

## **ANESTHETIZATION OF MAXILLARY TEETH AND SOFT TISSUE**

### **ANESTHETIZATION OF MAXILLARY PRIMARY AND PERMANENT INCISORS AND CANINES**

#### **SUPRAPERIOSTEAL TECHNIQUE (LOCAL INFILTRATION)**

Infiltration is the application of a local analgesic solution around the nerve ends. The aim is to deposit the solution as close as possible to the apex of the tooth. The technique involves:

1. After penetrating a stretched and topically anesthetized mucosa the needle is directed towards the apex of the tooth with little advancement before the solution is deposited (2 mm at most) because the apices of the maxillary primary anterior teeth are essentially at the level of the mucobuccal fold.
2. Because nerve fibers may be extending from the opposite side, it may be necessary to deposit a small amount of the anesthetic solution adjacent to the apex of the other central incisor to obtain adequate anesthesia in either primary or permanent teeth.
3. If a rubber dam is to be applied, it is advisable to inject a drop or two of anesthetic solution into the lingual free marginal tissue to prevent the discomfort associated with the placement of the rubber dam clamp and ligatures.
4. Before extraction of the incisors or canines in either the primary or permanent dentition, it is necessary for the palatal soft tissues to be anesthetized.
5. The nasopalatine injection provides adequate anesthesia for the palatal tissues of all four incisors and at least partial anesthesia of the canine areas.
6. Nerve fibers from the greater (anterior) palatine nerve usually extend to the canine area as well.
7. If only a single tooth is to be removed, adequate palatal anesthesia may also be obtained when anesthetic solution is deposited in the attached palatal gingiva adjacent to the tooth to be removed.
8. If it is observed that the patient does not have profound anesthesia of anterior teeth during the operative procedures with the suprapariosteal technique, a nasopalatine injection is advisable.

### **ANESTHETIZATION OF MAXILLARY PRIMARY MOLARS AND PREMOLARS**

Anesthetization of the maxillary primary molars and premolars is achieved by suprapariosteal technique (local infiltration). The innervation

of these teeth is supplied by the middle alveolar nerve. It also supplies the mesial root of the permanent first molar.

The primary first molar is covered with thin overlying bone therefore, it can be adequately anesthetized by local infiltration opposite the apices of the roots. However, the thick zygomatic process overlies the buccal roots of the primary second and permanent first molars in the primary and early mixed dentition. This thickness renders the infiltration technique less effective therefore, the injection should be supplemented with a second injection superior to the maxillary tuberosity area to block the posterior superior alveolar nerve. This supplemental injection helps compensate for the additional bone thickness and the posterior middle superior alveolar nerve plexus in the area of the second primary molar, which compromise the anesthesia obtained by injection at the apices only.

For anesthetization of the maxillary first or second premolar, a single injection is made at the mucobuccal fold to allow the solution to be deposited slightly above the apex of the tooth.

The greater palatine injection is indicated if maxillary primary molars or premolars are to be extracted or if palatal tissue surgery is planned.

If the rubber dam clamp impinges on the palatal tissue, injection of a drop or two of the anesthetic solution into the free marginal tissue lingual to the clamped tooth alleviates the discomfort and is less painful than the true greater (anterior) palatine injection.

### **ANESTHETIZATION OF MAXILLARY PERMANENT MOLARS**

Anesthetization of the maxillary first or second permanent molars involve the following steps:

1. The dentist instructs the child to partially close the mouth to allow the cheek and lips to be stretched laterally. The tip of the dentist's left forefinger (for a right-handed dentist) will rest in a concavity in the mucobuccal fold and is rotated to allow the fingernail to be adjacent to the mucosa. The ball of the finger is in contact with the posterior surface of the zygomatic process. The index finger should point in the direction of the needle during the injection.
2. The puncture point is in the mucobuccal fold above and distal to the distobuccal root of the first permanent molar. If the second molar has erupted, the injection should be made above the second molar.
3. The needle is advanced upward and distally, depositing the solution over the apices of the teeth. The needle is inserted for a distance of approximately 2 cm in a posterior and upward direction; it should be positioned close to the bone, with the bevel toward the bone. For complete anesthesia of the first permanent molar for operative

procedures, the suprapariosteal injection is made by insertion of the needle in the mucobuccal fold and deposition of the solution at the apex of the mesiobuccal root of the molar.

### **NASOPALATINE NERVE BLOCK**

This technique is painful and is not routinely used before operative procedures. Blocking the nasopalatine nerve anesthetizes the palatal tissues of the six anterior teeth. If the needle is carried into the canal, it is possible to anesthetize the six anterior teeth completely.

If the patient experiences incomplete anesthesia after suprapariosteal injection above the apices of the anterior teeth on the labial side, it may be necessary to resort to the nasopalatine injection.

The path of insertion of the needle is alongside the incisive papilla, just posterior to the central incisors. The needle is directed upward into the incisive canal. The discomfort associated with the injection can be reduced by deposition of the anesthetic solution in advance of the needle.

When anesthesia of the canine area is required, it may be necessary to inject a small amount of anesthetic solution into the gingival tissue adjacent to the lingual aspect of the canine to anesthetize overlapping branches of the greater palatine nerve.

### **GREATER (ANTERIOR) PALATINE INJECTION**

Greater palatine nerve innervates the maxillary posterior teeth in the palatal aspect. It is anesthetized at the region midway between the midline of the hard palate and the palatal surface of the posterior teeth.

The greater palatine injection anesthetizes the mucoperiosteum of the palate from the tuberosity to the canine region and from the median line to the gingival crest on the injected side.

This injection is used with the middle or posterior alveolar nerve block before surgical procedures. The innervation of the soft tissues of the posterior two thirds of the palate is derived from the greater and lesser palatine nerves.

Before the injection is made, it is helpful to bisect an imaginary line drawn from the gingival border of the most posterior molar that has erupted to the midline. Approaching from the opposite side of the mouth, the dentist makes the injection along this imaginary line and distal to the last tooth. In the child in whom only the primary dentition has erupted, the injection should be made approximately 10 mm posterior to the distal surface of the second primary molar. It is not necessary to enter the greater palatine foramen. A few drops of the solution should be injected slowly at the point where the nerve emerges from the foramen.

## **PERIODONTAL LIGAMENT INJECTION (INTRALIGAMENTARY INJECTION)**

The periodontal ligament injection has been used for many years as an adjunctive method of obtaining more complete anesthesia when suprapariosteal or block techniques failed to provide adequate anesthesia.

The technique is simple, requires only small quantities of anesthetic solution, and produces anesthesia almost instantly. The needle is placed in the gingival sulcus, usually on the mesial surface, and is advanced along the root surface until resistance is met. Approximately 0.2 mL of anesthetic is then deposited into the periodontal ligament. For multi rooted teeth, injections are made both mesially and distally.

Considerable pressure is necessary to express the anesthetic solution. A conventional dental syringe may be used for this technique. However, the great pressure required to express the anesthetic makes it desirable to use a syringe with a closed barrel, to offer protection in the unlikely event that the anesthetic cartridge breaks.

## **INTRAPULPAL INJECTION**

The intrapulpal injection is an adjunctive anesthesia technique designed to obtain profound pulpal anesthesia during direct pulp therapy when other local anesthesia attempts have failed. The intrapulpal injection often provides the desired anesthesia, but the technique has the disadvantage of being initially painful, although the onset of anesthesia is usually rapid.

## **COMMONLY MADE MISTAKES DURING LOCAL ANESTHESIA ADMINISTRATION**

1. Waving the needle in front of the patient. It is important from the behavior management point of view to place the needle and other instruments behind the patient. The needle should be kept out of the direct vision of the child.
2. Not getting supportive control of the patient's head and hands. It is difficult and dangerous to administer anesthesia or perform any treatment on a child who is hyper motive. So adequate reinforcement to restrict the movements of the head and the extremities is necessary so as to avoid complications.
3. Using long needles. Depth of penetration of a needle is very less compared to that in adults. Use of short needles will ensure that the needle does not extend into deeper tissues.
4. Using inappropriate doses. The appropriate dose for a child patient should be calculated by body weight and should not be exceeded, unless it is absolutely essential to do so.

5. Fast injection: Care must be taken for slow administration of the solution. Time should be allowed for slow dispersion of the solution into the tissues. Ideal rate of deposition is about 1ml/min, preceded by application of topical anesthesia and aspiration to avoid intravascular injection.
6. Not advising patients or parents regarding the post anesthesia side effects. Children should be strictly told not to bite their lips or cheek until the effects subside. Parents should be told to supervise this at home. Children usually tend to chew on the lips as it does not cause pain and feel like chewing gum and this can lead to severe laceration that can lead to ulceration.

## **COMPLICATIONS AFTER A LOCAL ANESTHETIC**

### **Generalized complications:**

#### **1. Psychogenic**

The most common psychogenic complication of local anesthesia is fainting. The chances of this happening are reduced by sympathetic management and administration of the anaesthetic to children in the semi-supine position.

#### **2. Allergy**

Allergy to local anaesthetics is a very rare occurrence. Allergy to other constituents of local anaesthetic cartridges may occur, for example, metabisulfite a reducing agent which prevents oxidation of epinephrine. Allergy can manifest in a variety of forms ranging from a minor localized reaction to the medical emergency of anaphylactic shock.

#### **3. Toxicity**

Over dosage of local anaesthetics leading to toxicity is rarely a problem in adults but can readily occur in children. As with all drugs dosages should be related to body weight. The maximum dose of lidocaine (lignocaine) is 4.4 mg/kg.

#### **4. Cardiovascular effects**

Cardiovascular effects caused by the injection of a dental local anaesthetic solution will be due to the combined action of the anaesthetic agent and the vasoconstrictor. Local anaesthetics affect the cardiovascular system by their direct action on cardiac tissue and the peripheral vasculature.

#### **5. Central nervous system effects**

At low doses the effect is excitatory as central nervous system inhibitory fibers are blocked, at high doses the effect is depressant and can lead to unconsciousness and respiratory arrest. Fatalities due to local anaesthetic overdose in children are generally due to central nervous tissue depression.

#### **6. Methaemoglobinaemia**

Prilocaine causes cyanosis due to methaemoglobinaemia. Methemoglobinemia is a rare, but potentially serious complication of the

administration of many drugs, most commonly due to excess accumulated metabolites of certain local anesthetics, notably, overdoses of prilocaine (ortho-toluidine) and benzocaine. In methaemoglobinaemia the ferrous iron of normal hemoglobin is converted to the ferric form which cannot combine with oxygen.

### **7. Drug interactions**

An advice from the appropriate physician should be requested in the treatment of children on significant long-term drug therapy. Apparently innocuous drug combinations can interact and cause significant problems in children

### **8. Infection**

The introduction of agents capable of producing a generalized infection, such as human immunodeficiency virus (HIV) infection and hepatitis, is a complication which should not occur when appropriate cross-infection control measures are employed.

## **Localized complications:**

### **Early localized complications**

#### **1. Pain**

Pain resulting from local anaesthetic injections can occur at the time of the injection due to the needle penetrating mucosa. The sites at which injection may be painful include:

- a) Intraepithelial
- b) Sub periosteal
- c) Into the nerve trunk
- d) Intravascular

#### **2. Intravascular injection**

Proper injection technique includes aspiration to minimize the possibility of inadvertent intravascular injection.

#### **3. Transient facial blanching**

This may happen due to two reasons:

- a) Inadvertent intravascular injection, especially arteriolar, may lead to vascular spasm, blanching, and pain along the distribution of the vessel. In these instances, the location of the area of blanching follows vascular pathways with the least resistance and can occur on both sides of the midline.
- b) It is also possible for the tip of the anesthetizing needle to irritate a small sympathetic nerve, prior to injection of anesthesia, resulting in a well-circumscribed and unilateral field of blanching, reflecting unilateral nerve distribution.

Both cases are transient and should resolve in 5 to 10 minutes.

- 4. Haematoma formation:** Hematoma sometimes arises during injection, and in these cases the patient and the parents should be

informed about its nature. The effusion of blood into extravascular spaces can result from inadvertently nicking a blood vessel during the injection of a local analgesic. It should be explained that swelling and discoloration will appear.

5. **Failure of local anaesthesia**
6. **Motor nerve paralysis**
7. **Interference with special senses**
8. **Broken needle**
9. **Syncope**

### **Late localized complications**

#### **1. Self-inflicted trauma**

Parents of children who receive regional local anesthesia in the dental office should be warned that the soft tissue in the area will be without sensation for 1 hour or more. These children should be observed carefully so that they will not purposely or inadvertently bite the tissue. Children who receive an inferior alveolar injection for routine operative procedures may bite the lip, tongue, or inner surface of the cheek. Sometimes a parent calls the dentist's office an hour or two after a dental appointment to report an injury to the child's oral mucous membrane. The parent may wonder if the accident occurred during the dental appointment; in all probability the child has chewed the area, and the result 24 hours later is an ulceration, often termed a "traumatic ulcer". The child should be seen in 24 hours, and a warm saline mouth rinse is helpful in keeping the area clean.

2. **Oral ulceration**
3. **Long-lasting anaesthesia**
4. **Trismus**
5. **Infection**
6. **Developmental defects**

### **REVERSAL OF DENTAL ANESTHESIA**

Phentolamine mesylate is the first pharmaceutical agent indicated for the reversal of soft-tissue anesthesia which is anesthesia of the lip and tongue, and the associated functional deficits resulting from an intraoral submucosal injection of a local anesthetic containing a vasoconstrictor.

### **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 case of:

- a) Moderate to severe pain associated with trauma or infectious processes such as abscessed teeth.

- b) Preoperatively or post operatively 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. Rarely does the recommended dosage of acetaminophen or non-steroidal anti-inflammatory drugs fail to control the dental pain, and in such cases, the combination of codeine and acetaminophen provides the needed pain relief. In cases of severe pain in which codeine and acetaminophen are not effective, hydrocodone and acetaminophen may be indicated.

### Common medications and dosages for oral pediatric postoperative pain management

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