LAST (Local Anesthetic Systemic Toxicity) Protocol

**PREVENTION**

a) Minimal dose necessary
b) Utilize clinically appropriate agents with highest minimum toxic dose (Box 1)
c) Consider avoiding in populations at increased risk (Box 2)
d) Aspirate prior to each injection
e) Test dose: 1-2ml of anesthetic with epinephrine 1:100,000 (monitor for increase in HR 10bpm or SBP 15mmHg)
f) Incremental injection 3-5ml q30-45sec
g) US guidance

**MONITORING**

(during injection and up to 30min after)

a) Oxygenation: pulse oximetry
b) Ventilation: clinical
c) Circulation: BP and HR q5min, ECG telemetry

**Suspect LAST?**

a) Prodromal symptoms: dizziness, tinnitus, metallic taste, perioral numbness
b) Seizures
c) Tachycardia/Tachydysrhythmia
d) Conduction block
e) Hypertension/Hypotension

**PRIMARY GOAL:** minimize hypoxia and acidosis

**AIRWAY:** 100% O2, Intubate if indicated, consider lipid therapy

**Dysrhythmia?**

**Hypotension?**

**Seizures?**

- Consider ECMO team alert

**ECMO team alert 515-1214**

**Lipid Therapy:** 1.5ml/kg lean body mass IV over 1 min (can repeat x1-2)

**Improvement?**

- NO
- 1. Benzodiazepines 2. Low dose paralytic

**0.25 ml/kg/hr continuous infusion**

**Hypotension?**

- NO
- 0.5 ml/kg/hr continuous infusion

Continue infusion at least 10 min post-ROSC

**Modified ACLS**

A. Epi 10-100mcg titrated to effect (<1mcg/kg)
B. Amiodarone for persistent ventricular dysrhythmia
C. AVOID: vasopressin, CCB, BB, lidocaine
D. Monitor ABG for acidosis and hypoxia
E. Expect prolonged resuscitation
LAST (Local Anesthetic Systemic Toxicity) Protocol continued

**BOX 1. Clinically appropriate agents with highest minimum toxic dose**

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>Onset (min)</th>
<th>Duration (min)</th>
<th>Max Dose (mg/kg)</th>
<th>Max Total Dose (mg)</th>
<th>Total Volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroprocaine</td>
<td>6-12</td>
<td>60</td>
<td>11</td>
<td>800</td>
<td>40ml of 2%</td>
</tr>
<tr>
<td>Chloro + Epi (1:200,000)</td>
<td>6-12</td>
<td>60</td>
<td>14</td>
<td>1000</td>
<td>50ml of 2%</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>2-5</td>
<td>50-120</td>
<td>4-5</td>
<td>300</td>
<td>30ml of 1%</td>
</tr>
<tr>
<td>Lido + Epi (1:200,000)</td>
<td>2-5</td>
<td>60-180</td>
<td>5-7</td>
<td>500</td>
<td>50ml of 1%</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>5-10</td>
<td>240-480 (3-8h)</td>
<td>2</td>
<td>175</td>
<td>35ml of 0.5%</td>
</tr>
</tbody>
</table>

**BOX 2. Populations at increased risk**

1. Heart disease (CHF, arrhythmia, ischemic disease, low or high CO states)
2. Liver disease
3. Pregnancy
4. Beta blocker, digoxin, calcium channel blocker, cyp P450 inhibitors
5. Acidosis
6. Low plasma protein
7. Mitochondrial disease

ASRA Checklist for Treatment of Local Anesthetic Systemic Toxicity

See page 3

**REFERENCES**

Checklist for Treatment of Local Anesthetic Systemic Toxicity

The Pharmacologic Treatment of Local Anesthetic Systemic Toxicity (LAST) is Different from Other Cardiac Arrest Scenarios

- Get Help
- Initial Focus
  - Airway management: ventilate with 100% oxygen
  - Seizure suppression: benzodiazepines are preferred; AVOID propofol in patients having signs of cardiovascular instability
  - Alert the nearest facility having cardiopulmonary bypass capability
- Management of Cardiac Arrhythmias
  - Basic and Advanced Cardiac Life Support (ACLS) will require adjustment of medications and perhaps prolonged effort
  - AVOID vasopressin, calcium channel blockers, beta blockers, or local anesthetic
  - REDUCE epinephrine dose to <1 mcg/kg
- Lipid Emulsion (20%) Therapy (values in parenthesis are for 70kg patient)
  - Bolus 1.5 mL/kg (lean body mass) intravenously over 1 minute (~100mL)
  - Continuous infusion 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/min if blood pressure remains low
  - Continue infusion for at least 10 minutes after attaining circulatory stability
  - Recommended upper limit: Approximately 10 mL/kg lipid emulsion over the first 30 minutes
- Post LAST events at www.lipidrescue.org and report use of lipid to www.lipidregistry.org