

Considerations on Local Anesthetics in Dentistry

By Dr. Del Valle & Dr. Shahgoli

Pain control by means of local anesthesia is an intrinsic part of every day clinical practice in dentistry. In the United States alone, dentists administer an estimated 300 million cartridges every year. Therefore, it falls upon the practicing dentist to acquire in-depth expertise in local anesthesia. It is our intention to provide a brief overview of local anesthetics and discuss potential adverse reactions and particular considerations in special patient populations.

Pharmacology

Local anesthesia is induced when propagation of an action potential is inhibited by blockage of sodium channels on the nerve membrane. Local anesthetics are classified as either amides or esters based on the bond between its hydrophilic and hydrophobic components. Most local anesthetics currently in use belong to the amide class (**Articaine, Lidocaine, Bupivacaine, Carbocaine**). Onset of action depends mainly on the pH of the tissues, (lower pH, like in an infection, will delay or all together prevent onset) and proximity of the deposition of the anesthetic to the nerve (infiltration vs a nerve block, the latter having slower onset). Duration of action depends on the length of time the anesthetic can stay in the nerve to block the sodium channels. Local anesthetics induce vasodilation and rapid diffusion from the site of injection. This vasodilation can be reduced by the addition of a vasoconstrictor, usually epinephrine. Bupivacaine is unique in that provides long-duration anesthesia in both arches. Biotransformation of amides occurs mainly in the liver and it becomes a consideration only in the patient with severe hepatic disease in terms of total dosage administered.

Adverse Reactions

Psychogenic Reactions

Anxiety-induced events are by far the most common adverse reaction associated with local anesthesia in dentistry. The most common being syncope, however, other symptoms might also present including hyperventilation, nausea and/or vomiting, or alterations in heart rate or blood pressure.

Allergic Reactions

True allergies to an amide anesthetic are exceedingly rare and, in addition, an allergy to one amide does not rule out the use of another amide. Allergy to epinephrine is impossible, however, allergies to sulfites, which are used as antioxidants whenever vasoconstrictor is present, are possible and should be considered. There is no cross-allergenicity between sulfites and sulfa. Symptoms of an allergy include urticaria, edema, and bronchospasm.

Toxicity

Toxicity of local anesthetics is a function of systemic absorption. High blood levels can result from repeated injections or a single intravascular injection, hence the need for aspiration prior to injection. Maximum recommended doses are weight dependent and therefore much more relevant in the pediatric population. High concentration solutions, like Articaine, will reach toxic levels with fewer injections. Symptoms depend on dose and worsen with increasing blood levels. These include, but are not limited to, sedation, slurred speech, disorientation, seizures and respiratory depression.

Paresthesia

Prolonged anesthesia or paresthesia of the lip or tongue may also occur after injection. Most of these reactions are transient and resolve within 8 weeks, but they may become permanent. Among the amides, Articaine has been reported to be more likely to be associated with paresthesia, therefore it should be used with more caution. The lingual nerve have been most commonly affected in this adverse reaction.



Contents

Page 1
Welcome to the Fall 2013 Newsletter

Page 2 & 3
Article: Considerations on Local Anesthetics in Dentistry

Page 4
Study Club Information & Event Info

Welcome to the Fall 2013 Edition

Thank you for checking out the fall edition of our newsletter. We hope you are enjoying the crisp autumn weather and all the season has to offer. Through sharing articles, research, tips, and events it is our goal that this newsletter provides you with an oral health resource. In the fifth edition you can find an article on the topic Considerations on Local Anesthetics in Dentistry and information on our upcoming event and study clubs. The study club provides continuing education credits to dentists who work with our practice or to dentists who are looking to get to know us better. Please be in touch with any questions or comments- feedback is always appreciated.

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Special Patient Populations

Pregnant Patients

The local anesthetic and vasoconstrictors used in dentistry can be safely administered to the pregnant or nursing patient. However, aspiration must always be carried out to avoid intravascular injection and compromising uterine blood flow. Among amides, Lidocaine has the best FDA ranking for use during pregnancy. In addition, its low-concentration formulation makes it easier to minimize total dosage.

Pediatric Patients

The main concern in pediatrics is the relative ease of inducing an overdose. Before administering local anesthetic, the dentist should be cognizant of the pediatric patient's weight and calculate the maximum dose to avoid an adverse event. Low-concentration formulations appear prudent in these cases. Again, lidocaine 2% may be the ideal anesthetic in the pediatric population.

Elderly Patients

There is no significant difference in response to local anesthetics between younger and older adults. Nonetheless, it is prudent to stay well below maximum recommended doses, as elderly patients often have some compromised hepatic function. Cardiovascular history in these patients should be considered when administering vasoconstrictor. In those with history of severe ischemic heart disease or recent myocardial infarction, vasoconstrictors should be avoided all together.

In conclusion, local anesthetics used in dentistry today are efficacious and safe. The decision regarding which drug to select depends on the estimated duration of action required, the patient's medical history and drug interactions.

Drug Formulations	Duration of Action IAN Block Mins	Max Dose mg/kg /cartridges
Articaine 4% w epi 1/200,000	230 mins	7mg/kg / 7
Bupivacaine .5% w epi 1/100,000	440 mins	2mg/kg / 10
Lidocaine 2% w epi 1/100,000	190 mins	7mg/kg / 13
Mepivacaine 3%	165 mins	6mg/kg / 11

NYC Interdisciplinary Study Club

Shahin Shahgoli
DDS

Antonio Del Valle
DMD, MD

Manhattan Maxillofacial Surgery Group
45 West 54th Street, New York, NY 10019
(212) 245-5801



Dental Study Club Meeting Information Meetings Include 3 CE Credits & Dinner

November 13 -- Lectured by Daniel Pompa, DDS
Current Advancements in Apical Surgery

January 22 -- Lectured by Jonathan Kang, DDS
CAD/CAM Advancements in Dentistry

Meeting Location: Dopo Teatro
125 West 44th Street (6th & 7th)
Time: 6:30 PM- 9:30 PM

If you are interested in attending our meeting, please contact us for availability. Seat reservations by RSVP only.

CONTACT

For reservations, questions,
or comments contact:

Carly Siegel
Marketing Manager
prmmmsg@gmail.com
(917) 675-0109