Local Anesthesia and Premedication Modified Methods for Children

Anesthetization of maxillary permanent molars

To anesthetize the permanent 2nd and 3rd molar effectively, the posterior superior alveolar (PSA) nerve block is recommended. For anesthesia of first molar this block must be supplemented with an infiltration injection over the mesiobuccal root. This is due to fact that the nerve supply to maxillary 1st permanent molar is via both the posterior and middle superior alveolar nerves. To anesthetize the maxillary first or second permanent molars, 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 finger be on a plane at right angles to the occlusal surfaces of the maxillary teeth and at 45° to the patient’s sagittal plane. The index finger should point in the direction of the needle during the injection. 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. 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 supraperiosteal 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.

Anesthetizing of the palatal tissues

Anesthesia of the palatal tissues may be one of the more exquisitely painful procedures performed in dentistry.

The method for achieving profound anesthesia with minimal pain in the palatal and lingual aspects after buccal infiltration, the interdental (interpapillary) infiltration, with slow injection of the anesthetic solution as the needle is penetrating the papilla. The interdental infiltration allows for diffusion of the anesthetic to the palatal aspect via the craterlike area of the interproximal oral mucosa joining the lingual and buccal interdental papillae, known as the col. Blanching of the area indicates sufficient anesthesia of the superficial soft tissues; however, additional palatal infiltration may be given as needed.
**Nasopalatal nerve block**

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. This technique is painful and is not routinely used before operative procedures. If the patient experiences incomplete anesthesia after supraperiosteal 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**

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.

**Supplemental injection techniques**

**Infraorbital nerve block and mental nerve block**

The infraorbital nerve block anesthetizes the branches of the anterior and middle superior alveolar nerves. It also affects innervation of the soft tissues below the eye, half of the nose, and the oral musculature of the upper lip on the injected side of the face. This leaves the child with a feeling of numbness above the mouth similar to that below the mouth when an inferior alveolar
nerve is blocked. In addition, there is temporary partial oral paralysis. These effects do not contraindicate use of the technique when it is truly needed. However, its use can be difficult to justify in routine operative and extraction procedures for teeth innervated by the anterior and middle superior alveolar nerves because the supraperiosteal techniques are more localized and just as effective. The infraorbital block technique is preferred when impacted teeth (especially canines or first premolars) or large cysts are to be removed, when moderate inflammation or infection contraindicates use of the supraperiosteal injection site, or when longer duration or a greater area of anesthesia is needed.

The mental nerve block leaves the patient with essentially the same feelings of numbness as the inferior alveolar nerve block. Blocking the mental nerve anesthetizes all mandibular teeth in the quadrant except the permanent molars. Thus the mental nerve block makes it possible for routine operative procedures to be performed on all primary teeth without discomfort to the patient. The inferior alveolar nerve block should be favored unless there is a specific contraindication to its use at the inferior alveolar nerve injection site. The mental nerve block is no more comfortable for the patient, and the technique puts the syringe in clear view of the patient, whereas the inferior alveolar nerve block may be performed with the syringe out of the child’s direct vision.

**Periodontal Ligament injection**

**Intraligamentary injection**

The periodontal ligament injection has been used as an adjunctive method of obtaining more complete anesthesia when supraperiosteal or block techniques failed to provide adequate anesthesia. This technique is a good method of obtaining primary anesthesia for one or two teeth. 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 multirooted 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. Some syringes are equipped with a metal or Teflon sleeve that encloses the cartridge and provides the necessary protection in
case of breakage. Syringes designed specifically for the periodontal ligament injection technique have been developed. One syringe, the Peri-Press, is designed with a lever-action “trigger” that enables the dentist to deliver the necessary injection pressure conveniently. The Peri-Press syringe has a solid metal barrel and is calibrated to deliver 0.14 mL of anesthetic solution each time the trigger is completely activated. There are some possible psychological disadvantages to the use of the periodontal ligament injection technique. The technique provides the patient with an opportunity to see the syringe and to watch the administration of the anesthetic. This may not be a significant problem for the experienced, well-adjusted dental patient, but it may contribute to the anxiety reaction of the new or anxiety prone patient. In addition, the design of the Peri-Press (which resembles a handgun) probably has some adverse psychological effects. There are two types of syringes designed specifically for intraligamentary injections: gun-like and pen-like. The vasoconstrictors might conceivably contribute to ischemia of the periodontal ligament, which could at least add to localized postoperative discomfort or possibly cause more serious damage to the periodontal ligament.

The periodontal ligament injection offers the following advantages for either primary or adjunctive anesthesia:

1. It provides reliable pain control rapidly and easily.
2. It provides pulpal anesthesia for 30 to 45 minutes, long enough for many single-tooth procedures without an extended period of postoperative anesthesia.
3. It is no more uncomfortable than other local anesthesia techniques.
4. It is completely painless if used adjunctively.
5. It requires very small quantities of anesthetic solution.
6. It does not require aspiration before injection.
7. It may be performed without removal of the rubber dam.
8. It may be useful in patients with bleeding disorders that contraindicate use of other injections.
9. It may be useful in young or disabled patients in whom the possibility of postoperative trauma to the lips or tongue is a concern.

Intrapulpal injection, Intraosseous injection, Interseptal 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.

Intraosseous injection techniques (of which the interseptal injection is one type) require the deposition of local anesthetic solution in the porous alveolar bone. One may do this by forcing a needle through the cortical plate and into the cancellous alveolar bone, or a small, round bur may be used to create access in the bone for the needle. A small, reinforced intraosseous needle may be used to penetrate the cortical plate more easily. This procedure is not particularly difficult in children because their cortical bone is less dense than that of adults. The intraosseous techniques have been advocated for both primary anesthesia and adjunctive anesthesia when other local injections have failed to produce adequate anesthesia. These techniques do not seem to offer any advantages over the periodontal ligament injection except when use of the latter is contraindicated by infection in the periodontal ligament space.

**Computer-Controlled Local Anesthetic**

a computer-controlled local anesthetic delivery system known as the Wand. The system includes a conventional local anesthetic needle and a disposable wand-like syringe held by a pen grasp when used for oral local anesthetic injections. A microprocessor with a foot control regulates the delivery of anesthetic solution through the syringe at a precision-metered flow rate, constant pressure, and controlled volume. The system includes an aspiration cycle for use when necessary. Block, infiltration, palatal, and periodontal ligament injections are all reported to be more comfortable for the patient with the Wand than with conventional injection techniques.

**Complications after Local Anesthetics**

**Anesthetic Toxicity**

Systemic toxic reactions from anesthetics are rarely observed in adults. However, young children are more likely to experience toxic reactions because of their lower body weight. Young children are also often sedated with pharmacologic agents before the treatment. The potential for toxic reactions increases when local anesthetics are used in conjunction with sedation medications. A direct linear relationship between the number of cartridges of local anesthetic administered and the frequency of severe reactions. It is most important for dentists who treat children to be acutely aware
of the maximum recommended dosages of the anesthetic agents they use because allowable dosages are based on the patient’s weight. For example, the toxic dose of lidocaine would be attained if hardly more than 1.5 cartridges (3 mL) of 2% lidocaine with 1:100,000 epinephrine were injected at one time in a patient weighing 14 kg (30 lb). Yet 5.5 cartridges of the same anesthetic agent would be required to reach the toxic level in an adolescent patient weighing 46 kg (100 lb). 1% and 2% lidocaine were equally effective for minor procedures on primary molars. The 1% lidocaine had a slightly lower effectiveness for major procedures, including pulpotomies and extractions.

**Trauma to soft tissue**

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 mouthrinse is helpful in keeping the area clean.

**Post-Operative Instructions**

1. Showing the patient the area that anesthetized with a mirror. This is to assure him that the area is not swollen and it just feels that.

2. Explain to the child not to bite his lip.

3. The parent should be informed of how well the child behaved. This is to avoid any surprise later on. If the patient behaved so poorly that either pre-medication or general anesthesia is needed.

**REVERSAL OF DENTAL ANESTHESIA**

Phentolamine mesylate became the first pharmaceutical agent indicated for the reversal of soft-tissue anesthesia, that 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. No serious adverse events were reported. The most common adverse reaction was transient injection site pain. Although tachycardia and cardiac arrhythmia may occur with the parenteral use of alpha-adrenergic blocking agents, such events are uncommon after the submucosal administration of OraVerse. Currently, OraVerse is not recommended for use in children younger than 6 years of age or in those who weigh less than 15 kg (33 lb). Clinical trials are being conducted in the U.S. for children from 2 to 5 years of age. These trials are being conducted under the FDA’s Pediatric Research.

**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 selection and dosages of analgesics vary because of the changes in body weight and composition that occur throughout childhood. The first choice in most cases is the least potent analgesic with the fewest side effects. 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. In cases of severe pain in which codeine and acetaminophen are not effective, hydrocodone and acetaminophen may be indicated.