

Nerve Block & Regional Anesthesia

Introduction:

Local anesthetics work by producing nerve conduction blockade at the level of nerve membrane receptors. The most commonly used agent is Lidocaine. Addition of Epinephrine (EN) reduces bleeding and systemic absorption by local vasoconstriction. The toxic limit of Lidocaine is 5mg/kg without Epinephrine and 7mg/kg with Epinephrine.

Topical anesthetics are useful in the pediatric population, but require long application

Local Anesthetic	Onset	Maximum Dose (mg/kg)		Duration of Action (hrs)	
		Plain	With EN	Plain	With EN
Bupivacaine (Marcaine)	Slow	2.5	3.5	2-4	4-8
Lidocaine (Xylocaine)	Rapid	5	7	0.5-2	1-4
Procaine (Novocaine)	Slow	6	9	0.25-0.5	0.5-1
Tetracaine (Pontocaine)	Slow	1.5	2.5	2-3	2-4

times for dermal anesthesia.

Topical Anesthetic	Onset	Maximum Application Area	Duration
EMLA Cream (Lidocaine 2.5% and Prilocaine 2.5%)	1-2 hours with occlusive dressing	Up to 10 kg: 100cm ² Up to 20 kg: 600 cm ² Above 20 kg: 2000 cm ²	3-4 Hours

Mucosal Topical Anesthetics:

Hurricane and Cetacaine both are applied to the mucosa for anesthesia. They contain Benzocaine (20% and 14% respectively) as the active ingredient. Onset is within minutes.

Absorption is related to the length of application. Extended periods of application are to be avoided. Ethylchloride applied topically may provide brief anesthesia by frosting the skin to reduce discomfort of needle injection for local anesthesia.

A. Local / Field Block:

Indications:

- Anesthesia for surgical procedures
- Anesthesia for wounds that require irrigation, debridement, and/or repair

Contraindications:

- None when using local anesthetics without epinephrine.
- Epinephrine should not be used at anatomic sites supplied by end-arteries (fingers, toes, nose, ears, penis) or in infection-prone wounds (animal/human bites, contaminated wounds).

Equipment:

- Sterile prep solution
- Sterile gloves and towels
- 5-ml syringe
- 25- or 27- gauge needle

- 1% or 2% Lidocaine solution

Technique:

2. Sterile prep wound with antiseptic such as Betadine, cleanse with alcohol swab.
3. Stretch skin taut to facilitate penetration, and directly infiltrate local anesthetic through wound edges and inside wound with a long 25-gauge needle; minimize needle sticks by orienting needle longitudinally along axis of wound and injecting beneath skin edges.
4. Inject the anesthetic slowly or add NaHCO_3 (1ml 10% NaHCO_3 to 9ml 1% Lidocaine) to reduce pain on infiltration. If more NaHCO_3 is added, it will precipitate in the Lidocaine. If this occurs, do not use the solution.
5. Irrigate wound thoroughly with normal saline; use an 18-gauge needle to introduce holes in the top of a plastic saline bottle and use this as a squirt bottle to irrigate.
6. Allow at least 5 minutes for the onset of the anesthesia, depending on the agent.
7. Sterilely drape the wound.

Complications and Management:

- Intravascular injection or overdose:
 - Initial signs of toxicity include dizziness, restlessness, paresthesia, and twitching, and may lead to generalized seizures, hypotension,

bradycardia, and cardiovascular collapse.

Complications are generally self-limited but may require supportive care until effects wear off.

- Stop the local anesthetic and hyperventilate with 100% O₂.
- Use IV diazepam (0.1-0.3mg/kg) for seizures.
- Initiate some protocols if necessary. Trendelenburg for hypotension and bradycardia.
- Prolonged CPR is indicated because the effects of the anesthetic will subside as the drug redistributes.

B. Nerve Blocks of the Hand:

Introduction:

A nerve block of the hand is a procedure in which anesthetic is injected around a nerve of the hand to provide regional anesthesia.

Indications:

- Repair of hand laceration
- Removal of a fingernail
- Finger dislocation
- Large surface area of the hand requiring anesthesia

Contraindications:

- Overlying skin infection
- Bleeding diathesis

Complications:

- Bleeding
- Injection of the nerve
- Intravascular injection
- Infection
- Technical failure such as breakage of the needle

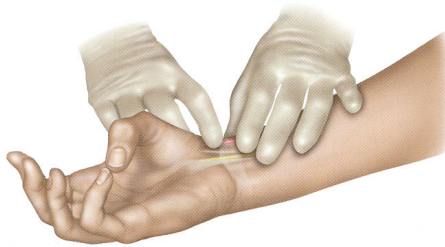
Equipment:

- Sterile prep solution
- Sterile gloves and towels
- 5-ml syringe
- 25- or 27- gauge needle

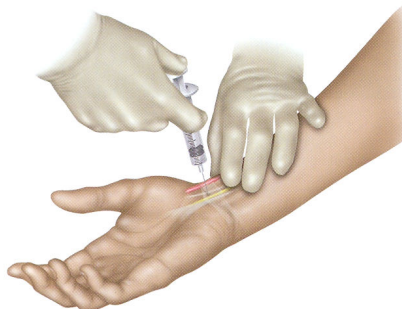
- 1% or 2% Lidocaine solution

Median Nerve Block:

1. Identify the flexor carpi radialis tendon and the palmaris longus tendon by having the patient oppose the thumb and fifth finger while flexing the wrist.



2. At the level of the proximal volar crease, enter with the needle perpendicular to the skin. A pop may be heard as the needle passes through the flexor retinaculum. Once into the deep fascia, inject 5-7 cc of anesthetic.



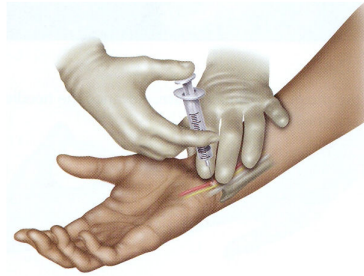
Ulnar Nerve Block:

- Palpate the ulnar artery and the flexor carpi ulnaris tendon. The ulnar nerve is found between these two at the level of the ulnar styloid.



Volar Approach

- Insert the needle between the artery and tendon at the proximal palmar crease. Advance the needle until paresthesias are felt, withdraw slightly, and inject 3-5 cc of anesthetic.



Lateral Approach

- Insert the needle under the flexor carpi ulnaris tendon at the proximal palmar crease. Advance the needle until paresthesias are felt, withdraw slightly and inject 3-5 cc of anesthetic.

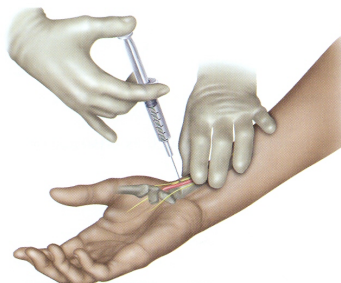


Radial Nerve Block:

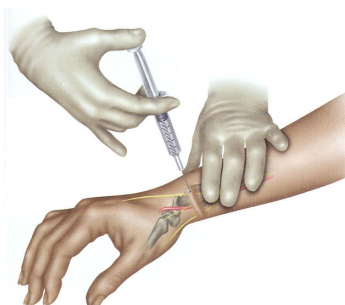
1. Identify the radial artery, radial styloid, and anatomic snuffbox.



2. At the level of the styloid and just lateral to the radial artery, inject 3 cc of Lidocaine.



3. Raise a subcutaneous wheal of anesthesia from the deep injection site around the radial surface of the wrist, extending dorsally to the level of the anatomic snuffbox.



Digital Nerve Block of the Finger

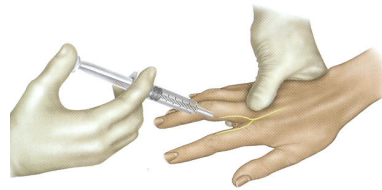
Lateral Approach

- Insert the needle at a 90° angle to the skin of the finger laterally at the level of proximal 1/3 of the proximal phalanx. Aspirate and then inject 3-5cc of anesthetic. Repeat on the opposite side of the digit.



Web Space Approach

- Insert the needle into the web space between the fingers. Aspirate and then inject 3-5cc of anesthetic. Repeat on the opposite side of the digit.



C. Nerve Blocks of the Foot:

Introduction:

A nerve block of the foot is a procedure in which anesthetic is injected around a nerve to provide regional anesthesia.

Indications:

- Laceration repair of the foot
- Large area of the foot requiring anesthesia
- Removal of a toenail

Contraindications:

- Injection through an area of infection
- Bleeding diathesis

Complications:

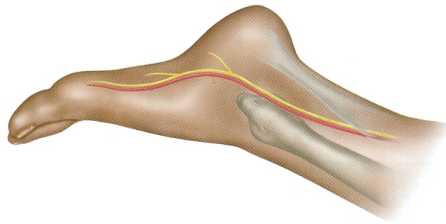
- Bleeding
- Injection of the nerve
- Intravascular injection
- Infection
- Technical failure such as breakage of the needle

Equipment:

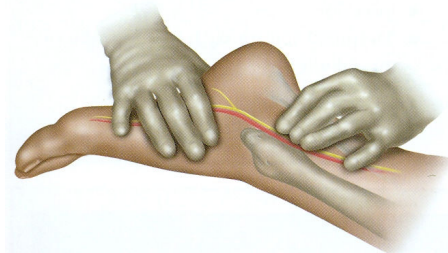
- Sterile prep solution
 - Sterile gloves and towels
 - 5-ml syringe
 - 25- or 27- gauge needle
-
- 1% or 2% Lidocaine solution

Posterior Tibial Nerve Block:

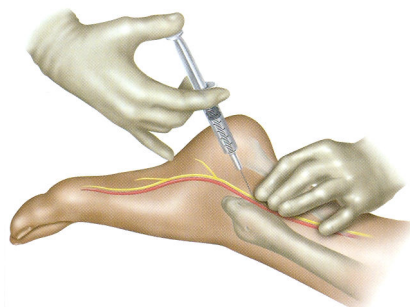
1. Position the patient prone with the foot held in slight dorsiflexion.



2. Palpate the posterior tibial artery just posterior to the medial malleolus.

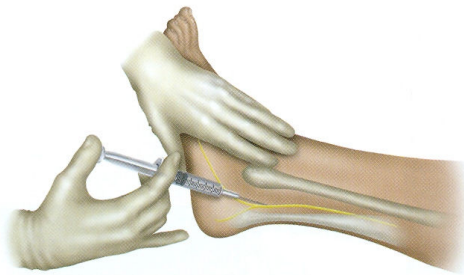


3. Insert the needle just posterior to the artery at the level of the top of the medial malleolus. Aspirate and then inject 3-5cc of anesthetic.



Sural Nerve Block:

- Position the patient supine with the foot held in slight dorsiflexion. Insert the needle lateral to the Achilles tendon and 1 cm superior to the lateral malleolus. Inject a subcutaneous band form just posterior to the lateral malleolus to the Achilles tendon.



Peroneal Nerve Block:

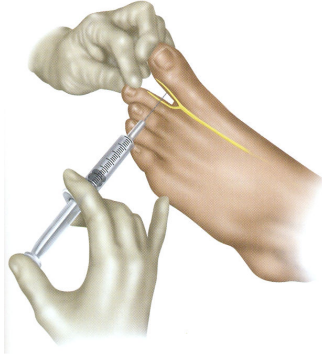
- Place the patient supine. Identify the extensor hallucis longus (EHL) tendon by dorsiflexing the great toe. Insert the needle and direct it beneath the EHL tendon at 30 degrees. Inject 3-5 cc of anesthetic. Block the superficial peroneal nerve with a wheal extending anteriorly across the ankle.



Digital Nerve Block of the Toe:

Lateral Approach

- Insert the needle at a 90-degree angle to the skin of the toes laterally at the level of the proximal phalanx. Aspirate and then inject 3-5cc of anesthetic. Repeat on the opposite side of the toe.



Web Space Approach

- Insert the needle into the web space between the toes. Aspirate and then inject 3-5cc of Lidocaine. Repeat on the opposite side of the toe.



Checklist for Local Field Block

1. Mentions handwashing
2. Checks patient's name and hospital number
3. Assembles correct equipments in the tray
4. Greets and introduces oneself to the patient
5. Explains procedure and gets verbal consent
6. Wears gown and gloves
7. Withdraws anesthesia from a vial and asks assistant to help (to prevent unsterility) <ul style="list-style-type: none">• Prepares the vial by cleaning rubber top with Betadine wipe• Fills the syringe with amount of air equal to amount of solution to be withdrawn (Less than toxic limit)• Injects air into vial, and removes medication• Expels excess air bubbles by taping side of syringe• Checks amount of anesthesia in syringe, Turns vial upright and removes needle of Anesthesia• If agency policy, removes old needle, and applies new one
8. Preps the site
9. Injects the anesthesia: <ul style="list-style-type: none">• Stretchs skin• Orients needle longitudinally along axis of wound and injects slowly• Infiltrates local anesthetic through wound edge and inside it (beneath skin)
10. Irrigates wound thoroughly
11. Gives adequate time to work anesthesia
12. Checks for initial signs and symptoms of toxicity
13. Checks for numbness
14. Drapes the wound
15. Ensures that the patient is relatively comfortable and maintains a dialogue throughout the procedure

Checklist for Nerve Block

1. Mentions hand washing
2. Gathers equipment
3. Identifies the patient
4. Greets and introduces oneself to the patient
5. Explains procedure to the patient
6. Places patient in comfortable position
7. Corrects position of the area
8. Identifies land mark and ascertain the point of needle entry
9. Wears gloves
10. Prepares the field
11. Inserts needle in correct site
12. Injects appropriate amount of Lidocaine
12. Thanks and listens to the patient questions
13. Records finding on patient's medical record