1. Femoral Nerve Block

Indications

Surgery on the anterior aspect of the thigh or superficial operations on the medial lower leg (saphenous nerve), as well as post-operative pain control for femur and knee surgery (knee arthroscopy requires addition of local anesthetic to the arthroscopy site). When combined with a sciatic block, a femoral nerve block can nearly completely anesthetize the leg below the mid-thigh level.

Relevant Anatomy

Femoral nerve (posterior divisions of L2-4) is formed in the psoas major muscle, runs between psoas and iliacus muscles and enters the thigh under the inguinal ligament lateral to the femoral artery, at which point it divides into multiple terminal branches (usually classified as anterior [mostly cutaneous] and posterior [mostly motor])

Landmarks and Surrounding Structures

Important landmarks include the femoral crease, ASIS, pubic tubercle, femoral artery (palpable) and veins (not palpable), both located medially

Cutaneous Innervation

The femoral nerve blocks the anterior thigh, as well as the medial lower leg (from the saphenous nerve). Note that it misses a portion of the medial thigh innervated by the obturator nerve (which also innervates the medially-located obturator externus, adductors [brevis, longus, and magnus], and gracilis muscles)

Muscular Innervation

Major muscles supplied by the femoral nerve include the anterior compartment muscles (quadriceps femoris, sartorius, and pectineus muscles), as well as the more proximal iliacus and psoas major muscles

Distributions Missed

Medial thigh (obturator nerve)

Technique

Traditional Femoral Block

A line is drawn from the ASIS to the pubic tubercle, in order to outline the inguinal ligament. The femoral artery is marked. A 4 cm 22 ga. needle is inserted just lateral to the femoral artery. The femoral nerve is often found within a triangular hyperechoic region, lateral to the femoral artery and superficial to the iliopsoas muscle. Prior to injection, scan both cephalad and caudally, to ensure that you are looking at the femoral nerve (which is continuous) and not mistaking it for lymph nodes (which are not). This is also important because sometimes the posterior division of the femoral nerve (usually located laterally) may have branched off at this level

Fascia Iliaca Block

Enter 1 cm caudal to the line between the lateral third and medial two-thirds of the inguinal ligament. Use a non-cutting needle to feel the two pops as the fascia lata and then the fascia iliaca are entered

Supplementation

Posterior

Complications

Analysis of the Closed Claims Database suggests that nerve damage is the cause of 16% of claims, with 78% of these occurring under general anesthesia and 22% occurring after regional anesthesia. The ulnar nerve is most commonly injured (28%), followed by the brachial plexus (20%). Keep in mind, however, that Closed Claims Data lacks a denominator [Kroll DA et al. Anesthesiology 73: 202, 1990]

See Also

- NYSORA Femoral Block
- Femoral Nerve Block @ USRA.ca

Adductor Canal Block

A reasonable alternative option for postoperative pain relief other than a femoral nerve block. This technique can be used for:

- Lower leg, foot and ankle surgery in combination with a popliteal-sciatic nerve block
- Knee procedures (Arthroscopy, Patellar surgery, ACL, MCL Reconstruction)
- Benefits of adductor canal block (1)
    - Targeted sensory blockade
    - Limited quadriceps weakness to facilitate ambulation and postoperative rehabilitation
    - Easier assessment of possible compartment syndrome
- Unique Contraindications:
    - None other than contraindications possible with other peripheral nerve blocks
- Unique Complications:
    - Neuropathy
        - Occurs in 6% of patients (2)
        - Symptoms include electric shock sensation at the area innervated and paresthesia. Most patient recover within 3 weeks. (2)
    - Vascular puncture
        - Only 1 reported case of iatrogenic pseudoaneurysm during an ultrasound-guided catheter placement (3)
    - Systemic toxicity of local anesthetics (4)
        - Incidence of LAST in 12,000 ultrasound-guided blocks was 0.08 per 1,000 blocks (5)
- Technique:
    - Position probe at transverse position to the longitudinal axis of the thigh approximately halfway between the anterior superior iliac spine and the patella (mid-thigh level).
    - Identify the visible pulsation of the femoral artery, vein just inferior to it and the saphenous nerve just lateral to the artery. (6)
        - Before needle insertion, do a thorough ultrasound examination of the femoral artery and its distributions to detect possible anatomic variations for prevention of vascular puncture. (3)

- Identify the borders of the adductor canal: sartorius muscle anteriorly, vastus medialis posterolaterally and adductor longus posteromedially
- At our institution, we normally use 5-15 ml of Ropivacaine 0.5%, depending on whether the block used was in combination with a popliteal-sciatic block for foot and ankle surgery or as a sole block for knee surgery.

.

2. Sciatic Nerve Block

Indications

- Surgery on the knee, calf, achilles tendon, foot, ankle.
- Post operatively for posterior knee pain following surgery

Anatomical Landmarks

Medial: Semitendinosus and Semimembranosus muscles

Lateral: Long/Short head of Biceps Femoris

Approaches

There are many approaches to block the sciatic nerve. Using ultrasound, both the popliteal and subgluteal approach are common. Using nerve stimulator, lateral and lithotomy approaches can be used.

Popliteal Approach

- Benefits to this particular approach:
    - Able to identify the sciatic nerve at it's most shallow position

Technique

- 1. Place the probe in the popliteal crease in the back of the knee and you should first see three circular structures lined up vertically. The first structure, more echogenic in appearance should be the tibial component to the sciatic nerve. The second structure is the popliteal vein and the third is the popliteal artery.
- 2. Move the probe more cephalad. The common peroneal component will come into view more laterally and the tibial component will move more medially. The popliteal vein and artery should remain in between these two structures. The medial side should reveal the semitendinosus/semimembranosus muscles and the lateral side should reveal the long and short head of the biceps femoris
- 3. Move up even more cephalad until these two nerves come together and form the sciatic nerve.
- 4. Measure the depth that the sciatic nerve is located from the surface of the ultrasound. Then make your skin wheal approximately at a similar distance from the top of the ultrasound probe. This should allow you to insert your needle in a plane which is relatively horizontal to the structure of interest and allow you to maintain great visualization of your needle.

Volume

Usual amount of local anesthetic used for this type of block is 20-30cc's

Onset

Typical onset of a sciatic nerve block with ropivicaine/bupivicaine can at times, take up to 30 minutes.

Optimal Ultrasound Probe

The linear Probe allows you to see structures well in a shallow plane but also has a wide field of view so that needle can be viewed.

The sciatic nerve can also be blocked proximally via a posterior approach, classically described by Labat. The landmarks for the classical approach by Labat are determined by first drawing a line from the greater trochanter to the posterior superior iliac spine. A second line is drawn from the greater

trochanter to the sacral hiatus. From the midpoint of the posterior superior iliac spine line, another line is drawn perpendicularly to the meet the sacral hiatus line. The intersection of the perpendicular line and the sacral hiatus line is the needle insertion point.

POSTERIOR APPROACH

- Posterior superior iliac spine
- Greater trochanter
- Sacral hiatus
- References: www.nysora.com

3. Ankle block

The nerve supply of the foot is primarily from the sciatic nerve:

- The **superficial peroneal nerve** (L4-S1) is located lateral to the extensor digitorum longus. **Sensory** : dorsum of foot and toes except b/w the great and second toes (deep peroneal n.)

- The **deep peroneal nerve** (L4-L5) is located lateral to the extensor hallicus longus. **Sensory** : between the great and second toes, **Motor** : extends the toes
- The deep peroneal, superficial, peroneal, and saphenous nerves can be blocked through a single needle entry site. A line is drawn across the dorsum of the foot connecting the malleoli and local anesthetic is infiltrated along this line across the anterior aspect of the foot.
- **Note: The three nerves that start with the letter S (superficial peroneal, sural, saphenous) are all Sensory only. The other 2 nerves, deep peroneal and tibial, are motor + sensory.**

- The **sural nerve** (S1-S2) is located superficially between the lateral malleolus and the Achilles tendon. **Sensory** : posterolateral leg, lateral foot, 5th toe
- **Technique** : Needle is inserted lateral to the tendon and is directed toward the malleolus as 5-10 ml of local anesthetic is injected subcutaneously.

- The **tibial nerve** is posterior to the medial malleolus. The posterior tibial nerve provides sensory innervation to the plantar aspect of the foot. It also supplies cutaneous, articular, and vascular branches to the medial malleolus, ankle joint, and Achilles tendon. Motor: flexes the toes

Technique: the posterior tibial artery is palpated and a needle is inserted posterolateral to the artery at the level of the medial malleolus. A paresthesia is often elicited at which time 2-5 mL of local should be injected. If no paresthesia, 7-10 ml should be injected as the needle is slowly withdrawn back from the posterior aspect of the tibia.

- The femoral nerve contributes one nerve to the ankle:
- The **saphenous nerve** (L3-L4) is just anterior to the medial malleolus**.**
  Sensory : anteromedial side of the leg, medial side of foot