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Emergencies at a Glance: Local Anesthetic Systemic Toxicity (LAST)

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Local Anesthetics

Local anesthetics fall into two main categories: amide local anesthetics and ester local anesthetics. Examples of amide local anesthetics include bupivacaine, lidocaine, mepivacaine, ropivacaine, prilocaine, articaine, and levobupivacaine. Examples of ester local anesthetics include chloroprocaine, benzocaine, procaine, tetracaine, and cocaine. Both categories of medication bind to sodium channels, blocking the ability for sodium to move freely in and out of the cell.

Interventions and Management of LAST

References

Risk Factors

- Renal/hepatic disease
- Low muscle mass and low plasma protein
- Cardiac disease
- Extremes of age
- Concentration and amount of local anesthetic
- Medications (be cautious in patients that disclose cocaine use)
- Pregnancy
- Block site location (due to being highly vascular from highest to lowest risk): intercostal blocks, caudal and epidural anesthesia, interfascial plane blocks of the abdominal wall, psoas compartment blocks, sciatic blocks, cervical and brachial plexus blocks

Preparation for Local Anesthetic Administration and Monitoring for LAST

Ensure all required steps are completed before initiating a regional block, including:

◦ Surgical team interviews are complete (nursing assessment, consents signed, history and physical updated)

◦ Equipment is ready for use, including:

▪ Monitoring equipment, which includes an appropriately sized blood pressure cuff, electrodes

for 3- or 5-lead electrocardiography (EKG) monitoring, and SpO_2 monitoring

▪ Oxygen and oxygen administration supplies (nasal cannula, nonrebreather, O_2 tank or wall O_2)

▪ Suction with tubing and yankeur

▪ BVM (bag-valve-mask) with face mask

◦ Ensure a 1:1 nurse/patient ratio (nurse must be current with ACLS if adult, PALS if pediatric)

Immediately before the anesthesia professional performs the block, attach monitoring equipment to the patient (including EKG monitor, blood pressure cuff, and pulse oximeter). Follow the facility's policies and procedures for how frequently to assess vital signs during this phase. When anesthesia professionals administer anxiolytics during this phase of care, some facilities will require the use of capnography monitoring via a nasal cannula to track $EtCO_2$ levels. Complete a time out with all personnel (including the anesthesia professional) who are present and the patient before the initiation of the block. Ensure the ultrasound machine or nerve stimulator (if appropriate) is present and functional and that all emergency equipment is functional and available in the perioperative area as appropriate.

Assisting anesthesia professionals with blocks depends on State and facility directives. and nurses

should refer to applicable policies, procedures, and State guidelines before assisting with neuraxial or local blocks

Safe Injection Techniques

Anesthesia professionals can use techniques to mitigate the risks of intravascular injection of local anesthetics. Nurses who assist the anesthesia professional during this procedure are instrumental in advocating safe and best practices for patients. Slow incremental injection of the local anesthetic while monitoring for symptoms allows the opportunity to stop an injection if symptoms arise. Aspiration before injection confirms the end of the needle is not in a blood vessel.

Utilizing an intravascular marker, such as epinephrine, can be a helpful tool to ensure appropriate placement of the needle. If the local anesthetic with epinephrine is injected into a blood vessel, there would be an increase in heart rate greater than 10 beats per minute (bpm) and an increase in the systolic BP of more than15 mm Hg. This would be considered a “positive” test dose, and the block should not proceed without intervention. Nurses should be aware if the anesthesia professional is using this technique so they can appropriately monitor for potential changes.

Using an ultrasound to guide needle placement and assess injections helps to decrease the risk of entering the vascular space compared to landmark based or nerve-stimulation based techniques. Nurses should be familiar with ultrasound equipment if they are expected to assist the anesthesia professional with the equipment.

Timing of LAST

Onset of symptoms after unintentional intravascular injection can vary from patient to patient. If symptoms occur less than 60 seconds after injection, there is a high suspicion that the local anesthetic has immediately entered the vascular space and traveled to the brain. If symptoms occur one to five minutes after the injection, there is a high suspicion that the local anesthetic is intermittently entering the vasculature or there is delayed tissue absorption.

Clinical Presentation of Toxicity

Symptoms can be highly variable. Suspect LAST if physiologic changes are noted after the local anesthetic administration.

- Central nervous system effects and symptoms:
  - Periorbital numbness, tinnitus, metallic taste, anxiety, mental status changes, visual

disturbances, muscle twitching, seizures
    - Severe CNS symptoms include CNS depression (lethargy, coma, respiratory depression)
- Cardiovascular effects and symptoms:
    - Tachycardia and hypertension (especially in the setting of utilization of a test dose of epinephrine)
    - Bradycardia and hypotension
    - Ventricular dysrhythmias and asystole

Interventions and Management of LAST

ASRA guidelines outline the management of LAST to ensure rapid recognition and treatment. Nurses should be familiar with the location of the emergency LAST equipment and supplies in the event of an emergency.

1. Immediately stop the injection or notify the anesthesia professionals to stop the injection

2. Call for help and request a LAST toxicity kit or lipid emulsion at the first sign of a serious LAST event

3. Administer Intralipids 20% per licensed practitioner's orders and ASRA guidelines

   Follow ASRA guidelines for appropriate dosing

4. Manage the airway

Administer 100% FiO2 via face mask; if necessary, ventilate with bag-valve-mask or advanced airway

5. Suppress seizure activity: consider a benzodiazepine or propofol in low dose increments

6. Manage dysrhythmias and provide cardiovascular support

   In patients in cardiac arrest, treatment differs from standard ACLS

   Epinephrine: lower doses utilized (see ASRA guidelines for up-to-date dosing)

   Provide high quality chest compressions to circulate lipid emulsion

   Avoid local anesthetics and other sodium channel blockers, beta blockers, calcium channel blockers, and vasopressin

   1. Administer amiodarone as the first line antiarrhythmic

7. Transfer patient to an area with monitoring capabilities, such as the postanesthesia care unit or a critical care unit.

   Monitor the patient for:

   Two hours after seizure activity