

Children remain at risk of lidocaine toxicity in the outpatient dental setting! Need for guidance on maximum volumes of lidocaine used in endodontic irrigation.



In the medical, dental, and surgical community, widely disseminated infiltration per kilogram of body weight to a protocols specify the maximum quantity of lidocaine void local anesthetic systemic toxicity (LAST). In contrast, our literature search uncovered no such protocol limiting the dose of lidocaine used to irrigate the tooth pulp chamber during pediatric endodontic treatment. We present this case in a 3-year-old boy who developed LAST following endodontic irrigation with lidocaine mixed with epinephrine during dental restoration under general anesthesia. Anesthesiologists caring for these patients must be aware of this little publicized irrigation practice to prevent LAST in the dental setting.

A Case Report: CNS Toxicity After Endodontic Irrigation with Lidocaine

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Patient:

A healthy 13 kg 3-year-old boy presented for dental restoration of numerous dentoalveolar infections under general anesthesia.

Procedural Events:

Pediatric anesthesiologist:

- Inhalation induction with sevoflurane
- IV: 40 mg of propofol
- Nasotracheal intubation
- IV: 2 mg dexamethasone
- IV: and 7 mg of ketorolac
- For the duration of the case, end-tidal concentration of sevoflurane at 2.8% - 3.0% was maintained,
- All measured patient vitals (i.e., SpO2%, EKG, FiO2, Et CO2, Temp) remained within the normal range.

Pediatric dentist:

- Dental radiographs, dental examination, and dental cleaning were performed
- Repair of 11 teeth: The pediatric dentist performed pulpectomy and placed composite crowns on 5 teeth, composite restoration of 4 teeth, and stainless steel crowns on 2 teeth.
- For local anesthesia, the dentist infiltrated a total of 0.8 mL 2% lidocaine with 1:100,000 into the patient's mouth.
- ***The dentist additionally used copious and unmeasured lidocaine with epinephrine as an intracanal irrigant for the pulpectomy of 5 teeth with the excess suctioned away.***

Extubation and Recovery:

- Once the 1.25 hours of dental work were complete, the anesthesiologist turned off the sevoflurane and extubated the patient. The patient breathed on his own with a respiratory rate of 32 breaths per minute and a SaO2 of 99%. His pulse was 115 beats per minute, and his blood pressure was 101/36.
- The patient remained unresponsive for 40 minutes (versus expected 5-15 minutes).

Differential for delayed emergence:

- Rule out hypothermia, hypercarbia associated acidosis, and a postictal state.
- Throughout the entire case, the patient's temperature and end-tidal CO2 remained normal, he breathed spontaneously, and he had no convulsions.

Discharge:

The anesthesiologist was able to rouse the patient by placing a cold ice pack on his abdomen, and he walked with assistance. After discharge, the parents expressed concern that their child remained drowsy and lethargic the remainder of the day. The patient returned to his baseline functional and mental status the following day.

Discussion Points:

- This case demonstrates LAST presenting in a pediatric patient due to excessive lidocaine exposure via endodontic irrigation.
- While there are guidelines that dictate safe dosages of lidocaine for intraoral injection, ***no such guidelines exist for the use of lidocaine during irrigation.***
- "The Rule of 25," a guideline for the safe injection of local anesthetic, states dentists may use up to 1 cartridge of any marketed local anesthetic per 25 lbs of a healthy patient's weight [1]. The 2% lidocaine with 1:100,000 epinephrine used in this case is sold in 1.8 mL cartridges. Thus, for this patient, the maximum recommended amount of lidocaine with epinephrine is thus $(1 \text{ cartridge}/25 \text{ lb}) \times (28.7 \text{ lb}) = 1.15$ cartridges, the equivalent to 2.07 mL. The 0.8 mL local anesthetic the dentist infiltrated is safely below this value.
- In contrast, ***the amount of irrigant used per tooth in root canal preparation ranges from 10 mL to 25 mL [2].*** The highly vascular nature of dental pulp [3] may promote the absorption of lidocaine into systemic circulation. Therefore, when the dentist irrigated the patient's 5 pulpectomies with lidocaine with epinephrine, the patient was exposed to a ***toxic amount of lidocaine.***

Notably, this patient's CNS depression was observed in the absence of any concerning changes in vitals, such as abnormalities in EKG findings or blood pressure readings. The isolated CNS symptoms without accompanying cardiovascular symptoms may be explained because the nervous system is more sensitive to the interference of action potentials compared to the cardiovascular system [4]. Furthermore, CNS symptoms generally precede cardiovascular symptoms in the presentation of LAST [4].

For the treatment of cardiovascular instability in pediatric patients with LAST, ***Intralipid (20% lipid emulsion)*** dosing follows the adult dosing regimens [5]. The American Society of Regional Anesthesia and Pain Medicine recommends an ***IV bolus of 1.5 mL/kg of lean body mass, followed by a continuous infusion of 0.25 mL/kg/min to be continued for at least 10 minutes after cardiovascular stabilization is achieved [5].***

Though this child recovered from LAST without deficits, the dangers of lidocaine dental irrigation must not be overlooked. Until safety guidelines have been established for the maximal safe doses of 2% lidocaine with 1:100,000 for irrigation of pulpectomies, ***dentists should avoid using the solution as an irrigant to avoid exposing patients to harm.***

References:

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