

15. FEMORAL NERVE BLOCK

INTRODUCTION

The femoral nerve block provides analgesia to the anterior thigh, including the flexor muscles of the hip and extensor muscles of the knee. Historically this block was also known as the “3-in-1 block,” suggesting that the femoral, lateral femoral cutaneous, and obturator nerves could be blocked from a single paravascular injection at the femoral crease. Studies have since demonstrated that the femoral and lateral femoral cutaneous nerves can be reliably blocked by a single injection, but the obturator nerve is often missed. Therefore, a posterior lumbar plexus block should be used when all three nerves need to be anesthetized (although this point remains controversial). The femoral nerve block is an ideal block for surgeries of the hip, knee, or anterior thigh and is often combined with a sciatic nerve block for near complete lower-extremity analgesia. Complete analgesia of the leg can be achieved without lumbar plexus block by combining a femoral nerve block with parasacral sciatic nerve block (which blocks the obturator over 90% of the time), or by adding an individual obturator nerve block to the femoral nerve block.

ANATOMY

The femoral nerve, formed by the dorsal divisions of the anterior rami of L2–L4, is the largest terminal branch of the lumbar plexus. It travels through the psoas muscle, leaving the psoas at its lateral border. The nerve then descends caudally into the thigh via the groove formed by the psoas and iliacus muscles, entering the thigh beneath the inguinal ligament (Figure 15-1). After emerging from the ligament, the femoral nerve divides into an anterior and posterior branch. At this level it is located lateral and posterior to the femoral artery (Figure 15-2). The anterior branch provides motor innervation to the sartorius and pectineus muscles and sensory innervation to the skin of the anterior and medial thigh. The posterior branch provides motor innervation to the quadriceps muscle (rectus femoris, vastus intermedius, vastus lateralis, and vastus medialis) and sensory innervation to the medial aspect of the lower leg via the saphenous nerve (Figures 15-3 and 15-4).

The anatomic location of the femoral nerve makes this block one of the easiest to master because the landmarks are usually simply identified (except in cases of morbid obesity), the patient remains supine, and the depth of the nerve is relatively superficial.

Figure 15-3

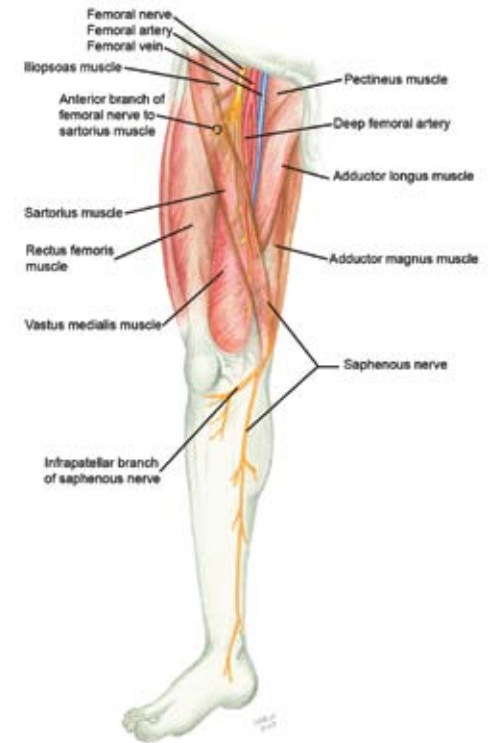


Figure 15-4. Dermatomes anesthetized with the femoral nerve block (dark blue)

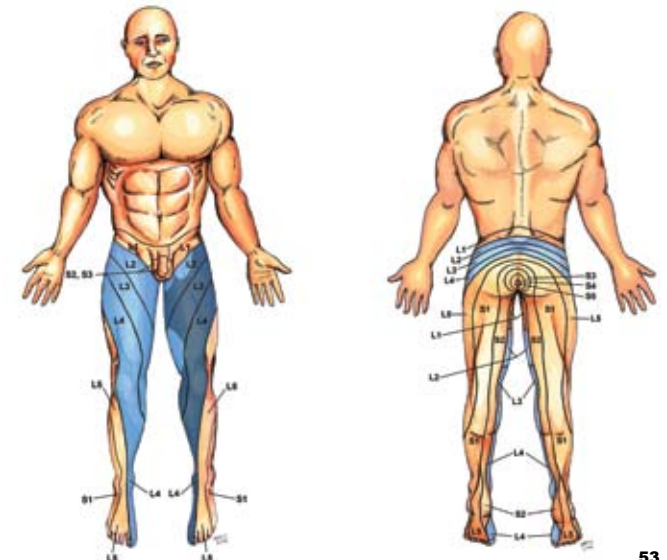


Figure 15-1

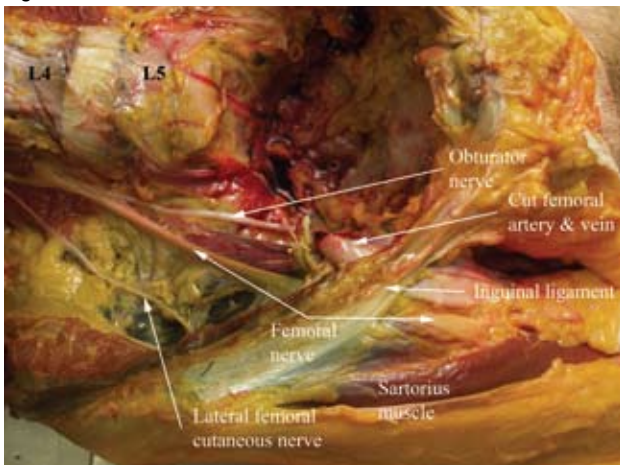
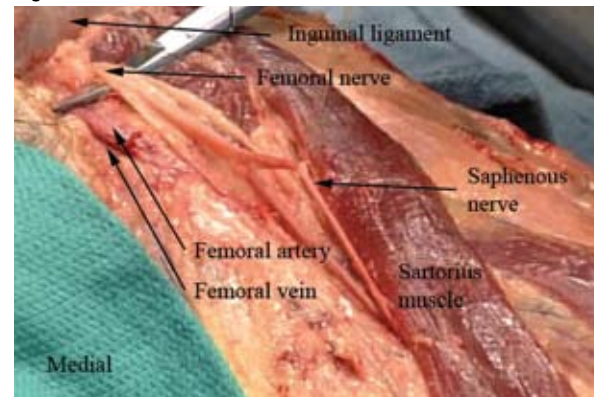


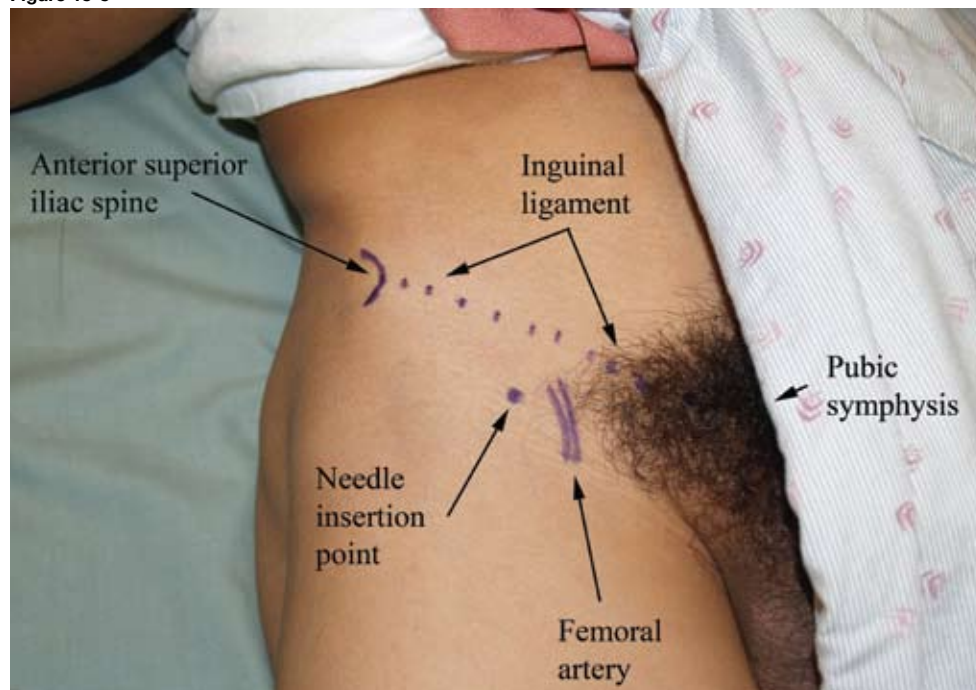
Figure 15-2



PROCEDURE

Landmarks. Place the patient supine, identify the anterior superior iliac spine and the pubic symphysis, and draw a line between these two landmarks. This line represents the inguinal ligament. The femoral nerve passes through the center of the line, which makes this landmark useful for positioning the needle in the inguinal crease, particularly in an obese patient. Then palpate the femoral pulse and mark it at the inguinal crease. Studies have demonstrated that the most successful point of needle entry is directly lateral (1–1.5 cm) to the artery in the inguinal crease. At this location the femoral nerve is wide and superficial, and the needle does not pass through significant muscle mass. Direct the needle cephalad toward the center of the inguinal ligament line (Figure 15-5).

Figure 15-5



Needles

- 22-gauge, 5-cm insulated needle.
- 18-gauge, 5-cm insulated Tuohy needle for catheter placement. The catheter is inserted 3 to 5 cm for the femoral block.

Stimulation. The nerve stimulator is initially set at 1.0 to 1.2 mA. The needle is directed cephalad at approximately a 30° to 45° angle. A brisk “patellar snap” with the current at 0.5 mA or less is indicative of successful localization of the needle near the femoral nerve. The nerve is usually superficial, rarely beyond 3 cm from the skin (Figure 15-6).

Local Anesthetic. In most adults, 20 to 40 mL of local anesthetic will produce a successful femoral block.

Teaching Points. Studies have demonstrated that the anterior branch of the femoral nerve is usually encountered with the first needle pass, which results in stimulation of the sartorius muscle, often seen as contraction of the lower medial thigh. If this occurs, advance the needle tip until either the sartorius twitch is extinguished or a patellar snap is elicited before redirecting the needle. If the sartorius twitch is extinguished without the patellar snap, withdraw the needle toward the skin (without exiting the skin), and redirect it slightly lateral and slightly deeper than the original needle pass. The posterior branch of the femoral nerve is typically lateral and deep to the anterior branch.

The anesthetist should resist the urge to use the patient’s thigh as a hand rest while directing the needle. Stimulation of the femoral nerve can result in brisk vastus muscle twitching that can disrupt needle positioning.

Figure 15-6



BLOCK WITH ULTRASOUND PROBE

Probe. High frequency (5–12 MHz), linear.

Probe Position. Place the probe in the inguinal crease, parallel to the inguinal ligament. The nerve will be visualized as a hyperechoic, triangular-shaped structure immediately lateral to the femoral artery.

Approach. Insert the needle at the lateral end of the ultrasound probe and advance it parallel to the ultrasound beam, in full view, until it approaches the femoral nerve (Figure 15-7). This is the preferred approach at Walter Reed Army Medical Center because it allows visualization of the entire needle. Some providers opt to advance

the needle to the nerve from a short-axis view (visualizing the needle as a dot) as opposed to the long-axis view. Both approaches are acceptable. The femoral nerve is easily visualized near the femoral artery in most patients (Figure 15-8). The relatively superficial depth of the femoral nerve at the inguinal crease enhances visualization of the needle under ultrasound. A medial approach to the femoral nerve should be avoided because the femoral artery can obstruct the needle approach to the femoral nerve.

Injection. Ensure that the needle has penetrated through the fascia lata (which divides the subcutaneous tissues of the thigh from the underlying muscles and vessels) as well as the fascia iliaca (which surrounds the iliopsoas and femoral

nerve). To ensure a successful block, the local anesthetic must either surround the femoral nerve completely or surround the medial, lateral, and inferior aspects of the nerve (Figure 15-9). If the local anesthetic is distributed only at the superior aspect of the nerve, the needle may not have crossed the fascia iliaca, the local anesthetic will be unable to properly penetrate the nerve, and the block may be delayed or fail.

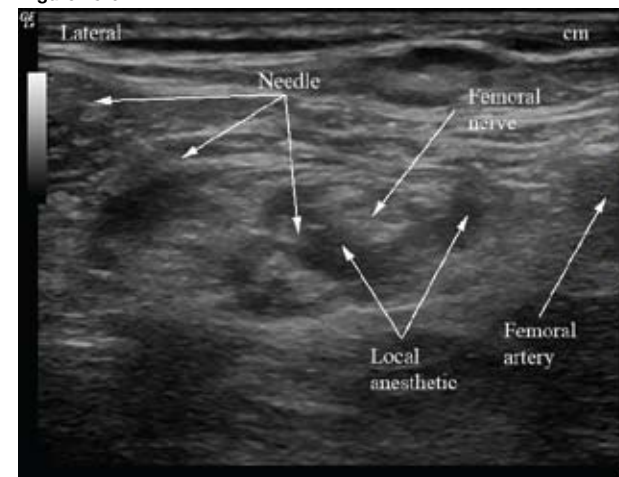
Figure 15-7



Figure 15-8



Figure 15-9



Teaching Point. Studies have demonstrated that use of the ultrasound can improve the femoral nerve block by decreasing the block latency by as much as 10 minutes, improving the sensory component of the block, and reducing the amount of local anesthetic needed to achieve block success.