

Local anesthetic systemic toxicity

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1 Local anesthetic systemic toxicity (LAST) is estimated to occur in 1 of 1000 local anesthetic administrations^{1,2}

It results from supratherapeutic levels of local anesthetic in the bloodstream. Most cases occur in hospitals (61%), while fewer occur in outpatient settings (14%), primarily following upper or lower extremity nerve blocks (19%), naso-oro-pharyngeal infiltration (17%) or spinal and epidural blocks (11%).¹ Lidocaine is most commonly implicated in LAST events (44%); however, bupivacaine has a lower safety margin and greater cardiac toxicity.^{1,2} Ropivacaine has a decreased potential for toxicity.³

2 Signs and symptoms of LAST typically appear within 1–5 minutes of local anesthetic administration and include oral numbness, metallic taste, dizziness, drowsiness and disorientation²

Severe manifestations may appear up to 6 hours after initial symptom onset, and include seizures, arrhythmias, cardiac arrest and death.¹

3 Extremes of age, pregnancy, renal disease, cardiac disease and hepatic dysfunction may increase risk of LAST^{1,2}

The minimum effective dose of local anesthetic should be used in these populations (generally 10%–20% dose reduction) and patients should be warned to report any signs or symptoms of LAST immediately.^{1,4} The maximum recommended doses of local anesthetic are as follows: bupivacaine (maximum dose 2 mg/kg, maximum dose with epinephrine 3 mg/kg), lidocaine (maximum dose 5 mg/kg, maximum dose with epinephrine 7 mg/kg), ropivacaine (maximum dose 3 mg/kg, maximum dose with epinephrine 3 mg/kg), prilocaine (maximum dose 6 mg/kg, maximum dose with epinephrine 8 mg/kg) and mepivacaine (maximum dose 5 mg/kg, maximum dose with epinephrine 7 mg/kg).⁵

4 Accidental intravascular injection of large doses of local anesthetic is the most important trigger of LAST¹

A slow injection technique (< 1 mL/s) with frequent aspirations and ultrasonography guidance for peripheral nerve blocks can decrease the likelihood of this.² The addition of epinephrine to local anesthetic infiltrations decreases systemic absorption.¹

5 After securing the airway and suppressing seizures, a bolus of 1.5 mL/kg of 20% lipid emulsion followed by infusion at 0.25 mL/kg/min for 30–60 minutes is recommended for patients at first signs of severe LAST^{3,6}

Lipid emulsion absorbs local anesthetic from tissues to attenuate the progression of toxicity.⁵

References

1. Macfarlane AJR, Gitman M, Bornstein KJ, et al. Updates in our understanding of local anaesthetic systemic toxicity: a narrative review. *Anaesthesia* 2021;76(Suppl 1):27-39.
2. Wadlund DL. Local anesthetic systemic toxicity. *AORN J* 2017;106:367-77.
3. El-Boghdadly K, Pawa A, Chin KJ. Local anesthetic systemic toxicity: current perspectives. *Local Reg Anesth* 2018; 11:35-44.
4. Rosenberg PH, Veering BT, Urmey WF. Maximum recommended doses of local anesthetics: a multifactorial concept. *Reg Anesth Pain Med* 2004;29:564-75, discussion 24.
5. El-Boghdadly K, Pawa A, Chin KJ. Local anesthetic systemic toxicity: current perspectives. *Local Reg Anesth* 2018; 11:35-44.
6. Lavonas EJ, Drennan IR, Gabrielli A, et al. Part 10: special circumstances of resuscitation. 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation* 2015;132(Suppl 2):S501-18.

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