

The Examination

For every joint of the lower extremity always begin with the patient in standing

IN STANDING

INSPECTION

1. **Cutaneous Structures:** Look for Erythema, scarring, bruising, and swelling in the following areas:
 - a. Peripatellar grooves
 - b. Suprapatellar bursa
 - c. Prepatellar bursa
 - d. Infrapatellar tendon
 - e. Anserine bursa
 - f. Popliteal fossa
2. **Muscle & Soft Tissue:**
 - a. Quadriceps atrophy
 - b. Hamstring atrophy
 - c. Calf atrophy
3. **Bones & Alignment:**
 - a. Patella position (Alta, Baha, Winking, Frog eyed),
 - b. Varus or Valgus alignment
 - c. Flexion contracture or Genu recurvatum

RANGE OF MOTION - ACTIVE

Standing is the best opportunity to assess active range of motion of the knee.

1. Ask the patient to squat into a deep knee bend. Both knees should bend symmetrically.
2. Ask the patient to then stand and extend the knee fully – lock the knee. The knee should straighten to 0 degrees of extension. Some people have increased extension referred to as genu recurvatum.

GAIT

1. Look for a short stance phase on the affected limb and an awkward gait if a concomitant leg length discrepancy
2. Look for turning on block
3. Screening
 1. Walk on the toes
 2. Walk on the heels
 3. Squat down – Active Range of Motion testing

SPECIAL TESTS

1. **Leg Length Discrepancy**
 - a. Look at patients back for evidence of a functional scoliosis
 - b. Place your hands on the patients Iliac crests looking for inequality which may mean a leg length discrepancy

IN SITTING

NEUROLOGIC EXAMINATION

1. Test the reflexes
 - a. L4 – Quadriceps reflex

VASCULAR EXAMINATION

1. Feel for the posterior tibial artery

SUPINE POSITION

INSPECTION

1. **Cutaneous Structures:** Again looking for scarring, erythema, bruising, and swelling as described above
 - a. Peripatellar grooves
 - b. Suprapatellar bursa
 - c. Prepatellar bursa
 - d. Infrapatellar tendon
 - e. Anserine bursa
 - f. Popliteal fossa
2. **Muscles and Soft Tissue:** Quadriceps atrophy, Calf atrophy

- a. Quadriceps can be measured for atrophy by measuring 10 cm up the thigh from the medial tibial plateau and at that point measuring the circumference of the leg.
- 3. **Bones & Alignment:** Flexion deformity, genu valgum or varus

PALPATION with the KNEE IN EXTENSION

1. **Temperature:** Feel the knee for warmth. A normal joint should be about 1 degree cooler than the surrounding tissues.
2. **Anterior Palpation**
 - a. Quadriceps muscle for tenderness
 - b. Move down to palpate the insertion of the quadriceps tendon into the superior pole of the patella (At positions 10 and 2 on the patella is where a patient typically feels enthesal pain)
 - c. Palpate over the patella feeling for a pre-patellar bursitis and pain/tenderness of the patella itself
 - d. Move down to the insertion of the patellar tendon (another enthesal site)
 - e. Move down the patellar tendon feeling for swelling and tenderness
 - f. Palpate the tibial tuberosity
 - g. Continue palpating down the anterior aspect of the tibia for pain and tenderness
3. **Palpate for the presence of an Effusion**
The three maneuvers looking for a knee effusion are:
 - a. **Fluid Wave test:** Milk the fluid upwards on the medial side into the suprapatellar space and the milk the fluid back down laterally and watch for the fluid wave. This works well in small to medium sized effusions. Large effusions will not reveal a fluid wave as you can't milk the fluid into the suprapatellar space as there is just too much fluid!
 - b. **Patellar Tap:** Compress the suprapatellar bursa with one hand and push down on the patella with the other hand. If fluid is present it will move from the suprapatellar bursa underneath the patella and you will be able to tap the patella downwards displacing the fluid to hit the femur.
 - c. **Ballotment:** Hold your hand over the suprapatellar pouch and compress the fluid down into the joint. With your other hand compress the fluid from below to feel the transmitted fluid wave. This works well with large effusions!
4. **Posterior Palpation**
 - a. Begin by palpating the hamstrings for tenderness
 - b. Move down to the popliteal fossa and palpate the landmarks and contents:
 - c. Superolateral: Biceps femoris tendon
 - d. Superomedial: Semi-membranosus and Semi-tendinosus tendons
 - e. Inferiorly: Gastrocnemius
 - f. Contents: Popliteal artery, vein, and nerve and feel for a Baker's cyst or lymphadenopathy

PALPATION with the KNEE IN 90 DEGREES OF FLEXION

1. **Medial Palpation**
 - a. Start at the soft-tissue (medial tibia) depression and move upwards
 - b. Palpate upwards until you reach the pes anserinus located just below the medial tibial plateau. This is the insertion of the Sartorius, Gracilis, and Semitendinosus tendons. The pes anserine bursa can become inflamed and result in medial knee pain.
 - c. Continue to palpate upwards until you come to the junction of the tibia and the femur. Palpate along the medial joint line noting for point tenderness.
 - d. Palpate over the medial collateral ligament for tenderness.
 - e.
2. **Lateral Palpation**
 - a. Begin lateral palpation over the fibula and palpate upwards.
 - b. Palpate upwards until you reach the lateral joint space. Palpate along the joint line noting for tenderness.
 - c. Palpate the thick biceps femoris tendon just posterior to the joint
 - d. Palpate anteriorly over the iliotibial band which inserts on the lateral tibial tubercle. The iliotibial band is a thick band of fascia and more conveniently palpable when the knee is flexed against resistance or extended.
 - e. The posterior tibial nerve can be palpated where it crosses the neck of the fibula.

RANGE OF MOTION – PASSIVE

1. Grasp the patients ankle and flex the knee as far as possible. The knee should flex at least 135 degrees. Note the distance between the heel and the buttock – with young patients the heel can usually touch the buttock.
2. Extend the knee back to full extension. With the knee in full extension you should not be able to slide your hand underneath the back of the knee. In fact the knee should have a few degrees of passive hyperextension.

SPECIAL TESTS AND STABILITY TESTING

Medial Collateral Ligament

The medial collateral ligament stability is performed with the patient supine. Ask the patient to slightly flex the knee to just unlock from full extension. Place one hand on the ankle and the other on the lateral side of the knee against the fibular head. While holding the ankle, push against the lateral aspect of the knee in an attempt to open the knee joint on the inside. Compare both sides. A gap in the medial collateral ligament may represent a deficiency in the ligament or pseudolaxity from joint space collapse.

Lateral Collateral Ligament

The lateral collateral ligament stability is performed with the patient supine. Ask the patient to slightly flex the knee to just unlock from full extension. Place one hand on the ankle and the other on the medial side of the knee against the tibia. While holding the ankle, push against the medial aspect of the knee in an attempt to open the knee joint on the outside. Compare both sides. A gap in the lateral collateral ligament may represent a deficiency in the ligament or pseudolaxity from joint space collapse.

Anterior Cruciate Ligament

1. **Anterior Drawer Test:** The anterior drawer test is also typically performed with the patient supine and the knee in 90° of flexion. The examiner quickly pulls the upper portion of the calf forward using both hands. The tibia must not be rotated and the hamstrings must be relaxed to properly assess the ACL. An intact ACL abruptly stops the tibia's forward motion as the ACL reaches its maximum length. If the tibia can be moved anteriorly without an abrupt stop, referred to as a discrete end point, this is considered a positive anterior drawer sign. It is often useful to perform this test on the uninjured knee to determine whether the amount of anterior translation differs between knees.
2. **Lachman Test:** Lachman test is typically performed while the patient lies supine with the knee flexed to 20° to 30°. The examiner stands to the side of the patient's leg with the patient's heel on the examination table. The femur is grasped with one hand just above the knee. While the examiner grasps the femur firmly to prohibit motion of the upper leg and to relax the hamstrings, the other hand grasps the proximal tibia. The lower leg is then given a brisk forward tug and a discrete end point should be felt. A positive test is one in which the end point is not discrete or there is increased anterior translation of the tibia. The test is more difficult to perform when the examiner has small hands or the patient has large legs, both situations making it more difficult to completely grasp the legs. In this situation, the patient may be placed prone with the knee at the same degree of flexion while the examiner attempts the same motion of the tibia.
3. **Pivot Shift Test:** The lateral pivot shift test combines a valgus stress (pushing the outside of the knee medially) with a twisting force while the knee is being flexed. In Losee's²⁰ version of the test, the patient rests on his/her back with the knee at 45° flexion. The examiner places a hand on the lateral aspect of the knee and pushes medially creating a valgus strain. At the same time, the examiner's other hand supports and pulls the foot laterally. As the examiner slowly extends the knee, the tibia and foot begin to twist internally. A positive test consists of an obvious "thud" or "jerk" at 10° to 20° flexion in the ACL-deficient knee, representing anterior subluxation of the tibia on the femur.

Posterior Cruciate Ligament

1. **Posterior Drawer Test:** Posterior or PCL stability is generally assessed using the posterior drawer test. This is performed with the patient supine and the knee flexed to 90°. The alignment of the knees is inspected: if the tibia of the affected knee is subluxed posteriorly (a posterior "sag"), then applying anterior pressure will correct the sag. If the subluxation can be corrected, it is considered a positive posterior drawer sign. Others consider a posterior drawer test to be positive if a posterior force on the tibia encounters no discrete end point, the reverse of the anterior drawer test.

Meniscal Injury

1. **McMurray Test:** McMurray test is performed with the patient supine. The examiner stands on the side of the affected knee and places one hand on the heel and another along the medial aspect of the knee, providing a valgus force. The knee is extended from a fully flexed position while internally rotating the tibia. The test is repeated while externally rotating the tibia. A positive sign is indicated by a "popping" and sensation of symptoms along the joint line, often accompanied by an inability to fully extend the knee.
2. **Apley Compression Test:** The Apley compression test is performed with the patient laying in a prone position on a low examination table. The examiner applies his/her knee into the posterior thigh of the leg to be examined, then flexes and externally rotates the tibia while gripping the ankle. The examiner then compresses the tibia downward. If this compression produces an increase in pain, the test is considered positive.
3. **The Medial-Lateral Grind Test:** The medial-lateral grind test is performed with the patient supine on the examination table. The examiner cradles the affected leg's calf in one hand and places the index finger and thumb of the opposite hand over the joint line. Valgus and varus stresses are applied to the tibia during flexion and extension. If a grinding sensation is palpated by the hand placed over the joint line, the medial-lateral grind test is deemed positive.

Patello-Femoral Testing

1. **Patellar Grind Test:** Push down on the patella into the trochlear groove. Instruct the patient to tighten the quadriceps and note the movement of the patella for crepitus. In the same manner ask the patient to relax the quadriceps and firmly hold the patella in the groove from above. Ask the patient to now flex the quadriceps and note any pain produced by restricting this movement.

NEUROVASCULAR TESTING

Knee Flexion: Hamstrings (L5, S1 – Sciatic Nerve)

Knee Extension: Quadriceps (L2,3,4 – Femoral Nerve)