



## **Ultrasound – Guided Lower Extremity Blocks**

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## **1. Femoral Nerve Block**

### **Indications**

Surgery involving the knee, anterior thigh, femur, or the saphenous nerve distribution of the lower leg

### **Anatomy**

The femoral nerve is a branch of the lumbar plexus arising from the L2-4 nerve roots. It arises in the psoas muscle. Distally, it is located between the psoas and iliacus muscles. It is blocked at the level of the inguinal crease. At this level the nerve is located superficial to the iliopsoas muscle and lateral to the femoral artery. The femoral nerve is typically covered by the fascia iliaca at this level.

### **Sonoanatomy**

A cross section of the femoral artery and vein are identified at the level of the inguinal crease. The femoral nerve is just lateral to the femoral artery. It typically has a hyperechoic triangle appearance and is covered by the fascia iliaca. The nerve is superficial to the large iliopsoas muscle. The fascia lata is also often visualized as a superficial structure on the ultrasound image.

### **Block technique**

Transducer: Linear, high-frequency probe

Needle: 4cm or 10cm short bevel needle

### **Scanning Technique**

The patient is positioned supine. Retraction of the panniculus throughout the procedure is often required in obese patients. Once the inguinal crease is identified, the linear probe is placed transverse over the inguinal crease and scanning is medial and lateral along the crease until the femoral artery and vein are visualized.

Once the femoral artery and vein are visible, the nerve can be identified as a hyperechoic triangle structure just lateral to the artery that is covered by the fascia iliaca. The nerve is occasionally oval or flat in appearance at this level. The nerve is superficial to the large iliopsoas muscle and is found deep to the superficial fascia lata.

### **Needling Technique**

The femoral artery, femoral vein, femoral nerve, iliacus muscle, fascia iliaca, and fascia lata are all typically identified prior to needle insertion. The block is performed in plane with a linear

probe. After antiseptic skin preparation, a short onset local anesthetic is injected at the needle insertion site approximately 1-2 cm lateral to the ultrasound probe. Local anesthetic is injected in the projected path of the needle. The block needle is then placed under the skin at the insertion site and advanced in plane toward the femoral nerve. The needle tip should be placed deep to the fascia iliaca and near the femoral nerve. Injection of local anesthetic within the epineurium of the nerve should generally be avoided. 1-2mL of local anesthetic can be injected to confirm correct needle tip position prior to injection of 10-25mL local anesthetic.

### **Volume of Local Anesthetic**

10-25mL of 0.5% ropivacaine or 0.25% bupivacaine

### **Complications**

- The needle tip should be positioned outside of the epineurium of the nerve to avoid trauma to the femoral nerve.
- Intravascular injection is rare. The needle tip should be advanced in plane under ultrasound visualization to avoid trauma to the femoral artery or vein or injection of local anesthetic into these structures.

### **Clinical pearls**

- Femoral nerve block is a basic block
- Quadriiceps weakness is expected after femoral nerve block. The patient should generally not bear weight on the blocked leg until complete resolution of the block.
- When scanning in the inguinal crease, occasionally the profunda femoris (deep femoral artery) and femoral artery are both visible. In this case, the ultrasound probe should be moved proximally until only the common femoral artery is visible.

## **2. Popliteal (Sciatic) Block**

### **Indications**

Lower leg, ankle and foot surgery. Medial portion of leg and ankle not innervated by sciatic nerve, must be supplemented with saphenous nerve block.

### **Anatomy**

The sciatic nerve bifurcates into the common peroneal and tibial nerves 5-10cm proximal to the popliteal fossa between the biceps femoris muscle laterally and the semimembranosus muscle medially. The popliteal artery and vein are deep and medial to the sciatic nerve. The femur is deep to all the aforementioned structures.

### **Sonoanatomy**

The transducer is placed in transverse orientation in the popliteal crease. The popliteal artery and vein can be identified deep and medial to the target nerves. The common peroneal nerve can be seen superficial and lateral to the tibial nerve. As the transducer is moved proximally up the leg, the common peroneal and tibial nerves converge into a common nerve sheath/bundle, which is the target for LA placement.

### **Block technique**

Transducer: Linear, high frequency probe.

Needle: 10cm short bevel needle

### **Scanning Technique**

The patient can be in supine, prone, or lateral position depending on patient mobility limitations. The transducer is typically placed in the popliteal fossa. A hyperechoic structure is typically visible superficial to the popliteal artery. This structure is usually the tibial nerve. The probe is then moved cephalad with tilting adjustment as needed to maintain visualization of the nerve structure. As the probe moves cephalad, another hyperechoic nerve structure should be visible, which ultimately will join with the initially identified nerve. Cephalad movement of the ultrasound probe is stopped at this junction or just cephalad to it, identifying the “split” of the sciatic nerve.

### **Needling Technique**

The most common needle approach is from the lateral side of the leg with the needle inserted in-plane and parallel to the transducer at the depth of the nerve. The skin is prepped with antiseptic solution, and a skin wheel is made with a short-lasting local anesthetic. The block needle is inserted and advanced medially toward the posterior aspect of nerve bundle. Once at

the target, local anesthetic is injected incrementally, ideally with visualization of LA spread around nerve. Needle repositioning may be done to ensure entire nerve bundle is surrounded by LA.

### **Volume of Local Anesthetic**

20-30mL of 0.5% ropivacaine or 0.25% bupivacaine

### **Complications**

- Intravascular injection
- Intra-neural injection
- Sparing of CPN or tibial nerve if proximal convergence into sciatic nerve not properly identified.

### **Clinical Pearls**

- In larger patients, muscle and adipose tissue increases proximally from the popliteal crease. Thus, the probe moves further away from the nerve, which can make visualization more difficult. In this case, a curvilinear, low frequency probe can be used.
- Correct identification of the nerve can be confirmed with a nerve stimulator eliciting planter flexion. Alternatively, the individual common peroneal nerve and tibial nerve can be identified separately closer to the popliteal crease, and each nerve can be blocked individually.
- This block will desensitize all but the medial aspect of the foot/ankle. Thus, if a medial incision is expected, a saphenous nerve block via an adductor canal approach can be used to achieve complete analgesia of the foot/ankle.