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MUSCULOSKELETAL

Information contained in this document is meant for quick reference and a supplement to formal ultrasound experience, education or training.

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HIP JOINT INJECTION

Objective:
Use ultrasound-guidance to examine the intra-articular joint space for aspirations and injections.

Injection of the hip joint is a commonly performed procedure. When done blind, the injection usually misses the joint. Since the hip is one of the largest joints in the body, guiding a hip joint injection with ultrasound is relatively easy to do.

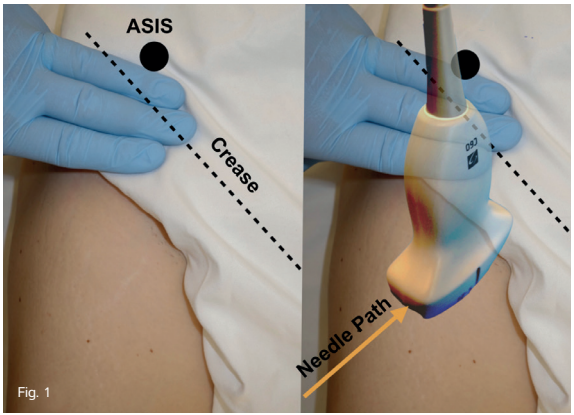

Fig. 1

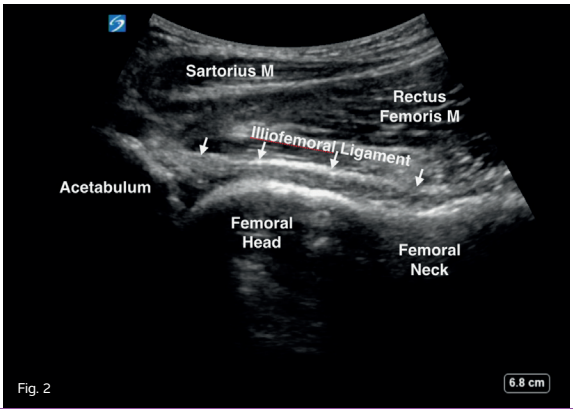

Fig. 2

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HIP JOINT INJECTION

Clinical Pearls:

- Remove undergarments that impede access to the hip crease.
- Patient Positioning: Place the patient in a supine position with the leg extended and the toes pointing inward.
- Transducer: Use a curved array transducer and the MSK exam type at a depth of 4-9 cm.
- Transducer Position: Place the transducer 4 cm distal to the Anterior Superior Iliac Spine (ASIS) directed to the umbilicus. (Fig. 1)
- The anatomy is identified in Fig. 2.
- Identify the target and measure the needle path. (Fig. 3a)
- Use color Doppler to identify the surrounding vessels and anatomy. (Fig. 3b)
- Sterilize the skin, and anesthetize lateral to the transducer.
- Note the angle of the needle to the skin for planning proper needle trajectory.
- With the BEVEL UP, advance the needle to the inside joint space target. (Fig. 4)
- Verify the needle position in the transverse plane.
- There should be little to no resistance to the flow of the injectate during the injection.

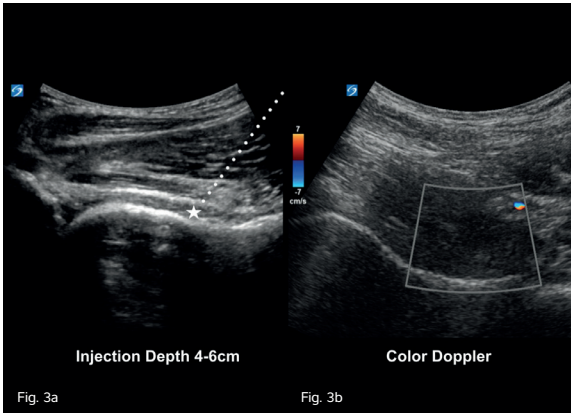

Fig. 3a Fig. 3b

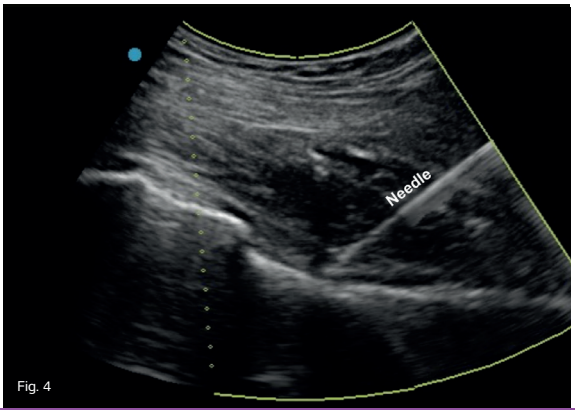

Fig. 4

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SUPRAPATELLAR RECESS

LONGITUDINAL SCANNING THE LATERAL SUPRAPATELLAR RECESS OF THE KNEE

Objective:
Assess the suprapatellar recess in the longitudinal view to confirm intra-articular needle tip position, and assess the quadriceps tendon for enthesopathies at the patella.

The knee joint has several compartments. All of them are contiguous in most people, so a substance injected into any one of them will distribute into the entire joint. The joint space is at the interface of the prefemoral fat pad and the deep surface of the quadriceps tendon fascia. It is usually easily visible when there is fluid in the joint space, which makes the lateral suprapatellar recess, often called the suprapatellar "bursa," the easiest compartment to access. Before placing a needle into the suprapatellar recess, it is best to start with a longitudinal view to determine how much fluid is in the joint or if the knee will be a "dry" target that will require further maneuvering to identify the recess borders.


Fig. 1

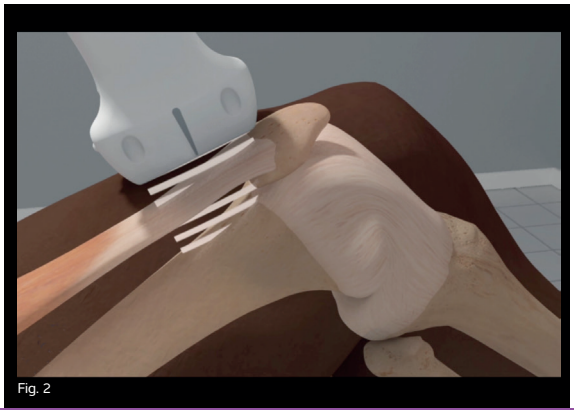
Fig. 2

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SUPRAPATELLAR RECESS LONGITUDINAL SCANNING THE LATERAL SUPRAPATELLAR RECESS OF THE KNEE

While scanning, you can help identify the suprapatellar recess by using a finger to push on the skin on the medial and lateral sides of the joint. This will move the fat pad. The quadriceps tendon is anchored by four large muscles and will not move during manipulation.

Clinical Pearls:

- Patient Positioning: Place the patient in a supine or seated position with the knee slightly bent 30 degrees and the toes pointed toward the ceiling. (Fig. 1)
- Transducer: Use a high frequency linear transducer and the MSK exam type setting at a depth of 3 cm.
- Transducer Position: Place the transducer in the longitudinal plane midline over the distal thigh and proximal to the knee to obtain the longitudinal image of the suprapatellar recess. (Fig. 2)
- Note there are two separate fat pads: The large prefemoral fat pad and the small triangular quadriceps fat pad, which is not connected to the prefemoral fat pad. Instead, it is connected to the quadriceps tendon deep fascia and patella. (Fig. 3 and Fig. 4)
- Scan through the quadriceps tendon, and extend over to the medial and lateral sides, as small amounts of synovial fluid will tend to accumulate in the more dependent areas of the suprapatellar recess.
- Increasing pressure of the transducer or squeezing the knee during dynamic scanning may help to detect small effusions or differentiate effusions from synovial thickening.
- Fluid in the knee joint will appear as an anechoic or hypoechoic area. (Fig. 3 and Fig. 4)

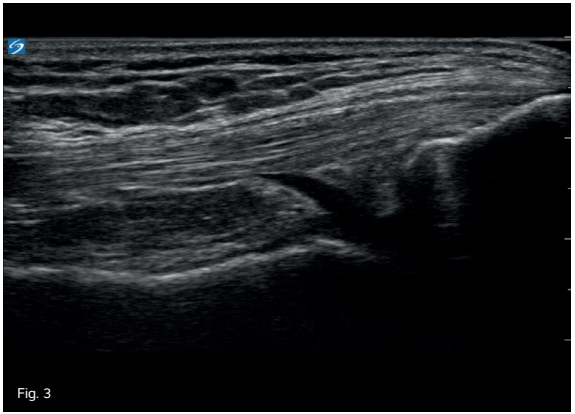
Fig. 3

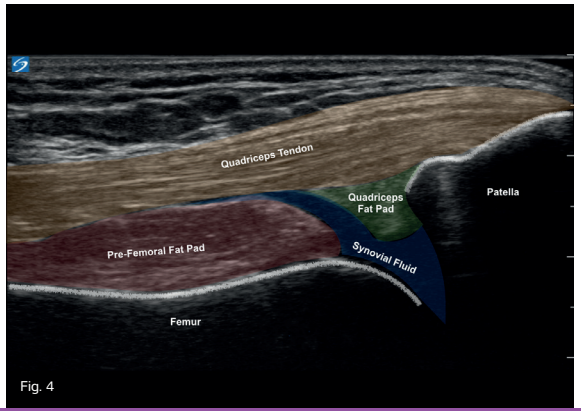

Fig. 4

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SUPRAPATELLAR RECESS

NEEDLE INJECTION: TRANSVERSE APPROACH

Objective:
Use ultrasound-guidance for the aspiration of fluid and injection of medication into the suprapatellar recess of the knee joint.

The in-plane technique with a lateral-to-medial approach is the preferred method for virtually painless knee joint aspirations and injections when performed with ultrasound-guidance.

The knee joint has several compartments. All of them are contiguous in most people, so a substance injected into any one of them will distribute into the entire joint. The easiest compartment to access is the lateral suprapatellar recess, which is often called the suprapatellar "bursa." This pouch in the knee joint is the preferred target for most aspirations and injections, because it is quite superficial and thus easy to locate by ultrasound. There are no vital structures nearby that can be damaged, and this approach causes the patient less procedural discomfort than other approaches.

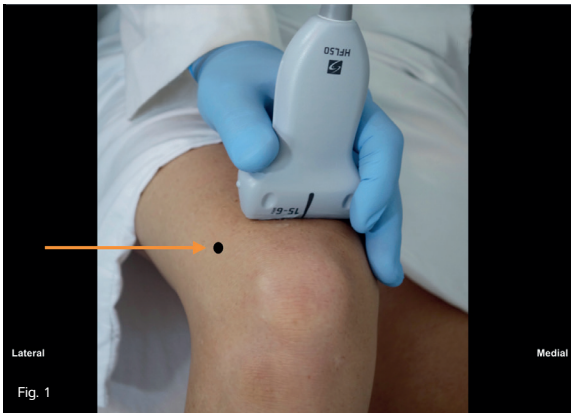

Fig. 1

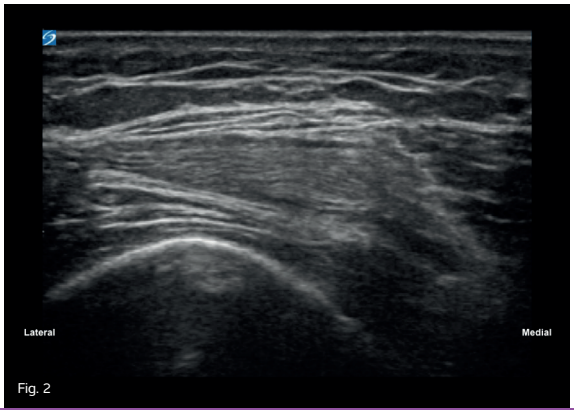

Fig. 2

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SUPRAPATELLAR RECESS NEEDLE INJECTION: TRANSVERSE APPROACH

While scanning, you can help identify the suprapatellar recess by using a finger to push on the skin on the medial and lateral sides of the joint. This will move the fat pad. However, the quadriceps tendon is anchored by four large muscles, and it will not move. Aim your needle at the interface between what moves and what does not.

Clinical Pearls:

- Patient Positioning: Place the patient in a supine position with the knee slightly bent. (Fig. 1)
- Transducer: Use a high frequency linear transducer and the MSK exam type setting at a depth of 2-3 cm.
- Transducer Position: Place the transducer in a transverse plane over the distal thigh about 1-2 in proximal to the patella to obtain the transverse image of the suprapatellar recess. (Fig. 2)
- Note that the target for your needle tip is the joint space, which is about 2 cm deep and situated at the interface of the superficial surface of the prefemoral fat pad and the deep fascia of the quadriceps tendon. This is identified between the heads of the arrows in Fig. 3.
- A needle length sufficient to reach the joint space is all that is needed. Measure the distance by pressing "freeze" on your ultrasound system, and using the caliper tools.
- Mark the skin with pen on the lateral aspect of the leg 2 cm below the level of the transducer surface.
- Use a sterile technique, and anesthetize the skin over your marked area.
- Introduce the injection needle parallel to the transducer, and travel lateral-to-medial to the joint space. Fluid in the knee joint will appear as an anechoic or hypoechoic area, and the needle can be seen easily in its long axis. (Fig. 4)
- Aspirate fluid from joint and inject medication. If possible, leave the aspiration needle in place, and switch syringes to avoid multiple passes.

* There are no important structures in the needle path that might be injured.

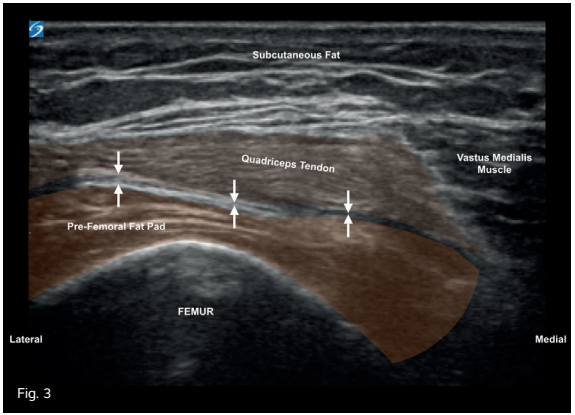

Fig. 3

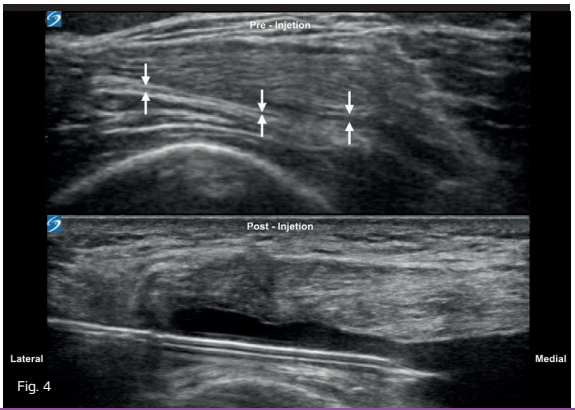

Fig. 4

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INFRAPATELLAR LIGAMENT

Objective:
Image through the infrapatellar ligament in both the longitudinal and transverse planes from its origin on the distal patella to its distal insertion on the tibial tuberosity. Evaluate the region of Hoffa's fat pad, and note deep and superficial infrapatellar bursae.

The infrapatellar ligament, also known as the patellar tendon, is the continuation of the common tendon of the rectus femoris. The infrapatellar ligament connects the patella to the tibial tuberosity. The main structures in the infrapatellar region are the the pre-patellar bursa located superficial to the patella, the infrapatellar ligament, Hoffa's fat pad, and two small infrapatellar bursae located on the deep and superficial surfaces of the distal ligament, dorsal femoral condyle, and tibial tuberosity.

The infrapatellar ligament is separated from the synovial membrane of the joint by Hoffa's fat pad and two small bursae that can be seen as two small triangular hypoechoic areas. This should be regarded as normal.

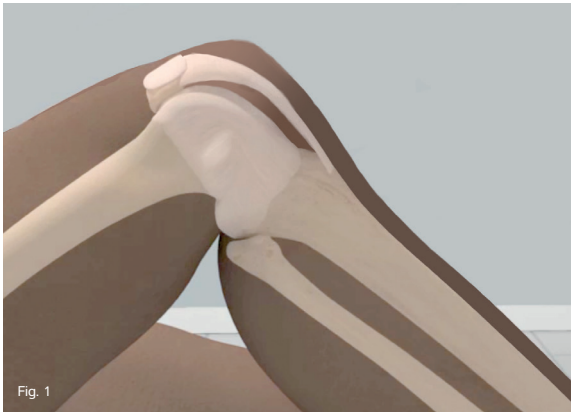
Fig. 1

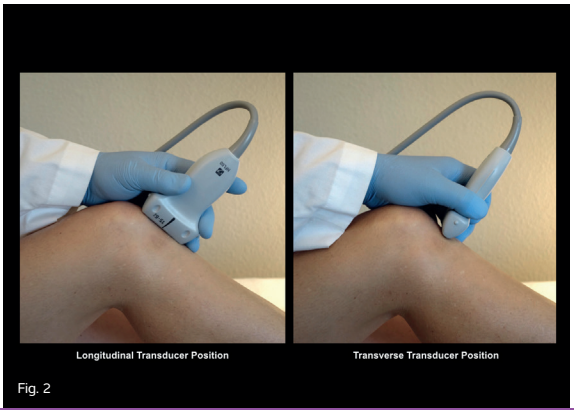

Fig. 2

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INFRAPATELLAR LIGAMENT

Clinical Pearls:

- Patient Positioning: Position the patient with the knee slightly flexed to put some tension on the ligament. (Fig. 1)
- Transducer: Use a high frequency linear transducer and the MSK exam type at a depth of 2-3 cm.
- Transducer Position: Place the transducer in the longitudinal plane on the midline of the ligament. (Fig. 2a)
- Scan the entire width of the infrapatellar ligament from the lateral-to-medial edge, and concentrate on both the ligament and then the deeper structures of Hoffa's fat pad and bursae. (Fig. 3)
- Turn the transducer 90 degrees for a transverse scan of the infrapatellar ligament. (Fig. 2b)
- Scan the infrapatellar ligament from the origin of the patella to the distal insertion on the tibia.
- Note the enveloping fascia of the knee joint, which surrounds the entire joint and includes the medial and lateral patella-femoral ligaments. (Fig. 4)

* A color Doppler exam of Hoffa's fat pad should be performed if the patient has tenderness upon palpation.

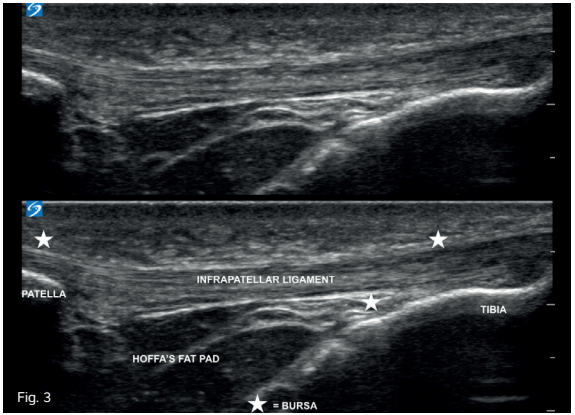

Fig. 3

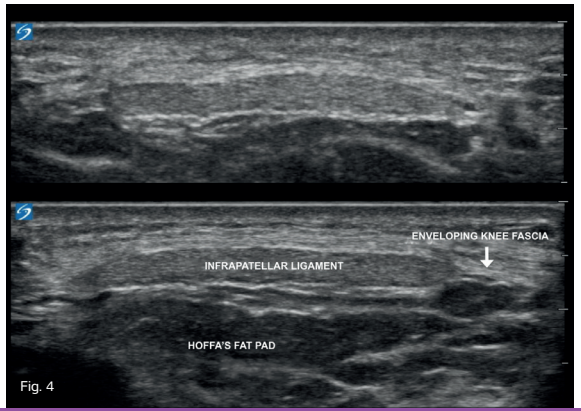

Fig. 4

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LATERAL COLLATERAL LIGAMENT

Objective:
Image the Lateral Collateral Ligament (LCL) from its femoral origin to the distal attachment on the posterior portion of the superior fibular head in the transverse and longitudinal planes.

The LCL of the knee originates just posterior and superior to the lateral epicondyle of the femur and inserts on the posterior portion of the superior fibular head. It often blends with the distal biceps femoris tendon, which makes it difficult, or impossible, to distinguish the LCL from the biceps femoris insertions.

Unlike the Medial Collateral Ligament (MCL) of the knee, the LCL does not adhere to the meniscus. Thus, injuries to the LCL do not necessarily affect the meniscus. The lateral inferior geniculate artery is often seen in scans of the LCL.

The LCL resists varus stress like those that occur with a medial-to-lateral force to the medial aspect of the knee, which is common with sports injuries. In addition to varus stress, the ligament stretches with full knee extension and slackens with flexion more than 30 degrees.

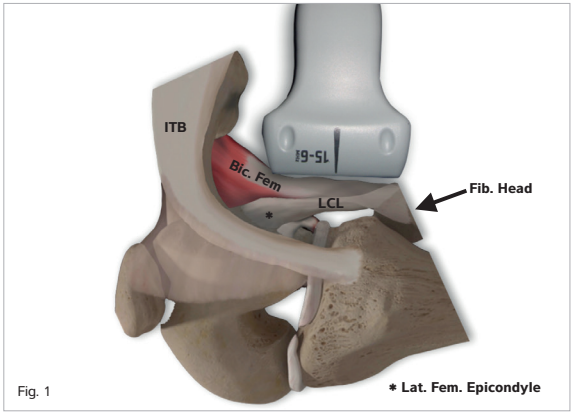

Fig. 1


Transverse Transducer Position
Fig. 2a


Longitudinal Transducer Position
Fig. 2b

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LATERAL COLLATERAL LIGAMENT

Clinical Pearls:

- Patient Positioning, Left Knee: Place the patient in the right lateral decubitus position with the left knee slightly bent about 15 degrees and the lateral aspect of the knee facing upward. (Fig. 2)
- Transducer: Use a high frequency linear transducer and the MSK exam type setting at a depth of 2-3 cm.
- Transducer Position: Place the transducer over the lateral epicondyle of the femur in the transverse plane perpendicular to the femur. (Fig. 2a)
- The lateral epicondyle of the femur appears as a small bump of bone. (Fig. 3)
- Turn the transducer 90 degrees to follow the LCL in its long axis. (Fig. 2b)
- Keep the proximal end of the transducer immediately posterior to the epicondyle, and image the LCL in its longitudinal plane from the proximal origin on the lateral epicondyle of the femur to the distal attachment on the fibula head.
- You should be able to see the LCL going directly superficial to the popliteus groove, across the knee joint line, and finally to the fibular head. (Fig. 3)
- Use color power Doppler to look for hypervascularity, which is often present in the acute phases of an injury.

* Most LCL injuries occur at its proximal end. However, the entire length of the ligament to the fibula should be scanned.

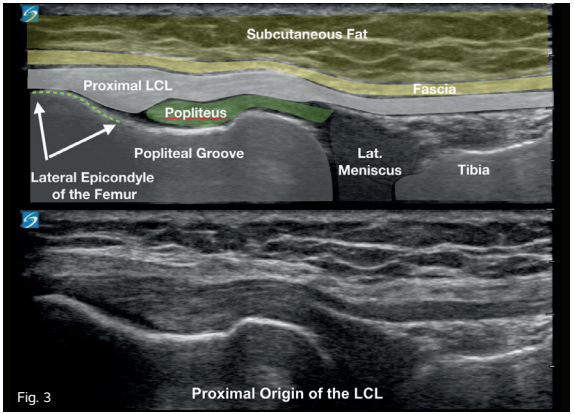

Fig. 3

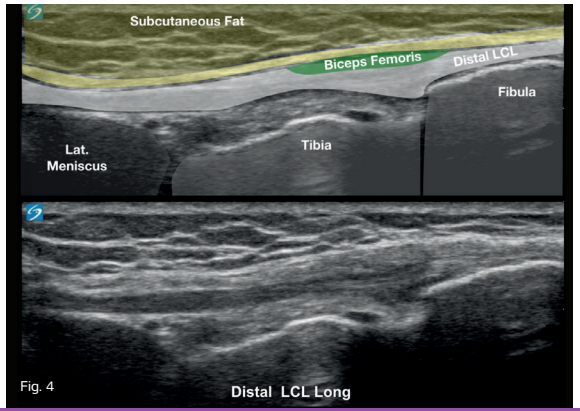

Fig. 4

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PES ANSERINE

Objective:
Image the pes anserine complex in both the longitudinal and transverse ultrasound views of the medial anterior aspect of the proximal tibia to assess for injury, tears, inflammation, or fluid collections. The distal aspect of the Medial Collateral Ligament (MCL) should also be examined as it passes just deep to the pes anserine tendons.

The pes anserine, otherwise known as the "goose foot," is the insertion point of three major muscles tendons that join together to insert on the proximal anterior medial surface of the tibial bone at the level of the tibial neck. The three muscles are the sartorius, gracilis, and semitendinosus. The MCL of the knee travels directly beneath the tendons of the pes anserine and should be assessed for abnormalities at the same time, since they both may cause pain to the medial aspect of the knee.

The pes anserine bursa is a small, fluid-filled sac located deep to the pes anserine tendons and may cause swelling, inflammation, and knee pain. The knee may be palpated for pain and swelling at the level of the tibial tubercle distal to the knee joint. Aspiration and injections of the pes anserine with corticosteroids or other medication may be performed with increased accuracy using ultrasound-guidance for needle tip placement.

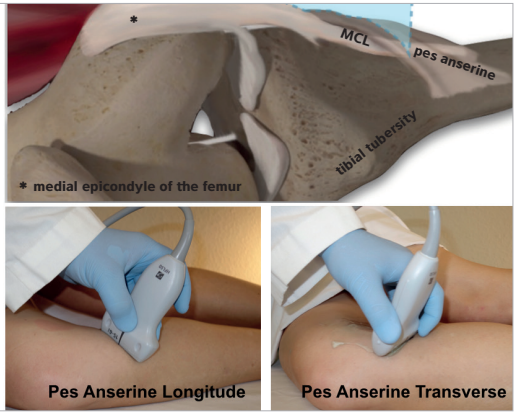

Fig. 1

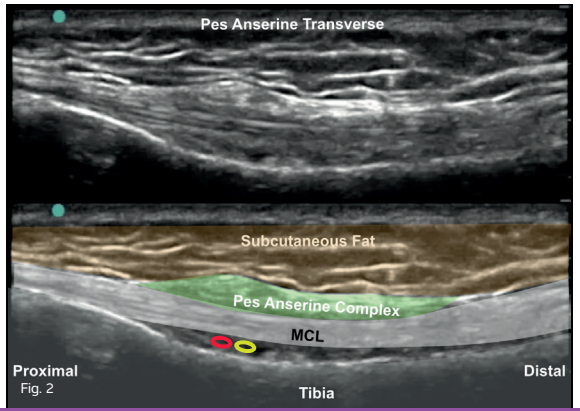

Fig. 2

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PES ANSERINE

Clinical Pearls:

- Patient Positioning: Place the patient in the supine position with the leg externally rotated, or roll the patient onto their affected side with the knee flexed 20-30 degrees for access to the medial aspect of the knee. (Fig. 1)
- Transducer: Use a high frequency linear transducer and the MSK exam type setting at a depth of 2-3 cm.

Transducer Positions:

- Position A: Place the transducer on the medial aspect of the distal femur in the longitudinal position as you would for an evaluation of the MCL. Slowly slide distally over the MCL; then as you pass the knee joint, rotate the transducer slightly anterior about 10-20 degrees to image the tendons of the pes anserine complex in the short axis. (Fig. 2)
  - The three tendons of the pes anserine will appear as small, hypoechoic areas above the longitudinal view of the MCL. (Fig. 3 and Fig. 4)
  - Turn the transducer about 90 degrees for the long axis view of the pes anserine complex. In the longitudinal view, the three muscle tendons of the pes anserine will blend together as they across over the medial tibia. In this position, the MCL will appear in its short axis just below the distal insertion point of the pes anserine. (Fig. 3 and Fig. 4)

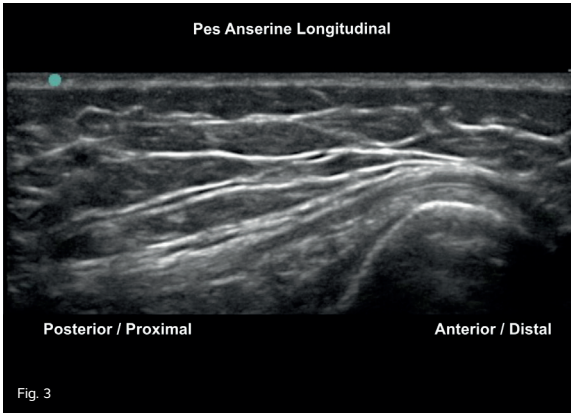

Fig. 3

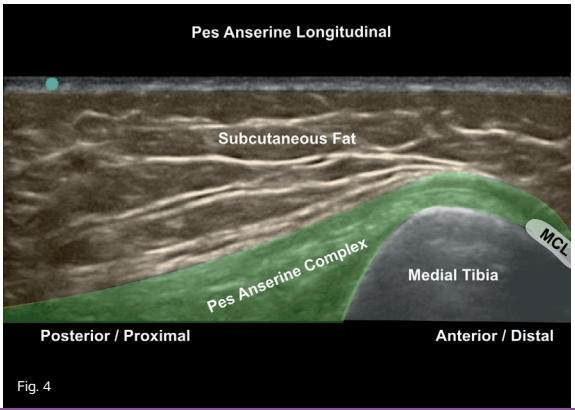

Fig. 4

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TIBIAL NERVE

Objective:
Image the Tibial Nerve (TN) for signs of blunt trauma, tears, compression, and inflammation.

The TN is an extension of the Sciatic Nerve (SN) after the bifurcation of the SN into the tibial and Common Peroneal Nerves (CPN) within the popliteal fossa of the posterior thigh. At the bifurcation of the SN into the CPN and TN, the CPN travels superficially and laterally, while the TN remains medial and deep, which provides innervation to the posterior compartment muscles of the leg.

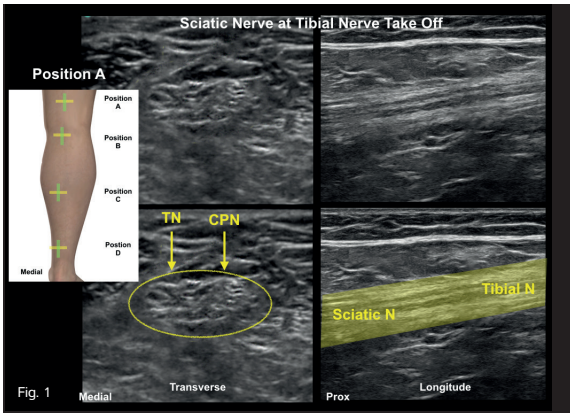

Fig. 1

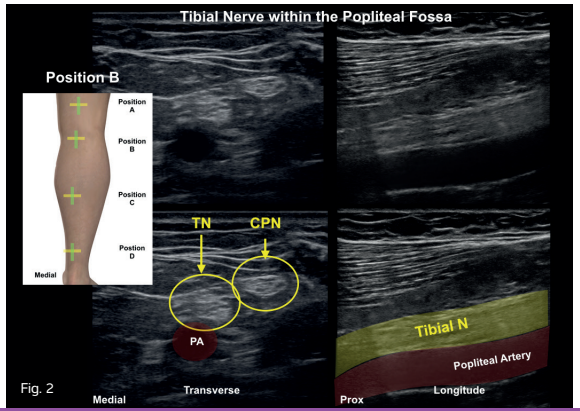

Fig. 2

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TIBIAL NERVE

The Tibial Nerve (TN) provides innervation to both the deep and superficial muscle compartments of the posterior leg.

Deep Muscle Compartment:
- Popliteus
- Flexor Hallucis Longus (FHL)
- Flexor Digitorum Longus (FDL)
- Tibialis Posterior (TP)

Superficial Muscle Compartment:
- Plantaris
- Soleus
- Gastrocnemius

Clinical Pearls:
- Patient Positioning: Place the patient in the prone position.
- Transducer: Use a high frequency linear transducer and the MSK exam type setting at a depth of 2- 4 cm. In some cases, a lower frequency linear transducer may need to be used due to increased patient size.
- Transducer Position: There are four positions along the back of the leg for imaging the TN. Follow the TN down the back of the leg in the transverse plane, and pause to obtain and image a longitudinal view for each transducer position.
- Position A: Place the transducer approximately 5 cm proximal to the popliteal fossa of the knee. At this level, the Sciatic Nerve (SN) bifurcates into the TN more medially and the Common Peroneal Nerves (CPN) laterally. The TN runs between the hamstring muscles and lies immediately superficial to the posterior tibial vein. (Fig. 1)
- Position B: Slide the transducer distally to the back crease of the knee. Here, the TN will stay deeper and more medial. (Fig. 2)
- Position C: Move the transducer to the mid-calf where the TN runs deep to the soleus on the medial aspect of the posterior leg. It runs along the anterior surface of the tibialis posterior muscle immediately adjacent to the posterior tibial veins and artery. (Fig. 3)
- Position D: The TN travels posteriorly to the tibia down to the ankle where it passes posteriorly and inferiorly to the medial malleolus just above the FHL tendon. (Fig. 4)

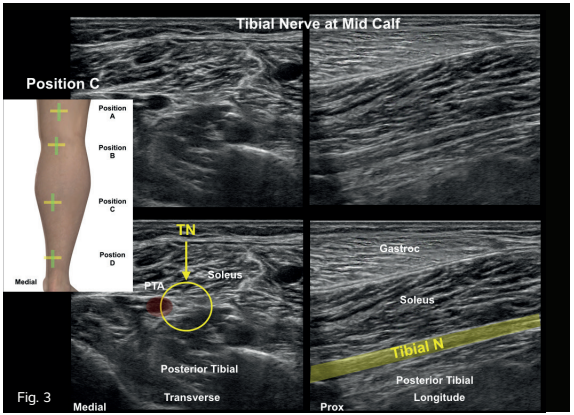

Fig. 3

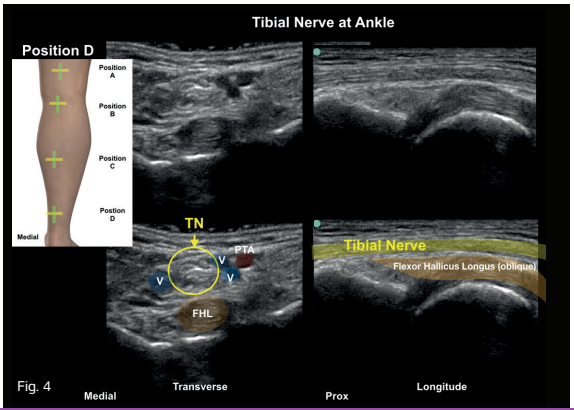

Fig. 4

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