Taking Care of a Patient with Epidural analgesia; Guidelines and learning module.

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A) MONITORING
- Gold standard is continuous monitoring of SpO₂, Cardiac monitor, and apnea monitor.
- Monitoring requirements may vary from case to case and will be specified by APS.

1) Documentation (on the regional surveillance sheet and patient documentation)

- Record of the catheter site, dressing, skin integrity, signs or symptoms of infection q shift.

1st 12 Hours record and assess:
- Q1H + PRN: SpO₂, HR, RR, BP, pain & sedation scores, motor & sensory block

Thereafter, if patient remains stable:
- Q1H + PRN: SpO₂ and sedation score
- Q4H + PRN: HR, RR, BP, pain & sedation scores, motor & sensory block, urine retention if no foley

Increase in infusion rate, bolus given or status change:
- Q1H x 4 hours: SpO₂, HR, RR, BP, pain & sedation scores, and motor/sensory block

Continue monitoring and documentation after the infusion is stopped:
- up to 2 hours if local anesthetic alone;
- up to 4 hours if fentanyl in the solution;
- up to 6 hours if morphine in the solution

In rare cases, such as in the context of cancer pain and palliative care, patients with an epidural, tunneled epidural or intrathecal catheter may require different monitoring. This would be ordered on a regular prescription sheet.
2) Sensory and motor monitoring

1. **Sensory blockade** is assessed by testing the patient’s response to an alcohol pad, ice or gentle touch; with reference to the dermatomal chart (p. 11). The area covered by the epidural containing local anesthetic will decrease or eliminate sensation to gentle touch or cold.
   - Sensation above nipple line (T4) for a lumbar epidural and at the clavicle (T1) for a thoracic epidural should never be impaired. It is an indication of higher block and can lead to serious complications. Another indication of higher block is numbness, weakness or tingling in the fingers and/or arms. These should be reported immediately to the APS.
   - Areas of decreased sensation require preventive management of pressure sores. Skin integrity of pressure areas must be monitored and documented once a shift.

2. **Motor blockade** is assessed using the Bromage Motor Scale. Lower limb motor deficit is assessed by the patient’s ability to flex their hips, knees and ankles. Weakness of the arms should be reported immediately to the APS.

<table>
<thead>
<tr>
<th>Bromage Motor Scale:</th>
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<tbody>
<tr>
<td>0 = No paralysis (flexes at the hip, knee and ankle)</td>
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<tr>
<td>1 = Flexion of the knee and ankle</td>
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<tr>
<td>2 = Flexion of the ankle only</td>
</tr>
<tr>
<td>3 = Complete paralysis of the legs and foot</td>
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*An increasing motor block should be brought to the attention of the APS immediately by calling 406-2406.

2) **Epidural catheter site evaluation**

- You will assess for skin integrity, dressing integrity and signs of infection.
- There are markings on the epidural catheter, which indicate the depth of insertion/placement. If possible, monitor catheter placement to detect migration or dislodgment of the catheter.
- Leakage at the epidural site is most of the time without consequence and is frequent with small infants. It requires more frequent assessment of dressing and skin integrity. However, accumulation of ooze underneath a dressing should be avoided since this becomes a risk factor for infection. Dressing may be reinforced with an oposite IV 3000. Call APS for inadequate analgesia or complete dressing change.
- The epidural dressing must remain intact. Only the APS team members can carry out dressing change. However, dressing may be reinforced with semi-permeable dressing.
B) MOBILIZATION:
- Sensory block, muscle weakness, and postural hypotension caused by the local anesthetic impair the ability to safely mobilize and create a considerable risk for patient injury. Mobilizing the patient may also increase the risk of catheter dislodgement or migration.
- Patients with a lumbar epidural infusion are not to be mobilized out of bed unless APS/Anesthesia is aware and in agreement.
- Patient with thoracic epidural may be mobilized out of bed always with assistance.
- If any problems are encountered, return the patient to bed immediately and contact the Anesthetist on call.
- Mobilize neonates and young infants carefully out of bed in parent’s arms as catheter can be easily dislodged.

C) ADMINISTRATION OF BOLUS AND PUMP PROGRAMMATION AND EPIDURAL BAG CHANGE
- At this time the APS members are responsible to change epidural infusion rate and to administer bolus via the epidural catheter.
- In rare cases such as in the context of cancer pain and palliative care, patients with an epidural, tunneled epidural or intrathecal catheter; ward nurses may administer bolus and change the rate of administration following appropriate teaching and with the support of the APS/anesthesia team.
- In a future context, considering the recent use of “smart pumps”, nurses taking care of a patient with an epidural catheter may change the epidural rate as per the anesthesiologist prescription. Independent double check is applied with another nurse or APS team member MUST BE PERFORMED from medication preparation to the bedside.
- At the time of revision, epidural solutions are delivered to the operating room for safety issues. In the future, possibility to have the epidural safely delivered to the ward will be discussed. In that eventuality, epidural bags will be changed by the nurse taking care of a patient with an epidural. Independent double check with another nurse or APS team member MUST BE PERFORMED from medication preparation to the bedside.

D) DISCONTINUATION OF THE EPIDURAL:
- Epidural infusion can be stopped from the pump by nursing staff as prescribed by anesthesia (eg; for a stop test or in preparation of epidural catheter discontinuation)
- After stopping an epidural infusion, the catheter can stay in situ for 24 hours.
- Prior to removal of the catheter, check for any anticoagulant medication that may have been given (heparin, enoxaparin, ASA, …) and let the APS member know.
- The epidural catheter is removed by the Anesthesiologists.
anesthesia residents, Acute Pain Service Nurse of nursing staff who received appropriate teaching and guidance.

- If your patient presents a fever or signs of infection at the site of the epidural at the time of removal, the tip of the catheter should be sent to be cultured.
- Removal of epidural catheter is recorded in the patient’s chart.

E) ACCIDENTAL CATHETER DISCONNECTION

- There is insufficient data to evaluate whether removal of an accidentally disconnected catheter is associated with increase frequency of infection.
  - Unwitnessed accidental disconnection; catheter should be removed by APS.
  - Witnessed accidentally disconnected; catheter may be left in place by taking the following precautions: clean the catheter with an alcohol swab let it dry, cut the end of the catheter with sterile scissors, and reconnect. (To be done by APS)
  - Intentional disconnection and reconnection of epidural delivery system should be limited to minimize the risk of infectious complications.

F) NOTIFY APS IF:

- Pain Control is unsatisfactory (pain score greater than 4/10)
- Sedation score greater than 2
- SpO₂ falls below 92% in room air or 95% on O₂ supplement
- Respiratory rate falls below the minimal respiratory rate per minute according to age (refer to the APS/Anesthesia regional order sheet for value).
- Infusion and or catheter problems
- Fall in blood pressure from patient’s baseline (30%)
- Fever (>38.5 °C)
- Complete paralysis of the legs and feet (Bromage Motor Score of 3) or increasing motor block
- Sensory block above nipple line (T4) for lumbar epidural or above the clavicle (T1) for thoracic epidural
- Catheter disconnection
- Suspicion of an epidural hematoma (refer to page 15 for S&S)
- Suspicion of an epidural abscess (refer to page 15 for S&S)

G) CRISIS MANAGEMENT

IN AN EMERGENCY / IF PATIENT DETERIORATES:

If SpO₂ < 92% in RA, respiratory rate falls below normal limit, and sedation score > 2:

a) Stop Epidural infusion
b) Administer 100% O₂ by face mask
c) Stimulate the patient
d) Immediately notify APS-anesthesia / call a code if necessary

*Have Naloxone (Narcan®) ready as ordered on the IV PCA order sheet (0.01 mg/kg)

*Have Intralipid 20% available (stored in the crash cart with the bupivacaine / ropivacaine cardiotoxicity resuscitation protocol)

ALWAYS HAVE RESUSCITATION MASK AND SUCTION AT THE BEDSIDE!!
DO NOT HESITATE TO CALL A CODE
Section 2

Anticoagulants and Antithrombotics

A) ANTICOAGULANTS AND ANTITHROMBOTICS IN PRESENCE OF INDWELLING EPIDURAL CATHETER

Patients receiving anticoagulant or antithrombotic therapy are at risk of bleeding and possibly at risk of developing a compressive hematoma leading to neurological injury during the placement and/or removal of epidural catheter.

It is primordial to consider the risk-benefit ratio of epidural in patients receiving anticoagulant or antithrombotic therapy or with underlying diseases impairing the coagulation profile.

Please refer to the

NSAIDs with the presence of an indwelling epidural catheter:
- There is an increased risk of epidural hematoma; Cox 2 inhibitor (e.g. celecoxib) should be considered.
NSAIDS are NOT to be given to patients with an epidural and receiving low molecular weight heparin.

Refer to the: Epidural Anesthesia and Anticoagulation – Pediatrics procedure on the intranet.
A) DESCRIPTION

Epidural analgesia is a method of providing analgesia by the administration of medication directly (ex. Local anesthetics and/or opioids) into the epidural space. It is an increasingly important therapeutic modality for pain management in neonates, children and adolescents providing continuous analgesia for acute and chronic medical and postoperative surgical pain.

B) SELECTION CRITERIA FOR EPIDURAL THERAPY

1) Indications:

- Postoperative surgical pain;
- Sympathetic blockade requirement (e.g. microvascular surgery in which vasodilatation is required for graft survival);
- Poor response to other more conventional pain modalities (e.g. terminal cancer pain, sickle cell);
- Children with impaired pulmonary function (e.g. cystic fibrosis, flail chest).

2) Contraindications:

- Infection: skin infection, septicemia, bacteremia, meningitis;
- Bleeding diathesis (coagulopathy, thrombocytopenia,...) inherited or acquired;
- Tumor or fibrosis of the epidural space;
- Major malformation of the spine (e.g. Spina bifida);
- Patient, guardian refusal;
- Progressive degenerative disease of the nervous system.

C) BENEFITS OF EPIDURAL

- Unlike systemically administered opioids that modify the perception of nociceptive input and allow patients to better tolerate pain, local anesthetics via epidural can inhibit pain completely (Yaster et al., 1997, p. 113);
- Provide continuous analgesia;
- Low systemic opioid serum level;
- Attenuation of the stress response.
D) **EPIDURAL ANATOMY** (Fig. 1)

As clearly described in Yaster, et al. (1997):

“The epidural space exists as a cylinder, filled with fat, nerves roots, blood vessels (arteries and valveless venous plexus), connective tissue and lymphatics.”

The spinal cord is protected by these structures: a bony vertebral column and 3 connective tissue coverings. These tissue coverings are the meninges: the pia, arachnoid, and dura mater.

The CSF is found between the pia mater and arachnoid mater. This space filled with CSF is called the subarachnoid (or intrathecal) space. The **EPIDURAL SPACE**, filled with fat and blood vessels and between the dura mater and the ligamentum flavum.

The epidural space extends from occiput to sacral canal. The largest capacity of the epidural space is within the caudal canal; the space narrows as it ascends. This structure has clinical implications relevant to the administration of epidural anesthetics. There will be a larger number of segments affected in the cervical and thoracic regions as the capacity of the epidural space is smaller for the same volume of a local anesthetic given (Litwack & Lubenow, 1989, p. 329).

![Diagram of epidural anatomy](image)

**FIG. 1**

E) **EPIDURAL PHYSIOLOGY:**

Opioids (Morphine, Hydromorphone, Fentanyl, Sufentanil) act by diffusing across the dura mater and into the outer surface of the spinal cord, where they bind to opioid receptors.

Local anesthetics (e.g. Bupivacaine) bind to the nerve roots as they exit and enter the spinal cord as well as at the spinal cord.
The site of the needle insertion, catheter tip location, volume & concentration of local anesthetic determines the extent and quality of sympathetic, sensory and motor blockade. The most common epidural placement(s) at MCH are:

- CAUDAL
- LUMBAR
- THORACIC

Placement of an epidural catheter level depends on the desired level of blockade.

(Refer to fig. 2 and 3)
FIG.
Section 4

Equipment and solutions

A) SOLUTIONS:

- Standard solutions used at MCH:
  1. Ropivacaine 0.1% & Fentanyl 2mcg/mL
  2. Ropivacaine 0.05% & Fentanyl 1mcg/mL
  3. Ropivacaine 0.1% & Morphine 10mcg/mL
  4. Ropivacaine 0.05% & Morphine 5mcg/mL
  5. Morphine 10mcg/mL
  6. Ropivacaine plain 0.05%, 0.1%, and 0.2%

1) Local Anesthetics:

- Epidural local anesthetic (ex. Ropivacaine) blocks nerve impulses at the spinal nerve.
- Local anesthetics may cause a sympathetic, sensory, or motor blockade or a combination of these.
- The nature and extent of the blockade is influenced by the volume and concentration of the chosen medication.

2) Epidural Opioids (Neuraxial Opioids):

- Epidural opioids modulate pain at opioid receptor sites of the (Dorsal Horn) substantia gelatinosa.
- Added to the local anesthetic to improve the quality of analgesia.
- Do not cause sympathetic or motor blockade.
- Their actions at other receptors are responsible for the following side effects: pruritus, nausea/vomiting, urinary retention, decreased bowel function, euphoria, and respiratory depression.

B) SET-UP AND EQUIPMENT

**Epidural/regional pump**
- Pediatric yellow faceplate CADD Solis with yellow transparent lockbox

**Epidural Tubing:**
- Color coded in yellow to distinguish epidural lines from IV tubing
- Epidural tubing must never be connected to an IV tubing

**Epidural Catheter(s):**
- The first solid & bold blue line is at 5cm, a double line is at 10cm, and a triple line is at 15cm.
C) RESUSCITATION SUPPLY

- O₂ set-up, ambu-bag, appropriate size resuscitation mask, flowmeter, and suction.
- Resuscitation sheet in chart.
- Crash cart is stocked and in nearby location.
- Naloxone is readily available.
- Intralipid 20% and its protocol are readily available
- If you require other airway/resuscitation supplies, you may contact RT department.

D) THE ORDER SHEET

A specific order sheet was created specifically for regional analgesia. It outlines:

1. Drug (local anesthetic and/or opioid)
2. Concentration of the solution
3. Rate of administration
4. Monitoring and equipment
5. Assessment guidelines
6. Adjuncts
7. O₂ therapy and crisis management

All changes made from primary prescription will be written on the standard physician prescription sheet and will be clearly identified as from APS and/or Anesthesia. A sample of this order sheet can be found in the Appendices at the end of this document.

E) PROGRAMING GUIDELINES

Many factors will influence the rate of the epidural (age, weight of patient, medications used, drug concentration, epidural catheter site, surgical procedure, medical condition of the patient, and drug toxicity considerations). The anesthesiologist will prescribe an epidural infusion rate after consideration of these variables.
A) EPIDURAL HEMATOMA

Epidural hematoma is a rare but extremely serious risk related to epidural therapy. It consists of the accumulation of blood in the epidural space due to the trauma caused by the epidural placement or removal. This pouch of blood may put pressure on the spinal that could lead to nerve damage that can be permanent if not treated immediately.

Signs and symptoms:

- Back pain
- Progressive neurological deficit (sensory abnormalities, motor blockade progression, and decrease anal sphincter tone)

Any patient having epidural therapy must be monitored for signs and symptoms of epidural hematoma:

** Suspected Epidural Hematoma is a Medical Emergency, the APS or anesthesiologist on call must be notified immediately. **

B) EPIDURAL INFECTION

- May be local or systemic in origin:
  - Superficial-deep Infection: cellulitis, epidural abscess
  - Systemic: meningitis, systemic sepsis
- Infection can occur locally as a result of poor aseptic technique or more commonly, because the dressing lifted and was contaminated.

Assessment & Management:

1. Superficial Infection: epidural catheter site would be red, slightly indurated and tender to touch.
   - The APS should be notified immediately
   - The catheter will be removed by an APS member and the tip sent for culture
   - The site should be cleansed bid with Chlorhexidine 1.0%, and covered with an occlusive, pore material until resolved.
2. An infection of the epidural space: is more serious and can result in a neurological
deficit. Although catheter related events are extremely rare, they can occur. The
APS/Anesthesia should be notified immediately. The epidural catheter will be
removed & sent for tip culture. Appropriate antibiotic therapy will be initiated. You should
look out for the following symptoms:
- Fever (> 39°C)
- Local overlying tenderness
- Severe back pain and rigidity
- Progressive neurological deficit
- Leukocytosis

C) LOCAL ANESTHETIC TOXICITY

Toxicity is caused by an overdose, accumulation over time, or inadvertent intravascular
injection of the local anesthetic.

Signs & Symptoms:
- A tingling sensation or numbness around the mouth and lips
- A metallic taste in the mouth
- A feeling of light-headedness
- Visual disturbances
- Muscle twitching
- Confusion/sedation
- Agitation/restlessness
  - May progress to:
    - Seizure(s)
    - Coma
    - Cardiac arrhythmia
    - Cardio respiratory arrest

Management:

IF PATIENT PRESENTS SERIOUS SIGNS AND SYMPTOMS
THAT ARE EVOLVING QUICKLY
*CALL A CODE*

- APS or the anesthesiologist on call should be notified immediately;
- STOP the infusion of local anesthetic;
- Administer 100% oxygen via face mask at 6 Lpm and bag-ventilate if needed to
  maintain a good ventilation;

Physician may consider midazolam to increase the seizure threshold.

IN CASE OF CARDIOTOXICITY:
**CALL A CODE**

- Do as above;

Physician will need to do:
  - Liquid resuscitation because of vasoplegia;
  - **Advance Cardiac Life Support** with some modifications:
    - Favor vasopressine instead of adrenaline (less arrhythmogenic)
    - **AVOID LIDOCAINE!**
    - Amiodarone is the antiarrhythmic of choice
    - Consider milrinone
    - Defibrillation if needed
    - Prolonged resuscitation (>1h)

Consider the use of **Intralipid 20%**: initial bolus of 1.5 mg/kg followed by an infusion of 0.25 mg/kg/min for 30-60 minutes according to anesthesia staff clinical judgment (See Appendix 3: Bupivacaine/Ropivacaine Cardio toxicity Resuscitation Protocol, ref.: [www.lipidrescue.org](http://www.lipidrescue.org)).

**D) HYPOTENSION**

- It is very important to be aware of this complication, especially when moving a patient to a sitting position, walking, etc.
- This effect is mostly seen in older children/adolescents or in patients with hypovolemia.

**Signs & Symptoms:**
- Hypotension is a reduction of the patient's baseline BP by more than 30%
- Patient may show tachycardia or severe bradycardia
- Hypovolemia & dehydration are the most common causes of post-operative hypotension, however the following causes should be considered in a patient with an epidural infusion:
  1. Sympathetic Blockade, especially in older children (>8yrs)
  2. Subarachnoid catheter migration and subarachnoid block

**Assessment & Management:**
- Dehydration status: skin turgor, oral mucous membranes, postural hypotension, renal function (urine output less than 1-2 ml/kg/hr).
- Vital signs, sedation score, temperature, sensory & motor block should be reassessed. Epidural infusion rate may need to be lowered.
- Patient should be supine with a patent intravenous catheter; elevate legs if needed. An IV fluid bolus may be started (10 ml/kg of RL or NS over 15 min.)
- Notify APS or the anesthesiologist on call immediately
E) SENSORY AND/OR MOTOR BLOCKADE

- This is a neurological effect caused by the local anesthetic producing a temporary blockade of motor and sensory fibers.
- **Sensory Blockade:** May produce a loss of sensation, numbness, usually in the segmental distribution of the block. Loss of proprioception creates a considerable risk for patient injury since he does not know the exact joint/foot position in the space or floor.
- **Motor Blockade (partial or complete):** Will result in leg weakness or loss of motor function to the lower limbs preventing early ambulation of the patient.

**Assessment & Management:**

*Sensory Blockade:*
- Assess the level of sensory blockade bilaterally and document findings
- **Sensory blockade** is assessed by testing the patient's response to an alcohol pad or ice with reference to the dermatome chart (p.6, figure 2).
- Usually, the sensory blockade must not be present above the nipple line (T4) for a lumbar catheter and above the clavicle (T1) for a thoracic catheter.

*Motor Blockade:*
- Lower limb motor deficit is assessed by the patient's ability to flex their hips, knees and ankles (Bromage Scale). Assess motor block using the Bromage Scale and notify APS if progression of motor block occurs.
- If a significant motor blockade is present, the following should be considered:
  1. Correct epidural placement but inappropriate concentration/rate of infusion
  2. Sub-optimal placement of the catheter (e.g. a lumbar catheter for an upper abdominal/thoracic surgery)
- Arm weakness is a medical emergency

F) CATHETER DISPLACEMENT

- Most Commonly: accidental displacement out of the epidural space results in inadequate analgesia
- Rarely: displacement may occur into the subarachnoid space or vascular system with serious consequences

**Signs & Symptoms:**
- A Spinal headache occurs when the dura mater is torn and the CSF leaks from the
intrathecal space. The tear may occur at the time of insertion of the epidural catheter or by the catheter migrating through the dura mater into the intrathecal space.

- **Into the Subarachnoid Space:** a rapidly changing sensory (total numbness) & motor block (deep/intense motor blockade), with eventual total paralysis if untreated which leads to respiratory distress and cardiac arrest. **CALL A CODE**

- **Into the Intravascular System:** Signs & symptoms of systemic toxicity will develop: drowsiness, tinnitus, visual changes, seizures and cardiac arrhythmia. **CALL A CODE**

**Assessment & Management:**

- If a patient presents with signs/symptoms of a spinal headache, bed rest is compulsory alongside maintaining hydration and providing simple analgesia.
- APS or the anesthesiologist on call should be notified immediately in order to evaluate treatment options.

**G) Postdural Puncture Headache**

Postdural puncture headache occurs when cerebro-spinal fluid is leaking out of the subarachnoid space vie a little hole in the dura mater. The dura is punctured when intrathecal or spinal analgesia (Refer to Appendix 2 on single Shot) is administered. Small gauge needles are used to decrease the risk of postdural puncture headache. The dura can also be punctured inadvertently (referred to as a “wet tap”) during the placement of an epidural catheter if the needle is pushed too far in. As the epidural needle has a larger gauge, the hole in the dura is bigger. Therefore, the risk of postdural puncture headache is higher. Usually the anesthetist knows when a dural puncture has occurred and will request monitoring for possible headache. It is the most common complication from an epidural catheter placement with an incidence of around 1%.

**Signs & Symptoms:**

- Dull, aching or throbbing headache, which worsens on sitting/standing (postural).
- The headache may be frontal, occipital or diffuse in location.
- Usually moderate to severe intensity.
- Possible neck stiffness, photophobia, visual disturbances, nausea and vomiting.
- The headache can occur 1 to 5 days after the dural puncture and may persist for many days.

**Treatment:**

- The first line treatment is conservative with the management of the symptoms with analgesics.
- Usually symptoms resolve within a week.
• Fluid intake is encouraged.
• For severe headache and persistent symptoms, a “blood patch” is the most effective treatment. It consists of the injection of the patient’s blood into the epidural space. In an attempt to plug the dural tear. Results are dramatic with almost immediate headache relief in 95% of the patients.

H) INSUFFICIENT PAIN RELIEF

• Insufficient pain relief may occur as a result of inadequate analgesic dose or catheter problems:
  - Catheter mal-positioned
  - Catheter kink, compression
  - Suboptimal placement of the epidural catheter in relation to surgical site
• Insufficient pain relief may alternatively occur as a result of a post-operative complication (ex. infection or compartment syndrome).

Signs & Symptoms:
• Patient is dissatisfied with level of pain relief, non-consolable
• Pain scores are graded as moderate to severe and/or unacceptable in range to the patient

Assessment & Management:
• Assess & Evaluate pain regularly as per Rx's., with an appropriate pain scale/G&D stage.
• Check equipment function, settings, residual medication volume
• Check the catheter insertion site:
  - Has the catheter moved in or out?
  - Check the catheter marking(s)
  - The blue markings help identify the catheter's depth of insertion in the epidural space. The first solid & bold blue marker seen outside of the insertion site is the 5cm mark, double line equivalent to 10cm, and a triple line equivalent to 15cm.
  - Following assessment, address your concerns to the APS or anesthesiologist on call.

I) PRURITUS

General Considerations:
• Pruritus occurs in a high percentage of patients with epidural opioid analgesia. The incidence is higher among patients receiving morphine. However, all patients receiving an opioid may experience this adverse reaction.
• Pruritus and pain share nerve pathways to the spinal cord, but are believed to be
different sensory modalities.

- Pruritus is related to Histamine release, generally located near eyes, nose and torso, but can affect all body parts. The reason for this response is not completely understood. However, there is a connection related to the activation of opioid receptors mu 1, mu 2. Thereby stimulating the "Itch Center" on the dorsal horn of the spinal cord.

- Naloxone is an example of a pure opioid antagonist to ALL opioid receptors. Given in a low dose, continuous infusion, pruritus can be alleviated while maintaining adequate analgesia (Borgeat, 1999), Nalbuphine is another alternative with the same results given in bolus doses (Kendrick, 1996) (Please refer to Anesthesia/APS Side effects management guidelines, Naloxone, and Nalbuphine guidelines for opioid induced pruritus in APS Binder).

The Efficacy of Antihistamines:

- Histamine blockers (H₂ antagonist) are: Diphenhydramine (Benadryl®) and Hydroxyzine (Atarax®). H₂ receptors are also located in the brain. Blocking these receptors results in the sedative effect. The sedative effect helps to break the itch-scratch cycle. However, because antihistamines work at the level of free nerve endings, they are ineffective in relieving opioid-induced pruritus at the “itch center” level (Fetzer, 1999).

Management Options:
- Naloxone Infusion via PIV
- Nalbuphine bolus
- Benadryl, Atarax (efficacy will vary)

J) NAUSEA AND VOMITING

Generalities
- Narcotics stimulate the chemoreceptor trigger zone, which may cause nausea & vomiting.
- Usually multi-factorial in origin
- Treat early and aggressively
- If nausea persists, r/o other causes such as antibiotic therapy, dehydration, environmental odors, etc.

Assessment & Management:
- Assess and maintain hydration
- Assess and treat for intractable postoperative nausea/vomiting
- Anti-emetic therapies are: Ondansetron, Droperidol, Metoclopramide, Dexamethasone, and Gravol
- It is important to note that anti-emetics and anti-histamines potentiate the sedative effect of narcotics. Therefore, it is important to follow prescriptions outlined on the Side Effects Order Sheet to avoid over-sedation.
- The choice of first line anti-emetic medication should be made considering the risk of
over-sedation. Ondansetron is the least sedative anti-emetic.

- Please refer to the side effects management Guidelines for Nausea/Vomiting in the APS binder.

**K) URINARY RETENTION**

**Pathophysiology:**
- Local Anesthetics block autonomic innervation of the bladder predisposing to urinary retention
- Opioids inhibit the micturition reflex by direct effect on the spinal cord, again predisposing to urinary retention

**Assessment & Management:**
- Monitor Intake & Output closely
  - Urine Output 1-2ml/kg/hr
- Assess for bladder distention (suprapubic pain while on epidural)
- A urinary catheter will remain insitu with patients receiving an epidural infusion (Please refer to the Anesthesia/APS Side effects management guidelines in APS binder).

**Removal of Foley Catheter:**
- Fentanyl +/- bupivacaine Solution: **2 hours** after epidural is stopped
- Hydromorphone +/- bupivacaine Solution: **4 hours** after epidural is stopped
- Epimorphine +/- bupivacaine Solution: **6 hours** after epidural is stopped
Protocol for Continuous Epidural Infusion following Selective Dorsal Rhizotomy

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During Surgery

1. The 20 gauge epidural catheter is placed under direct visualization in the epidural space by the operating surgeon and tunnelled lateral to the incision site. A small locking suture is placed around the epidural catheter at the site of exit from the skin. Make sure to use a connector that is either alligator or snaplock.
2. Following closure of the paraspinous muscles, the epidural catheter is aspirated for blood or cerebrospinal fluid to verify correct placement. Test dose with local anesthetics is to be discussed with Dr. Farmer. Preservative-free epidural morphine (epimorph) is administered via the epidural catheter by the surgeon at a dose of 50 mcg/kg.
3. Following completion of skin closure, the surgical site will be covered with an epidural dressing. The catheter is continued paraspinally up to the right or left shoulder and covered with Hypafix tape. The connector is fixed with a loop to a tongue depressor. Make sure to use a connector that is either alligator or snaplock.

After Surgery

4. A continuous infusion of preservative-free morphine at a concentration of 10 mcg/mL is started at 4 mcg/kg/h. Write an order on the Acute pain service regional analgesia order sheet (strike through bupivacaine in section 4 since the infusion is plain morphine).
5. Patients stay overnight in the post-anesthesia care unit (PACU), mainly to monitor for respiratory depression.
6. For patients with inadequate pain relief, the epidural infusion may be increased by 10%-20%. The infusion may be decreased by 10-20% for patients who appear over sedated.
7. Depending on the pain and sedation score, the infusion might be tapered down from the initial rate on Post-Op Day 2 or 3.
8. The epidural infusion is continued for 72 hours at which time the epidural catheter is removed by the neurosurgeons. Pain control with opioids and/or adjuvant medications usually need to be ordered or continued after the epidural is discontinued.
9. Sedation and respiratory depression are side-effects from epidural morphine. Patients should be monitored with continuous pulse oximetry and respiratory monitors at all times while on epidural therapy. Level of sedation is assessed hourly. Keep in mind that increasing sedation is the best early indicator of respiratory depression. Refer to the ‘APS Policies for Epidural Analgesia’ (section 1 A) for more details regarding monitoring.
10. Nausea and vomiting as well as pruritus are the most common side effects encountered with the administration of epidural morphine. Side effect medications
are ordered on APS order sheets. Favor medications with the least sedation effect. For example, naloxone infusion is preferred over diphenhydramine (Benadryl) to treat pruritus.

11. The dose of **diazepam (Valium)** to treat muscle spasms is lowered to 0.05 mg/kg for the above reasons.
SINGLE SHOT OF INTRatheCAL (SPINAL) OPIOIDS

An intrathecal or spinal single shot means that a bolus of medication, usually an opioid was administered in the subarachnoid space (where you would do an LP). This space is different from the epidural space. The epidural space is filled with fat and blood vessels in between the dura mater and the ligamentum flavum. This is where the epidural catheter is placed and the medication administered. In some situations, it is beneficial to administer only one dose of medication that will provide sustained pain relief for several hours without a catheter left in place. This single dose is administered beyond the epidural space, in the subarachnoid space, where the CSF is flowing. (Please refer to fig. 1 section 1)

Medication:

- Epimorphin: This is the most used medication in our setting. The advantage is that it offers sustained analgesia for up to 24 hours. It is often enough to cover the critical post-op period, analgesia speaking. For example, most of patients with spinal fusions who receive a spinal single shot of epimorphine in the OR will require little use of their PCA for the first 12-24 hours. Then, the opioid requirement slowly increases and dosages are adjusted accordingly.

Precautions:

- As long as morphine is present in the CSF, the patient is at risk of respiratory depression (peak risk for respiratory effect at 12 hours post administration). The patient may also experience opioid side effects such as pruritis and nausea/vomiting.
- Co-administration of CNS depressant medication (gravol, benadryl, benzodiazepine) should be approved by anesthesia and used with caution as it increases the risk of respiratory depression.
- The first dose of IV opioid should be half the usual dose. PCA/NCA dosing are safe. Opioids must not be given as prophylaxis during the duration of the single shot. No continuous infusion should be started on the PCA/NCA of patients under the effect of a single shot of spinal epimorphine.
- Pain scores are important and should be charted every 4 hours and PRN.
- 24 hours continuous monitoring of the SpO2 and respiratory rate post single shot bolus are required when the patient is transferred to the ward, and a 12 hours recovery room (or ICU) stay is highly recommended.
Practice Advisory on Treatment of Local Anesthetic Systemic Toxicity

For Patients Experiencing Signs or Symptoms of Local Anesthetic Systemic Toxicity (LAST)

- Get Help
- Initial Focus
  - Airway management: ventilate with 100% oxygen
  - Seizure suppression: benzodiazepines are preferred
  - Basic and Advanced Cardiac Life Support (BLS/ACLS) may require prolonged effort
- Infuse 20% Lipid Emulsion (values in parenthesis are for a 70 kg patient)
  - Bolus 1.5 mL/kg (lean body mass) intravenously over 1 min (~100 mL)
  - Continuous infusion at 0.25 mL/kg/min (~18 mL/min; adjust by roller clamp)
  - Repeat bolus once or twice for persistent cardiovascular collapse
  - Double the infusion rate to 0.5 mL/kg per minute if blood pressure remains low
  - Continue infusion for at least 10 mins after attaining circulatory stability
  - Recommended upper limit: approximately 10 mL/kg lipid emulsion over the first 30 mins
- Avoid vasopressin, calcium channel blockers, β-blockers, or local anesthetic
- Alert the nearest facility having cardiopulmonary bypass capability
- Avoid propofol in patients having signs of cardiovascular instability
- Post LAST events at www.lipidrescue.org and report use of lipid to www.lipidregistry.org

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The ASRA Practice Advisory on Local Anesthetic Toxicity is published in the society’s official publication Regional Anesthesia and Pain Medicine, and can be downloaded from the journal Web site at www.pain.org.


Continued on reverse...
BE PREPARED
- We strongly advise that those using local anesthetics (LAs) in doses sufficient to produce systemic toxicity (LAST) establish a plan for managing this complication. Making a local anesthetic toxicity kit and posting instructions for its use are encouraged.

RISK REDUCTION (BE SENSIBLE)
- Use the least dose of LA necessary to achieve the desired extent and duration of block.
- Local anesthetic blood levels are influenced by site of injection and dose. Factors that can increase the likelihood of LAST include: advanced age, heart failure, ischemic heart disease, conduction abnormalities, metabolic (eg, mitochondrial) disease, liver disease, low plasma protein concentration, metabolic or respiratory acidosis, and medications that inhibit sodium channels. Patients with severe cardiac dysfunction, particularly very low ejection fraction, are more sensitive to LAST and also more prone to receive ‘stacked’ injections (with resulting elevated LA tissue concentrations) because of slowed circulation time.
  - Consider using a pharmacologic marker and/or test dose, for example, epinephrine 5 μg/mL of LA. Know the expected response, onset, duration, and limitations of a “test dose” in identifying intravascular injection.
  - Aspirate the syringe prior to each injection while observing for blood.
  - Inject incrementally, observing for signs and querying frequently for symptoms of toxicity between each injection.

DETECTION (BE VIGILANT)
- Use standard American Society of Anesthesiologists (ASA) monitors.
  - Monitor the patient during and after completing the injection, as clinical toxicity can be delayed up to 30 mins (or longer after tumescent procedures).
  - Consider LAST in any patient with altered mental status, neurologic symptoms, or cardiovascular instability following a regional anesthetic.
  - Central nervous system signs (may be subtle or absent)
    - Excitation (agitation, confusion, muscle twitching, seizure)
  - Other symptoms include:
    - Depression (drowsiness, obtundation, coma, apnea)
    - Nonspecific (metallic taste, circumoral numbness, diplopia, tinnitus, dizziness)
  - Cardiovascular signs (often the only manifestation of severe LAST)
    - Initially may be hyperdynamic (hypertension, tachycardia, ventricular arrhythmias), then
      - Progressive hypotension
      - Conduction block, bradycardia, or asystole
      - Ventricular arrhythmia (ventricular tachycardia, torsades de pointes, ventricular fibrillation)
- Sedative hypnotic drugs reduce seizure risk, but even light sedation may abolish the patient’s ability to recognize or report symptoms of rising LA concentrations.

TREATMENT
- Timing of lipid infusion in LAST is controversial. The most conservative approach, waiting until after ACLS has proven unsuccessful, is unreasonable because early treatment can prevent cardiovascular collapse. Infusing lipid at the earliest sign of LAST can result in unnecessary treatment because only a fraction of patients will progress to severe toxicity. The most reasonable approach is to implement lipid therapy on the basis of clinical severity and rate of progression of LAST.
  - There is laboratory evidence that epinephrine can impair resuscitation from LAST and reduce the efficacy of lipid rescue. Therefore it is recommended to avoid high doses of epinephrine and use smaller doses, for example, 1 μg/kg, for treating hypotension.
  - Propofol should not be used when there are signs of cardiovascular instability. Propofol is a cardiovascular depressant with lipid content too low to provide benefit. Its use is discouraged when there is a risk of progression to cardiovascular collapse.
  - Prolonged monitoring (> 12 hrs) is recommended after any signs of cardiac toxicity because cardiovascular depression due to LAs can persist or recur after treatment.
References:


Royal North Shore Hospital & Community Health Services, New Zealand, Australia, (1999). Standards and Protocols for Epidural Analgesia: Nursing Education.

