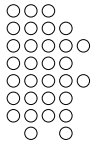


# Supplemental Injections



## Supplemental Injection Techniques



- **Intraosseous anesthesia** → Local anesthetic is deposited into the cancellous bone that supports the teeth
- **Periodontal Ligament Injection**
- **Intraseptal Injection**
- **Intraosseous Injection**
- **Intrapulpal Injection**

## Periodontal Ligament Injection

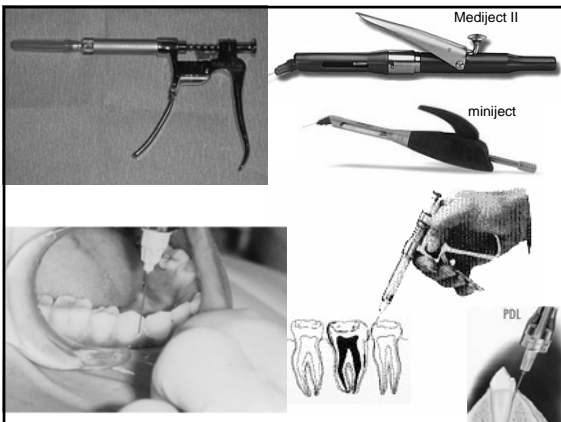


- Provides pulpal and soft-tissue anesthesia in a localized area (one tooth) of the mandible without producing extensive soft-tissue (e.g. Tongue and lower lip) anesthesia.
- Without the extensive soft tissue anesthesia, patients may be concerned that they are not adequately anesthetized.

## PDL injection



- Local anesthetic is diffused apically and into the marrow spaces surrounding the teeth.
- The solution is **not** forced apically through the periodontal tissues because of the increased hydrostatic pressure being exerted in a confined space. This could cause avulsion of a tooth.



## PDL injection



- The most frequent post-injection complications reported include mild discomfort and sensitivity to biting and percussion for 2 or 3 days.
- The most common causes of post-injection discomfort are:
  - Too rapid injection (producing edema and slight extrusion of the tooth → sensitivity on biting)
  - Injection of excessive volumes of local anesthetic into the site

## PDL Injection



- **Nerves anesthetized** – terminal nerve ending at the site of injection and at the apex of the tooth
- **Areas anesthetized** – bone, soft tissue, and apical and pulpal tissues in the area of injection

## PDL Injection Indications



1. Pulpal anesthesia of one or two teeth in a quadrant
2. Treatment of isolated teeth in 2 mandibular quadrants
3. Patients for whom residual soft-tissue anesthesia in undesirable
4. Situations in which regional block anesthesia is contraindicated
5. As a possible aid in diagnosis of pulpal discomfort
6. As an adjunctive technique after nerve block anesthesia if partial anesthesia is present

## PDL Injection Contraindications



1. Infection or inflammation at the site of injection
2. Primary teeth, when the permanent tooth bud is present
  - a. Enamel hypoplasia has been reported to occur in a developing permanent tooth when a PDL injection was administered to the primary tooth above it
  - b. There appears to be little reason for use of PDL technique in primary teeth because infiltration anesthesia and the incisive nerve block are effective
3. Patient who requires a “numb” sensation for psychological comfort

## Advantages of PDL Injections



1. Prevents anesthesia of the lip, tongue, and other soft tissues, thus facilitating treatment in multiple quadrants during a single appointment.
2. Minimum dose of local anesthetic necessary to achieve anesthesia (0.2 ml per root)
3. An alternative to partially successful regional nerve block anesthesia
4. Rapid onset of profound pulpal and soft-tissue anesthesia (30 seconds)
5. Less traumatic than conventional block injections
6. Well suited for procedures in children, extractions, and periodontal and endodontic single-tooth and multiple quadrant procedures

## Disadvantages of PDL Injections



1. Proper needle placement is difficult to achieve in some areas.
2. Leakage of local anesthetic solution into the patient's mouth produces an unpleasant taste
3. Excessive pressure or overly rapid injection may break the glass cartridge
4. A special syringe may be necessary.
5. Excessive pressure can produce focal tissue damage
6. Post injection discomfort may persist for several days
7. The potential for extrusion of a tooth exists if excessive pressure or volumes are used.

## PDL Injection Technique



- Area of insertion: along the long axis of the tooth to be treated
- Target area: depth of gingival sulcus
- Landmarks
  - Root(s) of the tooth
  - Periodontal tissues
- Procedure
  - Stabilize the syringe along the long axis of the root to be anesthetized
  - With the bevel of needle on the root, advance the needle apically until resistance is met
  - Deposit 0.2 ml of local anesthetic solution in a minimum of 20 sec
  - If tooth is multi-rooted, remove the needle and repeat the procedure on the other roots

## Indicators of Success of PDL Injection



- Significant resistance to the deposition of the local anesthetic solution
- Ischemia of the soft tissues adjacent to the injection site

## Failures of PDL Injection



1. Infected or inflamed tissues. The pH and vascularity changes at the apex and periodontal tissues minimize the effectiveness of the local anesthetic.
2. Solution is not retained. In this case, remove the needle and reenter at a different site until 0.2ml of local anesthetic is deposited and retained in the tissues.
3. Each root must be anesthetized with 0.2 ml of solution.

## Intraseptal Injection



- Similar in technique to the PDL injection.
- Useful for providing osseous and soft-tissue anesthesia and hemostasis for periodontal curettage and surgical flap procedures.
- May be effective when the PDL injection is not an option (infection, acute inflammation)
- The path of diffusion of the anesthetic solution is most likely through the medullary bone

## Intraseptal Injection



- **Nerves anesthetized** – terminal nerve endings at the site of injection and in the adjacent hard and soft tissues
- **Areas anesthetized** – Bone, soft tissue, root structure in the area of injection
- **Indication** – when both pain control and hemostasis are desired for soft-tissue and osseous periodontal treatment
- **Contraindicated** if infection or severe inflammation at the injection site

## Intraseptal Injection Advantages



1. Lack of lip and tongue anesthesia
2. Minimum volumes of local anesthetic necessary
3. Minimized bleeding during the surgical procedure
4. Atraumatic
5. Immediate (<30-sec) onset of action
6. Few postoperative complications
7. Useful on periodontally involved teeth (avoids infected pockets)

## Intraseptal Injection Disadvantages



1. Multiple tissue punctures may be necessary
2. Bitter taste of the anesthetic
3. Short duration of pulpal anesthesia; limited area of soft-tissue anesthesia
4. Clinical experience necessary for success

## Technique for Intraseptal Injection



- Area of insertion/target area – center of the interdental papilla adjacent to the tooth to be treated
- Landmarks – papillary triangle, about 2 mm below the tip, equidistant from adjacent teeth
- Stabilize the syringe and orient the needle correctly
  - Frontal plane: 45 degrees to the long axis of the tooth
  - Sagittal plane: at right angle to the soft tissue
  - Bevel – facing the apex of the tooth
- Slowly inject a few drops of local anesthetic as the needle enters the soft tissue and advance the needle until contacting the bone
- Applying pressure, push the needle slightly deeper (1-2 mm) into the interdental septum
- Deposit 0.2-0.4 ml of local anesthetic in a minimum of 20 sec

## Intraseptal Injection



Note the position of the needle apical to the apex of the papillary triangle for the intraseptal technique.

## Failures of Anesthesia Intraseptal Injection



- Infected or inflamed tissues. Changes in tissue pH minimize the effectiveness of the local anesthetic
- Solution not retained in the tissue. To correct: advance the needle further into the septal bone and re-administer 0.2 to 0.4 ml

## Intraosseous Injection



Deposition of local anesthetic solution into the interproximal bone between two teeth

## Intraosseous Injection



- **Nerves anesthetized** – terminal nerve endings at the site of injection and in the adjacent soft and hard tissues
- **Areas anesthetized** – Bone, soft tissue, and root structure in the area of injection
- **Indication** – pain control for dental treatment on a single or multiple teeth in a quadrant
- **Contraindications** – infection or severe inflammation at the injection site.

## Intraosseous Injection



- Because the intraosseous injection site is relatively vascular, it is suggested that the volume of local anesthetic delivered be kept to the recommended minimum to avoid possible overdose
- Because of the high incidence of palpitations noted when vasopressor-containing local anesthetics are used, a “plain” local anesthetic is recommended

## Intraosseous Injection

- **Advantages**
  - Lack of lip and tongue anesthesia
  - Atraumatic
  - Immediate (<30 seconds) onset of action
  - Few postoperative complications
- **Disadvantages**
  - Requires a special syringe
  - Bitter taste of the anesthetic drug (with leakage)
  - Occasional difficulty in placing anesthetic needle into predrilled hole
  - High occurrence of palpitations when vasopressor-containing local anesthetic is used



## Intraosseous Injection

- **Precautions**
  1. Do not inject into infected tissue
  2. Do not inject too rapidly
  3. Do not inject too much solution
  4. Do not use a vasopressor-containing local anesthetic unless necessary
- **Failures of anesthesia**
  1. Infected or inflamed tissues
  2. Inability to perforate cortical bone
    - If cortical bone is not perforated within 2 seconds, it is recommended that the drilling be stopped and an alternative site be used

"Intravascular injection is extremely unlikely, although the area injected into is vascular. Slow injection of the recommended volume of solution is important!"



## Intraosseous Injection

### Complications

- Palpitations
- Post-injection pain
  - unlikely, but NSAIDs may be used for post-injection discomfort
- Fistula formation
- Separation of the perforator or cannula
- Perforation of the lingual plate

### Duration of Anesthesia

- Pulpal anesthesia ~15-30 min



### • Stabident System

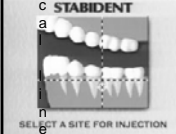
- 2 parts: a perforator, a solid needle that perforates the cortical plate of bone with a conventional slow-speed contra-angle handpiece, and an 8 mm long, 27-gauge needle that is inserted into this predrilled hole for anesthetic administration

### • X-tip

- Composed of a drill and guide sleeve. The drill leads the guide sleeve through the cortical plate, after which it is separated and withdrawn. The guide sleeve remains in the bone and accepts a 27-gauge ultrashort needle

### • Intraflow

- Combines the steps → the anesthetic cartridge is attached to a standard four-hole air hose and controlled by a rheostat. The intraflow is a modified slow-speed handpiece that consists of 4 main parts
  - A needle or drill that makes the perforation through the bone and delivers the local anesthetic
  - A transducer that acts as a conduit from the local anesthetic cartridge to the needle or drill
  - A latch tip or clutch that drive and governs the rotation of the needle or drill
  - A motor or infusion drive that powers the rotation of the needle or drill and, while holding the local anesthetic cartridge in place, powers the infusion plunger



**STABIDENT**

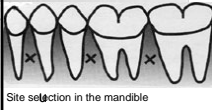
SELECT A SITE FOR INJECTION

**LATERAL PERFORATION**

General Rule  
Imagine a horizontal line along the gingival margins of the teeth and a vertical line through the interdental papilla. A point about 2mm apical to where these lines meet is usually a suitable site for a lateral perforation.

**VERTICAL PERFORATION**

General Rule  
Edentulous areas may be treated, if preferred, by choosing a site on the alveolar crest (where the cortical plate is thinnest) to provide a vertical perforation rather than a lateral perforation.

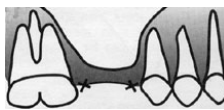


Site selection in the mandible

(a) Inject distal rather than mesial, where possible, because a smaller dose suffices. In most cases, a mesial injection will provide adequate anesthesia, but in a small number it will not.

(b) Avoid perforating between the lower central incisors (because good cancellous spaces are not present in this area).

(c) Avoid the mental foramen area. Preferably, a site between the bicuspids should be avoided, even though a perforation at a distance of 2mm from the gingival margin would usually be well clear of the mental foramen.




Site selection in the maxilla

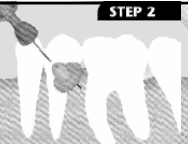
(a) Avoid perforating between the upper central incisors (because good cancellous spaces are not present in this area).

(b) Avoid perforating into the maxillary sinus. Penetrating the maxillary sinus would not cause permanent damage but local anesthesia would not be achieved.

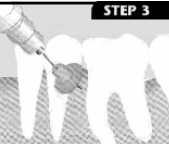
**STEP 1**




**STEP 2**



**STEP 3**



X-Tip



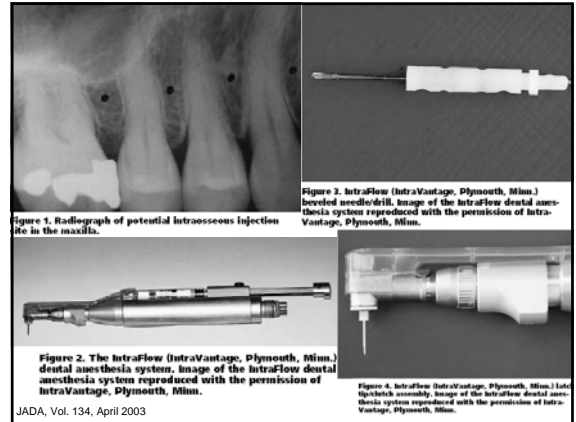
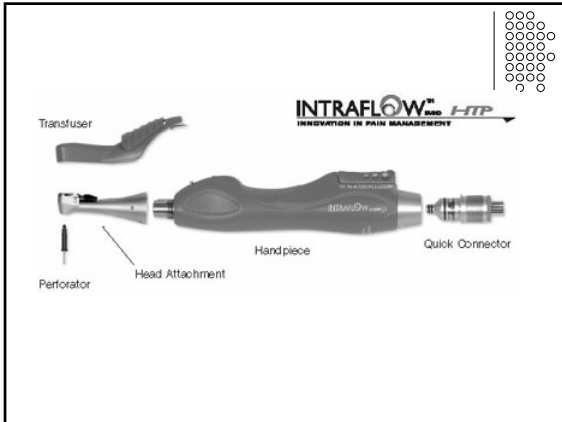


Figure 1. Radiograph of potential intraosseous injection site in the maxilla.

Figure 3. IntraFlow (IntraVantage, Plymouth, Minn.) beveled needle/drill. Image of the IntraFlow dental anesthesia system reproduced with the permission of IntraVantage, Plymouth, Minn.

Figure 2. The IntraFlow (IntraVantage, Plymouth, Minn.) dental anesthesia system. Image of the IntraFlow dental anesthesia system reproduced with the permission of IntraVantage, Plymouth, Minn.

Figure 4. IntraFlow (IntraVantage, Plymouth, Minn.) Late High-tech assembly. Image of the IntraFlow dental anesthesia system reproduced with the permission of IntraVantage, Plymouth, Minn.

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### Failures of Anesthesia Intraosseous Injection

- Infected or inflamed tissues. Changes in tissue pH minimize the effectiveness of the anesthetic
- Inability to perforate cortical bone. If cortical bone is not perforated within 2 seconds, it is recommended that the drilling be stopped and an alternative site be used

### Intrapulpal Injection

- Deposition of local anesthetic directly into the pulp chamber of a pulpally involved tooth provides effective anesthesia for pulpal extirpation and instrumentation
- The intrapulpal injection may be used on any tooth when difficulty in providing profound pain control exists
- Provides pain control both by the pharmacological action of the local anesthetic and the applied pressure.

### Intrapulpal

- **Nerves Anesthetized** – terminal nerve endings at the site of injection in the pulp chamber and canals of the involved tooth
- **Areas anesthetized** – tissues within the injected tooth
- **Indication** – when pain control is necessary for pulpal extirpation or other endodontic treatment the absence of adequate anesthesia from other techniques
- **Contraindication** - None

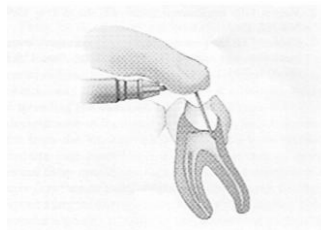
### Intrapulpal

<ul style="list-style-type: none"> <li>• <b>Advantages</b></li> <li>1. Lack of lip and tongue anesthesia</li> <li>2. Minimum volumes of anesthetic solution necessary</li> <li>3. Immediate onset of action</li> <li>4. Very few postoperative complications</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Disadvantages</b></li> <li>1. Traumatic             <ul style="list-style-type: none"> <li>- The intrapulpal injection is associated with a brief period of pain as the anesthetic is deposited</li> </ul> </li> <li>2. Bitter taste of the anesthetic (leakage)</li> <li>3. May be difficult to enter certain canals</li> <li>4. Need a small opening into the pulp chamber for optimum effectiveness             <ul style="list-style-type: none"> <li>- Large areas of decay make it more difficult to achieve profound anesthesia with the intrapulpal injection</li> </ul> </li> </ul>
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## Intrapulpal Technique

1. Insert a 25 or 27-gauge short or long needle into the pulp chamber or the root canal
2. Wedge the needle firmly into the pulp chamber or root canal
3. Deposit anesthetic solution under pressure
4. Resistance to the injection of the drug should be felt
5. Bend the needle, if necessary, to gain access to the canal
6. When the intrapulpal injection is performed properly, a brief period of pain may accompany the injection. Relief usually immediate
7. Instrumentation may begin ~30 seconds after the injection

## Intrapulpal Injection



## Intrapulpal Injection Complication

- Discomfort during the injection of anesthetic.
- The patient may experience a brief period of pain as the injection of the anesthetic drug is started.
- Almost immediately, the tissue is anesthetized and the pain ceases.

## Failures of Anesthesia Intrapulpal Injection

- Infected or inflamed tissues. Changes in the tissue pH minimize the effectiveness of the anesthetic. \* **Intrapulpal anesthesia invariably works to provide effective pain control\***
- Solution not retained in the tissue. To correct: try to advance the needle further into the pulp chamber or root canal and re-administer 0.2 to 0.3 ml of anesthetic.

- IOI has been a minor anesthetic delivery technique that has experienced cyclical popularity in dentistry. Supplemental IOI enhances block nerve anesthesia in the mandible for deep pulpal anesthesia.
- Some dentists use the IOI technique extensively as a primary technique to bring about anesthesia.
- Most dentists are aware of IOI but choose not to use it routinely because they are more comfortable with traditional infiltration and block techniques.
- This trend is changing as education, research and instrumentation reduce the cognitive and emotional barriers in the dentists' and patients' perceptions of the local anesthesia experience.