

Precautions to Vasoconstrictors and/or Local Anesthetic Agents

A complete and thorough review of the medical history must occur at each appointment to determine patients' current physical status. ¹⁻⁴

ASSOCIATED DISEASE	SIGNIFICANCE
Recent myocardial infarction (MI)	<ul style="list-style-type: none"> • Within 30 days – increase risk for cardiac events may preclude elective care • Determine severity and stability of cardiac condition through medical consultation • Utilize risk calculators for major adverse cardiac event (MACE) prior to procedures • Implement stress reduction protocols and limit exogenous epinephrine to 0.04 mg MRD (2 cartridges of 1:100,000 or 4 cartridges of 1:200,000)
Cerebrovascular Events (CVA, TIA, RIND)	<ul style="list-style-type: none"> • Highest risk of a repeat event within 90 days • Determine degree of impairment through medical consultation • Use vasoconstrictors with caution
Unstable angina, recent coronary artery bypass surgery, refractory arrhythmias, untreated or uncontrolled congestive heart failure	<ul style="list-style-type: none"> • Increases risk of severe outcomes
Uncontrolled diabetes mellitus	<ul style="list-style-type: none"> • Increases risk of hyperglycemic effects
Uncontrolled hyperthyroidism or thyrotoxicosis	<ul style="list-style-type: none"> • Increases risk of thyroid crisis • Adverse reaction with epinephrine
Pheochromocytoma: catecholamine producing tumors	<ul style="list-style-type: none"> • Generally a benign tumor of the adrenal gland • May lead to adrenal insufficiency • AVOID vasoconstrictors and delay elective dental care



*Physician consult for current physical status may be considered. Follow the American Society of Anesthesiologists' Physical Status Classification Guidelines.

Allergies and Medication Usage

Summary of Relative Contraindications of Local Anesthetic (LA) Agents: Allergies and Medication Usage¹⁻⁶



ALLERGY AND DRUG FACTORS*	SIGNIFICANCE/MODIFICATIONS
Documented allergy to local anesthetic (LA) drug Sulfite sensitivity/allergy to sodium bisulfite and metabisulfite	<ul style="list-style-type: none"> • AVOID anesthetics of the same chemical group • Use caution for patients with steroid-dependent asthma as they are at increased risk of sulfite allergy • AVOID vasoconstrictors
Atypical Pseudocholinesterase	<ul style="list-style-type: none"> • AVOID ester LA agents including topical anesthetics and other chemically related drugs
Malignant hyperthermia	<ul style="list-style-type: none"> • Administer amide anesthetic agents • Follow the guidelines provided by the Malignant Hyperthermia Association of the United States
Anxiolytics/benzodiazepines Valium (diazepam) Ativan (lorazepam)	<ul style="list-style-type: none"> • Possible central nervous system depressant effects • Limit anesthetic dosage
Cocaine, methamphetamine, amphetamine use/abuse	<ul style="list-style-type: none"> • Primary concerns are hypertensive crisis, myocardial ischemia, and cardiac arrhythmia • Prolonged and intense state of vasoconstriction • AVOID use of vasoconstrictor for 24 hours following use
Phenothiazines Antipsychotic/antiemetic/neuroleptic Thorazine (chlorpromazine) Mellaril (thioridazine)	<ul style="list-style-type: none"> • Possible hypotensive episodes • Limit vasoconstrictor per appointment: 0.04 mg epinephrine 0.2 mg levonordefrin
Monoamine oxidase inhibitors	<ul style="list-style-type: none"> • Risk of acute hypertensive crisis • Limit epinephrine per appointment: 0.04 mg
Tricyclic antidepressants (TCA) Elavil (amitriptyline) Anafranil (clomipramine)	<ul style="list-style-type: none"> • Risk of acute hypertension and cardiac dysrhythmia • TCAs potentiate effects of epinephrine • Limit epinephrine per appointment: 0.04 mg • AVOID levonordefrin

*Clinical judgment and possible physician consult may be advised when determining the benefits and risks of administering a vasoconstrictor to patients who are medically compromised. Lack of profound anesthesia may increase endogenous epinephrine exceeding that administered from a local anesthetic agent with a vasoconstrictor.

Systemic Health Problems

Summary of Relative Contraindications of Local Anesthetic (LA) Agents: Systemic Health Problems¹⁻⁶



SYSTEMIC HEALTH PROBLEM *	SIGNIFICANCE/MODIFICATIONS
Significant cardiovascular disease/history of myocardial infarction, stroke, and hypertensive drugs	Use LA with no vasoconstrictor or limit vasoconstrictor per appointment: 0.04 mg epinephrine, 0.2 mg levonordefrin
Controlled hypertension nonselective beta blockers: Inderal (propranolol) and Corgard (nadolol)	<ul style="list-style-type: none"> • Vasoconstrictors may increase risk of hypertensive episode • Limit vasoconstrictor per appointment: 0.04 mg epinephrine, 0.2 mg levonordefrin
Controlled diabetes	<ul style="list-style-type: none"> • Use epinephrine with caution • If significant cardiovascular disease is present, limit vasoconstrictor per appointment: 0.04 mg epinephrine, 0.2 mg levonordefrin
Controlled hyperthyroidism	<ul style="list-style-type: none"> • Limit vasoconstrictor per appointment: 0.04 mg epinephrine, 0.2 mg levonordefrin
Significant liver dysfunction	<ul style="list-style-type: none"> • Short appointments • Use amides judiciously • Articaine may be preferred agent (contains both ester and amide properties)
Significant renal dysfunction	<ul style="list-style-type: none"> • All drugs cleared more slowly and may lead to increased risk of overdose • Use ester and amide agents judiciously
Methemoglobinemia	<ul style="list-style-type: none"> • Reduced oxygen-carrying capacity • AVOID benzocaine and prilocaine
Glaucoma	<ul style="list-style-type: none"> • AVOID vasoconstrictors because they may increase ocular pressure
Pregnancy American Society of Anesthesiologists II US Food and Drug Administration (FDA) pregnancy and lactation drug categories" (A,B,C,D, and X) are no longer utilized	<ul style="list-style-type: none"> • Administration of LA is generally considered safe for mother and fetus • Physician consultation may be initiated • Elective care recommended in second trimester • Limit dosage of selected agent • Review the FDA's Updated Pregnancy and Lactation Labeling Rule

*Clinical judgment and possible physician consult may be advised when determining the benefits and risks of administering a vasoconstrictor to patients who are medically compromised. Lack of profound anesthesia may increase endogenous epinephrine exceeding that administered from a local anesthetic agent with a vasoconstrictor.

Local Anesthetic Agents in the United States

Readily Available Local Anesthetic Agents in the United States 1-2



DURATION CATEGORY	SPECIFIC AGENTS	MG/LB BODY WEIGHT <small>for weight ≤150 pounds</small>	HEALTHY ADULT US FOOD AND DRUG ADMINISTRATION (FDA) MAXIMUM NUMBER OF CARTRIDGES PER APPOINTMENT LIMITING AGENT	CONSIDERATIONS
Short acting	Mepivacaine 3% Prilocaine 4%, Plain	3.0 mg/lb 3.6 mg/lb*	400 mg or 7 cartridges 600 mg or 8 cartridges	<ul style="list-style-type: none"> • Sensitivity to sulfites • Short procedures: 20 minutes to 40 minutes pulpal anesthesia • Concern for self-mutilation post-operatively
Intermediate acting	Lidocaine 2% 1:50,000 epi Lidocaine 2% 1:100,000 epi Mepivacaine 2% 1:20,000 levo Articaine 4% 1:100,000 epi Articaine 4% 1:200,000 epi Prilocaine 4% 1:200,000 epi	3.2 mg/lb 3.2 mg/lb 3.0 mg/lb 3.2 mg/lb 3.2 mg/lb 3.6 mg/lb*	500 mg or 5.5 cartridges epinephrine 500 mg or 11 cartridges epinephrine 400 mg or 11 cartridges Mepivacaine = Levonordefrin No FDA Maximum noted No FDA Maximum noted 600 mg or 8 cartridges Prilocaine	<ul style="list-style-type: none"> • Provides enhanced hemostasis during surgical procedures • Intermediate duration agents provide approximately 60 minutes to 90 minutes of pulpal anesthesia • Appropriate for routine procedures on healthy adults • Rapid onset • 1:200,000 concentration allows twice as much epi to be administered without exceeding the MRD
Long acting	Bupivacaine 0.5% 1:200,000 epi		0.9 mg/lb – 90 mg 10 cartridges Bupivacaine	<ul style="list-style-type: none"> • Provides longest post-operative pain control
Maximum dosage of vasoconstrictors				<p><u>MRD for Healthy Adults</u> 0.2 mg epinephrine 1.0 mg levonordefrin</p> <p><u>MRD for Medically Compromised Adults</u> 0.04 mg epinephrine 0.2 mg levonordefrin</p>

*Some sources note Prilocaine 4% using 4.0 mg/lb. Both 3.6 mg/lb and 4.0 mg/lb are within the FDA recommendation level. To increase patient safety during the administration of local anesthetics and vasoconstrictors, the clinician should always administer the lowest clinically effective dose. "The maximum recommended dose (MRD) for a local anesthetic or vasoconstrictor is defined as the highest amount of an anesthetic drug that can be safely administered without complication to a patient while maintaining its efficacy."¹ The MRD for local anesthetic agents are determined by the manufacturer based on the review and approval by the US FDA. Maximum doses are also reviewed by the Council on Dental Therapeutics of the American Dental Association and the United States Pharmacopeial (USP) Convention. Maximum doses for some local anesthetic agents have been modified by experts in the field to adopt a more conservative dose than recommended by the USP, FDA, or manufacturers. Conservative doses are published in many textbooks, and have been traditionally taught in dental and dental hygiene programs. Each practitioner should determine the most appropriate dose for each specific patient and procedure to be performed.

Recommended Doses Per Appointment for Healthy Children

American Academy of Pediatric Dentistry (AAPD) Maximum Recommended Doses Per Appointment for Healthy Children ¹⁻³

TYPE OF AGENT	ANESTHETIC AGENTS	MG / LB	MG / KG	MAXIMUM PER APPOINTMENT ³
Short acting	Mepivacaine 3% plain	2.0	300 mg	Determined by weight, age, and procedure Systemic absorption of topical anesthetic must be included in total anesthetic administered Maximum total dose of local anesthetic should be reduced when administered with other medications that depress the CNS Always administer the lowest total dose possible to provide effective anesthesia Always have protocols for emergency management of patients in place
Intermediate acting	Mepivacaine 2% 1:20,000 levonordefrin	2.0	4.4	
	Lidocaine 2% 1:100,000 epinephrine	2.0	4.4	
	Articaine 4% 1:100,000 epinephrine	3.2	7	
	Articaine 4% 1:200,000 epinephrine	0.6	7	
Long acting	Bupivacaine 0.5%	0.6	1.3	



Use of Articaine in pediatric patients under four years of age is not recommended.

Use in pediatric patients under 12 years of age is not recommended.

Refer to AAPD guidelines related to doses for infants younger than 6 months of age. Maximum dose may be determined by using Standard Tables, Clark's Rule, or Young's Rule. Standard tables and Clark's Rule should not be used for children who are obese. The ideal body weight index should be used for calculating the MRD for children who are obese. A scale should be available in the dental office to accurately calculate the MRD for pediatric patients.

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4. Logothetis DD. *Local Anesthesia for the Dental Hygienist*. 3rd ed. St. Louis: Elsevier; 2022.

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4. Bassett K, DiMarco A, Naughton D. *Local Anesthesia for Dental Professionals*. 2nd ed. Upper Saddle River, New Jersey: Pearson; 2015.
5. United States Food and Drug Administration. Pregnancy and Lactation Labeling (Drugs) Final Rule. <https://www.fda.gov/drugs/labeling-information-drug-products/pregnancy-and-lactation-labeling-drugs-final-rule>. Accessed September 26, 2022.
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3. American Academy of Pediatric Dentistry. Use of Local Anesthesia for Pediatric Dental Patients. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2023:385-92.