

Peripheral Nerve Blocks: How to Spot Problems in the PACU



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Objectives



- ❧ To outline some common upper and lower extremity nerve blocks performed perioperatively for anesthesia and/or acute pain management
- ❧ To discuss the risks and benefits of peripheral nerve blocks
- ❧ To highlight potential side effects and complications of peripheral nerve blocks

Outline



- ❧ Case presentations
- ❧ Description of the common nerve blocks, including anatomy, approaches, equipment and drugs
- ❧ Summary of the risks and benefits
- ❧ Potential complications
- ❧ What to screen for in the PACU
- ❧ Patient education and care

Case A



- ❧ 19 year-old female with mild asthma undergoes right elbow debridement with a general anesthetic. An infraclavicular brachial plexus nerve block is done prior to induction for postoperative pain control.
- ❧ In the PACU, the patient has “chest tightness” and appears anxious. Breathing quietly, her oxygen saturation on room air is 90%. The PACU nurse attributes the chest tightness to anxiety. The patient is coached to take larger tidal volumes, at which point her saturation climbs to 92%. The patient has no pain. She is discharged home without further workup.

Case B



- ❧ A 16 year-old girl undergoes a left ACL repair under general anesthetic. A left femoral nerve block is done prior to induction for postoperative pain control.
- ❧ On admission to the PACU, the patient is arousable, but sleeping comfortably. After 45 min, she reports knee pain and foot numbness. The PACU nurse tells the patient that her numb foot is from the nerve block. The patient and her mother are distressed. Why did the anesthetist freeze her foot instead of her knee?

Case C



- ❧ A 45 year-old man with obesity, obstructive sleep apnea and scoliosis is scheduled for a right knee arthroscopy. These procedures are typically done under GA or spinal in this specific centre. PNB are reserved for inpatient procedures. The anesthetist does not feel that this patient is an appropriate candidate for either GA or spinal and suggests to the surgeon that the knee arthroscopy be done with a femoral nerve block and local infiltration
- ❧ The procedure goes well. The patient is discharged from the PACU to SDS without complication. The SDS nurses are told that the patient has had a nerve block. No other education/information is provided to the nurses or patient.

Nerve Blocks



Superficial cervical plexus

Brachial plexus

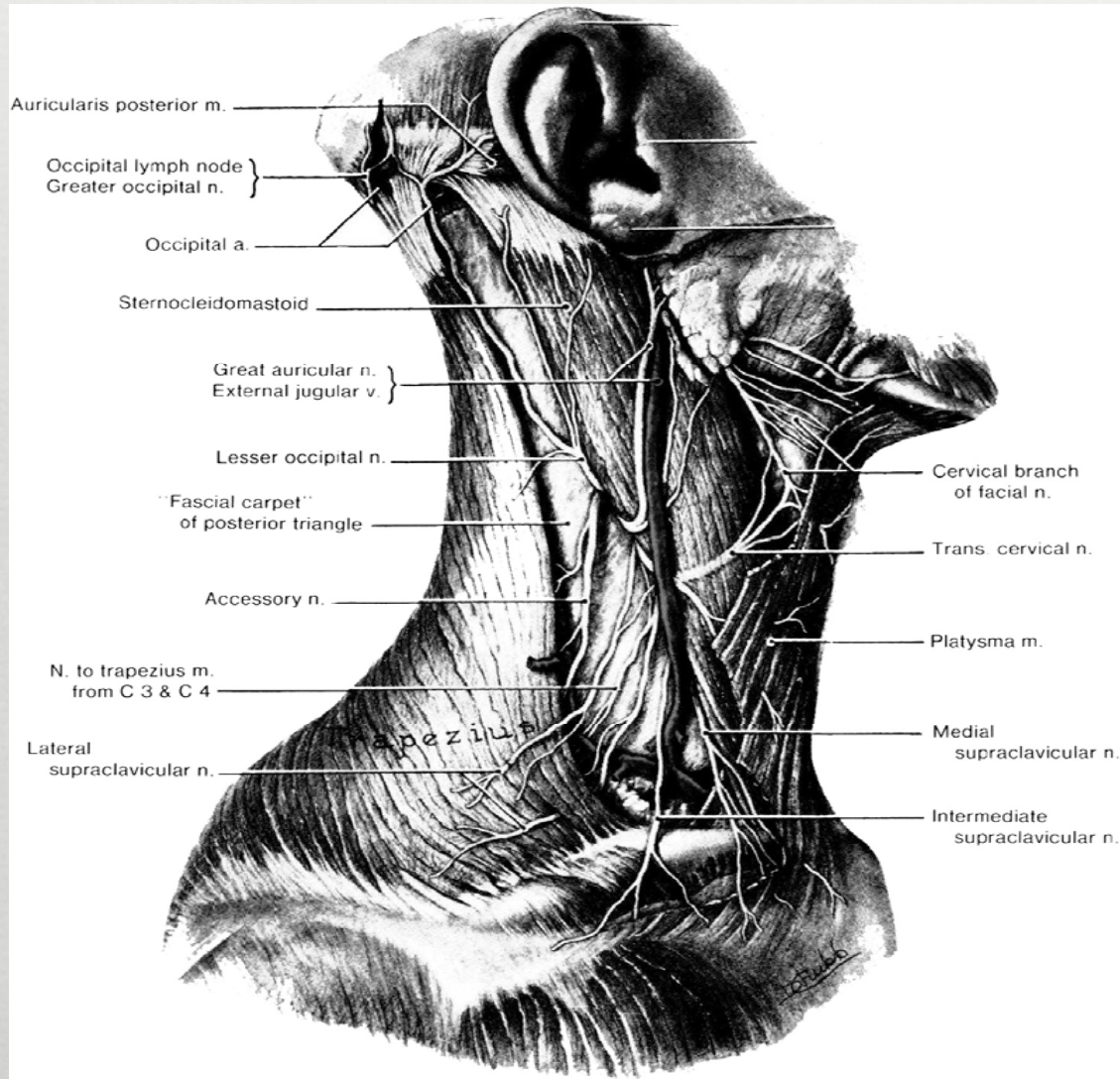
- ❧ Interscalene
- ❧ Supraclavicular
- ❧ Infraclavicular
- ❧ Axillary/Mid-humeral

Femoral/Saphenous

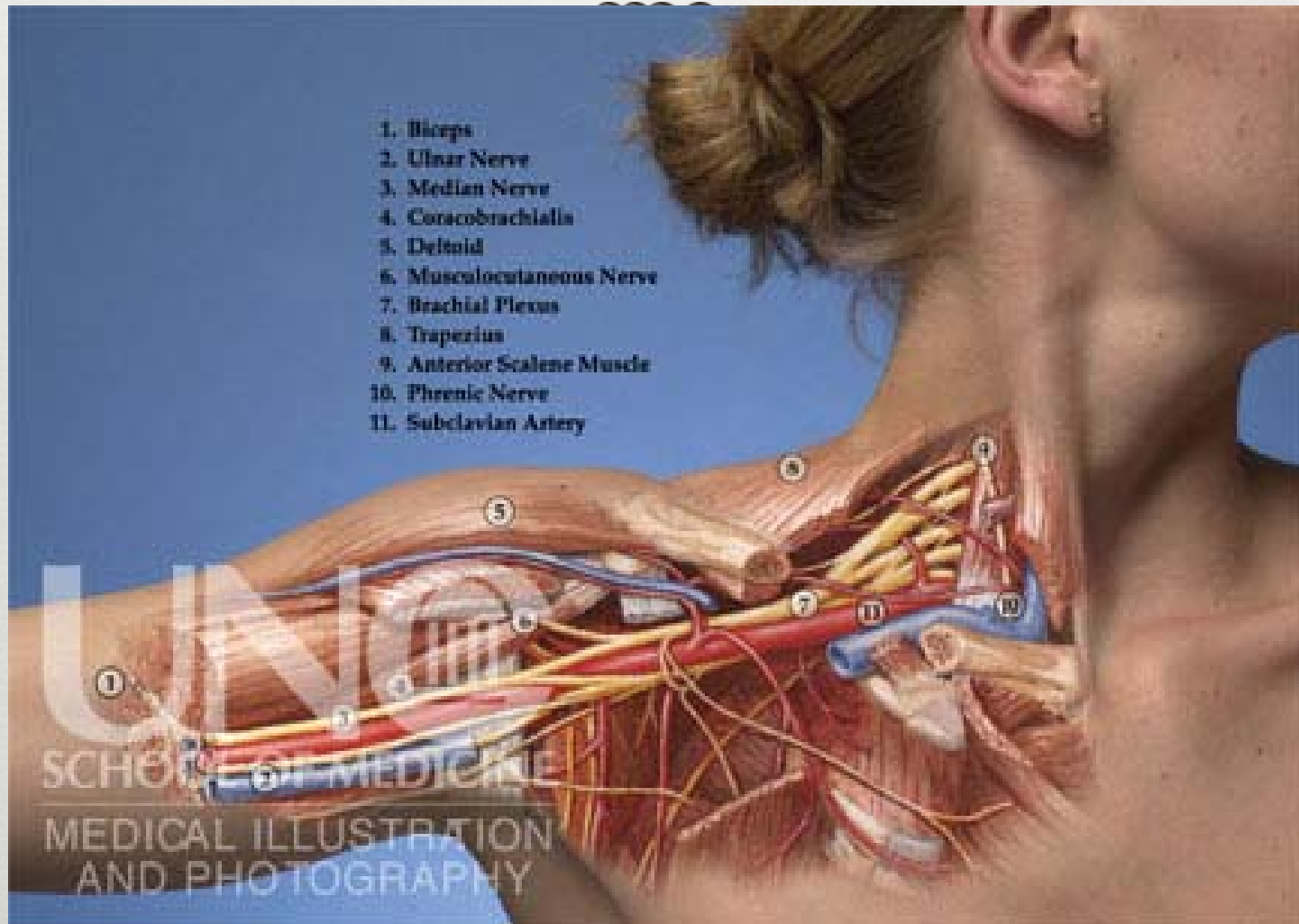
Sciatic/Popliteal

Ankle

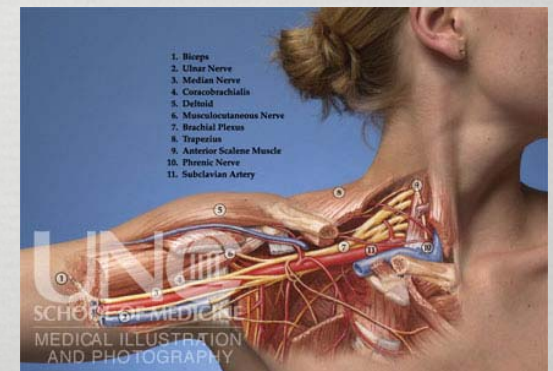
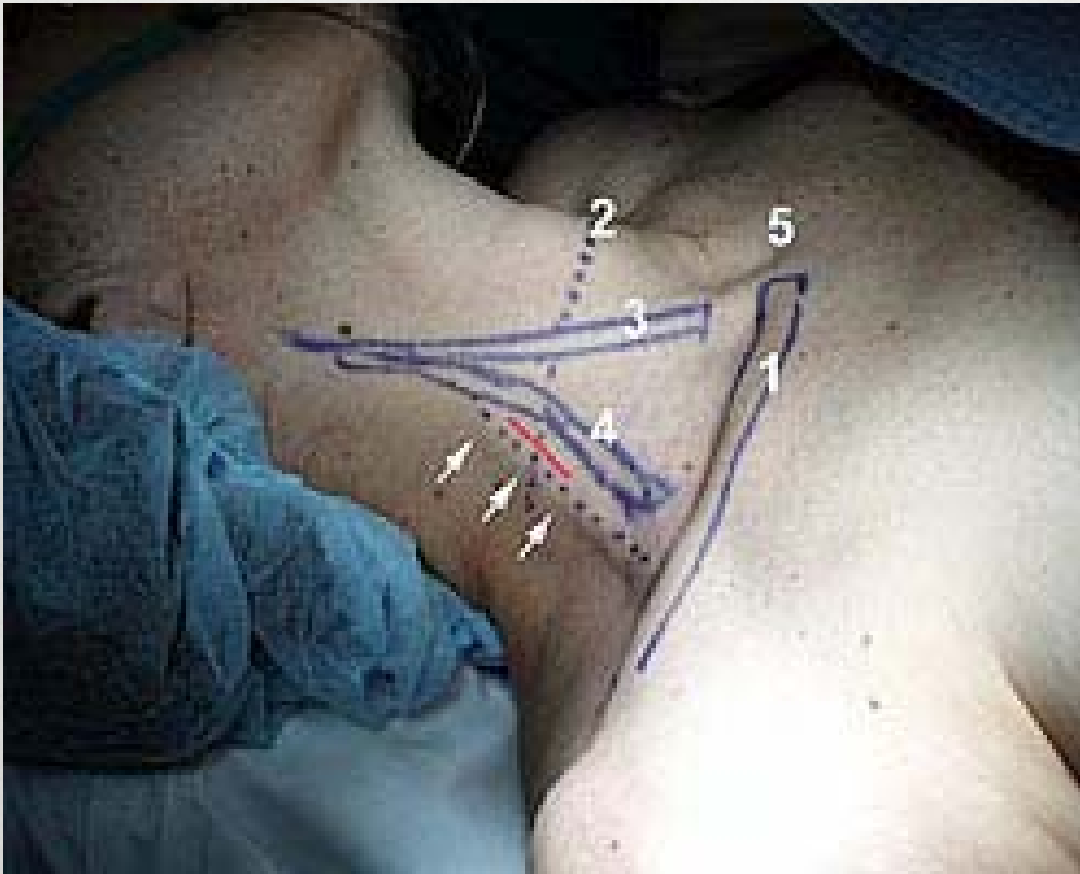
Superficial Cervical Plexus



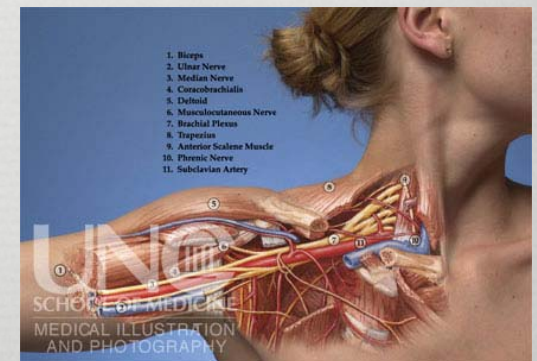
Brachial Plexus



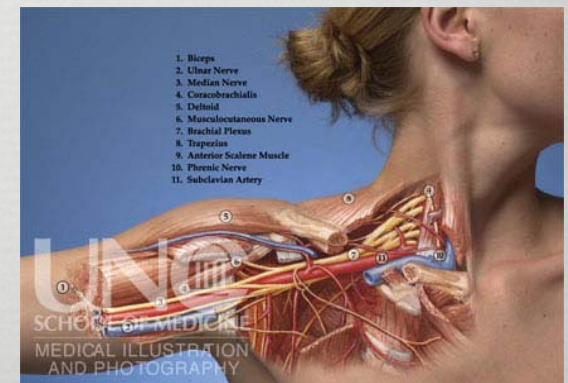
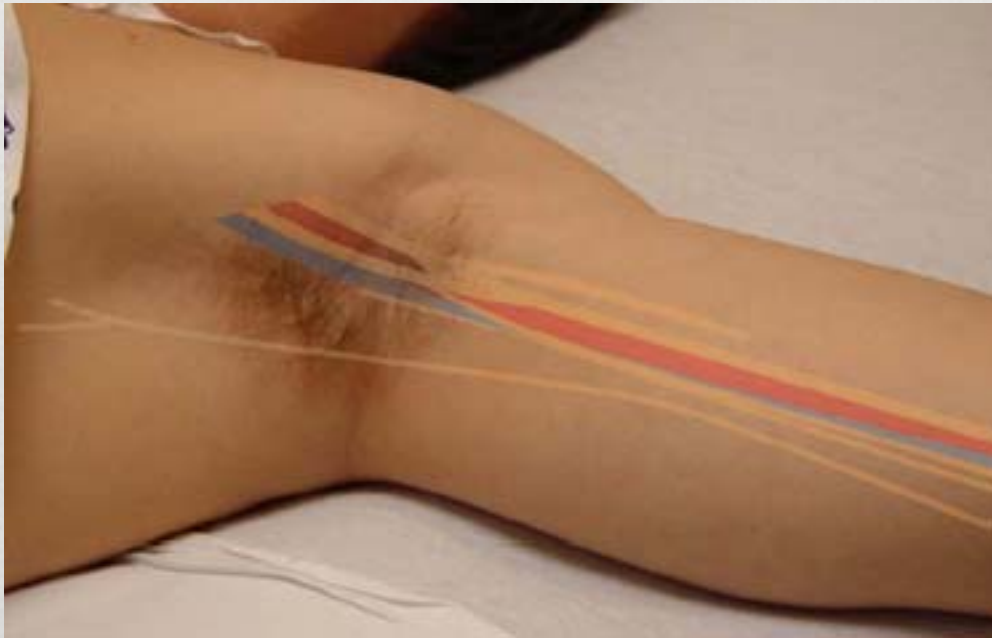
Interscalene Block



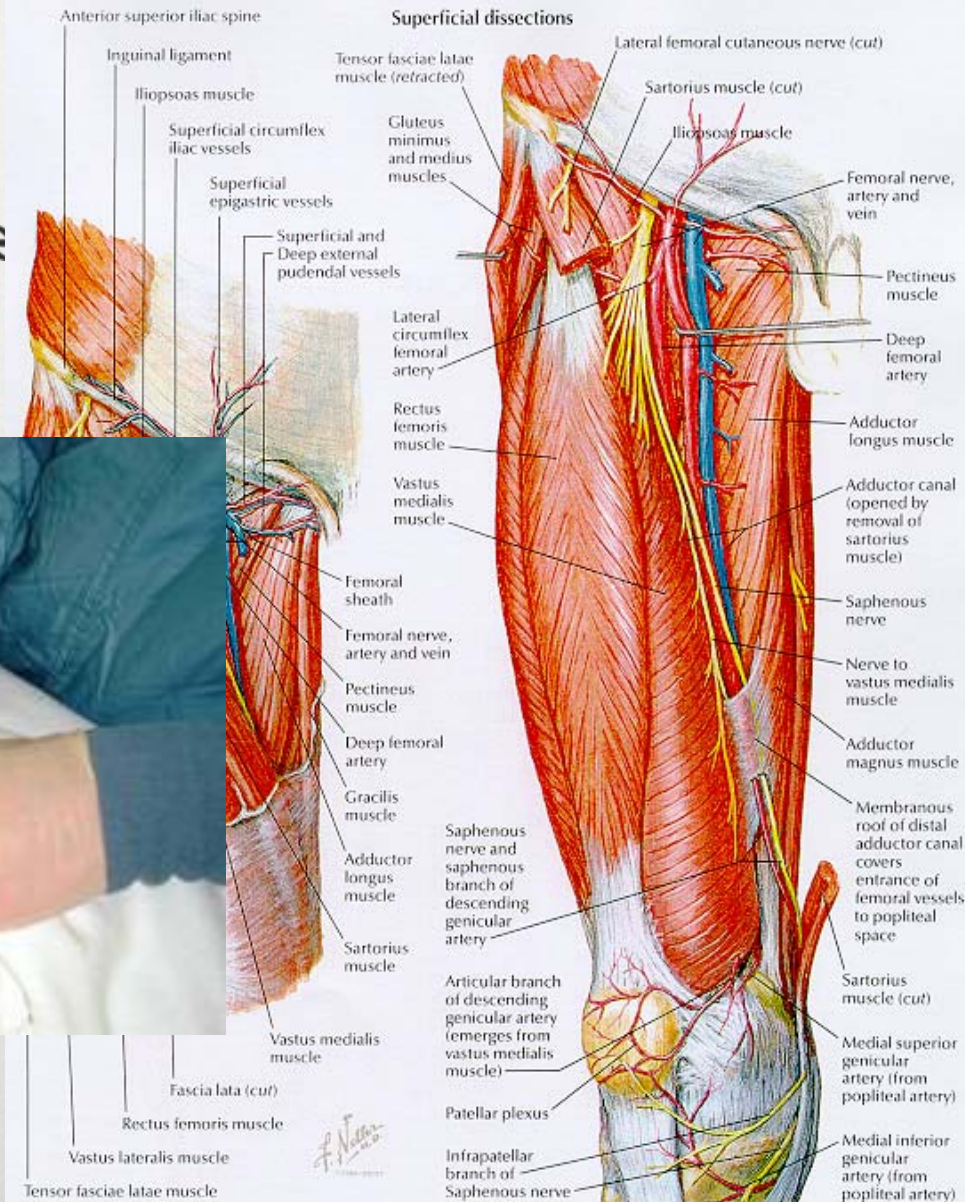
Infraclavicular Block



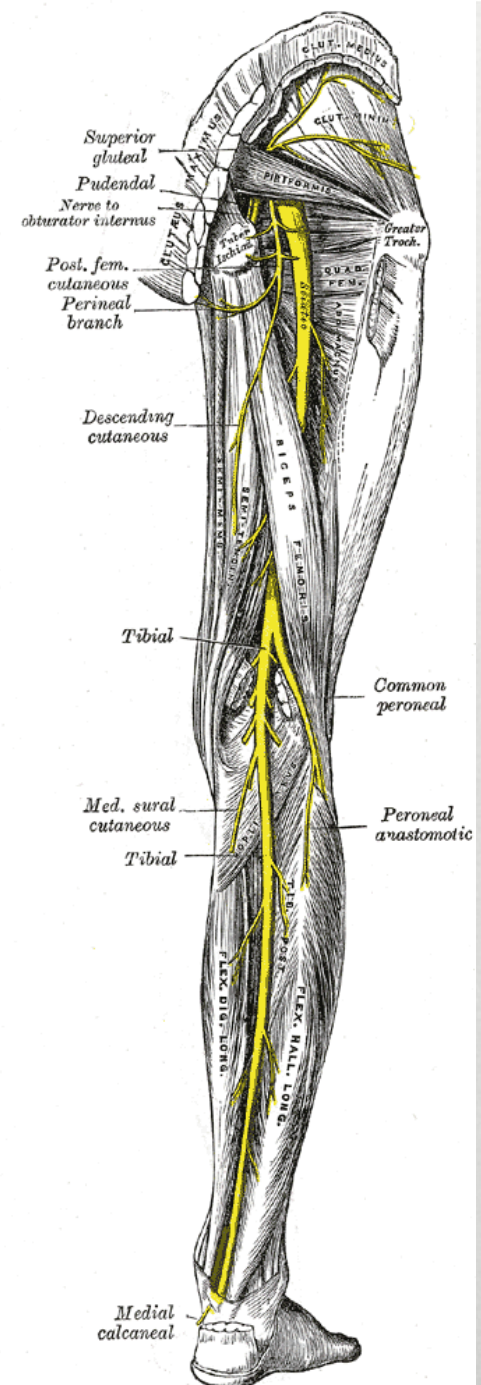
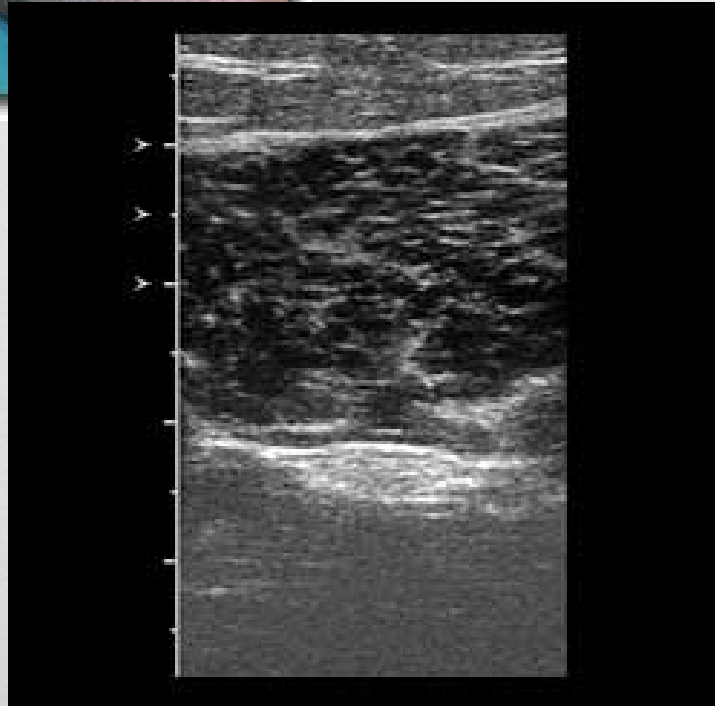
Axillary and Mid-Humeral



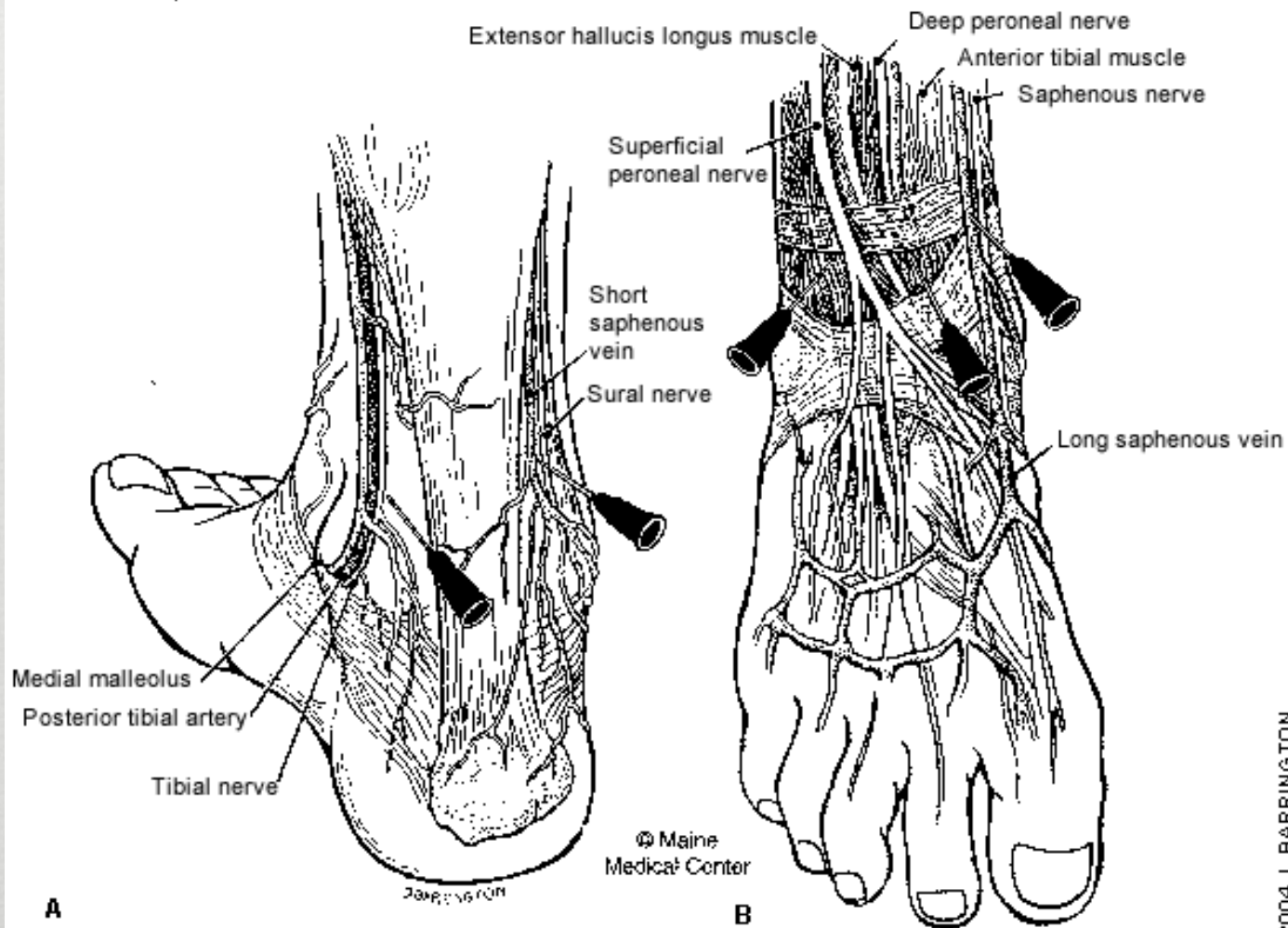
Femoral



Sciatic



Ankle



Ways to Find the Nerves



- ❧ Anatomical landmarks
- ❧ Paresthesias - transient nerve irritation (sensory fibers)
- ❧ Nerve stimulator - motor fibers identified
- ❧ Ultrasound guidance - sensory and motor nerves visualized

Drugs



- ❧ Bupivacaine (2.5-3 mg/kg)
- ❧ Lidocaine (3-7 mg/kg)
- ❧ Epinephrine
- ❧ Toxicity risk depends on total dose, vascularity of area injected, use of epinephrine, and patient factors (e.g. age, pregnancy and preop cardiac medications)

APPROXIMATE DURATION OF LOCAL ANESTHETICS WITH EPINEPHRINE 1:200,000'

Local anesthetic medication (concentration)	Length of surgical anesthesia	Length of pain relief	Maximum therapeutic dose limits
Lidocaine (1.5%)	1.5 to 2 hrs	3 to 5 hrs	5 to 7 mg/kg
Mepivacaine (1.5%)	2 to 2.5 hrs	5 to 6 hrs	5 to 7 mg/kg
Tetracaine (0.2%)	4 to 5 hrs	10 to 12 hrs	1.5 mg/kg
Bupivacaine (0.5%)	5 to 6 hrs	12 to 18 hrs	3.0 mg/kg

NOTE

1. R Sukhani, personal communication with the author, Chicago, 22 June 2001.

AORN JOURNAL

JANUARY 2002, VOL 75, NO 1

Table 1. Possible Contraindications for Peripheral Nerve Blocks

- Pre-existing coagulopathies, either endogenous (eg, thrombocytopenia) or iatrogenic (eg, warfarin therapy) due to increased risk of hematoma¹
 - Anatomic anomalies that make identification of physical landmarks difficult (eg, previous clavicular fracture)¹
 - Pre-existing neuropathies, which might cause the block to behave unpredictably¹
 - Hepatic disease that may interfere with clearance³
 - Excessive preoperative anxiety (not responsive to interventions)
 - Inability to tolerate positioning
 - Known allergies to local anesthetic agents^{3,5}
-

Benefits



- ❧ Single shot blocks can provide pain relief for 12 to 24 hours
- ❧ Fewer opioid-related side effects
- ❧ Earlier ambulation and discharge from PACU
- ❧ Cost effective

Risks



- ❧ Nerve injury
- ❧ Bleeding or hematoma formation
- ❧ Infection
- ❧ Block failure

Other Complications



- ❧ Local anesthetic toxicity: direct injection or gradual absorption
- ❧ Total spinal anesthesia
- ❧ Phrenic nerve block (C3, C4 and C5)
- ❧ Pneumothorax
- ❧ Horner's syndrome (SNS palsy)

Problems in the PACU



1. Local Anesthetic Toxicity

- ∞ CNS: lightheadedness or dizziness
drowsiness, disorientation
tongue heaviness, perioral numbness
metallic taste
tinnitus or visual disturbances
acute anxiety, tremors, twitching
apneas, LOC
seizures

Problems in the PACU



1. Local Anesthetic Toxicity continued...

- ∞ CVS: prolonged PR intervals
 - bundle branch blocks
 - ectopic beats
 - AV blocks
 - arrhythmias
 - low blood pressure
 - cardiac collapse
 - death

Table 3. Possible Adverse Reactions Associated With Regional Anesthetic Agents

Toxicities ^{1,3,6}	Allergic Reactions ³⁻⁵
<ul style="list-style-type: none">● Dysrhythmias, including cardiac arrest● Confusion progressing rapidly to seizures● Nausea, vomiting, diarrhea● Sensory disturbances<ul style="list-style-type: none">○ Blurred vision○ Tinnitus○ Metallic taste● Permanent neurologic injury	<ul style="list-style-type: none">● Urticaria● Gastrointestinal upset● Conjunctivitis● Laryngeal edema● Angioedema● Respiratory distress/arrest● Precipitous hypotension● Anaphylaxis

Problems in the PACU



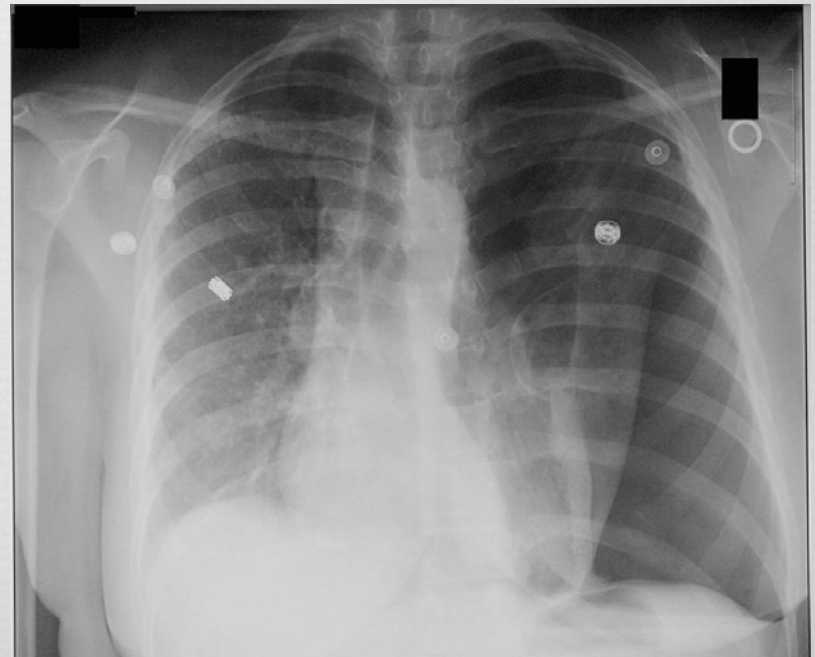
2. Respiratory symptoms

- ∞ Diaphragm paralysis from phrenic nerve block
- ∞ Pneumothorax

3. Hematoma formation

4. Swelling

- ∞ Elevation
- ∞ Ice



Problems in the PACU



5. Horner's syndrome:

- ❧ Ipsilateral ptosis (drooping eyelid)
- ❧ Enophthalmos (sunken eye)
- ❧ Hyperemia of the conjunctiva (bloodshot)
- ❧ Nasal congestion
- ❧ Hoarseness
- ❧ Miosis
- ❧ Anhidrosis



Other Considerations

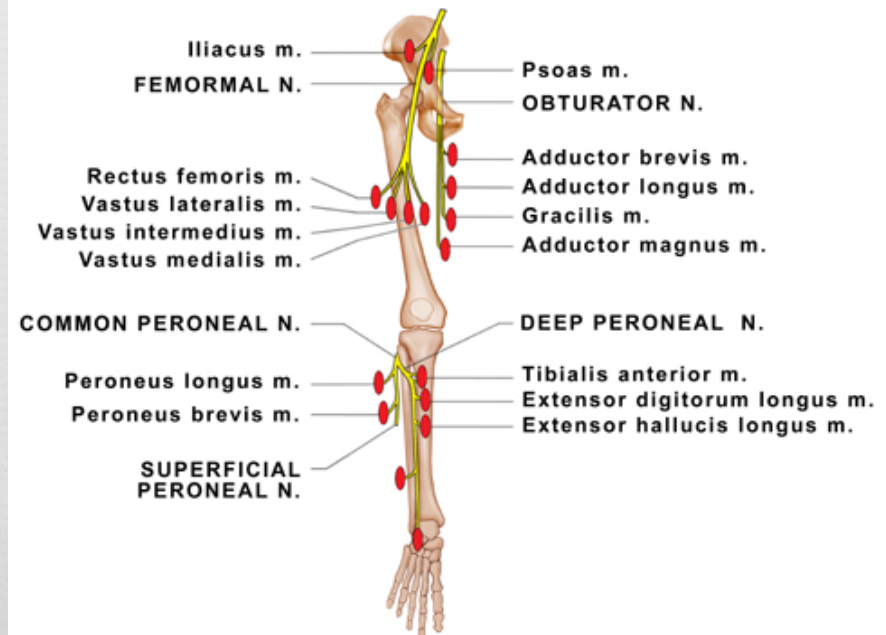
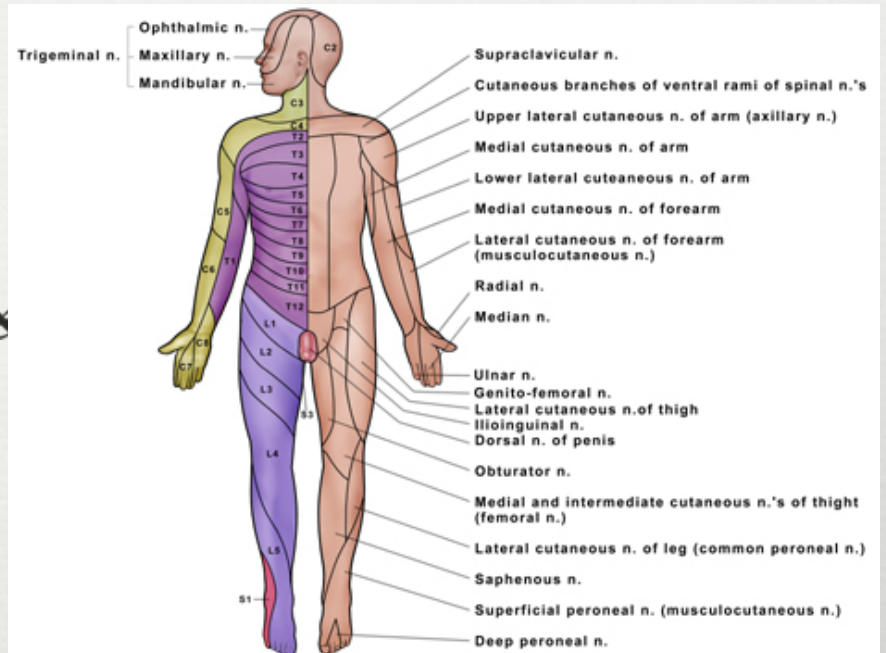
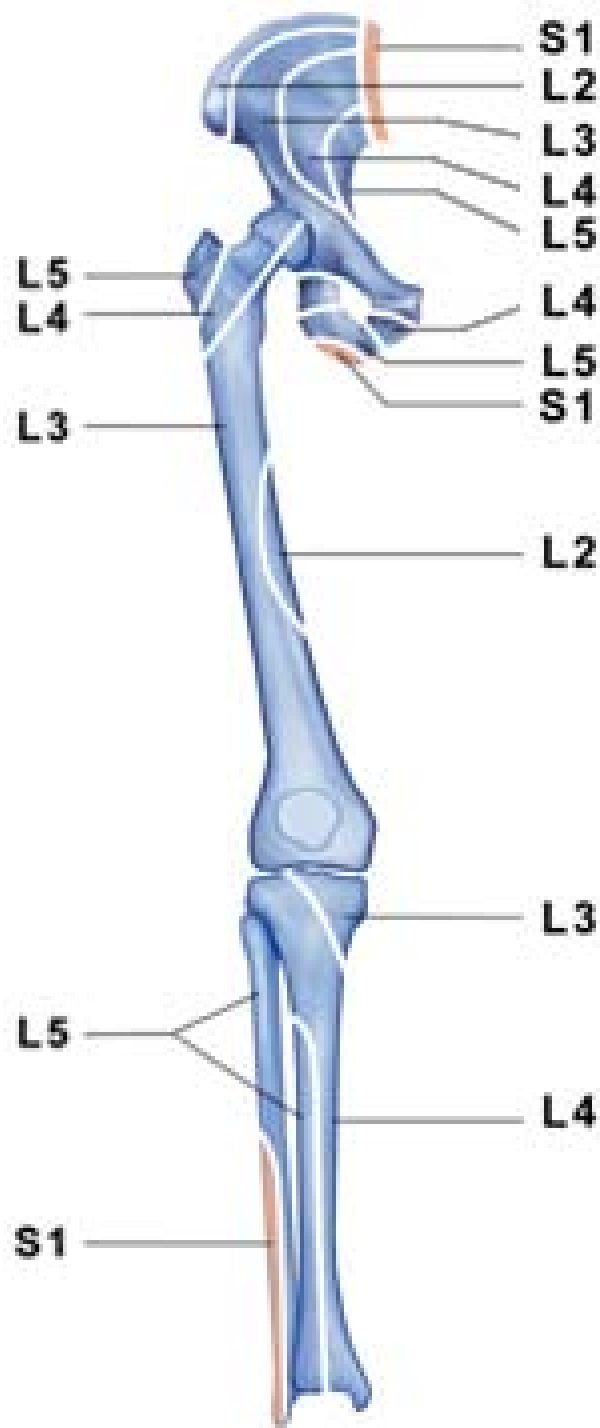


- ❧ Insensate extremities can be at risk of inadvertent injury, as motor function returns before sensation/proprioception after a PNB
- ❧ Insensate nerves can be at risk of ischemic or stretch injuries from prolonged immobility or non-neutral positioning
- ❧ Autonomic nerve blockade (last to recover) may contribute to swelling in the limb

How to Assess a PNB



- ❧ Unlike epidural and spinal blocks, peripheral nerve blocks are not generally chosen based on dermatomes, but osteotomes (or myotomes)
- ❧ The distribution and depth of the block depends on which nerves are being targeted and how much LA is used
- ❧ If pain is occurring, consider a “patchy” or failed block -- the patchy block can sometimes be saved with a field block of the nerve that was missed





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Patient Education



- ❧ The PNB will generally last 12-18 hours, wearing off gradually
- ❧ Change the limb position periodically and keep the limb neutral to avoid pressure sores and inadvertent nerve stretching
- ❧ Protect the limb from trauma or thermal injury
- ❧ Start taking oral pain meds as soon as the block begins to wear off (before pain occurs)
- ❧ If the block lasts longer than 36 hours, contact the surgeon or anesthesiologist on-call

Patient Education



- ❧ Nerve injury may result from the PNB or the surgery; in most cases of nerve injury, the nerve will recover (can take up to 6 months). Patient risk factors include pre-existing neuropathies.
- ❧ PNB: needle trauma or intraneural LA injection
- ❧ Surgery: nerve stretching or pressure from positioning or body habitus, tourniquet use, direct surgical manipulation or trauma

Table 5. Discharge Instructions for Patients Receiving Peripheral Nerve Blocks

Written and verbal discharge instructions should include:

- Strategies for avoiding injury to the affected limb
 - Use of sling until sensory and motor function return
 - Increased vigilance during movement
 - Cautionary information for smokers about cigarette safety
 - Duration of the anesthetic effect
 - Highly variable depending on the agents and type of block administered
 - Expected sensations that accompany recovery
 - Tingling, burning, paresthesia
 - Disruption in proprioception
 - Return of postsurgical pain
 - Pain management once home
 - When to take pain medications
 - Dosing pain medications: around the clock scheduled dosing is recommended,¹¹ but PRN may be ordered at the discretion of the surgeon
 - When to call center or physician
 - Hematoma formation at injection sites
 - Block does not resolve in 36 hours
-

Arm—activity

- Your surgical shoulder, arm, and hand will be numb and weak after surgery.
- You will not be able to move your arm until the medicine wears off.
- Protect the position of your arm, especially the elbow. Keep your arm in the sling resting on two pillows while you are awake or sleeping.
- Avoid putting your arm near or on objects that may be very hot or cold. Your ability to feel hot and cold will be decreased until the numbing medicine wears off.

Arm—pain medicine

- The numbing effect of the nerve block can last from 10 to 24 hrs. Start taking your pain medicine the night of surgery before going to sleep or before you feel the numbing medicine begin to wear off.
- Take your pain medicine at specific times throughout the day and night even if you do not feel pain.

Arm—additional instructions

- Have a responsible adult remain with you to assist you at home after surgery. Remember that you will not be able to use your surgical arm to perform activities, such as dressing, washing, and eating.
- You may experience numbness on the side of your face, hoarseness or congestion or have a red eye and droopy eyelid on the side of surgery. These side effects will decrease as the anesthesia in the shoulder wears off.
- You may feel mild discomfort when breathing after surgery and during recovery. This is caused by numbness of the nerve that supplies the diaphragm (ie, breathing muscle) on the side of surgery. You will feel better if you rest and sleep with your head and upper body at a 45-degree angle by using two to three pillows or by sitting in a recliner chair. This discomfort decreases as the anesthesia in the shoulder wears off.

Call information

- Call your physician at (telephone number) if you have any questions or problems.
- Go to the nearest emergency room or call 911 if you have coughing, chest pain, and/or shortness of breath unrelieved by sitting up. This may be a serious emergency.

Leg—activity

- Your surgical leg and foot will be numb and weak after surgery.
- You will need to use crutches when you walk because your leg may "give out."
- Do not put weight on your surgical leg for 24 hrs. After 24 hrs, follow the instructions given to you by your surgeon.
- Avoid putting your leg near or on objects that may be very hot or cold. Your ability to feel hot and cold will be decreased until the numbing medicine wears off.

Leg—pain medicine

- The numbing effect of the nerve block can last from 10 to 24 hrs. Start taking your pain medicine the night of surgery before going to sleep or before you feel the numbing medicine begin to wear off.
- Take your pain medicine at specific times throughout the day and night even if you do not feel pain.

Leg—additional instructions

- Have a responsible adult remain with you to assist you at home after surgery. Remember that you will not be able to walk without crutches or support. Work with your caregiver to learn correct transfer techniques.
- Rest with your leg elevated on pillows when possible.
- Use ice to lessen pain and swelling. Put crushed ice in a plastic bag and wrap the bag with a towel. Place this on your incision for 15 to 20 minutes out of each hour. Do not sleep on the ice bag because this could cause frostbite.
- Use caution when going up or down stairs; if you have stairs, talk with the nurse for support.
- Do not drive until you check with your surgeon.

Call information

- Call your physician at (telephone number) if you get a headache while sitting or standing. This may be a rare side effect of spinal or epidural anesthesia.
- Call your physician at (telephone number) if you have any questions or problems.
- Go to the nearest emergency room or call 911 if you experience coughing, chest pain, and/or shortness of breath that is unrelieved by sitting up. This may be a serious emergency.

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Case A



- ❧ 19 F with mild asthma admitted to PACU after elbow debridement under infraclavicular nerve block and GA
- ❧ Patient reports anxiety and chest discomfort. The O2 saturation is >92% with deep breathing, but falls to 90% while she is breathing quietly
- ❧ The patient returns to hospital 2 days later with increasing shortness of breath. CXR shows a large pneumothorax. A chest tube is placed and the patient is admitted to hospital for monitoring.

Case B



- ❧ 16 F post-ACL repair with pain in her knee and foot numbness after a femoral nerve block
- ❧ She is discharged home and without further workup or explanation for her symptoms
- ❧ The knee pain likely related to sciatic nerve distribution (posterior knee)
- ❧ The foot numbness was likely secondary to sciatic nerve stretching and tourniquet use during the case

Case C



- ❧ 45 M with obesity, OSA and scoliosis. Discharged to SDS with a femoral nerve block.
- ❧ The nurses in SDS were aware that the patient had a block, but had never been educated about PNB precautions. The surgeon and anesthesiologist had not arranged for crutches or alternative walking aid.
- ❧ The patient was encouraged to mobilize without support in SDS, as part of routine care. He fell, injuring his opposite knee

Take Home Points



- ❧ Peripheral nerve blocks offer patients effective postoperative pain control options
- ❧ Potential complications are rare, but important to understand
- ❧ Nurses play a key role in perioperative monitoring for adverse side effect and complications
- ❧ Patient education from both medical and nursing staff is paramount to a successful and safe PNB programme

Resources



- ❧ <http://www.nysora.com>
- ❧ <http://www.google.ca> for images
- ❧ Barnes S, Russell S. *Interscalene Blocks: Care in the Ambulatory Setting*. J PeriAnesth Nurs 2004; 19(5): 352-354
- ❧ McCamant KL. *Peripheral Nerve Blocks: Understanding the Nurse's Role*. J PeriAnesth Nurs 2006; 21 (1): 16-26
- ❧ Murauski JD, Gonzalez KR. *Peripheral Nerve Blocks for Postoperative Analgesia*. AORN J 2002; 75 (Jan): 136-47

Thank You



Questions and Comments