

Local Anesthetic Systemic Toxicity

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No financial conflicts of interest

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"One of the most striking facts shown by a study of reports is that the occurrence of an accident seldom finds the operator ready to apply suitable measures promptly."

1924:AMA Committee for the Study of Toxic Effects of Local Anesthetics

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Diagnosis
Prevention
Treatment

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Mechanism

Binding of Na ion channels by local anesthetics

- CNS
- Cardiac conduction system

Binding of Ca and K ion channels

Inhibition of mitochondrial oxidative phosphorylation¹

1) Neal et al, 2010

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Presenting Signs and Symptoms

Depression

Stimulation

CNS

CV

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Presenting Signs and Symptoms

	Depression	Stimulation
CNS	Drowsiness Dizziness Dysphoria Perioral numbness Dysarthria Loss of Consciousness (7%)	
CV		

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Presenting Signs and Symptoms

	Depression	Stimulation
CNS	Drowsiness Dizziness Dysphoria Perioral numbness Dysarthria Loss of Consciousness (7%)	Perioral paresthesia Tinnitus Agitation (11%) Seizure (68%)
CV		

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Presenting Signs and Symptoms

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CNS	Drowsiness Dizziness Dysphoria Perioral numbness Dysarthria Loss of Consciousness (7%)	Perioral paresthesia Tinnitus Agitation (11%) Seizure (68%)
CV	Bradycardia (27%) Conduction block (12%) Asystole (12%) Hypotension (18%)	

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Presenting Signs and Symptoms

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CNS	Drowsiness Dizziness Dysphoria Perioral numbness Dysarthria Loss of Consciousness (7%)	Perioral paresthesia Tinnitus Agitation (11%) Seizure (68%)
CV	Bradycardia (27%) Conduction block (12%) Asystole (12%) Hypotension (18%)	Tachycardia Ventricular ectopy ST changes Hypertension VT/VF (13%)

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Neal, et al, 2010

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What do I do?

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Prevention

"An ounce of prevention is worth a pound of cure"
(or 20% intralipid)

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Prevention

- Identify patients at higher risk for LAST

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Prevention

- Identify patients at higher risk for LAST

Greater risk at extremes of age (<6 months, >70 years)

Patient comorbidities

- Cardiac, renal, hepatic, mitochondrial disease

Block site

Number of blocks, drug volume

Drug selection: >90% involve potent local anesthetics

Neal, et al

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Prevention

- Identify patients at higher risk for LAST
- Limit the dose of local anesthetic

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Prevention

- Identify patients at higher risk for LAST
- Limit the dose of local anesthetic
- Limit the opportunity for intravascular injection or tissue uptake of local anesthetic

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Prevention

Limit the opportunity for intravascular injection or tissue uptake of local anesthetic

- Plan block approach away from vessels
- Aim needle tangentially to vessels whenever possible
- Aspiration before injection (2% False neg¹)
- Vasoconstrictors
 - Epinephrine
 - Local anesthetics

1) Pan et al, 2004

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Prevention

- Identify patients at higher risk for LAST
- Limit the dose of local anesthetic
- Limit the opportunity for intravascular injection or tissue uptake of local anesthetic
- Early detection of intravascular injection

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Diagnosis

Early detection and high level of suspicion are key

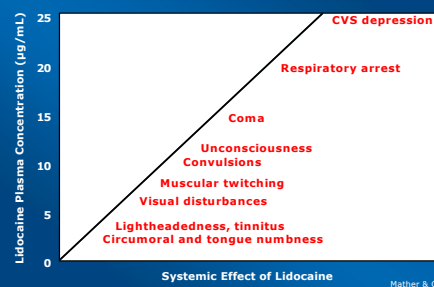
- Monitor patient during and after block
 - Full ASA monitors
 - Early CNS signs of intravascular injection
- Watch spread of local anesthetic during injection
- Consider epinephrine as marker for intravascular injection

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Diagnosis



Systemic Effect of Lidocaine

Mather & Cousins, 1979

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Diagnosis

<20% of cases had classic prodromal signs

Neal, et al, 2010

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Diagnosis

Review of case reports of LAST¹

- CNS 45%
- CNS & CV 44%
- CV 11%

Di Gregorio, et al, 2010

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Diagnosis

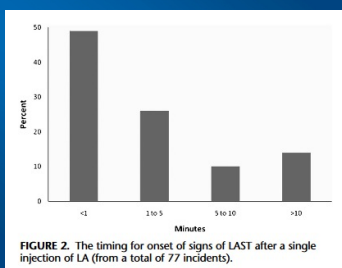


FIGURE 2. The timing for onset of signs of LAST after a single injection of LA (from a total of 77 incidents).

Di Gregorio, et al, 2010

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Be Vigilant!

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Treatment

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Treatment

Priorities – ABC's

Airway/Breathing

- Prevention of hypoxia and acidosis (respiratory)^{1,2,3}
- Consider muscle relaxation
 - Facilitate oxygenation and ventilation
 - No effect on underlying seizure

1) Moore & Bridenbaugh, 1960 2) Moore, et al, 1980 3) Heavner, et al, 1992

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Treatment

Control seizure

- Prevent acidosis (metabolic) and injury
- Benzodiazepines 1st choice
- Thiopental or Propofol 2nd choice
 - Potential for worsening hypotension/cardiovascular depression

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Treatment

Circulation

- Maintain coronary perfusion pressure
 - CPR
- **20% Intralipid**
 - 2nd IV
- Reduced doses of epinephrine (low dose = 10-100 mcg)
- Avoid vasopressin
- Avoid Ca channel blockers and β -blockers
- Amiodarone for arrhythmia treatment
- Consider cardiopulmonary bypass

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Treatment

CHECKLIST FOR TREATMENT OF LOCAL ANESTHETIC SYSTEMIC TOXICITY (LAST)

Preparation: Treatment of LAST requires rapid identification of LAST

- Recognize and treat LAST early (LAST score ≥ 1)
- Administer oxygen, cardiac arrest resuscitation, and other local anesthetic
- Stop injecting local anesthetic
- Call help
 - Consider lipid emulsion therapy at the first sign of a serious LAST event
 - Call for the LAST Rescue Kit
 - Administer rescue kit components: hyperventilate + resuscitation may be prolonged
- Administer lipid emulsion
 - Administer with 100% oxygen + avoid hyperventilation + advanced airway device if necessary
 - Consider resuscitation
 - Resuscitation preferred
 - Avoided doses of epinephrine, especially in bradycardic patients
 - Treat hypotension and tachycardia with phenylephrine (1 mg IV)

Lipid Emulsion 20%

(Purified and low risk for fire hazard)

Indication: 10-20 mg/kg (10-20 mL/kg) (10-20 mL/kg)

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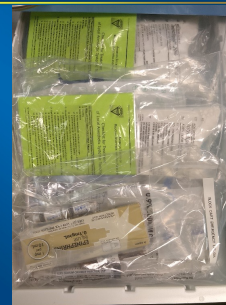
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<https://www.asra.com/advisory-guidelines/article/3/checklist-for-treatment-of-local-anesthetic-systemic-toxicity>

Preparation



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Resources

ASRA Practice Advisory on Local Anesthetic Systemic Toxicity
(RAPM Volume 35(2), March-April 2010)

Lipidrescue.org

Lipidregistry.org

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