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# Lower extremity peripheral nerve blocks in children

**Carmen Simion, MD, Santhanam Suresh, MD, FAAP**

*From the Department of Pediatric Anesthesiology, Children's Memorial Hospital, Northwestern University, Feinberg School of Medicine, Chicago, Illinois.*

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Children undergo a variety of orthopedic procedures. Although caudal block and opioids are used frequently, peripheral nerve blockade is gaining popularity in the pediatric population due to advancement in technique and technology and also due to the duration of analgesia.


Lower extremity regional anesthesia is becoming more popular in pediatric populations as an adjuvant to general anesthesia because of its benefits in the postoperative period.[1] Although caudal blockade remains the most popular and frequently used block in infants and small children for surgeries below the umbilicus, the advantages of the peripheral nerve blocks may supercede central neuraxial blocks while providing a longer duration of analgesia.[2,3] Commonly used lower extremity blocks in children are described below (Table 1).

## Femoral nerve block

### Anatomy

The femoral nerve arises from the dorsal division of the anterior rami at L2 to L4. It descends to the pelvis lateral to the psoas major muscle, passes deep to the inguinal ligament, and enters the anterior compartment of the thigh, where it divides into multiple branches supplying the muscle, joints, and skin in that region. At the level of the inguinal ligament, the femoral nerve is positioned lateral to the femoral artery.

### Indications

The femoral nerve block is probably the most common peripheral nerve performed in children, particularly those with fractured femurs,[4,5] where it provides painless transport, radiographic examinations, and applications of casts or splints. Combined with sciatic block, it can provide surgical anesthesia of the entire lower extremity from the mid-thigh level.

*Sensory distribution:* skin over anteromedial surface of thigh, medial surface of the leg and foot (saphenous nerve). *Motor feedback:* flexion, lateral rotation of the hip, extension and flexion of the knee.

### Technique

The use of a nerve stimulator or ultrasound guidance[2] increases the success rate, but the block can be easily performed using anatomic landmarks or surface mapping.[3]

With the child in supine position, anesthetized, or with sedation in older children and adolescents, a 22-gauge B-bevel or insulated needle is inserted at the inguinal crease (0.5 to 1 cm below inguinal ligament), approximately 0.5 to

**Address reprint requests and correspondence:** Santhanam Suresh, MD, FAAP, Department of Pediatric Anesthesiology, Children's Memorial Hospital, Northwestern University, Feinberg School of Medicine, Chicago, IL.

E-mail address: ssuresh@childrensmemorial.org.

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**Table 1** Lower extremity nerve blocks

| |
|---|
| Femoral Nerve |
| Lateral femoral cutaneous |
| 3-in-1 block |
| Sciatic nerve block |
| Posterior approach |
| Anterior approach |
| Infragluteal |
| Popliteal fossa block |
| Ankle block |

1 cm lateral to the femoral artery, at a 45-degree angle to the skin in a cephalad direction. The distances will vary according to the size of the child. As the needle advances, often two "pops" are felt as the fascia lata and fascia iliaca compartments are pierced. If a nerve stimulator is used, correct placement of the needle should elicit contractions of the quadriceps muscle ("patellar kick"); 5 to 10 mL of the local anesthetic solution is injected with repeated aspiration to avoid injection into the femoral artery. If a sartorius contraction is elicited, it is imperative to pull the needle back and redirect it laterally to avoid the anterior division of the femoral nerve that supplies the sartorius. This block can be easily performed using ultraound guidance. The nerve is imaged using a linear probe (7-13 mHz); the needle is then placed using an in-plane technique. As the nerve bundle is accessed, the local anesthetic is injected. A "donut" sign is elicited as the fascia iliaca compartment is filled with local anesthetic solution (Figure 1). Recently there has been increasing interest in the placement of continuous femoral catheters in children for postoperative pain control after major knee surgery.[6]

### Complications

Complications of the femoral nerve block are rare and related to the puncture of the femoral artery and potential neural injury. These may include femoral nerve compression by a hematoma, nerve injury from direct injection into the nerve, and femoral dysesthesia. It is necessary to avoid this technique in patients on anticoagulants or who have bleeding diathesis. Also, it is important to inform the patient that the use of long-acting local anesthetics can produce long-lasting motor block of the quadriceps muscle, making ambulation difficult and increasing the risk of falls.

## Lateral femoral cutaneous nerve block

### Anatomy

The lateral femoral cutaneous nerve arises from the L2 and L3 roots of the lumbar plexus and is purely sensory, supplying the anterolateral aspect of the thigh down to the knee. It emerges from the lateral border of the psoas muscle and enters the thigh 1 to 2 cm medial to the anterior superior iliac crest, passing obliquely under the fascia iliaca.

### Indications

This nerve block provides analgesia for muscle biopsy,[7] skin grafts,[8] femoral neck pinning, and femoral plate placement or removal. Blockade is also indicated for supplementation of femoral and sciatic nerve blocks to provide relief of tourniquet pain.

### Technique

With the patient supine, the anterior superior iliac spine is located and a blunt needle is placed 1 to 2 cm below and medial to the origin of the inguinal ligament at the anterior superior iliac crest. A B-bevel needle or a 22-gauge caudal needle is advanced through the skin and fascia lata, a distinct "pop" being felt. Two to 10 mL of the local anesthetic solution is injected after aspiration. Recently, we have been using an ultrasound-guided technique for this block. The fascia iliaca compartment can be easily identified and the needle insertion can be gauged as it is inserted. We find that ultrasonography also allows us to demonstrate the local anesthetic deposition in the facia iliaca compartment (Figure 2).

### Complications

It is very rare to see any complications associated with this nerve block. Care has to be taken to avoid intraneural injection of the local anesthetic. Using ultrasonography as a guidance to perform this nerve block may minimize these complications, allowing real-time visualization of the injection.

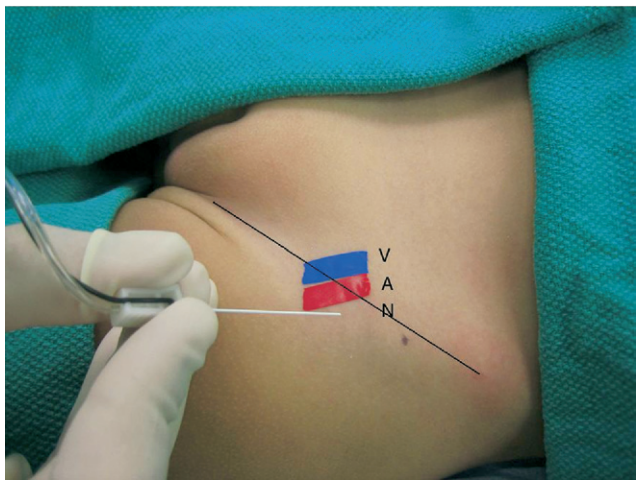


**Figure 1** Femoral nerve block. (Color version of figure is available online.)