



### K12 Childhood Prilocaine Fatality

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The goal of this presentation is to inform the attendees of the circumstances and toxicology involving the death of a child that resulted from inadvertent excessive administration of the local anesthetic prilocaine during a dental procedure.

This presentation will impact the forensic community and/or humanity by emphasizing the need for extreme caution when administering a local anesthetic to a patient with a low body mass, such as a child.

Severe toxicity from local anesthetics used in dental procedures is often due to accidental intravascular injection. To lessen the likelihood of such an occurrence, aspiration is performed before the anesthetic solution is injected. In the event that blood is aspirated, the needle is repositioned until no blood is observed upon aspiration. Nevertheless, rigorous adherence to such a precautionary measure, although fairly preemptive, does not definitively abolish inadvertent intravascular injection.

Among the local anesthetics commonly used in dental procedures is prilocaine or Citanest® (AstraZeneca Pharmaceuticals, Wilmington, DE). As with other local anesthetics, the pharmacological activity of prilocaine is mediated by blockage of voltage gated sodium channels. Administration of local anesthetics involves injection into the region of the nerve fibers to be blocked. The onset of anesthesia occurs an average of two minutes following prilocaine injection and lasts for approximately two hours. Prilocaine has a volume of distribution of 0.7-4.4 L/kg with 30% of the plasma concentration bound to proteins (1).

In preparation for a dental extraction procedure, a healthy 2-year-old male was administered nitrous oxide for sedation. This was followed by injection of four 1.8 mL ampules of the local anesthetic, prilocaine, with another ampule applied topically. Shortly thereafter, the child became quiet, exhibited seizure-like activity and became cyanotic. The child's condition improved following administration of 100% oxygen. However, upon arrival at the hospital, he went into cardiopulmonary arrest and was pronounced dead approximately 85 minutes after conclusion of prilocaine delivery. Routine toxicology screening analysis of blood and urine revealed the presence of only prilocaine and lidocaine. Anaphylactic reactions to amide-type local anesthetics are rare and measurement of serum tryptase, an indicator of anaphylaxis, was negative. Prilocaine concentration was measured by GC-MS with SKF-525A as internal standard. Blood obtained from the subclavian vein and the heart contained prilocaine at 14.6 and 13.0 mg/L, respectively. Concentrations of prilocaine in additional samples obtained at autopsy are indicated in Table 1. The cause of death was determined to be prilocaine toxicity resulting from excessive administration by injection. Prilocaine was measured in several other samples obtained at autopsy with the results reported herein. Kaliciak and Chan reported the death of an elderly patient undergoing a dental procedure with the blood prilocaine concentration of 13.4 mg/L, very similar to that found in the present fatality (2).

Table 1

Heart blood	13.0 mg/L
Peripheral blood	14.6 mg/L
Liver	14.0 mg/kg
Lung	26.1 mg/kg
Bile	31.1 mg/L
Vitreous fluid	14.7 mg/L
Urine	12.4 mg/L
Gastric contents	76.4 mg/L

As with all drug administration in the pediatric age group, the maximum dosage of prilocaine that may be safely delivered is governed by the weight of the child. Based on the manufacturer's recommendation of a maximum dose of 8 mg per kilogram, the total administered dose of prilocaine to this child, who weighed slightly less than 15 kilograms, would be limited to 120 mg of prilocaine (15 kg x 8 mg/kg). Delivery of such a dose corresponds to a total of 3 mL of prilocaine solution; available only as a 4% solution. As such, a maximum of one and two-thirds dental cartridges of prilocaine should be administered simultaneously to a child of this weight.



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This indicates that the significantly elevated concentration of prilocaine in this child is the result of excessive administration of this local anesthetic rather than a complication of direct intravascular bolus administration; a conclusion that is further supported by the dentist's account of the delivery of the prilocaine injections.

### References:

1. R.C. Baselt. *Disposition of Toxic Drugs and Chemicals in Man*, 7<sup>th</sup> ed., Biomedical Publications, Foster City, CA, 2004, pp 929-930.
2. H.A. Kaliciak and S. C. Chan. Distribution of prilocaine in body fluids and tissues in lethal overdose. *J. Anal. Toxicol.* 10: 75-6 (1986).

### Prilocaine, Fatality, Anesthetic