. J Orthop Sports Phys Ther 1979

踝關節防護 Ankle Protection 1/2

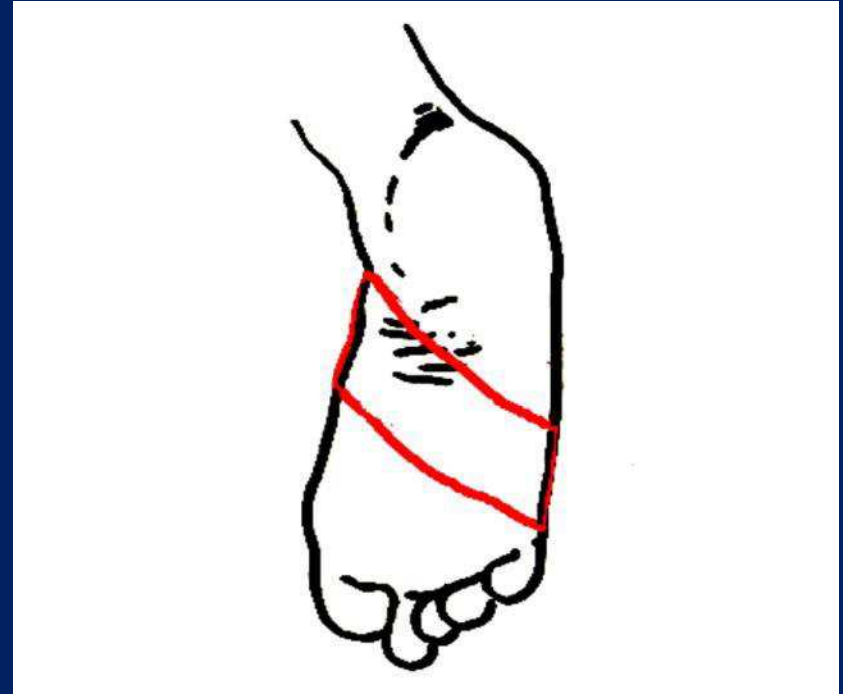
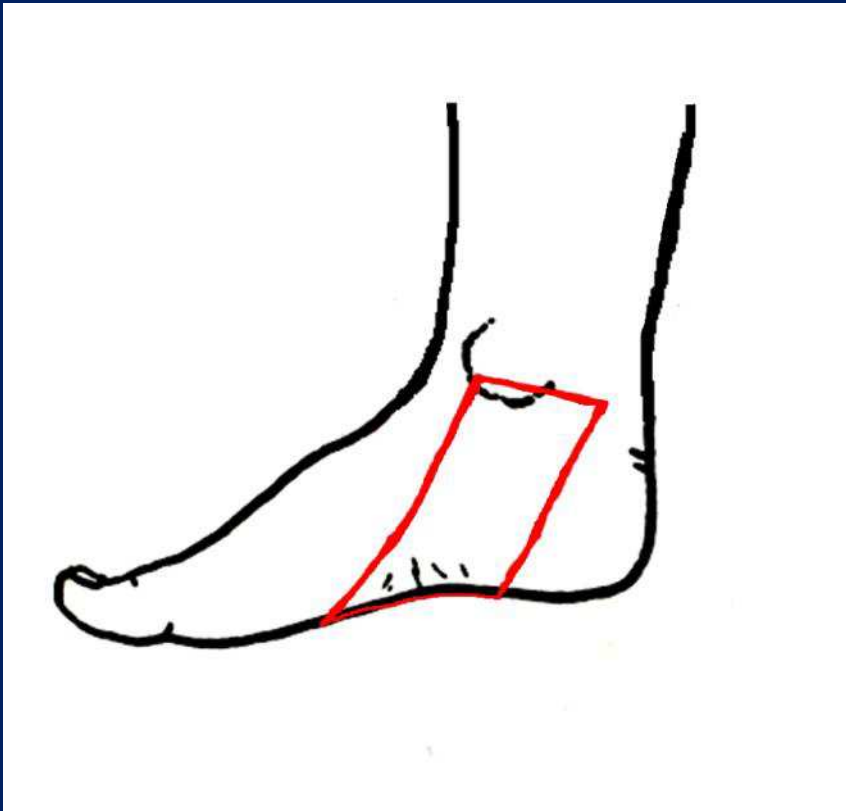


踝關節防護 Ankle Protection 2/2

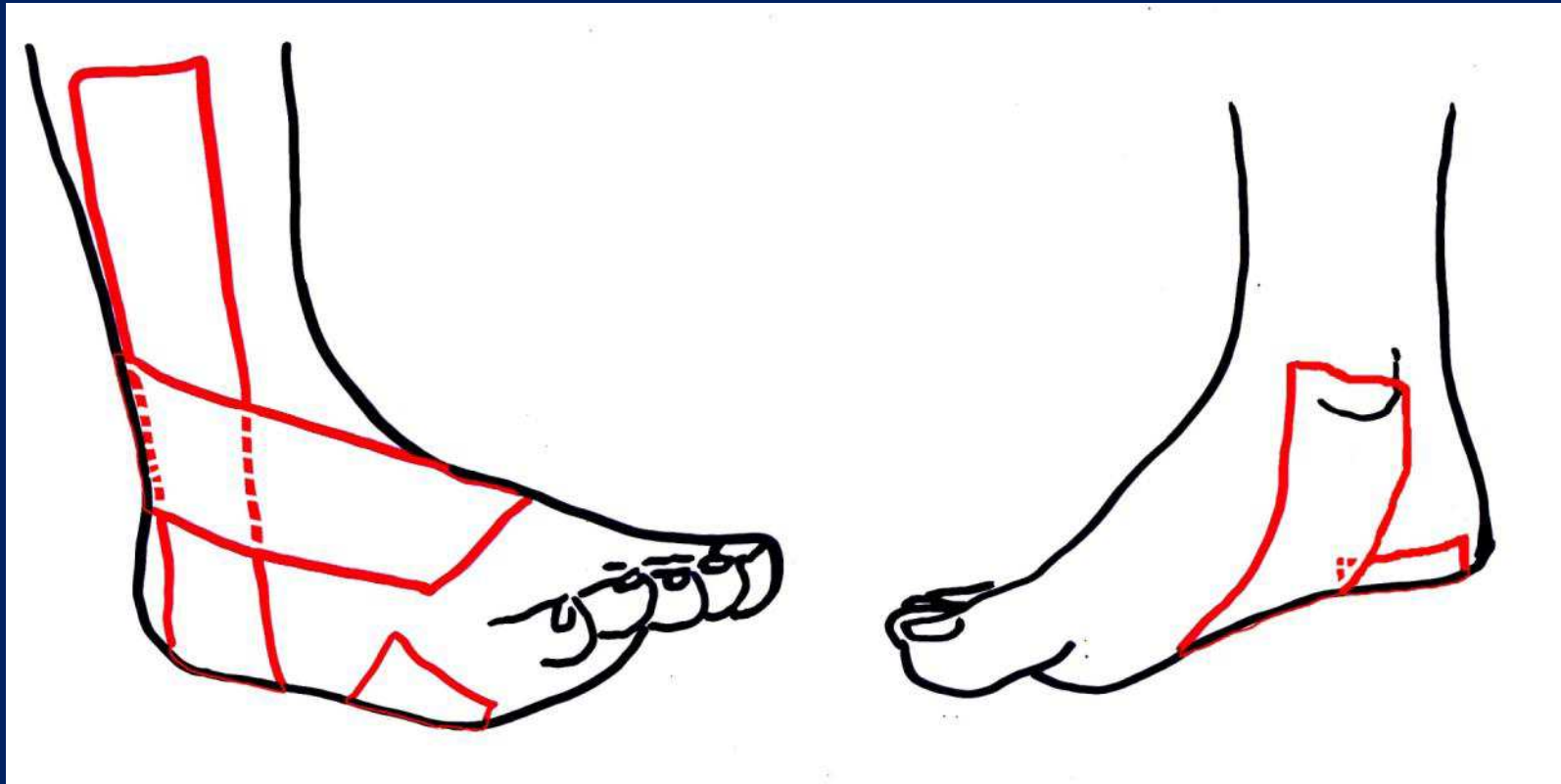


足弓支撐 Arch Support Taping

Ankle Protection Taping後，得加上Arch Support Taping



足弓支撐+踝關節固定 Arch Support Taping + Ankle Protection



A case of Ankle sprain

1ST DAY



1ST DAY



Ankle sprain

7 DAYS LATER

F8: 53CM



Taping for the ankle sprain

- Prevention injury

Br J Sports Med 2005

- Mechanical stabilization

Br. J. Sports Med. 1990

- Improves proprioception

Br. J. Sports Med. 1995

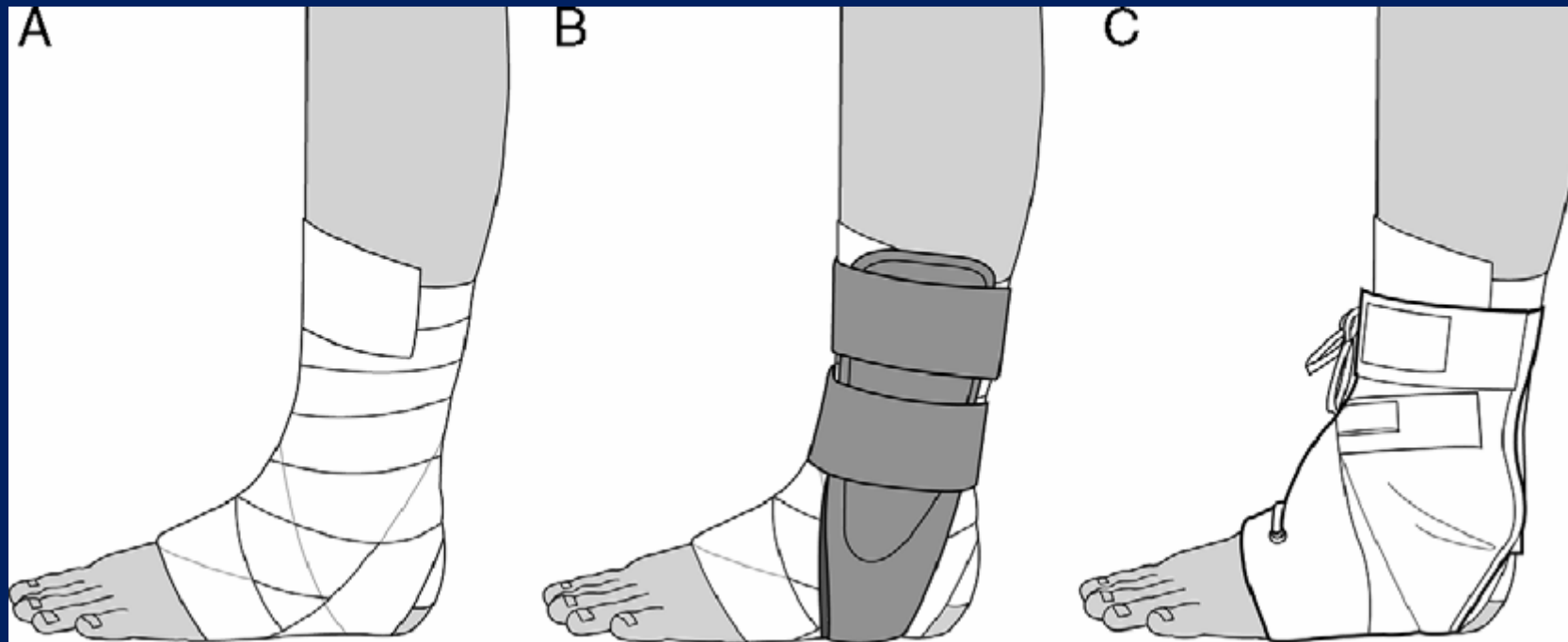
- External support and early mobilization

BMJ 2006

- Improves ankle-foot edema

External ankle supports in functional rehabilitation

- A, Taping B, Semirigid support C, Lace-up support



- **Lace-up** supports are most effective

Kerkhoffs GM, Acta Orthop Scand. 2003

Low activity demand

- Taping
- Figure of Eight Bandage



Taping and Bracing improve Proprioception

Garn, 1998

Friden, 1989

Guskiewicz, 1996

Heit, 1989

Jerosch, 1995

Tropp, 1985

Feuerbach, 1994

Single leg rasing 10 seconds

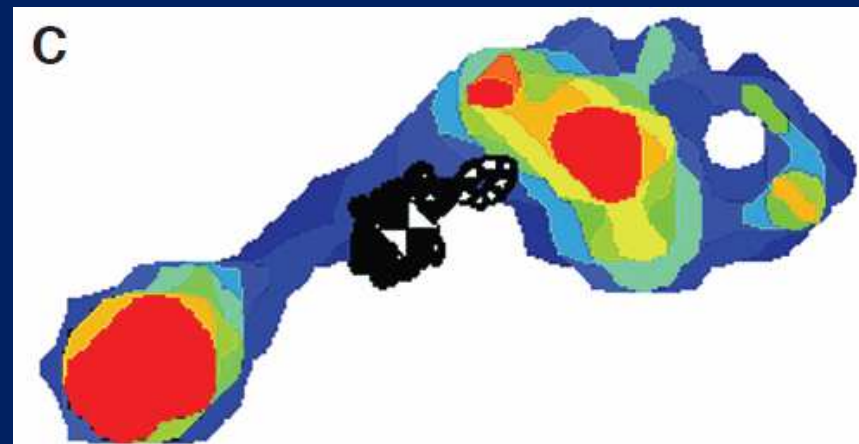
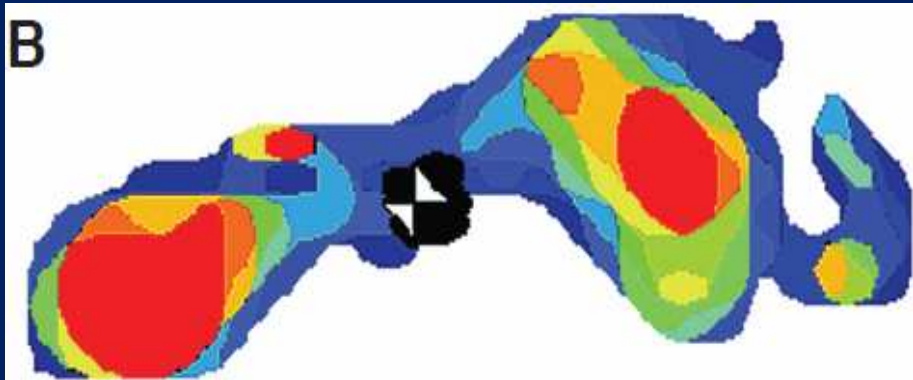




The migration of center of pressure

eyes open

eyes closed

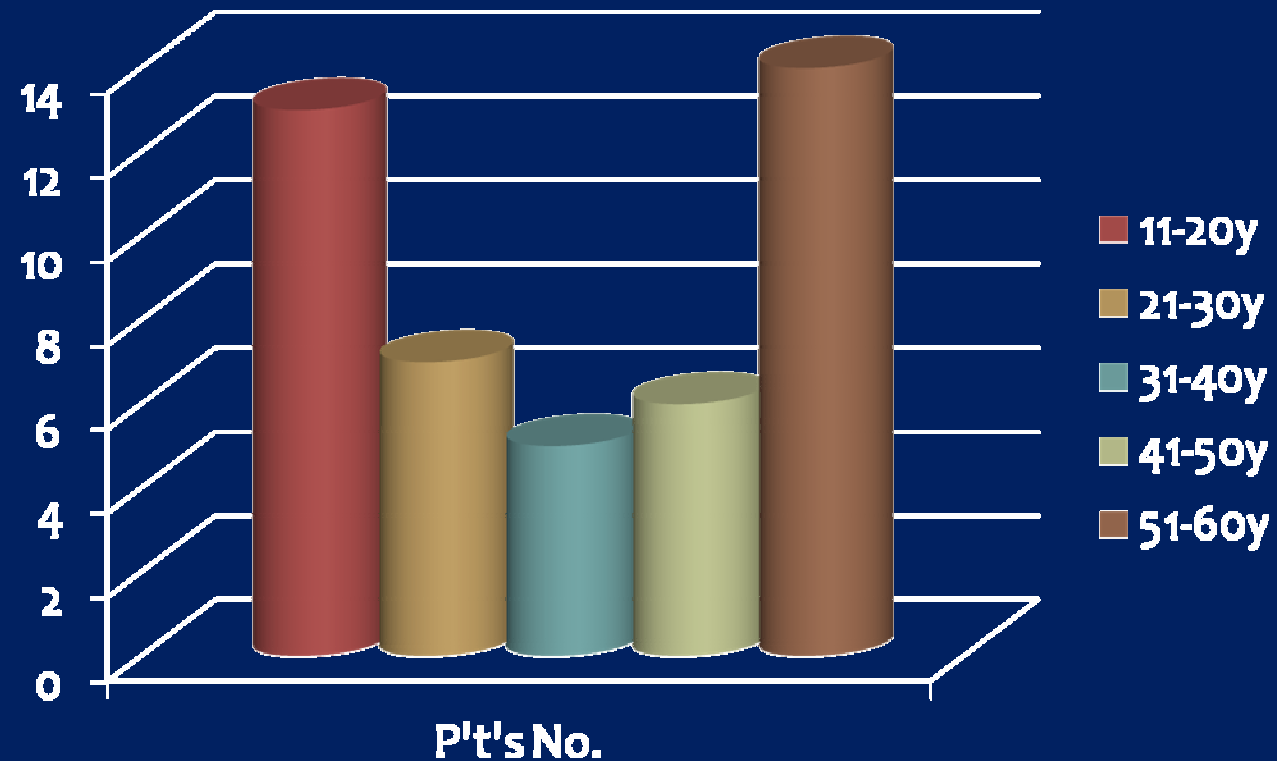


Single leg rasing 10 seconds



Material and Method

- From Jan. 2012 to Mar. 2012
- 45 patients
- Age: 11-59y
- Male: 25
- Female: 20
- R't: 21
- L't 24



Immediate Satisfaction

28 Pts

- 好: 18 64%
- 差不多: 9 32%
- 不好: 1 4%

Tape allergy: 1 Pt

Results

- 已改善: 26 93%
- 未改善: 2 7%

Theories of Lateral Sway



- Neutral foot

Lateral body sway



- the closed-chain pronation of the rearfoot complex

Ankle sprain



- After the pronation range is exceeded, the foot rapidly moves into inversion.

Keep foot in a “Neutral Position”
+ Forefoot lateral wedge



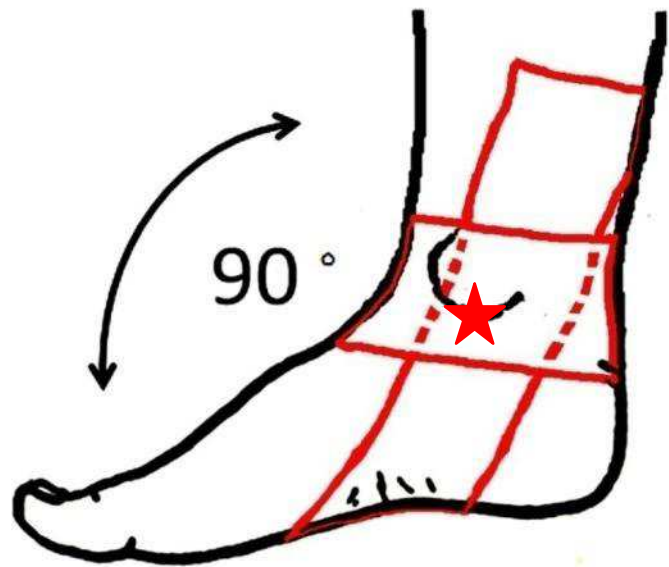
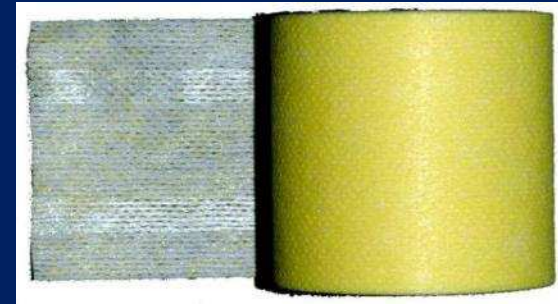
Medial Ankle Sprain (Eversion)



Medial Ankle Ligament Injury

- Isolated medial ligament injury is rare
- Deltoid ligament injury
 - during forced external rotation
 - often associated with fractures/dislocations around the ankle

Taping for acute medial ankle sprain



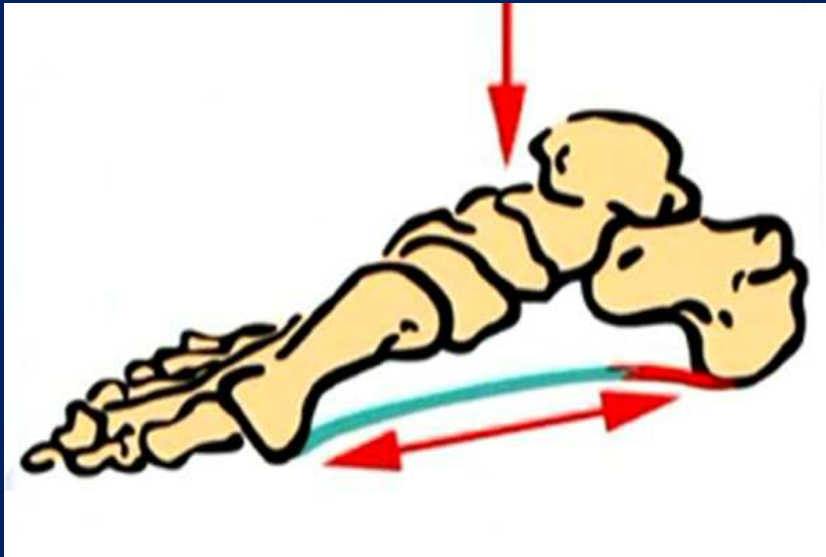
Acute medial ankle ligament injury



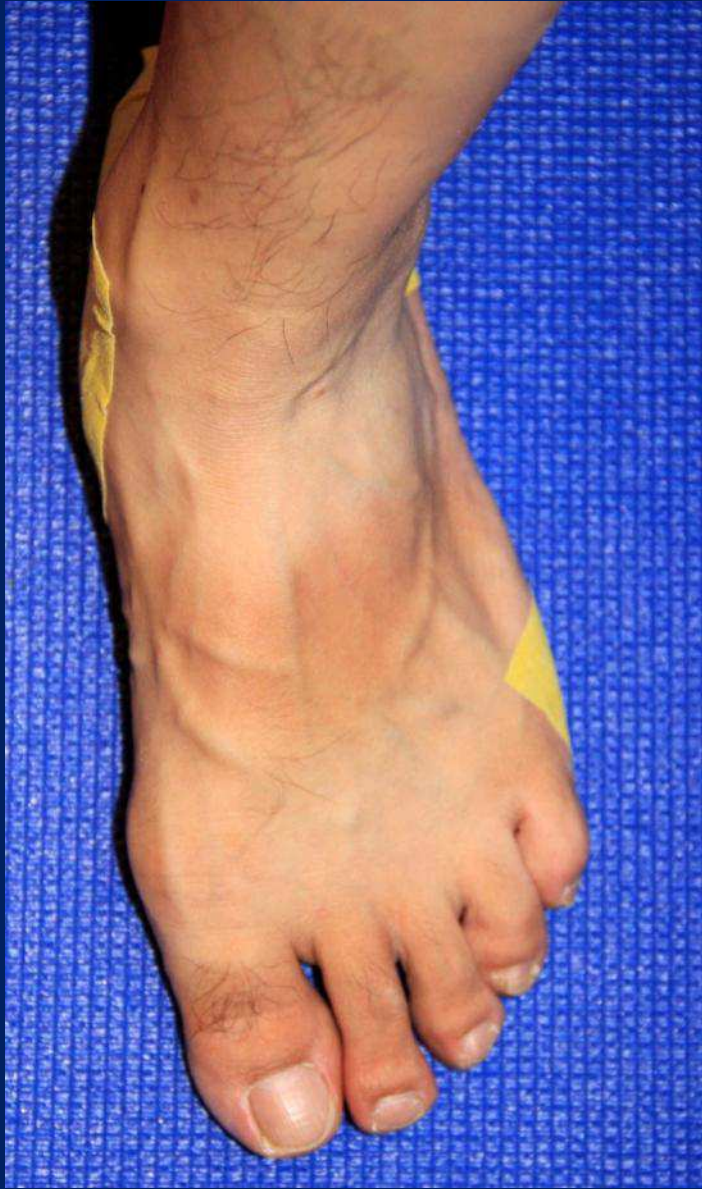
Arch support Fos



Plantar heel pain



- The plantar fascia ligament is made of fibrous bands of tissue and runs between the heel bone and metatarsal head
- Stretches with every step.



Biomechanical and Anatomic Factors Associated with a History of Plantar Fasciitis in Female Runners

1. Greater vertical ground reaction force load rates
2. A lower medial longitudinal arch of the foot

Heel pads

1. Decreasing pressure under the heel
2. Tx: plantar heel spur syndrome, plantar heel pad atrophy, plantar fasciitis

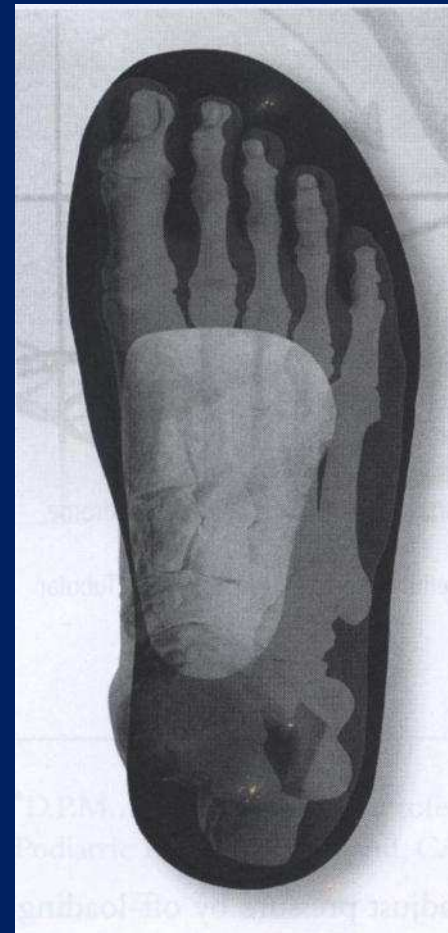


Medial longitudinal arch supports

Arch Support FOs



Arch Pads



Achilles heel injuries



Classification of Achilles Tendon Injuries (anatomical zone)

Zone 1: Noninsertional Area

- Achilles paratenonitis
- Adhesive tendinopathy
- Achilles tendinosis
- Achilles tendon rupture

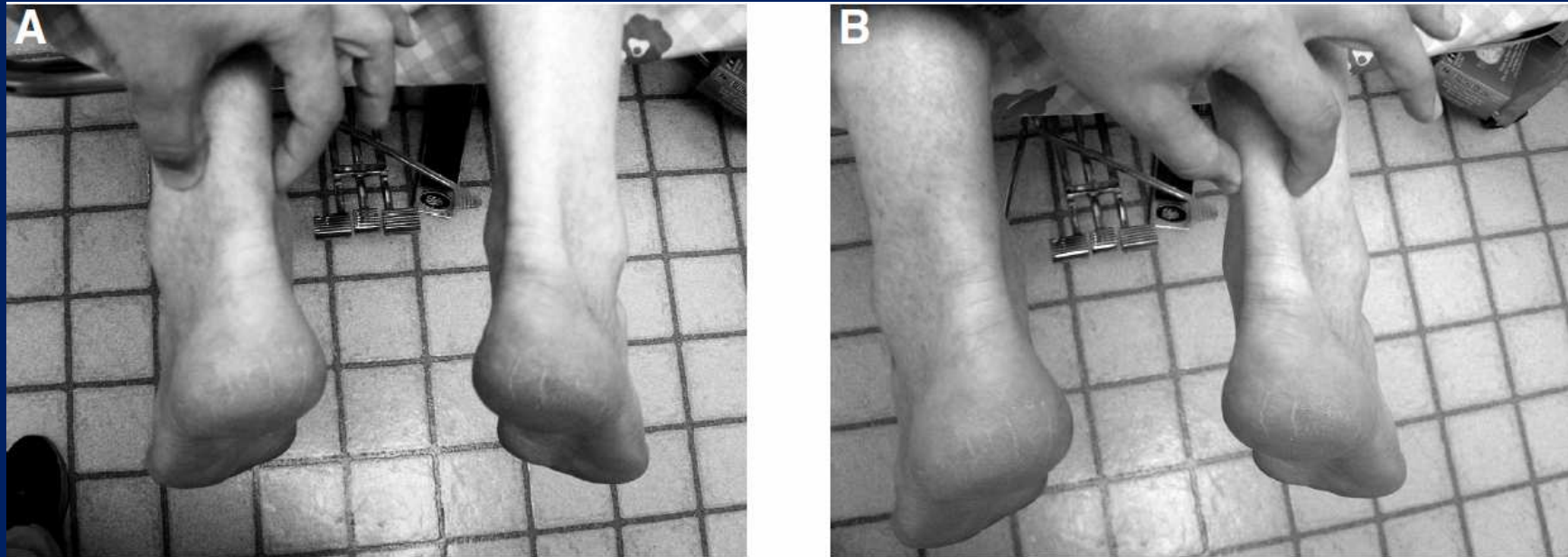
Zone 2: Insertional Area

- Retrocalcaneal bursitis
- Achilles insertional calcific tendinosis
- Retro-Achilles bursitis
- Distal Achilles tendo-fasciitis
- Avulsion fracture of the calcaneus

Treatment

- Changing footwear: open-backed shoe to relieve pressure on the affected region
- Acute phase: **restricted ankle dorsiflexion**, NSAIDs, rest, and ice
- **Orthoses**: to reduce hindfoot twisting (pronation, and supination)
- Stretching and Strengthening: heel cord stretching

Achilles Tendinosis



marked thickening and the lack of normal anatomical contour on the left

Achilles tendonitis



VAS: 7 → 5



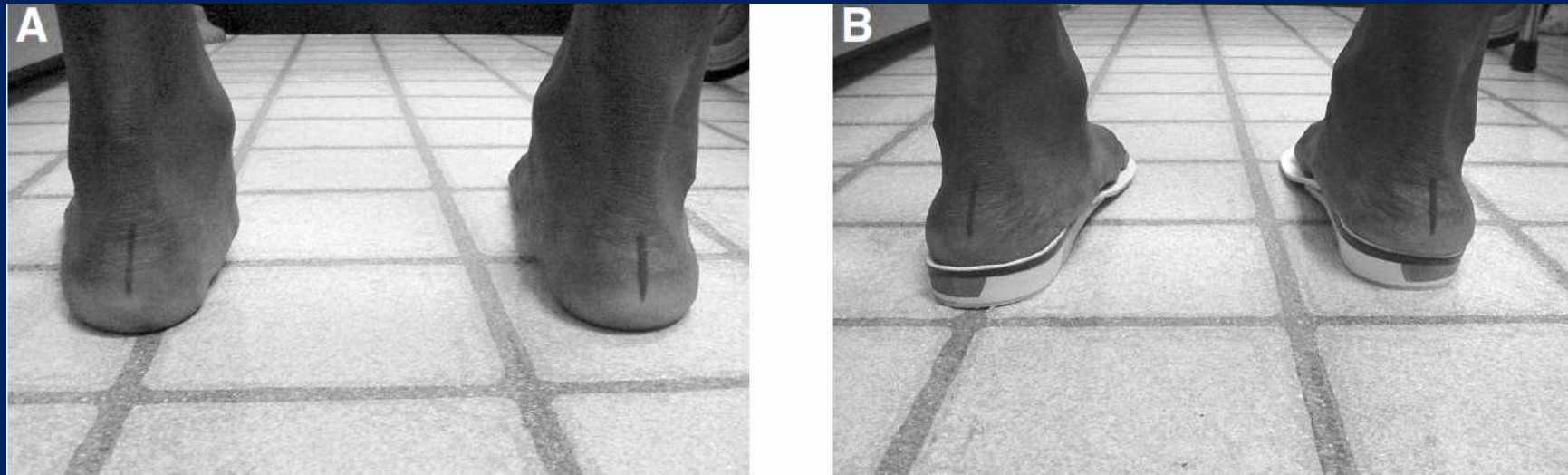
Neutral Calcaneal Stance Position



Resting Calcaneal Stance Position

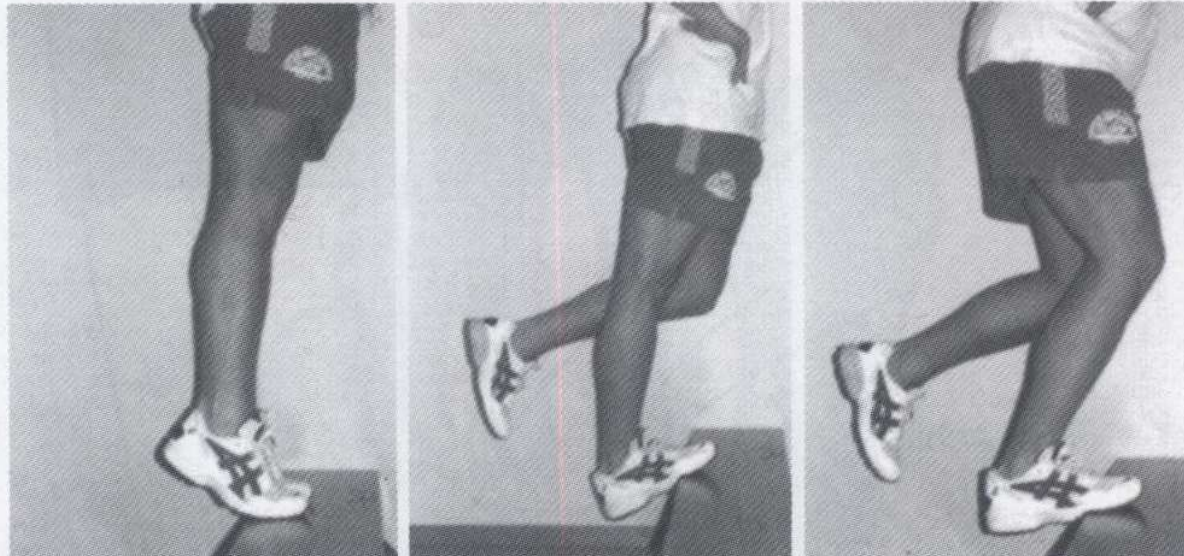


Foot Orthoses



limiting the excessive pronation and alleviating the excessive pull along the medial Achilles tendon

Heel cord stretching



A

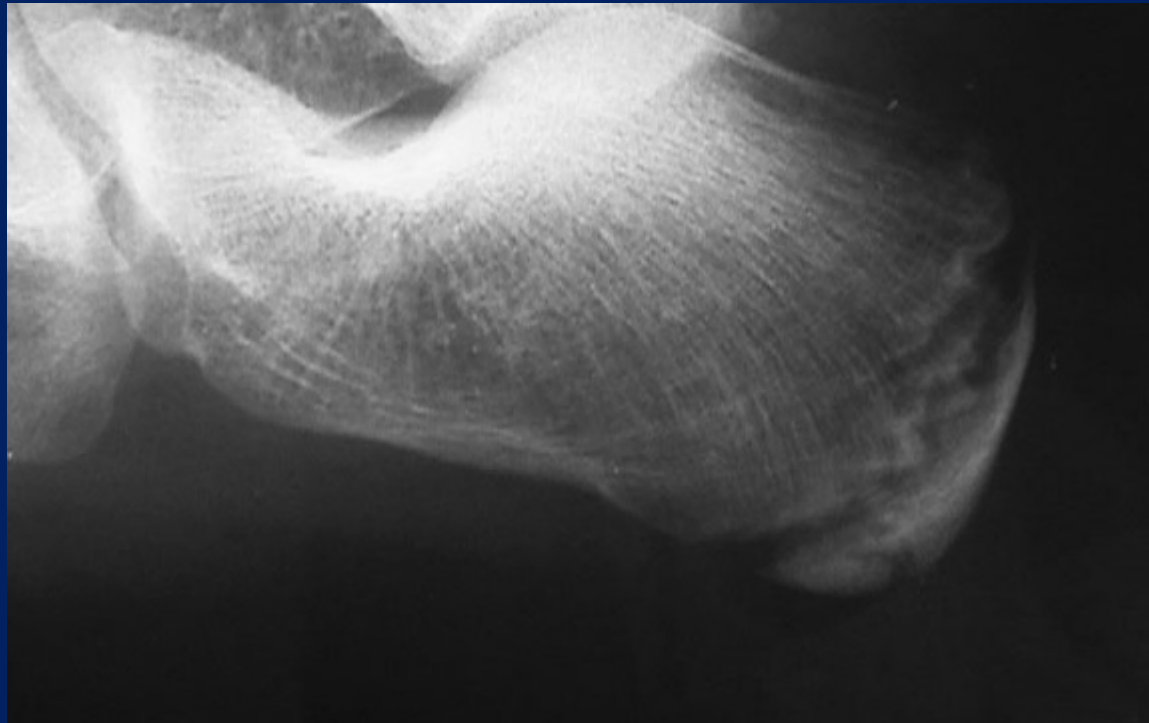
B

C

Figure 30.7 A, Begin in an upright body position with all weight on the forefoot and the ankle joint in plantar flexion. B, Lower the heel slowly, eccentrically loading the calf and keeping the knee straight. C, The exercise is also done with the knee bent to eccentrically load the soleus. In both exercises, the patient returns to the starting position by stepping back up with the opposite leg. (From Alfredson H, Pietilä T, Jonsson P, et al: Am J Sports Med 1998;26:360-366.)

Sever's disease(calcaneal apophysitis)

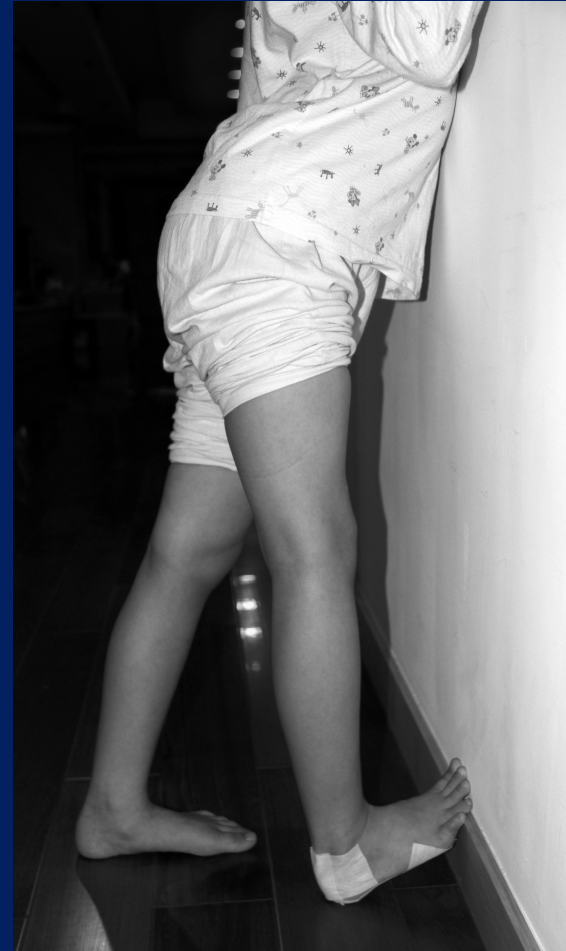
- Rest of the affected area
- Heel cord stretching



- Rest of the affected area



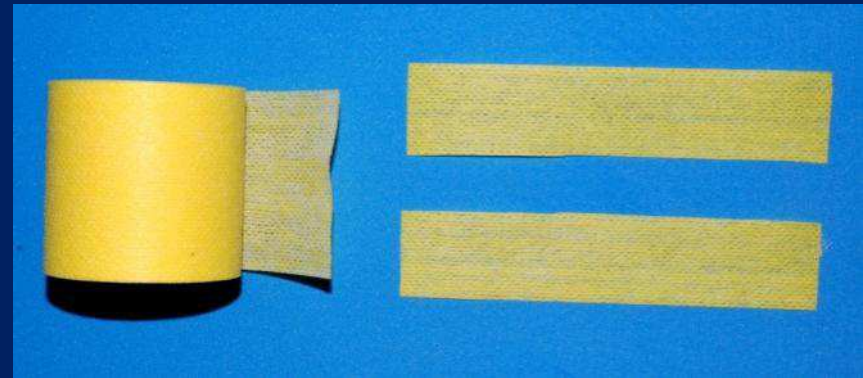
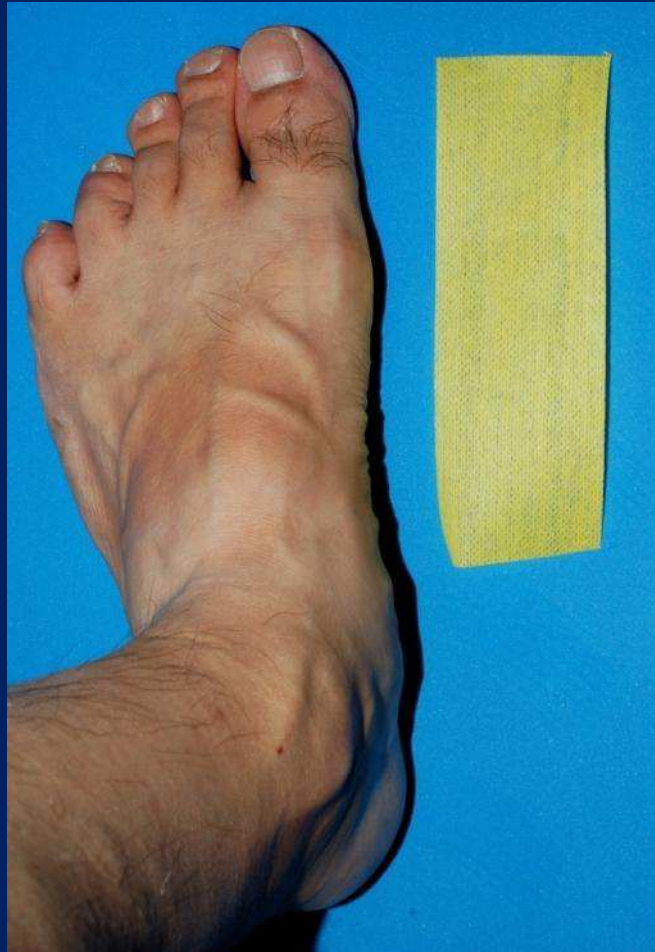
Heel cord stretching



Hallux valgus (Bunion)

- Widen athletic shoe
- Silicon pad
- Achilles stretching
- Medial longitudinal arch support, Morton's extension under the 1st MTP joint
- Taping

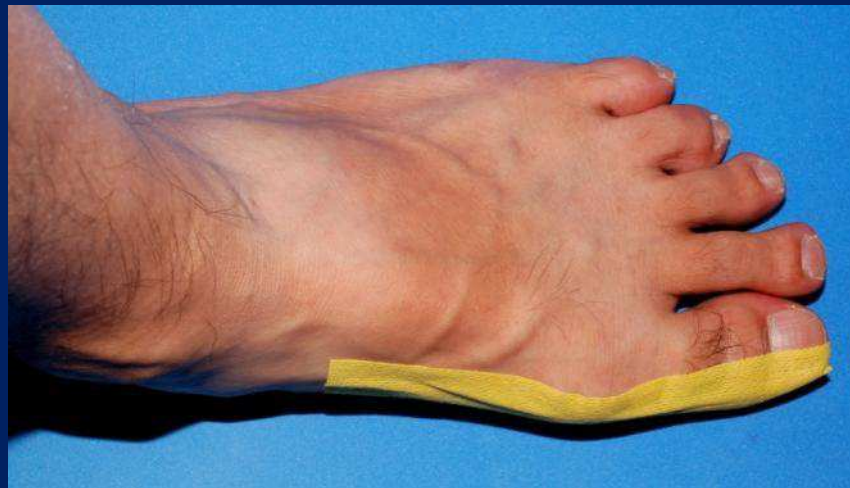
Hallux Valgus



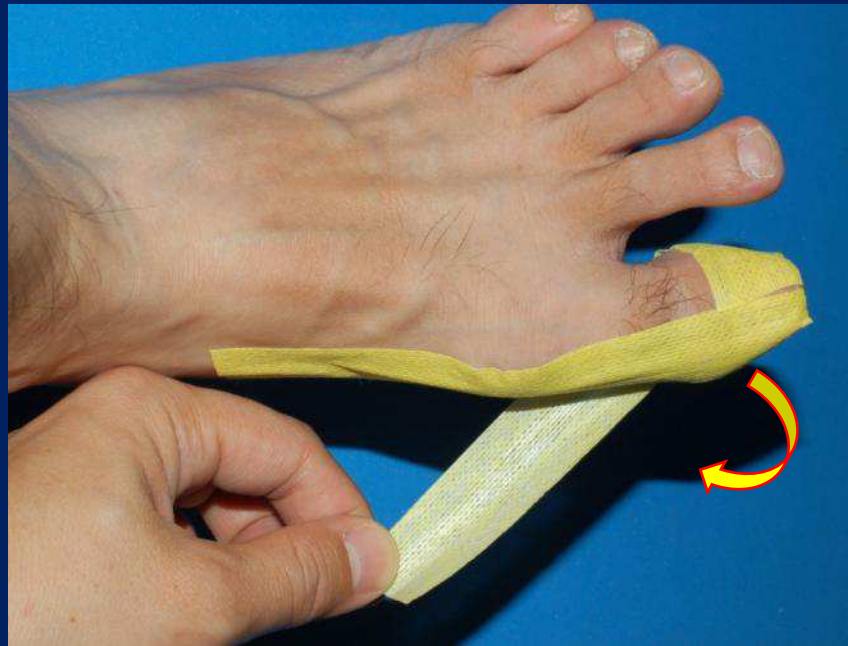
Hallux Valgus medialization



Hallux Valgus



Hallux Valgus **supination**



Hallux Valgus



Hallux Valgus Anchor taping



Hallux Valgus



Hallux Valgus anti-pronation taping



Hallux Valgus



Hallux Valgus



**Medial longitudinal arch support +
Morton's extension under the 1st MTP joint
metatarsal dome**



Crossover taping for lesser toes

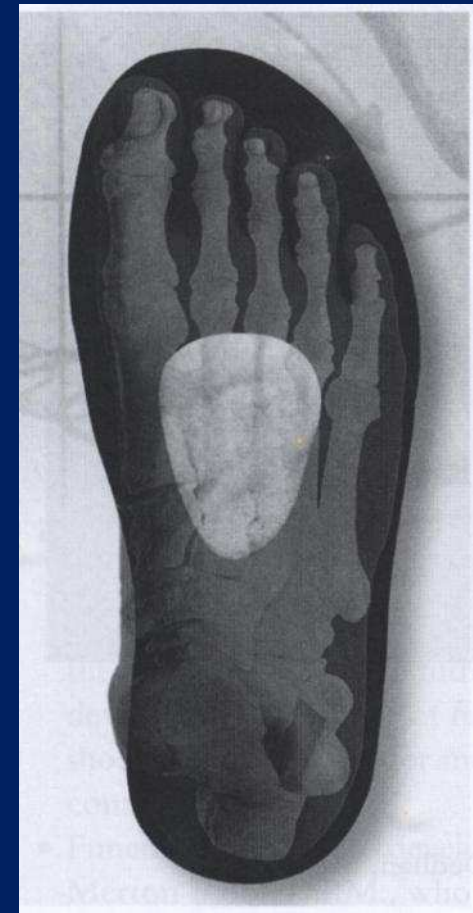
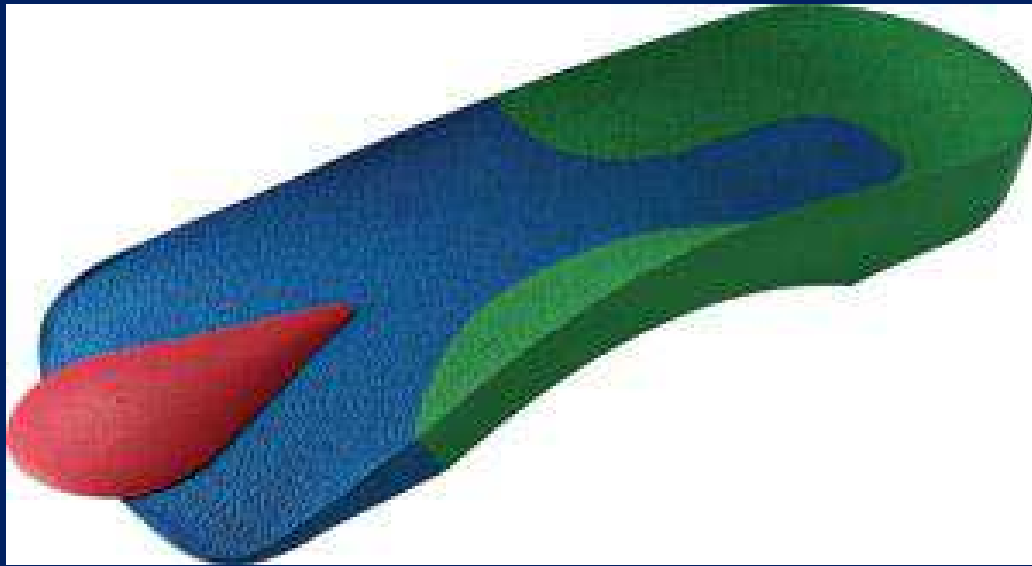


Interdigital Neuroma (Morton's Neuroma)

- Mulder's sign



- Stiff shoes, wide toe box
- Orthotics
- Metatarsal pads,
- Avoiding high heels



Turf Toe

- Turf toe is a sprain of the soft tissue plantar structures of the first MTP joint from extreme dorsiflexion.





Thank You

