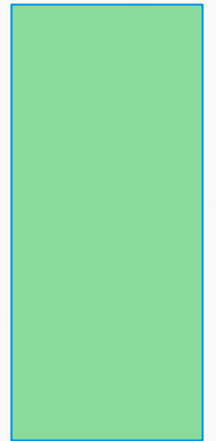


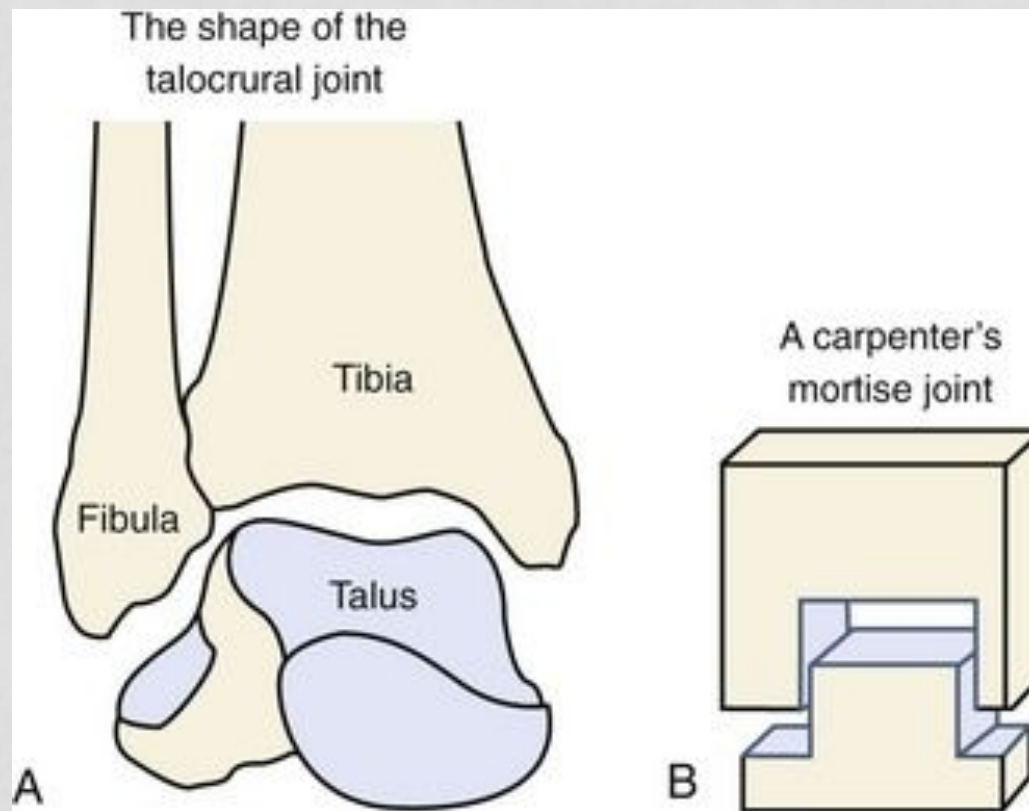
LOWER LEG, ANKLE & FOOT ASSESSMENT



TALOCRURAL JOINT

- Located between the Talus and the distal ends of the Tibia and Fibula
- Joint Type - Synovial Hinge Joint
- Actions Available
 - Plantar Flexion 40 degrees
 - Dorsiflexion 20 degrees
- End feels – Firm Ligamentous
- Resting Position - 10 degrees of plantar flexion
- Close pack Position – Full dorsiflexion
- Capsular pattern – Plantar Flexion > Dorsiflexion

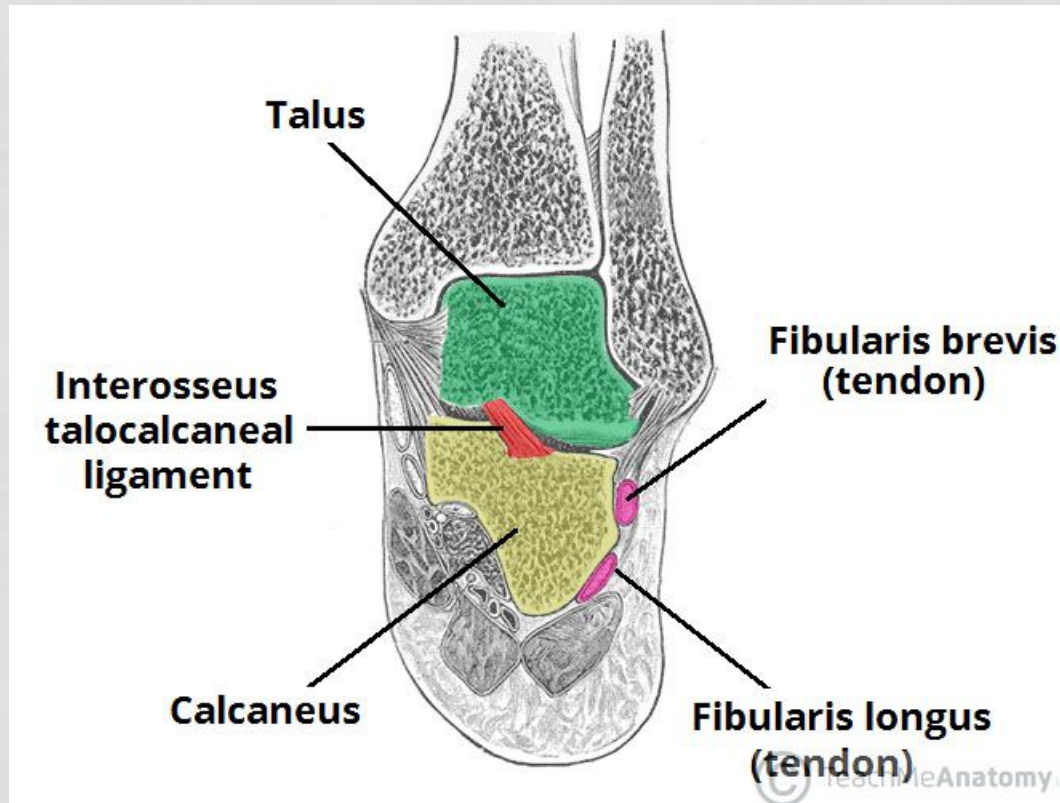
TALOCRURAL JOINT



SUBTALAR JOINT

- Located between the Talus and the calcaneus
- Joint Type - Synovial Gliding Joint
- Actions Available
 - Inversion 30 degrees
 - Eversion 15 degrees
- End feel – Firm Ligamentous
- Resting Position – Mid ROM
- Close Pack Position – Full Inversion
- Capsular Pattern – Inversion/Eversion

SUBTALAR JOINT



PROXIMAL TIBIOFIBULAR JOINT

- Normally the Proximal Tibiofibular Joint is related to the knee but is equally important at the ankle. When functioning correctly the joint moves 30 degrees anterior lateral to posterior medial. Restriction can occur moving either anterior or posterior

MOVEMENT

AROM

- Plantar flexion 50°
- Dorsiflexion 20°
- Supination 45°-60°
- Pronation 15°-30°
- Toe extension (great toe MTP- 70°, IP- 0°) (toes MTP- 40°, PIP-0°, DIP- 30°)
- Toe flexion (great toe MTP- 45°, IP- 90°) (toes MTP-40°, PIP- 35°, DIP-60°)
- Toe abduction
- Toe adduction

PROM

- Plantar flexion (tissue stretch)
- Dorsiflexion (tissue stretch)
- Inversion, supination (tissue stretch)
- Eversion, pronation (tissue stretch)
- Adduction (tissue stretch)
- Abduction (tissue stretch)
- Flexion of toes (tissue stretch)
- Extension of toes (tissue stretch)
- Adduction of toes (tissue stretch)
- Abduction of toes (tissue stretch)

RIM

- Knee flexion
- Plantar flexion
- Dorsiflexion
- Supination
- Pronation
- Toe extension
- Toe flexion

FUNCTIONAL MOVEMENTS

- Squatting (both ankles should dorsiflex symmetrically)
- Standing on toes (plantar flexion should be symmetrical)
- Squatting and bouncing at the end of squat
- Standing on one foot at a time
- Standing on toes one foot at a time
- Going up and down stairs
- Walking on toes
- Running straight ahead
- Running, twisting and cutting
- Jumping
- Jumping and going into a full squat

MUSCLES

PLANTAR FLEXION

- Muscles creating Plantar flexion
 - Prime Movers – Soleus and Gastrocnemius
 - Synergists – Tibialis posterior, Flexor digitorum Longus, Flexor Hallicus Longus
 - S1-S2

DORSIFLEXION

- Muscles Creating Dorsiflexion
 - Prime mover – Tibialis Anterior
 - Synergists – Extensor Digitorum Longus and Extensor Hallicus Longus
 - L4-L5

INVERSION

- Muscles Creating Inversion
 - Prime movers – Tibialis Anterior and Tibialis Posterior
 - L4 – L5

EVERSION

- Muscles creating Eversion
 - Fibularis Longus, Brevis and Tertius
 - L5-S2

ANATOMY REVIEW VIDEO

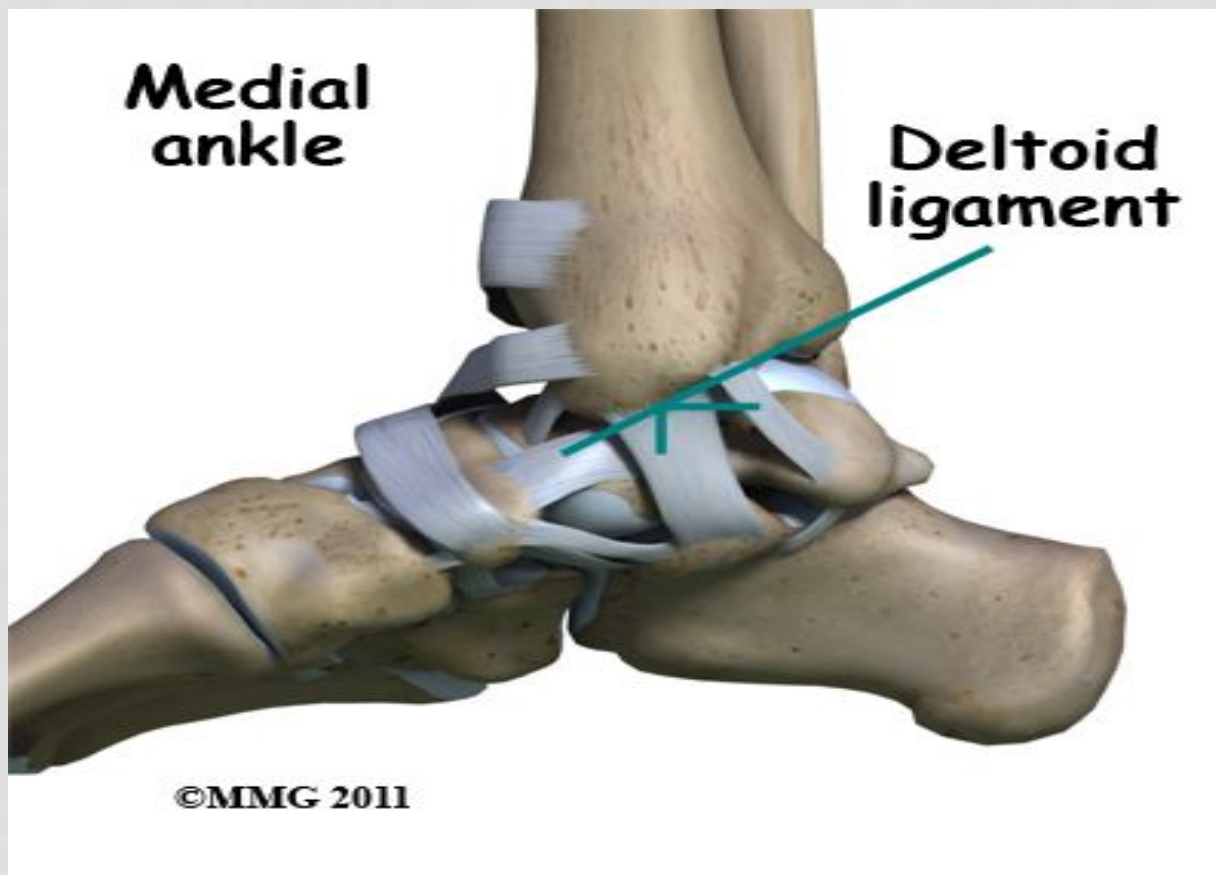
- https://youtu.be/4hCS1O2LP_c

LIGAMENTS

TALOCRURAL JOINT LIGAMENTS

- Deltoid Ligament is located on the medial side and is made up of the following
 - Tibionavicular
 - Tibiocalcaneal
 - Posterior Tibiotalar
 - Anterior tibiotalar

DELTOID LIGAMENT



DELTOID LIGAMENT – TIBIONAVICULAR LIGAMENT

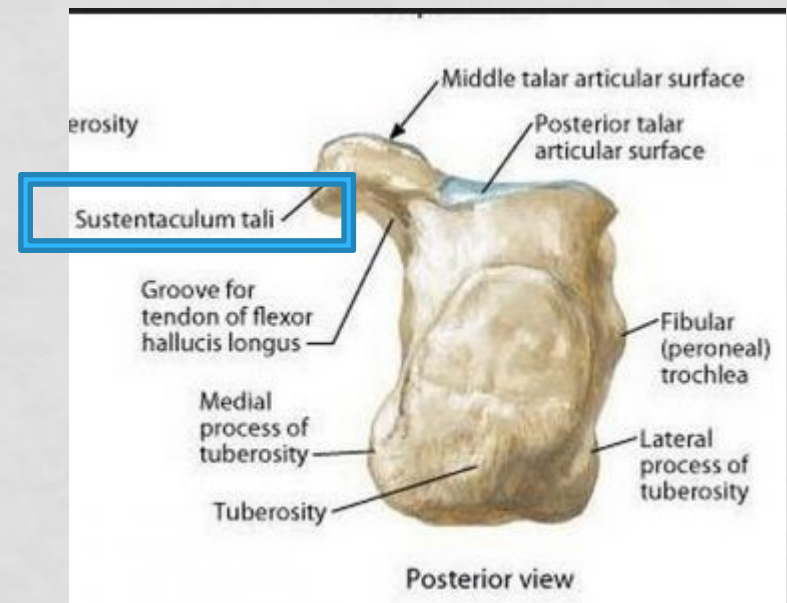
- Medial malleolus apex forward to navicular tuberosity
- Resists forward excursion/PF
- Transmits leg IR to foot

TIBIONAVICULAR LIGAMENT



DELTOID LIGAMENT - TIBIOCALANEAL LIGAMENT

- Descends and attaches to sustentaculum tali
 - Sustentaculum Tali - a horizontal shelf that arises from the anteromedial portion of the calcaneus.
- Resists all of the movements



TIBIOCALCANEAL LIGAMENT



DELTOID LIGAMENT – POSTERIOR TIBIOTALAR

- Passes back and lateral to medial talus on medial tuberosity
- Resists posterior excursion/DF
- Transmits leg ER to foot

POSTERIOR TIBIOTALAR LIGAMENT



DELTOID LIGAMENT – ANTERIOR TIBIOTALAR

- Above tip of medial malleolus to medial talus
- Resists anterior excursion/PF
- Transmits leg IR to foot

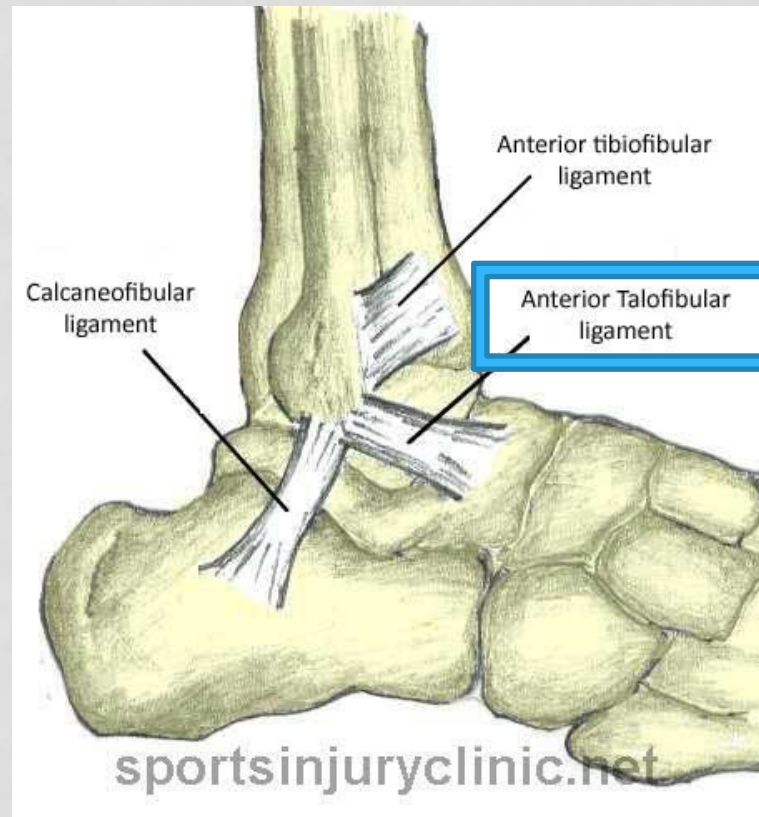
ANTERIOR TIBIOTALAR LIGAMENT



LATERAL COLLATERAL LIGAMENTS – ANTERIOR TALOFIBULAR LIGAMENT

- Lateral malleolus to talus
- Resists anterior excursion, PF, INV
- Transmits leg ER to foot

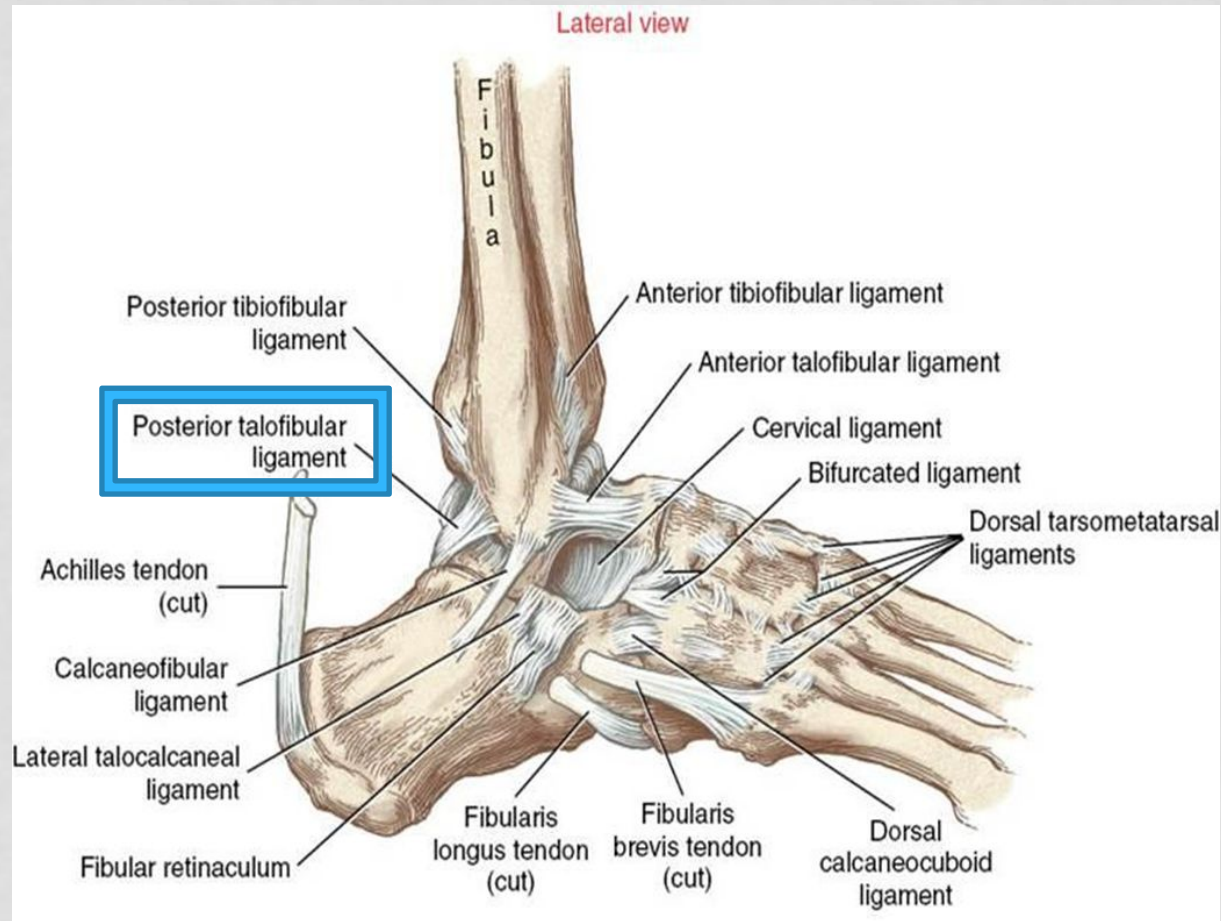
ANTERIOR TALOFIBULAR LIGAMENT



LATERAL COLLATERAL LIGAMENTS - POSTERIOR TALOFIBULAR LIGAMENT

- Runs horizontal from inferior lateral malleolus to lateral talus
- Resists anterior excursion of tibia and fibula
- Transmits leg IR to foot

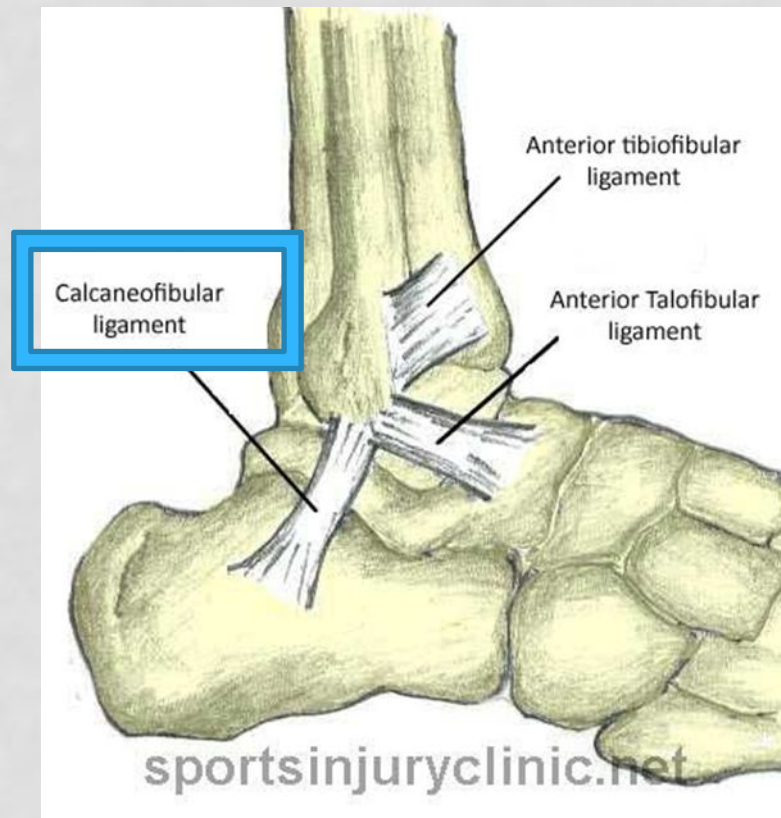
POSTERIOR TALOFIBULAR LIGAMENT



LATERAL COLLATERAL LIGAMENTS – CALCANEALOFIBULAR

- Passes from apex of fibular back/down to peroneal tubercle of calcaneous
- Resists INV, posterior excursion, DF
- Transmits leg ER to foot

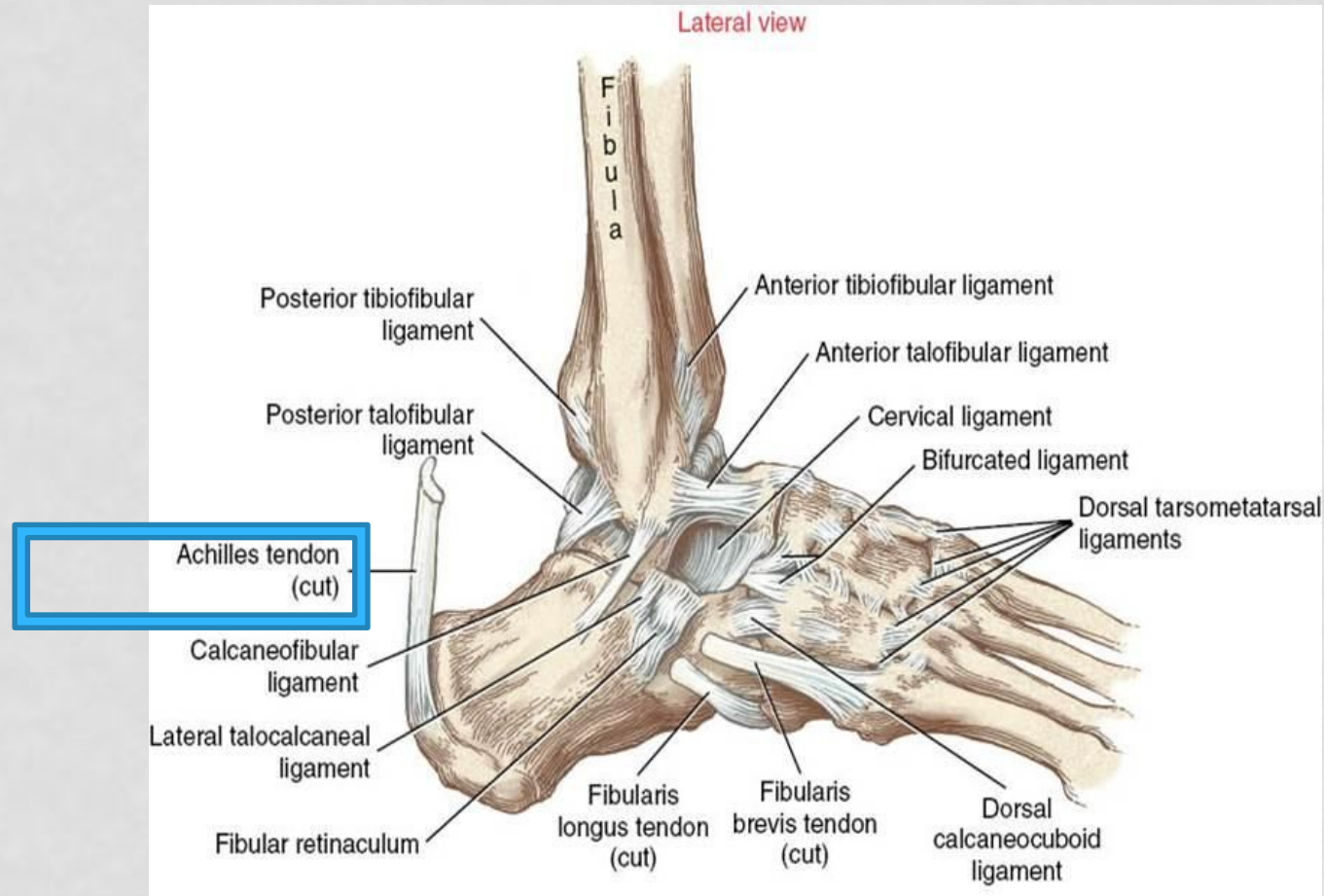
CALCANEALOFIBULAR



SUBTALAR JOINT LIGAMENTS

- Lateral Talocalcaneal
 - Mildly limits Inversion
- Medial Talocalcaneal
 - Restricts Eversion
- Interosseous
 - Limits Inversion
- Cervical
 - Limits Inversion
- Spring
 - Assists in maintaining medial longitudinal arch

SUBTALAR JOINT LIGAMENTS



ARCHES

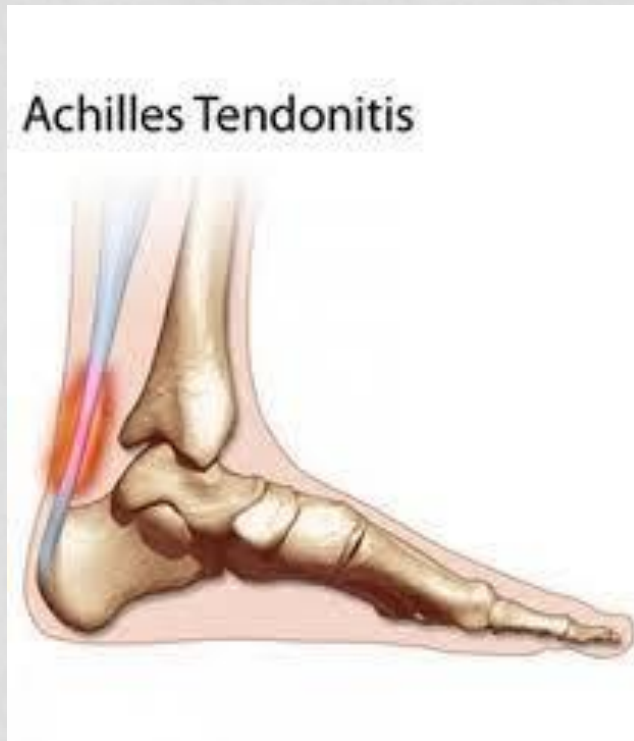
THE ARCHES



DYSFUNCTIONS

ACHILLES TENDONITIS

- Overuse injury of the achilles tendon
- Most common in runners who have suddenly increased intensity or duration of their training.



ACHILLES RUPTURE

- Complete or partial tear that occurs when the tendon is stretched beyond its capacity
- Causes are;
 - Forceful jumping or pivoting
 - Sudden accelerations of running



SEVER'S DISEASE

- Inflammation of the growth plate in the heel of growing children.
- Presents pain in the heel and is caused by repetitive stress to the heel
- Common in active children



TIBIALIS POSTERIOR TENDONITIS

- Pain and swelling over the course of the posterior tibial tendon
- Usually there is a weakness causing an eversion of the foot
- Usually have an inability to stand on their toes on affected side



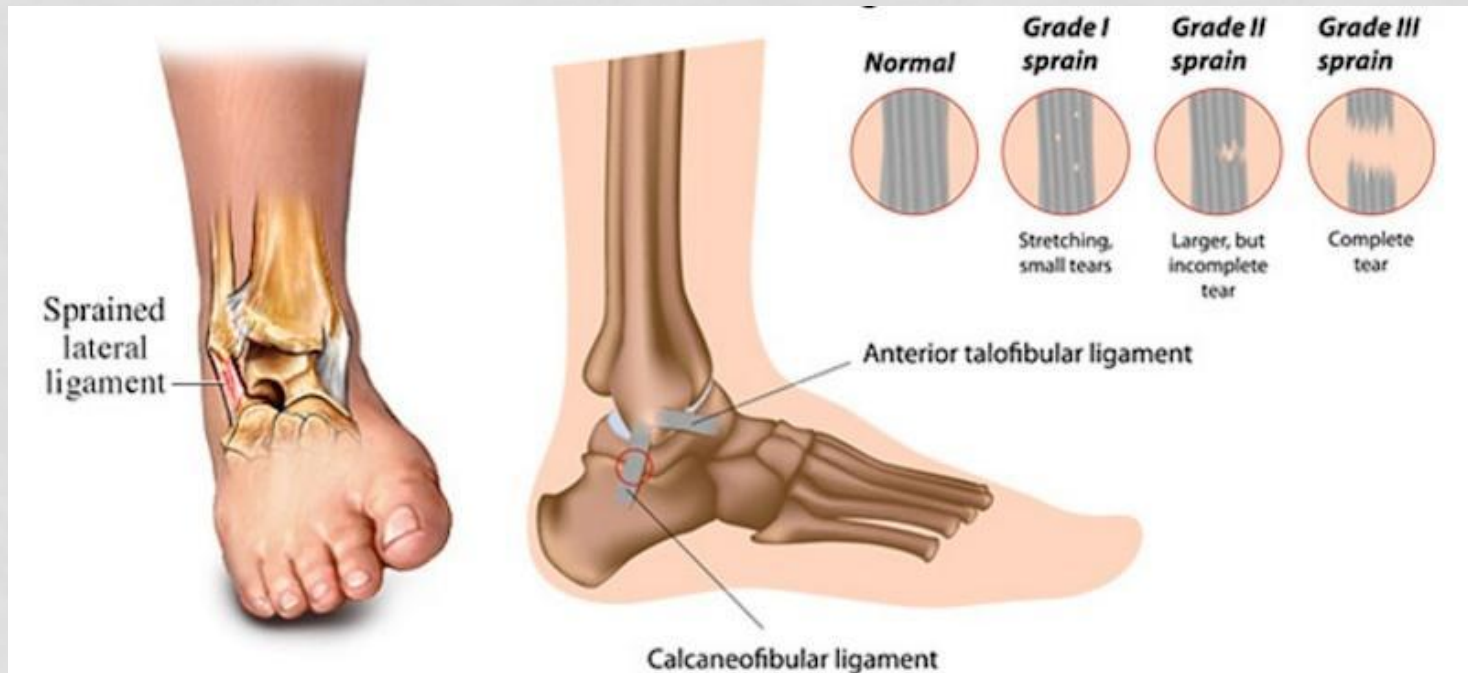
SYNDESMOTIC ANKLE SPRAIN

- Also known as a high ankle sprain
- Involves the ligaments binding the distal tibia and fibula at the distal tibiofibular syndesmosis



INV SPRAIN

- Lower quarter ankle sprain, stretch or tear to the calcaneofibular ligament
- Swelling on lateral side of the ankle, may go up calf and to toes



HYPOMOBILE FIRST RAY, HALLUX RIGIDUS

- Disorder of the joint located at the base of the big toe.
- Causes pain and stiffness in the joint, with time it gets increasingly harder to bend the toe



HALLUX VALGUS

- Relatively common condition in which there is medial deviation of the head of the first metatarsal and lateral deviation of the hallux.



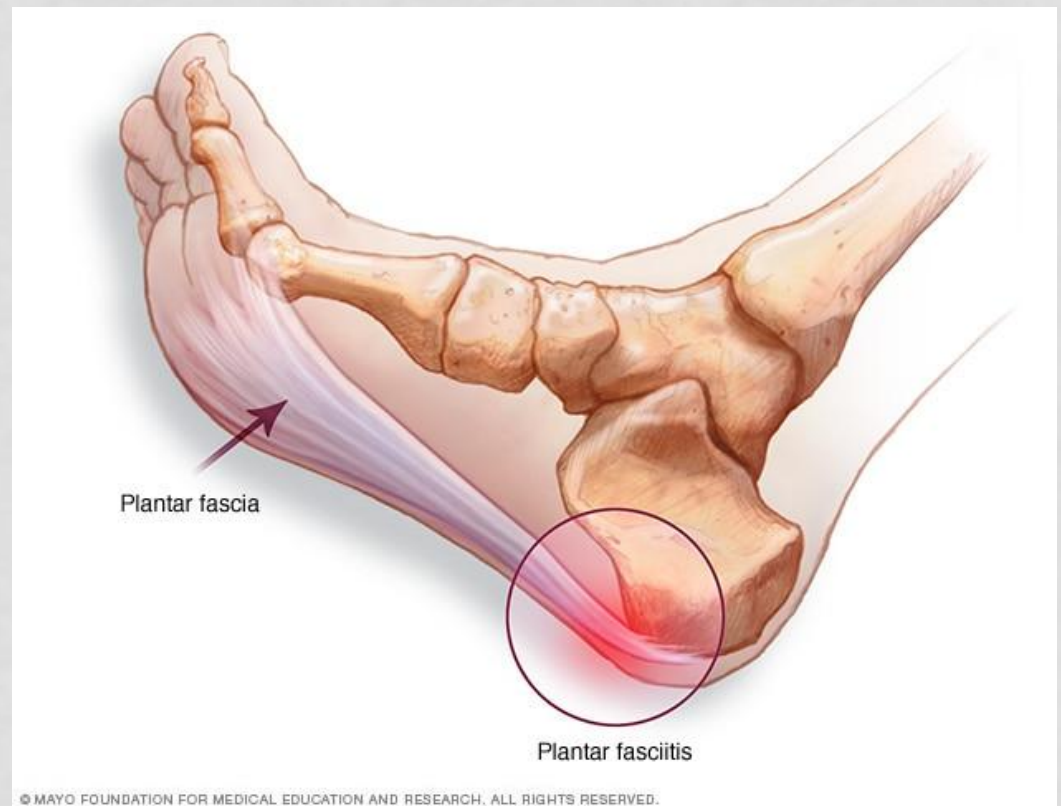
SESAMOIDITIS

- Overuse injury involving chronic inflammation of the sesamoid bones and the tendons involved with those bones.
- Caused by increased pressure on the sesamoids.
- Often associated with a dull, longstanding pain beneath the big toe joint. The pain comes and goes, usually occurring with certain shoes or certain activities.



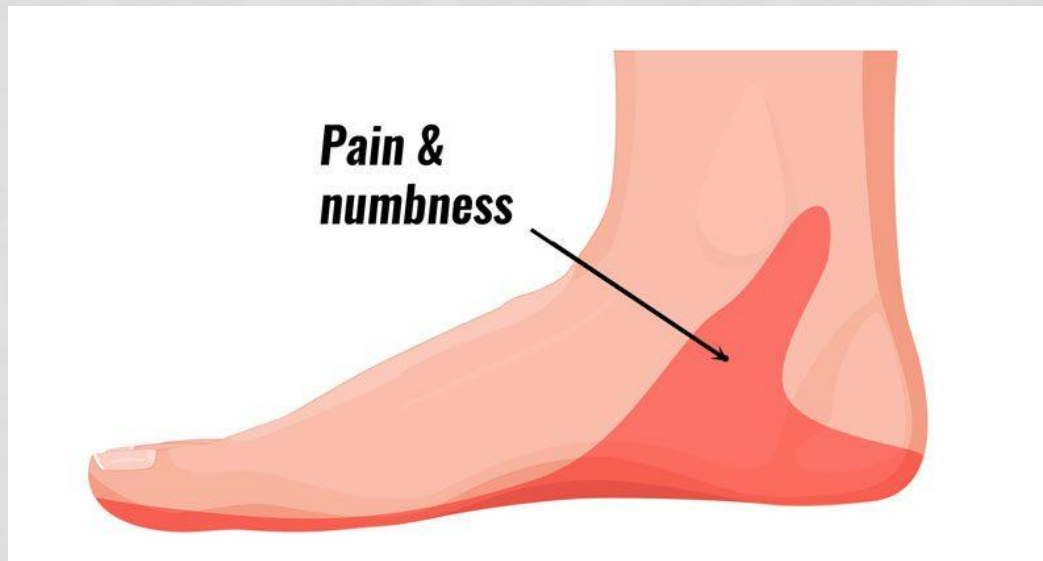
PLANTAR FASCIITIS

- Inflammation of the plantar fascia
- Intense heel pain



TARSAL TUNNEL SYNDROME

- Compression neuropathy and painful foot condition in which the posterior tibial nerve is compressed as it travels through the tarsal tunnel.
- This tunnel is located behind the medial malleolus
- Pain, numbness and/or a tingling sensation on the foot



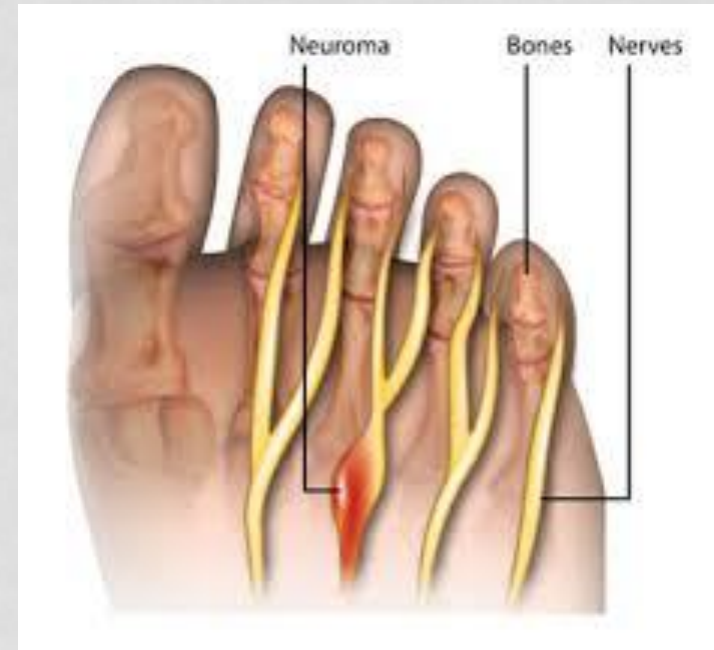
HEEL SPUR

- Calcium deposit causing a bony protrusion on the underside of the heel.
- Often painless, but can cause heel pain



MORTON'S NEUROMA

- Formation of an interdigital neuroma as a result of injury to one of the digital nerves. Usually between the 3rd and 4th toes. You must take care to differentiate between this and a stress fracture
- Stress fracture will be more painful when the bone is palpated.
- Pain on the outer border of the foot. Pain is often intermittent (cramp like) shooting up the side and to the tip of the affected toe or the adjacent 2 toes



DVT

- Deep vein thrombosis
- Pain and swelling
- Severe general contraindication.
- Send to doctor immediately



ANKLE TESTS

ANTERIOR DRAWER TEST OF THE ANKLE

- Used primarily to test the Anterior Talofibular ligament
 - The most commonly Ligament injured in the ankle
- How its done?
 - Patient supine, foot relaxed
 - Examiner stabilizes Tibia and Fibula and hold the foot in 20 degrees of plantar flexion
 - Draw the talus forward into the ankle mortise
- Positive Sign – Excessive anterior movement, recreation of pain, dimple appears over area of anterior talofibular ligament
- Alternately the foot and talus may be stabilized and posterior movement of tibia and fibula used. In this case excessive posterior movement is positive

<https://youtu.be/qoWaHa3M1nw>

SQUEEZE TEST OF THE LEG

- Tests for Syndesmosis injury (High ankle sprain – damage to the Anterior/Posterior Tibiofibular ligaments and interosseous membrane)
- How its done?
 - Client supine
 - Examiner grasps lower leg at midcalf and squeezes the Tibia and Fibula together and continues applying the same force distally towards the ankle
- Positive sign
 - Pain in lower leg PROVIDED that fracture, Contusion and compartment syndrome have been ruled out

<https://youtu.be/ANgWSz0UoDg>

TALAR TILT TEST

- Tests for Calcaneofibular Ligament Tear
- How its done?
 - Client lies supine or side lying, foot in a relaxed position
 - Examiner holds foot in anatomical position, plantar flexion with inversion and eversion to effect other ligaments
- Positive sign
 - Pain or excessive on eversion stresses the deltoid ligament primarily tibionavicular, tibiocalcaneal, and posterior tibiotalar ligaments
 - Pain or excessive motion on inversion Calcaneofibular Ligament and to some degree the anterior talofibular ligament

<https://youtu.be/UHNbm6Z3XK4>

EXTERNAL LATERAL ROTATION STRESS TEST

- Tests for Syndemosis
- How its done?
 - Client seated legs hanging over the table flexed at 90
 - Examiner stabilizes leg with one hand with the other hand Dorisflex the foot to neutral and applies a passive lateral rotation stress to the foot and ankle
- Positive Sign
 - Pain produced over the anterior/posterior tibiofibular ligaments and interosseous membrane. Medial pain or feeling of talus displace may indicate tear of deltoid ligament

<https://youtu.be/dE5eRk-3qbo>

LATERAL ANKLE STABILITY

- Calcaneofibular
 - Inversion in neutral
- Anterior Talofibular
 - Plantarflexion and Inversion
- Posterior Talofibular
 - Rotate talus laterally in neutral with slight INV

MEDIAL ANKLE STABILITY

- Tibiocalcaneal
 - Eversion in neutral
- Posterior Tibiotalar
 - Dorsiflexion/Eversion/posterior glide
- Anterior Tibiotalar
 - Plantarflexion/Eversion
- Tibionavicular
 - Plantarflexion/Eversion

THOMPSON'S TEST

- Tests for Achilles Rupture
- How its done?
 - Client prone or knees on a chair with the feet over the edge of the table or chair
 - Examiner – while patient is relaxed squeeze the calf muscle.
- Positive sign?
 - Absence of plantar flexion when the calf is squeezed is a sign. Remember the long flexor muscles can still produce plantar flexion with

<https://youtu.be/z-7cJ7LpCqY>

BRUEGER'S TEST

- Test Arterial Blood supply to the lower limb
- How its done?
 - Client supine
 - Examiner elevates clients leg 45 degrees for at least 3 minutes
- Positive Sign
 - If the leg blanches or prominent veins collapse shortly the test is positive.
 - The test is confirmed positive if after the 3 minutes the clients leg are dangled over the table and it take 1 -2 minutes for colour to return

HOMAN'S SIGN

- Tests for Deep Vein Thrombosis
- How its done?
 - Client supine
 - Examiner passively dorsiflexes the foot
- Positive sign
 - Pain in the calf, along with possibly finding other signs including tenderness on palpation, pallor and swelling in the leg, loss of the dorsalis pedis pulse

DORSAL PEDIS PULSE



Dorsalis Pedis: To palpate pulse, place fingers just lateral to the extensor tendon of the great toe. If you cannot feel a pulse, move fingers more laterally.

MORTON'S NEUROMA

- Morton's neuroma is a painful condition that affects the ball of your foot, most commonly the area between your third and fourth toes. Morton's neuroma may feel as if you are standing on a pebble in your shoe or on a fold in your sock.
- Morton's neuroma involves a thickening of the tissue around one of the nerves leading to your toes. This can cause a sharp, burning pain in the ball of your foot. Your toes also may sting, burn or feel numb.
- High-heeled shoes have been linked to the development of Morton's neuroma. Many people experience relief by switching to lower heeled shoes with wider toe boxes. Sometimes corticosteroid injections or surgery may be necessary.

MORTON'S TEST

- Tests for Morton's Neuroma
- How its done?
 - Client supine
 - Examiner grasps around metatarsal heads and squeeze heads together
- Positive sign?
 - Pain is positive for stress fracture or Morton's neuroma

TINEL'S SIGN AT THE ANKLE

- Tests for anterior deep peroneal nerve, posterior tibial nerve entrapment
- How its done?
 - Tapping on the front of ankle (anterior deep peroneal Nerve)
 - Tapping behind the medial malleolus (posterior Tibial Nerve)
- Positive sign?
 - Tingling, paresthesia felt distally is a positive sign

Arch assessment

To assess if a patient has a drop arch have the patient sit, visually assess how high the arch is. You can use your finger stacked as a measurement. Then has the patient stand, once again look at the height of the arch or measure with your fingers.

Positive: if the arch flattens out during weight bearing then it is a drop or fallen arch.

LOWER LIMB TENSION TESTS

- Tibial Nerve
 - Ankle DF/EV with Straight Leg Raise
- Peroneal Nerve
 - Ankle PF/INV with
 - SLR
- Sural Nerve
 - Ankle DF/INV with
 - SLR

<https://youtu.be/-fToh3Li7OM>

FIBULAR GLIDE ASSESSMENT

- Client supine (hook lying position) heels aligned
- Examiner grasps head of the fibula firmly and apply an anterior lateral and posterior medial pressure
- Perform bilaterally together
- Possible results
 - If anterior lateral motion is restricted when compared bilaterally it is considered an Anterior Glide Restriction
 - If posterior medial motion is restricted it is considered a fibular glide restriction

ANTERIOR FIBULAR GLIDE RESTRICTION

- Possible musculature causes
 - Gastrocnemius, Soleus, FDL, FHL and possibly the Biceps femoris
- Testing the posterior compartment and biceps femoris can help verify the causative musculature

CONTINUED

- Verify posterior compartment
 - Client is supine, legs extended
 - Examiner grasp calcaneus allowing the sole of the foot to rest along the forearm
 - Dorsiflex the ankle
 - Compare bilaterally

CONTINUED

- Verify Biceps Femoris
- Client is prone
- Examiner Flexes the knees to 90, Grasp distal end of tibia and fibula and passively internally rotate
- Compare bilaterally

INTRINSIC TX

INTRINSIC TX FOR BICEP FEMORIS TIGHTNESS

- Client seated or supine
- Examiner places sole of foot on forearm and grasp the heel
- With lateral hand grasp the head of the fibula and take up any anterior motion with anterior lateral force
- Dorsiflex and evert the ankle to the first barrier
- Provide a non yielding resistance as client attempts to plantar flex and invert their ankle for 7 – 10 seconds
- Take up any anterior lateral motion at the fibular head as well as dorsiflexion and eversion of the foot to the next barrier

ASSOCIATED CONDITIONS

- Dorsiflexion restriction
- Eversion Restriction
- Posterior compartment syndrome
- May play a role in plantar fasciitis and heel spurs
- Shin Splints

JOINT PLAY

TALOCRURAL JOINT

- Long-axis extension (traction)
 - Stabilize the proximal segment and apply traction to the distal segment.
 - Stabilize the tibia and fibula by allowing the leg to relax. Both hands are placed around the ankle, distal to the malleoli, and a longitudinal distractive force is applied.
- Anteroposterior glide
 - Stabilize the tibia and fibula and the talus and foot forward.
 - To test the posterior movement hands are in the same placement and push the foot backwards.

SUBTALAR JOINT

- Talar rock
 - Patient is sidelying with both hips and knees flexed.
 - Examiner sits with back to the patient.
 - Place both hands around the ankle just distal to the malleoli. A slight distractive force is applied to the ankle and a rocking movement forward and backward (plantarflexion-dorsiflexion) is applied to the foot. Normally the examiner should feel a clunk at the extreme of each movement.
- Side tilt medially and laterally
 - Place both hands around the calcaneus. Flex and extend wrists this will medially and laterally tilt the calcaneus on the talus.

MIDTARSAL/TARSOMETATARSAL JOINTS

- Rotation
 - Proximal row of tarsal bones (navicular, talus and calcaneus) is stabilized, the mobilizing hand is placed around the distal row of tarsal bones (cuneiforms and cuboid). The distal row of bones is then rotated on the proximal row of bones.
- Anterioposterior glide
 - Stabilize the proximal tarsal and move the distal tarsal forward.
 - To test the posterior movement hands are in the same placement and push the tarsal backwards.

METATARSOPHALANGEAL AND INTERPHALANGEAL JOINTS

- Long-axis extension
 - Stabilize the metatarsal bone or proximal phalanx and apply a longitudinal distractive force to the proximal or distal phalanx
- Anteroposterior glide
 - Stabilize the proximal tarsal and move the distal tarsal forward.
 - To test the posterior movement hands are in the same placement and push the tarsal backwards.
- Side glide
 - Stabilize the proximal bone with one hand. Apply a slight traction to the distal bone with the other hand and move the distal bone sideways (right and left) in relation to the stabilized bone without causing a torsion motion.
- Rotation
 - Perform at the metatarsophalangeal and interphalangeal joint with the same motions as previous slide.