

Physical Examination of the Knee and Ankle



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Disclosures

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Objectives

At the conclusion of the workshop, participants should be able to:

1. Learn the basics of knee and ankle physical exam: inspection, palpation, range of motion, and strength
2. Develop confidence in your physical examination skills of the knee through hands-on practice
3. Learn how to perform provocative tests of the knee and ankle, specifically Lachman's, McMurray's (knee) and anterior drawer (ankle)
4. Demonstrate competency in performing a physical examination of the knee

Inspection

- Gait
- Alignment
- Swelling
- Effusion
- Muscle mass
 - Quadriceps bulk
- Skin Discoloration
 - Bruising
 - Erythema



Palpation

- Anterior compartment

- Tendons

- Quadriceps
 - Patellar

- Bones

- Tibial plateau
 - Patella
 - Medial/lateral patellar facet
 - Tibial tubercle

- Joint line

- Lateral compartment

- Bones

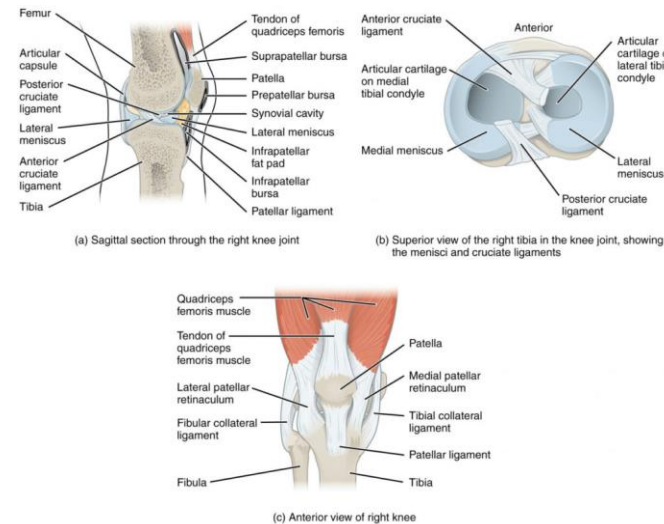
- Fibular Head
 - Femoral condyle

- Ligaments

- Lateral collateral Ligament (LCL)

- Iliotibial band

- Iliotibial band bursae



- Medial compartment

- Bones

- Femoral condyle
 - Tibial plateau

- Ligaments

- Medial collateral ligament (MCL)
 - Patellofemoral ligament

- Tendons

- Pes anserine
 - Pes anserine bursae

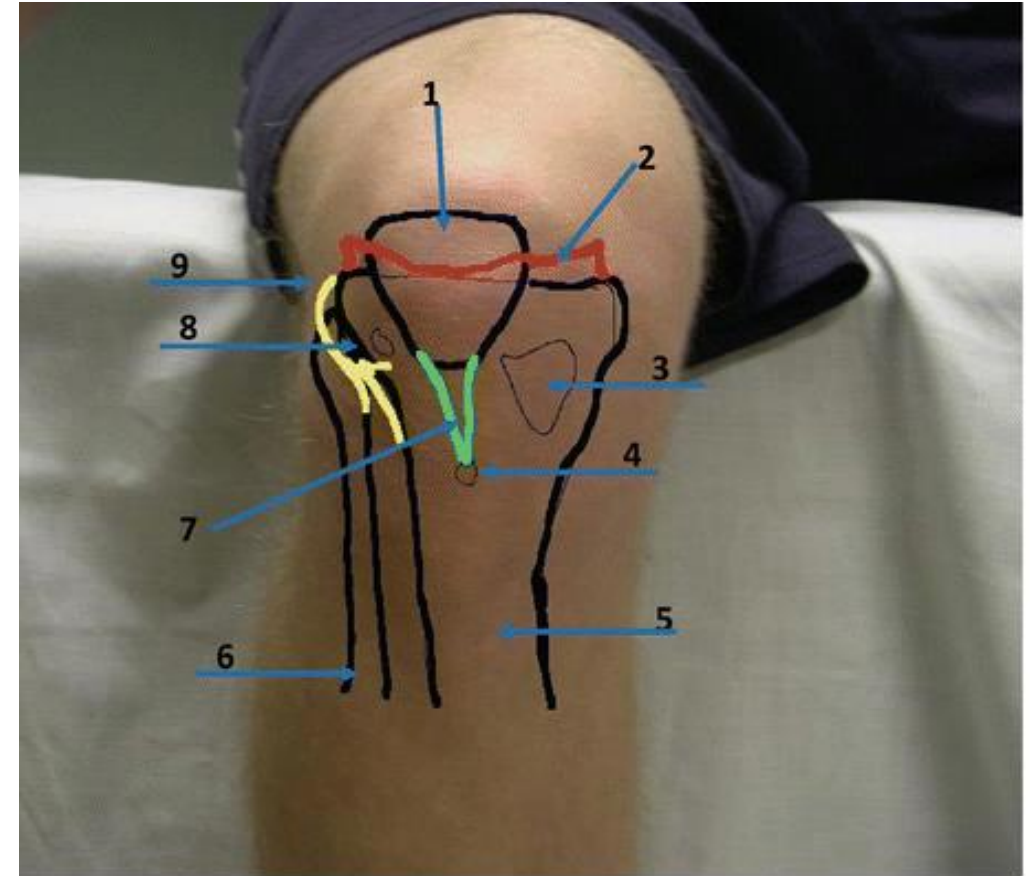
- Posterior compartment

- Tendons

- Hamstrings
 - Popliteal fossa

Anterior Compartment

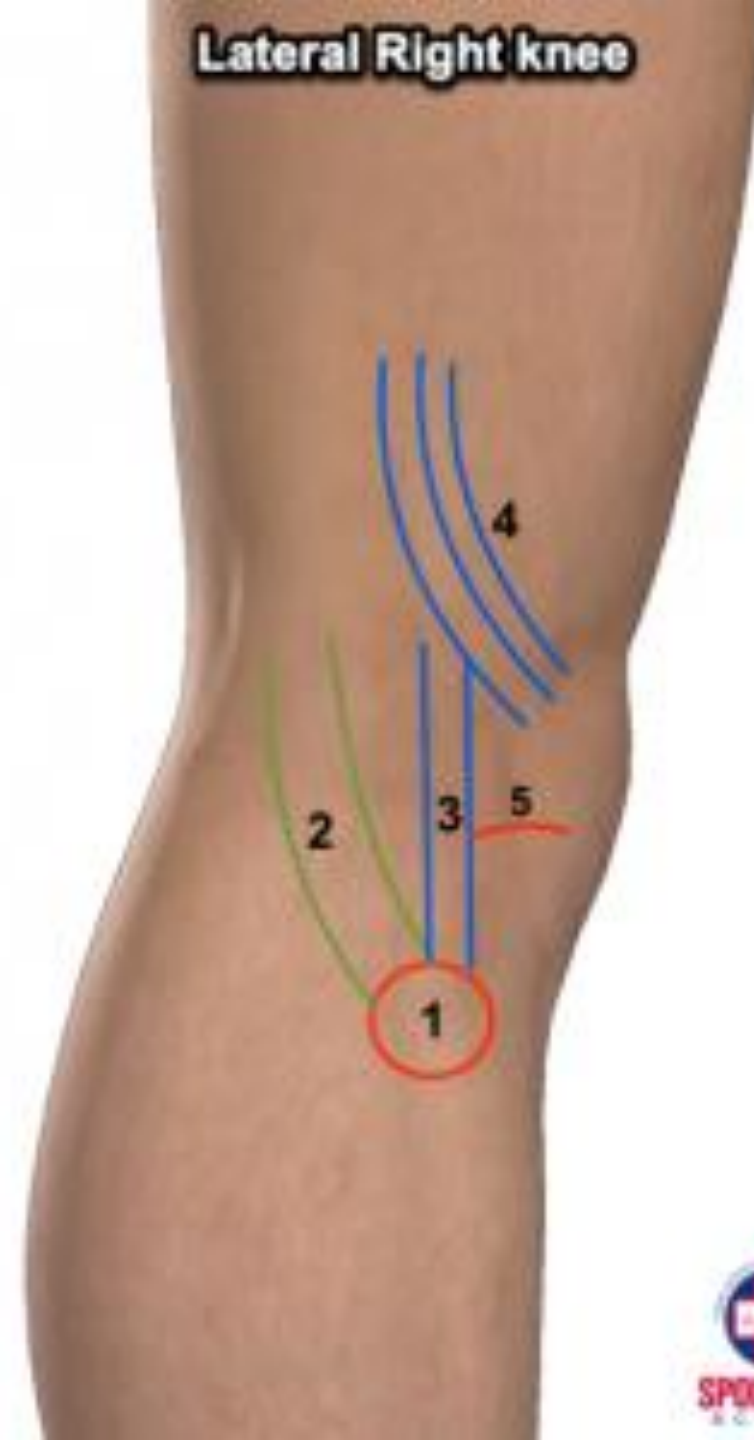
- Tendons
 - Quadriceps
 - Patellar
- Bones
 - Tibial plateau
 - Patella
 - Medial/lateral patellar facet
 - Tibial tubercle
- Joint line



- 1 – Patella 2 – Meniscus
3 – Pes Anserine (Sartorius, Gracilis, semitendinosus muscles all insert here)
4 – Tibial Tuberosity (Patellar tendon inserts here)
5 – Tibia 6 – Fibula
7 – Patellar Tendon 8 – Gerdy's Tubercle (Iliotibial tract inserts here)
9 – Superficial Peroneal Nerve

Lateral Compartment

- Bones
 - Fibular Head
 - Femoral condyle
- Ligaments
 - Lateral collateral Ligament (LCL)
- Iliotibial band
- Iliotibial band bursae

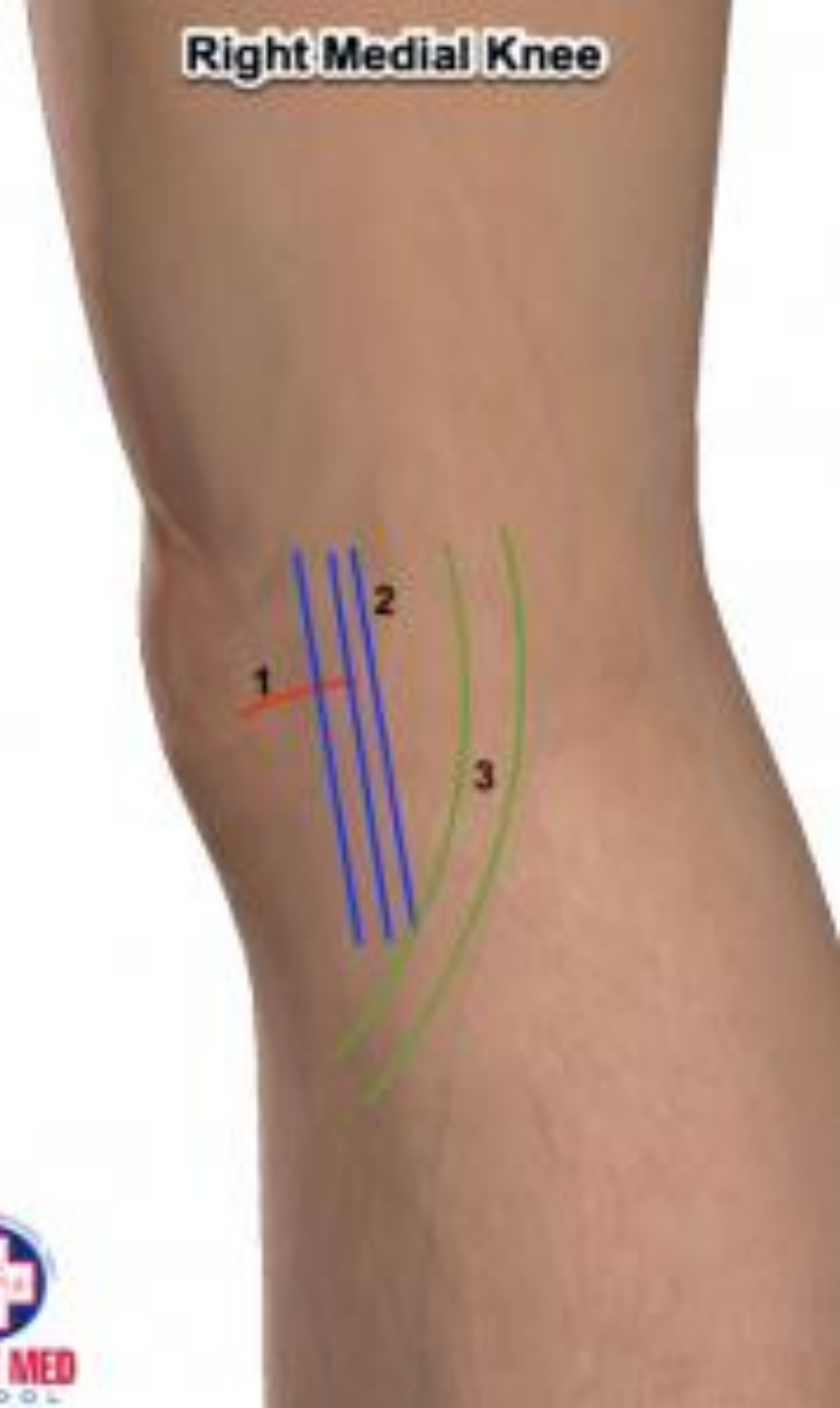


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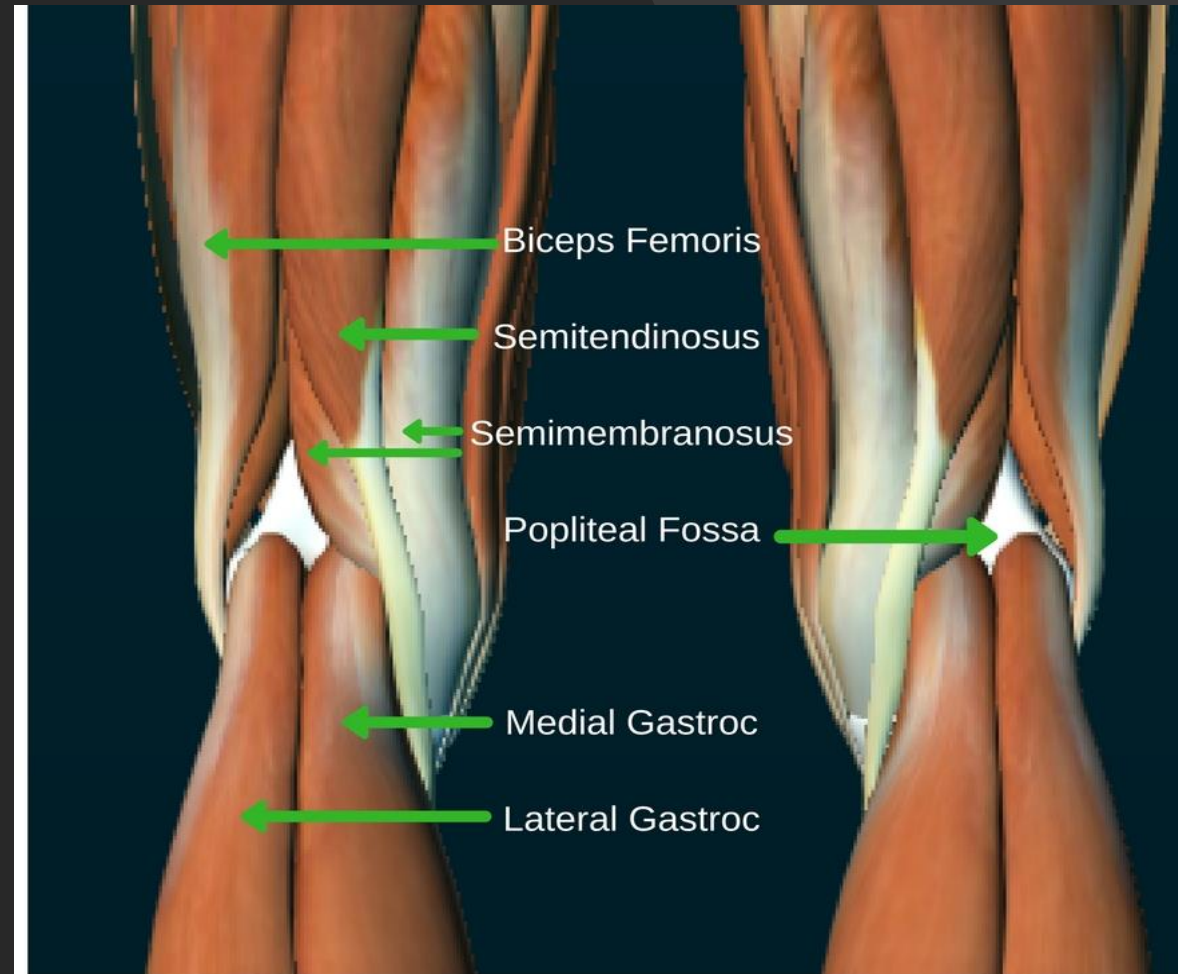
Medial Compartment

- Bones
 - Femoral condyle
 - Tibial plateau
- Ligaments
 - Medial collateral ligament (MCL)
 - Patellofemoral ligament
- Tendons
 - Pes anserine
- Pes anserine bursae



Posterior Compartment

- Muscles/Tendons
 - Hamstrings
 - Gastrocnemius
- Popliteal fossa



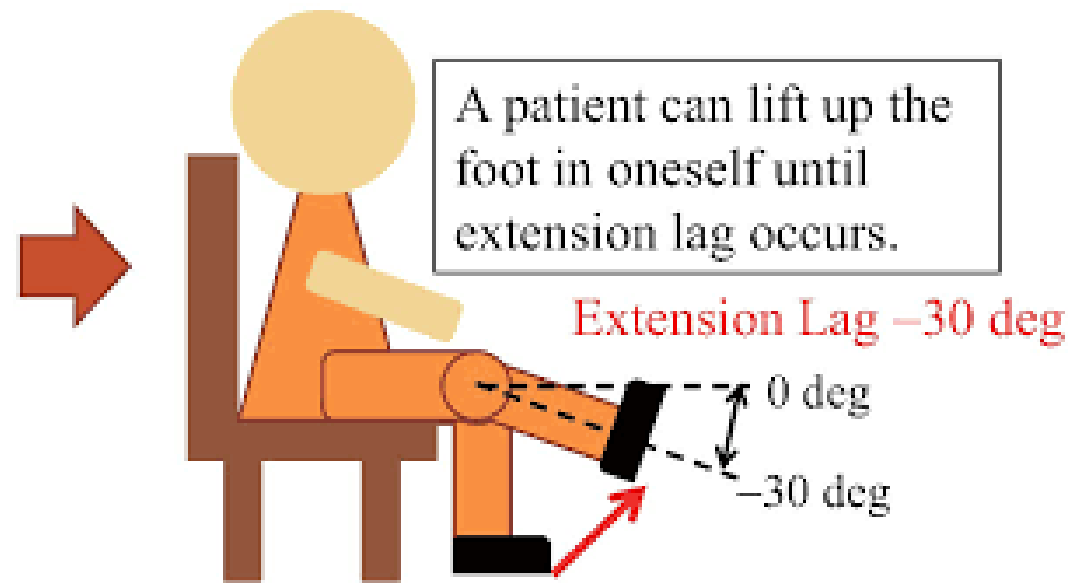


Functional Testing

- Range of Motion
 - Active
 - Passive
- Extension lag
- Strength Testing
- Patellofemoral tracking
 - J-sign

Extension Lag

- Patient is in seated position with knee flexed to 90 degrees off edge of examination table
- Patient is asked to extend leg
- Positive test is inability to fully extend leg

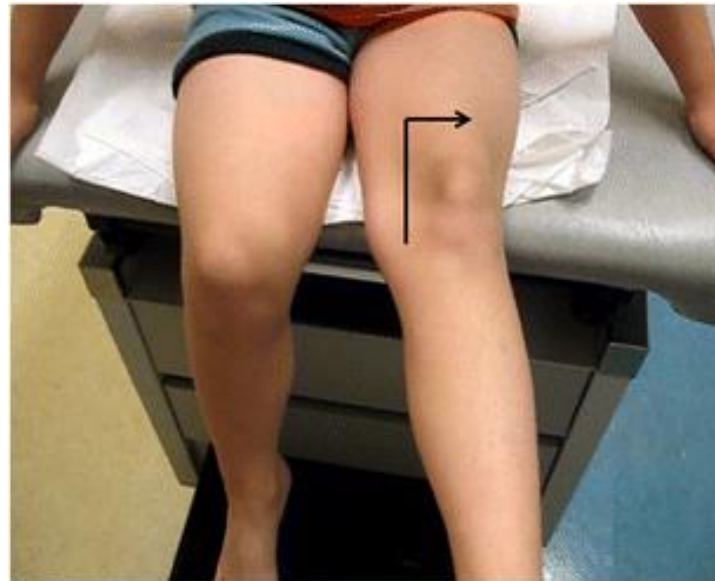


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J-Sign

- Patient in seated with legs in the dependent position with knee flexed to 90 degrees
- Patient extends leg
- Patella will track laterally as knee begins to move into full extension



Provocative Testing

- Patellofemoral pain
 - Patellofemoral grind test
- Patellar instability
 - Apprehension
- MCL
 - Valgus stress test
- LCL
 - Varus stress test

- ACL
 - Lachman's test
- PCL
 - Posterior drawer test
- Meniscus
 - McMurray's
- Iliotibial band
 - Ober's test



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Patellofemoral Grind Test

- Patient in a supine position
- Knee in full extension
- Apply direct downward pressure
- Move patella medial to lateral and superior to inferior
- Also ask patient to tighten quadriceps muscle
- Pain with engaging quadriceps muscle consistent with patellofemoral syndrome



Valgus Stress Test

- Place the knee in 30 degrees of flexion
- Move the knee from side to side
- Check the opening when a valgus stress is applied
- Place the knee in 0 degrees of flexion
- Repeat steps above



Varus Stress Test

- Place knee in 30 degrees of flexion
- Move knee from side to side
- Check for opening when a varus stress is applied
- Place knee in full extension
- Repeat steps above



Lachman's Test

- Patient in supine position
- Bend knee to 20-30 degrees of flexion
- Stabilize femur with one hand, with other hand pull tibia anteriorly and posteriorly against femur
- Feel for a firm endpoint
- Positive test
 - Soft or no endpoint
 - Increased forward movement of the tibia – anterior translation
- Modifications
 - Place your flexed leg under knee to stabilize the femur while testing
 - Seated position for patient
 - Patient foot stabilized between legs



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Posterior Drawer Test

- Most accurate test for PCL injury
- Place patient in supine position with knee flexed to 90 degrees
- Stabilize the foot
- Push backward on the tibia
- Positive test is when there is posterior translation of the tibia



McMurray's Test

- Lie patient supine and hold the knee in flexion
- One hand is over knee joint while the other hand holds the leg on the plantar aspect of the foot
- Knee is moved from full flexion to extension with the tibia in internal rotation with a varus stress applied to the knee (lateral meniscus) or in external rotation with a valgus stress applied to the knee (medial meniscus)
- Pain or painful click as knee is moved from flexion to extension in either internal or external rotation
- Tibia traps the meniscus between the femoral condyle and the tibia



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Ober's Test

- Patient positioned on the unaffected side
 - Good leg against the table, painful leg resting on top
- Legs in slight flexion
- Painful leg is flexed to 90 degrees and then hip is extended
- Knee remains suspended in air indicative of shortened iliotibial band

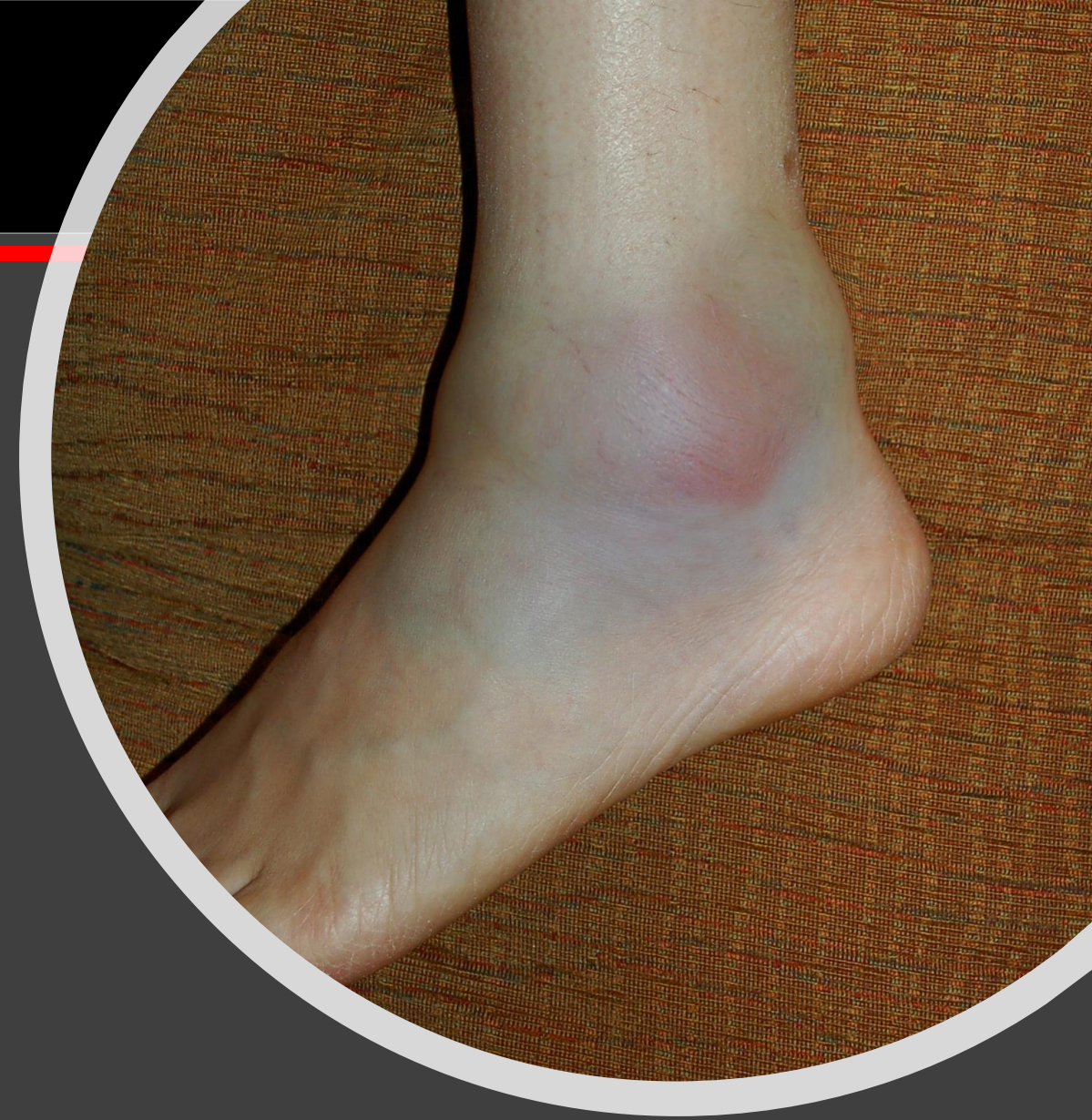
Knee Exam Practice

Knee Exam Highlights

- Use history and/or mechanism of injury to focus exam
- Inspection
 - Quad bulk
 - Need to have knee in full extension to assess for small knee effusion
- Palpation
 - Anterior – patella (facets), quad/patellar tendons, medial/lateral joint line
 - Lateral - Gerdy's tubercle, fibular head, tibial plateau, LFC, joint line, LCL, IT band, hamstring tenon bundle
 - Medial – tibial plateau, pes anserine, MFC, joint line, MCL
 - Posterior – popliteal fossa, medial/lateral hamstring bundles, gastrocnemius
- Functional tests
 - ROM, strength, J-sign (patellar tracking), extension lag – ACL (effusion) or MCL (no effusion), occasionally patellar dislocation
- Provocative tests
 - Ligaments – varus/valgus stress, Lachman's, posterior drawer
 - Patellofemoral pain – grind
 - Meniscus – McMurray's
 - Apprehension test
 - Ober's – IT band
- If nothing hurts to palpation of the knee, make sure you examine the HIP

Inspection

- Gait
- Alignment
- Swelling
- Effusion
- Muscle mass
 - Tibialis muscles
 - Peroneal muscles
 - Gastrocnemius
- Skin Discoloration
 - Bruising
 - Erythema



Palpation

- Anterior

- Tendons
 - Extensor
- Ligaments
 - Tibiofibular
- Muscles
 - Anterior tibialis
- Bones
 - Tibia
 - Talus
- Syndesmosis

- Posterior

- Tendons
 - Achilles
- Ligaments
 - Posterior tibiofibular
- Muscles
 - Gastroc/Soleus
- Bones
 - Tibia
 - Posterior malleolus
 - Calcaneus

- Medial

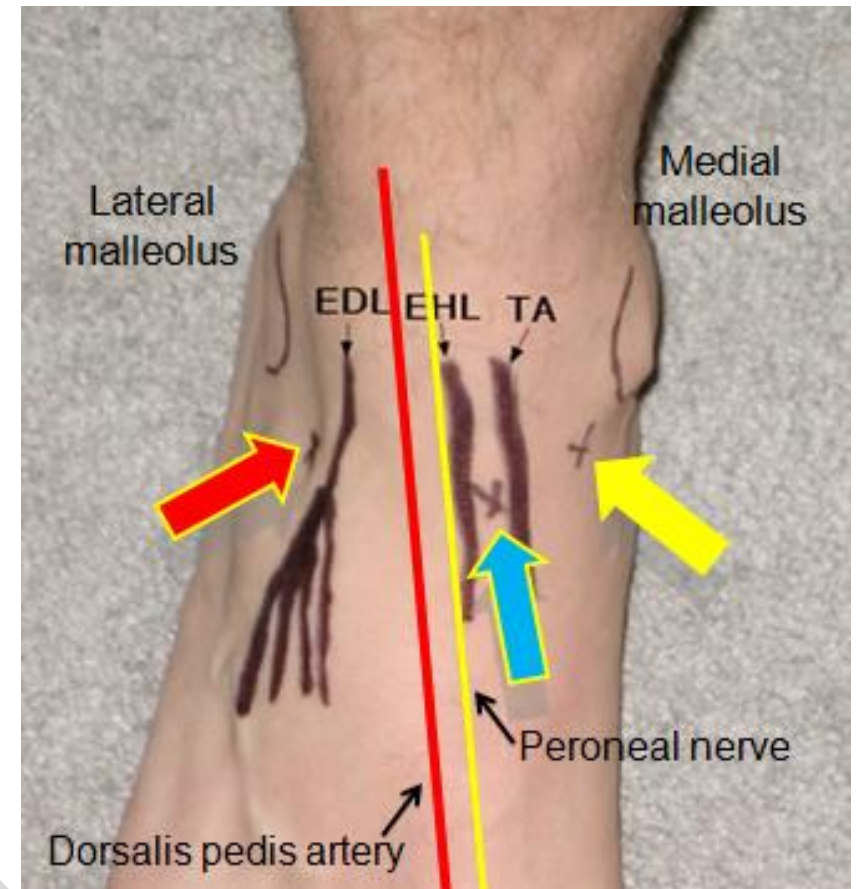
- Tendons
 - Tibialis
- Ligaments
 - Deltoid ligament
- Muscles
 - Tibialis
- Bones
 - Tibia
 - Medial malleolus

- Lateral

- Tendons
 - Peroneal
- Ligaments
 - Anterior talofibular (ATFL)
 - Calcaneofibular (CFL)
 - Posterior talofibular (PTFL)
- Muscles
 - Peroneal
- Bones
 - Fibula
 - Lateral malleolus
 - Base of the 5th metatarsal

Anterior

- Tendons
 - Extensor
- Ligaments
 - Tibiofibular
- Muscles
 - Anterior tibialis
- Bones
 - Tibia
 - Talus
- Syndesmosis



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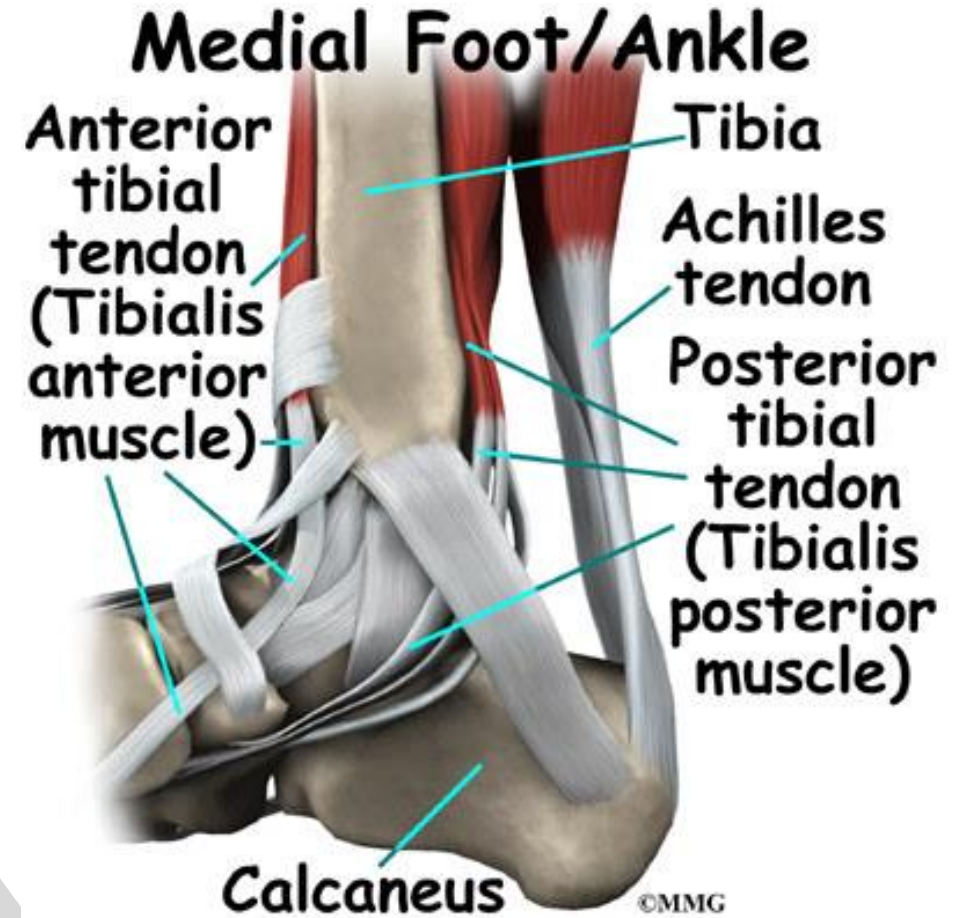
Posterior

- Tendons
 - Achilles
- Ligaments
 - Posterior tibiofibular
- Muscles
 - Gastroc/Soleus
- Bones
 - Tibia
 - Posterior malleolus
 - Calcaneus



Medial

- Tendons
 - Tibialis
- Ligaments
 - Deltoid ligament
- Muscles
 - Tibialis
- Bones
 - Tibia
 - Medial malleolus



Lateral

- Tendons
 - Peroneal
- Ligaments
 - Anterior talofibular (ATFL)
 - Calcaneofibular (CFL)
 - Posterior talofibular (PTFL)
- Muscles
 - Peroneal
- Bones
 - Fibula
 - Lateral malleolus



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Functional Testing

- Range of Motion
 - Active
 - Passive
- Strength Testing
- Proprioception
- Single leg hop



Provocative Tests

- Anterior Drawer Test
- Talar Tilt
- Eversion Stress Test
- Squeeze Test

Anterior Drawer Test

- Patient sitting in dependent leg position with knee at 90 degrees
- Ankle flexed to 90 degrees
- Stabilize the anterior tibia with the heel of one hand just proximal to the ankle joint with fingers extending around to medial tibia
- Other hand on plantar aspect of heel with fingers wrapping around posterior heel
- Pull anteriorly with the hand holding the calcaneus while also pushing posteriorly with the hand stabilizing the tibia



Talar Tilt

- Patient sitting in dependent leg position with knee at 90 degrees
- Ankle flexed to 90 degrees
- Stabilize the anterior tibia with the heel of one hand just proximal to the ankle joint with fingers extending around to medial tibia
- Other hand on plantar aspect of heel with fingers wrapping around posterior heel
- Move ankle side to side to assess for increased motion in inverted position

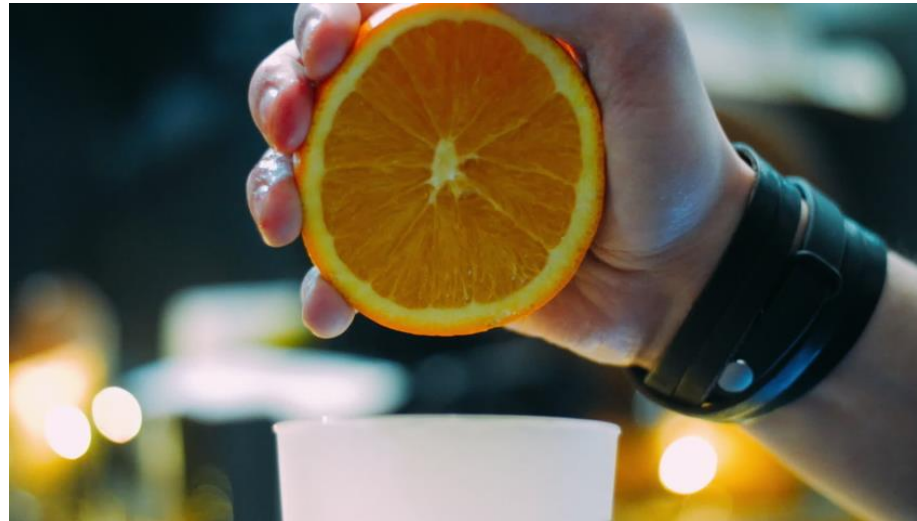


Eversion Stress Test

- Patient is seated, but may be lying as well
- Knee is flexed to 90 degrees
- Stabilize tibia with one hand and hold the calcaneus with the other
- Keep ankle in a neutral position and apply an abduction force to the calcaneus
- Pain over the deltoid ligament is considered positive

Squeeze Test

- Squeeze tibia and fibula in middle of lower leg
- If syndesmotic injury is present, patient will have pain over the distal leg pain over the interosseous ligament



Ankle Examination Practice

Ankle Exam Highlights

- Use history and/or injury mechanism to focus exam
- Inspection
- Palpation
 - Anterior – syndesmosis, anterior tibiofibular ligament, talus, extensor tendons
 - Lateral – ATFL, CFL, PTFL, peroneal tendon, fibula (physis), lateral malleolus, base of the 5th metatarsal
 - Medial – deltoid, medial malleolus, anterior/posterior tibiotalar tendons
 - Posterior – Achilles
- Functional testing
 - ROM, strength, proprioception (common reason for recurrent ankle sprains), single leg hop (return to play)
- Inversion mechanism → sprains and strains
 - Lateral stability ligamentous
- Eversion mechanism → increased risk of fracture
 - Bone stability due to fibula longer than tibia
- Provocative tests
 - Anterior drawer
 - Talar tilt
 - Eversion stress test
 - Squeeze test

References

1. Larkins LW, Baker RT, Baker JG. Physical Examination of the Ankle: A Review of the Original Orthopedic Special Test Description and Scientific Validity of Common Tests for Ankle Examination. Arch Rehab Research Clin Translation 2020; 2(3).
2. Malanga GA, Andrus S, Nadler SF, McLean J. Physical examination of the knee: a review of the original test description and scientific validity of common orthopedic tests. Arch Phys Med Rehabil 2003;84:592-603
3. Orndorff DG, Hart JA, Miller MD. Physical Examination of the Knee. Curr Sports Med Reports 2005;4(5):243-248.