Fixing Faces Painless: Facial Anesthesia In Emergency Medicine

The woman in Room 2 is moaning in pain and holding her cheek. She thought she was getting better after having her wisdom tooth removed 3 days ago, but today the pain has been unbearable. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She took her last 2 pills while sitting in the waiting room. Your examination is unrevealing. There is no swelling, bleeding, or abscess. You suspect a dry socket, but what should you do for her pain? Should you give her something intravenously? Would a dental block be beneficial? How long do common local anesthetics last anyway?

As you mull over the patient in Room 2, you walk into Room 3 and find a “Friday night special,” an underage male who was drinking with his friends and decided to go for a ride. He smashed his car and his face in the process. His forehead is littered with lacerations and pieces of jagged glass. He is intoxicated, agitated, and unhappy about the prospect of you digging into his face. How should you go about extracting the larger glass fragments? Should you have the nurse clean the patient with a surgical scrub? Should you use a tuberculin syringe to dig the fragments out? Will the patient need sedation for this procedure? How about one of those fancy scrubs? Should you use a tuberculin syringe to dig the fragments out? Will the patient need sedation for this procedure? How about one of those fancy scrubs?

It is almost the end of the shift, and a 40-year-old woman walks in holding her jaw. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief. She has had a toothache for several days and has an appointment with her dentist tomorrow morning. She has been taking the hydrocodone that the dentist prescribed for her, but it has provided only minimal relief.

Upon completion of this article, you should be able to:
1. Determine which patients will benefit from regional anesthesia.
2. Perform the most common facial anesthesia procedures.

Date of most recent review: May 14, 2009
Termination date: December 1, 2012
Method of participation: Print or online answer form and evaluation
Prior to beginning this activity, see “Physician CME Information” on page 20.

December 2009
Volume 11, Number 12

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ness over an unremarkable right lower canine. A review of her previous medical records reveals nothing significant except an allergy to lidocaine. You would like to give her a dental block, but can you?

Painful facial and oral conditions are very common reasons for emergency department (ED) visits. Dental-related complaints alone account for approximately 0.4% to 10.0% of ED visits and involved an estimated 3 million patients between 1997 and 2000.¹

All emergency medicine clinicians will be called upon at some point to treat dental problems as well as facial lacerations, facial foreign bodies, tongue lacerations, and severe facial abrasions. Although these emergencies can be challenging and frustrating to treat (see the second vignette), managing them can be immensely rewarding for the emergency clinician with a basic understanding of dental and facial neuroanatomy and knowledge of some simple techniques. After all, there is no more appreciative and satisfied patient than one who has been relieved of severe pain.

Having diagnostic and treatment plans in place will facilitate care of these patients. Regional facial anesthesia should be an integral part of these plans, as the skilled use of this technique makes the clinician’s job easier and the patient’s experience less traumatic.

This issue of Emergency Medicine Practice focuses on determining which patients will benefit from regional anesthesia and how to perform the most common facial anesthesia procedures.

Critical Appraisal Of The Literature

A literature search utilizing PubMed and MD-Consult was conducted using the keywords facial anesthesia, dental blocks, trigeminal nerve, benzocaine, bupivacaine, lidocaine, and intraoral anesthesia. The Cochrane Database of Systemic Reviews and www.guidelines.gov yielded only one guideline pertaining to the use of intraoral anesthesia in pediatric dental patients.

Much of what is known and accepted about facial anesthesia has been established in the dental literature. While the texts do an adequate job of detailing how to perform the procedures, they do not specifically address whether these procedures are effective or worthwhile in the ED setting. The question of whether odontalgic pain can be controlled or at least mitigated in the ED setting with regional anesthetic techniques is also unexplored.

Anatomy

The use of facial and oral cavity anesthesia for pain relief or surgical procedures requires a thorough knowledge of trigeminal nerve anatomy. (See Figure 1.) The trigeminal nerve provides most of the sensa-

Figure 1. Distribution Of The Trigeminal Nerve

The branches are as follows: 1, trigeminal nerve; 2, gasserian ganglion; 3, mandibular nerve and foramen ovale; 4, maxillary nerve and foramen rotundum; 5, ophthalmic nerve and superior orbital fissure; 6, nasociliary nerve; 7, frontal nerve; 8, lacrimal nerve; 9, supraorbital nerve; 10, supratrochlear nerve; 11, zygomatic nerve; 12, anterior superior alveolar branches; 13, posterior superior alveolar branches; 14, buccal nerve; 15, posterior nasal branches; 16, greater palatine nerve; 17, infraorbital nerve; 18, nasopalatine nerve; 19, auriculotemporal nerve; 20, lingual nerve; 21, inferior alveolar nerve; 22, mental nerve. (Redrawn from Haglund J, Evers H: Local anaesthesia in dentistry, ed 2, Sodertalje, Sweden, 1975, Astra Lakemedel. Reprinted with permission from: Malamed SF. Medical Emergencies In The Dental Office, Edition 4. St. Louis: Mosby; 1993. Copyright © Elsevier.)
Neurophysiology And Pharmacology

Local anesthesia is defined as the loss of sensation in a circumscribed area of the body caused by inhibition or depression of the conduction process in peripheral nerves. The potency, rapidity of onset, and duration of action of local anesthetics are dependent upon the lipid solubility, degree of protein binding, and vasoactivity of the drug.

Local anesthetics used in clinical practice work by blocking the conduction process along the nerve axon of peripheral nerves. Only induction methods that are transient and completely reversible have application in this setting. The following properties are desirable for local anesthetics used in the ED:

- The systemic toxicity should be extremely low.
- The time to onset should be as short as possible.
- The duration of action must be long enough to permit the intended procedure and, when required, long enough to permit extended analgesia.
- They must not cause permanent alteration of the nerve structure.
- They should not produce allergic reactions.
- They must be potent enough to give complete anesthesia but not so concentrated that they cause harm to or irritate tissue.

Access to a broad selection of local anesthetics maximizes the clinician’s ability to tailor intervention to each patient’s profile. In general, however, most emergency clinicians rely on 2 agents: lidocaine and bupivacaine, both amides. Amides have a very low incidence of true, documented allergy risks; most people who say they are allergic to these drugs have had symptoms secondary to intravascular injection or side effects from the addition of epinephrine. True hypersensitivity reactions are usually secondary to methylparaben, the preservative used in amide anesthetics. In patients with suspected methylparaben allergy, cardiac lidocaine or anesthetic lidocaine or bupivacaine cartridges can be used, as they do not contain this preservative.

Lidocaine is the most commonly used local anesthetic for intradermal infiltration. Its popularity is likely due to its predictable clinical effect and good safety record. It is prepared as a 1% to 2% concentration with or without the vasoconstrictor epinephrine. Epinephrine prolongs the duration of action and decreases the systemic absorption of the drug. According to the manufacturer’s package insert, by decreasing the absorption, the vasoconstrictor lessens the drug’s toxicity and increases the safe maximum dose from a range of 3 to 5 mg/kg to 7 mg/kg. (See Table 1.) Some authors dispute this claim and continue to recommend 4.4 mg/kg as the safest maximum dose of lidocaine with epinephrine; 4.4 mg/kg is the recommended dose by the Council on Dental Therapeutics. The Council on Dental Therapeutics of the American Dental Association and the United States Pharmacopeial Convention independently reviewed the maximum recommended doses (MRDs) and no longer adjust them for inclusion of a vasoconstrictor. In general, epinephrine is thought to be contraindicated for use in the nose and ears, but evidence for this is lacking.

Bupivacaine is a very potent local anesthetic that has a slightly slower onset of action than lidocaine but a longer duration of effect. It is clinically available in 0.25% and 0.5% concentrations, and the maximum dose for use in the face or mouth areas is 1.3 mg/kg, while the maximum dose for the rest of the body is 2.5 to 3 mg/kg. All cartridges of bupivacaine contain a vasoconstrictor, whereas lidocaine cartridges can be obtained with or without a vasoconstrictor. The popular bupivacaine cartridges contain 1.8 cc or 9 mg of the anesthetic. Bupivacaine has high protein binding and is thus well suited for pro-

<table>
<thead>
<tr>
<th>Agent</th>
<th>Onset</th>
<th>Duration</th>
<th>Maximum Dose</th>
<th>Maximum Dose With Epinephrine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bupivacaine</td>
<td>5-10 min</td>
<td>200 min + (up to 540 min w/epinephrine)</td>
<td>2.5 mg/kg</td>
<td>3 mg/kg</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>&lt;2 min</td>
<td>30-60 min (longer with epinephrine)</td>
<td>3 mg/kg</td>
<td>5 mg/kg</td>
</tr>
<tr>
<td>Articaine</td>
<td>2-3 min</td>
<td>180-360 min</td>
<td>7 mg/kg</td>
<td>7 mg/kg</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>3-5 min</td>
<td>45-90 min</td>
<td>5-6 mg/kg</td>
<td>5 mg/kg</td>
</tr>
<tr>
<td>Prilocaine</td>
<td>5 min</td>
<td>30-90 min</td>
<td>5 mg/kg</td>
<td>7 mg/kg</td>
</tr>
<tr>
<td>Ropivacaine</td>
<td>5-15 min</td>
<td>200 min +</td>
<td>3 mg/kg</td>
<td>3 mg/kg</td>
</tr>
<tr>
<td>Procaine</td>
<td>10-20 min</td>
<td>40 min</td>
<td>7 mg/kg</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

*Note: doses in the table are based on the manufacturers’ package inserts. Recommended doses in the text differ from the table based on the author’s experience.
cedures and situations in which prolonged analgesia is required. The duration of soft tissue anesthesia is typically 4 to 8 hours, and the duration of dental pulp anesthesia is typically 2 to 4 hours. This effect is somewhat reduced in the maxilla. Three small prospective studies have suggested that because of a central but undetermined mechanism, use of bupivacaine can significantly reduce the narcotic requirement in a number of painful conditions, even over a period of several days. Long-acting anesthetics are often used successfully in conjunction with nonsteroidal anti-inflammatory drugs to enhance postsurgical pain control following dental extraction as well as other painful surgical procedures.

In 5 prospective studies comparing lidocaine and bupivacaine, the bupivacaine groups all had significantly less postoperative pain as well as decreased pain at 24 and 48 hours. These studies suggest that bupivacaine may be useful in the ED for many painful conditions such as abscesses and odontalgia when prolonged anesthesia and analgesia are desired.

Topical anesthesia is effective only on surface mucosa to a depth of 2 to 3 mm. However, it does allow for atraumatic and painless needle insertion in the mucous membrane, which is helpful in the needle-averse patient. Lidocaine and benzocaine, which are available as liquids, gels, ointments, and sprays, are the 2 most frequently used topical agents in the ED setting. Some topical anesthetics are marketed in pressurized spray containers, although there is no good evidence that these are more effective than other forms.

Spray devices that do not deliver metered doses should not be used intraorally. This is especially important with regard to benzocaine, as methemoglobinemia has been reported after the use of nonmetered topical sprays during procedures such as esophagogastroduodenoscopy and transesophageal echocardiography. Nonmetered use may result in dangerously large doses relative to body weight. There are no reported cases of methemoglobinemia in the medical literature when benzocaine was applied to the mucosa with a cotton-tipped applicator prior to a single oral injection. The incidence of methemoglobinemia after use of benzocaine ointment is rare.

**Equipment**

**Syringes**
The choice of syringe for use in facial anesthesia is determined by the location of the injection. Intraoral injection typically requires that the clinician use one hand to retract the mucosa and one hand to inject. Needle aspiration is of paramount importance with this type of injection. The use of breech-loading, thumb ring aspirating syringes allows for better control and ease of aspiration. Aspirating syringes, which are available in stainless steel or reusable plastic, use local anesthetic cartridges. (See Figure 2.) Traditional plunger-type medical syringes do not allow for easy one-handed aspiration and are not advisable. Side effects and complications increase dramatically with intravascular injections.

**Needles**
Patients and physicians may assume that the smaller the needle gauge, the less traumatic the experience will be. However, this may not always be true, especially when smaller caliber needles are compared. In a prospective study involving more than 800 patients, those receiving oral injections with 25-, 27-, or 30-gauge needles had no significant differences in pain scale scores. However, 30-gauge needles are more likely to break and to be deflected away from their intended target than are 25- and 27-gauge needles. This information was confirmed by Stanley Malamed, DDS, of Dentsply International. Given this, 25- and 27-gauge needles appear to be the best choice for intraoral anesthesia.

**Cartridges**
Lidocaine and bupivacaine are available in standard multidose bottles or in single-use cartridges. The cartridge used in most aspirating systems contains 1.8 cc of anesthetic.

**Emergency Department Evaluation**
Before administering local or regional anesthesia, the clinician should determine whether the patient can tolerate the planned procedure. This assessment is important because local and topical anesthetics may have systemic effects in addition to local and regional effects. Table 2 lists information that should...
be obtained as part of the patient history prior to anesthetic injection.

The physical examination of the patient requiring dental anesthesia is determined by his or her chief complaint. In a patient presenting with a toothache, the teeth as well as the oral cavity, neck, face, and submandibular area should be examined for infection or injury. The areas of infiltration should be clear of infection or obvious debris. The landmarks should be visible, and sites of injection should be easily accessible. If the patient’s general history is suggestive of any cardiac decompensation (eg, history of congestive heart failure or recent weakness, shortness of breath, chest pain), a cardiac examination should be conducted. Identification of a murmur is not a concern, however, and endocarditis prophylaxis is unnecessary with intraoral anesthetic injections. In general, local anesthetic injection does not require antibiotic prophylaxis, even in the patient with a known history of valve disease.

### Treatment

#### Patient Positioning

Any patient receiving local anesthetic injections should be in a physiologically sound position before and during the injection. Vasodepressor syncope is the most commonly observed emergency in dentistry and can occur before, during, or immediately after injection of a local anesthetic. To prevent syncope, the patient should be placed in a supine position with the feet slightly elevated. A local injection should not be given to patients who are waiting in the hallway or seated in a chair, even if they are sitting in the ED.

#### Topical Anesthesia

Use of topical benzocaine has been shown to decrease the pain of mucosal injections and thus should be routinely used before any injection that penetrates the oral mucosa. Lidocaine gel may be substituted as long as the clinician realizes that the setup time will be 1 to 2 minutes longer and the systemic absorption will be greater. In a prospective randomized trial comparing topical benzocaine and lidocaine with placebo in 60 healthy volunteers, the topical anesthetics significantly reduced the pain associated with intraoral injections. The area to be injected should first be wiped clean with gauze, and a small amount of anesthetic should be applied where needle penetration is planned. A small quantity of topical anesthetic may also be placed on a cotton-tipped applicator and then transferred to the mucosa. Use of more than the recommended amount of drug will result in undesirable anesthesia of the soft palate, pharynx, and other areas; in the case of topical lidocaine, systemic absorption and adverse effects may also occur.

#### Distraction Techniques

Dentists often use distraction techniques to enhance soft tissue anesthesia after topical drugs have been applied and during the injection itself. The goal is to control pain via the gate theory. Two techniques are generally employed. The first involves vigorously shaking the lip for 5 to 10 seconds before injecting into the mucobuccal fold. The second technique, used when palatal anesthesia is intended, involves firmly pressing a cotton-tipped applicator against the presentation site to produce ischemia, or blanching, of the normally pink tissues. This is done immediately before and during the palatal injection.

#### Selection Of A Local Anesthetic

The selection of an appropriate local anesthetic should be based on several factors:

1. **How long is pain control needed?**
   Bupivacaine is a good choice for lengthy procedures such as cleaning and suturing complex forehead lacerations. Lidocaine is better for lip lacerations, so the patient does not accidentally bite the lip and unknowingly mutilate the repair.

2. **Is there a need for postprocedural pain control?**
   A patient with odontalgia from pulpitis requires pain control overnight or longer. In this case, a longer acting preparation such as bupivacaine with epinephrine is appropriate.

3. **Is there a need for immediate hemostasis?**
   Injectable anesthetics are vasodilators. The addition of a vasoconstrictor limits the vasodilation and bleeding. For example, epinephrine assists with hemostasis immediately after the injection. Anesthetics containing epinephrine in concentrations of 1:50,000 or 1:100,000

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Table 2. Screening Questions Before Administration Of Facial Anesthesia

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>1. Has the patient had an adverse reaction to local anesthetics or complications related to a dental visit?</td>
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<tr>
<td>2. Has the patient taken any medications including herbal medications, alcohol, or street drugs in the last 12 hours?</td>
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<tr>
<td>3. Is the patient allergic to lidocaine, benzocaine, or procaine?</td>
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<tr>
<td>4. Does the patient take anticoagulants such as warfarin, aspirin, or clopidogrel or experience easy bruising or excessive bleeding?</td>
<td></td>
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<tr>
<td>5. Does the patient have a history of epilepsy or seizures? Stress or hyperventilation may provoke a seizure in patients whose condition is otherwise controlled.</td>
<td></td>
</tr>
<tr>
<td>6. Does the patient have a history of fainting, nervousness, or dizzy spells? This may suggest postural hypotension, seizures, fear, or abnormal anxiety.</td>
<td></td>
</tr>
<tr>
<td>7. Is the patient pregnant? Pregnancy is not a contraindication to local anesthetics or epinephrine; however, it is prudent to be conservative when administering any drugs to pregnant women.</td>
<td></td>
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</tbody>
</table>
are recommended when hemostasis is needed.  

4. What is the possibility of self-mutilation in the postanesthesia period?  
 Patients who do not have the mental or physical faculties to prevent self-mutilation should not be given a long-acting anesthetic.

5. Are there any relative or absolute contraindications?  
 The only absolute contraindication is reproducible allergy to an anesthetic or vasoconstrictive agent. An allergy to the amides lidocaine and bupivacaine is very rare. The metabolism and excretion of amides and esters differ, and this may raise a concern in some patients. Ester anesthetics are quickly metabolized by plasma pseudocholinesterase; therefore, patients with pseudocholinesterase deficiency (ie, patients with sensitivity to succinylcholine, patients with myasthenia gravis, and patients taking cholinesterase inhibitors) are at increased risk for systemic toxicity. Amide local anesthetics are metabolized in the liver; thus, decreases in hepatic function or liver blood flow will reduce the metabolic rate and predispose the patient to systemic toxicity. Significant renal impairment may result in slightly elevated blood levels of esters or amides, and although rarely clinically evident, these elevated levels may produce toxicity.

**Intraoral Anesthesia**

The type of injection is determined by the desired region of anesthesia. Smaller sites may require only an infiltration. Larger areas may require a regional block (eg, an inferior alveolar, forehead, or infraorbital nerve block, etc).

**Supraperiosteal Injection**

**General**

The supraperiosteal injection is the most common technique for providing intraoral anesthesia to one tooth. It is also invaluable for management of toothaches and traumatic dental injuries such as fractures, luxations, and dry sockets. This injection can be used in the maxilla or mandible, but it may be slightly less effective in the latter because of the increased thickness and density of the mandibular bone. Use of a slightly larger amount of anesthetic when working in the mandibular area usually achieves the desired level of anesthesia in the ED.

**Distribution Of Anesthesia**

The area affected by this block includes the entire pulp, the root area of the tooth, the buccal mucoperiosteum, and the connective tissue and mucous membrane associated with the particular tooth. (See Figures 3 and 4.)

**Technique**

Topical anesthetic should be applied to the mucobuccal fold (that area of the buccal mucosa where the attached gingiva gives rise to the loose buccal mucosa) that corresponds to the desired injection area. (See Figure 5.) A 25- or 27-gauge short needle should be inserted into the height of the mucobuccal fold above the apex of the tooth to be anesthetized. The bevel should be kept toward the alveolar bone, and the needle should be kept parallel with the long axis of the tooth. The needle should be advanced several millimeters until the tip is over the apex of the tooth. The depth of injection is typically only a few millimeters. (See Figure 3.) When the bone is contacted, the needle should be withdrawn slightly, aspiration performed, then the anesthetic injected slowly at a rate not exceeding 1.8 cc per minute.

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Figures 3 and 4. Approximate Depth Of Penetration Of Supraperiosteal Injection

Injection volumes will vary, but most teeth will require between 0.5 and 1.0 cc of anesthetic. Anesthesia is achieved within 3 to 5 minutes in most cases. If anesthesia is not complete, the injection may be repeated.

Pitfalls And Tips
- The deposition of anesthetic proximal to the apex of the tooth will result in excellent soft-tissue anesthesia but poor pulp anesthesia.
- Depths of needle placement will vary somewhat depending upon the tooth being anesthetized. Molars have longer roots than incisors, so they will require deeper needle placement.

Peritonsillar Abscess Anesthesia
General
A peritonsillar abscess is often best anesthetized using both topical and injectable anesthetics.

Technique
This technique can be challenging. The emergency clinician should first palpate for the most fluctuant area of the abscess using a cotton-tipped applicator. Topical anesthetic should then be applied to the abscess. A small amount of topical 20% benzocaine spray may be applied with caution in order to avoid making the patient gag or cough. Alternatively, a small amount of topical 20% benzocaine gel or 10% lidocaine may be applied with a cotton-tipped applicator. Abscesses that are very fluctuant may not require further anesthesia, as aspiration may be easily accomplished with only topical anesthesia. In abscesses where fluctuance is not anatomically obvious, or if an incision rather than an aspiration is to be performed, infiltration anesthesia will also be required. A 3-cc syringe with a long 27-gauge needle should be used. The long needle allows for better visualization because the needle barrel does not obscure the injection site. Lidocaine with epinephrine (1-2 cc) should be injected intramuscosally until the mucosa blanches. Care should be taken not to inject the drug into the abscess, as further distension worsens the patient’s pain and makes the anesthesia less effective.

Pitfalls And Tips
Spraying large amounts of benzocaine onto the back of the throat may cause the patient to gag or cough, so this should be avoided. Methemoglobinemia has also been reported, although rarely, after large doses of topical benzocaine.

Greater Palatine Nerve Block
General
Injuries to the palate that require use of palatal anesthesia for repair are rare. Nevertheless, palatal blocks are useful when extensive palatal laceration repairs are indicated and as an adjunctive technique to anesthetize the maxillary teeth. Topical anesthetic may not be very effective on the palate, although distraction techniques may help minimize the pain of injection (see below for a description of this technique).

Distribution Of Anesthesia
The greater palatine nerve block affects the posterior portion of the unilateral hard palate as well as the overlying soft tissues, anteriorly as far as the first premolar and medially to the midline. (See Figure 6.)

Technique
Topical anesthetic, if utilized, should be placed over the greater palatine foramen. This foramen usually sits 1 to 2 cm medial to the palatal gingival margin and adjacent to the posterior half of the second molar or the anterior half of the third molar. After about 2 minutes, the anesthetic should be wiped from the mucosa. A cotton-tipped applicator should

Figure 6. Distribution Of Anesthesia: Greater Palatine Nerve Block

be positioned over the foramen and pressed until the tissue becomes white, or ischemic, at the injection site. A short 27-gauge needle should be directed from the opposite side of the mouth toward the target area, which is just anterior to the greater palatine foramen. The bevel should be placed against the blanched palate. Holding the bevel in this position and injecting a drop or two of anesthetic into the mucosa will help to decrease the pain of injection somewhat. The tissue should be slowly punctured and the needle advanced gently until bone is contacted. 

(See Figure 7.) Only a small amount of anesthetic (less than 0.5 cc) is necessary.

**Pitfalls And Tips**
The tight adherence of the mucosa to the palate makes injection in this area uncomfortable. The procedure must be performed slowly and with the use of distraction because topical anesthesia is minimally effective.

**Nasopalatine Nerve Block**

**General**
The nasopalatine nerve block is used to augment a supraperiosteal infiltration of the anterior maxillary teeth or to anesthetize the anterior palatal mucosa during repair of a palatal laceration.

**Distribution Of Anesthesia**
The nasopalatine nerve serves the anterior portion of the palatal area, extending from premolar to premolar. 

(See Figure 8.)

**Technique**
The incisive foramen lies directly behind the incisive papilla, which is directly behind the central incisors.

Topical anesthetic should be applied to the incisive foramen, allowing adequate time (approximately 2 minutes) for the anesthetic to penetrate the mucosa. Pressure should be applied to the lateral aspect of the papilla with a cotton-tipped applicator until the area becomes blanched. The bevel of the needle should be directed toward the mucosa, approaching the injection site at a 45° angle. The bevel (not the needle) should be placed against the mucosa, and a small amount of anesthetic should be injected into the mucosa while pressure is exerted against the syringe. This will anesthetize the mucosa prior to the injection.

While the cotton-tipped applicator is pressed against the mucosa, the needle should be gently advanced through the blanched mucosa toward the incisive foramen until it contacts bone. 

(See Figure 9.) The needle should then be withdrawn slightly and a small amount (< 0.4 cc) of anesthetic injected.
Pitfalls And Tips
The application of topical anesthetic has minimal effectiveness on the hard palate; therefore, distraction techniques are necessary for patient comfort during injection.

Infraorbital Nerve Block

General
When administered properly, the infraorbital nerve block provides anesthesia to the anterior superior alveolar nerve and the middle superior alveolar nerve as well as to the infraorbital nerve.

Distribution Of Anesthesia
Anesthesia of the anterior superior alveolar nerve, the middle superior alveolar nerve, and the main infraorbital nerve affects the lower eyelid; lateral nose; medial cheek; unilateral upper lip; and the unilateral upper central incisor, lateral incisors, canines, and premolars (variably). The mucoperiosteum of these teeth is anesthetized as well. (See Figure 10.)

Technique
The infraorbital nerve block should be administered in the following manner:
1. A long 25- or 27-gauge needle should be used.
2. The height of the mucobuccal fold over the first premolar is the point of insertion and the landmark for this block. The target area is the infraorbital foramen directly beneath the infraorbital notch.
3. Topical anesthetic should be applied over the insertion point and wiped off after 1 minute.
4. The notch of the infraorbital rim should be located with the index finger of the noninjecting hand. The infraorbital foramen is approximately 1 cm below the notch along an imaginary line that connects the pupil and the corner of the mouth.
5. The lip should be retracted with the thumb of the noninjecting hand, and the needle, with the bevel toward the bone, should be inserted into the height of the mucobuccal fold over the first premolar. The syringe should be oriented toward the infraorbital foramen, with the needle parallel to the long axis of the tooth. (See Figure 11.) The needle should be slowly advanced until it contacts the roof of the infraorbital foramen. (See Figure 12.) The general depth of insertion should be 15 to 16 mm, but this is variable.
6. Once the needle tip is over the infraorbital foramen with the bevel facing the foramen, aspiration should be performed and approximately 1 cc of anesthetic slowly deposited. The patient should feel anesthesia of the cheek, eyelid, and lip.
7. Pressure should be exerted over the foramen.

Figure 10. Distribution Of Anesthesia: Infraorbital Nerve Block

Figure 11. Landmark For The Infraorbital Foramen Is The First Maxillary Premolar

Figure 12. Infraorbital Foramen
Clinical Pathway For The Treatment Of Facial Injury

Facial Injury

- Unilateral forehead
  - Supraorbital/supratrochlear nerve block (Class I)

- Lower eyelid, medial cheek, upper unilateral lip
  - Infraorbital nerve block (Class I)

- Unilateral lower lip or chin
  - Mental nerve block (Class I)

Long duration of action required?

- Yes: 0.5% bupivacaine with epinephrine
- No: 1% or 2% lidocaine with epinephrine

Clinical Pathway For Treatment Of Tooth Pain

Tooth pain/Injury

- Are more than 1 or 2 teeth involved?
  - Yes
  - No: Supra-periosteal Infiltration

Which teeth are involved?

- Anterior maxillary
  - Infraorbital nerve block (Class I)

- Anterior mandibular teeth
  - Mental nerve block (Class I)

- Posterior mandibular teeth
  - Inferior alveolar nerve block (Class I)

Long duration of action required?

- Yes: 0.5% bupivacaine with epinephrine
- No: 1% or 2% lidocaine with epinephrine

See back page for class of evidence definitions.
for 1 minute to force the anesthetic through the foramen. This will allow for good anesthesia of the anterior superior alveolar nerve and thus the anterior teeth. Anesthesia should be sufficient in 3 to 5 minutes.

**Pitfalls And Tips**
- If the patient develops pain on insertion and the needle is difficult to advance (i.e., it bumps into the periosteum), the needle should be directed laterally (away from the bone) and slowly advanced.
- If the lower eyelid becomes numb but the lip does not, placement was above the foramen. If the lip is numb but the eyelid is not, placement was below the foramen.

**Inferior Alveolar Nerve Block**

**General**
Administration of an inferior alveolar nerve block requires great skill, but it can be very useful for dry socket pain, postextraction pain, or pulpitis pain of the mandibular teeth. The lingual and buccal nerves are often anesthetized simultaneously with the inferior alveolar nerve block.

**Distribution Of Anesthesia**
An inferior alveolar nerve block provides anesthesia to the unilateral mandibular teeth, the body of the mandible, the buccal mucoperiosteum, and the mucous membrane anterior to the first mandibular molar. The anterior two-thirds of the tongue and the floor of the oral cavity as well as the lingual soft tissues are also anesthetized. (See Figure 13.)

**Technique**
The target area for this block is the inferior alveolar nerve as it passes downward toward the mandibular foramen on the medial aspect of the mandibular ramus. The injection site should be located using the following technique: the thumb of the noninjection hand is placed in the coronoid notch of the mandibular ramus while simultaneously retracting the soft tissues of the buccal mucosa and the lip. (See Figure 14.) An imaginary line extends from the thumbnail posteriorly toward the pterygomandibular raphe.
Distribution Of Anesthesia

The mental nerve provides sensory innervation to the buccal tissues lying anterior to the mental foramen as well as to the lower lip and chin on the side of the injection. The incisive nerve provides sensory innervation to the teeth anterior to the mental foramen. The distribution of the mental nerve is also affected during anesthesia of the incisive nerve.

Technique

The target area for both the mental and incisive nerves is the mental foramen, which is usually located between the apices of the first and second premolars. The site of penetration is the mucobuccal fold adjacent to the canine or first premolar. The mucous membrane should be penetrated at the injection site, with the bevel facing the mandibular bone and the syringe directed toward the mental foramen. (See Figure 17.) The needle should be advanced 5 to 6 mm until the foramen is reached. The mental foramen does not need to be penetrated for either the mental or incisive blocks to be effective. After aspiration, approximately half a cartridge (0.9 cc) should be deposited over 20 to 30 seconds. (Note: All cartridges made in the United States contain 1.8 cc.)

The incisive nerve block is performed similarly to the mental nerve block except digital pressure is placed over the mental foramen for 2 to 3 minutes, thus forcing the anesthetic into the foramen and anesthetizing the incisive nerve. This effect can be achieved by placing the finger over the mental foramen during and after the injection; it can be done intraorally or extraorally.

Pitfalls And Tips

Penetration of the needle into the mental foramen is not recommended as this is more likely to cause paresthesia or injury to the mental nerve. Pressure inside the oral cavity after the injection

Mental/Incisive Nerve Block

General

The mental nerve is one of the terminal branches of the inferior alveolar nerve. It exits at the mental foramen near the apices of the mandibular premolars. The incisive nerve is the other terminal branch of the inferior alveolar nerve, and it continues on in the incisive canal to innervate the remaining mandibular teeth anterior to the mental foramen. The mental nerve block is very useful for treatment of lower lip and chin lacerations, and the incisive nerve block is ideal if the lower anterior teeth need to be anesthetized.
helps to ensure the success of the incisive nerve block. (See Figure 18.)

**Tongue Anesthesia**

**General**
Suturing the tongue is never an easy endeavor, and the thought of tongue anesthesia via direct infiltration gives many emergency clinicians reason to go directly to the next chart! The tongue is innervated bilaterally by the lingual nerve. Anesthesia can be approached in the same manner as the inferior alveolar nerve block. Topical anesthetic is also a necessary adjunct.

**Distribution Of Anesthesia**
The lingual nerve provides sensation and taste to the anterior two-thirds of the unilateral tongue. It also provides sensory innervation to the mucous membranes of the floor of the mouth and the lingual side of the mandible.

**Technique**
Anesthesia of the tongue can be accomplished in several ways. A laceration that is deep enough to require repair almost always involves more than topical anesthesia, but topical medication can certainly help to lessen the pain of the injection. Topical drugs can be 5% lidocaine or 20% benzocaine. A gel that can be applied by cotton-tipped applicator is preferable so that swallowing of the anesthetic, as well as inadvertent overdose, is avoided.

If only half of the tongue is lacerated, the lingual nerve on that side of the tongue should be blocked. The lingual nerve is just slightly anterior and inferior to the inferior alveolar nerve, and it is usually anesthetized when the inferior alveolar nerve is blocked; therefore, the approaches are the same. (See Figure 16.) If the laceration is in the midline or on the posterior one-third of the tongue, direct infiltration is likely necessary. A large midline laceration could be repaired by using bilateral lingual nerve blocks, although this practice is often discouraged because of a loss of sensation in the entire tongue and a choking sensation experienced by the patient.

**Pitfalls And Tips**
- Use of 4% lidocaine as a topical anesthetic in this situation is a time waster because it must be kept on the tongue for a minimum of several minutes to take effect. Some EDs now use 20% benzocaine, which has a much faster onset.
- Some authors claim that a suture placed through the tip of the tongue makes it easy to hold the tissue. In the author’s experience, having an assistant hold the tongue with gauze is usually sufficient.

**Forehead Block**

**General**
The forehead and scalp can be successfully anesthetized by blocking the supraorbital and supratrochlear nerves as they exit the supraorbital foramen directly above the orbit. (See Figure 19.) Such anesthesia is ideal for forehead lacerations, debridement of forehead burns, or removal of glass after windshield injuries.

**Distribution Of Anesthesia**
The supraorbital nerve supplies sensation to most of the forehead back to the vertex of the scalp, whereas the supratrochlear nerve supplies sensation to the most medial aspect of the forehead and to the bridge of the nose.

**Figure 19. Forehead Block**
Technique
The landmark is the supraorbital notch of the superior orbital rim, which is located directly above the pupil of the eye when the patient is looking straight ahead. The supratrochlear nerve is 0.5 to 1.0 cm medial to the notch. From 1 to 3 cc of anesthetic should be placed in the area of the supraorbital notch. This technique requires correct placement and is not always successful. An easier technique requiring less precision involves placing a line of anesthetic along the entire length of the orbital rim on top of the eyebrow. (See Figure 20.). This will ensure anesthesia to all branches of the supraorbital nerve.

Pitfalls And Tips
- If the anesthetic line is not extended enough medially, the supratrochlear nerve will not be blocked, preserving sensation to the medial forehead.
- Holding pressure on the eyelid during and immediately after the injection will prevent swelling of the eyelid.

Facial Anesthesia Complications

Medical Complications
Toxicity from local anesthetics is rare in doses used in facial and dental infiltration.2 Caution should be taken, however, when using these drugs in pediatric and elderly patients. The lower body weight of children and the comorbidities of older patients increase the risk of toxicity. Strict adherence to dosage guidelines must be observed when using local anesthetics in children, and maximum doses should be reduced in medically compromised or debilitated elderly patients. Neurologic and cardiac toxicity is possible with any of the local anesthetics but is more prevalent with bupivacaine than with lidocaine. This increased prevalence is secondary to the higher degree of protein binding and the lipophilic nature of bupivacaine. Adherence to dosage guidelines and prevention of intravascular injection minimizes toxicity and side effects. Newer anesthetics such as ropivacaine have fewer toxic effects and similar duration of action as bupivacaine, but they are much more expensive and are not available in cartridge form.7

Local Complications

Persistent Anesthesia Or Paresthesia
Trauma to any nerve may lead to paresthesia, hyperesthesia, or dysesthesia. These complications usually resolve within 8 weeks but in rare cases may persist for a prolonged duration.17 A retrospective review conducted over a 21-year period at the University of Toronto Faculty of Dentistry revealed 143 reports of paresthesia, which were most likely to occur with the use of articaine and prilocaine during inferior alveolar nerve block.2 Persistent paresthesia most commonly involved anesthesia of the tongue (most frequent) or the lower lip. In a retrospective case review of 4987 patients at the University of Southern California (USC) School of Dentistry, 16 patients had unexplained paresthesia (not a result of surgery) and all 16 patients had significant or complete resolution by 2 months.2 Persistent paresthesia are more common with the use of 4% anesthetic solutions (not often used in emergency medicine) and when the needle is directed into a foramen. The recommended treatment is usually tincture of time, as paresthesia may not begin to resolve for 2 months and may take up to a year to completely resolve.18,19

Hematoma
Hematoma and bruising can occur after intraoral injections and are most often noted after a posterior superior alveolar nerve block, which is not often used by emergency clinicians. The inferior alveolar nerve block is an infrequent cause. Hematomas rarely cause more than cosmetic problems; but they can be sore, and occasionally their size can lead to trismus. The airway is rarely a concern, but patients who take anticoagulants must be screened appropriately to approximate the risk-benefit ratio. In the author’s experience, patients with severe anticoagulation in most cases do not definitively need an inferior alveolar nerve block in the ED. A supraperiosteal injection should be considered instead. Direct pressure should be applied to the hematoma as soon as it is evident. This is usually the only treatment needed; however, reversal of anticoagulation should be considered if patients have an airway-threatening emergency.

Systemic Complications
There are 3 main types of systemic complications re-
lating to use of local anesthetics: overdose reactions, allergic reactions, and idiosyncratic reactions.

**Overdose Reactions**
Overdose reactions are caused by the following factors:

- The biotransformation of the drug is unusually slow. Amide anesthetics are metabolized in the liver. Liver disease does not contraindicate their use, but the minimal effective dose should be used.
- The elimination of nonbiotransformed drug from the body through the kidneys is too slow. Severe renal dysfunction may lead to a gradual increase in the level of active anesthetic in the blood.²⁰
- Absorption from the injection site is unusually rapid. Use of vasoconstrictors in local anesthetics increases the duration of action and reduces systemic toxicity by decreasing absorption. In emergency medicine, facial anesthesia techniques should use drugs containing vasoconstrictors unless this is contraindicated by the patient’s medical status. Topical anesthetics, typically lidocaine and benzocaine in the ED, can also cause toxicity. Lidocaine, an amide, is rapidly absorbed into the circulation and is much more likely to result in elevated blood levels than are the esters (eg, benzocaine), which are very poorly absorbed. As discussed, benzocaine has been known to cause methemoglobinemia when used in very large doses, although this is rare.

**Allergic Reactions**
Toxic allergic reactions to the current amino-type local anesthetics (eg, lidocaine and bupivacaine) are extremely rare, and the literature seems to bear this out.²¹,²² However, a few cases of possible allergic-type phenomena have been reported.² If allergy to one amide is present, this does not contraindicate the use of another amide, as cross-allergy does not occur.²³

Hypersensitivity to the ester-type local anesthetics (eg, benzocaine) is much more frequent, but the esters are rarely used as injectable anesthetics. Benzocaine is more often used as a topical anesthetic in the ED. The reactions to topical anesthetics are nontoxic and appear to be primarily local phenomena limited to the site of application.²⁴ Cross-allergy does occur with ester-type anesthetics.²³

Of note, methylparaben is used as a bacteriostatic agent in multiuse bottles of lidocaine and bupivacaine, but it is also found in cosmetics and other drugs. For those who have been sensitized to methylparaben, preservative-free single-use bupivacaine cartridges or cardiac lidocaine may be used. Allergies to sodium bisulfite and metabisulfite are being reported with increasing frequency as bisulfites are commonly sprayed on fruits and vegetables to maintain their fresh appearance. All dental cartridges containing a vasoconstrictor also contain bisulfite or metabisulfite. Patients with a true bisulfite allergy should be administered an anesthetic without a vasoconstrictor. There is no cross-allergenicity between sulfites and the sulfa-type antibiotics (sulfonamides).²³,²⁵

Questions for the patient with a suspected allergy to local anesthetics:
1. **Can you describe your reaction?** Itching; hives; rash; feeling faint, dizzy, or lightheaded; excessive perspiration; shaking; palpitations
2. **How was your reaction treated?** Epinephrine, histamine blocker, corticosteroid, oxygen, spirits of ammonia (smelling salt), no treatment necessary
3. **What position were you in at the time of the reaction?** Supine, upright, partially reclined
4. **What is the name, address, and telephone number of the doctor who was treating you when this reaction occurred?**
5. **Do you know which agent was used? Was it injected? Sprayed? Topical?**

**Procedural Complications**

**Local Complications**

**Needle Breakage**
A 30-year study at the USC School of Dentistry revealed that in 34 cases of litigation resulting from broken needles, 33 breaks occurred during inferior alveolar nerve infiltration. Also of note, all but 1 of the broken needles were 30-gauge needles.² Similarly, data from needle manufacturers overwhelmingly support the fact that 30-gauge needles are much more likely than other sizes to break.¹⁶ Bending the needle prior to injection can weaken it. To minimize the risk of breakage, the needle gauge should be 27 or larger, and the needle should not be bent. If a needle is broken inside the mouth, removal is usually easily performed with forceps or a hemostat. If the broken tip is no longer visible, the patient should be referred to an oral maxillofacial surgeon for possible removal. It is important to tell the patient that removal may not be necessary or possible.

**Facial Nerve Paralysis**
Transient facial nerve paralysis can occur with the introduction of local anesthesia into the capsule of the parotid gland, which is located at the posterior border of the mandibular ramus. This may occur during an inferior alveolar nerve block when the needle is placed too far posterior behind the ramus; entrance is thus gained into the parotid gland, where the terminal portions of the facial nerve run. Portions of the face may then droop or become paralyzed, although this phenomenon is transient and lasts only as long as the anesthetic. The patient
should be assured that facial nerve function will return within a few hours. Contact lens wearers should remove their contacts until muscular function returns.

**Trismus**
Trismus is defined as a restricted opening of the mouth usually caused by a tetanic spasm of the jaw muscles. Trauma to the muscles or vessels of the infratemporal fossa is the most common etiologic factor in trismus associated with dental injections. Hemorrhage, a localized infection, and toxicity of a local anesthetic solution can lead to localized myonecrosis and subsequent spasm and trismus. Likewise, excessive volumes of anesthetics and multiple attempts during inferior alveolar nerve blocks are associated with postinjection trismus. Trismus typically begins 2 to 4 days post injection, and patients usually begin to improve within 48 to 72 hours after the onset of symptoms. Heat therapy, physiotherapy, and analgesics are often all that is required, with complete recovery taking about 6 weeks. If trismus does not improve in 6 weeks, referral to an oral surgeon is warranted.

**Systemic Complications**
**Overdose Reactions**
Procedural complications can also result in overdose reactions. The following factors have been implicated:

- The total dose that is administered is too large. The maximum recommended dose (MRD) of a parenterally administered anesthetic is determined by the patient's age, physical status, and weight. The MRD is unlikely to be exceeded during facial anesthesia in the ED; however, surpassing the MRD is the number one cause of local anesthetic overdose reactions.
- Inadvertent intravascular administration. Intravascular injection is most likely to occur when an inferior alveolar nerve block is performed. Overdose reactions are more likely to occur after intravascular injection because the blood level of the anesthetic in end organs may be high. Adherence to a few basic principles can prevent intravascular injection. An aspirating syringe should always be used when intraoral injections are administered. The use of nonaspirating syringes is generally unacceptable. The needle gauge should not be smaller than 27 because smaller needles impede aspiration. The anesthetic should always be administered slowly, at approximately 1 cc per minute.

**Special Circumstances**
Local anesthetics can be used safely in almost all patient populations as long as maximum dosing guidelines and proper injecting techniques are strictly followed. True defined allergies are absolute contraindications to local anesthetic use, and a history suggestive of atypical or deficient pseudocholinesterase is a relative contraindication to the use of ester-type anesthetics. Patients with severe liver or renal impairment may not be able to metabolize or excrete amides, causing increased levels in the blood. These conditions are relative contraindications to use of amide anesthetics.

**Controversies/Cutting Edge**
**Are Some Local Anesthetics Safer Than Others?**
In general, the most commonly available local anesthetics are highly effective and safe when used properly. Aspiration before injection and gradual administration are important. A comprehensive patient history should be obtained to determine if there are contraindications to local anesthesia. Maximum doses, although rarely approached with facial anesthesia, cannot be exceeded. The MRD should be lowered in elderly persons and small children. In addition, bupivacaine is a known myocardial irritant when used at high doses. If these guidelines are followed, the anesthetics commonly available in the ED are very safe.

**What Local Anesthetics Should Be Available In The ED?**
Although new anesthetics are constantly being developed, none have added significant functionality to drugs that are already available in the modern ED. In general, every ED provides access to a short-acting anesthetic (ie, lidocaine) and a long-acting anesthetic (ie, bupivacaine). Lidocaine with epinephrine is also routinely stocked, whereas bupivacaine with epinephrine is less readily available. Bupivacaine cartridges with epinephrine are becoming more common in the ED with growing acceptance of its effectiveness in controlling pain; sales of ED dental kits containing the anesthetic have also increased, according to one manufacturer. Generally, emergency clinicians should use only aspirating syringes when performing intraoral injections. This is the standard in dentistry and should be so in emergency medicine as well.

Two new local anesthetics, ropivacaine and levobupivacaine, may become options for the emergency clinician in the future. At this time, neither is available in cartridge form. Ropivacaine, an amide anesthetic, is pharmacologically and clinically similar to bupivacaine, but in animal studies it appears to be less cardiotoxic and neurotoxic. It has been shown to be effective in several peripheral nerve block indications as well as in epidural administration. However, its duration of action is approximately 20% shorter than that of bupivacaine.
Disposition

Discharge instructions listing the side effects and the potential complications of local and regional facial anesthesia should be provided to all patients, just as specific instructions are given after a patient receives sedation. Discharge instructions should address the possibility of facial droop, persistent paresthesia, dysesthesia, hematoma, and trismus and should also warn of possible tissue damage from inadvertent self-injury. A follow-up physician’s visit should be scheduled along with instructions for return to the ED if necessary.

Summary

The use of regional anesthesia has become more prevalent in everyday practice in the ED. Every emergency clinician sees facial lacerations, dental infections, and dental trauma. Clearly, proficiency with facial anesthesia makes our jobs easier and can make patients more comfortable. A complete text dealing solely with sedation and regional anesthesia in the ED has recently been published, and an instructional video demonstrating common facial nerve blocks is now available online. The physician should certainly use all available references when learning these new procedures.

Part of the challenge in becoming proficient with facial anesthesia is having access to the right equipment, including aspirating syringes with thumb rings. If long-term pain control is desired, bupivacaine with epinephrine is also required. The emergency clinician should become familiar with topical anesthetics as highly effective adjuncts and should always be conscious of the contraindications and risks of allergies, side effects, and complications.

Case Conclusions

You suspect that the cause of the first patient’s pain is not simply postextraction pain but also alveolar osteitis or dry socket. The pain associated with this condition is severe, and an inferior alveolar nerve block would not only provide long pain relief but would also allow for the socket to be packed appropriately (ie, with dry socket paste [guaiacol and eugenol paste]).

The patient in Room 3 has a large laceration and a foreign body requiring careful exploration and repair. You convince the patient to undergo a block of the supraorbital and supratrochlear nerves with lidocaine with epinephrine. The patient is so impressed with how well the block

Risk Management Pitfalls For Facial Anesthesia

1. “It must have been a defective needle or something. I’ve never had one break before!”
   Proper technique and selection of an appropriate needle size will prevent almost all needle breaks. A 30-gauge needle is not recommended, and bending a needle prior to use weakens it and should be avoided.

2. “Hmm. Beats me! I am not sure why you have a slight facial droop.”
   Introduction of anesthetic into the parotid gland will sometimes cause paralysis of the facial nerve. Strict adherence to proper technique during an inferior alveolar nerve block almost always prevents facial nerve involvement. If a slight droop occurs, reassure the patient that this almost always corrects itself after the anesthesia wears off. A persistent palsy is very unusual, but the patient should be given a referral to an oral maxillofacial specialist in the unlikely event this occurs.

3. “I never aspirate. All this talk about aspirating syringes is ridiculous! Using plain syringes is fine.”
   Intravascular injection is a leading cause of complications including traumatic hematomas and relative overdose (from the anesthetic or the vasopressor agent). The standard of care in dentistry is to use aspirating syringes; this should be the standard in emergency medicine as well.

4. “Ester, amide, whatever! I have never heard of anyone who cannot tolerate a little benzocaine spray!!”
   It is true that allergies to the amides bupivacaine and lidocaine are rare, but allergies to the esters are more common. The esters include 20% benzocaine, which is often used in topical gels, ointments, sprays, and liquids. Of note, the indiscriminate spraying of 20% benzocaine has been associated with methemoglobinemia, especially in small children, although rarely.

5. “I do not know the toxic dose of local anesthetics. I never get close to these doses with facial anesthetics anyway.”
   It is true that emergency clinicians will most likely never get close to the MRD of a local anesthetic during facial anesthesia, but this becomes more of a risk in small children, elderly patients, and people with liver or severe renal disease. Although it is unusual, excessive local anesthetic volume remains the leading cause of overdose reactions.
works and how painlessly you are able to remove the larger glass fragments that he requests you do the laceration repair instead of involving a plastic surgeon.

You really want to help the patient with the toothache obtain better pain control, but you are worried about the lidocaine allergy. After questioning her, you suspect that she is not truly allergic, but you cannot be sure. Could it be the methylparaben preservative she is allergic to? You go to your computer and learn that you can give her bupivacaine cartridges, which do not cross-react with lidocaine and contain no paraben preservative. You explain this to your patient, who enthusiastically agrees to the procedure. After a simple supraperiosteal injection, she leaves your department pain free.

References
Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study, will be included in bold type following the reference, where available. In addition, the most informative references cited in this paper, as determined by the authors, will be noted by an asterisk (*) next to the number of the reference.


Cost-Effective Strategies
Topical Anesthetics
Many EDs now stock topical benzocaine gel for intraoral use before an injectable anesthetic. If an ED has only benzocaine spray, the drug should be sprayed onto a cotton-tipped applicator and applied to the mucobuccal fold. Likewise, topical lidocaine can be used; however, the clinician must be aware of increased absorption with lidocaine vs. benzocaine.

Injectable Anesthetics
Most EDs have lidocaine with and without epinephrine in multidose vials; however, many do not have multidose bottles of bupivacaine with epinephrine, perhaps because bupivacaine is used less often. Although a 50-cc multidose bottle of bupivacaine with epinephrine is less expensive ($10-$15) than a canister of 1.8-cc cartridges ($45-$55 for 50 cartridges), it is quite likely that a significant amount of the multidose bupivacaine will be wasted. The cartridges may be necessary depending on the type of syringes used.

Aspirating Syringes
A decision must be made as to whether to obtain plastic syringes or metal syringes. Plastic syringes are disposable (some types have reusable thumb aspirators), while metal syringes require sterilization. Over the long term, sterilization of metal syringes is more cost-effective; however, this is not a reasonable alternative for many EDs. A box of 100 disposable aspirating dental syringes with attached needles and reusable thumb rings costs approximately $30. On the other hand, a metal syringe without needles is approximately $20 to $40, plus the cost of an autoclave and labor.
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1. Bupivacaine has relatively low protein binding which accounts for it's prolonged duration of action?
   a. True  
   b. False

2. The allergenic potential of bupivacaine is greater when it is supplied in cartridge form than when it is in multi-dose bottle form.
   a. True  
   b. False

3. Smaller gauge needles have definitively been shown to decrease the pain of intraoral injection and, therefore, 30 gauge needles should be used when performing regional blocks in the mouth.
   a. True  
   b. False

4. Which of the following statements about topical anesthesia of the oral mucosa is true?
   a. Most topical anesthetics penetrate to a depth of approximately 5 mm.
   b. Topical benzocaine and topical lidocaine both have a set-up time of approximately 20 to 30 seconds.
   c. Topical anesthetics are usually not effective on the hard palate.
   d. Benzocaine should never be used because of the risk of methemoglobinemia.

5. The unilateral anterior mandibular teeth can be anesthetized by performing a mental nerve block and holding digital pressure over the foramen, either from a position inside the mouth (in the mucobuccal fold) or from a position outside the mouth on the skin of the chin.
   a. True  
   b. False

6. A patient has a 3 cm laceration parallel to and above the right eyebrow almost extending to the midline of the forehead. The best regional anesthesia technique to be used would anesthetize which of the following nerves?
   a. Frontal nerve
   b. Supraorbital nerve
   c. Supratrochlear nerve
   d. Supraorbital and supratrochlear nerve

7. Which of the following is true?
   a. Lidocaine and bupivacaine are both esters, while benzocaine is an amide.
   b. Lidocaine is an amide, while bupivacaine and benzocaine are esters.
   c. Bupivacaine is an ester, while lidocaine and benzocaine are amides.
   d. Bupivacaine and lidocaine are amides, while benzocaine is an ester.
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**Fixed Faces Painsfully: Facial Anesthesia In Emergency Medicine**
Benko K. December 2009, Volume 11; Number 12

This issue of Emergency Medicine Practice focuses on determining which patients will benefit from regional anesthesia and how to perform the most common facial anesthesia procedures. For a more detailed discussion of this topic, including figures and tables, clinical pathways, and other considerations not noted here, please see the complete issue at www.ebmedicine.net/topics.

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<th>Key Points</th>
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<tr>
<td>Consider patient allergies to amides and esters before proceeding with use of these agents.</td>
<td>Allergies to the amides bupivacaine and lidocaine are rare, but allergies to the esters are more common. The esters include 20% benzocaine, which is often used in topical gels, ointments, sprays, and liquids. Of note, the indiscriminate spraying of 20% benzocaine has been associated with methemoglobinemia, especially in small children, although rarely.</td>
</tr>
<tr>
<td>Have the patient in proper position, lying supine at a 45° angle, before performing facial anesthesia.</td>
<td>Placing the patient in a supine position will prevent syncope, which is the most commonly observed emergency in dentistry and can occur before, during, or immediately after injection of a local anesthetic.</td>
</tr>
<tr>
<td>Use less than the maximum recommended dose (MRD) of injectable anesthetic.</td>
<td>Surpassing the MRD is the number one cause of local anesthetic overdose reactions. The MRD of a parenterally administered anesthetic is determined by the patient’s age, physical status, and weight.</td>
</tr>
<tr>
<td>Use distraction techniques (shake the lip or use a cotton-tipped applicator on the palate) to decrease the pain of injection.</td>
<td>Use these techniques immediately before and during the palatal injection. The goal is to control pain via the gate theory.</td>
</tr>
<tr>
<td>Approach the injection for an inferior alveolar block from the opposite premolars, and do not inject if the bone of the mandible is not contacted.</td>
<td>If the injection is too far anterior (too close to the thumb in the coronoid notch) or too far posterior, or if it enters the inferior alveolar artery, complications and adverse effects may occur. A 30-year study at the USC School of Dentistry revealed that in 34 cases of litigation resulting from broken needles, 33 breaks occurred during inferior alveolar nerve infiltration. Also of note, all but 1 of the broken needles were 30-gauge needles. Bending the needle prior to injection can weaken it. To minimize the risk of breakage, the needle gauge should be 27 or larger, and the needle should not be bent.</td>
</tr>
<tr>
<td>Do not use long-acting anesthetics when anesthetizing children’s lips as self-mutilation can result.</td>
<td>Lidocaine is better for these types of lacerations. Bupivacaine is a good choice for lengthy procedures such as cleaning and suturing complex forehead lacerations.</td>
</tr>
<tr>
<td>Ensure that the discharge instructions address possible side effects and complications of facial anesthesia as well as appropriate follow-up.</td>
<td>Discharge instructions should address the possibility of facial droop, persistent paresthesia, dysesthesia, hematoma, and trismus and should also warn of possible tissue damage from inadvertent self-injury. A follow-up physician’s visit should be scheduled along with instructions for return to the ED if necessary.</td>
</tr>
</tbody>
</table>
REFERENCES

These references are excerpted from the original manuscript. For additional references and information on this topic, see the full text article at ebmedicine.net.


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