Pain Control for Operative Dentistry

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Pain Control

Historically, the public has associated dental treatment with pain. This association is no longer valid because techniques for the elimination of pain, including atraumatic injection, have been available for years and are essential to a successful dental practice. Local anesthesia for operative dentistry must be profound, often to depths required for pulpal anesthesia. The following information, if understood and practiced, should eliminate pain associated with dental procedures. For additional information the reader is referred to Malamed’s Handbook of Local Anesthesia.1

Local Anesthesia

Injection is used to achieve local anesthesia in restorative dentistry. The administration of local anesthesia to all tissues in the operating site is recommended for most patients to eliminate pain and reduce salivation associated with tooth preparation and restoration. To administer effective anesthesia, the dentist must have a thorough knowledge of the patient’s physical and emotional status and an understanding of the effects of the drug to be injected and the advantages and disadvantages of adding vasoconstrictors.

A therapeutic dose of a drug is the smallest amount that is effective when properly administered and does not cause adverse reactions. An overdose of a drug is an excessive amount that results in an overly elevated local accumulation or blood level of the drug, which causes adverse reactions. The normal healthy patient can safely receive five to eight cartridges of anesthetic per appointment. Each 1.8-mL cartridge contains anesthetic, with or without a vasoconstrictor (e.g., lidocaine 2% [anesthetic] with epinephrine 1:100,000 [vasoconstrictor], lidocaine 2% plain [no vasoconstrictor]). The number of permissible cartridges increases as body weight increases. According to Malamed, the maximum recommended dose of 2% lidocaine with epinephrine 1:100,000 is 4.4 mg/kg, or 2 mg/lb, to an absolute maximum of 300 mg (Online Table 20-1).1 Online Tables 20-1 and 20-2 will help calculate the maximum dose for a specific agent depending on the weight of the patient. These dosages are averages, however, and the dentist must be alert to adverse systemic effects when injected dosages approach the recommended limits.1

Local anesthetics have different durations of action for pulpal and soft tissue anesthesia. Pulpal (deep) anesthesia varies from 30 to 90 or more minutes. Soft tissue anesthesia varies from 1 to 9 hours, depending on the specific agent and whether or not a vasoconstrictor is included. Local anesthetics are selected on the basis of the estimated length of the clinical procedure and the degree of anesthesia required (Online Box 20-1). Two (or more) anesthetic agents can be administered when needed. The total dose of both anesthetics should not exceed the lower of the two maximum doses for the individual agents. Anesthetics also are available in amide and ester types. Hypersensitivity and allergic reactions in affected patients are much less frequent with the amide type of local anesthetic.1

Patient Factors

CARDIOVASCULAR SYSTEM

Before administering any drug, the condition of the cardiovascular system (heart and blood vessels) must be assessed. At minimum, blood pressure, heart rate, and rhythm should be evaluated and recorded for all patients. According to the latest guidelines, patients with a systolic pressure less than 160 mm Hg and a diastolic pressure less than 100 mm Hg (stage 1 hypertension) are good candidates for all dental procedures. Patients with blood pressure consistently greater than the aforementioned numbers (stage 2 hypertension) should be referred to their physicians, particularly if the elevation is greater than 20 mm Hg.2 Malamed suggested that any resting patient with a pulse rate less than 60 beats per minute (beats/min) or greater than 110 beats/min be questioned further. Athletes in good physical condition may have a lower heart rate, but without this information, the lower heart rate may indicate a heart block. Additionally, five or more “missed beats” (premature ventricular contractions) per minute with no obvious cause is an indication for medical consultation.

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Patients with valvular heart disease or a predisposition to bacterial endocarditis should have prophylactic antibiotics prescribed before dental treatment; the American Heart Association defines the recommended regimen for these patients with valvular heart disease or a predisposition to bacterial endocarditis should have prophylactic antibiotics prescribed before dental treatment; the American Heart Association defines the recommended regimen for these patients.

With careful operative dentistry, the gingiva should be minimally abraded, even in subgingival tooth preparations.

### CENTRAL NERVOUS AND RESPIRATORY SYSTEMS

The central nervous system (CNS) is more easily affected by overdose of injected anesthetic drugs compared with the cardiovascular system. Anesthetics depress the CNS, but when administered properly for local anesthesia, little or no clinical evidence of depression is encountered. At minimal to moderate overdose levels, depression is manifested in excitation (e.g., talkativeness, apprehension, sweating, elevated blood pressure and heart rate, elevated respiratory rate) or drowsiness. At moderate to high overdose levels, tonic-clonic seizure activity may occur, followed by generalized CNS depression, depressed blood pressure, reduced heart rate (<60 beats/min), depressed respiratory rate, and respiratory arrest. With lidocaine and procaine, the usual progression of excitatory signs and symptoms described previously may not be seen, and the first clinical evidence of overdose may be mild sedation or drowsiness. However, be depressed and arrested by CNS depression resulting from overdose.

### ALLERGY

Malamed stated that documented, reproducible allergy is an absolute contraindication for administration of local anesthetic. When a patient reports a history of “sensitivity” or “reaction” to an injected dental anesthetic, the dentist must believe the patient until further investigation disproves the patient’s claim. Anaphylactic shock from an allergic reaction can be immediate and life threatening. Fast injection and intravascular injection of anesthetics are reasons for

### TABLE 20-1 Approximate Duration of Action of Local Anesthetics*

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>mg/kg</th>
<th>mg/lb</th>
<th>MRD, mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articaine</td>
<td>7.0</td>
<td>3.2</td>
<td>None listed</td>
</tr>
<tr>
<td>With vasoconstrictor</td>
<td>2.0</td>
<td>0.9</td>
<td>90</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>7.0</td>
<td>3.2</td>
<td>500</td>
</tr>
<tr>
<td>With vasoconstrictor (Canada)</td>
<td>6.6</td>
<td>3.0</td>
<td>400</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>6.6</td>
<td>3.0</td>
<td>400</td>
</tr>
<tr>
<td>With vasoconstrictor</td>
<td>8.0</td>
<td>3.6</td>
<td>600</td>
</tr>
<tr>
<td>Prilocaine</td>
<td>8.0</td>
<td>3.6</td>
<td>600</td>
</tr>
</tbody>
</table>

**MANUFACTURER’S AND FDA (MRD)**

**CALCULATION OF MILLIGRAMS OF LOCAL ANESTHETIC PER DENTAL CARTRIDGE (1.8 ml CARTRIDGE)**

<table>
<thead>
<tr>
<th>Local Anesthetic</th>
<th>Percent Concentration</th>
<th>mg/ml</th>
<th>mg/1.8 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articaine</td>
<td>4</td>
<td>40</td>
<td>72*</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>0.5</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>2</td>
<td>20</td>
<td>36</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>2</td>
<td>20</td>
<td>36</td>
</tr>
<tr>
<td>Prilocaine</td>
<td>3</td>
<td>30</td>
<td>54</td>
</tr>
</tbody>
</table>

*These anesthetics all are from the amide category.

(From Malamed SF: Handbook of local anesthesia, ed 6, St. Louis, 2013, Mosby.)
Sometimes, a tooth is not sensitive to and from the anesthetized site. Without epinephrine, is the prolongation of anesthesia because of reduced blood flow to tissues (ischemia) where a vasoconstrictor is used. The alpha effect of the temporary reduction in blood flow and volume in tissue is beneficial for successful tooth preparation and restoration.

Benefits

COOPERATIVE PATIENT

When a local anesthetic appropriate for the procedure is properly administered, patient anxiety and tension should be minimal. The appreciation and trust of the patient for the dentist (and dental assistant) are expressed in a more relaxed and cooperative attitude. Physically and emotionally, the patient and the dentist benefit from a relatively calm environment.

SALIVATION CONTROL

Saliva control is a primary reason for the use of profound anesthesia in most patients. For years, it has been observed that complete anesthesia of all tissues (teeth and gingival tissues) in the dental operating site results in a marked reduction of salivation. Sometimes, a tooth is not sensitive and does not require anesthesia. If all other sensations from the operating site are eliminated, however, salivation is controlled.

HEMOSTASIS

The term hemostasis, as used in operative dentistry, refers to the temporary reduction in blood flow and volume in tissue (ischemia) where a vasoconstrictor is used. The alpha effect of the vasoconstrictor causes constriction of the small blood vessels; the affected tissue bleeds less if cut or abraded. The principal function of a vasoconstrictor in operative dentistry is the prolongation of anesthesia because of reduced blood flow to and from the anesthetized site. Without epinephrine, anesthesia from 1 mL of lidocaine 2% lasts only 5 to 10 minutes; with epinephrine, the anesthesia lasts 40 to 60 minutes. Reduced blood flow helps keep the patient’s blood level of the anesthetic and the vasoconstrictor at a low level by reducing the rate of absorption into the circulatory system.

OPERATOR EFFICIENCY

Local anesthesia greatly benefits the dentist and the patient and is beneficial for successful tooth preparation and restoration. It improves operator efficiency, and usually, the patient is calmer and more cooperative. This increased cooperation may reinforce the dentist’s confidence and calmness, which may promote more efficient treatment. Without distractions or management problems from the patient, the dentist can focus on the treatment and its completion within a reasonable time frame.

Administration

PSYCHOLOGY

Patients have varying degrees of concern about receiving an intraoral injection. A concerted effort by the dentist and dental assistant is required to make the procedure more acceptable, and a positive approach is desirable with all patients during this phase of treatment. Probably the greatest positive effect is achieved through a caring manner, rather than by what is said. Words such as pain, sting, hurt, and inject should not be used because no matter what else is said, the patient will remember these potentially fear-invoking words. The operator must use a kind, considerate, and understanding approach. Every assurance should be made that the comfort of the patient is paramount and that the teeth and soft tissues will be treated with care. Such assurances, confidently and softly spoken, are welcomed during the administration of local anesthesia. One example is, “I may be taking longer than you expected, but we are giving the solution slowly to be kind to your tissues.” Patients who feel secure (safe from pain and in caring hands) gratefully accept local anesthesia. The art of tactfully keeping the syringe and needle from the view of the patient should be practiced. Here, the chairside assistant can be a tremendous help.

TECHNIQUE STEPS AND PRINCIPLES

Because profound, painless anesthesia of teeth and contiguous soft tissues is so important in operative dentistry, the salient features of a recommended technique for infiltration anesthesia of a maxillary canine are presented here. Technique instructions for injection and infection control (particularly avoiding accidental needlestick injury) are described, and the following principles for the injection of a local anesthetic and epinephrine are also applicable to infiltration and conduction anesthesia. Infiltration anesthesia involves a supra-periosteal or field block, where deposition is near the nerve ends in the operating site. Conduction anesthesia involves a nerve block, where deposition is near a nerve trunk at a distance from the operating site.

In this example of infiltration anesthesia, the needle entry spot and direction are different from that presented in some textbooks on local anesthesia. Aspiration and slow deposition of solution are emphasized. For other local anesthesia injections (inferior alveolar, Gow-Gates mandibular, posterior alveolar, infraorbital, mental, and periodontal ligament), the reader is referred to a textbook on local anesthesia.

The routine supine position of the patient helps prevent vasodepressor syncope because it maintains blood supply and blood pressure to the brain. As a precaution, the upper torso should never be more than 10 degrees below the horizontal plane because this may cause respiratory distress secondary to the force of viscera against the diaphragm. Occasionally, patients may complain of breathing difficulty that is relieved only by sitting upright or standing (orthopnea), in which case a compromise in patient position is necessary. Another exception to the supine position is when symptoms suggest an epinephrine overdose; in this case, a semi-erect or sitting position is best because it minimizes any further elevation in cerebral blood pressure. Symptoms of overdose include fear, perspiration, weakness, pallor, palpitations, anxiety, and restlessness.

The syringe must have an aspirating feature. When anesthetic is administered, aspiration is second in importance only to slow deposition of solution. For this purpose, the rod (piston) has a harpoon on its cartridge end and a thumb ring on the other end (Online Fig. 20-1, H). The harpoon engages the cartridge plunger, which results in its potential reverse
Online Fig. 20-1  

A, Prop/guard (Stik-Shield) card. The periphery of the hole (h) is indexed (i) (four pairs of short cuts) to accept four external ridges (r) of the sheath (s) shown in B. B, The sheath (s) covers the injection portion of the needle, and the cap (c) covers the reverse end (cartridge needle). Sheath and cap are joined by spot plastic weld (w). Note the external ridge (r). C, With the fingers of one hand holding the prop/guard card printed-side up (and supporting it), the dental assistant (DA) uses the ends of the thumb, index, and middle fingers of the other hand to press the last one third of the sheath through the hole while lining up external ridges to align with the card indices. (Do not, at this time, jar the cap [on reverse end] loose with hand.) D, The dental assistant applies thumb pressure (arrow) on the end of the cap to insert sheath fully to its collar. (Do not, at this time, loosen the cap by any twisting motion.) E, The dental assistant’s left hand holds the sheath (card on sheath) and presses down on the countertop in a stationary position (left arrow), while the fingers of right hand “twist-break” plastic weld at cap/sheath union and deliberately move the cap off of the reverse-end needle. Note the horizontal right arrow depicting the movement of the hand (away from needle), which discards the cap. F, The dental assistant’s left hand, still holding the carded sheathed needle, now inserts the reverse-end needle into the hole in the threaded end of the syringe held by the other hand (kept at least 3 inches away from card).
Online Fig. 20-1, cont’d  

G. The dental assistant’s left hand screws the sheathed needle clockwise onto the syringe threads to a full-seating position against the syringe nose. Note the protection of both hands by the guard card during such threading. The harpoon (h) is used later. H. The dental assistant lays the prepared syringe (minus anesthetic cartridge) on the countertop or tray behind the patient, propped up because of the guard card and ready for the operator. Note the harpoon (h) on the piston end. I and J. While fully retracting the spring-loaded, movable, rear cartridge seat of the syringe by hand retraction of the piston, the operator or assistant (behind the patient) inserts the cartridge, rearward end first (I), and “drops” the forward end (diaphragm end) of the cartridge into position (J) without dragging across or bending the reverse-end needle. The operator or the assistant slowly releases the piston retraction, moving the rear cartridge seat and the cartridge forward, allowing the reverse-end needle to pierce diaphragm. (Leakage of cartridge during later attempted deposition is usually caused by a bent reverse-end needle poorly centered on the diaphragm.) K and L. With the syringe propped by the card on countertop (or tray) behind the patient, the operator or assistant holds the sheath by the fingers of one hand (card protected) and the syringe by the other hand, which is kept stationary (K) as the sheath is loosened and removed away from the needle (L). M. The guard card now props the sheath.
movement to create negative pressure when the operator’s thumb (in the ring) pulls back gently.

Injection into infected tissue should be avoided because of the risk of spreading the infection. Also, the anesthetic becomes less effective because the infected tissue is acidic rather than basic. Alternative approaches such as nerve block should be used.

**Disposable Needle**

The sheath covers the needle and the cap covers the reverse end (cartridge end) of the disposable needle (see s and c in Online Fig. 20-1, B). For each patient (appointment), the dental assistant selects a sheathed, capped, new disposable needle of the desired length and gauge. The sheathed needle comes sterile from the manufacturer. The needle remains sheathed except for setting the harpoon and testing the syringe preparedness (see the later discussion on principles), until the moment of entry at the injection site. This helps prevent accidental needlestick injury, which among other things indicates needle replacement. For each patient appointment, using a new, sterile needle contaminated only by that patient’s oral tissue eliminates cross-infection via the needle. Keeping the sheath in place ensures that the needle is sharp. When the needle contacts the firm periosteal tissue or bone, a minute barb can be formed that causes pain on withdrawal or during subsequent re-injection.

The needle must be sufficiently long that its full length is never out of sight (never completely within tissue). This means that in the unlikely event that a needle breaks at the hub junction, some of the needle is exposed for grasping and withdrawal. Needles of 27-gauge are generally recommended, although some operators prefer the 30-gauge, short needle for infiltration anesthesia of maxillary teeth. The 30-gauge needle may not allow aspiration, and some authorities believe that it does not pierce or move in tissue more easily than the 27-gauge needle. Also, the 30-gauge, long needle may deviate during injection for conduction anesthesia of the inferior alveolar nerve.

**Prop/Guard Card**

The dental assistant inserts the sheathed needle end into the prop/guard card (Stik-Shield; Tacoma, WA) (see Online Fig. 20-1, A through D) and removes the cap on the reverse end of the needle (see Online Fig. 20-1, E). The dental assistant inserts the reverse end of the needle into the hole at the threaded end of the syringe and screws the sheathed needle to a full seating position against the nose of the syringe (see Online Fig. 20-1, F and G). The guard card protects both hands. The card hits the nose of the syringe before the needle could injure the hand holding the syringe. The dental assistant inserts the cartridge and sets the harpoon or lays the propped (by card) syringe on a tray or countertop (see Online Fig. 20-1, H) behind the
Anesthetic Cartridge

Using a new cartridge for each patient is imperative. Because some ingredients do not have an extended shelf life, the anesthetic cartridge should not be more than 18 months past the date of manufacture. The expiration date is printed on the packing container. Some manufacturers place an expiration date on the cartridge. The diaphragm end of the cartridge should not be contaminated by contact with potentially infected surfaces. The cartridge should not be immersed in a sterilizing solution (cold sterilizing solution or alcohol) because this can diffuse through the diaphragm and cause tissue damage. Cartridges should not be exposed to sunlight and should be stored at room temperature.

The weakest solution of anesthetic that will be effective should be used. Lidocaine 2% with 1:100,000 epinephrine is commonly used in operative dentistry and is generally recommended; 1 mL (half a cartridge) provides infiltration anesthesia for 40 to 60 minutes for anterior teeth. The addition of a vasoconstrictor to the anesthetic solution is necessary to prolong anesthesia by decreasing the rate of absorption of the anesthetic into blood. The vasoconstrictor may reduce the potential of anesthetic toxicity. As previously described, the vasoconstrictor in the anesthetic solution administered by infiltration is useful in reducing occasional hemorrhage by producing slight, transient ischemia of the cut or abraded soft tissue.

Before its use, the anesthetic solution should be warmed to approximately body temperature. Otherwise, the relatively cold solution contributes to the pain of injection. An approximately 30°F difference exists between room temperature and body temperature. The anesthetic cartridge can be warmed in an anesthetic warmer, which is usually heated by a low-watt light bulb, or the cartridge can be held tightly in the palm of the hand for 10 to 15 seconds.

Anesthetic Syringe

The anesthetic syringe includes a rod (or piston) that has a harpoon (or barb) on the cartridge end and a thumb ring on the other end. The harpoon and thumb ring are features that allow the operator to aspirate during injection. The harpoon engages the cartridge plunger. During injection, the operator should use the thumb ring and periodically reverse the movement of the rod to create negative pressure causing aspiration. Periodic aspiration during injection is important to ensure that the solution is not being injected into a blood vessel. If the tip of the needle is in the vessel, blood is aspirated into the cartridge, indicating the need to reposition the needle. For patient safety and comfort, periodic aspiration is as important as slow deposition of the anesthetic solution.

Assembly of Syringe

To assemble the syringe, the assistant or operator picks up the syringe and, while holding the piston fully retracted, inserts the cartridge (see Online Fig. 20-1, I and J). The cartridge needle should be diaphragm centered. If it is not, the assistant or the operator guides the axial alignment of the cartridge such that the needle pierces the center of the diaphragm as the spring-loaded, retracted piston is slowly released. If the cartridge needle is malpositioned or bent as the cartridge is loaded, leaking can occur as injection is initiated. The distasteful solution may drip freely into the patient’s mouth. If so, injection must be aborted, and another cartridge must be placed properly in the syringe.

The harpoon is set into the cartridge plunger by a light, quick thrust from the palm of the hand on the thumb ring (see Online Fig. 20-1, N). Too strong a blow may crack or break the cartridge.

The sheath should be removed out of the patient’s view, carefully moving it away from the hand holding the needle and syringe; the hand is held stationary on the tray or countertop (see Online Fig. 20-1, K and L). The prop/guard card protects the hand during sheath removal (see Online Fig. 20-1, L). It also props the sheath, thus preventing contamination (see Online Fig. 20-1, M).

The assembled syringe is tested by pressing the plunger forward 1 to 2 mm to verify that it slides easily and to ensure that the solution is emitted from the needle tip without leakage (see Online Fig. 20-1, O). If preparation of the injection site has been accomplished previously by wiping of the entry site with gauze and the 1- to 2-minute placement of topical anesthetic (see the next discussion on principles), the injection procedure follows.

Topical Anesthetic

Before needle entry, the mucosa at the injection site should be wiped free of debris and saliva with a sterile gauze. After this, a lidocaine topical anesthetic ointment is applied for a minimum of 1 to 2 minutes to the selected entry spot (using a cotton-tipped swab, limiting the area of application to the swab dimension). This procedure often is started immediately after positioning the patient in the chair and following the wiping. The chairside assistant may perform the wiping and the application of the topical anesthetic. The use of a topical anesthetic is generally recommended. However, effective injection techniques, including a slow deposition rate (approximately 60 seconds per cartridge), a warmed cartridge, and the use of sharp needles, are more important factors in achieving painless injection than the use of a topical anesthetic.

Injection Site

If in place, the needle sheath should be removed in a one-person procedure, taking care to protect the hand with the shield (see Online Fig. 20-1, K and L). With the left hand, a right-handed operator gently raises the lip outward and upward to identify the vestibular fornx, or the mucogingival junction, where the attached gingiva joins the alveolar mucosa (Online Fig. 20-2). Holding the lip high enough, the operator visualizes the location of the root end and determines the injection site in the alveolar mucosa (1) as it is stretched perpendicular, or nearly so, to the long axis of the tooth and (2) toward the periosteal target area, which is very near the root end of the tooth to be operated on (see Online Fig. 20-2). The injection site should be 5 to 10 mm lateral of the mucogingival line, allowing some freedom of needle movement and avoiding causing tissue tension. If the needle is held parallel to the tooth long axis, rather than at an angle as recommended, the needle tends to enter too close to the attached mucosa and thus to the sensitive periosteal lining, which would cause pain.
An important principle is to deposit the smallest volume that will provide effective anesthesia. A common error is to deposit excessive anesthetic (with epinephrine) causing overdose reactions.

After deposition, the needle is gently withdrawn and resheathed. A one-handed procedure is recommended. The operator inserts the needle partially into the propped sheath (remaining after the unsheathing procedure), uprights the sheath on the tray or countertop, and seats the needle fully into the sheath (Online Fig. 20-3, A and B). The sheathed syringe is left propped for possible reuse or for later removal and disposal (see Online Fig. 20-3, C). Resheathing is crucial in the prevention of needlestick injuries, which can cause cross-infection to the operator and other office personnel. The Occupational Safety and Health Administration (OSHA) stipulates that needle resheathing should be in a one-handed procedure. It is also recommended that resheathing should be done by the same person who gave the injection; this eliminates the hazard of passing exposed needles. Even though multiple injections using the same needle for a patient creates no infection control concerns, multiple uses are discouraged because the used needle and the contents of its lumen may be infectious to dental personnel if accidental needlestick injury occurs.

It is important that the patient be continually observed during and after the administration of local anesthesia. An anesthetized patient should never be left unattended and unobserved. Adverse reactions, if they occur, demand immediate attention by the dentist.

**Disposal of Needle and Cartridge**

Proper disposal of the needle and cartridge is crucial. Removal and disposal of the sheathed, used needle is done by the dental assistant, who carefully unscrews the sheathed needle from the syringe (see Online Fig. 20-3, D) and moves it away from the syringe with a shield-protected hand (see Online Fig. 20-3, E). Tissue contact with the uncapped, exposed cartridge needle should be avoided. If the needle hub is too tight to remove manually recapped. The assistant’s hands should be gloved, preferably with utility gloves.

Disposal of the sheathed, used needle immediately follows its removal from the syringe. With the protective guard card still in place, the needle is placed in a nearby sharps disposal container by laying the attached card on the orifice rim (see Online Fig. 20-3, F). With the thumb pressing on the plastic, the sheathed needle is pushed out of the card into the container (see Online Fig. 20-3, G). The cartridge also should be disposed of in the sharps container. The sharps container must be leak-proof and hard walled and display an OSHA biohazard label.
Emergency Procedures

The importance of taking pretreatment vital signs cannot be overemphasized. The patient’s pretreatment blood pressure and pulse rate should be recorded in the chart. These vital signs are useful to uncover previously unknown cardiovascular problems and to serve as a baseline if an adverse reaction occurs during treatment. Adverse reactions occurring during or after administration of local anesthesia can lead to serious complications that require emergency procedures. Foremost among these procedures are the following: (1) Place the patient in a supine position (note the exception below), (2) summon medical assistance, (3) monitor vital signs, and (4) apply basic life support (open the airway and use cardiopulmonary resuscitation [CPR], if needed). The supine position, with legs (only) slightly elevated, increases the volume of circulating blood and aids in increasing blood pressure. This procedure for a patient in syncope, or with syncopal symptoms, should relieve hypoxia of the brain and return the patient to, or help maintain, consciousness. The supine position should not be used, however, when symptoms (e.g., fear, perspiration, weakness, pallor, palpitations) suggest an epinephrine overdose. In this case, a semi-erect or sitting position is best because it minimizes any further elevation in cerebral blood pressure.

Analgesia (Inhalation Sedation)

The most appropriate method of preventing pain is by blocking the nerve pathways capable of conducting nerve impulses. For patients who have a low threshold of pain and are apprehensive (hyper-responders), raising the threshold by inhalation sedation is an adjunctive aid to anesthesia by injection. The use of nitrous oxide and oxygen is one method of inhalation sedation. The reader is referred to a textbook on anesthesia that covers inhalation sedation in detail. The operator should understand that this method of pain control has definite limitations. Analgesia should not be thought of as general anesthesia in any stage or depth. It is simply a condition in which the pain threshold is elevated. With inhalation sedation, the patient is conscious of the activities around him or her.

Hypnosis

The fear of pain associated with dental procedures sometimes can be controlled by hypnosis. A favorable mental attitude may be established through suggestions of relaxation. The dentist and the patient may derive certain benefits through hypnosis. The dentist has the opportunity to work on a more relaxed and cooperative patient and has better control over patient habits such as talking and rinsing and oral tissue
tension. The patient who is relaxed is less fatigued at the end of the appointment and has no specific recollection of having experienced discomfort.

Hypnosis has some merit under certain circumstances and has produced satisfactory results for some practitioners when it is properly applied. Before hypnosis is attempted, the operator must know how to recognize and cope with conditions associated with psychological, emotional, and mental factors and must be thoroughly familiar with all of the principles involved in hypnosis.

Hypnosis is not a way to eliminate all other accepted means of minimizing dental pain or discomfort, but it may be a valuable adjunct in improving accepted procedures. Also, posthypnotic suggestion has been found to be successful in alleviating certain noxious dental habits.

References