Nursing Management of Patients Receiving Regional Nerve Blocks

Self-Directed Learning Package

(March, 2021)
Objectives

By completing this self-directed learning package, learners will be able to:

- Explain what a regional nerve block is
- State common upper and lower regional nerve blocks
- Recall local anesthetics used for regional nerve blocks
- Explain the risks and benefits of regional nerve blocks
- Identify potential side effects and complications of peripheral nerve blocks
- Describe how to assess a patient with a regional nerve block

What is a Regional Nerve Block?

- Regional Nerve Block Analgesia is a technique of injecting a local anesthetic solution around a nerve or nerve plexus thus preventing sensory nerve impulses from reaching the Central Nervous System (CNS).
- Intra-operatively, it is used for surgeries involving joints, muscles, and nerves. Continuous upper and/or lower extremity anesthesia can be continued into the post-operative period for approximately 48 – 72 hours, combined with nonsteroidal anti-inflammatory (NSAIDS) and/or opioids to provide effective and safe analgesia. Blocks can be either single injection or continuous infusion.
- Single Shot Regional Nerve Block:
  - The local anesthetic (either long or short acting) is injected near the area of the plexus or nerve one time only. This injection may be administered using a needle or via a catheter and is given by anesthesia staff.
- Continuous Regional Nerve Block Infusion:
  - The local anesthetic (sometimes mixed with a narcotic) is continuously infused via a catheter in the proximity of the nerve or plexus. The patient may have a continuous background rate with or without the option of patient controlled regional nerve block (not currently offered at the BCHS).
Common Nerve Blocks

Front

- Intercrural
- Infrascapular
- Suprascapular
- Axillary
- TAP
- Femoral nerve
- Adductor Canal
- Saphenous
- Ankle block

Back

- Thoracic paravertebral or Erector spinae plane
- Celiac plexus
- Lumbar plexus
- Sciatic nerve
- Popliteal
Myotomes and Osteotomes

Unlike epidural and spinal blocks, peripheral nerve blocks are not generally chosen based on dermatomes, but osteotomes/myotomes (bone/muscle supplied by a particular nerve root).

**Myotomes**

A myotome is the segmental innervation of skeletal muscle by the ventral (motor) root(s) of the spinal nerve(s).

**Osteotomes**

The innervation of the bones and joints (osteotome) often does not follow the same segmental pattern as the innervation of the muscles and other soft tissues.

**Distribution and Depth of the Block**

The distribution and depth of the block depends on which nerves are being targeted and how much local anesthesia is used. Because of this, the patient may be able to feel and move the area that is blocked while they are experiencing pain control. 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.
Medications Used

The mode of action is the same for all commonly used local anesthetics. Local anesthetics reversibly block conduction of neural impulses along nerve fibers by binding to sodium channels in the nerve. When the nerve cannot uptake sodium it cannot transmit an impulse.

<table>
<thead>
<tr>
<th>Anesthetic</th>
<th>Onset (minutes)</th>
<th>Duration of anesthesia* (hours)</th>
<th>Duration of analgesia* (hours)</th>
<th>Maximum dose** (mg/kg) without/with epi</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% lidocaine</td>
<td>10 to 20</td>
<td>2 to 5</td>
<td>3 to 8</td>
<td>4.5/7</td>
</tr>
<tr>
<td>1.5% mepivacaine</td>
<td>10 to 20</td>
<td>2 to 5</td>
<td>3 to 10</td>
<td>5/7</td>
</tr>
<tr>
<td>0.2% ropivacaine</td>
<td>15 to 30</td>
<td>n/a</td>
<td>5 to 16</td>
<td>3/3.5</td>
</tr>
<tr>
<td>0.5% ropivacaine</td>
<td>15 to 30</td>
<td>4 to 12</td>
<td>5 to 24</td>
<td>3/3.5</td>
</tr>
<tr>
<td>0.25% bupivacaine</td>
<td>15 to 30</td>
<td>n/a</td>
<td>5 to 26</td>
<td>2.5/3</td>
</tr>
<tr>
<td>0.5% bupivacaine (+epi)</td>
<td>15 to 30</td>
<td>5 to 15</td>
<td>6 to 30</td>
<td>2.5/3</td>
</tr>
</tbody>
</table>

*Duration varies widely by site of injection. These are generalized ranges of duration.

Benefits, Risks, and Complications

Benefits

- Single shot blocks can provide pain relief for 12-24 hours
- Fewer opioid-related side effects
- Earlier ambulation and discharge

Risks

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

Complications and Side Effects

- Local Anesthesia Systemic Toxicity
- Allergic Reaction
- Respiratory Symptoms
  - Diaphragm paralysis
  - Pneumothorax
- Hematoma Formation
- Horner’s Syndrome
- Other
Complications

Local Anesthetic Toxicity

- Accidental intravascular injection of local anesthetic can occur during performance of the block.
- Relatively uncommon with local anesthetic blocks compared to epidurals because the majority of regional blocks are done near a major thick-walled artery/vein compared to epidurals which are done closer to thin-walled smaller veins. The latter are more easily penetrated, even by the thin catheter.
- Signs and symptoms:

<table>
<thead>
<tr>
<th>System</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Nervous</td>
<td>lightheadedness or dizziness, drowsiness, disorientation, tongue heaviness, perioral numbness metallic taste, tinnitus or visual disturbances (blurred vision)</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>prolonged PR intervals, bundle branch blocks, ectopic beats, AV blocks</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>nausea, vomiting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>acute anxiety, tremors, twitching, apneas, LOC, seizures</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>arrhythmias, low blood pressure, cardiac collapse, death</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>diarrhea</td>
</tr>
</tbody>
</table>

Treatment:
Local Anesthetics

- lightheadedness
- tinnitus
- confusion
- unconsciousness
- seizure
- coma
- peri-oral numbness

Toxicity Factors
1. Agent
2. Dose
3. Administration Rate
4. Injection Site
5. +/- Vasoconstrictor
6. Acidity (pH)

I’m the most toxic!
Only I can save you!

Kross and Bruce.com
Respiratory Symptoms

- **Diaphragm paralysis** from phrenic nerve block (C3, C4, and C5)
  - When the phrenic nerve is paralyzed only on one side (right or left), the patient may have enough diaphragm movement on the other side to breathe adequately.
  - Rarely presents a problem clinically unless the patient has severe pulmonary disease.
  - Decreased breath sounds can be present, and an elevated hemidiaphragm can be noticed on a chest X-ray (stepwards.com).

- **Pneumothorax**
  - Pneumothorax is the most common complication of brachial plexus block especially when supraclavicular approach is used.
  - When the pleura is punctured there is sudden onset of chest pain which may be associated with dyspnoea, cough & rarely hemoptysis.
  - On physical examination, there may be decreased excursion of the affected side, increased resonance on percussion & decreased breath sounds on auscultation.
  - Pneumothorax in the postoperative period needs to be differentiated from bronchospasm, pulmonary edema, pulmonary embolism and pulmonary aspiration.
  - X ray chest in upright position helps in detecting pneumothorax.
**Allergic reaction**

Most adverse reactions to local anesthetics are non-allergic. However, two different types of allergic reactions to local anesthetics have been described:

- Allergic contact dermatitis and delayed swelling at the site of administration:
  - Affected patients develop a localized eczematous and pruritic rash within 72 hours at the site of local anesthetic administration.
- Urticaria and anaphylaxis
  - These types of reactions are rare and the data implicating local anesthetics are limited to case reports.

**Hematoma formation**

- Inadvertent puncture of nearby vascular structures can lead to perineural hematoma.
- It is prudent to avoid performing peripheral nerve blocks (PNBs) in patients with an abnormal coagulation status in anatomic locations in which application of pressure to the puncture site is not possible.
- The vast majority of hematomas may be controlled with direct pressure to the needle puncture site; rarely, surgical decompression may be required.

**Horner's Syndrome (SNS palsy)**

- On the same side as the block, caused by diffusion of the local anesthetic on the sympathetic cervical ganglion chain after a brachial plexus block
- Resolves with resolution of the block; patient reassurance is all that is needed for management.

<table>
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<tr>
<td>- Ptosis (drooping eyelid)</td>
</tr>
<tr>
<td>- Enophthalmos (sunken eye)</td>
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<tr>
<td>- Hyperemia of the conjunctiva (bloodshot)</td>
</tr>
<tr>
<td>- Nasal congestion</td>
</tr>
<tr>
<td>- Hoarseness</td>
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<tr>
<td>- Miosis (excessive constriction of the pupil of the eye)</td>
</tr>
<tr>
<td>- Anhidrosis (perspiration is diminished or absent)</td>
</tr>
</tbody>
</table>
Other Considerations

- Extremities can be at risk for inadvertent injury, as motor function returns before sensation/proprioception after a regional nerve block
- Insensate nerves can be at risk for ischemic or stretch injuries from prolonged immobility or non-neutral positioning
- Autonomic nerve blockade (last to recover) may contribute to swelling

How to Assess a Peripheral Nerve Block

The patient should have:
- Reduced pain at the site of the procedure
- Limited motor control of the limb
- Limited sensation to the limb
- Proximal muscle weakness with preservation of distal motor movement, depending on which particular nerves are blocked e.g. upper quadriceps muscles in the thigh are weak but the patient is able to move the ankle and wiggle toes.

Motor strength:
- Have the patient try and move the muscle group affected and chart absent, weak, moderate, or strong.
- For example, for a femoral block the muscle group affected would be the quadriceps and obturator.

Sensory level:
- Use light touch to the affected area and compare with the unaffected side.
- You will be documenting the area of decreased sensation.
- For example with for a femoral block the patient will have decreased sensation to the anterior and lateral thigh.
- If you are finding it difficult to assess, you may use ice as sometimes the patient detects a change in sensation rather than the absence of cold.

Pain:
- Obtain a self-report from the patient.
Test Yourself

1. Highlight the area of the upper extremity that a supraclavicular block covers

2. Highlight the area of the upper extremity that an interscalene block covers

3. Highlight the area of the upper extremity that an axillary block covers
4. Highlight the area of the lower extremity that a adductor canal block covers

5. Highlight the area of the body that a pericapsular nerve group (PENG) block covers
6. A 19 year old female with mild asthma comes to Day Surgery after elbow surgery under supraclavicular nerve block and general anesthesia. She reports anxiety and chest discomfort. Her oxygen saturation is 92% with deep breathing but falls to 90% when she is breathing quietly.
   a. What assessment should be done?
   
   b. What could the problem be?
   
   c. What treatment do you anticipate?

7. A 50 year old male comes to Day Surgery after a right upper extremity surgery under interscalene block and general anesthesia. He reports no discomfort and his vital signs are stable. You notice that his right eyelid is slightly droopy compared to his left.
   a. What assessment should be done?
   
   b. What could the problem be?
   
   c. What treatment do you anticipate?

8. A 75 year old female comes to the PACU after a left hip surgery under PENG block and general anesthesia. Her vital signs are stable and she reports 2/10 pain in her left hip. She asks for some water and when she takes a drink she tells you it tastes like metal.
   a. What assessment should be done?
   
   b. What could the problem be?
   
   c. What treatment do you anticipate?
References


