Ankle Stability for Rehabilitation and Injury Prevention

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I. Anatomy of the Ankle

- Bones
- Joints
- Muscles/tendons
- Ligaments
- Fascial Tissue
- Apaneurosis

1. Bones

- Not all-inclusive
- Tibia
- Fibula
- Talus
- Calcaneus
- Navicular
- Metatarsals

2. Joints

- TaloFibular
  - Joint that is not a real “joint” but more spacing between the two vertical bones
  - Stretched often in very bad ankle inversion sprains
- Subtalar
  - Allows tilting and tipping of the ankle
- Talo-crural

Joints Cont.

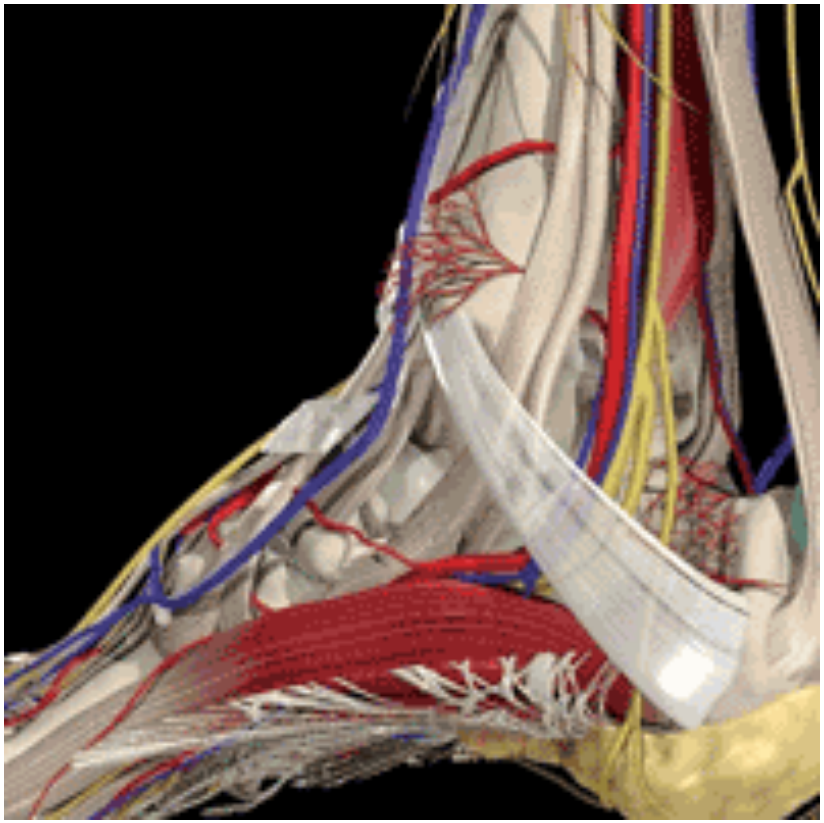
- Metatarsal joints
  - Proximal (closest to body) and distal (furthest from ankle joint)
- Mid-tarsal joints
  - In between the little bones of the foot (mid-foot region) there are small bones that allow for foot movement. They have ligaments in between that hold them together

3. Muscles/Tendons

- Not all-inclusive
- Dorsi-flexors:
  - Anterior tibialis
  - Peroneus Tertius
- Plantar flexors
  - Gastroc
  - Soleus
  - Posterior tibialis
  - Peroneal longus and brevis

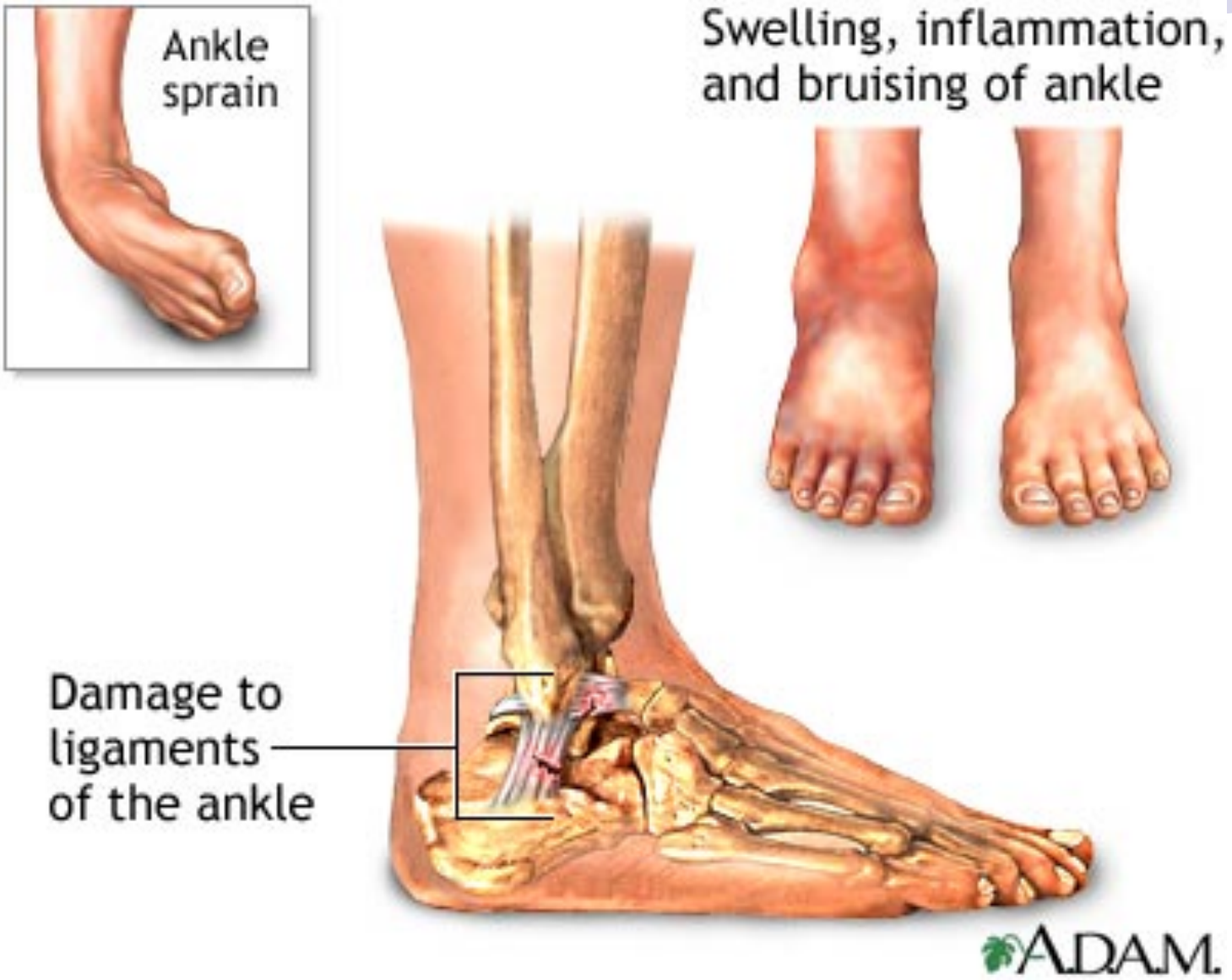
Muscles Cont.

- Evertors
  - Peroneals
    - three
- Invertors
  - Posterior tibialis
  - Flexor hallicus
  - Flexor digitorum
- Plantar supporters



Foot musculature and examples

4. Ligaments


Ankle sprain
Swelling, inflammation, and bruising of ankle
Damage to ligaments of the ankle
A.D.A.M.

Ligaments explained

- Ankle sprains
  - Tipping in, so that the outside of the ankle is closer to the ground
  - Inversion sprain
  - Fibula is the outside (lateral) bone
    - Fibula to heel bone (calcaneus)
    - Fibula to talus (middle bone

Ligaments

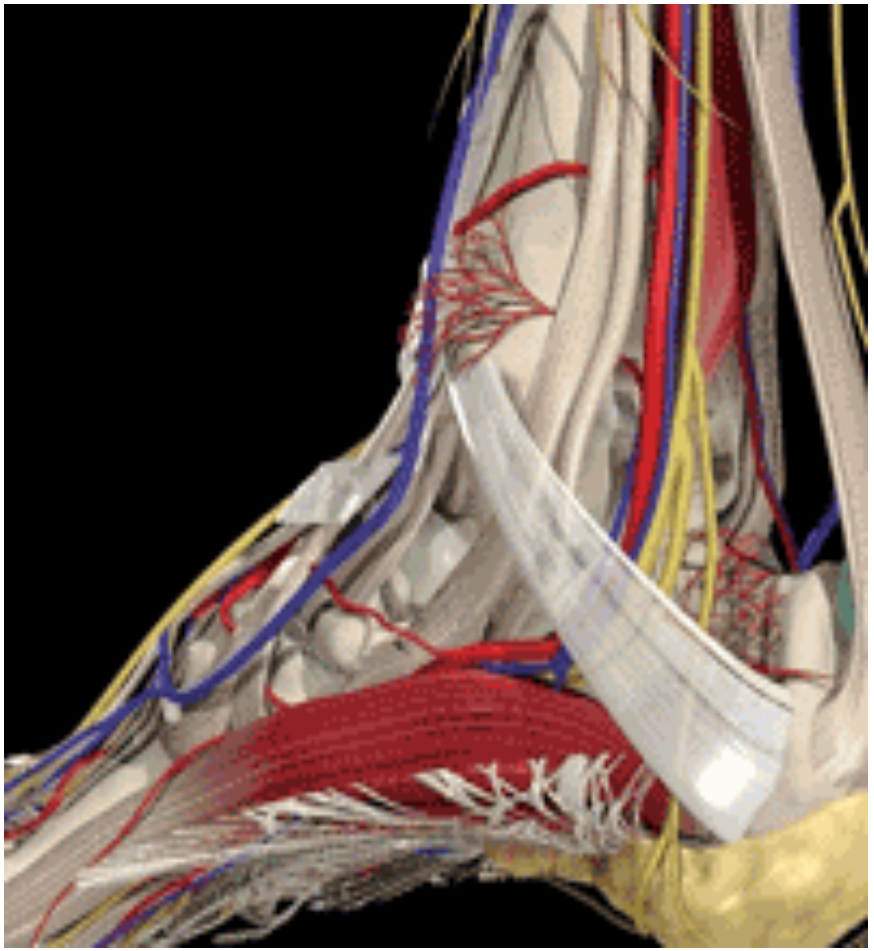
- Medial, or inside ligaments
- Connect the tibia to bones of the foot and ankle
  - Tibia-to-navicular
  - Tibia to calcaneus
  - Tibia to talus

5. Fascial Tissue

- On the plantar aspect of the foot
- Anterior portion of the ankle

6. Apaneurosis

- Thickened tissue on the bottom of the foot
- Helps to support human weight bearing
- Gets tough and can scar down to the other tissues on the plantar aspect of the foot



II. Movement/ Kinesiology

- Dorsiflexion/Plantar Flexion
- Inversion/Eversion
- Toe extension/flexion
- Sub-talar motion
- Pronation/Supination

III. Common Injuries

- Inversion ankle sprain
  - Outside muscles stretch to allow the foot to turn in
  - Ligaments, which prevent this rocking motion, need to stretch
  - On the inside, there may be compression of the joint, or bones, due to excessive force
  - Will also have an aspect of plantar or dorsi-flexion as well

IV. Biomechanics - advanced

- Gait, analyzing the importance of:
  - 1. Dorsiflexion available ROM
  - 2. Great toe ROM functionally, closed chain
  - 3. Great toe ROM functionally, open chain

V. Rehabilitation

- Scar tissue can develop when the muscles rub against one another in the wrong way
- As well, when one muscle works harder than another, or if one is “stuck” to another, there is scar tissue formed
  - When muscles are stuck, they cannot do 100% of their own job… they job-share with what they are adhered to, making it impossible to have perfect biomechanics

Rehab cont.

- Anything that is stretched, means that it needs to return to its normal position
- If the musculature hyper-contracted because it tried to fix the sprain, then the injury, or scar tissue created from the trauma, needs to be released to allow normal function

Rehab cont.

- Without release of tissue adhesions, there is no such thing as normal function
- Without joint mobilization, if the joint capsule and surrounding tissue are still in protective mode, the joint will not allow itself to function properly
- Without proprioceptive training, the body will not learn how to:
  - 1. anticipate motion
  - 2. Only move to the extent that is necessary and not overcontract or undercontract
  - 3. balance using all aspects of the body –weight shifting, surrounding musculature, core support

1. Balance

- Following, you will see many exercises geared toward improving balance on one foot, using hip and leg muscles as well as lower leg and foot, to improve balance

- 1. stand on one foot and try to balance
- 2. Stand on one foot with knee bent, try to balance
- 3. stand on one foot, knee straight, close eyes, try to balance
- 4. Stand on one foot, knee bent, close eyes, balance
- 5. Stand on one foot and bend at waist to barely touch the floor and come back to straight, try to balance as well

2. Stability – BOSU Ball

- Bosu ball is a half-ball, hard surface on one side (to mimick a floor that is unstable) and a squishy, giving, air-filled surface on the other side (1/2 ball)
- Great for rehabilitation and injury prevention, core stability and lower extremity balance exercise

BOSU Ball Cont.

- Rock side to side, attempting to keep control of the ball, bending one knee and straightening the other one, alternating
- Try to keep hips as level as possible

Bosu Cont.

- Single foot balance
- This exercise is very difficult at first and may make you fall off balance
- Adivce: have person stand by or do this next to table or rail for hand-held assistance as needed

Bosu Single foot stance - advanced

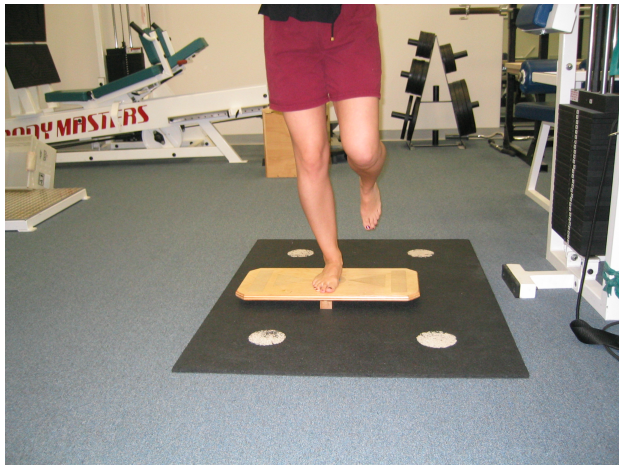
- Add dimension in a … plane by reaching forward gently to touch the ground and rising to stand again
- This works the hamstrings (eccentrically) on the way down and concentrically on the way back up
- As well, the quadriceps and hip stabilizers work to maintain balance, and hold the knee in slight flexion

Bosu- upper body involvement

- Add upper arm motion, with our without weight, to throw off balance
- As well, lift opposite knee, and increase demand for stability on ankle musculature of weight-bearing leg

Sport Specific Stability

- Balance Board – standing on one foot, allows for strengthening of the ankle in a front-back perspective (dorsiflex/plantar flex)
- Important for any running or walking deficiencies
- Picture 2 is side to side balance important for chronic ankle instability, and ankle sprain prevention and rehab



Performing Arts ankle stability

- Sumo squats with plantar flexion in a toe-extended posture (can be done flat footed, in pointe shoes, or other sport specific)
- Works on soleus in coordination with quads, inner thighs, and gluteals

Perf Arts. Cont.

- Lunged weight bearing heel raises
  - Stand in lunge with body weight on front leg, knee bent
  - Lift heel off of ground, slowly, to full planter flexion (push top of foot forward)
  - Slowly lower down, preventing ankle from moving sideways (sickling in dance, inverting, etc.)
  - Try to prevent shaking of the leg and sharp movements
  - Works the soleus and the ankle stability
  - The more confident you are, the more pressure you can have on the front leg

General Strengthening of the Calf

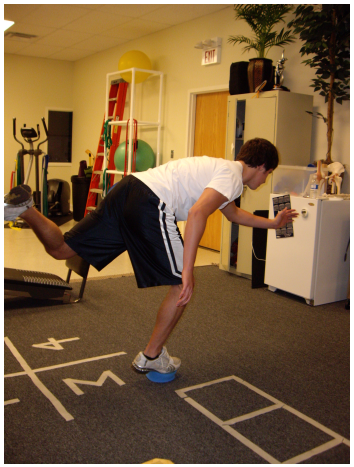
- Two main muscles – gastroc (works when the knee is straight to lift the heel
- Soleus works when the knee is bent to raise the heel, oft times in squatting, and lowering as well as agility moves in ball sports (side shuffle, block and “ready” position)
- Standing heel raises, with legs straight, tighten quads
- As well, keep ankles straight forward, or vary it by toeing in or out
- Squat down, bend knees, and hang on to something stable, lean backwards so that knees do not go over toes, and raise heels off ground

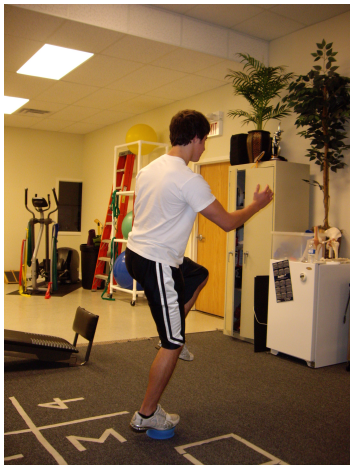
PODS

- Dense Foam circle, meant to only be able to support part of the foot and ankle at a time
- Start: 2 pods, 2 feet – ads core stability dimension to lower extremity strength
- Squats: either up and down, or holding for time

Pods – Other exercises

Sport-Specific - Running





- With one foot on POD, you can mimick the extremes of running gait, with opposite UE and LE motion, creating torque at the hip and knee, making balance increasingly hard
- Tip body and hips

3. Flexibility

- Gastroc Soleus
- Straight Knee Bent Knee
- Heel flat for both, foot straight, very important

Shin Strength/Calf Flexibility

- Can be done as heel walking, or stationary
- Lift front part of foot off of ground, keeping heels in contact with the ground. Alternate feet.
- Do not allow compensation – do not flex hips and stick butt backwards

Trigger Point Massage Products

- Calf Roller
- 10 rolls from knee to ankle on calf
- 10 ankle circles in 5 places of your choice
- 10 rocks of the foot and calf side to side (windshield wipers) in 5 places
- 10-10-10-5 program

Foot Wheel

Click For Larger Image

- Place pressure on the bottom of the foot
- Roll roller back and forth from heel to toes
- Pull toes up for deeper massage
- 3-5 minutes, 1-2x/day, before and after activity

Summary

- Balance and strength are very important
- Freeing scar tissue is the first step- manually, with methods such as Active Release Techniques (ART)
- You can “Activate” muscles and strengthen all you want. If there are adhesions holding joints or muscles from moving, proper motion will never be achieved, and strengthening will only *encourage* improper motion
- Be healthy, be smart!
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