

# Local Anesthesia and Pain Control for the Child and Adolescents

It is important at each visit to reduce discomfort to a minimum and to control painful situations.

Because there is usually some discomfort associated with the procedure, use of a local anesthetic is generally indicated when

- operative work is to be performed on the permanent teeth, and in primary teeth.
- The local anesthetic can prevent discomfort that may be associated with placing a rubber dam clamp, ligating teeth, and cutting tooth structure.
- Even the youngest child treated in the dental office normally presents no contraindications for the use of a local anesthetic.

## *ANALGESICS*

In addition to local administration of anesthetics, systemic administration of analgesics is occasionally necessary to help control pain. These analgesics may be needed in

\*instances of moderate to severe pain associated with trauma or infectious processes such as abscessed teeth

\* or they may be administered preoperatively or postoperatively in association with a dental procedure that may cause pain for the child.

The rationale for the preoperative administration of analgesics draws on the theory that giving the drug before the procedure provides effective analgesia because it precedes the inflammatory response and subsequent pain incurred during the operative procedure.

The first choice in most cases is the least potent analgesic with the fewest side effects. The following table provides common pediatric pain management agents and their appropriate dosage schedules. Rarely does the recommended dosage of acetaminophen or nonsteroidal anti-inflammatory drugs fail to control the dental pain, and in such cases, the combination of codeine and acetaminophen provides the needed pain relief. Finally, in cases of severe pain in which codeine and acetaminophen are not effective, hydrocodone and acetaminophen may be indicated.

<b>Medication</b>	<b>Availability</b>	<b>Dosage</b>
Acetaminophen	Elixir: 160 mg/5 mL Tablets: 325 mg Chewable: 160 mg	10-15mg/kg/dose given at 4-to 6-hour intervals
Ibuprofen	Suspension: 100 mg/5 mL Tablets: 200, 300, 400, 600, 800 mg	4-10mg/kg/dose given at 6- to 8-hour intervals
Tramadol	Tablets: 50, 100 mg	1-2mg/kg/dose given at 4- to 6-hour intervals – maximum 100 mg
Codeine and acetaminophen	Suspension: 12 mg/5 mL 12 mg codeine/120 mg acetaminophen/5 mL	0.5-1.0mg/kg/dose given at 4- to 6-hour intervals
Hydrocodone and acetaminophen	Suspension: 7.5 mg hydrocodone/325 mg acetaminophen/15 mL Tablets: 5 mg hydrocodone/325 mg acetaminophen	0.3mL/kg/dose given at 4- to 6-hour intervals <50 kg 0.135 mg/kg

## **TOPICAL ANESTHESIA**

Topical anesthetic is used to minimize the discomfort caused during administration of local anesthesia. Topical anesthetic agent is effective on surface tissues (2-3 mm in depth) to reduce painful needle penetration of the oral mucosa. A variety of topical anesthetic agents are available in gel, liquid, ointment, patch, and aerosol forms.

### **Agents Used as Topical Anesthetics**

1. Ethyl p-aminobenzoate
2. Butacaine sulfate
3. Cocaine
4. Dyclonine
5. Lidocaine
6. Tetracaine.

The topical anesthetic benzocaine is manufactured in concentrations up to 20%; lidocaine is available as a solution or ointment up to 5% and as a spray up to a 10% concentration. Ethyl p-aminobenzoate (benzocaine) is best suited in dentistry as they provide a rapid onset and longer duration of action. They are not known to produce any allergic reactions.

## Method of Application of Topical Anesthetic Agent

The mucosa at the site of application is cleaned and dried. A small amount of the agent is taken on a cotton swab and applied to the tissue .

Topical anesthesia is produced in about 30 seconds. Onset of action for benzocaine is 30 seconds, tetracaine is 60 seconds and lidocaine is 3-5 minutes.



## LOCAL ANESTHESIA

### Definition

“The loss of sensation in a circumscribed area of the body due to depression of excitement in nerve endings or an inhibition of conduction process.”

### Local Anesthetics

They are drugs that produce anesthesia in the region where it is applied or introduced.

It is required that these drugs remain in the local area following their administration and gets absorbed slowly for a prolonged duration of action. Almost all of the local anesthetic agents except cocaine causes vasodilation, which means that these drugs are absorbed at a faster rate into the circulation, decreasing the duration and quality of anesthetic action and may lead to overdose. Thus a vasoconstrictor is added to the local anesthetic solution to counteract the vasodilation.

### Classification of Local Anesthetic Agents

#### 1. Ester group:

a. Benzoic acid esters. Examples are:

- Cocaine
- Benzocaine
- Butacaine
- Piperocaine
- Tetracaine

b. Para-aminobenzoic acid esters. Examples are:

- Procaine
- Propoxycaine
- Chlorprocaine

#### 2. Amide group

- a. Bupivacaine
- b. Lidocaine
- c. Mepivacaine
- d. Prilocaine
- e. Etidocaine
- f. Articaine

### 3. Quinoline group

a. Centbutridine: It is five to eight times as potent as lidocaine with similar onset of action and duration. It does not adversely affect the CNS and the CVS in high doses.

### Composition of Local Anesthetic Solution

I. Local anesthetic agent : Lignocaine hydrochloride 2%

II. Vasoconstrictor: Adrenaline 1: 50,000 to 1: 2,00,000 Uses- Delays the absorption of LA from the site

- a. Provides blood less field
- b. Prolongs the action
- c. Reduces systemic toxicity

III. Reducing agent: Sodium metabisulfite

– Prevents oxidation of the solution

IV. Preservative: Methyl paraben, capryl hydro cuprino toxin

V. Fungicide: Thymol

VI. Vehicle: Ringer's solution

### Mechanism of Action

Local anesthetic agents are weak bases; they are commonly combined with a strong acid (HCl) to improve water solubility, tissue diffusibility and stability in solution. When acid is injected into the tissue, it interacts with tissue buffers, forming free base, or unionized from which permits diffusion of the anesthetic agent across the nerve membrane; where it dissociates into ionized form. It in turn interferes with the conduction of action potential along the peripheral nerve fibers by impairing the functions of sodium ion channels. Nerve impulses cannot be propagated when adequate numbers of sodium channels are not available.

- Recovery from nerve blockade is dependent on redistribution and metabolism of the local anesthetic solution.

### Onset and Duration of Action of Anesthesia of 2% Lignocaine 1:100,000 Epinephrine

#### *Onset of Action*

Infiltration—2 minutes

Block—2-4 minutes

#### *Duration of Action*

Infiltration – Pulpal—1 hour

– Soft tissue—2½ hours

Block – Pulpal—1½ hours

– Soft tissue—3-5 hours

## ***Contraindications for local anesthetics:***

- Absolute contraindications for local anesthetics include a documented local anesthetic allergy. True allergy to an amide group is exceedingly rare. Allergy to one amide does not rule out the use of another amide but allergy of one ester rules out the use of another ester.
- A bisulfate preservative is used in local anesthetics with epinephrine. For patients having an allergy to bisulfate, use a local anesthetic without a vasoconstrictor.
- A long acting local anesthetic (Bupivacaine) is not recommended for children or physically or mentally disabled patient due to its prolonged effect, which increases the risk of soft tissue injury.
- Prilocaine may be contraindicated in patient with methemoglobinemia, sickle cell anemia or symptoms of hypoxia or in patients receiving acetaminophen or phenacetin, since both medications elevate methemoglobin levels.

## ***Maximum amount of local anesthesia that can be given is:***

4.4 mg/kg body weight: Lidocaine, Mepivacaine

6.0 mg/kg body weight: Prilocaine

7.0 mg/kg body weight: Articaine

## **AAPD Guidelines on Selection of Syringes**

The American Dental Association (ADA) has established standards for aspirating syringes for use in the administration of local anesthesia. Needle selection should allow for profound local anesthesia and adequate aspiration. Larger gauge needles provide for less deflection as needle passes through soft tissues and for more reliable aspiration.

The depth of insertion varies not only by injection technique, but also by the age and size of the patient. Dental needles are available in 3 lengths:

- Long (32 mm)
- Short (20 mm)
- Ultra short (10 mm)

Needle gauges range from size 23 to 30.

Needles should not be bent or inserted to their hub for injections to avoid needle breakage.

## **General Techniques**

### *Use of Assistant*

- Assistant should be ready at all times to restrain hands; position the child control movements.
- Assistant can help block view and keep the patient distracted.

### *Use Topical Anesthetic*

- Use appropriate topical anesthetic
- Allow at least 1 minute for application.

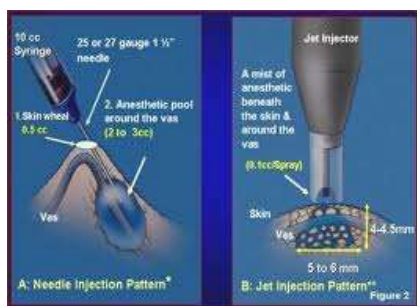
## Jet Syringe

It is a needle less method of depositing local anesthetic agent, primarily used for topical anesthesia. The solution is forced through a very small opening, which penetrates the mucosal membrane. This method is not adequate for producing pulpal anesthesia.

Other uses of jet injection are

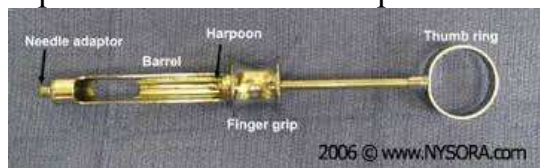
- to obtain gingival anesthesia before placement of rubber dam
- removal of a loose tooth or placement of the band.

The posttreatment soreness at the injected site and the associated cost are some of the disadvantages of this method.



## Metal Cartridge Type Syringe (Aspirating Syringe)

This is a relatively safe syringe that helps prevent intravascular injections of anesthetic agent. A preloaded anesthetic carpule is used .



## Computer Controlled Local Anesthetic Delivery Systems (CCLD)

This method of delivery system has an edge over the conventional method in providing controlled deposition of the solution. It enables the dentist in accurate placement of the needle while delivering the predetermined amount of solution through a foot activated control. The pain perceived by the patient is also reduced compared to the traditional method.

