POPLITEAL NERVE BLOCK

Surgical Specialty:	Pediatric Pain/Regional Anesthesia
Authors:	Margaret C. Stewart, MD, Kathleen M. Gibbons, MD University of Michigan, Ann Arbor, MI

Background:

- General Considerations
  - The popliteal nerve block (PNB) provides analgesia for lower extremity surgeries, as it covers the sensory and motor function of the lower extremity, except for the saphenous sensory distribution. This block is performed in the popliteal fossa proximal to the division of the sciatic nerve into the common peroneal nerve (CPN) and the tibial nerve (TN).
  - The boundaries of the popliteal fossa include the semitendinosus and semimembranosus tendons medially and the biceps femoris tendon laterally. Care must be taken to successfully target the sciatic nerve before it divides if both tibial and common perineal nerve coverage is necessary. [1]
  - PNB results in anesthesia of the lower limb, with the exception of the sensation to the medial calf, which is supplied by the saphenous nerve. Combined PNB and saphenous nerve block will result in complete anesthesia of the leg below the knee.
  - This technique provides motor and sensory blockade with a duration of action of up to 8-24 hours, depending on the dose of local anesthetic and added adjuvants.
  - In pediatric patients, PNB is used for intra/postoperative analgesia for surgical procedures involving the lower leg, ankle, and foot, most commonly related to trauma and congenital diagnoses.
  - This block may be performed under ultrasound-guidance (USG) or via landmark or nerve stimulation-based techniques; the use of USG is associated with lower volumes of local anesthesia (LA) due to improved ability to verify peri-neural LA spread.
  - Use of regional anesthesia in pediatric patients decreases overall opioid requirements and opioid-related side effects, reduces the amount of intraoperative anesthesia utilized, limits the stress hormone response, improves analgesia, and shortens recovery time.[2]
- Patient Considerations
  - PNB may be performed safely both in awake, cooperative patients or after GA is induced in younger or less cooperative patients.
  - Standard GA considerations apply for those performed after the induction of GA.
- Associated Co-morbidities/Syndromes
  - The presence of neuropathy, trauma, infection, or coagulopathy may preclude the use of PNB.

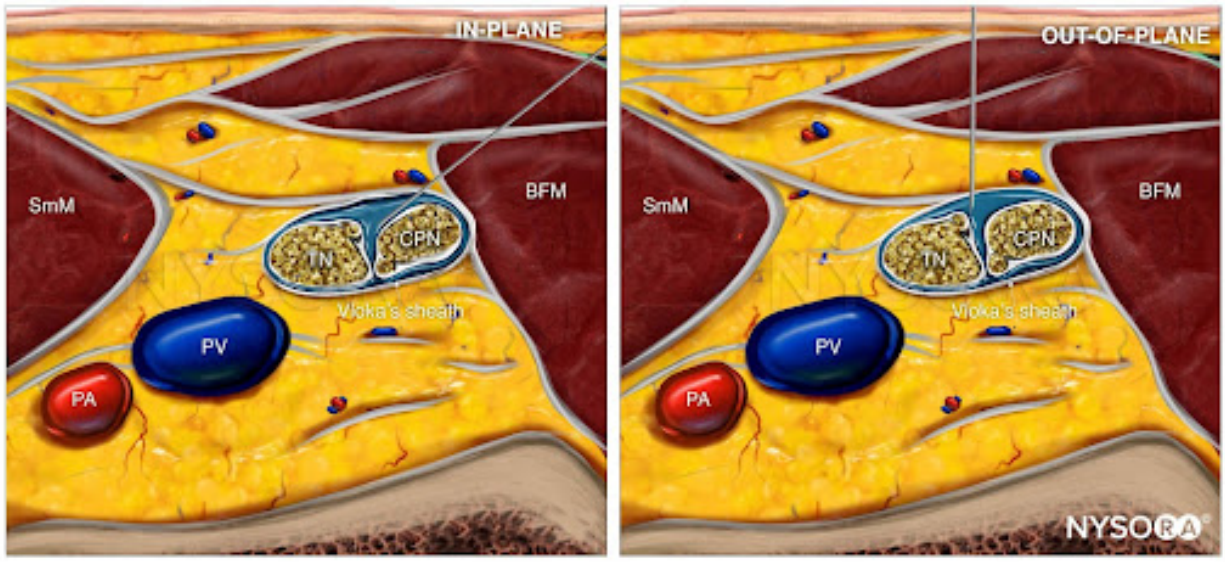
Anesthetic Planning:

- Pre-Anesthetic Evaluation
    - Standard preoperative anesthetic evaluation, as well as block-specific considerations, including pre-existing neuropathy, presence of rash or infection over the site of needle placement, coagulopathy or use of anticoagulant medications, or allergy to local anesthetic medication, should be assessed.
    - Discuss Risks/Benefits/Alternatives with patient and/or guardian and surgeon.
        - Benefits of PNB (+/- saphenous nerve block) include predictable, targeted anesthesia over the lower leg and reliable postoperative analgesia, allowing for decreased use of opioids and sedative medications, and other benefits listed above.
        - PNB is 100% elective. The alternatives to PNB include oral or intravenous (IV) analgesic medications and/or local infiltration by the surgeon.
        - Risks associated with PNB include block failure, infection, hematoma, intravascular injection, local anesthetic systemic toxicity (LAST), and nerve injury.[1]
    - Additional labs/tests indicated during work-up
        - None indicated.
        - Consider documenting pre-existing neurological deficits prior to block placement.
    - Discussions to have with the surgeon/family
        - Failure of block requiring alternative pain control methods.
        - Postoperative neurological exam may be compromised secondary to motor and sensory blockade.
        - Postoperative weakness/numbness may require additional care post-operatively to avoid limb injury (e.g., avoidance of extreme heat/cold) as well as caution against weight-bearing for 24 hours after block placement.

- Specific or Unique Room Set-Up Requirements
    - Airway
        - Natural airway.
        - A nasal cannula may be placed for the administration of supplemental O_2 if needed during sedation as well as for CO_2 monitoring.
        - LMA or ETT as indicated if block is performed after induction of GA.

    - Equipment[4]
        - Ultrasound machine with 8-12 Hz linear transducer
        - Sterile ultrasound probe sleeve and gel
        - Sterile gloves
        - Antiseptic solution for skin disinfection
        - Echogenic 5 cm nerve block needle
        - 3-way stopcock
        - Sterile saline syringe (10 mL)
        - Local anesthetic mixture syringe

        - Lidocaine in a 1 mL syringe with a 25G needle for skin wheal, in awake patients
        - Peripheral nerve stimulator and insulated stimulating needle if using nerve stimulation-based technique as opposed to or in addition to USG
    - Emergency Equipment[1]
        - O_2 source
        - Suctioning
        - Resuscitation equipment, including lipid emulsion
    - Drugs[1,4]
        - Local Anesthetic (LA) Medications (institutional practice may vary)
            - 0.3-0.5 mL/kg, maximum 25 mL
                - 0.2%-0.5% ropivacaine
                - 0.2-0.5% bupivacaine
                - 2% lidocaine
        - Adjuvants (institutional practice may vary)
            - Epinephrine 1:200,000
            - Dexamethasone IV 0.5 mg/kg, maximum 10 mg, at the time of block
            - Dexmedetomidine perineural (PN) or IV 1 mcg/kg, maximum 50 mcg
        - Premedication as needed for awake nerve block
        - Rescue Medications in the event of LAST
            - Epinephrine, midazolam
            - Lipid emulsion: initial bolus of 1.5 mL/kg over 1 minute, repeated every 3-5 minutes as necessary, followed by infusion of 0.25-0.5 mL/kg/min
    - Monitors
        - Standard ASA monitors, including EKG
    - Blood Availability
        - Not required.
    - PICU Bed Availability
        - Not required.
    - Other Indicated Resources
        - Anatomy

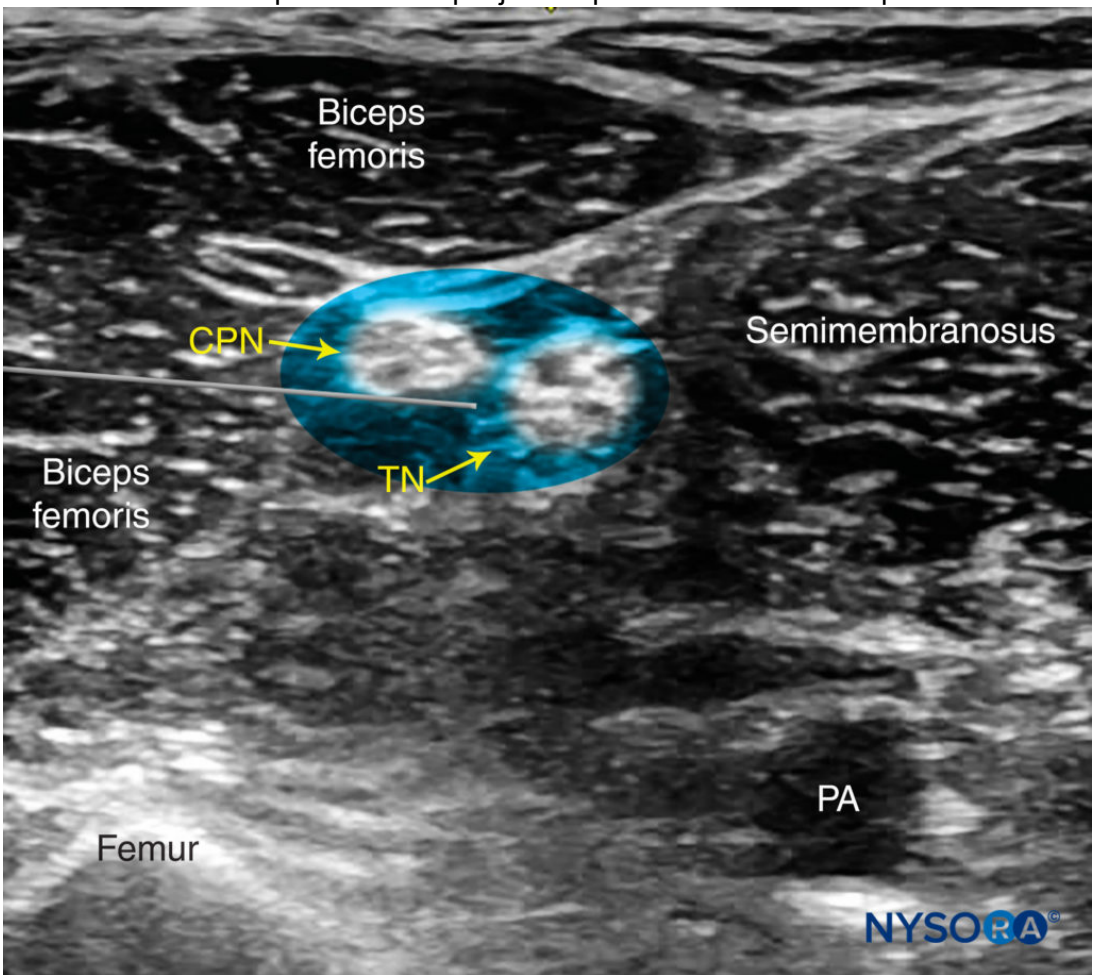


Source: NYSORA.COM

Intraoperative Considerations:

- General
  - All-stop patient/procedure time out with verification of maximum local anesthetic dose and confirmation of correct side.
  - Administer sedative medications in awake patients if needed.
  - Consider post-induction blockade in patients who are unable to tolerate awake block.
- Positioning[1,4]
  - Lateral, supine, or prone, depending on the approach
  - If supine, consider a leg positioning device or assistant to elevate and stabilize the leg, enabling access to the posterior thigh for block placement
  - If nerve stimulation is used, positioning should allow motor responses to be observed.
- Ultrasound Scanning[1,4]
  - Place the probe just proximal to the popliteal crease
  - The probe should be moved from distal to proximal, identifying the common peroneal nerve and tibial nerve combining as the sciatic nerve
  - Scan for the popliteal artery (PA) and popliteal vein (PV). Color imaging can be helpful in identifying these structures; the PA should be pulsatile, and the PV can be more easily compressed by the probe.
- Technique[1,4]
  - Sterile preparation of supplies.
  - Skin disinfection.
  - The needle should be inserted just as the CPN and TN start to divide.
  - With the lateral approach, the advancement of the needle should be in-plane, lateral to medial toward the sciatic nerve.
  - With the posterior approach, the advancement of the needle can be either in-plane or out of plane.
  - Following negative aspiration, a test dose with saline or D5W is recommended to visualize the spread and confirm the location of the needle tip.

- LA spread should be visualized surrounding the neural structures. If the spread is inadequate, the needle may be re-positioned with care. An additional test dose should be given after needle repositioning to identify the needle tip.
- Visualization of the needle tip at all times is critical to reduce the risk of vascular injection and inadequate block.
- Care must be taken to avoid injection against high resistance, which may indicate intraneural needle position. Keep injection pressure less than 15 psi.



Source: NYSORA.COM

- Block Considerations
  - Use of ultrasound may result in increased speed of onset and success rate, and a reduction in the volume of local anesthetic required
  - Color Doppler may be used to identify large vessels (e.g., popliteal artery and vein) prior to needle insertion and medication injection.
  - Identification of the tibial and common peroneal nerve coalescing should occur prior to LA injection.
- Post-op Care
  - Standard PACU care and discharge criteria.

Case Specific Complications/Pitfalls

- Intravascular Injection/LAST
  - Prevention via careful technique, use of a test dose, intermittent aspiration, and incremental injection.
- Intraneural Injection
  - High injection pressure may signify intra-fascicular injection
  - Nerve injury is usually transient, lasting a few weeks to months. If prolonged, consider neurology evaluation.[1,3,4]

References

1) Tsiu B. and Suresh S. Pediatric Atlas of Ultrasound- and Nerve Stimulation-Guided Regional Anesthesia. Springer; 2016.
2) Bosenberg, A. Benefits of regional anesthesia in children. *Pediatr Anesth* 2012; 76(12): 10-18. PubMed Link
3) Walker BJ, Long JB, Madhankumar S, et al. Complications in Pediatric Regional Anesthesia: An Analysis of More than 100,000 Blocks from the Pediatric Regional Anesthesia Network. *Anesthesiology.* 2018 Oct; 129(4): 721-32. PubMed Link
4) Hadzic A, Lopez AM, Vandepitte C, Sala-Blanch X. Ultrasound-Guided Popliteal Sciatic Nerve Block. NYSORA. Accessed 12/16/2022. https://www.nysora.com/topics/regional-anesthesia-for-specific-surgical-procedures/lower-extremity-regional-anesthesia-for-specific-surgical-procedures/foot-and-anckle/ultrasound-guided-popliteal-sciatic-block/

Reviewed by:

Reviewer #1: Saeedah Asaf, MD, University of Arkansas Medical Center

Reviewer #2: Gail Shibata MD, University of California-San Francisco

Reviewer #3: Bob Weaver, MD, University of Kentucky

Created: 9/8/2022; Last revised: 8/7/2025