Local anesthetic delivery system

Product name: CompuDent featuring the WAND Handpiece

Manufacturer: Milestone Scientific, 151 S. Pfingsten Road, Deerfield, Ill. 60015, 1-800-862-1125, "www.milesci.com"

ADA Acceptance: Received ADA Seal of Acceptance in May 1998

CONSIDERATIONS FOR ACCEPTANCE

The Council on Scientific Affairs evaluated the WAND for safety and efficacy according to the ADA Acceptance Program Guidelines for Instruments and Accessory Products and American National Standards Institute/ADA Specification No. 34 for Dental Aspirating Syringes. The WAND was cleared for marketing by the U.S. Food and Drug Administration through a 510(k) application.

CLINICAL EVALUATIONS

The WAND system was evaluated in terms of subjects' experience of pain and anxiety and its utility for different types of injections.[1] Researchers evaluated subjective pain response by performing injections with the WAND vs. traditional syringes. Fifty dentists received contralateral palatal injections, one side with the WAND and the other side with a traditional syringe. Pain was rated subjectively using two scales: a five-point verbal scale and a 100-millimeter visual analog scale. The investigators found that 48 of the 50 subjects rated the WAND injection as less painful than a traditional syringe injection. The reduction in pain associated with injections given by the WAND compared with those given by a traditional syringe was statistically significant.

A second study involved use of the WAND for traditional block injections and infiltrations.[2] In addition, the researchers described the WAND-assisted anterior middle superior alveolar nerve block. This palatal injection resulted in pulpal and palatal soft-tissue anesthesia without anesthesia of the overlying facial soft tissue. A third article describes a significant decline in fear level for return dental visits in patients who had received injections via the WAND at previous dental appointments.[3]

BENEFITS AND CONSIDERATIONS

The WAND is effective for all injections that can be performed using a standard aspirating syringe with some automation. The WAND is held like a pen, which may be less cumbersome than a traditional syringe. A foot pedal controls aspiration and injection of the anesthetic. Injections may take more time because of the reduced anesthetic flow rate. The controlled flow of anesthetic is thought to reduce pain and, thus, patient fear and anxiety.

ADA ACCEPTED American Dental Association

"The WAND local anesthetic delivery system is Accepted as a device that has been shown to safely and effectively deliver anesthetic solution when used by an appropriately qualified professional."—Council on Scientific Affairs, American Dental Association.

1. Hochman MN, Chiarello D, Hochman CB, Lopatkin R, Pergola S. Computerized local anesthetic delivery vs. traditional syringe technique: subjective pain response. N Y State Dent J 1997;63(7):24-9.
2. Friedman MJ, Hochman MN. A 21st century computerized injection system for local pain control. Compend Contin Educ Dent 1997;18:995-1003.
3. Krochak M. Using a precision-metered injection system to minimize dental injection anxiety. Compend Contin Educ Dent 1998;19(2):137-46.

Local anesthetics

Cocaine, the first widely used local anesthetic, was introduced to dentistry in 1884 when a dental surgeon operated painlessly on his own upper incisors after undergoing an injection of cocaine into the infraorbital nerve.[1] Parenteral administration of cocaine was found to be toxic, however, which led to the search for alternative drugs. In 1904, procaine, an ester local anesthetic that was suitable for injection, was introduced. The ester local anesthetics were followed by the amides in the 1940s. Amide anesthetics include mepivacaine, prilocaine, bupivacaine, etidocaine and articaine. Articaine is a unique amide because it contains an ester group and a thiophene group that increases its liposolubility.[2]

Injectable local anesthetics consist of amphiphilic molecules, meaning that they dissolve in both aqueous and lipid environments. A lipophilic ring structure on one end of the molecule is combined with a hydrophilic secondary or tertiary amino group on the other. The esters and amides are distinguished by the type of chemical bond joining the two ends of the molecule. In the United States, only amide-type local anesthetics are marketed in dental cartridges. This is because the amides have the fewest overall risks with the greatest clinical benefits. The benefits include a greater efficacy in achieving intraoral anesthesia and a lower risk of allergic reaction.

SELECTING A LOCAL ANESTHETIC

Selection of a local anesthetic for a dental procedure should be based on four criteria:[3]

- duration of the dental procedure;
- requirement for hemostasis;
- requirement for postsurgical pain control;
- contraindication(s) to specific anesthetic drugs or vasoconstrictors.

Duration. Short-acting agents that typically provide pulpal and hard-tissue anesthesia for up to 30 minutes after submucosal infiltration are 2 percent lidocaine, 3 percent mepivacaine and 4 percent prilocaine.

Intermediate-acting agents that typically provide up to 60 minutes of pulpal anesthesia are 4 percent articaine with 1:100,000 or 1:200,000 epinephrine, 2 percent lidocaine with 1:50,000 or 1:100,000 epinephrine, 2 percent mepivacaine with 1:20,0000 levonordefrin and 4 percent prilocaine with 1:200,000 epinephrine.

Long-acting agents that typically last up to eight hours after nerve block are 0.5 percent bupivacaine with 1:200,000 epinephrine and 1.5 percent etidocaine with 1:200,000 epinephrine.[3]

The addition of adrenergic drugs also increases the duration of action of local anesthetics. Epinephrine and levonordefrin activate α-adrenergic receptors in blood vessels, causing vasoconstriction. Decreasing tissue blood flow slows the absorption of the local anesthetic, thus prolonging its duration of action.

Hemostasis. Lidocaine with epinephrine usually is administered for temporary hemostasis. The 1:50,000 strength of epinephrine provides little benefit over the 1:100,000 strength in terms of duration of anesthesia, but it significantly decreases bleeding when given by local infiltration.[3]

Postsurgical pain control. Bupivacaine and etidocaine can alleviate surgical pain for up to eight hours after a procedure.[3]

Contraindications. Allergy is the only contraindication for use of any local anesthetic. There is little evidence of cross-allergenicity among the amides; however, if an allergy to one anesthetic is suspected, another anesthetic with the least molecular similarity should be chosen. Lidocaine is most similar to prilocaine and etidocaine in structure, whereas mepivacaine is most similar to bupivacaine. Articaine has a unique molecular structure. When the clinician suspects that a patient may have an allergy to sulfite preservatives, he or she should use the 3 percent mepivacaine and 4 percent prilocaine solutions without vasoconstrictor.

Repeated injection of local anesthetics containing vasoconstrictors can decrease blood flow to the extent that anoxic tissue injury results. Local anesthetic solutions containing vasoconstrictors may be contraindicated in patients with significant cardiovascular disease or in patients taking medications that may increase the activity of the vasoconstrictor. ■

1. Hall RJ. Hydrochlorate of cocaine. N Y Med J 1884;40:609-11.
2. Malamed SF, Gagnon S, Leblanc D. Articaine hydrochloride: a study of the safety of a new amide local anesthetic. JADA 2001;132:177-85.
3. Yagiela JA. Injectable and topical local anesthetics. In: Ciancio SG, ed. ADA guide to dental therapeutics. 2nd ed. Chicago: American Dental Association; 2000.