

## EXODONTIA IN THE PRIMARY DENTITION

The extraction of primary teeth is an integral part of any dental practice that includes children. Fear, the main deterrent to seeking dental care, reaches its maximum in a child anticipating any form of oral surgery. For this reason alone it is very desirable that the dentist who has successfully carried (lie youngster through many previous experiences (the first visit to the dental office, dental x-ray examinations, prophylaxis, and operative procedures) be the person to perform the extraction. Whenever possible, the child should be iik .Tined several days in advance that he or she has an appointment for a tooth extraction. If this is not done, he or she will be apprehensive of every visit to tht dental office. Baldwin has indicated that a period of 4 to 7 days' prior notice ui impending surgery is adequate for children, and that such a period of advance warning is a deterrent to adverse psychological reactions. Recognition of an abnormality and diagnosis of the condition is a prerequisite to the correct resolution of any oral surgical problem. Good dental radiographs, therefore, are of prime importance before any surgery is undertaken. They are also essential for protection against medicolegal action.

The most frequent oral surgical problem in children is the extraction of one or more carious teeth. Good radiographs will determine if the roots of the primary molars are still fully formed and encircle the developing tooth bud. If so extra (sue must be taken to separate the roots and prevent dislodgment of tin siieedaneous tooth. If a carious tooth whose roots are partially resorbed is to he extracted, the radiographs will denote the areas of resorption and potential areas of root fracture.

Dentists frequently see children when they are in pain from a tooth-aeiie. If this is the case, the offending tooth is generally easy to identify because of its mobility and sensitivity to percussion. Lymphadenopathy often exists along with soft tissue swelling and reddening around the affected ana. Radiographs are essential as part of the diagnosis and should be retained as a permanent record. The use of antibiotics in children needing dental extractions is an important consideration.

A good rule to follow is if the dental abscess is well resolved and a fistulous tract established, and if the patient is asymptomatic and in good general health, an antibiotic is not mandatory. If, however, there is pain or fever or periapical swelling and adenopathy, and the infection apparently has not reached its maximum limit, or if the child lias a chronic debilitating condition such as congenital heart disease, proper antibiotic therapy should be instituted.

One of the tenets of good surgery is profound anesthesia. Inasmuch as good operative dentistry is based on the same premise, the dentist should be able to provide this quite readily. Chapter 6 illustrates the procedures for local anesthesia. In some cases, especially with the very young child, extraction of teeth is best performed under general anesthesia. It should be pointed out that the decision to perform more complex operations, such as frenectomies, removal of impacted teeth, and the like, will depend entirely on the dentist's training and feeling of competency.

He or she should, however, be able to diagnose these conditions, understand their implications, relate them to the parent, and render acceptable judgments as to when surgery should take place.

In all procedures with children, slow, smooth, and graceful movements as opposed to fast, jerky, and awkward movements are the most desirable. This is particularly true during extractions. Not only will such actions be conducive to good patient management, but they also will minimize breaking the roots of primary teeth, which are frequently thin and fragile. If a root should be fractured, it is advisable to be cautious in removing the root tips, so that the permanent tooth bud will not be jeopardized. Frequently, the better part of valor is to leave the embedded root tip and let it be exfoliated or resorbed. In such a case, the parent should be advised that the root tip remains. This should be recorded in the patient's chart, and the area *should* be rechecked at periodic intervals.

Young children seldom have any problems with healing of extraction sites postoperatively. So-called dry sockets are rarely encountered. Some discomfort, however, may be experienced when the local anesthetic wears off. It is a good procedure to have children bite on a gauze pack for at least 2 hour following surgery. In addition, the child should keep his or her head elevated and avoid eating or drinking for several hours. Soft diets are recommended for the first day, avoiding such foods as peanuts and popcorn so that food debris will not be trapped in the sockets. The prevention of lip biting can be a problem, but with the use of short-acting anesthetic agents and an appropriate warning to the child and the parent, trauma to the cheeks and lips should be infrequent.

In general, the removal of deciduous teeth is not difficult; it is facilitated by the elasticity of young bone and the resorption of the root structure. Children's upper and lower forceps can be used for the removal of all deciduous teeth. These forceps have the design of the universal upper and lower forceps (Nos. 150 and 151). If children's forceps are not available, deciduous teeth can be removed with the forceps used for the removal of their succedaneous analogues. However, the "cow-horn" (No. 16) forceps is not used for the extraction of lower deciduous molars because the sharp beaks of this forceps could cause damage to the unerupted premolar teeth.

The maxillary and mandibular six anterior teeth are removed by luxation to the labial side, followed by mesial rotation, and then pressure in the direction of removal. Because of the lingual position of the erupting permanent incisor teeth, little can be gained by placing lingual pressure on these teeth. The maxillary and mandibular molars are luxated to the buccal and lingual areas and delivered to the mesial or lingual. Frequently a mesial or distal path of exit is necessary because of the root formation.

Adequate radiographs are invaluable for the removal of any deciduous tooth. The presence and position of the permanent successor must be established as well as the status of the root formation of the deciduous tooth that is to be removed. Many times the resorption of the deciduous root is unequal, leaving a long, thin root portion. If a root is fractured during the extraction, it should be removed by the

judicious use of root exolevers or a small curet. The Potts elevators also are valuable here (Fig. 7-2). Care must be exercised not to injure the crown of the permanent tooth or its surrounding bony support. **If** the removal of the deciduous root tip jeopardizes the permanent tooth, it is better to leave the root tip intact. It will resorb or can be removed at a later date without jeopardy to the permanent tooth.

Occasionally the radiograph will demonstrate that the permanent premolar is wedged tightly between the bell-shaped roots of the deciduous tooth. This occurs most often in a deeply carious tooth of a young patient in which no deciduous root resorption has occurred. Care must be taken that the succedaneous tooth is not removed with the deciduous tooth because of the viselike grip of the roots.

If the radiograph shows this condition, the deciduous crown should be sectioned into a mesial and a distal half before a forceps is placed on the tooth to remove the two portions separately. If at any time a permanent tooth is removed during the extraction of a deciduous tooth, it should be replaced in the alveolar bone with as little handling as possible and with the operator's making sure that the buccal aspect of the tooth is placed on the buccal side of the alveolus.

## INDICATIONS AND CONTRAINDICATIONS FOR EXTRACTION

**Indications.** Any tooth that is not useful in the total dental mechanism is considered for removal.

1. Pulp pathologic conditions, either acute or chronic, in a tooth that is not amenable to endodontic therapy condemns the tooth. A tooth that is not restorable by dental procedures can be considered in this category, even if a pulp pathologic condition is not demonstrable.

2. Periodontal disease, acute or chronic, that is not amenable to treatment may be cause for extraction.

3. Traumatic effects on the tooth or alveolus sometimes are beyond repair. Many teeth in the line of jaw fracture are removed to treat the fractured bone.

4. Impacted or supernumerary teeth often do not take their place in the line of occlusion.

5. Orthodontic consideration may require the removal of fully erupted teeth, erupting teeth, and overretained deciduous teeth. Malposed teeth and third molar teeth that have lost their antagonists can be included.

6. Devitalized teeth, radiographically negative, have been removed as a last resort at the request of the nossibiliti that the are foci of infection, although this concept is considered extremely questionable today, mainly because neither the dentist nor the physician can diagnose accurately whether such infection is present.

7. Prosthetic considerations may require the removal of one or many teeth for design or stability of the prosthesis.

8. Esthetic considerations at times transcend purely functional factors.

9. There may be a pathologic condition in surrounding bone that involves the tooth, or treatment of the pathologic condition may require removal of the tooth. Examples are cysts, osteomyelitis, tumors, and bone necrosis.

**Contraindications.** Few conditions are absolute contraindications for extraction of teeth. Teeth have been removed in the presence of all types of complications because of necessity. In these situations much more preparation of the patient is necessary to prevent serious damage or death or to obtain healing of the local wound. For example, the injection of a local anesthetic, let alone the extraction of a tooth, can cause instant death in a patient in an Addisonian crisis. Surgical intervention of any kind, including exodontics, may activate systemic or local disease. Therefore a list of relative contraindications is given. In some instances these conditions become absolute contraindications.

**LOCAL CONTRAINDICATIONS.** Local contraindications are associated mainly with infection and, to a lesser extent, with malignant disease. Acute infection with an uncontrolled cellulitis must be controlled so that it does not spread further. The patient may exhibit a toxemia, which brings complicating systemic factors into consideration. The tooth that caused the infection is of secondary importance at the moment; however, to better control the infection, the tooth is removed as soon as such removal does not endanger the life of the patient. Before antibiotics became available the tooth was never removed until the infection had become localized, the pus was drained, and the infection had subsided to a chronic state. This sequence of events took much longer than the present method of removing the tooth as soon as an adequate blood level of a specific antibiotic had brought systemic factors under control.

2. Acute pericoronitis is managed more conservatively than other local infections because of the mixed bacteriologic flora found in the area, the fact that the third molar area has more direct access to the deep fascial planes of the neck, and the fact that removal of this tooth is a complicated procedure involving ossisection.

3. Acute infectious stomatitis is a labile, debilitating, and painful disease, which is complicated by intercurrent exodontics.

4. Malignant disease disturbed by the extraction of a tooth embedded in the growth will react with exacerbated growth and nonhealing of the local wound.

5. Irradiated jaws may develop an acute radio-osteomyelitis after extraction because of a lack of blood supply. The condition is severely painful and may terminate fatally.

**SYSTEMIC CONTRAINDICATIONS.** Any systemic disease or malfunction can complicate or be complicated by an extraction. These conditions are too numerous to list. Some of the more frequently encountered relative contraindications are as follows:

1. Uncontrolled diabetes mellitus is characterized by infection of the wound and absence of normal healing.

2. Cardiac disease, such as coronary artery disease, hypertension, and cardiac decompensation, can complicate exodontia. Management may require the help of a physician. Usually a postinfarction patient is not subjected to oral surgery within 6 months of his infarction.<sup>2</sup>
4. Blood dyscrasias include simple as well as more serious anemias, hemorrhagic diseases such as hemophilia, and the leukemias. Preparation for extraction varies considerably with underlying factors. Debilitating diseases of any kind make patients poor risks for further traumatic insults.
5. Addison's disease or any steroid deficiency is extremely dangerous. The patient who has been treated for any disease with steroid therapy, even though the disease is conquered and the patient has not taken steroids for a year, may not have sufficient adrenal cortex secretion to withstand the stress of an extraction without taking additional steroids.
6. Fever of unexplained origin is rarely cured and often is worsened by extraction. One possibility is an undiagnosed subacute bacterial endocarditis, a condition that would be complicated considerably by an extraction.
7. Nephritis requiring treatment can create a formidable problem in preparing the patient for exodontics.
8. Pregnancy without complications presents no great problem. Precautions should be taken to guard against low oxygen tension in general anesthesia or in extreme fright. Obstetricians hold varied opinions regarding the timing of extractions, but they usually prefer that necessary extractions be done in the second trimester. Menstruation is not a contraindication, although elective exodontia is not done during the period because of less nervous stability and greater tendency toward hemorrhage of all tissues.
9. Senility is a relative contraindication that requires greater care in overcoming a poor physiologic response to surgery and a prolonged negative nitrogen balance.
10. Psychoses and neuroses reflect a nervous instability that complicates exodontics.

*Clinical examination* consists of visual evaluation (color, swelling, and condition of tooth and surrounding structures), palpation and percussion, instrumentation, and vitality tests. The tooth in question is examined closely. In addition, adjacent teeth and surrounding structures are examined carefully for problems that may be pertinent. The overhanging margin of the restoration on the next tooth that will fracture on extraction, osteoradionecrosis in the underlying jaw, or a fractured jaw under the loose tooth in a patient who has come from a barroom fight should not be overlooked. A clinical survey of the general health status of the fully clothed patient in the dental chair also is a necessary art in the successful dental practice.

*Radiographic examination* is necessary, both preoperatively and postoperatively. Many conditions that could not be diagnosed otherwise are thus revealed, such as the curved root, the large cyst, a new abscess, or carious exposure of the pulp on an adjacent tooth that was not present on radiographs made several years earlier. The man whose jaw was fractured in the fight will sue when he becomes sober, claiming

the jaw was fractured during the extraction, unless a preoperative radiographic record exists. A postoperative radiograph is equally important for clinical evaluation as well as for record purposes. It might be necessary to prove that a fracture received by the patient convalescing in a nightclub was not sustained during the extraction. With better radiographic procedures and protection, there is negligible radiation associated with these radiographs. However, because of current emphasis on reduction of radiation exposure, routine postoperative radiographs are not made when clinical evidence of normal extraction is present. Children and pregnant women are not given postoperative radiographs after uncomplicated procedures.

*Blood pressure determination* in the dental office has provided a service to the dentist in making him or her aware of the patient's hypertension and to the patient who often is not aware of his hypertension and its management. Some tests, such as urinalysis, can be done in a well-equipped office, but most tests are done in a laboratory. Tests for bleeding are not done accurately in the office. If such tests are indicated, they should be done in a laboratory, in the hospital, or in the physician's office. Although such tests are expensive and time consuming, there should be no hesitancy in ordering them if they are indicated.

Screening tests for diabetes and hemoglobin level are available from commercial firms in the form of treated paper strips. A service is performed if every dental patient is screened yearly, particularly if he does not obtain a yearly physical examination, since unknown cases of diabetes and anemia are thereby discovered in the dental office and referred to the physician for treatment.

### **REMOVAL OF TEETH IN THE HOSPITAL**

Hospitalization of patients for exodontic procedures should always be considered when medical management of the patient may be a problem or the postoperative course may necessitate special care.

Before a patient is admitted to a hospital, arrangements must be made with the admitting office so that a bed will be available. The operating room secretary is also called so that an operating room can be reserved for the procedure.

The dental staff of the hospital is obligated to observe the basic rules of the hospital and the American Hospital Association. Although it is not the object of this text to outline hospital procedure, some basic rules should be noted. A patient who will undergo general anesthesia must have a physical examination, which includes a history. All patients admitted to a hospital should have routine laboratory tests. These usually consist of a hematocrit (HCT), a white blood cell count (WBC), a differential white count, and a urinalysis. A chest radiograph and serological tests may be required by some hospitals. Patients older than 45 years of age often are examined by an electrocardiogram (ECG) if general anesthesia is to be used. The dentist must write the necessary orders and an admission note, which includes the reason for the admission and the contemplated procedure. A dental history and oral examination should also be included in the dentist's note.

The dentist should check with the operating room personnel to be sure that all instruments necessary for the procedure will be available. In many hospitals the dentist must provide certain instruments.

In the operating room, sterile precautions are employed. The surgeon is expected to scrub and to wear a cap, gown, mask, and gloves.

The area around the patient's mouth should be prepared with an antiseptic solution to remove surface contaminants. If a single extraction or a minor procedure is to be performed, the simple placement of sterile towels to isolate the mouth is all the draping necessary. For multiple extractions or more extensive procedures, sterile sheets should be added so that the entire patient is covered to guard against contamination.

On completion of surgery a description of the operative procedure is dictated so that it may be added to the patient's chart. This note should include the following: date; names of the patient, surgeon, assistant, and anesthetist; type of anesthesia and agents used; surgical procedure and how it was accomplished; any complications (such as extensive hemorrhage); and condition of the patient at completion of surgery.

New orders are written, since preoperative orders are usually cancelled by the operating room procedure. Orders suggested by the consulting physician have to be rewritten to be given. Routine postoperative orders include patient's ambulatory status (bed rest until recovered, then up and about), hot or cold applications for swelling, antibiotics if needed for infections, diet, and an order for an analgesic and a hypnotic, if needed. Daily progress notes are entered by the dentist.

At the time of the patient's discharge from the hospital, a discharge summary of one paragraph is written, including reason for admission, surgical procedure, postsurgical course, and condition on discharge.

### MANAGEMENT OF ACUTELY INFECTED TEETH

With the advent of antibiotics the management of acutely infected teeth has changed. In the past it was necessary to treat the patient palliatively until the infection could be localized and drained and the tooth extracted. Today this sometimes long delay can be avoided by use of antibiotics. If the cause of the infection (that is, the tooth) can be removed, the resolution of the infection will be accelerated. The abscess formation may not have reached the stage at which tissue is broken down and pus formed. Antibiotics may control **the acute** infectious process, preventing pus formation. In any event a blood level of antibiotics should be established as soon as possible. Once this blood level is established, the tooth should be removed if a surgical extraction is not deemed necessary. If a difficult extraction is anticipated, the patient should be placed on antibiotics until such time as a surgical flap can be raised and bone be removed without spreading the infection into surrounding tissues. The patient should remain on antibiotics after removal of an acutely infected tooth for 3 days after all evidence of the infection has disappeared.

### COMPLICATIONS OF EXODONTICS

Complications arise from errors in judgment, misuse of instruments, exertion of extreme force, and failure to obtain proper visualization prior to acting. The old

adage "To do good, you must see good" is apropos to exodontics, and one might add "Do well what you see." . •

Because of the anatomy of the maxillary antrum and its proximity to the maxillary premolar and molar roots, the antrum should always be considered when extracting teeth in this area.

Extreme force applied to upper molars can result in removal of the molar tooth along with the entire maxillary alveolar process and the floor of the antrum. The first, second, and third molars, along with the tuberosity, have been removed in one segment because of improper use of force in the maxilla. If during an extraction the surgeon feels large segments of bone moving with the tooth when pressure is applied, the forceps should be set aside and a flap raised. If judicious removal of part of the alveolar bone allows the tooth to be removed, then the remaining bone, which is attached to the periosteum, may be retained, and it will heal. This will minimize the bony defect. If the bone cannot be removed from the tooth, the mucosa should be incised and reflected so that the mucosa will not tear as the tooth and bone are removed. A laceration is much more difficult to repair than a well-planned incision.

Large antral perforations resulting from exodontics should be closed at the time of the extraction. The bone in the area should be smoothed with a rongeur or bone file. The mucoperiosteal flap, is returned to position, and a watertight closure should be accomplished without putting undue pressure on the flap. If this cannot be done, the flap should be freed by means of an incision extending vertically into the mucobuccal fold and the mucosa of the flap undermined to allow it to advance over the defect.

When the antrum is entered during exodontics, the patient should be made aware of the situation and asked to not blow the nose postoperatively and also to refrain if possible from coughing or sneezing. Antibiotics and vasoconstrictive nose drops are prescribed to guard against infection of the sinus and to allow for emptying of the fluid that will collect within the sinus.

Occasionally, buccal roots of premolars and molars are pushed laterally through the wall of the maxilla and lie above the attachment of the buccinator muscle. When the operator uses root exo-levers in this area, a finger of the left hand should be held against the buccal plate so that he or she can be aware of any movement of the root in this direction. If the root is dislodged into these tissues, a small incision is made in the mucosa inferior to the root tip and the root tip is removed with a small hemostat or similar instrument.

The infratemporal space lies directly posterior and superior to the tuberosity of the maxilla. Within this space lie many important neurovascular structures. In the elevation of third molars or third molar root tips and in the removal of supernumerary molars, care must be taken not to dislodge them posteriorly. If an object is to be removed from the infratemporal space, adequate visualization and careful dissection are necessary. The incision should include the entire tuberosity and extend posteriorly to the anterior pillar of the fauces. Blind dissection and groping for objects in this area can be complicated by massive hemorrhage or nerve damage.



In the third molar region of the mandible, the lingual surface of the mandible curves laterally, close to the apices of this tooth. Therefore it is not difficult to dislodge a root tip inferiorly into this space when the lingual plate is fractured. When a root tip is displaced in this area, a finger should be placed inferior to the root tip (in the mouth) to stabilize the tip against the lingual plate of the mandible. Access to this area is gained by making a mucoperiosteal flap on the lingual side of the mandible and extending anteriorly enough that the tissues can be retracted lingually for good vision.

Recovery of a root tip in the mandibular canal is principally a problem of access and vision. Usually it is difficult to remove bone overlying the canal from within the depths of the wound, which is usually the third molar socket. Access may be gained by removal of bone from the buccal plate and by careful removal of bone that overlies the canal. If one of the vascular components of the canal has been injured, it may be necessary to pack the socket with gauze, allowing 10 minutes for control of the hemorrhage. If hemorrhage cannot be controlled in this manner, the injured vessel should be severed completely and allowed to retract into the canal. At this time the socket is again packed, and hemorrhage control is usually accomplished.

## POSTEXODONTIC COMPLICATIONS

Postoperative hemorrhage is the most common complication after exodontics. If the

patient calls from home to report that hemorrhage has started again, he should be

advised first to clear the mouth of any blood clots with a gauze sponge and then

rinse the mouth with warm salt water. All excessive blood clots should be removed

from the vicinity of the socket but the clot in the socket should not be removed.

A pad of gauze that has been folded so that pressure is exerted on the area of surgery. If a pad of gauze is not available, the patient use a tea bag that has been placed in cold water to soften the tea leaves. The patient is advised to bite (not chew) on the pad or tea bag for 20 minutes. If bleeding persists at the end of this period, the patient should be seen by the dentist.

In cases of persistent hemorrhage, gauze sponges and hemostatic agents such as Gelfoam, topical thrombin, oxidized cellulose, and Avitene may be helpful for the local control of hemorrhage in addition to an adequate armamentarium.

The patient is seated and a local anesthetic administered. The clot that has formed within the socket is removed. Next, the area of hemorrhage is located. If the hemorrhage is coming from a bone bleeder within the socket, the dull side of a curet

is used to burnish the bone in the area of hemorrhage. If generalized bone bleeding is present, the socket is packed with a hemostatic agent such as Gelfoam soaked in thrombin, and a purse-string suture is applied to hold the hemostatic agent in place. The patient is asked to bite on a moist gauze sponge. If the hemorrhage is from the surrounding soft tissue, a tension suture is placed to apply pressure to the area (see Chapter 12).

In patients with advanced periodontal disease, postoperative bleeding will occur if granulation tissue is allowed to remain after removal of the affected teeth. At the time of surgery a few minutes spent removing the granulation tissue and suturing the alveolar mucosa will assure good hemorrhage control.

Infection can occur as a postoperative complication. Treatment of such infection is managed by using the principles outlined in Chapter 10.

Dry socket (localized osteitis) is one of the most perplexing postoperative complications. The etiology of the dry socket is unknown, but the following factors increase the incidence of this painful post-extraction sequela: trauma, infection, decreased vascular supply of the surrounding bone, and general systemic condition.

The condition rarely occurs when meticulous methods are employed during difficult or **SSc** extractions. Meticulous debridement of alveolar extraction wounds should be done routinely. The etiology may be related to factors that impede or prevent adequate nourishment from reaching the newly formed blood clot within the alveolus. Patients with dense osteosclerotic bone or with teeth that have osteosclerotic alveolar walls because of chronic infection are predisposed to dry sockets.

Dry socket usually develops on the third or fourth postoperative day and is characterized by severe, continuous pain and necrotic odor. Clinically the condition may be described as an alveolus in which the primary blood clot has become necrotic and remains within the alveolus as a septic-foreign body until it is removed by irrigation. This usually occurs a few days after extraction, leaving the alveolar walls divested of their protective covering. The denuded bone is accompanied by severe pain, which can be controlled only by local application of potent analgesics and oral or parenteral use of analgesics or narcotics.

To treat a septic alveolus properly, one must understand the physiology of bone repair. If the loss of the primary blood clot results from a sclerotic condition of the alveolar walls and the absence of nutrient vessels, then the resulting denuded bone surface must be viewed as any other denuded bone surface, and the dentist must rely on nature's methods of bone repair for ultimate recovery and not employ any other methods that would disturb the healing process.

A septic alveolus is a denuded bone surface. Nature abhors denuded bone and responds to repair it. Behind this denuded and traumatized surface an immediate mechanism is set up to physiologically correct the defect. All denuded bone becomes necrotic and must be removed before it can be replaced by normal bone. During this period the contiguous region behind the alveolus is defended against invasion of pyogenic organisms within the septic alveolus, provided nothing is done to break through or violate this wall until the repair mechanism is ready to replace

the nonvital structure. This process usually takes 2 to 3 weeks, depending on the regenerative capacity of the individual.

With the completion of this cycle the nonvital alveolar wall is sequestered molecularly or en masse, and immediately behind it is a defensive and regenerative layer of juvenile connective tissue that ultimately fills the void and undergoes osseous replacement. During this period, treatment should be directed only to maintenance of wound hygiene, with employment of antiseptic, analgesic dressings within the alveolus of sufficient potency to keep the patient comfortable. Nature must do the repairing. Curettage is contraindicated and will not only delay physiological healing and repair but may also permit invasion of infection into and beyond the area of defense immediately behind the denuded alveolus.

Prevention, of course, is the best treatment. To this end, atraumatic surgery, avoidance of contamination, and maintenance of a good level of general health are important.

When a dry socket does develop, treatment should be palliative. The socket is gently irrigated with warm normal saline solution to remove all debris. After the socket has been carefully dried, it is lightly dressed with 1/4-inch plain gauze saturated with an obtundent paste, such as equal parts of thymol iodide powder and benzocaine crystals dissolved in eugenol. The dressing may be changed as necessary until pain has subsided and granulation tissue has covered the walls of the socket.

## EMERGENCIES IN THE DENTAL OFFICE

The number of emergencies that arise in a dental office is inversely proportional to the preventive measures taken by the dentist. A good medical history, carefully evaluated, may be the best insurance against office emergencies. Although dental emergencies are rare, the dentist and staff must be prepared to manage those that do arise. A well-organized plan of treatment should be worked out and rehearsed to cope with these situations. Emergency drills, just like fire drills, may save lives. Emergency situations can be of a minor or a major nature, but in all instances, if improper care is given, the outcome can be disastrous.

The dental office should be equipped with oxygen that can be applied under positive pressure. An emergency tray containing all the necessary drugs should be readily available and checked from time to time to ensure completeness. Drugs should never be taken from an emergency tray for routine use.

Syncope (fainting) is probably the most common emergency and is usually associated with the administration of a local anesthetic. The etiology is cerebral hypoxia, resulting from the disturbance of the normal mechanism of blood pressure control. Dilation of the splanchnic vessels causes a fall in blood pressure with a decrease in cerebral blood flow. The initiation of this reaction is of a psychic nature and should not be interpreted as a reaction to the drug administered. Symptoms include pallor, dizziness, light-headedness, clammy skin, nausea, and sometimes complete loss of consciousness. The treatment consists of placing the patient in a supine position, with the head lower than the rest of the body. An airway is maintained, and oxygen should be administered. Mild respiratory stimulants such as

spirits of ammonia can be used, but analeptics and other more potent agents are generally not used unless specifically indicated. Prevention of syncope can be accomplished by considering the psychic constitution of the patient. Measures should be taken to allay apprehension.

Toxic reactions to local anesthetics are characterized by an initial excitatory phase followed by marked depression. The patient may become talkative and anxious. Nausea and vomiting may occur. If the drug is given intravenously, the initial excitatory phase may be brief, terminating in convulsions followed by marked depression. (When administering a local anesthetic, always aspirate before injecting.) If any signs of reaction to the drug are noted during an injection, the needle should be withdrawn immediately.

Most toxic reactions to local anesthesia are of a minor nature and can be treated palliatively. If convulsions occur and become increasingly intense, a short-acting barbiturate or diazepam should be given intravenously to control the convulsion. Oxygen should then be given to ensure adequate oxygenation. When the stimulatory phase is mild or of short duration, no sedative is given but oxygen is administered, and steps are taken to maintain adequate circulation.

In cases of severe central nervous system stimulation or depression or cardiovascular collapse, the dentist should initiate treatment but call for additional professional help. The calling of other professional personnel does not indicate inadequacy on the part of the dentist but instead shows good judgment.

To avoid allergic reactions to medication, the dentist should complete an adequate history and evaluation before using the drug.

Allergic reactions to drugs can vary from delayed reactions that are more annoying than dangerous to anaphylactoid reactions that are severe and often lead to the death of the patient. Most drugs at one time or another have been associated with allergic reactions. Penicillin, sulfonamides, and other antibiotics are the most common drugs the dentist may use that are associated with allergic reactions.

Delayed or less severe reactions may be characterized by swelling at the site of injection, angioneurotic edema, pruritus, and urticaria. Treatment consists of antihistamines and palliative care.

Anaphylactoid reactions develop quickly. The patient becomes extremely apprehensive, intensive itching occurs, and asthmatic breathing develops. Urticaria may develop rapidly; the blood pressure falls, and the pulse becomes weak or absent. The patient may lapse into an unconscious state with or without convulsions. Death may occur within a few minutes or several hours later.

Treatment of an anaphylactoid reaction consists of the immediate application of a tourniquet above the site of injection if possible.

Because of the vasopressor, bronchodilator, and antihistaminic effects of epinephrine, it is the drug of choice in reactions of this type. The dosage in the adult will range from 0.3 to 1 mg (0.3 to 1 ml of a 1:1,000 solution) subcutaneously or intramuscularly. In all severe systemic reactions a cannulated vein allows for rapid use of drugs and fluid management. If possible, an intravenous route should be started and maintained. The intravenous route allows for titration or fractional doses of epinephrine, although the total dosage is approximately the same. Oxygen under

pressure should be given with assisted respiration. Antihistamines, such as diphenhydramine, 50 mg, are given intravenously or intramuscularly. Corticosteroids such as hydrocortisone (Solu-Cortef), 100 mg intravenously or intramuscularly, are usually recommended for their peripheral vascular effect.

Professional aid should be called as soon as possible to consult in the further treatment of the patient. If symptoms continue, consider readministration of epinephrine or antihistamine. If the blood pressure is low, consider the use of a vasopressor drug such as phenylephrine, 1 to 5 mg intramuscularly.

During exodontics, teeth are sometimes inadvertently displaced into the oropharynx, larynx, trachea, and esophagus. Teeth in these positions can present serious problems that could be avoided by simple precautions. A gauze screen should always be placed to block off the oropharynx from the mouth. This is true whether the exodontic procedure is performed under general or under local anesthesia.

Teeth displaced into the oropharynx present no problem, provided they can be retrieved before they descend into the deeper structures. When a tooth is displaced in the oropharynx while the patient is under local anesthesia, the patient is instructed to hold perfectly still and not swallow or take a breath until the tooth can be retrieved. If this occurs under general anesthesia, everything stops until the tooth is retrieved. The assistant should be cautioned not to move the retractor or suction tip because any movement may cause the loss of the tooth into the larynx or esophagus.

When a tooth is displaced in the posterior portion of the mouth, the natural reflex of the patient is to cough or swallow. In the majority of cases the patient will swallow, carrying the tooth into the esophagus. Regardless of the patient's reactions, radiographs should be taken to determine the exact location of the tooth. If the tooth is found to be in the gastrointestinal tract, a high bulk diet should be prescribed, and the patient should contact the dentist if any gastrointestinal symptoms occur. Usually the tooth will be passed without incident.

In coughing, the patient can either cough up the foreign body or it will be lodged in the larynx or aspirated into the tracheobronchial tree. The abdominal thrust procedure should be used to dislodge large objects from this area. In the case of teeth in the larynx, a laryngeal spasm may occur, blocking the exchange of air. The tooth may be removed by means of a laryngoscope and a Magill forceps. If the tooth cannot be removed quickly, an airway must be established. This can be accomplished by a cricothyroidotomy through the triangularly shaped cricothyroid membrane and into the trachea. The cricothyroid membrane is located between the thyroid cartilage (Adam's apple), which is the largest of the tracheal cartilages, and the cricoid cartilage, which is the next inferior tracheal cartilage. Oxygen then should be given through the established airway until the tooth is removed and the laryngeal spasm is broken.

Teeth aspirated into the tracheobronchial tree present a serious problem. The removal of teeth in this position can be accomplished only by someone trained in methods of bronchoscopy. The patient may cough continuously, and cyanosis may occur. Oxygen should be given until the patient can be transferred to an area where

a radiograph of the chest and direct bronchoscopy can be accomplished. The aspiration of teeth and other debris during dental operations has been associated with a high incidence of lung abscesses.

Under all circumstances a radiograph of the chest and possibly of the abdomen must be taken to establish the exact location of any tooth that is displaced.