

CHECKLIST FOR TREATMENT OF LOCAL ANESTHETIC SYSTEMIC TOXICITY (LAST)

The Pharmacologic Treatment of LAST is Different from Other Cardiac Arrest Scenarios

- ❖ **Reduce** individual **epinephrine** boluses to ≤ 1 mcg/kg
- ❖ **Avoid** vasopressin, calcium channel blockers, beta blockers, or other local anesthetics
- Stop injecting local anesthetic
- Get help
 - Consider lipid emulsion therapy at the first sign of a serious LAST event
 - Call for the LAST Rescue Kit
 - Alert the nearest cardiopulmonary bypass team - resuscitation may be prolonged
- Airway management
 - Ventilate with 100% oxygen / avoid hyperventilation / advanced airway device if necessary
- Control seizures
 - Benzodiazepines preferred
 - **Avoid** large doses of **propofol**, especially in hemodynamically unstable patients
- Treat hypotension and bradycardia – **If pulseless, start CPR**

Lipid Emulsion 20%

(Precise volume and flow rate are not crucial)

Greater than 70 kg patient	Less than 70 kg patient
Bolus 100 mL Lipid Emulsion 20% rapidly over 2-3 minutes	Bolus 1.5 mL/kg Lipid Emulsion 20% rapidly over 2-3 minutes
• Lipid emulsion infusion 200-250 mL over 15-20 minutes	• Lipid emulsion infusion ~0.25 mL/kg/min (ideal body weight)
If patient remains unstable: <ul style="list-style-type: none">• Re-bolus once or twice at the same dose and double infusion rate; be aware of dosing limit (12mL/kg)• Total volume of lipid emulsion can approach 1 L in a prolonged resuscitation (e.g., > 30 minutes)	

- Continue monitoring
 - At least 4-6 hours after a cardiovascular event
 - Or, at least 2 hours after a limited CNS event
- Do not exceed 12 mL/kg lipid emulsion (particularly important in the small adult or child)
 - Much smaller doses are typically needed for LAST treatment
- See reverse side of this checklist for further details



Risk Reduction (Be sensible)

- Use the least dose of local anesthetic necessary to achieve the desired extent and duration of block.
- Local anesthetic blood levels are influenced by site of injection and dose. It is important to identify patients at increased risk of LAST prior to using local anesthetics, e.g., infants <6 months old, small patient size, advanced age and frailty, heart failure, ischemic heart disease, conduction abnormalities, or rhythm disorders, metabolic (e.g., mitochondrial) disease, liver disease, low plasma protein concentration, acidosis, and medications that inhibit sodium channels. Patients with very low ejection fraction are more sensitive to LAST and may be especially prone to elevated local anesthetic levels associated with 'stacked' injections.
- Consider using a pharmacologic marker and/or test dose, e.g. epinephrine 2.5 to 5 mcg/mL (total 10-15 mcg). 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 in the syringe or tubing
- Inject incrementally, while observing for signs and inquiring for symptoms of toxicity between each injection.
- Consider discussing local anesthetic dose as part of the pre-procedural or pre-surgical pause ("time out").
- Cardiovascular signs (occasionally the only manifestation of severe LAST)
 - o Initially may be hyperdynamic (hypertension, tachycardia, ventricular arrhythmias), then
 - o Progressive hypotension
 - o Conduction block, bradycardia or asystole
 - o Ventricular arrhythmia (ventricular tachycardia, Torsades de Pointes, ventricular fibrillation or asystole)
- Sedation may abolish the patient's ability to recognize or report LAST-related symptoms.

Treatment

Suggested components of a "LAST Rescue Kit"

- 1 L (total) lipid emulsion 20%
- Several large syringes and needles for administration
- Standard IV tubing
- ASRA LAST Checklist
- Administer lipid emulsion at the first sign of a serious LAST event.
- Lipid emulsion can be used to treat LAST caused by any local anesthetic.
- Standard dose epinephrine (1 mg) can impair resuscitation from LAST and reduce the efficacy of lipid rescue. Use smaller doses than typical for ACLS, e.g., $\leq 1\text{mcg/kg}$ boluses, or for treating hypotension.
- Propofol should not be used when there are signs of cardiovascular instability.
- Prolonged monitoring (2-6 hours) is recommended after any signs of LAST, since cardiovascular depression due to local anesthetics can persist or recur after treatment.
 - o If LAST event is short-lived and without signs of cardiovascular instability, one may consider proceeding with surgery after an uneventful ~30 minute interval of monitoring.

Detection (Be vigilant)

- Monitor the patient during and after completing injection. Clinical toxicity can be delayed 30 minutes or longer.
- Use standard American Society of Anesthesiologists (ASA) monitors.
- Communicate frequently with the patient to query for symptoms of toxicity.
- Consider LAST in any patient with altered mental status, neurological symptoms or signs of cardiovascular instability after a regional anesthetic (e.g., change in HR, BP, ECG). Consider LAST even when the local anesthetic doses is 1) small (susceptible patient), 2) atypically administered (subcutaneous, mucosal, topical), 3) administered by the surgeon, or 4) after recent tourniquet deflation.
- Central nervous system signs (may be subtle, atypical, or absent)
 - o Excitation (agitation, confusion, vocalization, muscle twitching, seizure)
 - o Depression (drowsiness, obtundation, coma, or apnea)
- Non-specific (metallic taste, circumoral numbness, diplopia, tinnitus, dizziness)

Please report LAST events to www.lipidrescue.org

The Third American Society of Regional Anesthesia and Pain Medicine Practice Advisory on Local Anesthetic Systemic Toxicity. Executive Summary 2017. Reg Anesth Pain Med 2018;43:113-123

The ASRA LAST™ smart phone app can be purchased from The Apple App Store or Google Play

