

**For the LAST time! When should I give lipid emulsion for L.A.S.T.?
Wait, how can I avoid the need to give it in the first place?**

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Keywords:

Regional Anesthesia

Quality and Performance Improvement

Education and Continuous Professional Development

Patient Safety

Practice Guidelines and Statements

Learning Objectives:

Recognize common problems that can lead to complications with nerve block performance

Identify changes that can be implemented to minimize the occurrence of Local Anesthetic Systemic Toxicity

Assess patients for signs and symptoms of Local Anesthetic Systemic Toxicity

Describe the appropriate treatment of severe signs and symptoms of Local Anesthetic Systemic Toxicity

Recognize the importance of preparation and teamwork in minimizing the risk of Local Anesthetic Systemic Toxicity

Stem Case and Key Questions Body:

“The Basics”: 42yo female, for rotator cuff repair at your Outpatient Surgery Center. Patient will be the 1st case of Day at 7:45 am.

Comorbidities: BMI 50, mild developmental delay, very anxious and “rigidity”

Anesthetic Plan: General anesthesia, and with an Interscalene peripheral nerve block placed, preoperatively for post-op pain control.

CASE: “The Details”:

Patient arrives late & IV placement is difficult. It is now 7:38 am. Finding the desired nerve block tray causes further delay & USG printer is out of paper. Due to patient anatomy, locating adequate sono-anatomy with USG is difficult. Patient is squirming, due to the pain of multiple needle passes & the procedure is prolonged. Patient receives 5 mg midazolam IV, stops squirming so much, but is substantially sedated, so communication is now more difficult. With final bolus injected, anesthesiologist is called urgently to OR for difficult intubation

The physician anesthesiologist/CRNA and OR nurse for the case now arrive to greet the patient and take her to OR.

While APS team nurse records vital signs (with her back to patient), MD/CRNA arouses patient and asks her how she feels, while at the same time, removing the NC oxygen and EKG pads. Patient responds, “Yes, my lips are tingling. What is that loud noise?” The patient proceeds to spasm twice, closes her eyes, then exhibits pronounced seizure activity.

1) NOW WHAT? What is your immediate action plan?

CASE: Here's what happens next... Arrival of lipid emulsion 20% to bedside is delayed; however, bolus is given when it arrives. Initial vital signs: BP 60/40, HR 30 with PVC's on monitor.

2) NOW WHAT? Do we give epinephrine? How about preemptive chest compressions?

CASE: The patient has poor respiratory effort & is difficult to mask ventilate. O₂ Saturation is now 82%. A decision was made to intubate. BP marginally improves, and it is now 72/48.

3) NOW WHAT? What is your ventilation strategy?

CASE END OPTION #1:

Seizures abate. BP normalizes. PVC's are gone. There is return of spontaneous respirations, and patient is extubated. Patient begins to communicate, but is drowsy.

4) NOW WHAT? What is your treatment/management plan?

CASE END OPTION #2:

Patient remains hemodynamically unstable and is threatening to “crash.”

5) NOW WHAT?

CV instability worsens, despite repeat boluses and is now “maxed out” at the recommended Intralipid infusion rate.

6) NOW WHAT?

Post-Case Discussion:

7) WHAT ARE THE “RED FLAGS” PRESENT IN THIS CASE?

8) WHAT HAPPENED TO THE PATIENT? WHY DID THIS HAPPEN?

9) WHAT ISSUES SHOULD BE ADDRESSED TO MINIMIZE THE LIKELIHOOD OF THIS COMPLICATION???

Case Discussion

1) NOW WHAT? What is your immediate action plan?

- Call for help AND for crash cart (or "L.A.S.T. box")
- While awaiting arrival of the LAST treatment box/Lipid Emulsion 20%, assess respirator and CV status:
 - Replace nasal cannula or face mask O₂, reassess Oxygen Saturation (Pulse Oximetry)
 - Assess Respiratory Effort/Control airway
 - Replace EKG pads, observe rhythm (can call for 12-lead EKG as well)
 - Restart BP cuff
- Draw up Lipid Emulsion 20%
- Draw up in tandem with two 60 ml syringes.
 - Hand off 1st syringe to bolus while drawing up the second syringe
 - Bolus Dose: 1.5ml/kg initial bolus
 - Use Ideal Body Weight: think "Give a 100ml"...then determine exact dose as follows:
 - Begin Lipid Emulsion 20% infusion (0.25ml/kg/min) or about 18-20ml/minute (for IBW 70kg)
- Treat the Seizure:
 - Versed IV in divided doses
 - Propofol can be used, but is avoided in the setting of CV instability (and can cause CV instability too!)

2) NOW WHAT?

- Do we give epinephrine?
 - Answer: Do not give at all or give < 1 mcg/kg per dose.
 - Lipid Emulsion 20% will act significantly in less than 2-3 min. This can lead to a severe Hypertensive Crisis and serious complications.
- ALSO: Avoid vasopressin, Calcium Channel Blockers, Beta Blockers, and additional local anesthetic (eg anti-arrhythmic) dosing

3) NOW WHAT?

- What is your ventilation strategy?
 - Answer: Hypoxia and hypercarbia (sedation, OSA, pickwickian, etc) have lowered the seizure threshold. Ventilation Target = Give Fast Ventilations (vs both intermittently).
 - NOTE: if BP is undetected, defer to ACLS guidelines for ventilation during CPR

Option #1:

4) NOW WHAT? What is your post-CV stabilization management plan?

Answer: Continue the infusion > 10 minutes after achieving CV stabilization followed by continuous telemetry monitoring for > 12 hours. Consider transfer to hospital from your OSC to facilitate this monitoring if it is not possible at your present operative venue.

Option #2:

5) NOW WHAT? Patient remains unstable?

Answer: Repeat Lipid 20% bolus & double the infusion rate to 0.5ml/kg/min (max 10ml/kg in first 30min)

6) Patient is about to crash, what is your plan?

Answer: Alert nearest facility with cardiopulmonary bypass and call for emergency transport

Post-Case Discussion:

7) WHAT ARE THE “RED FLAGS” HERE?

- Nerve block took a long time with multiple needle passes.
- Difficult anatomy
- Poor communication with patient due to cognitive deficit & significant sedation
- Procedure is in neck:
 - Higher risk because:
 - possible direct injection into arteries to brain with small dose
 - shorter transit time if significant vascular uptake occurs with larger volume
 - Bolus was abruptly given (Expect possibility of immediate high vascular uptake)
- Time was not taken to educate the patient about what symptoms should be reported immediately.
- Patient was not questioned directly regarding early symptoms of LAST (No “meaningful contact”)
- There was a delay in administering lipid emulsion 20%.

8) WHAT HAPPENED TO THE PATIENT? WHY DID THIS HAPPEN?

Answer: Large intravascular uptake of drug mass over short period of time:

- Macerated tissue opens capillary beds and leads to higher vascular uptake.
- Direct arterial puncture, even with small volume, into vertebral or carotid artery.
- Hypoxia and hypercarbia, which may occur due to over-sedation, will lower the seizure threshold. Significant cardiovascular signs may be very unlikely if only a small volume was directly injected into an artery; however, direct arterial injection in the neck could cause severe neurologic symptoms almost immediately.

9) WHAT ISSUES SHOULD BE ADDRESSED TO MINIMIZE THE LIKELIHOOD OF THIS COMPLICATION???

Answer: Multiple factors identified within this case lead to the increased likelihood of serious L.A.S.T. including: Program/Organizational Issues, Skill/Technique Issues, Patient Selection, Production Pressure

1) Program/Organizational

- Avoiding Late start
- Inadequate patient education
- Poor procedure preparation
- Lack of immediately available rescue medications, materials
- Identifying multiple RF in this patient early
- Poor transfer of events between individuals
- Inadequate monitoring of patient
- Consideration of a Plan B

2) Skill/Technique

- Technical Skills/Proficiency of the Operator
- Non-technical skills – Meaningful Contact, minimize sedation, developed routine

3) Patient Selection

- RISK FACTORS: High BMI, MR, Anxiety

4) Production Pressure to be efficient at your OSC and “keep up the pace of turnover” ...time is money

ADDITIONAL INFORMATION

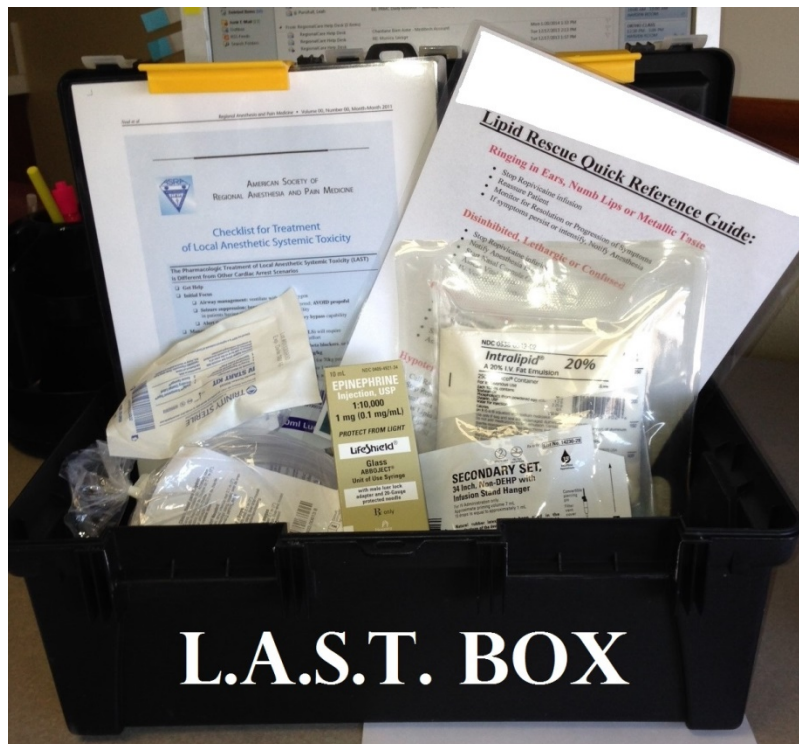
-There may be an Immediate (within a few min) or a Delayed increase (15-30 min) in plasma levels of local anesthetic after a bolus of local anesthetic. Be prepared for severe immediate L.A.S.T. and continue to monitor for escalating or minor symptoms of L.A.S.T. Ongoing monitoring and specific evaluation of patient is important.

-Lipid Emulsion 20% is only recommended for cardiovascular effects, but it was used here immediately because of rapidly escalating neurologic symptoms.

-Hypercarbia and hypoxia lower the seizure threshold & worsen symptoms. Be sure to use supplemental Oxygen & Ventilate...USE THE MINIMUM AMOUNT OF SEDATION NEEDED TO ACCOMPLISH THE TASK!!!

-Ropivacaine is described as having larger "gap" between neurologic and cardiovascular symptoms than Bupivacaine, but ongoing Meaningful Contact with the patient is more important in minimizing the likelihood of these outcomes

-Preparation and Teamwork are essential in treating severe symptoms of L.A.S.T.



REFERENCES:

-ASRA Checklist for Treatment of LAST

-Barrington et al Preliminary Results of the Australasian Regional Anaesthesia Collaboration. A Prospective Audit of more than 7,000 Peripheral Nerve and Plexus Blocks for Neurologic and Other Complications. RAPM 2009 34;6: 534-541

Auroy et al Major Complications of Regional Anesthesia in France. The SOS Regional Hotline Service. Anesthesiology 2002 97;5: 1274-1280