

Local Anesthesia in Oral Surgery

- Local anesthesia (L. A.) could be defined as a loss of sensation in a circumscribed area of the body caused by a depression of excitation in nerve ending or inhibition of the conduction process in peripheral nerves
- Local anesthesia, as it is known today, began when a German chemist (**Albert Niemann**) (1860) successfully isolate the active principle of coca leaf, he named it cocaine.
- In (1884) an ophthalmologist (**Carl Koller**) used the first local anesthetic on a patient with glaucoma.
- In (1898) professor (**Heinrich Braun**) introduced procaine as the first derivative of cocaine which is known as the first synthetic local anesthetic drug.
- In (1940) the first modern local anesthetic agent was introduced and known as lidocaine, (trade name Xylocaine) , the discoveries continued until our days where local anesthesia is used widely in all dental treatments.

Pharmacology

- Local anesthetics are divided into two functional groups based on their chemical properties: amides and esters.
- The ester group includes the earlier anesthetics procaine, cocaine, and novocaine. Although generally the topical anesthetics (applied before the injection) are still part of the ester family.
- The more modern amide group includes lidocaine (or xylocaine), mepivacaine (or carbocaine), prilocaine (or citanest), bupivacaine (or marcaine), and etidocaine (or duranest).
- The amides are preferable to the esters because the means by which the body breaks down the substance of the drug is less likely to cause an allergic reaction.

- (Esters are reduced by esterase in the tissue and amides are reduced in the liver and excreted in the kidneys.) The lipid solubility, potency, duration of action, and ionization constant are all preferable in the amide group.

Anesthetic Action

- The most popularly held theory postulates that the local anesthetic interferes with the sodium channel and blocks the sodium transfer necessary for nerve conduction (The Specific Receptor Theory).
- The anesthetic inhibits sodium flow through the membrane. Different anesthetics bind at different sites in the membrane. The anesthetic must permeate 8 to 10 mm of the nerve's length to profoundly block the generation of the nerve impulse since an impulse can be strong enough to skip over one or two of the nerve cells.
- General anesthetics act on the synapses of the central nervous system, while the local anesthetics affect the axonal membranes of peripheral nerves.
- Local anesthetics act during the depolarization phase of the nerve impulse generation. The rate of depolarization is reduced and the nerve doesn't ever reach the firing potential.

Vasoconstrictors

- Has the following advantages:
 1. It reduces toxic effects by retarding the production of the constituents.
 2. By confining the anesthetic agent to a localized area it increases the depth and duration of anesthesia.
 3. It produces a relatively bloodless field of operation for surgical procedures.

The use of vasoconstrictors should be carefully used with patients that are medically compromised by high blood pressure, cardiovascular disease, or hyperthyroidism. If the patient's condition is controlled with medication, slow administration with sure negative aspiration may be acceptable. No more than 2 cartridges of lidocaine with 1:100,000 concentration of epinephrine should be used on epinephrine sensitive patients.

Contraindications for Epinephrine in Local Anesthesia

Epinephrine is contraindicated in patients with:(from Malamed *Handbook of Local Anesthesia*)

- blood pressure over 200 torr systolic or 115 torr diastolic,
- uncontrolled hyperthyroidism,
- severe cardiovascular disease including less than 6 months after a myocardial infarction or cerebrovascular accident
- daily episodes of angina pectoris or unstable angina
- cardiac dysrhythmias despite appropriate therapy
- medicated with β -blocker, monoamine oxidase inhibitors, or tricyclic antidepressants; or general anesthesia with a halogenated anesthetic like halothane, methoxyflurane, or ethrane.

Toxicity

- So for a average weight patient the maximum dose is $2 \text{ mg/lb} \times 180$ divided by 36 mg in the cartridge = 10 cartridges. But the maximum dose for this drug is 300 mg which is 8 cartridges. In the same patient, the maximum dose for citanest would be 5.5 cartridges.

- If the anesthetic does not produce pain control on the second injection, it may be because of a lower pH of the tissues, edema, hemorrhage, or transudation in the surrounding area.
- If the patient indicates pain, the nerve has returned to function and it is usually more difficult to achieve profound anesthesia again. Anesthetics are not as effective when infection is present because the pH of the tissues is too low to allow the anesthetic to penetrate the nerve sufficiently.

Types of vasoconstrictors

1. *Adrenaline* (epinephrine, Supranol) , a synthetic alkaloid almost identical with the natural secretion of adrenal medulla.
2. *Noradrenalin* (laevoartenol, norepinephrine), a synthetic substance similar to the pressor amine secreted in the human body by monoaminergic neurons in the brain and at the adreno-neural and myo-neural junctions of the sympathetic nervous system.
3. *Felypressin* (Octapressin), a synthetically produced polypeptide similar to that secreted from the human posterior pituitary gland.

Uses of local anesthesia

- **Elimination of pain**

For extraction of teeth, conservative dentistry, minor oral surgery. Under special circumstances, quite major oral surgery.

- **Diagnostic aid**

If local anesthesia abolishes pain, then the cause must be in the area of distribution of the nerve blocked.

- **Control of bleeding**

Due to vasoconstrictor content, e.g. prior to surgery, to arrest postoperative hemorrhage. The local anesthetic permits suturing while the vasoconstrictor reduce bleeding.

Terminology

- **Pain** - unpleasant physical sensation experienced followed the application of noxious stimuli; although the supporting tissues of the teeth can themselves give rise to pain most of the nerve endings in the periodontal membrane are proprioceptive
- **Anesthesia:** - means loss or abolition of all modalities of sensation which includes pain and touch
- **Analgesia** - means loss of pain sensation only
- **Paresthesia** - means altered sensation (tingling sensation) and this may occur when a damaged nerve is regeneration or when a local anesthesia is either starting to work or its effect is wearing off

Constituents of local anesthesia:

1. Sterile distilled water.
2. Local anesthetic drug or combination of drugs.
3. Buffer to maintain *pH*.
4. NaCl to make solution isotonic.
5. Preservative to prevent inactivation of vasoconstrictor.
6. Antiseptic.

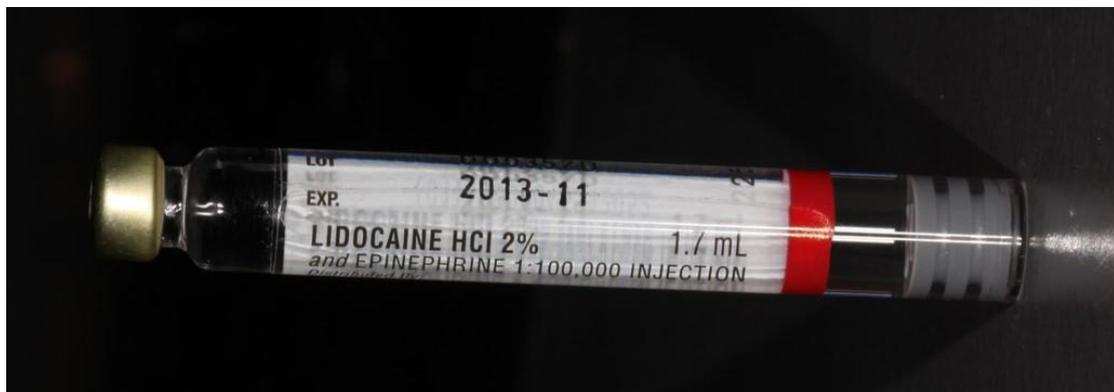
Equipment

Equipments include the syringe, the needle, and the local anesthetic cartridge (containing the local anesthetic solution). •



Cartridge (carpule)

The solution in the cartridge contains the local anesthetic, sodium chloride, distilled water, and if indicated, a vasoconstrictor drug with preservative.



- **The syringe**

The basic design of the dental syringe consists of a metal barrel and plunger (piston) united by a spring loaded hinge mechanism. At the end of the barrel there is screw hub by which the needle is attached.

Types of dental syringe:

1. Aspirating dental syringe:

The end of the piston has a device like a hook which will penetrate the thick rubber stopper at the end of the cartridge.

2. Non-aspirating dental syringe:

In this type the piston or the plunger will end in a smooth flat end that a slight amount of aspiration may be achieved with this type by making a small initial injection of solution and then releasing the pressure on the piston, which then rebounds to produce

