

# **Back To Chiropractic CE Seminars**

## **Ankle/Foot History & Exam ~ 4 Hours**


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**This course counts toward your California Board of Chiropractic Examiners CE. (also accepted in other states, check our website or with your Chiropractic State Board)**

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**Marcus Strutz, DC  
Back To Chiropractic CE Seminars**



# ANKLE/FOOT HISTORY & EXAM

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Back to Chiropractic CE Seminars

# Course Objectives

1. To examine the anatomy and physiology of the ankle and foot joints as well as the surrounding osseous and soft tissues.
2. To evaluate common ankle and foot issues and injuries as well as the causes due to anatomical, postural, and habitual means.
3. To perform a thorough history of the ankle and foot, taking into account the Ottawa ankle rules and sprain grades.
4. To examine and perform examination procedures and observations of the ankle involving gait, posture, range of motion, muscle testing, and orthopedic testing.

# Course Objectives

- Hour 1 and 2: History-taking of the ankle involving past history; mechanism of injury; current presentation and symptoms; and effect on daily activity.
- Hour 3 and 4: Examination of the ankle involving gait, posture, active and passive range of motion, muscle testing, and orthopedic testing.

# General Outline

1. History and anatomy
2. Examination and testing
  1. Observation and palpation
  2. Range of motion
  3. Orthopedic testing
  4. Neurological testing
3. Common conditions
4. Treating and care protocol

# History Taking

- History of complaint
  - What brings the patient in today?
    - When and how did it begin?
  - History of current complaint?
    - If so, what was the cause?
    - How did it resolve?
    - What was the prior care for that complaint?

# History Taking

- Current complaint information
  - Was trauma involved?
  - Did the issue present suddenly or gradually?
  - What has the patient done to alleviate the pain?
  - What situations or habits make it worse or better?



# History Taking

- Obtain patient information
  - Age, gender, height, weight, and blood pressure
    - Should measure blood pressure on first visit before testing
  - Type of employment
    - What are their daily work postures?
    - How much weight do they carry daily?
    - Are there any repetitive actions?
    - How long do they sit or stand including commute?
    - What type of shoes do they wear at work?

# History Taking

- Presentation of the current complaint
  - Where is the site of pain?
    - Does the pain travel to another location?
  - Ask the patient to describe the pain
    - Ex. Sharp, dull, sore, achy, stabbing, burning, throbbing, tingling, shooting, numbing, sensitive, etc.
  - What is their numerical pain scale from 0-10?
    - 0 is no pain; 10 is excruciating pain
  - Since the onset, has the pain improved, worsened, or stayed the same?
  - Frequency, duration, time of day of the complaint
    - Ex. Constant, periodic, daily, weekly, with certain activity, upon waking, etc.

# History Taking

- Ankle and foot specific questions
  - What type of shoes did you wear during the injury?
  - What type of shoes do you wear typically?
  - Do you use orthotics or shoe inserts?
  - Were you able to walk/ continue activity/ bear weight after the injury?
  - Was there any immediate swelling after the injury?

# History Taking

- Other questions from the patient's history
  - Past surgeries or hospitalizations
  - Past trauma or accidents
  - Past illnesses
  - Current conditions or illnesses
  - Current medications
  - Past imaging taken
  - Past chiropractic care
    - If so: when, duration of care, reason for care, type of chiropractic care, resolution of complaint

# History Taking

- Other questions from patient's history
  - Daily activities, habits, or hobbies
    - Diet, sleep, water intake, drinking, and smoking
    - Types of exercise or extracurricular activity
      - Ex. How long do you run? How much weight do you lift?
  - Family history of illness or conditions
    - Ex. Arthritis, cancer, diabetes, other metabolic/ systemic issues, etc.

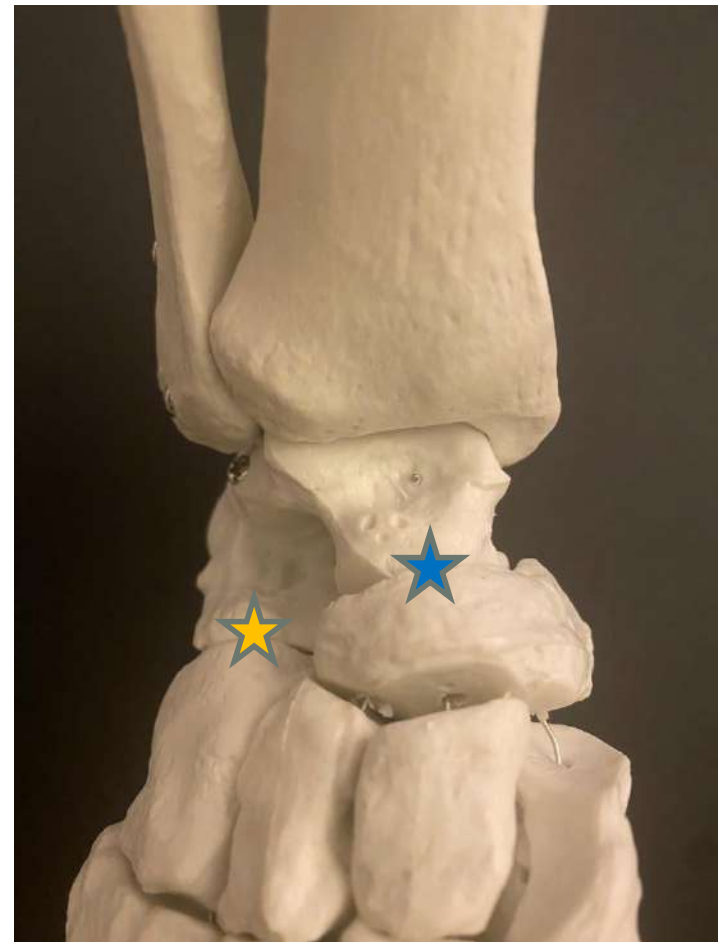
# Anatomy (Rearfoot)

- Inferior tibiofibular joint ★
- Tibiotalar joint ★
- Subtalar joint ★



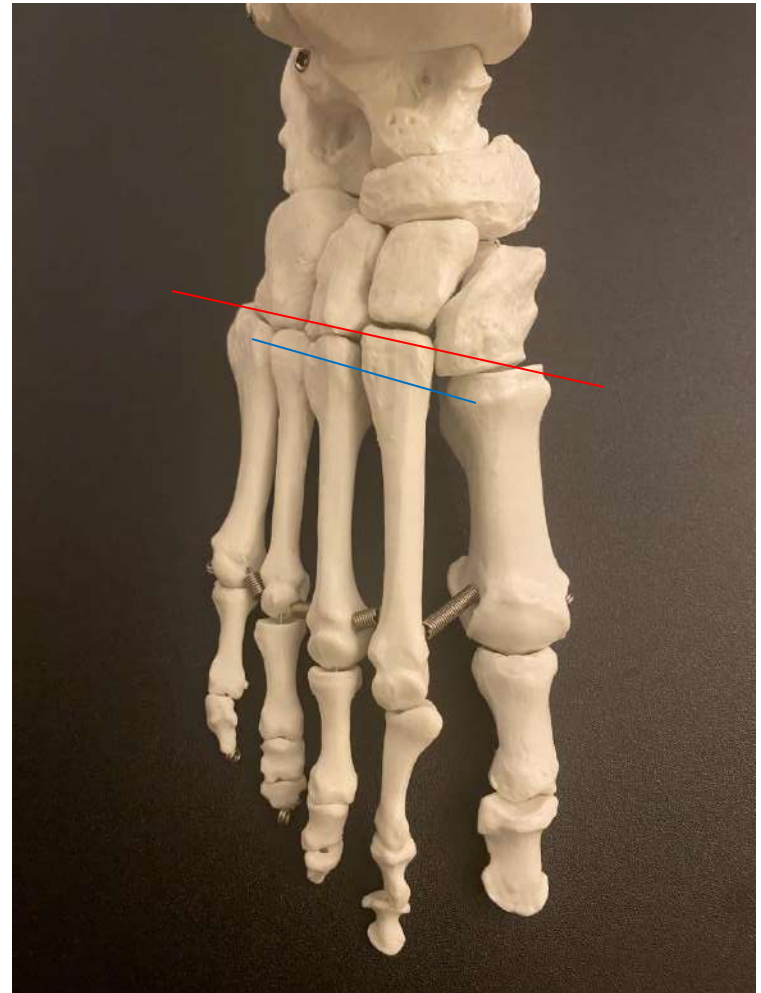
# Anatomy (Midfoot)

- Transverse tarsal joint
  - Comprised of two joints:
  - Calcaneocuboid joint ★
  - Talonavicular joint ★



# Anatomy (Forefoot)

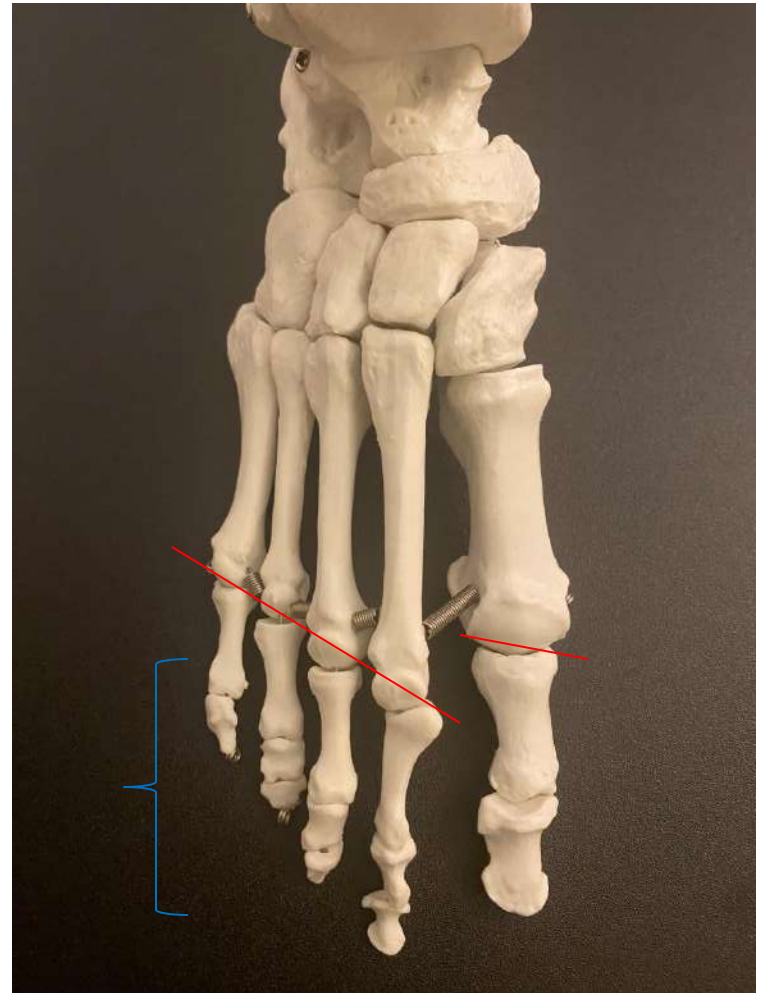
- Tarsometatarsal joints (**Red**)
- Intermetatarsal joints (**Blue**)





# Anatomy (Forefoot)

- Metatarsophalangeal joints (Red)
- Interphalangeal joints (Blue)
  - Proximal
  - Distal



# Anatomy (Tarsals)

- Calcaneus ★
- Talus ★
- Navicular ★
- Cuboid ★
- Cuneiforms ★
  - Medial, intermediate, distal

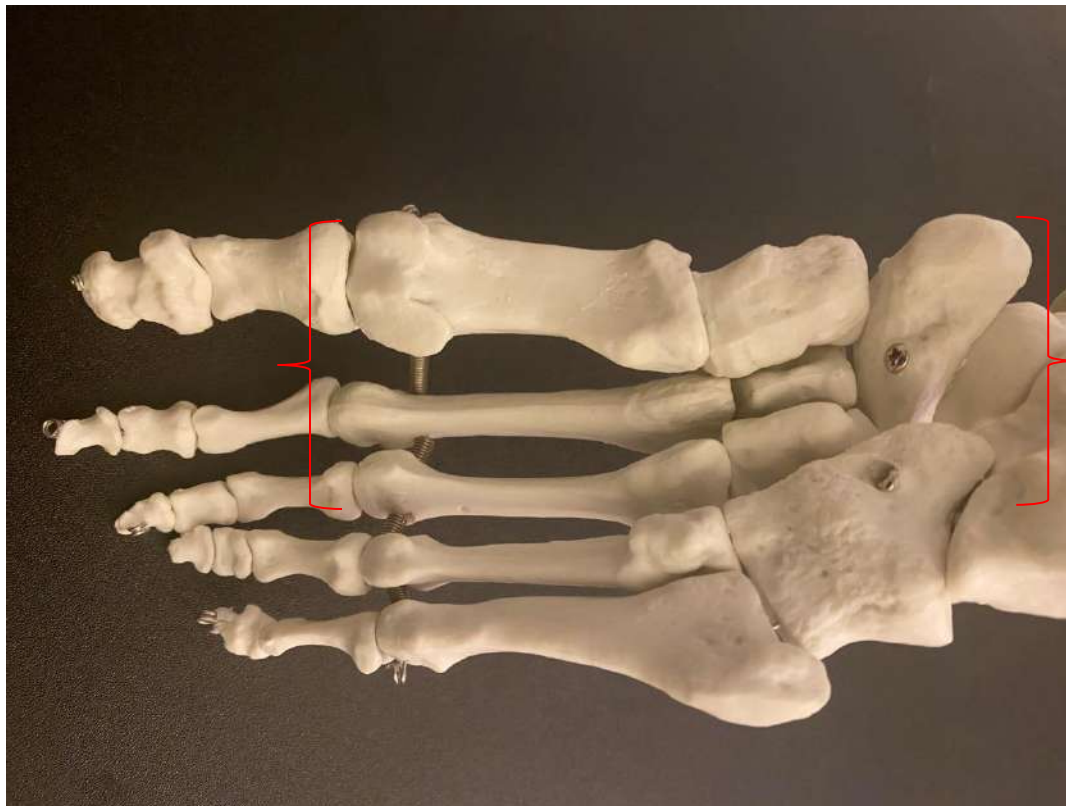


# Anatomy (Metatarsals and Phalanges)

- Components of each long bone: base, shaft, and head
- Styloid process is the base of metatarsal 5
- Digits 2-5: proximal, middle, and distal phalanx
- Digit 1: proximal and distal phalanx

# Anatomy (Foot arches)

- Medial longitudinal arch
  - Includes metatarsals 1-3, cuneiforms, navicular, talus, and medial calcaneus



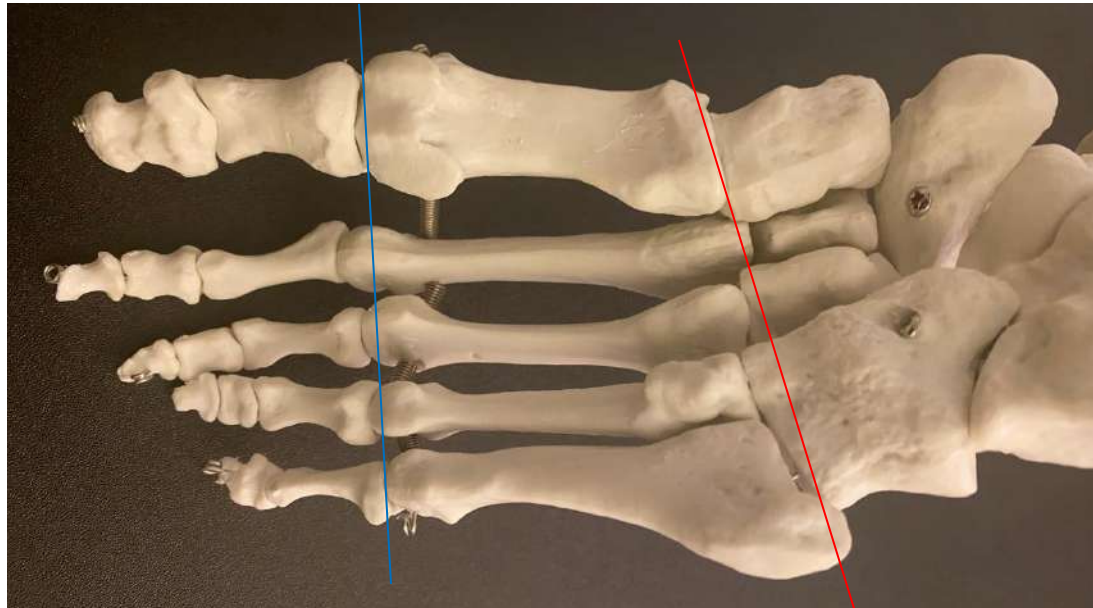
# Anatomy (Foot arches)

- Lateral longitudinal arch
  - Includes metatarsals 4-5, cuboid, and lateral calcaneus



# Anatomy (Foot arches)

- Proximal transverse tarsal arch (**Red**)
  - Includes metatarsal bases 1-5, cuneiforms, and cuboid
- Distal transverse tarsal arch (**Blue**)
  - Includes heads of all metatarsals and bases of all proximal phalanges



# Examination

- Observation (Patient seated)
  - Scars or distinguishing marks
  - Discoloration
    - Bruising
    - Redness
  - Tissue morphology
    - Swelling
    - Soft tissue masses
    - Muscular atrophy
  - Deformation
    - Bunions, hammer toe, varus and valgus deformities, etc

# Toe Anomalies

- Hammer toe
  - Bend in the proximal interphalangeal joint
- Claw toe
  - Upward bend of the metatarsophalangeal joint accompanied by a downward bend of the proximal interphalangeal joint
- Mallet toe
  - Bend in the distal interphalangeal joint



# Toe Anomalies

- Hallux valgus/ Bunion
  - Inward deformity at the metatarsophalangeal joint on the first digit
- Tailor's bunion
  - Inward deformity at the metatarsophalangeal joint on the fifth digit

# Examination

- Observation (Patient seated non-weightbearing)
  - Forefoot varus or valgus
    - Toes and forefoot will appear supinated (varus) or pronated (valgus) relative to heel
  - Normal valgus tilt of the head of the talus to the trochlea of the talus is 35-45 degrees
    - Degrees above range → valgus
    - Degrees below range → varus

# Examination

- Observation (Patient seated non-weightbearing)
  - Rearfoot varus or valgus
    - Calcaneus will appear inverted (varus) or everted (valgus) relative to the talus
  - Can be due to atypical angulation of the calcaneus, tibia, and/ or subtalar joint

# Examination

- Observation (Patient standing)
  - Foot flare (Normal Fick's angle= 12-18 degrees)
  - Rearfoot varus or valgus
    - Observe bowing of the Achilles tendon
  - In-toeing/ Pigeon toe
  - Medial arch integrity
    - Pes planus (dropped arch) or pes cavus (high arch)
  - Tibial internal or external rotation
  - Hip anteversion or retroversion

# Examination

- Helbing's Sign
  - Medial bowing of the Achilles tendon
  - Can occur with pes planus (flatfoot) from collapse of the medial longitudinal arch

# Examination

- Haglund's Deformity
  - Bony enlargement at the insertion of the Achilles tendon
  - Due to shoes repetitively rubbing on the back of the heel
  - May be seen in athletes or with repetitive use of shoes with firm backs

# Examination

- Observation (Gait)
  - Check shoe wear to see wear pattern on soles and heel
  - Symmetry of weight distribution on both feet during gait
  - Length of stride
  - Flexion and extension of hips and knee joint
  - Location of plantar contact when striking the ground

# Examination

- Observation (Gait)
  - Adequate and symmetrical dorsiflexion before heel strike and plantarflexion during toe-off
  - Varus during heel strike and foot flat stances
  - Valgus during foot flat and toe-off stances
  - Heel and toe walk
    - If done due to antalgic reasons, check if injury to forefoot or rearfoot is preventing contact
    - For active walking, heel walk evaluates L4/5 and toe walk evaluates S1



# Examination

- Palpation
  - Tenderness
  - Swelling and heat
  - Bony or soft tissue masses
- Pulses
  - Dorsalis pedis pulse
    - Best palpated between bases of metatarsals 1 and 2
  - Posterior tibial pulse
    - Palpated posterior to the medial malleolus

# Examination

- Active range of motion via goniometry
  - Plantarflexion: ~40-50 degrees
  - Dorsiflexion: ~15-20 degrees
  - Supination: ~20-30 degrees
  - Pronation: ~10-20 degrees
  - Toe flexion
  - Toe extension
  - Great toe flexion
  - Great toe extension
- Passive range of motion
  - Slight degree of movement past active range of motion

# Examination

- Accessory motion
  - Talocrural joint
    - Long-axis extension
    - Anterior-to-posterior glide
  - Subtalar joint
    - Long-axis extension
    - Anterior-to-posterior glide
    - Medial-to-lateral glide

# Examination

- Accessory motion
  - Transverse tarsal joint
    - Anterior-to-posterior shearing at joint
    - Anterior-to-posterior glide of cuboid and navicular
  - Tarsometatarsal joint
    - Anterior-to-posterior shearing at joint
    - Anterior-to-posterior glide of each cuneiform
    - Rotation of metatarsal bases on proximal tarsals
  - Intermetatarsal joint
    - Anterior-to-posterior shearing of each metatarsal base

# Examination

- Accessory motion
  - Metatarsophalangeal joints
    - Rotation of phalangeal bases on metatarsal heads
    - Anterior-to-posterior glide of phalanges on metatarsals
    - Medial-to-lateral tilt of phalanges on metatarsals
  - Interphalangeal joints
    - Rotation of phalangeal bases on proximal phalanx
    - Anterior-to-posterior glide of each phalanx
    - Medial-to-lateral tilt of phalanges on proximal phalanx

# Examination

- Muscle strength testing
  - Myotome pattern for lower extremity
    - L2: Hip flexion
    - L3: Knee extension
    - L4: Ankle dorsiflexion
    - L5: First toe extension
    - S1: Ankle plantarflexion
    - S2: Knee flexion

# Examination

- Muscle strength testing
  - Specific muscles and peripheral innervation
    - **Tibialis anterior**: inversion and dorsiflexion; deep fibular nerve
    - **Tibialis posterior**: inversion and plantarflexion; tibial nerve
    - **Fibularis longus/ brevis**: eversion and plantarflexion; superficial fibular nerve
    - **Triceps surae** (Gastrocnemius, Soleus, Plantaris): Plantarflexion; tibial nerve

# Examination

- Muscle strength testing
  - Specific muscles and peripheral innervation
    - **Extensor hallucis longus/ brevis**: first digit extension; deep fibular nerve
    - **Extensor digitorum longus/ brevis**: digit 2-5 extension; deep fibular nerve
    - **Flexor hallucis longus/ brevis**: first digit flexion; tibial nerve (longus) and medial plantar nerve (brevis)
    - **Flexor digitorum longus/ brevis**: digit 2-5 flexion; tibial nerve (longus) and medial plantar nerve (brevis)



# Orthopedic Testing

- Drawer Test

- Anterior

- Stabilizing hand on distal, anterior tibia while contact hand holds the posterior calcaneus and applies a posterior-to-anterior force
    - Excessive anterior motion can indicate damage to the anterior talofibular ligament

- Posterior

- Stabilizing hand on distal, posterior tibia while contact hand holds the foot dorsum and applies a anterior-to-posterior force
    - Excessive posterior motion can indicate damage to the posterior talofibular ligament

# Orthopedic Testing

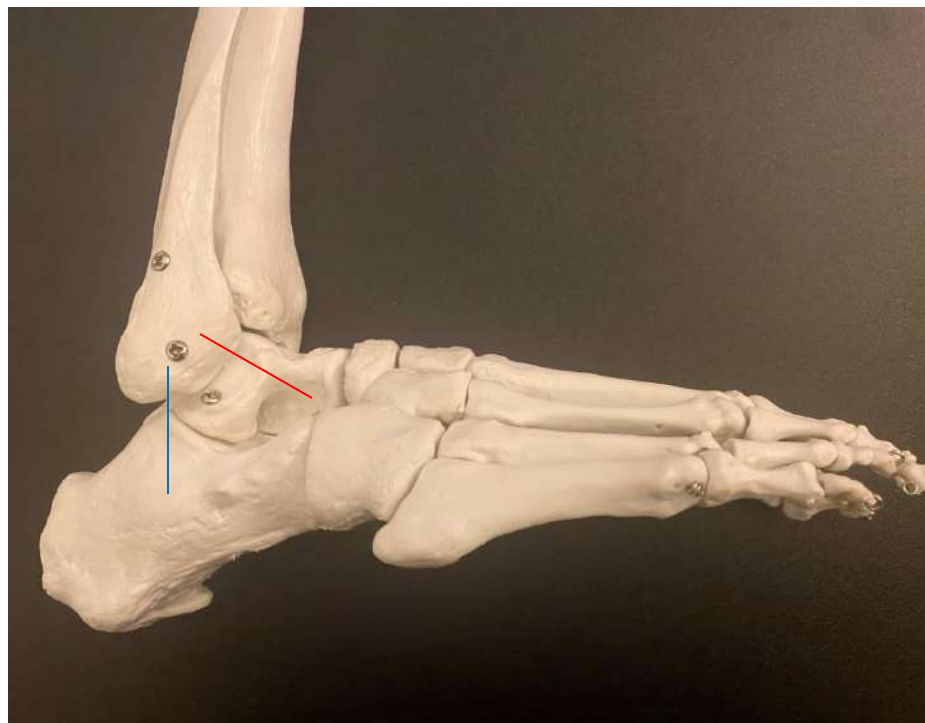
- Stress tests
  - Inversion/ Eversion
    - Pain with passive inversion can indicate damage to the lateral collateral ligament
    - Pain with passive inversion can indicate damage to the medial collateral ligament/ deltoid ligament

# Orthopedic Testing

- Stress tests
  - External rotation test (Kleiger Test)
    - With patient seated with foot held passively at 90 degrees from the tibia, examiner passively externally rotates the foot.
    - Pain at the anterior or posterior tibiofibular ligaments or interosseous membrane can indicate a high ankle/ syndesmosis injury
    - Cotton's Test: Stabilize the distal tibia and fibula while applying external rotational force
      - Excess motion or a clunk can indicate syndesmotic instability

# Anatomy

- Lateral collateral ligaments
  - Anterior talofibular (Red)
  - Posterior talofibular
  - Calcaneofibular (Blue)



# Anatomy

- Medial collateral ligaments
  - AKA Deltoid ligament



# Orthopedic Testing

- Navicular Drop Test
  - Step 1: the distance between the navicular tubercle and the floor is measured while the patient has the foot on the floor with minimal weight-bearing
  - Step 2: a new measurement is taken while the patient is fully weight-bearing
  - A difference greater than 10 mm can indicate significant pronation, pes planus, or a dropped medial longitudinal arch

# Orthopedic Testing

- Calcaneal Squeeze Test
  - With patient seated or prone, external pressure applied to different locations causing pain can indicate a variety of issues
    - Medial and lateral sides together: calcaneal fracture
    - Posterior calcaneus: fracture or bursitis
    - Medial calcaneal tubercle: Plantar Fasciitis
    - Plantar surface: Fat Pad Syndrome, Plantar Fasciitis

# Orthopedic Testing

- Windlass Test
  - Patient stands and examiner passively extends the metatarsophalangeal joint of the first digit while allowing the interphalangeal joint to bend
    - Pain may indicate Plantar Fasciitis



# Orthopedic Testing

- Buerger's Test
  - Step 1: Supine patient's leg is passively lifted 45 degrees from the table for 3 minutes.
    - If the sole of the foot blanches at a decreased angle and/ or in less time than the 3 minutes, arterial insufficiency may be suspected.
  - Step 2: Patient sits up with legs overhanging the table as blood returns to the extremity.
    - If normal complexion and venous appearance take longer than 1-2 minutes to return, arterial insufficiency may be suspected.

# Orthopedic Testing

- Tibia and fibula squeeze test
  - Medial and lateral compression is applied simultaneously along the shafts of the tibia and fibula to the malleoli
  - Pain can indicate a high ankle/ syndesmotic injury

# Orthopedic Testing

- Forefoot Compression
  - Patient is supine and metatarsals are compressed on both sides going lateral to medial
    - Pain can indicate Morton's Neuroma of the plantar nerves, metatarsalgia, inflammation, or stress fracture

# Orthopedic Testing

- Hoffa's test
  - Patient is prone with feet overhanging the table while actively dorsiflexing and plantarflexing the ankles. Examiner observes and palpates the Achilles tendon to compare laxity of the tendon
    - Pain and/ or decreased tautness in the tendon may indicate an Achilles rupture or strain, calcaneal fracture, or calcaneal bursitis
    - If done passively due to pain or inability, the affected ankle may have more range in passive dorsiflexion

# Orthopedic Testing

- Thompson's Test
  - Patient is prone and has their feet overhanging the table as examiner squeezes the calf
    - If no plantarflexion occurs, an Achilles rupture may be present

# Orthopedic Testing

- Matles Test
  - Patient is prone and is asked to flex the knee to 90 degrees
    - If the examiner observes the foot goes into dorsiflexion, this can indicate and Achilles tendon rupture

# Orthopedic Testing

- Peroneal Tendon Dislocation Test
  - Patient is prone and the knee is flexed to 90 degrees. The patient doriflexes and plantarflexes against the examiner's resistance.
    - If the tendon slides anteriorly over the lateral malleolus, this can indicate a peroneal tendon dislocation

# Orthopedic Testing

- Tinel's Test
  - With the foot relaxed, the examiner taps behind the medial malleolus to evaluate the posterior tibial nerve as well as the dorsum anterior to the talus to evaluate the deep peroneal nerve
    - Tingling or paresthesia can indicate Tarsal Tunnel Syndrome or nerve entrapment



# Anatomy

- Tarsal Tunnel
  - Posterior to the medial malleolus and under the flexor retinaculum
  - Structures anterior to posterior:
    - Tibialis posterior muscle
    - Flexor digitorum longus muscle
    - Posterior tibial artery
    - Tibial nerve
    - Flexor hallucis longus muscle

# Neurological Testing

- Myotomes

- L2: Hip flexion
- L3: Knee extension
- L4: Ankle dorsiflexion
- L5: First toe extension
- S1: Ankle plantarflexion
- S2: Knee flexion

- Dermatomes

- L1: near inguinal ligament
- L2: proximal anterior thigh
- L3: mid anterior thigh
- L4: anterior, medial knee
- L5: anterior, lateral knee to dorsum
- S1: posterior, lateral leg
- S2, posterior, medial leg

# Neurological Testing

- Crude sensation
  - Evaluates the anterior spinothalamic tract
  - May use cotton or swab
- Pain
  - Evaluates the lateral spinothalamic tract
  - May use toothpick or pin
- Vibration
  - Evaluates the dorsal column medial lemniscus pathway
  - Via 128 Hz tuning fork
- Two-point discrimination
  - Evaluates the dorsal column medial lemniscus pathway
  - May use toothpick or caliper about 5 cm apart on average

# Neurological Testing

- Lower extremity deep tendon reflexes (DTR)
  - Achilles DTR
    - Evaluates S1/ S2
    - Location: proximal to calcaneal insertion as foot is passively dorsiflexed to neutral
  - Posterior tibial DTR
    - Evaluates L4/ L5
    - Location: posterior to medial malleolus

# Neurological Testing

- Lower extremity deep tendon reflexes (DTR)
  - Patellar DTR
    - Evaluates L2/ L3/ **L4**
    - Location: between patellar apex and tibial tuberosity
  - Medial hamstring DTR
    - Evaluates L5
    - Location: near insertion at medial, posterior thigh

# Neurological Testing

- Upper motor neuron (UMN) reflex tests
  - Evaluates for pyramidal tract lesions
  - May use opposite end of reflex hammer
  - If positive, great toe will extend and other digits will fan out, indicating an UMN lesion
- Babinski
  - Run tool from lateral plantar surface, crossing the MTP joint area, and ending on the underside of the great toe
- Chaddock
  - Run tool from lateral side of foot to fifth digit

# Neurological Testing

- Upper motor neuron lesion tests (cont.)
  - Evaluates for pyramidal tract lesions
  - May use opposite end of reflex hammer
  - If positive, great toe will extend and other digits will fan out, indicating an UMN lesion
- Gordon
  - With patient's leg relaxed, examiner grabs calf
- Oppenheim
  - Run tool along tibial crest

# Functional Assessment Tools

- To be given to the patient on examination day:
- Ankle Joint Functional Assessment Tool
  - Compares pain and ability of affected ankle to unaffected ankle
  - To be taken at initial visit, 2 weeks post treatment, and discharge date
- Foot and Ankle Ability Measure
  - Rates difficulty and/ or inability of walking, endurance, and daily activities



# Functional Assessment Tools

- To be given to the patient on examination day:
- Foot and Ankle Outcome Score
  - Rates recent reporting of ankle symptoms, stiffness, pain, function, and quality of life within the past week
- Foot Functional Index
  - Quantifies pain, difficulty, and limitation of activity in walking and climbing

# Ankle Sprain Classification

- Grade I – Mild
  - Involves mild stretch of the ligaments and tendons with microscopic tearing
  - Usually is not accompanied by bruising or discoloration
  - Minimal swelling and some tenderness present
  - No apparent instability or loss of function
  - Weight-bearing possible
  - Healing time ranges from 2-14 days
  - Treatment may involve R.I.C.E (rest, ice, compression, elevation), mobilization and strengthening exercises

# Ankle Sprain Classification

- Grade II – Moderate
  - Involves partial tearing ligaments and tendons
    - Some soft tissues may be completely torn such as the anterior talofibular ligament while the other lateral collateral ligaments may be partially torn
  - May be accompanied by bruising or discoloration
  - Swelling and tenderness present
  - Possible instability or loss of function
    - May have limp, weakness; may be unable to tip-toe or run/ jump
  - Weight-bearing possible but with increased difficulty
  - Healing time can range from 4-8 weeks
  - Treatment may involve splinting, R.I.C.E (rest, ice, compression, elevation), mobilization and strengthening exercises

# Ankle Sprain Classification

- **Grade III – Severe**
  - Involves complete tear of the ligaments and tendons
  - May see balled-up muscle under the skin from full tear such as in a full Achilles tendon rupture
  - May be accompanied by profuse bruising or discoloration
  - Diffuse swelling and significant pain present
  - Complete instability and loss of function
  - Full weight-bearing not possible
  - Laxity present in varus stress and in drawer tests
  - Healing time ranges from 10 weeks- 6 months
  - Treatment may involve immobilization, surgical intervention, and R.I.C.E (rest, ice, compression, elevation) followed by mobilization and strengthening exercises

# Ottawa Ankle Rules

- The purpose of these rules was to screen out which patients should have an x-ray offered to them depending on their presentation in office
- This allows for providers and patients to save on potentially costly imaging and unnecessary exposure to radiation
- These rules should not be applied to young children, pregnant women, and those who have an inability to follow the examination due to inebriation or head trauma
- Following rules include the Buffalo Rule modifications

# Ottawa Ankle Rules

- An **ankle x-ray** is required if the patient presents with pain in the malleoli as well as:
  - Bone tenderness within the distal 6 cm of the posterior edge of the tibia or at the tip of the medial malleolus
  - Bone tenderness within the distal 6 cm of the posterior edge of the fibula or at the tip of the lateral malleolus
  - Inability to bear weight immediately after trauma and inability to take four steps in the emergency department

# Ottawa Ankle Rules

- A **foot x-ray** is required if the patient presents with pain in the midfoot as well as:
  - Bone tenderness at the base of the fifth metatarsal AKA styloid process
  - Bone tenderness at the navicular
  - Inability to bear weight immediately after trauma and inability to take four steps in the emergency department

# Additional conditions

- Sever's Disease
  - AKA calcaneal apophysitis
  - Occurs in growing children when the growth plate of the heel becomes inflamed
  - Look out for: history of sports or repetitive stress on the heel; tight shoes; inflammation around the heel; pain upon waking; pain when jumping; tip-toeing



# Additional conditions

- Freiberg's Disease
  - Lack of blood supply to, typically, the second metatarsal head, which causes necrosis
  - Look out for: stiffness and swelling at the affected toe; pain at the ball of the foot; sclerosis at the affected toe via X-ray

# Additional conditions

- Plantar Fasciitis
  - Inflammation of the plantar fascia from repetitive activity
  - Look out for: history of sports, athleticism, continuous standing, pes planus, high arch, rheumatoid arthritis; pain after resting the foot such as sleep or driving; Achilles tendon insertion pain or swelling

# Additional conditions

- Fat Pad Syndrome
  - Thinning of the fat tissue under the heel/ loss of elasticity of the heel soft tissue which can cause soreness with activity
  - Look out for: history of repetitive standing, running, jumping, non-ergonomic footwear; history of corticosteroid injections in the foot; history of rheumatoid arthritis, lupus, or diabetes; increased pain when walking on hard surfaces; increase in body weight

# Additional conditions

- Stress fracture
  - Small fracture in the bone due to repetitive activity or increase in activity which may appear in the calcaneus or metatarsals
  - Look out for: history of athleticism especially sports involving running; history of osteoporosis or osteopenia; increased pain with activity and relief with rest; swelling or bruising

# Additional conditions

- Accessory ossicle
  - Common variant in which a small sesamoid or rounded bone failed to fuse during development
  - Look out for: local pain; well-corticated and rounded appearance via X-ray
  - May be similar in presentation to a fracture prior to radiographs

# Additional conditions

- Retrocalcaneal Bursitis
  - Inflammation of the bursa between the posterior aspect of the calcaneus and the Achilles tendon
  - Look out for: history of frequent tight shoe wear, Haglund's Deformity, high foot arches; red, tender prominence of tissue near the Achilles tendon insertion

# Additional conditions

- Achilles Tendinitis
  - Overuse of the Achilles tendon causes inflammation or irritation
  - Look out for: history of running or athleticism; hypertonic triceps surae muscles; flat arches and hyperpronation; pain after rest and at the start of exercise; pain with dorsiflexion/ plantarflexion; inflammation along the tendon to its insertion

# Additional conditions

- High ankle/ Syndesmotic injury
  - Injury of the high ankle/ syndesmotic ligaments that connect the distal aspects of the tibia and fibula (anterior, posterior, and interosseous tibiofibular ligaments)
  - Look out for: mechanism of injury involving sudden twisting (especially external rotation) or high impact of the ankle from sports, jumping, running; positive Kleiger Test and Cotton Test; positive squeeze test of the tibia and fibula; swelling; difficulty weight-bearing



# Additional conditions

- **Peroneal Tendon Dislocation**
  - A dislocation or subluxation of the peroneal tendons accompanied by damage to the superior peroneal retinaculum, the overlying fibrous tissue that covers the peroneus longus and brevis tendons
  - Look out for: mechanism of injury involving sudden dorsiflexion and/ or inversion prior to the foot being in plantarflexion and eversion; popping sound/ sensation over the lateral malleolus with ankle movement; inflammation and tenderness at the lateral malleolus; instability in the ankle joint; positive peroneal tendon dislocation test

# Additional conditions

- Reactive Arthritis
  - AKA Reiter's Syndrome
  - Joint inflammation triggered by infection elsewhere in the body
  - Look out for: history of infection and aged between 20-40; skin rash/ lesions, urethritis, eye inflammation such as conjunctivitis or uveitis; sacroiliitis; inflammation at knee, foot, and ankle joints; positive HLA-B27 marker via lab work

# Additional conditions

- Gout
  - Inflammatory arthritis involving increased accumulation of uric acid
  - Look out for: swelling in the joints extremities especially the big toe; history or remission and flare-ups; a diet high in red meat; tophi at joint areas

# Additional conditions

- Guillain-Barre Syndrome
  - Autoimmune condition in which the body's immune system attacks the peripheral nervous system
  - Look out for: history of recent infection in the past weeks; bilateral ascending paralysis/ weakness starting in the feet; paralysis may appear in upper extremities and upper body; spread of paralysis can range from hours to weeks
  - May be a medical emergency especially if the patient presents with difficulty breathing

# Additional conditions

- Morton's Neuroma
  - AKA intermetatarsal/ interdigital neuroma
  - Thickening of the tissue around the plantar nerves that is typically found between the third and fourth metatarsals
  - Look out for: positive forefoot compression test; tight shoe wear; sensation of a mass in the forefoot area; discomfort when putting weight on the ball of the foot

# Additional conditions

- Compartment Syndrome
  - Increased pressure in the compartments of the leg that cause decreased of blood flow and nerve compression of the muscles
  - Look out for: history of trauma or overuse; severe pain; altered sensation; difficulty/ weakness in dorsiflexion; decreased pulse at dorsum; pallor at the extremity

# Treatment and Maintenance

- Manipulation
  - Long-axis distraction of the tibiotalar joint using a bimanual interphalangeal contact
  - Tibiotalar joint can also be adjusted with anterior-to-posterior (A-P) glide, inversion, and eversion depending on the restriction
  - Subtalar joint can be adjusted with A-P, P-A glides as well as medial-to-lateral and lateral-to-medial glide
  - Dorsal-to-plantar or plantar-to-dorsal glide adjustments of the tarsals
  - Long-axis distractions of the metatarsophalangeal and interphalangeal joints

# Treatment and Maintenance

- Mobilization
  - Any of the above manipulation methods above can be mobilized by the doctor in the event of patient preference, sensitivity, or depending on the case presentation
  - Post-ankle injuries can be helped via alphabet ankle mobilization, in which the patient traces letters to restore range of motion
  - With the foot planted and stationary, the patient (in a crouched down position) can carefully lean in forward at different angles to increase the range of dorsiflexion



# Treatment and Maintenance

- R.I.C.E
  - Rest, ice, compression, elevation
  - Helps in many overwork or trauma ankle/ foot injuries
- Ergonomic changes
  - Suggest changing shoes with rigid heel backings to softer or wider alternative
  - Utilize supports for shoes with flat soles to maintain the medial longitudinal arches
  - In instances in which the patient must stand for long periods of time, they can practice shifting weight from one foot to the other. The weight-bearing leg is locked with the foot pointed straight while the resting leg is slightly bent with the forefoot slightly flared out to maintain balance.

# Treatment and Maintenance

- Orthotics and inserts
  - Different inserts aid in the support of maintaining the various arches of the foot
  - Usually come in three main categories: rigid, semirigid, and soft
- Bracing
  - Often used after a more acute injury for stability while avoiding the use of injured tissue structures
  - Long-term use runs the risk of limiting range of motion as well as muscle atrophy

# Treatment and Maintenance

- Balance rehabilitation
  - Exercises on stability boards can aid in strengthening and proprioception post-injury
  - Activities that assist in balance and proprioception include but are not limited to: yoga, Tai Chi, and working with a physical therapist or personal trainer
- Strengthening
  - Towel exercises using the toes to grip and gather a towel on the floor aids in strengthening the plantar muscles
  - Strengthening the anterior and posterior knee muscles to provide stability and decrease the risk of re-injury

# Treatment and Maintenance

- Stretching

- Patient can perform active at-home exercises while the doctor can assist in passive stretches to reach past active end-range of motion
- Common active stretches include: triceps surae stretches against the wall, resisted dorsiflexion and plantarflexion utilizing resistance bands, and heel and toe raises
- Passive stretching utilizing pin-and-stretch involved holding the muscle near its insertion while shortened, followed by moving the limb in a way that performs the opposite function of the muscle
  - Ex. For tibialis anterior, the muscle will be pinned near the proximal anterolateral aspect of the tibia with the ankle already in dorsiflexion and eversion. While keeping the insertion pinned, the ankle will be passively plantarflexed and everted.

# Treatment and Maintenance

- Taping
  - Rigid sports tape aids in recent trauma to restrict motion and restore stability
  - A horseshoe shape taping method on the back of the heel near the plantar area can assist in lessening the discomfort of Fat Pad Syndrome by thickening the soft tissue beneath the calcaneus
  - Kinetic taping can be used nearer to the tail-end of treatment as it can help the patient more with proprioception rather than stability

# Treatment and Maintenance

- Soft tissue work
  - Soft tissue manipulation through various techniques such as massage, pin-and-stretch, blade work, etc. to the muscles, tendons, and ligaments
  - Massage and pin-and-stretch of the muscles of the anterior knee can help with issues in reaching full range of motion; and conditioning to the posterior muscles can relieve tension for the Achilles tendon
  - Blade work and manual massage to the plantar fascia can relieve plantar fasciitis or any tension in the plantar area
  - Blade work to the lateral collateral ligaments can help in regaining mobilization post-injury to an inversion ankle sprain

# Treatment and Maintenance

- Referral
  - Fractures can warrant referral to primary care provider and/ or orthopedic surgeon
  - Emergency referrals depending on case of compartment syndrome, Guillain-Barre Syndrome, or any risk that can lead to permanent disability, etc.
  - Co-management with physical therapists, rheumatologists, nutritionist, etc. depending on the care needs and maintenance of the patient

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