



## Facial Block Anesthesia

Providing effective and efficient pain relief is a prime goal of the emergency physician. The patient who presents with oral or dental pain may not be able to see a dentist for hours or days. Facial block anesthesia will provide pain relief and, in some cases will sustain the pain-free period until definitive care can be provided. Proficiency in this technique is also useful in the repair of certain lip and intraoral lacerations. Using illustrative cases, the anatomic approach to all of the facial nerve blocks will be presented.

- Discuss the oral, dental, and neurologic anatomies of the head and neck.
- Explain appropriate nerve block techniques for a given orodental complaint.
- Explain the concepts of regional anesthesia, local anesthetic pharmacology, and the possible complications associated with facial nerve block anesthesia.

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## Facial Anesthesia in Emergency Medicine

### I. INTRODUCTION

#### A. Dentition

There are 32 permanent teeth. The teeth are numbered beginning with the upper right wisdom tooth (#1) to the upper left wisdom tooth (#16), and then from the lower left wisdom tooth (#17) to the lower right wisdom tooth (#32). It is easier to become familiar with the names of the teeth (central incisor, etc) rather than each tooth number. Each quadrant of the mouth contains 3 molars, 2 premolars, 1 canine, and 2 incisors. Each tooth contains its own alveolar nerve supply.

#### B. Instruments

1. SYRINGES Aspirating syringes, which contain either thumb rings or finger grips are best to use as they allow one handed aspiration (fig.1). Standard medical aspirating syringes available in most ED's are somewhat cumbersome to use in the oral cavity as aspiration often requires two hands with these syringes.

2. NEEDLES Multi-beveled 25 or 27 gauge needles are best for infiltrations and blocks. The belief that the 27 or 30 gauge needles cause less pain is erroneous and, in fact, 25 gauge needles can be used more safely because they are relatively noncompliant and do not break as easily as more narrow needles. 25 gauge needles require less effort to aspirate and are also less likely to be deflected by bone, thereby allowing for more accurate anesthetic placement. Length of the needle used varies from 3/4" to 1 5/8" depending upon where it is to be used.

3. TOPICAL ANESTHETICS Topical anesthetics can be used in the oral cavity for a variety of reasons including pain relief from injections, infections, inflammatory conditions, ulcerations and wounds. Topical preparations traditionally come in the form of liquids, sprays or viscous gels. 6-20% benzocaine, an ester, is one of the most commonly used topical dental anesthetics because of its rapidity of onset (30 secs), brief duration (5-15 mins), and lack of systemic absorption. 2-5% lidocaine, an amide, also is available for use as a topical anesthetic and comes in the form of sprays, gels, viscous solutions and liquids.

When using topical anesthetics, the gels or viscous solutions and the higher concentrations are more effective. Most topical anesthetics are not effective on the palatal mucosa.

4. INJECTABLE ANESTHETICS Primary considerations when picking an injectable anesthetic for facial blocks include the safety profile, duration of action, and general availability in the E.D. The addition of a vasoconstrictor increases the duration of action as well as the maximum allowable dose. Tables 1 & 2. Bupivocaine (Marcaine) with epinephrine is a logical choice to use given its long duration of action. Lidocaine with or without a vasoconstrictor is a good choice if a long duration of action is not of primary importance, such as in laceration repair. Dental carpules containing 1.8 cc of anesthetic are available in many preparations and fit easily into most dental aspirating syringes.

### II. GENERAL CONSIDERATIONS

#### A. Infiltrations vs. Blocks

Infiltrations (field blocks) are best for individual tooth pathology, localized soft tissue anesthesia, and augmenting anesthesia after a block. Blocks are better for multiple tooth pathology or for areas where

diffuse anesthesia is needed. Blocks also allow avoidance of both localized areas of infection and wound margin distortion during laceration repair. Blocks should be performed first in cases where both blocks and infiltrations may be necessary.

#### B. Amides vs. Esters

Most agents in use today are amides and true allergies are rare. For that rare patient, procaine (Novocain) is an ester and should be well tolerated. It's duration of action, however, will be shorter than that of Marcaine.

#### C. To Lessen the Pain of Injection.

Anesthetics kept at room temperature or slightly warmed are less painful upon injection than are anesthetics which are chilled. If using multi-dose vials, adding bicarbonate as a buffer is an easy way to decrease the acidity of the drug, thereby, decreasing the burning. Remember to inject slowly and, if available, use a topical anesthetic such as 20% benzocaine or 5% lidocaine a few minutes before injecting. Also, distraction techniques such as shaking the lip tend to prepare the mucosa for injection.

### III. ANATOMY

A. The Fifth Cranial Nerve (TRIGEMINAL) conveys the sensations of touch, pressure, pain, and temperature from the skin of the face and anterior scalp, the hard and soft tissues of the mouth, and the mucosal linings of most of the spaces of the head. The sensory portion of the nerve is composed of three divisions, the ophthalmic ( $V_1$ ), the maxillary ( $V_2$ ), and the mandibular ( $V_3$ ). Figure 2.

1. The Ophthalmic division provides sensation to the skin of the upper eyelid and part of the lower eyelid, to the forehead, anterior scalp, and part of the nose. It also provides sensation to the mucosa of the anterior nasal cavity as well as the frontal, ethmoidal and sphenoidal air sinuses.
2. The Maxillary division of the fifth cranial nerve supplies sensation to the maxilla and associated structures such as the maxillary teeth, the periosteum and the mucous membranes of the maxillary sinus and the nasal cavity, and the soft and hard palate. It also provides sensation to the lower eyelids, the upper lip and the side of the nose. The detailed anatomy of the trigeminal nerve is rather complicated and consists of many branches. Those branches which the Emergency Physician should be familiar with are the following:
  - a. Infraorbital nerve—supplies sensation to the lower eyelid, medial cheek, the side of the nose and the upper lip. It exits the infraorbital foramen which is located on the inferior border of the infraorbital ridge. The foramen is located on a direct line connecting the pupil of the eye with the corner of the mouth.
  - b. Nasopalatine Nerve—provides sensation to the most anterior part of the hard palate and the adjacent gum margins of the upper incisors. It enters the hard palate thru the incisive canal. This nerve is rarely blocked in clinical practice.
  - c. Greater Palatine Nerve—provides sensation to most of the hard palate and palatal aspect of the gingiva. It enters the hard palate thru the posterior palatine foramen which is 1 cm palatally from the 3<sup>rd</sup> molar. Again, this nerve is rarely blocked in clinical practice.
  - d. The Superior Dental Plexus consists of the following three nerves. This group of nerves give rise to the individual alveolar nerves which innervate the pulp of the teeth. Posterior Superior Alveolar Nerve—supplies sensation to all of the roots of the 3<sup>rd</sup> and 2<sup>nd</sup> molars as well as two roots of the 1<sup>st</sup> molar. Middle Superior Alveolar Nerve—supplies sensation to the two maxillary premolars (bicuspid). Anterior Superior Alveolar Nerve—supplies sensation to the incisors and canine teeth as well as the floor of the nasal cavity.

3. Mandibular division of the trigeminal nerve is the largest of the divisions and is the only one which carries both motor and sensory fibers. It consists of the following major three branches:

- a. Long Buccal Nerve—supplies sensation to the buccal mucous membrane and the mucoperiosteum over the maxillary and mandibular teeth.
- b. Lingual Nerve-- supplies sensation to the anterior two-thirds of the tongue, the lingual mucous membrane and the mucoperiosteum.
- c. Inferior Alveolar Nerve—supplies sensation to all of the lower teeth, although the central and lateral incisors and the buccal aspect of the molar teeth may receive additional sensory innervation. The Inf. Alveolar Nerve gives rise to the Mental Nerve which exits the mental foramen. This foramen is located on the mandible in between the 1<sup>st</sup> and 2<sup>nd</sup> premolars. The mental nerve supplies sensation to the skin of the chin and the mucous membrane of the lower lip.

#### IV. GENERAL PRINCIPLES OF CORRECT INJECTION TECHNIQUE

- A. Seat the patient in a comfortable reclining position in a chair or gurney.
- B. Position yourself correctly and adjust the patients position to optimize access and vision.
- C. Apply topical anesthetic when appropriate, allowing sufficient time for the anesthetic to take effect (at least 30 secs for benzocaine or 2 minutes for lidocaine).
- D. Retract the mucosa in order to enhance vision and minimize needle insertion trauma.
- E. Dry the injection site with a small gauze pad wiping off any saliva or excess topical anesthetic.
- F. Penetrate the mucosa using distraction (e.g. vibration of lip) to minimize the pain of insertion.
- G. Insert the needle gently and slowly to its intended position. Use a palm's up technique.
- F. Aspirate prior to injection and reposition the needle if a postive aspirate is obtained.
- G. Inject at a rate of 2cc/min or slower.
- H. Remove the needle slowly along the same path as insertion.

#### V. MAXILLARY ANESTHESIA

A. **Supraperiosteal Injection**—ideally suited for anesthesia of one or two teeth or a circumscribed portion of the maxilla. This technique will be utilized for most cases of individual tooth pathology and will probably be the procedure you use most in the ED for tooth anesthesia. Figure 3.

Technique—Retract the patient's lip to expose the tooth and vestibular mucosa. After applying topical, insert the needle at the greatest concavity of the mucobuccal fold and direct it at the apex of the tooth. Withdraw if you hit bone. Depth of insertion of any supraperiosteal infiltration is 3-4 mm. Remember to aspirate first. The amount of anesthetic is usually 1-2 cc for this infiltration. This block will be the one that is most commonly used for individual tooth pathology. Figure 4.

B. **Anterior Superior Alveolar Nerve Injection**---good for the central, lateral incisors and first premolar. Figure 5.

Technique—retract the lip, apply topical, dry mucosa, and advance the needle until the tip is just above the periosteum adjacent to the apex of the canine. Aspirate and inject 1-2 cc slowly.

C. **Middle Superior Alveolar Nerve Injection**—good for the maxillary premolars, adjacent bone, periodontal ligaments and adjacent soft tissues. Figure 6.

Technique—retract the corner of the mouth and the buccal mucosa adjacent to the premolars. Apply topical, dry mucosa, advance needle in the mucobuccal fold in the direction of the apex of the 2<sup>nd</sup> premolar. Advance 3-5 mm, aspirate, and inject 1-2 cc.

D. **Posterior Superior Alveolar Nerve Block**—good for all three maxillary molars, adjacent bone, periodontal ligaments, and buccal gingiva. Is really a block, not an infiltration. This block can be difficult for the beginner and if anesthesia is incomplete, a supraperiosteal infiltration can be used to augment the effect. Figure 7.

Technique—retract the cheek and palpate the zygomatic process. A good rule of thumb is that the needle axis should be at an angle of 45 degrees to the occusal and midsagittal planes. The needle is inserted thru the mucosa and the underlying buccinator muscle to a depth of 1.5-2 cm. A total of 2-3 cc is slowly deposited after negative aspiration. Topical anesthetic can be used.

**E. Infraorbital Nerve Block**—good for providing anesthesia to both the middle and anterior superior alveolar nerves as well as to the main trunk of the infraorbital nerve. Thus, an infraorbital block will numb the central incisor, lateral incisor, canine, premolars, the upper lip, lateral nose and lower eyelid. This block is a nice technique to use when lacerations are present on the lip or many front teeth are injured. Figure 8.

Technique—two techniques can be used, an intraoral approach and an extraoral approach. The extraoral approach has no advantages over the intraoral approach and has the disadvantages of requiring skin disinfectant, lack of effective topical anesthetic, and possibly increased patient fear.

The intraoral technique is as follows: locate the infraorbital foramen. It is situated 5-10 mm below the infraorbital rim in a line which runs from the pupil to the corner of the mouth. Retract the patients upper lip with the thumb of your noninjecting hand. Keep the index finger of the same hand on the infraorbital foramen. After applying and drying the topical anesthetic, advance your needle into the mucobuccal fold in front of the second maxillary premolar. The needle should parallel the long axis of the tooth. Advance the needle approximately 1.5 cm and inject (after aspirating). Don't worry about puncturing the eyeball as it is protected by the infraorbital rim and the orbital floor. You only need to be close to the nerve to achieve good results, not actually in the foramen. Figure 9.

**F. Nasopalatine (Incisive Canal) Nerve Block**—rarely used. This block is indicated for surgical procedures involving the anterior palate, for laceration or puncture wound repair of the anterior palate or for augmenting anesthesia of the incisor teeth.

Technique—Insert the needle from a lateral direction thru the incisive papilla, which overlies the incisive foramen. Insert the needle 2-4 mm until bone is gently contacted and aspirate. Inject VERY SLOWLY and use a small amount of anesthetic (0.3-0.5 cc). Topical anesthetic works very poorly on the palate. Figure 10.

**G. Greater (Anterior) Palatine Nerve Block**—used to anesthetize the posterior two-thirds of the palate. Again, rarely used in clinical emergency medicine. The greater palatine nerve proceeds anteriorly from the greater palatine foramen which lies on the lateral aspect of the hard palate, generally opposite the 2<sup>nd</sup> or 3<sup>rd</sup> molar. Figure 11.

Technique—insert the needle approximately halfway between the midline and the gingival margin a few mm anterior to the foramen. Again, inject slowly and only use a small amount of anesthetic.

## VI. MANDIBULAR ANESTHESIA

**A. Supraperiosteal Infiltration**—Again, this procedure is good for one or two affected teeth and is relatively simple to perform. It is important that the needle is close to the mandibular periosteum overlying the root tip of the tooth.

Technique—Retract the lower lip, apply topical anesthetic and wipe off after 1 minute, and advance the needle slowly to the target. The needle should be inserted at the depth of the mucobuccal fold toward the mandibular periosteum. The depth of insertion is only a few millimeters. 1-2 cc of anesthetic is usually sufficient.

**B. Mental Nerve Infiltration**—Good for anesthesia of the labial mucosa, gingiva, and the lower lip adjacent to the incisors and canine. To block the associated tooth pulps, a supraperiosteal infiltration or inferior alveolar nerve block is better. Figure 12.

Technique—Retract lip, apply topical, and wipe dry. Advance the needle into the mucobuccal fold adjacent to the second premolar. Advance the needle approximately 1 cm and aspirate. Deposition of 1-2 cm of anesthetic in this area is sufficient. Remember that cross-innervation occurs in the central incisor area.

**C. Buccal Nerve Block**—good for anesthesia of the cheek and posterior buccal mucous membranes. Won't be used much in the ED. Usually used when excessive manipulation of the buccal mucosa is anticipated.

Technique—The nerve can be blocked at the level of the coronoid notch or the mandibular vestibule. For coronoid notch infiltration, retract the mucosa and apply topical anesthetic to the area. Needle puncture is made lateral and distal to the last mandibular molar at the level of the occlusal plane. Insertion of the needle is limited to approx. 3 mm by the anterior edge of the ramus. Aspirate and inject 0.5-1.0 cc of anesthetic. Figure 13.

For mandibular vestibule infiltration, the tissue is prepared as above and the infiltration is made submucosally at the depth of the vestibule just distal to the last molar. Figure 14.

**D. Inferior Alveolar (lingual) Nerve Block**—This block is very useful for EM physicians in that it provides anesthesia to the mandible from retromolar region to the midline, to the anterior labial region and to the lingual areas. The nerve is very close to the lingual nerve which is often anesthetized simultaneously.

Technique—The needle end point is the mandibular sulcus. The landmarks that need to be identified are the coronoid notch on the anterior edge of the ramus of the mandible and the pterygomandibular raphe. The raphe is just a roll of soft tissue running from behind the mandibular third molar superiorly to the soft palate. Figure 15.

In preparation for the block, grasp the posterior edge of the ramus (outside of the face) with the noninjecting hand. The thumb of that hand is placed inside the mouth, retracts the cheek and lies in the coronoid notch of the ramus. After placing the topical anesthetic, approach the injection point from the opposite premolars. The needle is placed in the raphe approx 2 cm posterior to the midline of your fingernail. Advance the needle approx 2 cm into the mucosa until you hit the bone. Withdraw slightly, aspirate, and inject. It may take up to 4 cc or so of anesthetic until you get comfortable with the procedure. Usually the lingual nerve is anesthetized as well as the inf. Alv. Nerve, but, if necessary, usual practice is to withdraw slightly (0,5 cc) and reinject.

## VII. Complications

1. Overdosage—rare, more common in children. See Table for max. dosages.
2. Side effects and complications:
  - CNS—lightheadedness, dizziness, tinnitus, visual changes, nausea. At increased doses, confusion, disorientation, nystagmus, facial tremors, seizures, respiratory depression and death.
  - Cardiac—usually benign. The doses which cause significant cardiac effects are those where significant CNS effects have already occurred. The exception is the high potency anesthetics where CNS and cardiac doses are similar (bupivocaine, etidocaine).
  - Prevention--CNS and Cardiac side effects and complications are much more common when intravascular injection occurs. These effects can be minimized by aspirating prior to injection, injecting slowly, and by staying below the maximum doses of local and epi.
3. Allergies
  - True allergies are more common in the ester family (novocain) than in the amide family. Allergies to the amides (lidocaine, bupivocaine, etc ) are rare and are usually side effects (nervousness, palpitations, etc). Be aware, however, that allergies to the preservatives in amides (PABA) can occur and also that severe allergic reactions can occur up to 1 hour after administration.
4. Facial Nerve Palsy
  - Occasionally, when performing an inf. alveolar block, the needle is inserted too far and enters the parotid capsule causing transient paralysis of the facial nerve. This is transient, but the patient should be reassured and instructed to use natural tears until the paralysis resolves.
5. Trismus
  - usually caused by damage to the medial pterygoid muscle which occurs when the injection of the inf. Alv. Nerve is too medial. May also occur secondary to infection or hematoma. Almost always is mild and temporary. If severe, should refer to OMF.

## 6. Hematoma

--particularly likely from Post. Sup. Alveolar N. block. secondary to the artery of the same name.  
Most hematomas are an inconvenience or cosmetic nuisance rather than a true danger.

## References

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