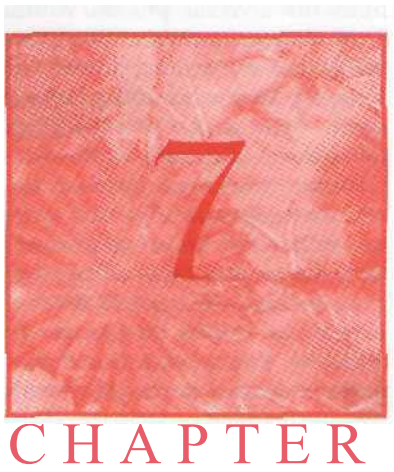
Principles of Uncomplicated Exodontia

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Extracrion of teeth is a procedure that incorporates the principles of surgery and many principles from physics and mechanics. When these principles are applied correctly, a tooth can probably be removed intact from the alveolar process without untoward sequelae. This chapter presents the principles of surgery and mechanics for uncomplicated tooth extraction. In addition to a discussion of the fundamental underlying principles, there is also a detailed description of techniques for removal of specific teeth with specific instruments.

At the outset it is important to remember that removal of a tooth does not require a large amount of brute force but rather can he accomplished with finesse and controlled force in such a manner that the tooth is not pulled from the hone but instead is lifted gently from the alveolar process. During the preoperative period the degree of difficulty that is anticipated for removing a particular tooth is assessed. If the preoperative assessment leads the surgeon to believe that the degree of difficulty will be high and the initial attempts at tooth removal confirm this, a deliberate surgical approach—not an application of excessive force—should be taken. Excessive force may injure local tissues and destroy surrounding bone and teeth. Moreover, excessive force heightens the intraoperative discomfort and anxiety of the patient. The most efficient way to remove a tooth is slowly.

PAIN AND ANXIETY CONTROL

The removal of a tooth is a challenge to the dentist. This is because profound local anesthesia is required to prevent pain during the extraction, and control of the patient's anxiety is necessary to prevent psychologic distress. Local anesthesia must be absolutely profound to eliminate sensation from the pulp, perindontal ligament, and buccolingual soft tissues.

It is equally important for the dentist to recognize the anxiety that invariably exists in patients about to undergo tooth extraction. Few patients face this procedure with tranquility, and even patients with no overt signs of anxiety are likely to have internal feelings of distress.

Local Anesthesia

Profound anesthesia is needed if the tooth is to be removed without pain for the patient; therefore it is essential that the surgeon remember the precise innervations of all teeth and surrounding soft tissue and the kinds of injection necessary to anesthetize those nerves totally. Table 7-1 summarizes the sensory in nervation of the teeth and surrounding tissue. It is important to remember that, in areas of nerve transition, some overlap exists. For example, in the region of the mandibular second premolar, the buccal soft tissues are Innervated primarily by the mental branch of the inferior alveolar nerve but also by terminal branches of the long buccal nerve. Therefore it may be necessary to supplement the inferior alveolar nerve block with a long buccal nerve block to achieve adequate anesthesia of the buccal soft tissue when extracting this particular tooth.

When anesthetizing a maxillary tooth for extraction, the surgeon should anesthetize the adjacent teeth as well. During the extraction process the adjacent teeth are usually subjected to certain amounts of pressure, which may be sufficient to cause the patient pain. This is also true for mandibular extractions, but the mandibular-block anesthetic usually produces sufficient anesthesia.

Profound local anesthesia results in the loss of all pain, temperature, and touch sensations, but it does not anesthetize the proprioceptive fibers of the involved nerves. Thus the patient feels a sensation of pressure, especially when the force is intense. The surgeon must therefore remember that the patient will need to distinguish between sharp pain and the dull, albeit intense, feeling of pressure.

In spite of profound soft tissue anesthesia and apparent pulpal anesthesia, the patient may continue to have sharp pain as the tooth is luxated. This is especially likely when the teeth have a pulpitis or the surrounding soft and hard tissues are inflamed or infected. A technique that should be employed in these situations is the periodontal ligament injection. When this injection is delivered properly and the local anesthetic solution injected under pressure, immediate profound local anesthesia occurs in almost all situations. The. anesthesia is relative-

TABLE 7-1

Sensory Innervation of Jaws

Nerve	Teeth	Soft Tissue
Inferior alveolar nerve	All mandibular teeth	Buccal soft tissue of premolars, canine, and incisors
Lingual nerve	None	Lingual soft tissue of all teeth
Long buccal nerve	None	Buccal soft tissue of molars
Anterior superior alveolar nerve	Maxillary incisors and canine tooth	Buccal soft tissue of incisors and canine
Middle superior alveolar nerve	Maxillary premolars and portion of first molar tooth	Buccal soft tissue of premolars
Posterior superior alveolar nerve	Maxillary molars except for portion of first molar tooth	Buccal soft tissue of molars
Anterior palatine nerve	None	Lingual soft tissue of molars and premolars
Nasopalatine nerve	None	Lingual soft tissue of incisors and canine

ly short-lived, so the surgical procedure should be one that can be accomplished within 15 or 20 minutes. Intraosseous injections may be used where standard and periodontal ligament injections have failed. The Stabident System is useful for the intraosseous injection.

It is important to keep in mind the pharmacology of the various local anesthetic solutions that are used so that they can be employed properly. Table 7-2 summarizes the commonly used local anesthetics and the amount of time they can be expected to provide profound anesthesia. The dentist must remember that pulpal anesthesia of maxillary teeth after local infiltration lasts a much shorter time than does pulpal anesthesia of mandibular teeth after block anesthesia. In addition, pulpal anesthesia disappears 60 to 90 minutes before soft tissue anesthesia docs. Therefore it is quite possible that a patient may still have lip anesthesia after having lost pulpal anesthesia and may be experiencing pain.

Only a certain amount of local anesthetic can be safely used in a given patient. To provide profound anesthesia for multiple tooth extractions, it may be necessary to inject multiple cartridges of local anesthetic. Thus it is important to know how many cartridges of a given local anesthetic solution can be administered safely. Table 7-3 summarizes (in two different ways) the maximal amounts of local anesthetic that can be used. First, each local anesihelic has a recommended maximal dose based on milligrams per kilogram. The second column in Table 7-3 indicates the number of cartridges that can safely be used on a Healthy 154 pound (70 kg) adult. It is rarely necessary to exceed this dose, even in patients larger than 154 pounds. Patients who are smaller, especially children, should be given proportionally less local anesthetic. The most likely victim of overdose is the small child to whom 3% mepivacaine (Carbncaine) is administered. For a patient who weighs 44 pounds (20 kg), the recommended maximal amount of mepivacaine is 100 mg. If the child is given two cartridges of 1.8 ml each, the dose totals 108 mg. Therefore a third cartridge of 3% mepiva-caine should be avoided. It is wise to remember that the smallest amount of local anesthetic solution sufficient to provide profound anesthesia is the proper amount.

Although it is self-evident that local anesthesia is necessary for intraoperative pain control, the surgeon should also acknowledge its role in postoperative pain control. For routine extractions where mild-to-moderate analgesics only will be necessary, usually no additional local anesthetic is necessary. After procedures that have been more traumatic (e.g., the removal of impacted teeth) and where stronger analgesics arc likely to be necessary, many surgeons use a long-lasting local anesthetic (e.g., etiodocaine), instead of or in addition to their usual local anesthetic. By doing this the clinician provides the patient with 4 to *6* hours of local anesthetic with no pain. This method also allows adequate time for the patient to take the required analgesics and for the analgesics to take effect before the discomfort begins.

TABLE 7-2

Duration of Anesthesia

Local Anesthetic	Maxillary Teeth	Mandibular Teeth	Soft Tissue
Group 1*	10-20 min	40-60 min	2-3 hr
Group 2†	50-60 min	90-100 min	3-4 hr
Group 3‡	60-90 min	3 hr	4-9 hr

*Group 1: Local anesthetics without vasoconstrictors.
Mepivacainp 3%.
Prilocaine 4%.
+Group 2: Local anesthetics with vasoconstrictors.
Lidocaine 2% with 1:50,000 or 1:100,000 epinephrine.
Mepivacaine 2% with 1 :20,000 levonordefrin,
Prilocaine 4% with 1:400,000 epinephrine.
Articaine 4% with 1:100,000 epinephrine.
+Group 3: Long-acting local anesthetics.
Bupivacaine 0.5% with 1 :?00,000 epinpphrine.
Etidocaine 1.5% with 1:200,000 epinephrine.

Sedation

Management of patient anxiety must be a major consideration in oral surgical procedures. Anxiety is a more important factor in oral surgical procedures than in other areas of dentistry. Patients are frequently already in pain and may be agitated and fatigued, both of which lower the

TABLE 7-3

Recommended Maximal Local Anesthetic Doses

Drug/Solution	Maximal Number of mg/kg	Number of Cartridges for 70-kg (154 lb) Adult	Number of Cartridges for 20-kg (44 lb) Child
Lidocaine 2% with 1:100,000 epinephrine	5.0	10	3.0
Mepivacaine 2% with 1:20,000 levonordefrin	5.0	10	3.0
Mepivacaine 3% (no vasoconstrictor)	5.0	6	2.0
Prilocaine 4% with 1:200,000 epinephrine	5.0	6	2.0
Articaine 4% with 1:100,000 epinephrine	7.0	6	1.5
Bupivacaine 0.5% with 1:200,000 epinephrine	1.5	10	3.0
Etidocaine 1.5% with 1:200,000 epinephrine	8.0	15	5.0

Patient's ability to deal with pain or pain-producing situations. Patients who are to have extractions may have predetermined concepts of how painful such a procedure will be; they have seen other patients, including family members, who have reported how painful it is to have a tooth extraction. They arc thus convinced that the procedure they are about to undergo will be uncomfortable. In addition, patients may experience certain psychologic complications when surgical procedures are being performed. The removal of teeth causes a variety of reactions; a patient may mourn tor lost body parts or perceive the extraction as a confirmation that youth has passed. In such situations, patients would like to avoid the extraction; because they cannot avoid it, they become doubly agitated.

Finally, anxiety is likely to be higher because the procedure is truly uncomfortable. As noted previously, although the sharp pain is eliminated by local anesthetic, a considerable amount of pressure sensation still exists. Other noxious stimuli are present during an extraction procedure, such as the cracking of bone and clicking of instruments. For these reasons, prudent dentists use a prospective planned method of anxiety control to prepare themselves and their patients for the anxiety associated with tooth extraction.

Anxiety control may sometimes consist of a proper explanation of the planned procedure, including assurance that there will be no sharp pain and an expression of concern, caring, and empathy from the dentist. For the mildly anxious patient with a caring dentist, no pharma-cologic assistance is necessary.

As patient anxiety increases, it becomes necessary to employ pharmacologic assistance. Fundamental to all anxiety-control techniques are a thorough explanation of the procedure and an expression of concern. These are augmented with drugs given in a variety of ways. Preop-erative orally administered drugs, such as diazepam, may provide a patient with rest the night before the surgery and some relief of anxiety in the morning. However, orally administered drugs are usually not profound enough to control moderate-to-severe anxiety once the patient enters the operative suite.

Sedation by inhalation of nitrous oxide and oxygen is frequently the technique of choice and may be the sole technique required for many patients who have mild-to-moderate anxiety. If the dentist is skilled in the use of nitrous oxide and the patient requires a routine, uncomplicated surgical procedure, nitrous oxide sedation is frequently sufficient.

An extremely anxious patient who is to have several uncomplicated extractions may require parenteral sedation, usually by the intravenous (IV) route. IV sedation with anxiolytic drugs, such as diazepam or midazolam with or without a narcotic, allows patients with moderate anxiety to undergo surgical procedures with minimal psychologic stress. If the dentist is not skilled at using this modality, the patient should be referred to a dentist or oral maxillofacial surgeon who can provide it.

Further discussion of the techniques of oral, inhalation, or IV sedation is beyond the scope of this text.

PRESURGICAL MEDICAL ASSESSMENT

When evaluating a patient preoperatively, it is critical that the surgeon examine the patient's medical status, Patients may have a variety of maladies that require treatment modification before the required surgery can be performed safely. Special measures may be needed to control bleeding, prevent infection, and prevent worsening of the patient's preexisting disease state. This information is discussed in detail in Chapter 1. The reader should refer to that chapter for information regarding the specifics of altering treatment for medical management reasons.

INDICATIONS FOR REMOVAL OF TEETH

Teeth are removed from the mouth for a variety of reasons. Although the position of modern dentistry is that all possible measures should be taken to preserve and maintain teeth in the oral cavity, it is still necessary to remove some of them. This section discusses a variety of general indications for removing teeth. It must be remembered that these indications are recommendations and not absolute rules,

Severe Caries

Perhaps the most common and widely accepted reason to remove a tooth is that it is so severely carious that it cannot be restored. The extent to which the tooth is carious and is considered to be nonrestorable is a judgment call to be made between the dentist and the patient.

Pulpal Necrosis

A second, closely aligned rationale for removing a tooth is the presence of pulp necrosis or irreversible pulpitis that is not amenable to endodontics. This may he the result of a patient declining endodontic treatment or of a root canal that is tortuous, calcified, and untreatable by standard endodontic techniques. Also included in this general indication category is the endodontic failure. In this situation, endodontic treatment has been done but has failed to relieve pain or provide drainage.

Severe Periodontal Disease

A common reason for tooth removal is severe and extensive periodontal disease. If severe adult periodontitis has existed for some time, excessive bone loss and irreversible tooth mobility will be found. In these situations the hypermobile teeth should be extracted.

Orthodontic Reasons

Patients who are about to undergo orthodontic correction of crowded dentition frequently require the extraction of teeth to provide space for tooth alignment. The most commonly extracted teeth arc the maxillary and mandibular first premolars, but second premolars or a mandibular incisor may occasionally require extraction for this same reason.

Malopposed Teeth

Teeth that are malopposed or malpositinned may be indicated for removal in several situations. If they traumatize soft tissue and cannot be repositioned by orthodontic treatment, they should be extracted. A common example of this is the maxillary third molar, which erupts in severe buccal version and causes ulceration and soft tissue trauma in the check. Another example is malopposed teeth that arc hypererupted because of the loss of teeth in the opposing arch. If prosthetic rehabilitation is to be carried out in the opposing arch, the hynererupted teeth may interfere with construction of an adequate prosthesis. In this situation the malopposed teeth should be considered for extraction.

Cracked Teeth

A clear but uncommon indication for extraction of teeth is a tooth that is cracked or has a fractured root. The cracked tooth can be painful and is unmanageable by a more conservative technique. Even endodontic and complex restorative procedures cannot relieve the pain of a Clacked tooth.

Preprosthetic Extractions

Occasionally, teeth interfere with the design and proper placement of prosthetic appliances, that is, full dentures, partial dentures, or fixed partial dentures. When this happens, preprosthetic extractions are necessary.

Impacted Teeth

Impacted teeth should be considered for removal. If it is clear that a partially impacted tooth is unable to erupt into a functional occlusion because of inadequate space, interference from adjacent teeth, or some other reason, it should be scheduled for surgical removal. However, it removing the impacted tooth is contraindicated, such as in cases of medical compromise, full bony impaction in a patient who is over the age of 35, or in a patient with advanced age, then the tooth may be retained. See Chapter *9* for a more thorough discussion of this topic.

Supernumerary Teeth

Supernumerary teeth are usually impacted and should be removed. A supernumerary tooth may interfere with eruption of succedaneous teeth and has the potential for causing their resorption and displacement.

Teeth Associated with Pathologic Lesions

Teeth that are involved in pathologic lesions may require removal- In some situations the teeth can be retained and endodontic therapy performed, however, if maintaining the tooth compromises the complete surgical removal of the lesion, the tooth should be removed.

Preradiation Therapy

Patients who are to receive radiation therapy for a variety of oral tumors should have serious consideration given to removing teeth in the line of radiation therapy. See Chapter 18 for a more thorough discussion of the effects of radiation therapy on the teeth and jaws.

Teeth Involved in Jaw Fractures

Patients who sustain fractures of the mandible or the alveolar process occasionally must have teeth removed. In a majority of situations the tooth involved in the line of fracture can be maintained, but if the tooth is injured or severely luxated from the surrounding bony tissue, its removal may be necessary to prevent infection.

Esthetics

Occasionally, a patient requires removal of teeth for esthetic reasons. In these situations teeth may be severely stained, as with tetracycline staining or fluorosis, or they may be severely malopposed and usually protruding. Although other techniques, such as bonding, can be employed to relieve the staining problem, and orthodontic or osteotomy procedures can be used to correct severe protrusion, the patient may choose to have extraction and prosthetic reconstruction.

Economics

A final indication for removal of teeth is economic. All of the indications for extraction already mentioned may become stronger if the patient is unwilling or unable financially to support the decision to maintain the tooth. The inability of the patient either to pay for the procedure or to lake enough time from work to allow it to be performed may require that the tooth be removed.

CONTRAINDICATIONS FOR THE REMOVAL

liven if a given tooth meets one of the requirements for removal, in some situations the tooth should not be removed because of other factors or contraindications to extraction. These factors, like the indications, are relative in their strength. In some situations the contraindication can be modified by the use of additional care or treatment, and the indicated extraction can be performed. In other situations, however, the contraindication may be so significant that the tooth should not he removed until the severity of the problem has been resolved. Generally the contraindications are divided into two groups: (1) systemic and (2) local.

Systemic Contraindications

Systemic contraindications preclude extraction because the patient's systemic health is such that the ability to withstand the surgical insult may be compromised (see

Chapter 1). One systemic contraindication is a group of conditions called *severe uncontrolled metabolic diseases.* Brittle diabetes and end-stage renal disease with severe uremia are part of this group. Patients with mild diabetes or well-controlled severe diabetes can be treated as reasonably normal patients. It is only when the disease process becomes uncontrolled that the patient should not have a tooth removed.

Patients who have uncontrolled leukemias and lymphomas should not have teeth removed until the leukemias can be brought under control. The potential complications are infection as a result of nonfunctioning white cells and excessive bleeding as a result of an inadequate number of platelets. Patients with any of a variety of severe uncontrolled cardiac diseases should also have their extractions deferred until the disease can be brought under control. Patients with severe myocardial ischemia, such as unstable angina pectoris, and patients who have had a recent myocardial infarction (MI) should not have a tooth extracted. Patients who have severe uncontrolled hypertension should also have extractions deferred, because persistent bleeding, acute myocardial insufficiency, and cerebrovascular accidents are more likely to occur as a result of stress caused by the extraction. Patients who have severe, uncontrolled cardiac dysrhythmias should have their extraction procedures deferred as well.

Pregnancy is a relative contraindication; patients who are in the first or last trimester should have their extractions deferred if possible. The latter part of the first trimester and the first month of the last trimester may be as safe as the middle trimester for a routine uncomplicated extraction, but more extensive surgical procedures should be deferred until after the child has been delivered.

Patients who have a severe bleeding diathesis, such as hemophilia, or severe platelet disorders should not have teeth extracted until the coagulopathy has been corrected. Most severe bleeding disorders can be controlled by the administration of coagulation factors or platelet transfusions. Close coordination with the patient's hematologist can result in an uncomplicated recovery from the extraction procedure in most situations. Similarly, patients who take anticoagulants can have routine extractions performed when care is taken to manage the patient appropriately.

Finally, patients who take or have taken a variety of medications should have surgery performed with caution. Drugs to watch for include corticosteroids, immunosuppressives, and cancer chemotherapeutic agents.

Local Contraindications

Extractions of indicated teeth have several local contraindications. The most important and most critical is a history of therapeutic radiation for cancer. Extractions performed in an area of radiation may result in osteoradionecrosis and therefore must be done with extreme caution. Chapter 19 discusses this in detail.

Teeth that are located within an area of tumor, especially a malignant tumor, should not be extracted. The surgical procedure for extraction could disseminate cells and thereby hasten the metastatic process.

Patients who have severe pericoronitis around an impacted mandibular third molar should not have the tooth extracted until the pericoronitis has been treated. Nonsurgical treatment should include irrigations, antibiotics, and removal of the maxillary third molar to relieve impingement on the edematous soft tissue overlying the mandibular impaction. If the mandibular third molar is removed in the face of severe pericoronitis, the incidence of complications increases. If the pericoronitis is mild and the tooth can be removed easily, then immediate extraction may be performed.

Finally, the acute dentoalveolar abscess must be mentioned. It is abundantly clear from many prospective studies that the most rapid resolution of an infection secondary to pulpal necrosis is obtained when the tooth is removed as early as possible. Therefore acute infection i not a contraindication to extraction. However, it maybe difficult to extract such a tooth because the patient may not be able to open the mouth sufficiently wide, or it may be difficult to reach a state of adequate local anesthesia, If access and anesthesia considerations can be met, the tooth should be removed as early as possible.

CLINICAL EVALUATION OF TEETH FOR

In the preoperative assessment period the tooth to be extracted should be examined carefully to assess the difficulty of the extraction. A variety of factors must be specifically examined to make the appropriate assessment.

Access to Tooth

The first factor to be examined in preoperative assessment is the extent to which the patient can open the mouth. Any limitation of opening may compromise the ability of the surgeon to do a routine uncomplicated extraction. If the patient's opening is substantially com-promised, the surgeon should plan for a surgical approach to the tooth instead of a forceps extraction Additionally the surgeon should look for the cause of the reduction of opening. The most likely causes are trismu; associated with infection, temporomandibular join (TMJ) dysfunction (especially internal joint derangemert with displacement of the disk without reduction), and muscle fibrosis.

The location and position of the tooth to be extracted within a dental arch should be examined. A properlly aligned tooth has a normal access for placement of elevators and forceps. However, crowded or otherwise malopposed teeth may present difficulty in positioning the proper forceps onto the tooth for extraction. When access is a problem, a compromise forceps must be chosen or surgical approach may be indicated.

Mobility of Tooth

The mobility of the tooth to be extracted should to assessed preoperatively. Greater-than-normal mobility is frequently seen with severe periodontal disease. If teeth are excessively mobile, an uncomplicated tooth

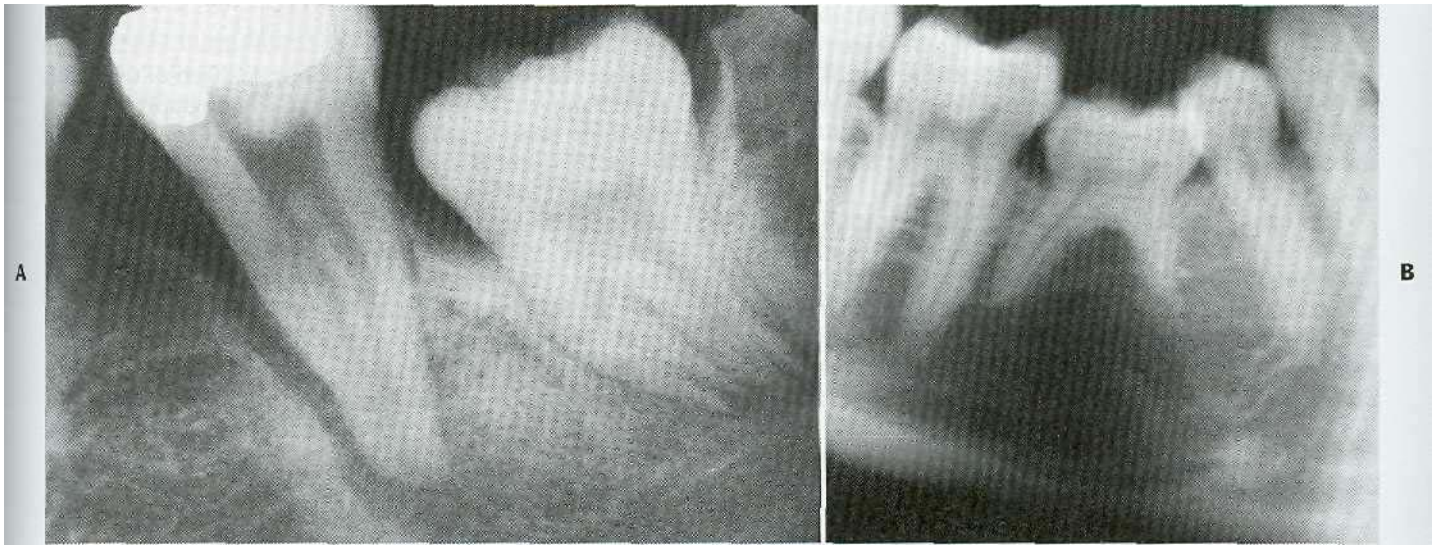


FIG. 7-1 A, Tooth with severe periodontal disease with bone loss and wide periodontal ligament space. This kind of tooth is easy to remove. B, Retained mandibular second primary molar with an absent succedaneous tooth. It is submerged, and likelihood for ankylosed roots is high.

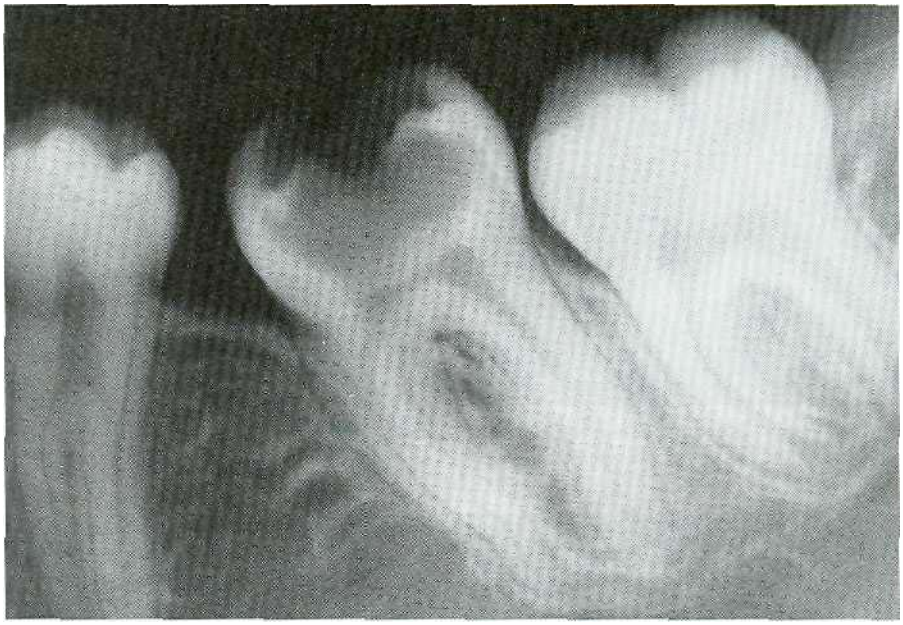


FIG. 7-2 Teeth with large carious lesions are likely to fracture during extraction, making extraction more difficult.

removal should be expected, and there should be more involved and complicated soft tissue management after the extraction (Fig. 7-1, *A)*.

Teeth that have less-than-normal mobility should be carefully assessed for the presence of hypercementosis or ankylosis of the roots. Ankylosis is often seen with primary molars that are retained and have become submerged (Fig. 7-1, *B);* in addition, it is seen occasionally in nonvital teeth that have had endodontic therapy many years before the extraction. If the clinician believes that the tooth is ankylosed, it is wise to plan for a surgical removal of the tooth as opposed to a forceps extraction.

Condition of Crown

The assessment of the crown of the tooth before the extraction should be related to the presence of large caries or restorations in the crown. If large portions of the crown have been destroyed by caries, the likelihood of crushing the crown during the extraction is increased; thus causing more difficulty in removing the tooth (Fig. 7-2). Similarly, the presence of large amalgam restorations will produce a weakness in the crown, and the restoration will probably fracture during the extraction process (Fig. 7-3). In these two situations it is critical that the forceps be applied as far apically as possible so as to grasp the root portion of the tooth instead of the crown.

If the tooth to be extracted has a large accumulation of calculus, the gross accumulation should be removed with a scaler or ultrasonic cleaner before extraction. The reasons for this are that calculus interferes with the placement of the forceps in the appropriate fashion, and fractured calculus may contaminate the empty tooth socket once the tooth is extracted.

The surgeon should also assess the condition of the adjacent teeth. If the adjacent teeth have large amalgams or crowns or have had endodontic therapy, it is important to keep this in mind when elevators and forceps are used to mobilize and remove the indicated tooth. If the adjacent teeth have large restorations, the surgeon should use elevators with extreme caution, because fracture of the restorations may occur (Fig. 7-4). The patient should be informed before the surgical procedure about possible damage to these restorations.

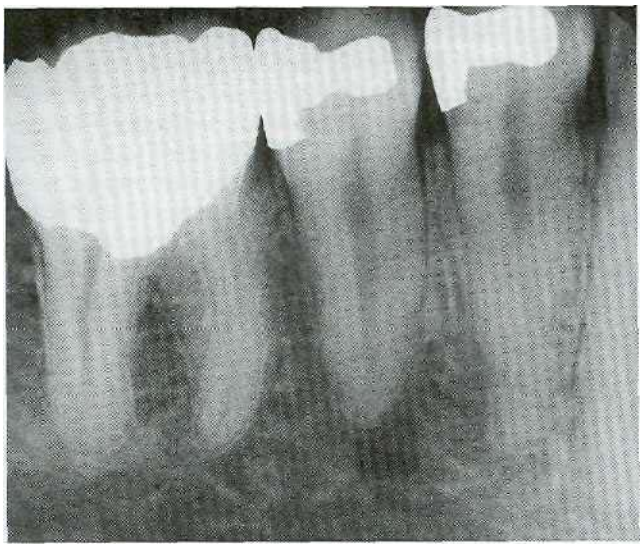


FIG. 7-3 Teeth with large amalgam restorations. These are likely to be fragile and to fracture when extraction forces are applied.

RADIOGRAPHIC EXAMINATION OF TOOTH

It is essential that proper radiographs be taken of the tooth to be removed. In general, periapical radiographs provide the most accurate and detailed information concerning the tooth, its roots, and the surrounding tissue. Panoramic radiographs are used frequently, but their greatest useful-ness is for impacted teeth as opposed to erupted teeth.

For radiographs to have their maximal value they must meet certain criteria. First of all, they must be prop erly exposed, with adequate penetration and good con trast. The radiographic film should have been proper positioned, so that it shows all portions of the crown and roots of the tooth under consideration without distortion (Fig. 7-5). The radiograph must be properly processed, with good fixation, drying, and mounting. The mounting should be labeled with the patient's name and the date on which the film was exposed. The radiograph should be mounted in the American Dental Association stan-dardized method, which is to view the radiograph as if looking at the patient; the raised dot on the film faces the observer. The radiograph should be reasonably current; as to depict the presently existing situation. Radiograph: older than 1 year should probably be retaken before sur-gery. Finally, the radiograph must be mounted on a view box that is visible to the surgeon during the operation, Radiographs that are taken but not available during surgery are of no value.

The relationship of the tooth to be extracted to adjacent erupted and unerupted teeth should be noted. If it is a pri mary tooth, the relationship of its roots to the underlying succedaneous tooth should be carefully noted. It is possible that the extraction of the primary teeth can injure or dislodge the underlying tooth. If surgical removal of a root or part of a root is necessary, the relationship of the root structures of adjacent teeth must be known. Bone removal should be performed judiciously whenever it is necessary, but it is particularly important to be careful if adjacent roots are close to the root being removed.

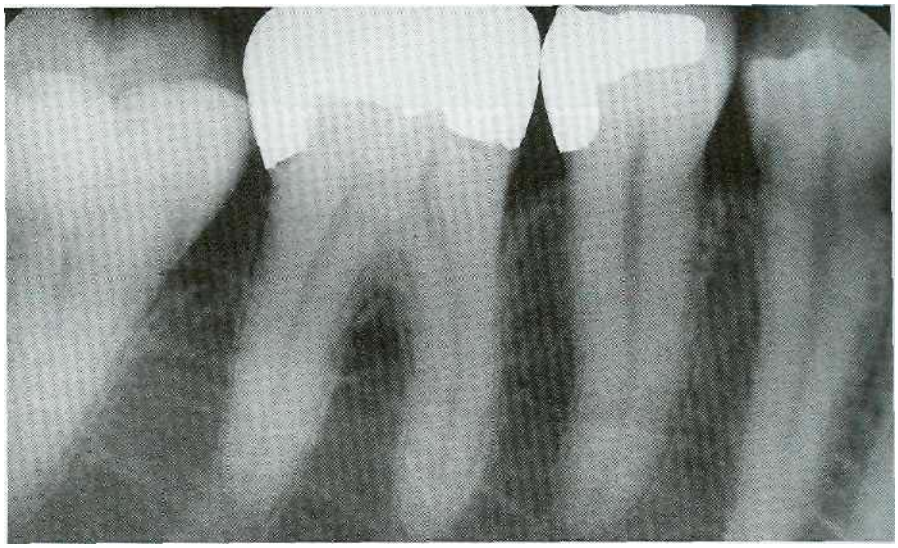


FIG. 7-4 Mandibular first molar. If it is to be removed, surgeon must take care not to fracture amalgam in second premolar with elevators or forceps.

Relationship of Associated Vital Structures

When performing extractions of the maxillary molars, it is essential to be aware of the proximity of the molars' roots to the floor of the maxillary sinus. If only a thin layer of bone exists between the sinus and the roots of the molar teeth, the potential for perforation of the maxillary sinus during the extraction increases. Thus the surgical treatment plan may be altered to an open surgical technique, with division of the maxillary molar roots into individual roots before the extraction proceeds (Fig. 7-6).

The inferior alveolar canal may approximate the roots of the mandibular molars. Although the removal of an erupted tooth rarely impinges on the inferior alveolar canal, if an impacted tooth is to be removed, it is important that the relationship between the molar roots and the canal be assessed. Such an extraction may lead to injury to the canal and cause consequent anesthesia of the inferior alveolar nerve (Fig. 7-7).

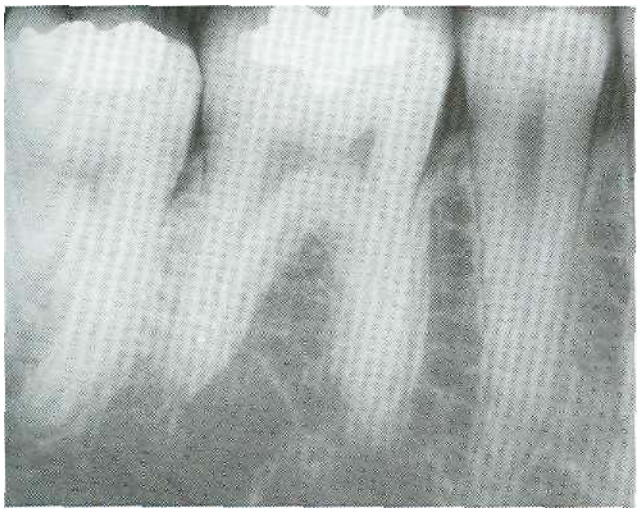


FIG. 7-5 Properly exposed radiographs for extraction of mandibular first molar.

A periapical radiograph taken before the removal of mandibular premolar teeth should include the mental foramen. Should a surgical flap be required to retrieve a premolar root, it is essential that the surgeon know where the mental foramen is to avoid injuring the mental nerve during flap development (see Fig. 7-3; Fig. 7-8).

Configuration of Roots

Radiographic assessment of the tooth to be extracted probably contributes most to the determination of difficulty of the extraction. The first factor to evaluate is the number of roots on the tooth to be extracted. Most teeth have the typical number of roots, in which case the surgical plan can be carried out in the usual fashion, but many teeth do have an abnormal number of roots. If the number of roots is known before the tooth is extracted, an alteration in the plan can be made to prevent fracture of the additional roots (Fig. 7-9).

The surgeon must know both the curvature of the roots and the degree of root divergence to plan the extraction procedure. Roots of the usual number and of average size may still diverge substantially and thus make the total root width so wide that it prevents extraction with normal forceps. In situations of excess curvature with wide divergence, surgical extraction may be required (Fig. 7-10).

The shape of the individual root must be taken into consideration. Roots may have short, conic shapes that make them very easy to remove. However, long roots with severe and abrupt curves or hooks at their apical end are more difficult to remove. The surgeon must have knowledge of the roots' shapes before surgery to allow an adequate plan to be made (Fig. 7-11).

The size of the root must be assessed. Teeth with short roots are easier to remove than teeth with long roots. A long root that is bulbous as a result of hypercementosis is even more difficult to remove. The periapical radiographs of older patients should be examined carefully for evi-

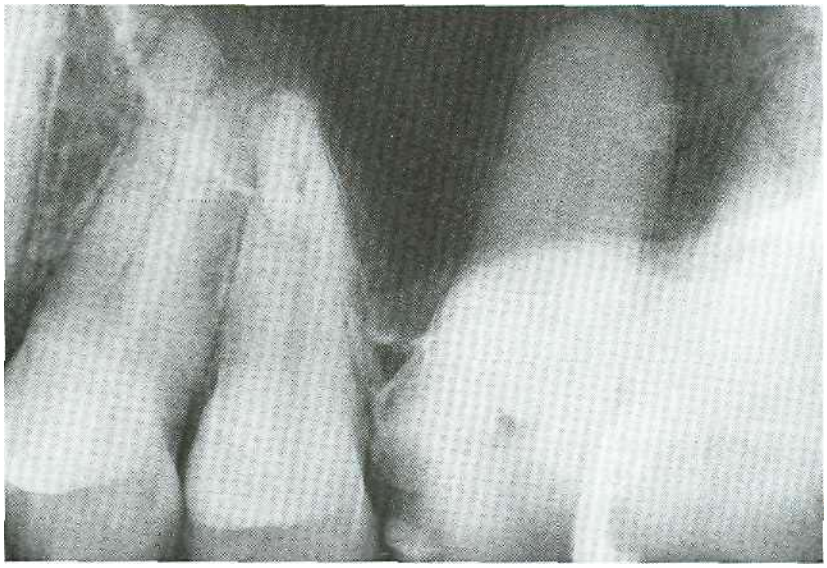


FIG. 7-6 Maxillary molar teeth immediately adjacent to sinus present increased danger of sinus exposure.

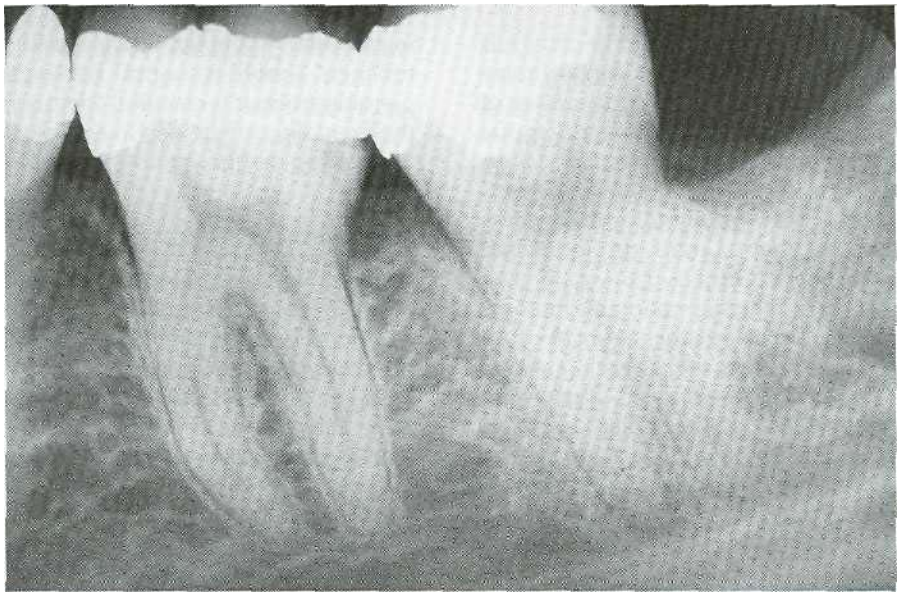


FIG. 7-7 Mandibular molar teeth that are close to inferior alveolar canal. Third molar removal is procedure most likely to result in injury to nerve.

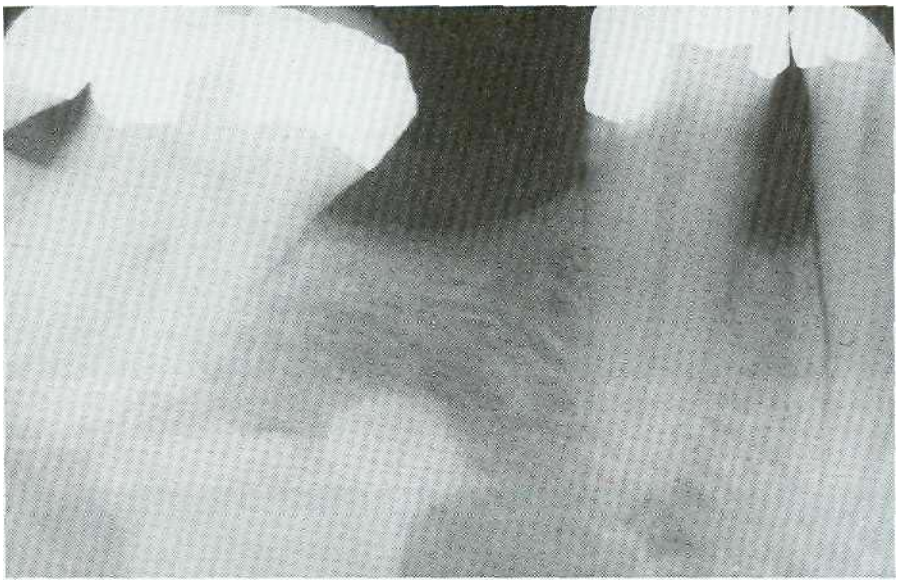


FIG. 7-8 Before premolar extractions that require a surgical flap are performed, it is essential to know relationship of mental foramen to root apices. Note radiolucent area at apex of second premolar, which represents mental foramen.

dence of hypercementosis, because this process seems to be a result of aging (Fig. 7-12).

The surgeon should look for evidence of caries extending into the roots. Root caries may substantially weaken the root and make it more liable to fracture when the force of the forceps is applied (Fig. 7-13).

Root resorption, either internal or external, should be assessed on examination of the radiograph. Like root caries, root resorption weakens the root structure and renders it more likely to be fractured. Surgical extraction may be considered in situations of extensive root resorption (Fig. 7-14).

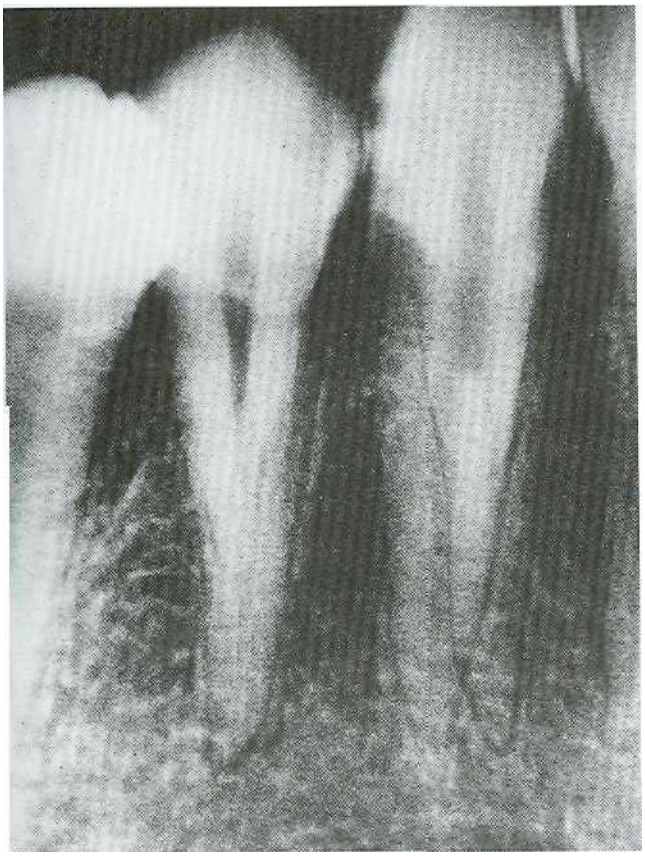
The tooth should be evaluated for previous endodontic therapy. If there was endodontic therapy many years before the extraction process, there may be ankylosis or the tooth root may be more brittle. In both of these situations, surgical extraction may be indicated (Fig. 7-15).

Condition of Surrounding Bone

Careful examination of the periapical radiograph indicates the density of the bone surrounding the tooth to be extracted. Bone that is more radiolucent is likely to be less dense, which makes the extraction easier. On the other

hand, if the bone appears to be radiographically opaque (indicating increased density) with evidence of condensing osteitis or other sclerosis-like processes, it will be more difficult to extract.

The surrounding bone should also be examined carefully for evidence of apical pathology. Teeth that have nonvital pulps may have periapical radiolucencies that represent granulomas or cysts. It is important to be aware of the presence of such lesions, because they should be removed at the time of surgery (Fig. 7-16).



F1C. 7-9 Mandibular canine tooth with two roots. Knowledge of this fact preoperatively may result in less traumatic extraction.

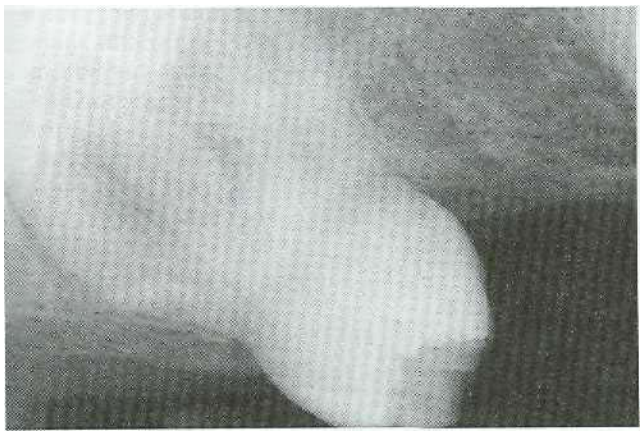


FIG. 7-10 Widely divergent roots of this maxillary first molar make extraction more difficult.

Summary

Presurgical assessment of the patient includes evaluation of the level of anxiety, determination of health status and any necessary modifications of routine procedures, evaluation of the clinical presentation of the tooth to be removed, and radiographic evaluation of the tooth root and bone. All four of these major factors must be weighed when estimating the difficulty of the extraction. If any factor or combination of factors presents a level of difficulty that seems too great, the dentist should refer the patient to an oral and maxillofacial surgeon.

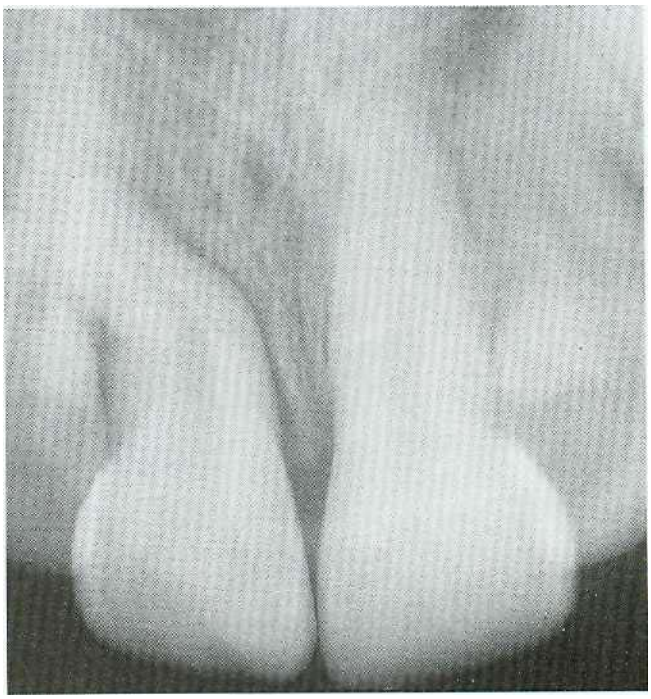


FIG. 7-11 Curvature of roots of this tooth is unexpected. Preoperative radiographs allow surgeon to plan extraction more carefully.

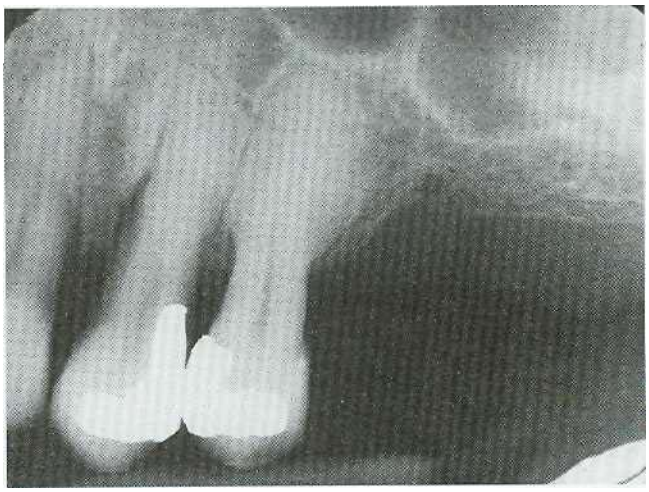


FIG. 7-12 Hypercementosis increases difficulty of these extractions, because roots are larger at apical end than at cervical end. Surgical extraction will probably be required.

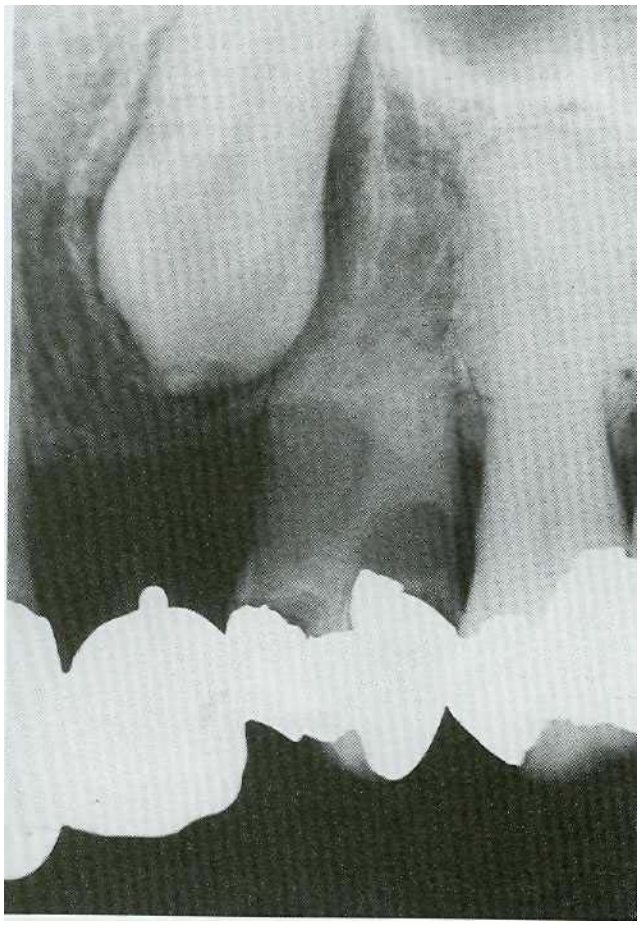


FIG. 7-13 Root caries in first premolar tooth make extraction more difficult, because fracture of tooth is likely. Note hypercementosis of second premolar.

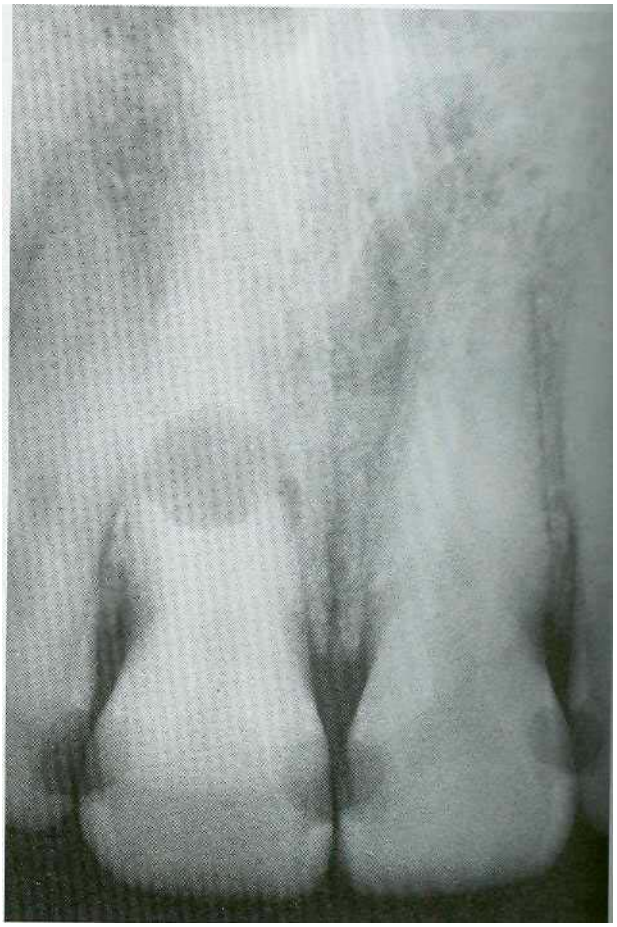


FIG.7-14 Internal resorption of root makes closed extraction almost impossible because fracture of root will almost surely occur.

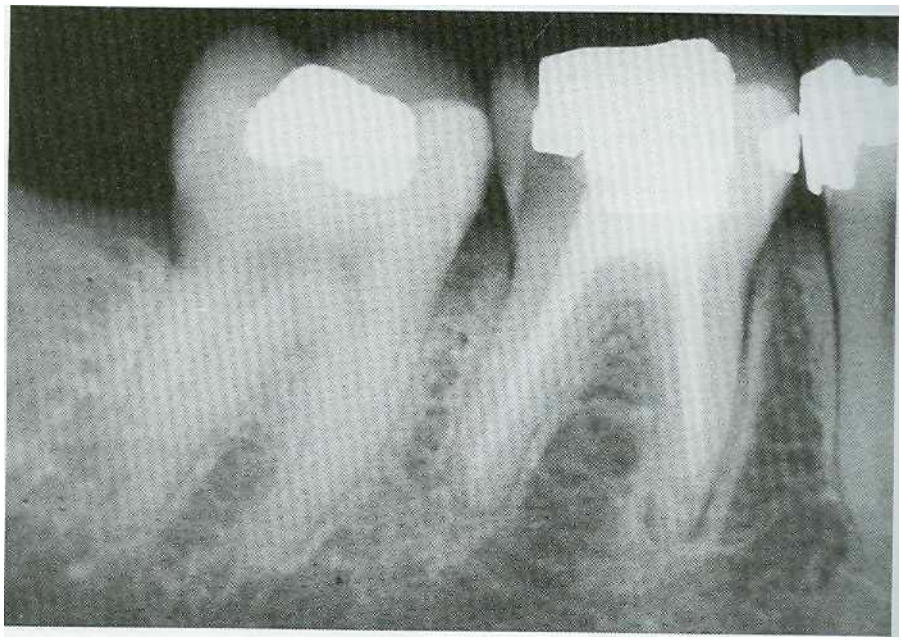


FIG.7-15 Tooth made brittle by previous endodontic therapy. It is thus more difficult to remove.

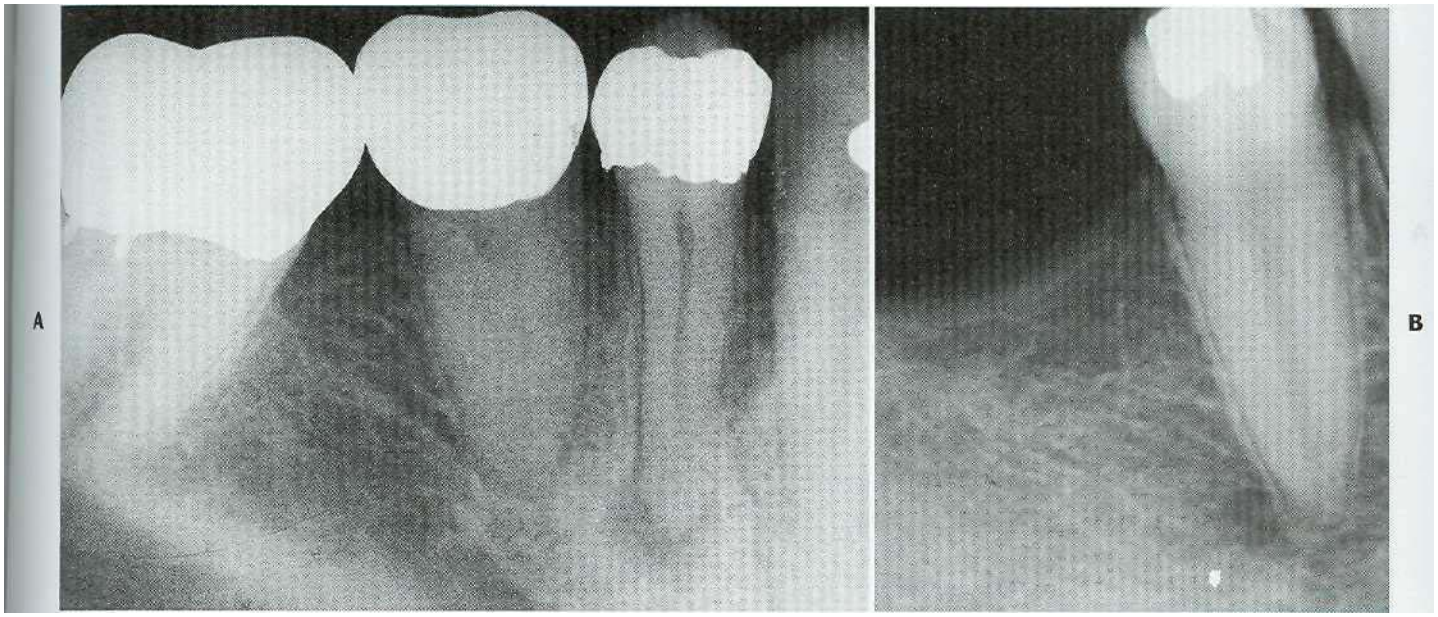


FIG. 7-16 A, Periapical radiolucency. Surgeon must be aware of this before extraction so that proper management can be delivered. B, Periapical radiolucency around mandibular premolar represents mental foramen. Surgeon must be aware that this is not pathologic condition. Intact lamina dura is noted in B but not in A.

PATIENT AND SURGEON PREPARATION

Surgeons must prevent inadvertent injury or transmission of infection to their patients or to themselves. The concept of universal precautions states that all patients must be viewed as having blood-borne diseases that can be transmitted to the surgical team. To prevent this transmission, surgical gloves, surgical mask, and eyewear with side shields are required- (See Chapter 5 for a detailed discussion of this topic.) Additionally most authorities recommend that the surgical team wear long-sleeved gowns that can be changed when they become visibly soiled (Fig. 7-17).

If the surgeon has long hair, it is essential that the hair be held in position with barrettes or other holding devices or be covered with a surgical cap. It is a major breach in aseptic technique to allow the surgeon's hair to hang over the patient's face and mouth (Fig. 7-18).

Before the patient undergoes the surgical procedure, a minimal amount of draping is necessary. A sterile drape should be put across the patient's chest to decrease the risk of contamination (see Fig. 7-17).

Before the extraction, patients should vigorously rinse their mouths with an antiseptic mouth rinse, such as chlorhexidine. This reduces the gross bacterial contamination in the patient's mouth, which helps to reduce the incidence of postoperative infection.

To prevent teeth or fragments of teeth from falling into the mouth and potentially being swallowed or aspirated into the lungs, many surgeons prefer to place a 4 X 4 inch gauze loosely into the back of the mouth (Fig. 7-19). This oral partition serves as a barrier so that, should a tooth slip from the forceps or shatter under the pressure of the forceps, it will be caught in the gauze rather than be swallowed or aspirated. The surgeon must take care that the gauze is not positioned so far posteriorly that it makes the patient gag. The surgeon should explain the purpose of the partition to gain the patient's acceptance and cooperation for allowing the gauze to be placed.

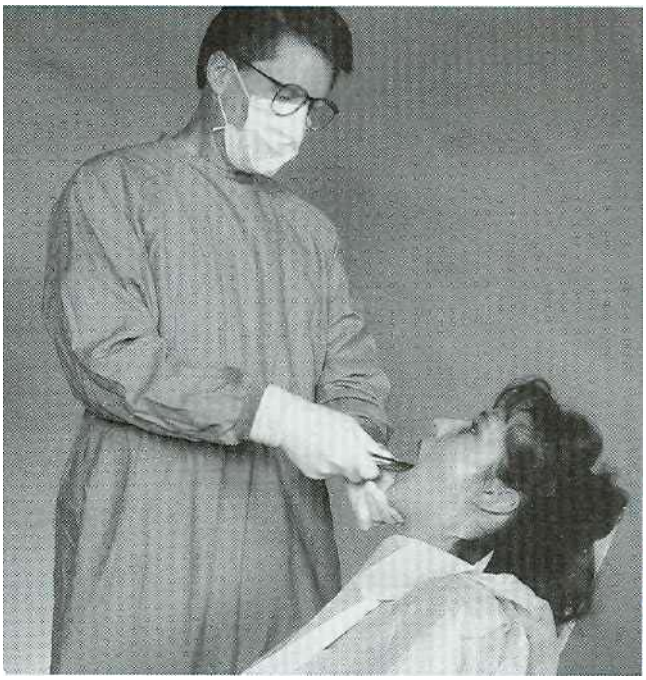


FIG. 7-17 Surgeon, prepared by wearing protective eyeglasses, mask, and gloves. Surgeons should have short or pinned-back hair and should wear long-sleeved smocks that are changed daily or sooner if they become soiled. Patient should have full, waterproof drape.

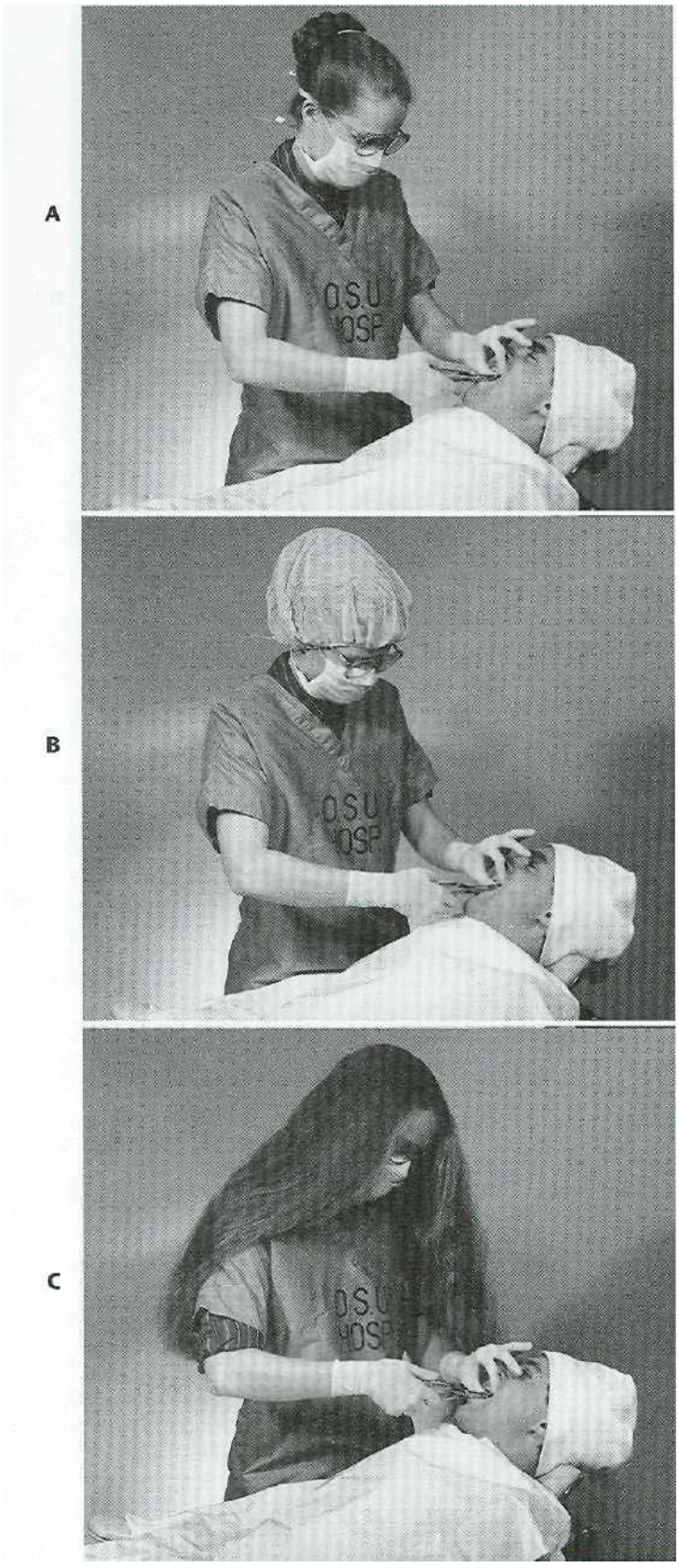


FIG. 7-18 A, If dentist's hair is long, it should be tied so that it stays in place and does not drape into surgical field. B, As an alternative, dentist's hair can be placed under surgical cap. C, Long and uncontrolled hair that drapes into surgical field is unacceptable.

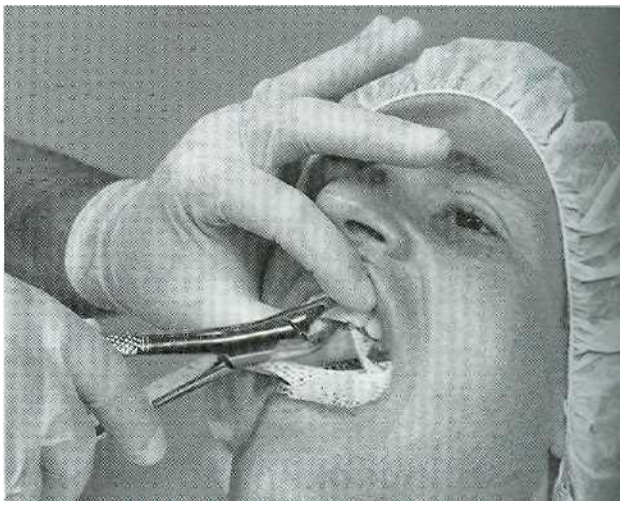


FIG. 7-19 A gauze partition can be placed in the mouth to help guard against loss of tooth or tooth fragments into the oral pharynx.

CHAIR POSITION FOR FORCEPS EXTRACTION

The positions of the patient, chair, and operator are critical for successful completion of the extraction. The best position is one that is comfortable for both the patient and surgeon and allows the surgeon to have maximal control of the force that is being delivered to the patient's tooth through the forceps. The correct position allows the surgeon to keep the arms close to the body and provides stability and support; it also allows the surgeon to keep the wrists straight enough to deliver the force with the arm and shoulder and not with the hand. The force delivered can thus be controlled in the face of sudden loss of resistance from a root or bone fracture.

Dentists usually stand during extractions, so the positions for a standing surgeon will be described first. Modifications that are necessary to operate in a seated position will be presented later.

For a maxillary extraction the chair should be tipped backward so that the maxillary occlusal plane is at an angle of about 60 degrees to the floor. The height of the chair should be such that the height of the patient's mouth is at or slightly below the operator's elbow level (Fig. 7-20). During an operation on the maxillary right quadrant, the patient's head should be turned substantially toward the operator, so that adequate access and visualization can be achieved (Fig. 7-21). For extraction of teeth in the maxillary anterior portion of the arch, the patient should be looking straight ahead (Fig. 7-22). The position for the maxillary left portion of the arch is similar, except that the patient's head is turned slightly toward the operator (Fig. 7-23).

For the extraction of mandibular teeth, the patient should be positioned in a more upright position so that when the mouth is opened widely, the occlusal plane is parallel to the floor. A bite block should be used to stabilize the mandible when the extraction forceps is used. Even though the surgeon will support the jaw, the additional support provided by the bite block will result in less stress being transmitted to the jaws. The chair should be lower than for extraction of maxillary teeth, and the

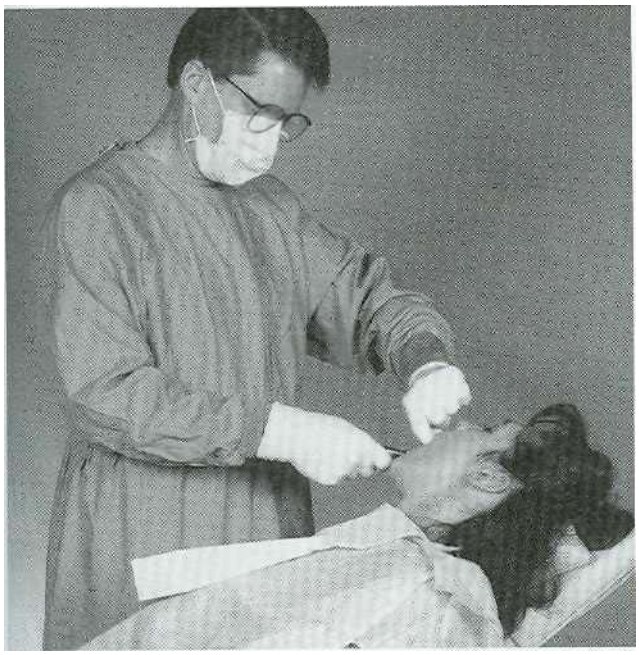


FIG. 7-20 Patient positioned for maxillary extraction: tilted back so that maxillary occlusal plane is at about 60-degree angle to floor. Height of chair should put patient's mouth slightly below surgeon's elbow.



FIG. 7-22 Extraction of anterior maxillary teeth. Patient looks straight ahead.

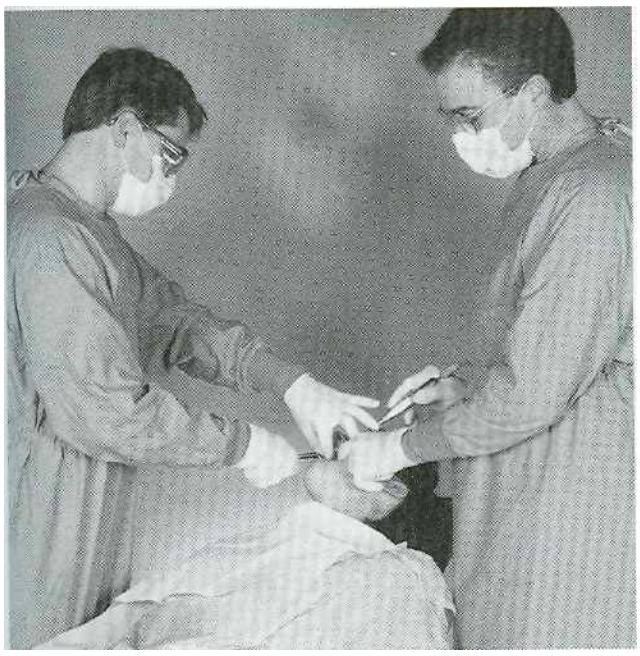


FIG. 7-21 Extraction of teeth in maxillary right quadrant. Note that surgeon turns patient's head toward self.

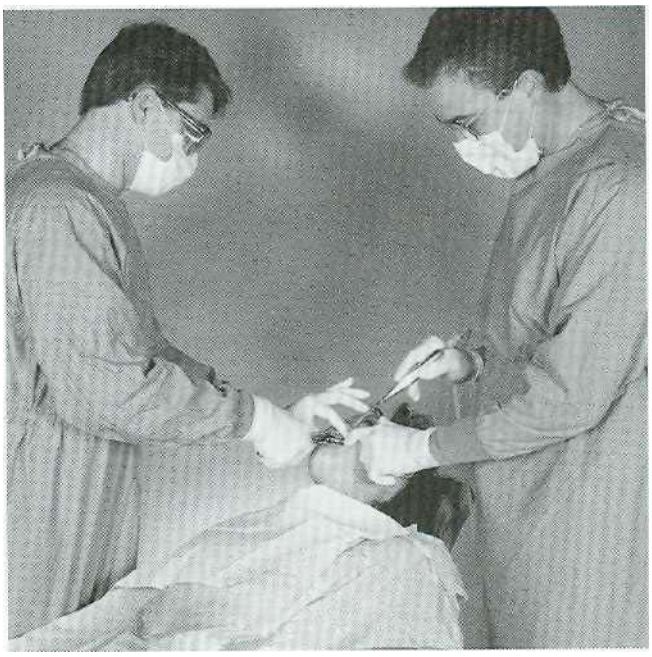


FIG. 7-23 Patient with head turned slightly toward surgeon for extraction of maxillary left posterior teeth.

surgeon's arm is inclined downward to approximately a 120-degree angle at the elbow (Fig. 7-24), which provides a comfortable, stable position that is more controllable than the higher position. During removal of the mandibular right posterior teeth the patient's head should be turned severely toward the surgeon to allow adequate access to the jaw, and the surgeon should maintain the proper arm and hand position (Fig. 7-25). When removing teeth in the anterior region of the mandible, the surgeon should rotate around to the side of the patient (Figs. 7-26 and 7-27). When operating on the left posterior mandibular region, the surgeon should stand in front of the patient, but the patient's head should not turn quite so severely toward the surgeon (Fig. 7-28).

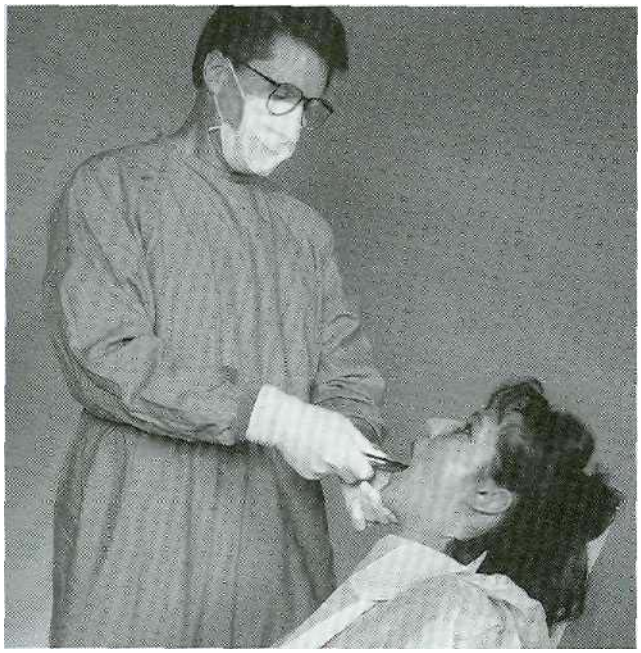


FIG. 7-24 For mandibular extractions, patient is more upright so that mandibular occlusal plane of opened mouth is parallel to floor. Height of chair is also lower to allow operator's arm to be straighter.

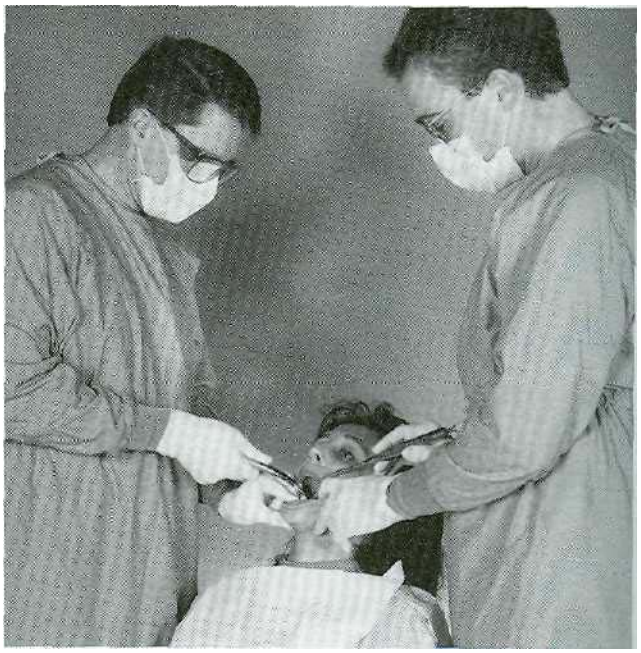


FIG. 7-26 For extraction of mandibular anterior teeth, surgeon stands at side of patient, who looks straight ahead.

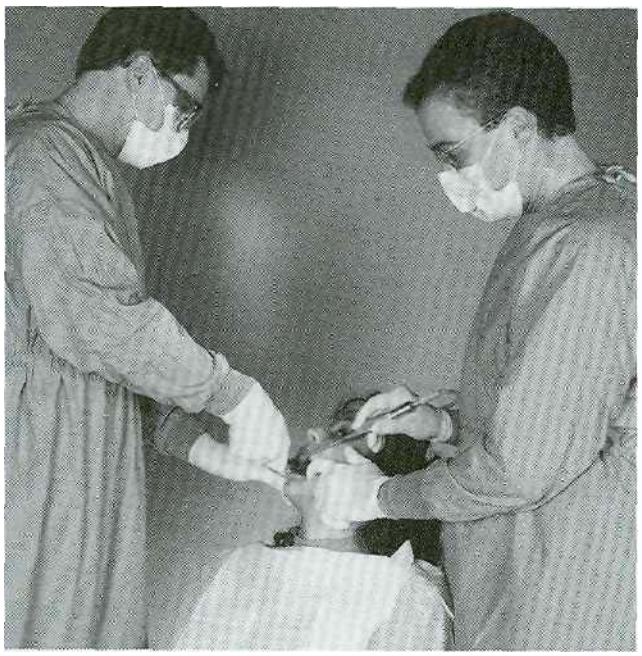


FIG. 7-25 Patient with head turned toward surgeon for removal of mandibular right teeth.

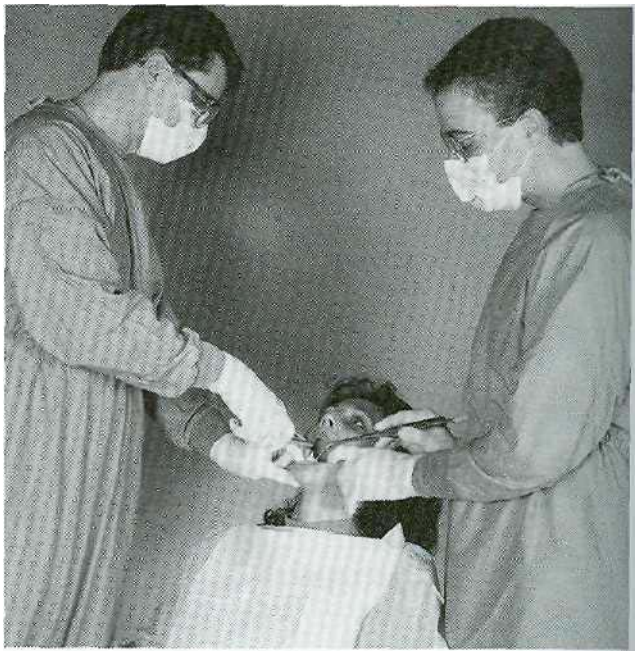


FIG. 7-27 When English style of forceps is used for anterior mandibular teeth, patient's head is positioned straight.

Some surgeons prefer to approach the mandibular teeth from a posterior position. This allows the left hand of the surgeon to support the jaw better, but it requires that the forceps be held opposite the usual method and that the surgeon view the field with a more upside-down perspective. The left hand of the surgeon goes around the patient's head and supports the jaw. The usual behind-the-patient approach is seen in Figures 7-29 and 7-30.

If the surgeon chooses to sit while performing extractions, several modifications must be made. For maxillary extractions, the patient is positioned in a reclining position similar to that used when the surgeon is standing. However, the patient is not reclined quite as much; therefore the max-

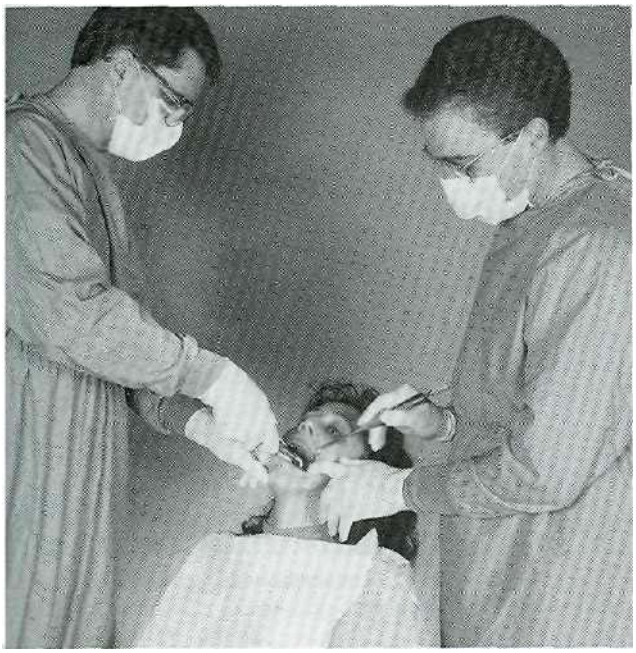


FIG. 7-28 For extraction of mandibular posterior teeth, patient turns slightly toward surgeon.



FIG. 7-30 Behind-the-patient approach for extraction of posterior left mandibular teeth. Hand is positioned under forceps.

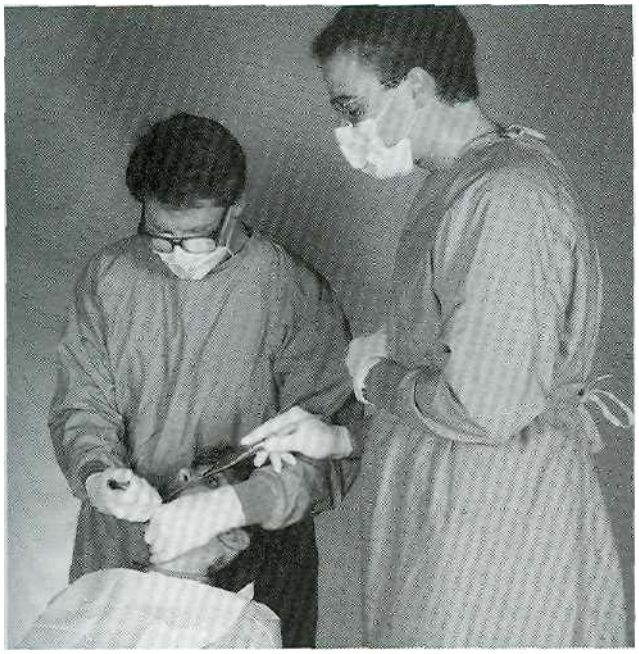


FIG. 7-29 Behind-the-patient approach for extraction of posterior right mandibular teeth. This allows surgeon to be in comfortable, stable position.

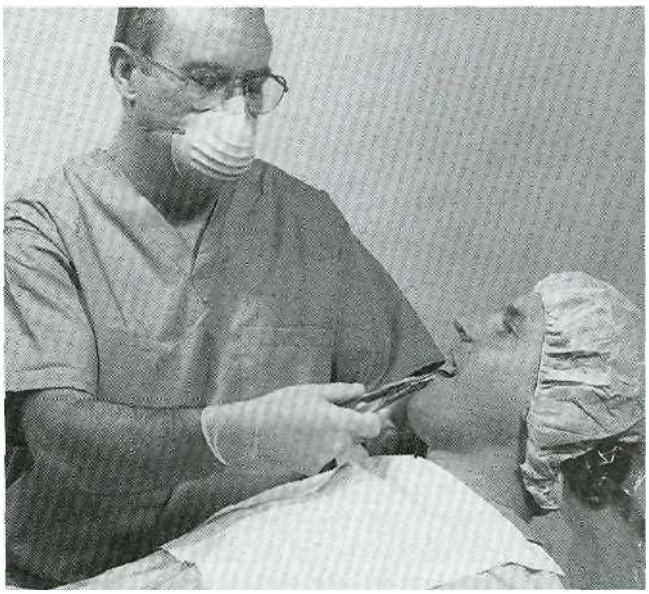


FIG. 7-31 In seated position, patient is positioned as low as possible so that mouth is level with surgeon's elbow.

illary occlusal plane is not perpendicular to the floor as it is when the surgeon is standing. The patient should be lowered as far as possible so that the level of the patient's mouth is as near as possible to the surgeon's elbow (Fig. 7-31). The arm and hand position for extraction of the maxillary anterior and posterior teeth is similar to the position used for the same extractions performed while standing (Fig. 7-32).

As when the surgeon is standing, for extraction of teeth in the lower arch, the patient is a bit more upright than for extraction of maxillary teeth. The surgeon can work from the front of the patient (Figs. 7-33 and 7-34) or from behind the patient (Figs. 7-35 and 7-36). When the English style of forceps is used, the surgeon's position is usually behind the patient (Fig. 7-37). It should be noted that the surgeon and the assistant have hand and arm positions similar to those used when the surgeon is in the standing position.

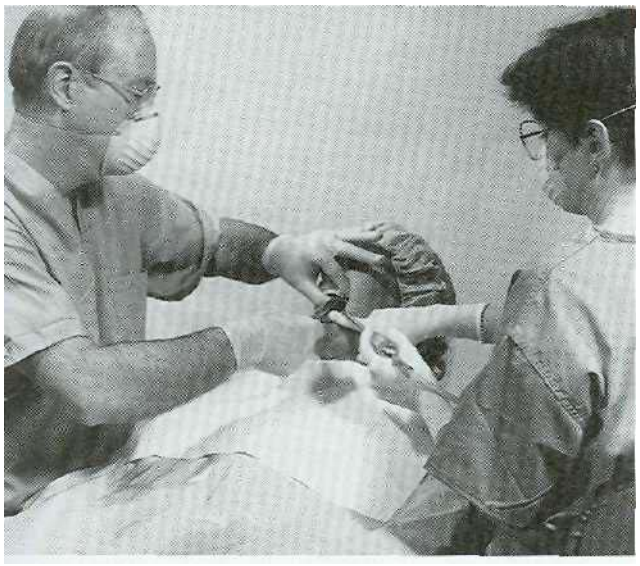


FIG. 7-32 For extraction of maxillary teeth, patient is reclined back approximately 60 degrees. Hand and forceps positions are same as for standing position.



FIG. 7-34 For removal of mandibular posterior teeth, patient's head is turned toward surgeon.



FIG. 7-33 For extraction of mandibular teeth, operator's hand and arm position is similar to that used for standing position. Patient is placed more upright so that mandibular occlusal plane of open mouth is nearly parallel to floor. Surgeon's opposite hand helps support mandible.



FIG. 7-35 For removal of anterior teeth, surgeon moves to position behind patient so that mandible and alveolar process can be supported by surgeon's opposite hand.

MECHANICAL PRINCIPLES INVOLVED IN TOOTH EXTRACTION

The removal of teeth from the alveolar process employs the use of the following mechanical principles and simple machines: the lever, wedge, and wheel and axle.

Elevators are used primarily as levers. A lever is a mechanism for transmitting a modest force—with the mechanical advantages of a long lever arm and a short effector arm—into a small movement against great resistance (Fig. 7-38). When an elevator is used for tooth extraction, a purchase point can be made and a crane Pick can be used to elevate the tooth or a tooth root from the socket (Fig. 7-39). The small, straight elevator is frequently used to help mobilize teeth in a similar fashion, without the preparation of a purchase point.

The second machine that is useful is the wedge (Fig. 7-40). It is useful in several different ways for the extraction of teeth. First the beaks of the extraction forceps are usually narrow at their tips; they broaden as they go superiorly. When the forceps is used, there should be a conscious effort made to force the tips of the forceps into the periodontal ligament space to expand the bone and force the tooth out

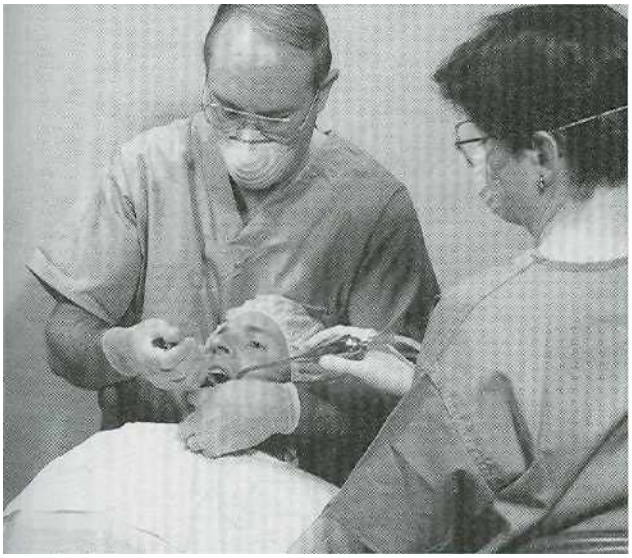


FIG. 7-36 The behind-the-patient position can be used for removal of mandibular posterior teeth. Hand is positioned under forceps for maximum control.



FIG. 7-37 When English style of forceps is used, a behind-the-patient position is preferred.

of the socket (Fig. 7-41). The wedge principle is also useful when a straight elevator is used to luxate a tooth from its socket. A small elevator is forced into the periodontal ligament space, which displaces the root toward the occlusion and therefore out of the socket (Fig. 7-42).

The third machine used in tooth extraction is the wheel and axle, which is most closely identified with the triangular, or pennant-shaped, elevator. When one root of a multiple-rooted tooth is left in the alveolar process, the pennant-shaped elevator is positioned into the socket and turned. The handle then serves as the axle, and the tip of the triangular elevator acts as a wheel and engages and elevates the tooth root from the socket (Fig. 7-43).

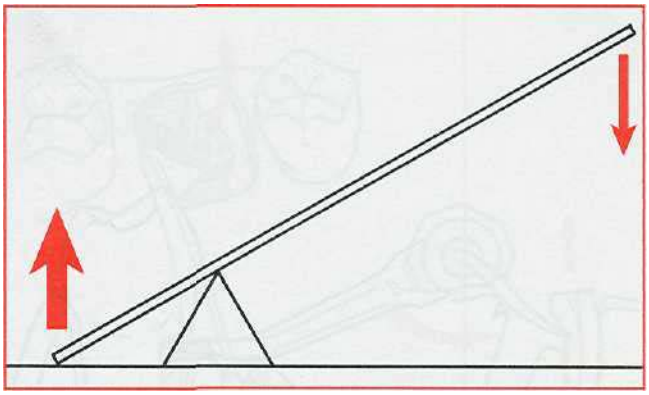


FIG. 7-38 First-class lever transforms small force and large movement to small movement and large force.

PRINCIPLES OF FORCEPS USE

The primary instrument used to remove a tooth from the alveolar process is the extraction forceps. Although elevators may help in the luxation of a tooth, the instrument that does most of the work is the forceps. The goal of forceps use is twofold: (1) expansion of the bony socket by use of the wedge-shaped beaks of the forceps and the movements of the tooth itself with the forceps, and (2) removal of the tooth from the socket.

The forceps can apply five major motions to luxate the teeth and expand the bony socket: The first is apical pressure, which accomplishes two goals. Although the tooth moves in an apical direction minimally, the tooth socket is expanded by the insertion of the beaks down into the periodontal ligament space (Fig. 7-44). Thus apical pressure of the forceps on the tooth causes bony expansion. A second accomplishment of apical pressure is that the center of the tooth's rotation is displaced apically. Because the tooth is moving in response to the force placed on it by the forceps, the forceps becomes the instrument of expansion. If the fulcrum is high (Fig. 7-45), a larger amount of force is placed on the apical region of the tooth, which increases the chance of fracturing the root end. If the beaks of the forceps are forced into the periodontal ligament space, the center of rotation is moved apically, which results in greater movement of the expansion forces at the crest of the ridge and less force moving the apex of the tooth lingually (Fig. 7-46). This process decreases the chance for apical root fracture.

The second major pressure or movement applied by forceps is the buccal force. Buccal pressures result in expansion of the buccal plate, particularly at the crest of the ridge (Fig. 7-47). Although buccal pressure causes expansion forces at the crest of the ridge, it is important to remember that it also causes lingual apical pressure.

Third, lingual pressure is similar to the concept of buccal pressure but is aimed at expanding the linguocrestal bone and, at the same time, avoiding excessive pressures on the buccal apical bone (Fig. 7-48).

Fourth, rotational pressure, as the name implies, rotates the tooth, which causes some internal expansion of the tooth socket. Teeth with single, conic roots, such as the maxillary incisors, and mandibular premolars, with

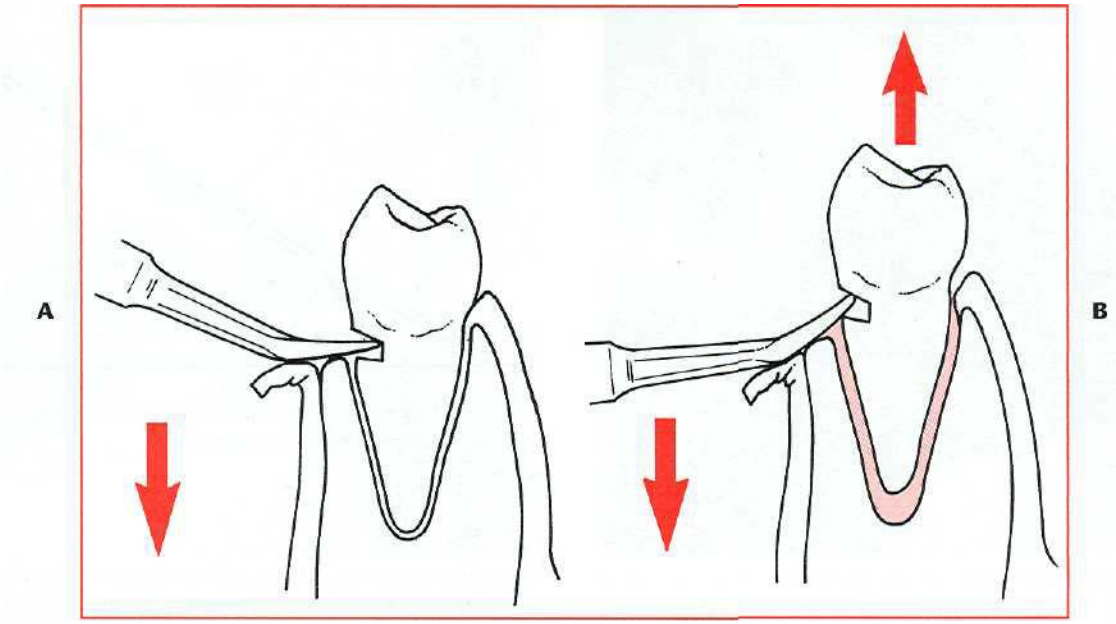


FIG. 7-39 In removal of this mandibular premolar tooth, purchase point has been placed in tooth, which creates first-class lever situation. When Crane pick is inserted into purchase point and handle forces apicaliy (A), tooth is elevated occlusally out of socket with buccoalveolar bone used as fulcrum (B).

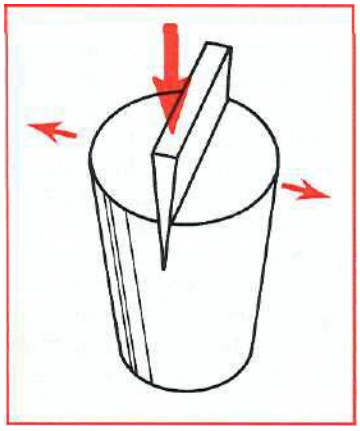


FIG. 7-40 Wedge can be used to expand, split, and displace portions of substance that receives it.

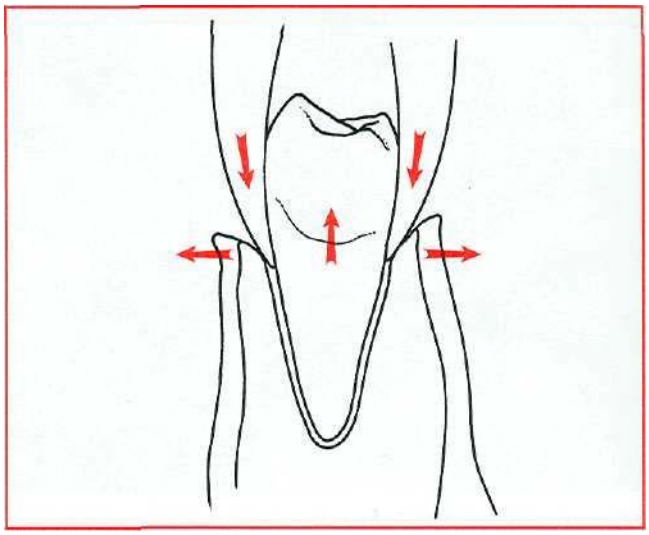


FIG. 7-41 Beaks of forceps act as wedge to expand alveolar bone and displace tooth in occlusal direction.

roots that are not curved, are most amenable to luxation by this technique (Fig. 7-49). Teeth that have other than conic roots or that have multiple roots—especially if those roots are curved—are more likely to fracture under this type of pressure.

Finally, fractional forces are useful for delivering the tooth from the socket once adequate bony expansion is achieved. Tractional forces should be limited to the final portion of the extraction process and should be gentle (Fig. 7-50).

In summary, a variety of forces can be used to remove teeth. A strong apical force is always useful and should be applied whenever forceps is adapted to the tooth. Most teeth are removed by a combination of buccal and lingual forces. Because maxillary buccal bone is usually thinner and the palatal bone is a thicker cortical bone, maxillary teeth are usually removed by strong buccal forces and less vigorous palatal forces. In the mandible the buccal bone is thinner from the midline posteriorly to the area of the molars. Therefore the incisors, canines, and premolars are removed primarily as a result of strong buccal force and less vigorous lingual pressures. The mandibular molar teeth have stronger buccal bone and usually require a stronger lingual pressure than the other teeth in the mouth. As mentioned earlier, rotational forces are useful for single-rooted teeth that have conic roots and no

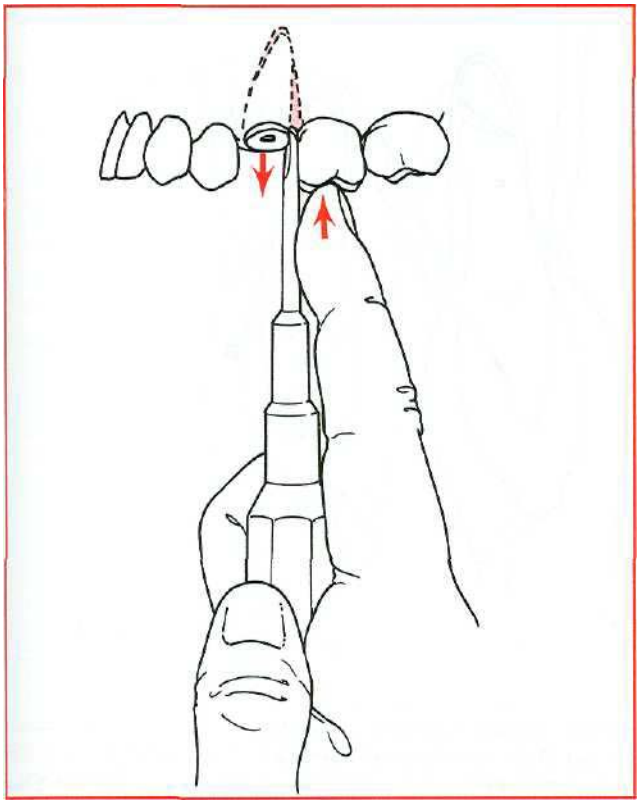


FIG. 7-42 Small, straight elevator, used as wedge to displace tooth root from its socket. Its use in this fashion gives this elevator the nickname "shoehorn."

severe curvatures at the root end. The maxillary incisors, particularly the central incisor and mandibular premolars (especially the second premolar), are most amenable to rotational forces.

PROCEDURE FOR CLOSED EXTRACTION

An erupted root can be extracted using one of two major techniques: (1) closed or (2) open. The closed technique is also known as the *simple,* or *forceps* technique. The open technique is also known as the surgical, or flap, technique. This section discusses the closed, or forceps, extraction technique; the open technique is discussed in Chapter 8.

The closed technique is the most frequently used technique and is given primary consideration for almost every extraction. The open technique is used when the clinician believes that excessive force is necessary to remove the tooth or when a substantial amount of the crown is missing and access to the root of the tooth is difficult.

The correct technique for any situation should lead to an atraumatic extraction; the wrong technique may result in an excessively traumatic extraction.

Whatever technique is chosen, the three fundamental requirements for a good extraction remain the same: (1) adequate access and visualization of the field of surgery, (2) an unimpeded pathway for the removal of the tooth, and (3) the use of controlled force to luxate and remove the tooth.

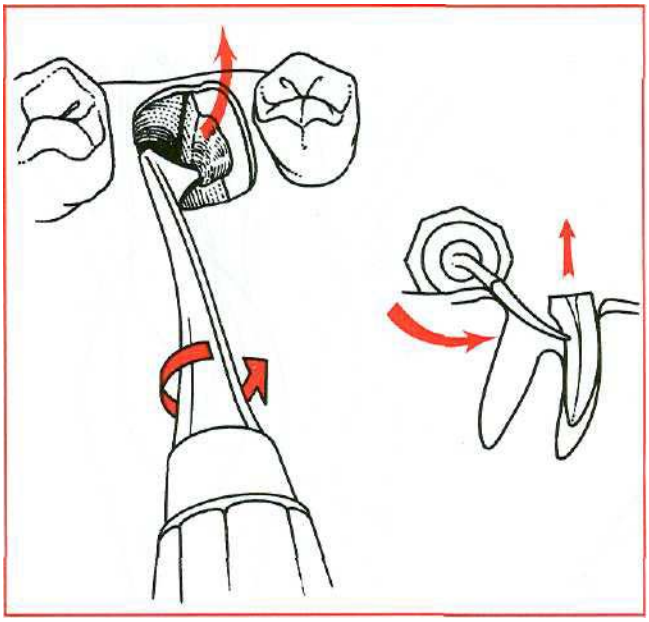


FIG. 7-43 Triangular elevator in role of wheel-and-axle machine, used to retrieve root from socket.

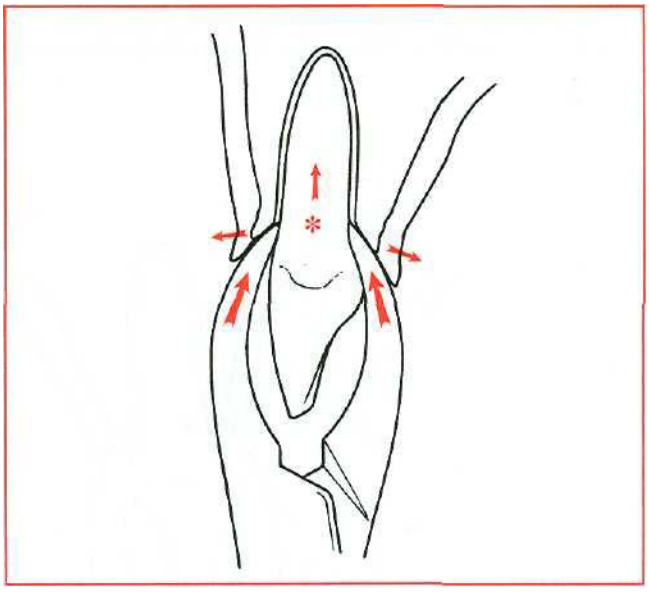


FIG. 7-44 Extraction forceps should be seated with strong apical pressure to expand crestal bone and to displace center of rotation *(*)* as far apically as possible.

For the tooth to be removed from the bony socket, it is necessary to expand the alveolar bony walls to allow the tooth root an unimpeded pathway, and it is necessary to tear the periodontal ligament fibers that hold the tooth in the bony socket. The use of elevators and forceps as levers and wedges with steadily increasing force can accomplish these two objectives.

Five general steps make up the closed-extraction procedure:

Step 1: Loosening of soft tissue attachment from the tooth. The first step in removing a tooth by the closed

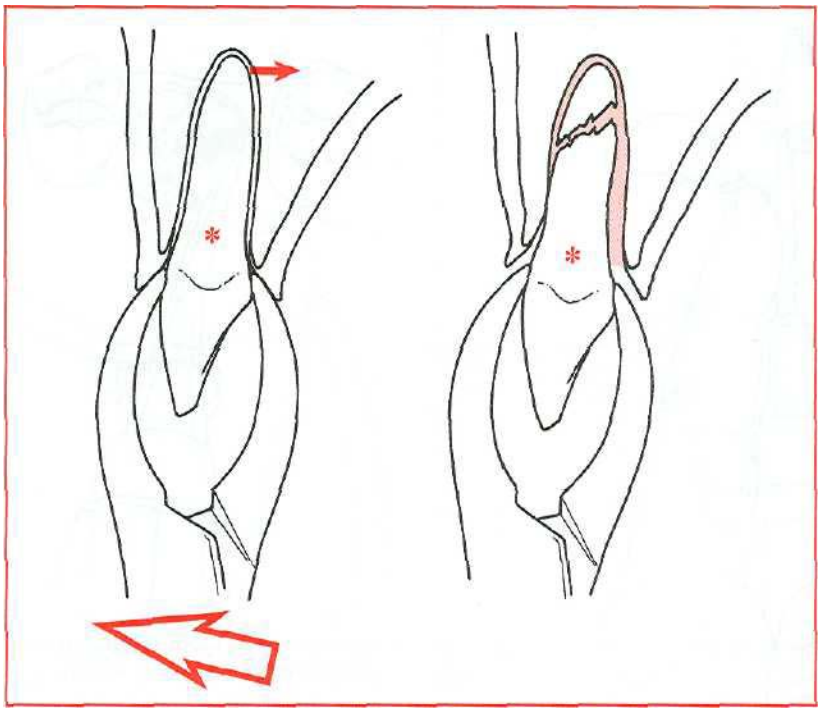


FIG. 7-45 If center of rotation *(*)* is not far enough apicaliy, it is too far occlusally, which results in excess movement of tooth apex (A). B, Excess motion of root apex caused by high center of rotation results in fracture of root apex.

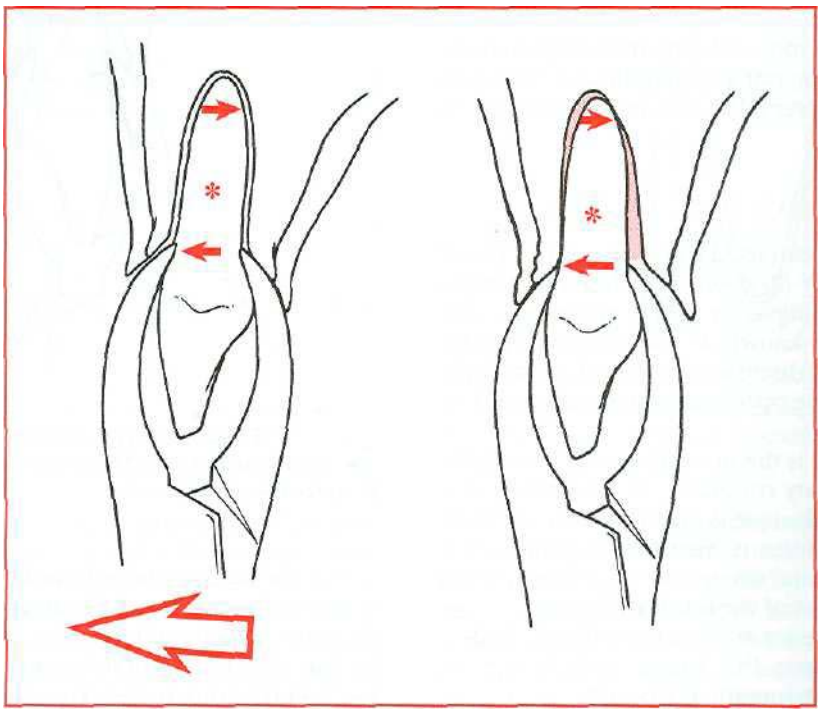


FIG. 7-46 If forceps is apicaliy seated, center of rotation *(*)* is displaced apically and less apical pressures are generated (A). This results in greater expansion of buccal cortex, less movement of apex of tooth, and therefore less chance of fracture of root (B).

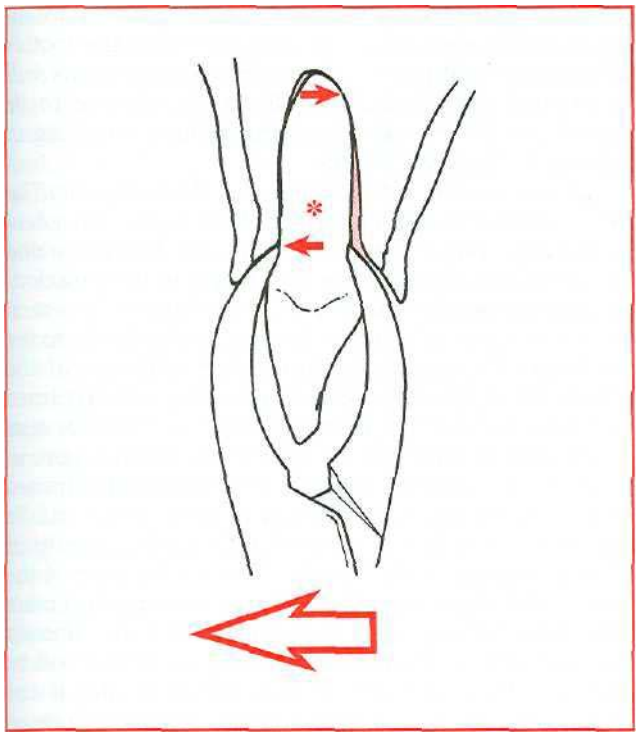


FIG. 7-47 Buccal pressure applied to tooth will expand buccocortical plate toward crestal bone, with some lingual expansion at apical end of root. * Center of rotation.

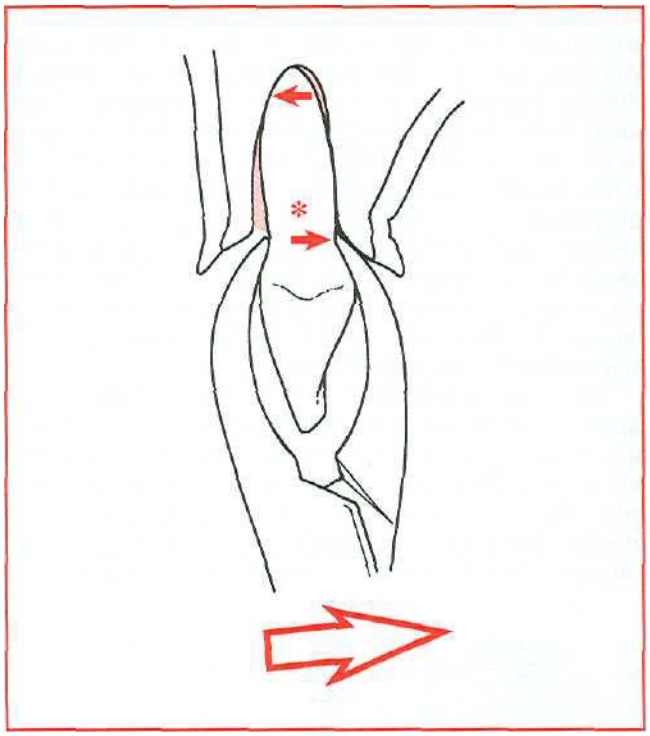


FIG. 7-48 Lingual pressure will expand linguocortical plate at crestal area and slightly expand buccal bone at apical area. * Center of rotation.

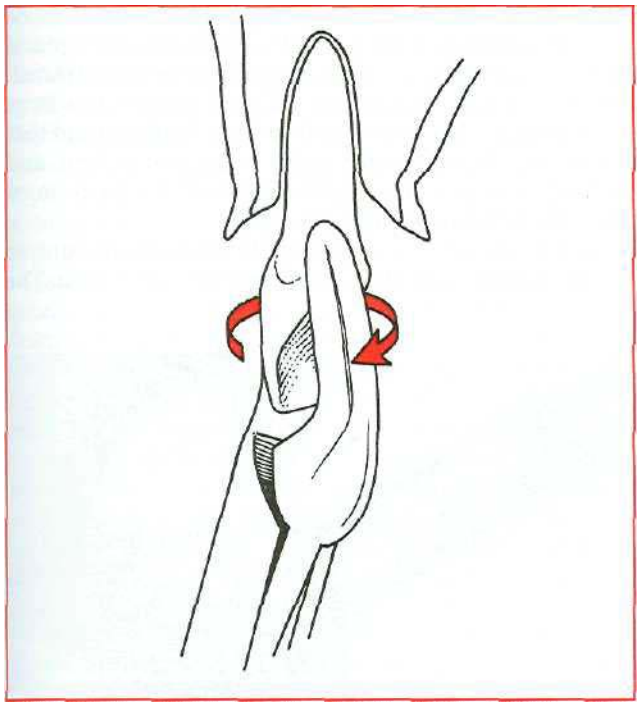


FIG. 7-49 Rotational forces, useful for teeth with conic roots, such as maxillary incisors and mandibular premolars.

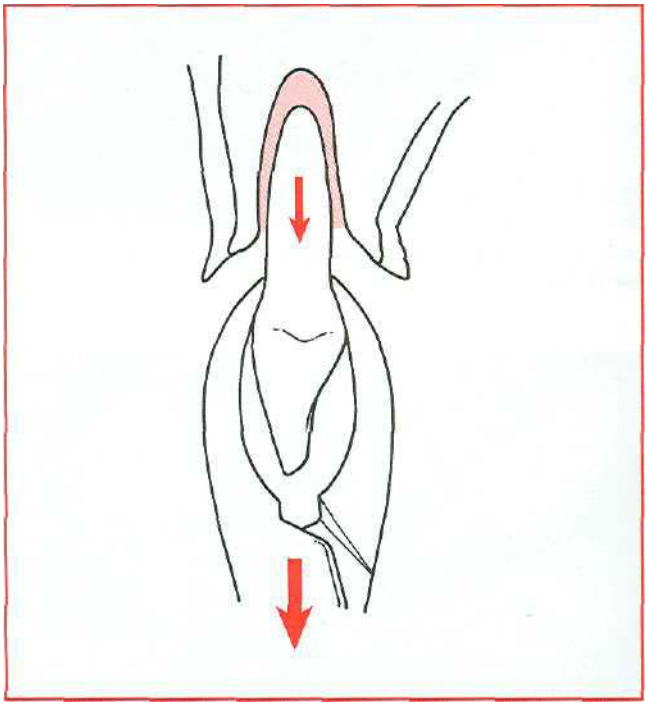


FIG. 7-50 Tractional forces are useful for final removal of tooth from socket. They should always be small forces, because teeth are not "pulled."

extraction technique is to loosen the soft tissue from around the tooth with a sharp instrument, such as the Woodson elevator or the sharp end of the no. 9 periosteal elevator (Fig. 7-51). The purpose of loosening the soft tissue from the tooth is twofold. First, it allows the surgeon to ensure that profound anesthesia has been achieved. When this step has been performed, the dentist informs the patient that the surgery is about to begin and that the first step will be to push the soft tissue away from the tooth. A small amount of pressure is felt at this step, but no sensation of sharpness or discomfort. The surgeon then begins the soft tissue-loosening procedure, gently at first and then with increasing force.

The second reason that the soft tissue is loosened is to allow the tooth-extraction forceps to be positioned more apically, without interference from or impingement on the soft tissue of the gingiva. As the soft tissue is loosened away from the tooth, it is slightly reflected, which thereby increases the width of the gingival sulcus and allows easy entrance of the beveled wedge tip of the forceps beaks.

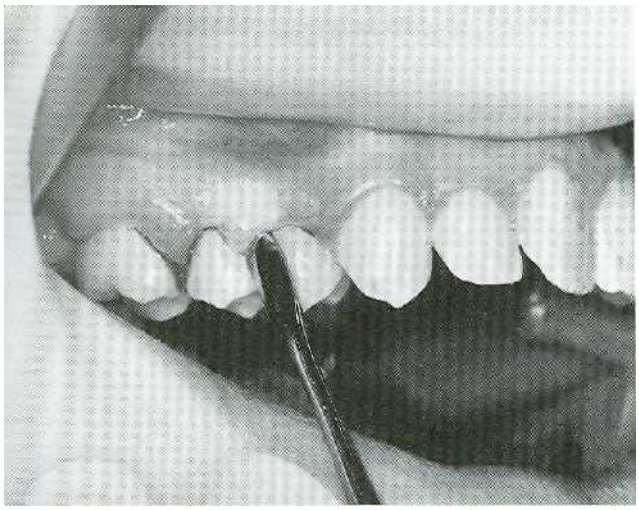


FIG. 7-51 Woodson elevator, used to loosen gingival attachment

If a straight elevator is to be used to luxate the tooth, the Woodson elevator is also used to reflect the tooth's adjacent gingival papilla where the straight elevator will be inserted (Fig. 7-52). This allows the elevator to be placed directly onto alveolar bone, without crushing or injuring the gingival papilla.

Step 2: Luxation of the tooth with a dental elevator. The next step is to begin the luxation of the tooth with a dental elevator, usually the straight elevator. Expansion and dilation of the alveolar bone and tearing of the periodontal ligament require that the tooth be luxated in several ways. The straight elevator is inserted perpendicular to the tooth into the interdental space, after reflection of the interdental papilla (Fig. 7-53). The elevator is then turned in such a way that the inferior portion of the blade rests on the alveolar bone and the superior, or occlusal, portion of the blade is turned toward the tooth being extracted (Fig. 7-54). Strong, slow, forceful turning of the handle moves the tooth in a posterior direction, which results in some expansion of the alveolar bone and tearing of the periodontal ligament. If the tooth is intact and in contact with stable teeth anterior and posterior to it, the amount of movement achieved with the straight elevator will be minimal. The usefulness of this step is greater if the patient does not have a tooth posterior to the tooth being extracted, or if it is broken down to an extent that the crowns do not inhibit movement of the tooth.

In certain situations the elevator can be turned in the opposite direction and more vertical displacement of the tooth will be achieved, which can possibly result in complete removal of the tooth (Fig. 7-55).

Luxation of teeth with a straight elevator should be performed with caution. Excessive forces can damage and even displace the teeth adjacent to those being extracted. This is especially true if the adjacent tooth has a large restoration or carious lesion. It must be kept in mind that this is only the initial step in the extraction process, and that the forceps is the major instrument for tooth luxation and removal in most situations.

Step 3: Adaptation of the forceps to the tooth. The proper forceps is then chosen for the tooth to be extracted. The

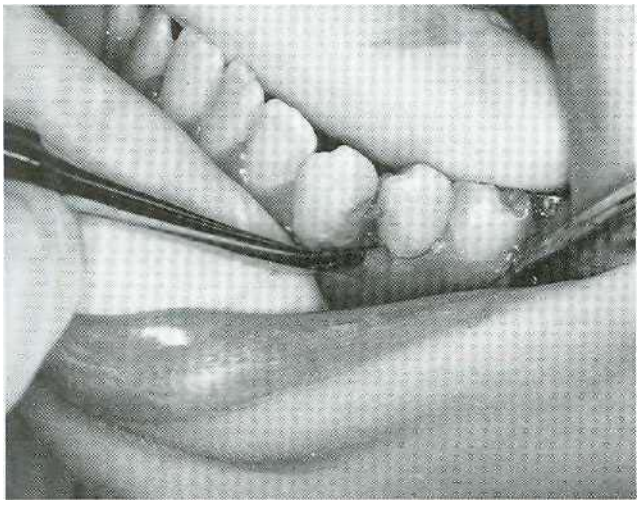


FIG. 7-52 Reflection of gingival papilla to allow straight elevator to be used to luxate tooth without injury to papilla.

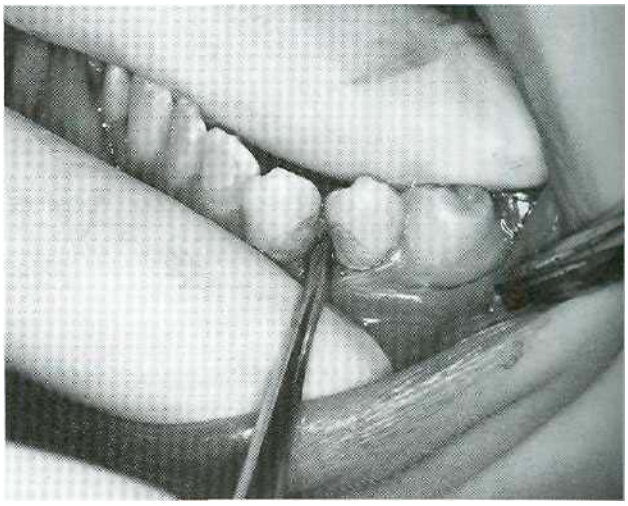


FIG. 7-53 Small, straight elevator, inserted perpendicular to tooth after papilla has been reflected.

beaks of the forceps should be shaped to adapt anatomically to the tooth, apical to the cervical line, that is, to the root surface. The forceps is then seated onto the tooth so that the tips of the forceps beaks grasp the root underneath the loosened soft tissue (Fig. 7-56). The lingual beak is usually seated first and then the buccal beak. Care must be taken to confirm that the tips of the forceps beaks are beneath the soft tissue and not engaging an adjacent tooth. Once the forceps has been positioned on the tooth, the surgeon grasps the handles of the forceps at the very ends to maximize mechanical advantage and control (Fig. 7-57).

If the tooth is malopposed in such a fashion that the usual forceps cannot grasp the tooth without injury to adjacent teeth, another forceps should be employed. The maxillary root forceps can often be useful for crowded lower anterior teeth (Fig. 7-58).

The beaks of the forceps must be held parallel to the long axis of the tooth so that the forces generated by the application of pressure to the forceps handle can be delivered along the long axis of the tooth for maximal effectiveness in dilating and expanding the alveolar bone. If the beaks are not parallel to the long axis of the tooth, it is increasingly likely that the tooth root will fracture.

The forceps is then forced apically as far as possible to grasp the root of the tooth as apically as possible. This accomplishes two things: First, the beaks of the forceps act as wedges to dilate the crestal bone on the buccal and lingual aspects. Second, by forcing the beaks apically, the center of rotation (or fulcrum) of the forces applied to the tooth is displaced toward the apex of the tooth, which results in greater effectiveness of bone expansion and less likelihood of fracturing the apical end of the tooth.

At this point the surgeon's hand should be grasping the forceps firmly, with the wrist locked and the arm held against the body; the surgeon should be prepared to apply force with the shoulder and upper arm without any wrist pressure. The surgeon should be standing straight, with the feet comfortably apart.

Step 4: Luxation of the tooth with the forceps. The surgeon begins to luxate the tooth by using the motions discussed earlier. The major portion of the force is directed toward the thinnest and therefore weakest bone. Thus in the maxilla and all but the molar teeth in the mandible, the major movement is labial and buccal (i.e., toward the thinner layer of bone). The surgeon uses slow, steady force to displace the tooth buccally. The motion is deliberate and slow, and it gradually increases in force. The tooth is then moved again toward the opposite direction with slow, deliberate, strong pressure. As the alveolar bone begins to expand, the forceps is apically reseated with a strong, deliberate motion, which causes additional expansion of the alveolar bone and further displaces the center of the rotation apically. Buccal and lingual pressures continue to expand the alveolar socket. For some teeth, rotational motions are then used to help expand the tooth socket and tear the periodontal ligament attachment.

Beginning surgeons have a tendency to apply inadequate pressure for insufficient amounts of time. The following three factors must be reemphasized: (1) The for-

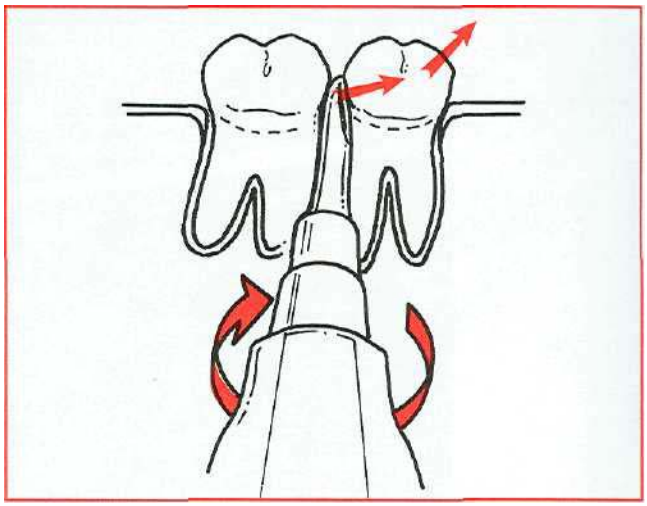


FIG. 7-54 Handle of small straight elevator, turned so that occlusal side of elevator blade is turned toward tooth.

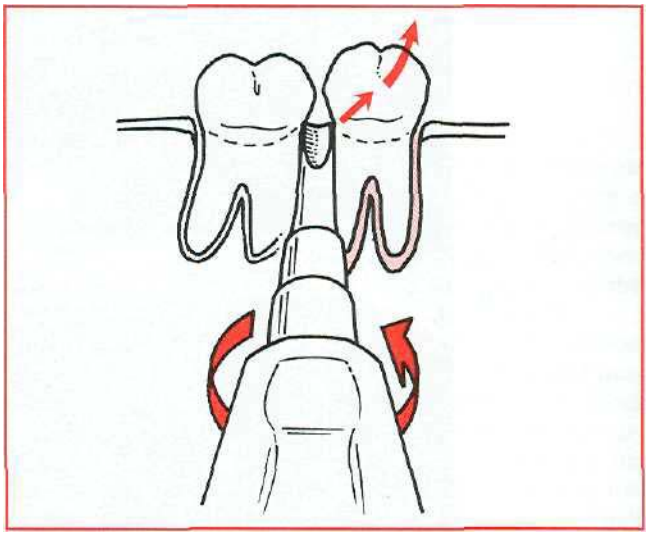


FIG. 7-55 Handle of elevator, which may be turned in opposite direction to displace tooth further from socket. This can be accomplished only if no tooth is adjacent posteriorly.

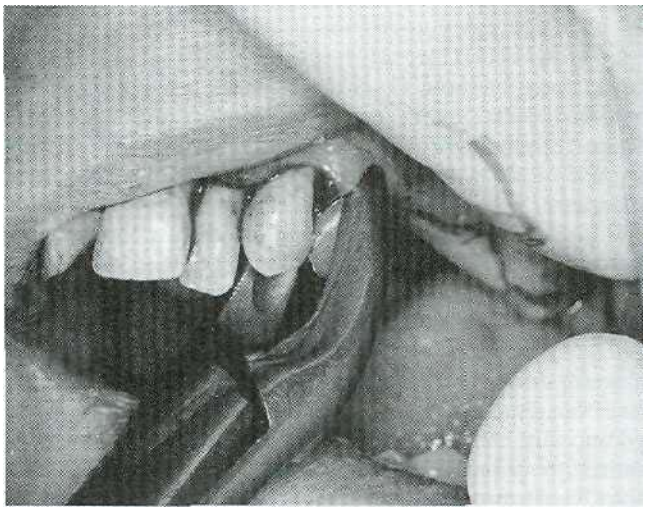


FIG. 7-56 Tips of forceps beak, forced apically under soft tissue.

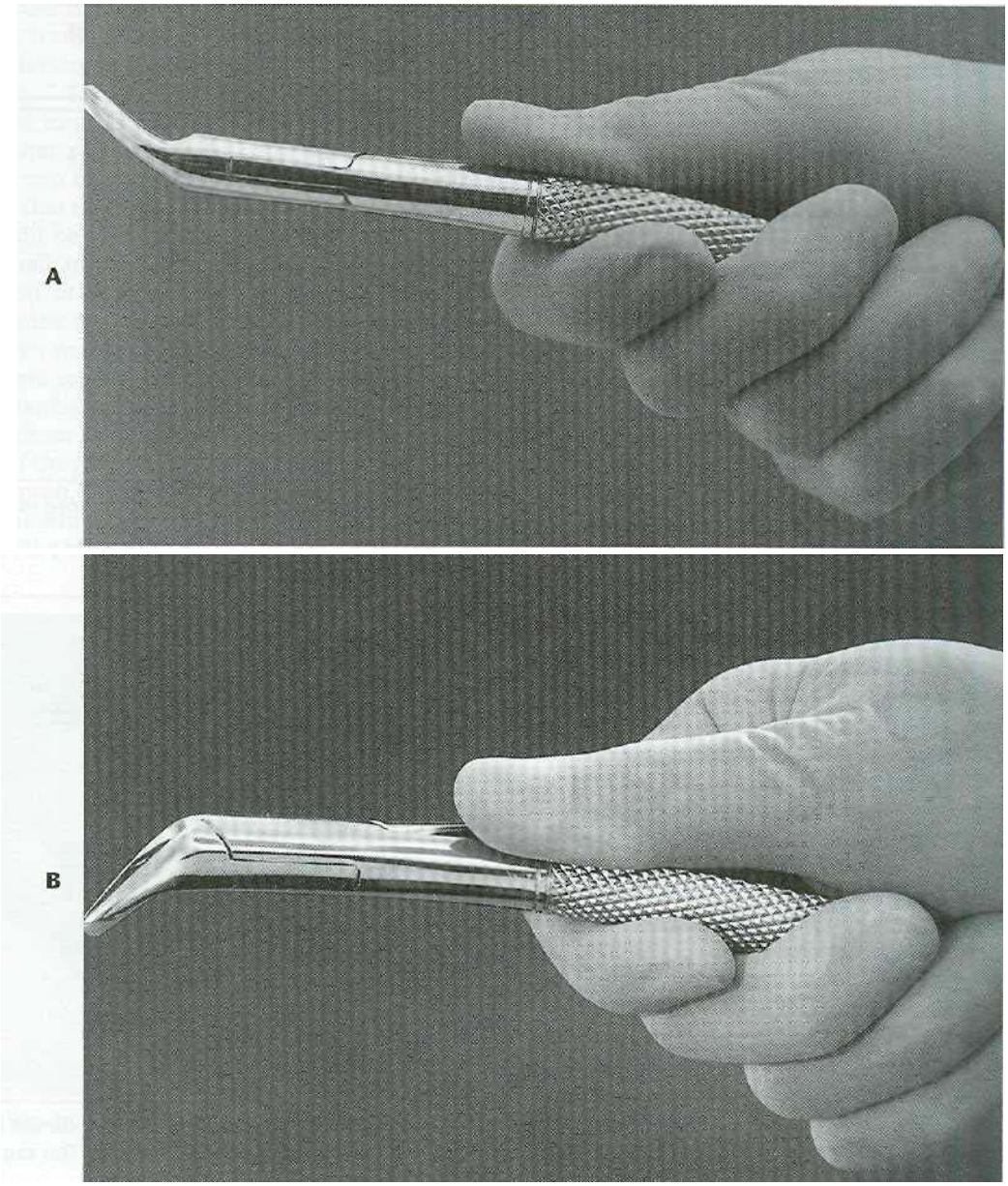


FIG. 7-57 Forceps handles, held at very ends to maximize mechanical advantage and control. A, Maxillary universal forceps. B, Mandibular universal forceps.

ceps must be apically seated as far as possible and reseated periodically during the extraction; (2) the forces applied in the buccal and lingual directions should be slow, deliberate pressures and not jerky wiggles; and (3) the force should be held for several seconds to allow the bone time to expand. It must be remembered that teeth are not pulled; rather, they are gently lifted from the socket once the alveolar process has been sufficiently expanded.

Step 5: Removal of the tooth from the socket. Once the alveolar bone has expanded sufficiently and the tooth has been luxated, a slight tractional force, usually directed buccally, can be used. Tractional forces should be minimized, because this is the last motion that is used once the alveolar process is sufficiently expanded and the periodontal ligament completely severed.

It is useful to remember that luxation of the toot with the forceps and removal of the tooth from the bone are separate steps in the extraction. Luxation is directed toward expansion of the bone and disruption of the peri-odontal ligament. The tooth is not removed from bone until these two goals are accomplished. The novice surgeon should realize that the major role of the forceps is not to remove the tooth but rather to expand the bone so that the tooth can be removed.

For teeth that are malopposed or have unusual positic in the alveolar process, the luxation with the forceps and removal from the alveolar process will be in unusual dire tions. The surgeon must develop a sense for the direction the tooth wants to move and then be able to move it in that direction. Careful preoperative assessment and planning help to make this determination during the extraction

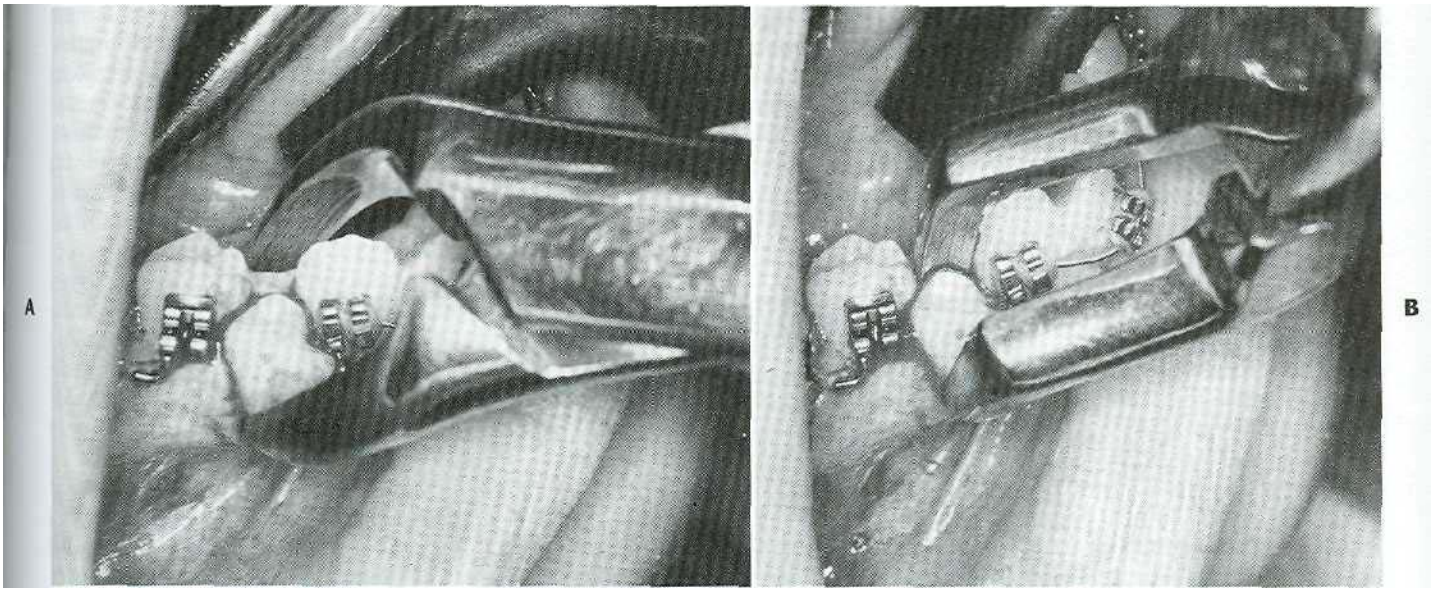


FIG. 7-58 A, No. 151 forceps, too wide to grasp premolar to be extracted without luxating adjacent teeth. B, Maxillary root forceps, which can be adapted easily to tooth for extraction.

Role of Opposite Hand

When using the forceps and elevators to luxate and remove teeth, it is important that the surgeon's opposite hand play an active role in the procedure. For the right-handed operator, the left hand has a variety of functions. It is responsible for reflecting the soft tissues of the cheeks, lips, and tongue to provide adequate visualization of the area of surgery. It helps to protect other teeth from the forceps, should it release suddenly from the tooth socket. It helps to stabilize the patient's head during the extraction process. In some situations, large amounts of force are required to expand heavy alveolar bone; therefore the patient's head requires active assistance to be held steady. The opposite hand plays an important role in supporting and stabilizing the lower jaw when mandibular teeth are being extracted. It is often necessary to apply considerable pressure to expand heavy mandibular bone, and such forces can cause discomfort and even injury to the TMJ unless a steady hand counteracts them. A bite block placed on the contralateral side is also used to help support the jaw in this situation. Finally, the opposite hand supports the alveolar process and provides tactile information to the operator concerning the expansion of the alveolar process during the luxation period. In some situations it is impossible for the opposite hand to perform all of these functions at the same time, so the surgeon requires an assistant to help with some of them.

Role of Assistant during Extraction

For a successful outcome in any surgical procedure, it is essential to have a competent assistant. During the extraction the assistant plays a variety of important roles that contribute to making the surgical experience atraumatic. The assistant helps the surgeon visualize and gain access to the operative area by reflecting the soft tissue of the cheeks and tongue so that the surgeon can have an unobstructed view of the surgical field. Even during a closed extraction, the assistant can reflect the soft tissue so that the surgeon can apply the instruments to loosen the soft tissue attachment and adapt the forceps to the tooth and tooth root in the most effective manner.

Another major activity of the assistant is to suction away blood, saliva, and the irrigating solutions used during the surgical procedure. This prevents fluids from accumulating and makes proper visualization of the surgical field possible. Suctioning is also important for patient comfort, because most patients are unable to tolerate an accumulation of blood or other fluids in their mouths. During a surgical procedure it is almost impossible for the assistant to suction too much.

During the extraction the assistant should also help to protect the teeth of the opposite arch, which is especially important when removing lower posterior teeth. If traction forces are necessary to remove a lower tooth, occasionally the tooth releases suddenly and the forceps strike the maxillary teeth and sometimes fracture a tooth cusp. The assistant should hold either a suction tip or a finger against the maxillary teeth to protect them from an unexpected blow.

During the extraction of mandibular teeth, the assistant may play an important role by supporting the mandible during the application of the extraction forces. A surgeon who uses the hand to reflect the soft tissue may not be able to support the mandible. If this is the case, the assistant plays an important role in stabilizing the mandible to prevent TMJ discomfort. Most often the surgeon stabilizes the mandible, which makes this role less important for the assistant.

The assistant also provides psychologic and emotional support for the patient by helping alleviate patient anxiety during the surgery. The assistant is important in gain-

ing the patient's confidence and cooperation by using positive language and physical contact with the patient during the preparation and performance of the surgery. The assistant should avoid making casual, offhand comments that may increase the patients' anxiety and lessen their cooperation.

SPECIFIC TECHNIQUES FOR REMOVAL OF EACH TOOTH

This section describes specific techniques for the removal of each tooth in the mouth. In some situations several teeth are grouped together (e.g., the maxillary anterior teeth), because the technique for their removal is essentially the same.

Maxillary Teeth

In the correct position for extraction of maxillary left or anterior teeth, the left index finger of the surgeon should reflect the lip and cheek tissue; the thumb should rest on the palatal alveolar process (Fig. 7-59). In this way the left hand is able to reflect the soft tissue of the cheek, stabilize the patient's head, support the alveolar process, and provide tactile information to the surgeon regarding the progress of the extraction. When such a position is used during the extraction of a maxillary molar, the surgeon can frequently feel with the left hand the palatal root of the molar becoming free in the alveolar process before realizing it with the forceps or extracting hand. For the right side, the index finger is positioned on the palate and the thumb on the buccal aspect.

Maxillary incisor teeth. The maxillary incisor teeth are extracted with the upper universal forceps (no. 150), although other forceps can be used. The maxillary incisors generally have conic roots, with the lateral ones being slightly longer and more slender. The lateral incisor is more likely also to have a distal curvature on the apical one third of the root, so this must be checked radiographically before the tooth is extracted. The alveolar bone is thin on the labial side and heavier on the palatal side, which indicates that the major expansion of the alveolar process will be in the buccal direction. The initial movement is slow, steady, and firm in the labial direction, which expands the crestal buccal bone. A less vigorous palatal force is then used, followed by a slow, firm, rotational force. Rotational movement should be minimized for the lateral incisor, especially if a curvature exists on the tooth. The tooth is delivered in the labial-incisal direction with a small amount of tractional force (Fig. 7-60).

Maxillary canine. The maxillary canine is usually the longest tooth in the mouth. The root is oblong in cross section and usually produces a bulge called the canine eminence on the anterior surface of the maxilla, The result is that the bone over the labial aspect of the maxillary canine is usually quite thin. In spite of the thin labial bone, this tooth can be difficult to extract simply because of its long root. Additionally, it is not uncommon for a segment of labial alveolar bone to fracture from the labial plate and be removed with the tooth.

The upper universal (no. 150) forceps is the preferred instrument for removing the maxillary canine. As with all extractions, the initial placement of the beaks of the forceps on the canine tooth should be as far apically as pos-sible. The initial movement is to the buccal aspect, with return pressure to the palatal. As the bone is expanded and the tooth mobilized, the forceps should be reposi-tioned apically. A small amount of rotational force may

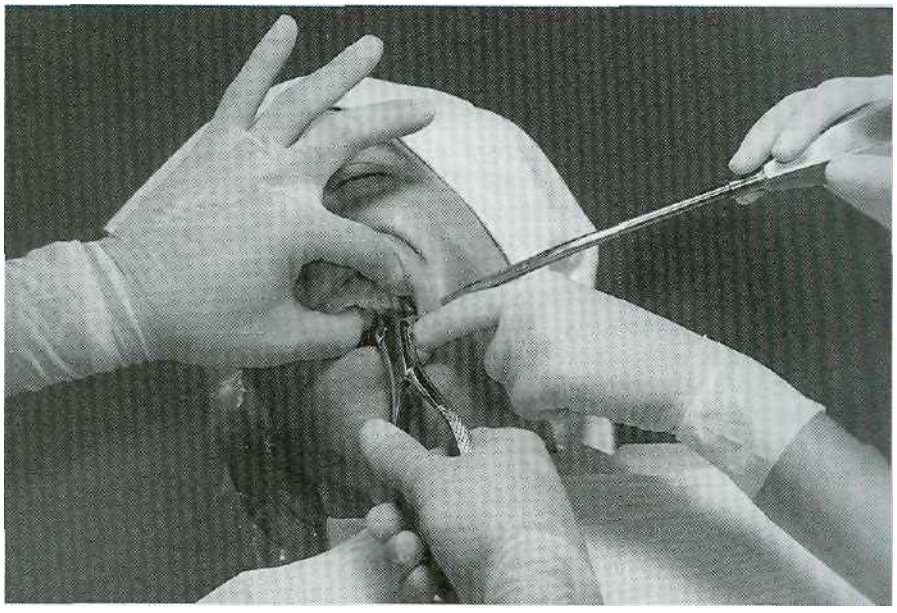


FIG. 7-59 Extraction of maxillary left posterior teeth. Left index finger reflects lip and cheek and supports alveolar process on buccal aspect. Thumb is positioned on palatal aspect of alveolar process and supports alveolar process. Head is steadied by this grip, and tactile information is gained regarding tooth and bone movement.

be useful in expanding the tooth socket, especially if the adjacent teeth are missing or have just been extracted. After the tooth has been well luxated, it is delivered from the socket in a labial-incisal direction with labial fractional forces (Fig. 7-61).

If, during the luxation process with the forceps, the surgeon feels a portion of the labial bone fracture, a decision must be made concerning the next step. If the palpating finger indicates that a relatively small amount of bone has fractured free and is attached to the canine tooth, the extraction should continue in the usual manner, with caution taken not to tear the soft tissue. However, if the palpating finger indicates that a relatively large portion of labial alveolar plate has fractured, the surgeon

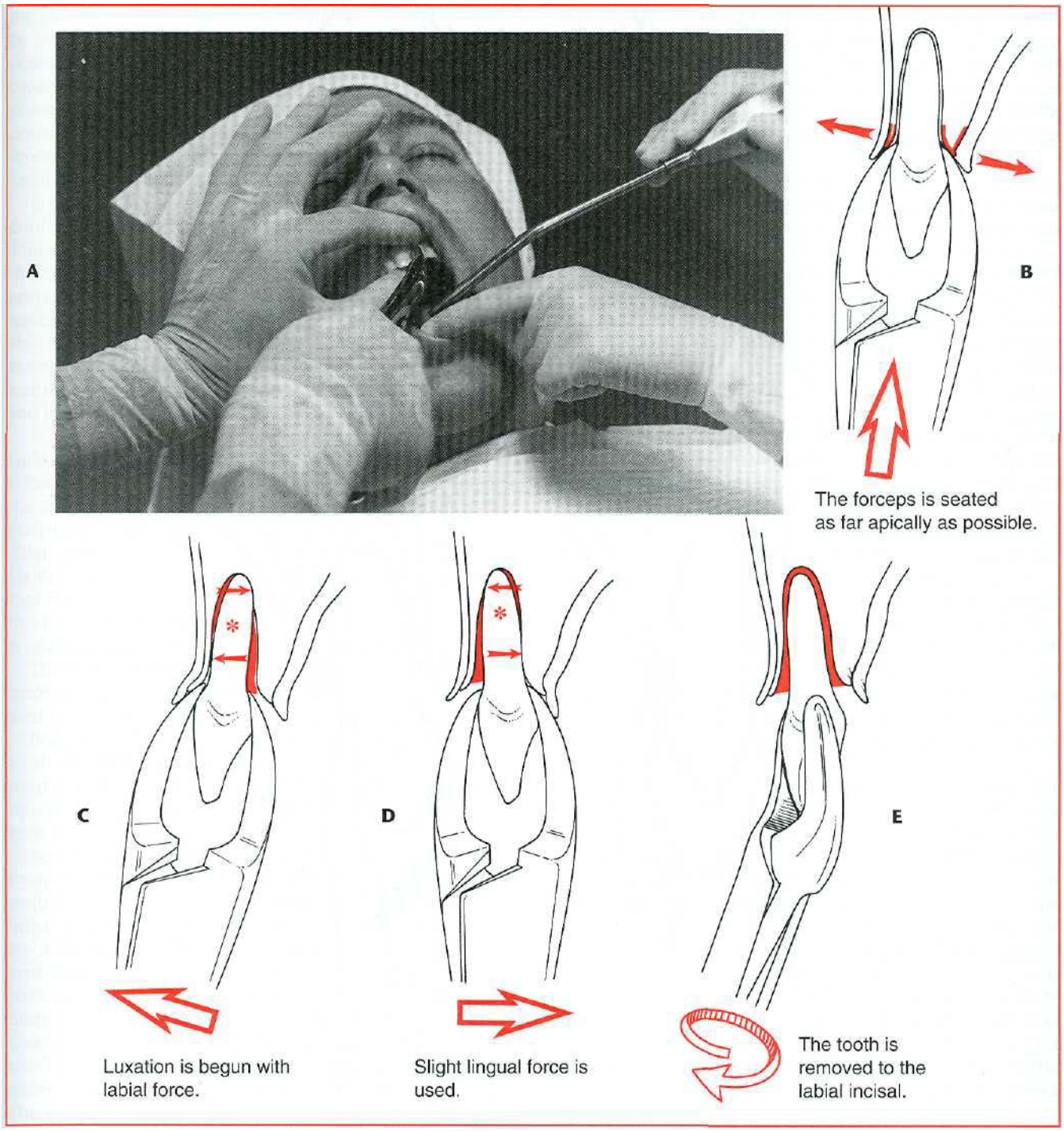


FIG. 7-60 A, Maxillary incisors are extracted with no. 150 forceps. Left hand grasps alveolar process. Assistant helps reflect and protect soft tissue. B, Forceps is seated as far apically as possible. C, Luxation is begun with labial force. D, Slight lingual force is used. E, Tooth is delivered to labial incisor with rotational, tractional movement.

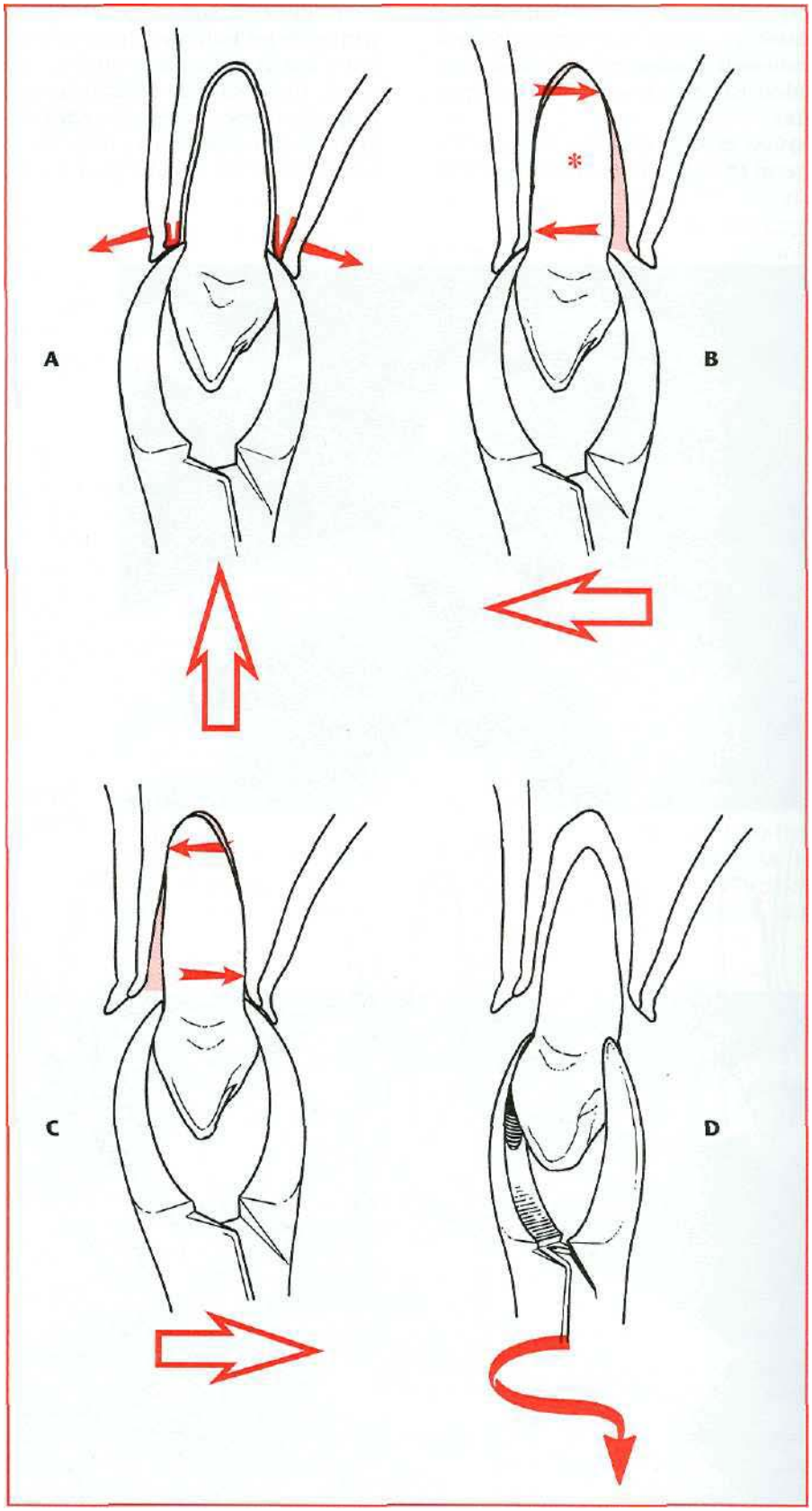


FIG. 7-61 A, Hand and forceps position for removal of maxillary canine is similar to that for incisors. Forceps is seated as far apically as possible. B, Initial movement is buccally. C, Small amounts of lingual force are applied. D, Tooth is delivered in labial-incisal direction with slight rotational force.

should stop the surgical procedure. Usually the fractured portion of bone is attached to periosteum and therefore is viable. The surgeon should use a thin periosteal elevator to raise a small amount of mucosa from around the tooth, down to the level of the fractured bone.

The canine tooth should then be stabilized with the extraction forceps, and the surgeon should attempt to free the fractured bone from the tooth, with the periosteal elevator as a lever to separate the bone from the tooth root. If this can be accomplished, the tooth can be removed and the bone left in place attached to the periosteum. Normal healing should occur. If the bone becomes detached from the periosteum during these attempts, it should be removed, because it is probably nonvital and may actually prolong wound healing. This procedure can be used whenever alveolar bone is fractured during extraction.

Prevention of fractured labial plate is important. If during the luxation process with the forceps a normal amount of pressure has not resulted in any movement of the tooth, the surgeon should seriously consider doing an open extraction. By reflecting a soft tissue flap and removing a small amount of bone, the surgeon may be able to remove the stubborn canine tooth without fracturing a larger amount of labial bone. By using the open technique, there will be an overall reduction in bone loss and in postoperative healing time.

Maxillary first premolar. The maxillary first premolar is a single-rooted tooth in its first two thirds, with a bifurcation into a buccolingual root usually occurring in the apical one third to one half. These roots may be extremely thin and are subject to fracture, especially in older patients in whom bone density is great and bone elasticity is small (Fig. 7-62). Perhaps the most common root fracture when extracting teeth in adults occurs with this tooth. As with other maxillary teeth, the buccal bone is relatively thin compared with the palatal bone.

The upper universal (no. 150) forceps is the instrument of choice. Alternatively, the no. 150A forceps can be used for removal of the maxillary first premolar.

Because of the high likelihood of root fracture, the tooth should be luxated as much as possible with the straight elevator. If root fracture does occur, a mobile root tip can be removed more easily than one that has not been well luxated.

Because of the bifurcation of the tooth into two relatively thin root tips, extraction forces should be carefully controlled during removal of the maxillary first premolar. Initial movements should be buccal. Palatal movements are made with relatively small amounts of force to prevent fracture of the palatal root tip, which is harder to retrieve. When the tooth is luxated buccally, the most likely tooth root to break is the labial. When the tooth is luxated in the palatal direction, the most likely root to break is the palatal root. Of the two root tips, the labial is easier to retrieve because of the thin, overlying bone. Therefore buccal pressures should be greater than palatal pressures. Any rotational force should be avoided. Final delivery of the tooth from the tooth socket is with tractional force in the occlusal direction and slightly buccal (see Fig. 7-62).

Maxillary second premolar. The maxillary second premolar is a single-rooted tooth for the root's entire length. The root is thick and has a blunt end. Consequently, the root of the second premolar fractures only rarely. The overlying alveolar bone is similar to that of other maxillary teeth in that it is relatively thin toward the bucca, with a heavy palatal alveolar palate.

The recommended forceps is the maxillary universal forceps, or no. 150; some surgeons prefer the no. 150A. The forceps is forced as far apically as possible so as to gain maximal mechanical advantage in removing this tooth. Because the tooth root is relatively strong and blunt, the extraction requires relatively strong movements to the bucca, back to the palate, and then in the buccoocclusal direction with a rotational, fractional force (Fig. 7-63).

Maxillary molar. The maxillary first molar has three large and relatively strong roots. The buccal roots are usually relatively close together, and the palatal root diverges widely toward the palate. If the two buccal roots are also widely divergent, it becomes difficult to remove this tooth by closed, or forceps, extraction. Once again the overlying alveolar bone is similar to that of other teeth in the maxilla; the buccal plate is thin and the palatal cortical plate is thick and heavy. When evaluating this tooth radiographically, the dentist should note the size, curvature, and apparent divergence of the three roots. Additionally the dentist should look carefully at the relationship of the tooth roots to the maxillary sinus. If the sinus is in close proximity to the roots and the roots are widely divergent, sinus perforation caused by removal of a portion of the sinus floor during tooth removal is increasingly likely. If this appears to be likely after preoperative evaluation, the surgeon should strongly consider a surgical extraction.

The paired forceps no. 53R and no. 53L are usually used for extraction of the maxillary molars . These two forceps have tip projections on the buccal beaks to fit into the buccal bifurcation. Some surgeons prefer to use the no. 89 and no. 90 forceps, which are sometimes called the *upper cowhorn forceps.* These two forceps are especially useful if the crown of the molar tooth has large caries or large restorations.

The upper molar forceps is adapted to the tooth and apically seated as far as possible in the usual fashion (Fig. 7-64). The basic extraction movement is to use strong buccal and palatal pressures, with stronger forces toward the buccal than toward the palate. Rotational forces are not useful for extraction of this tooth because of its three roots. As mentioned in the discussion of the extraction of the maxillary first premolar, it is preferable to fracture a buccal root than a palatal root (because it is easier to retrieve the buccal roots). Therefore if the tooth has widely divergent roots and the dentist suspects that one root may be fractured, the tooth should be luxated in such a way as to prevent fracturing the palatal root. The dentist must minimize palatal force, because this is the force that fractures the palatal root. Strong, slow, steady, buccal pressure expands the buccocortical plate and tears the periodontal ligament fibers that hold the palatal root in its position. Palatal forces should be used but kept to a minimum.

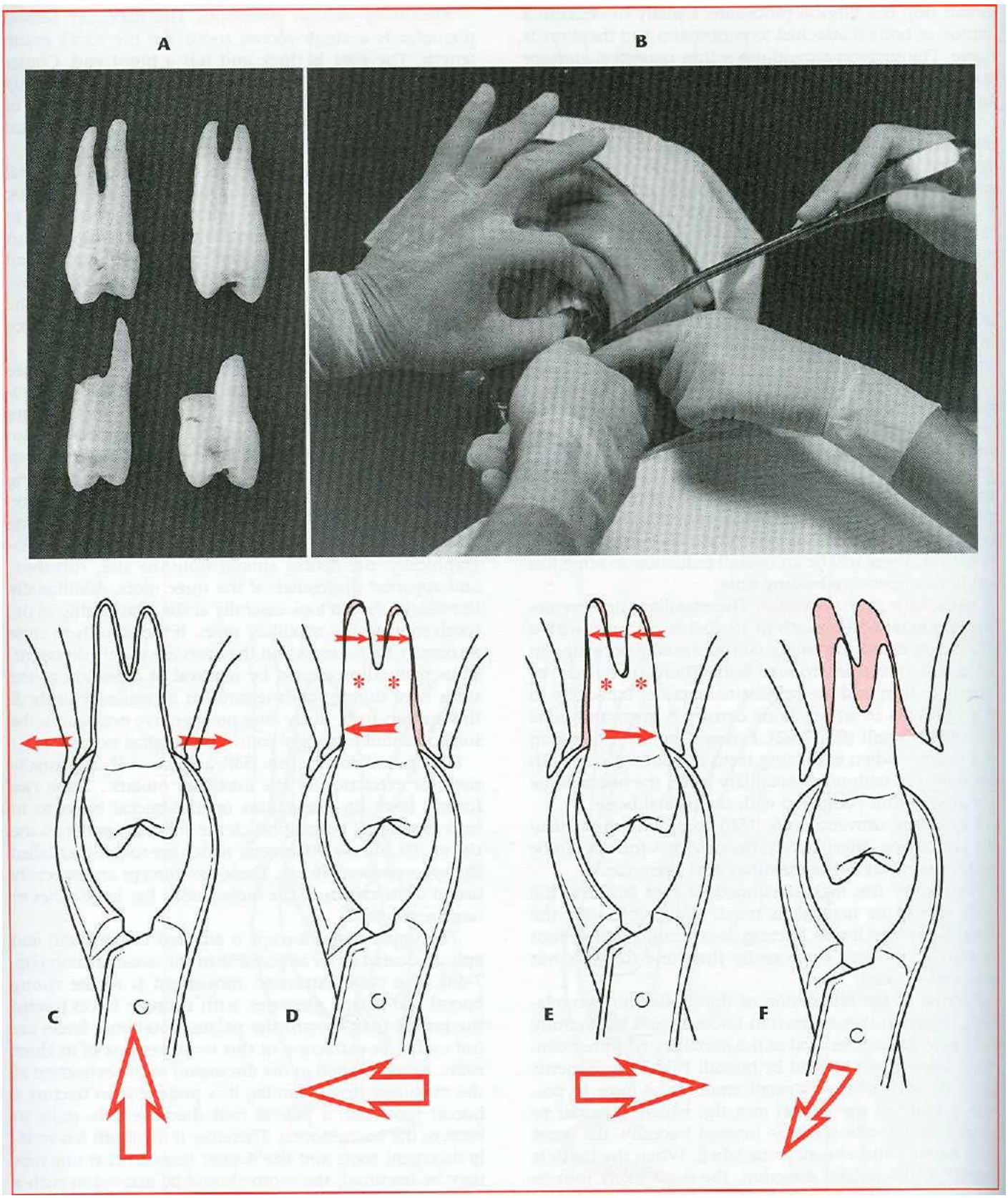


FIG. 7-62 A, Maxillary first premolar has two thin roots that are quite subject to fracture during extraction. B, Maxillary premolars are removed with no. 150 forceps. Hand position is similar to that used for anterior teeth. C, Firm apical pressure is applied first to lower center of rotation as far as possible and to expand crestal bone. D, Buccal pressure is applied initially to expand buccocortical plate. Apices of roots are pushed lingually and are therefore subject to fracture. E, Palatal pressure is applied but less vigorously than buccal pressure. F, Tooth is delivered in buccoocclusal direction with combination of buccal and tractional forces.

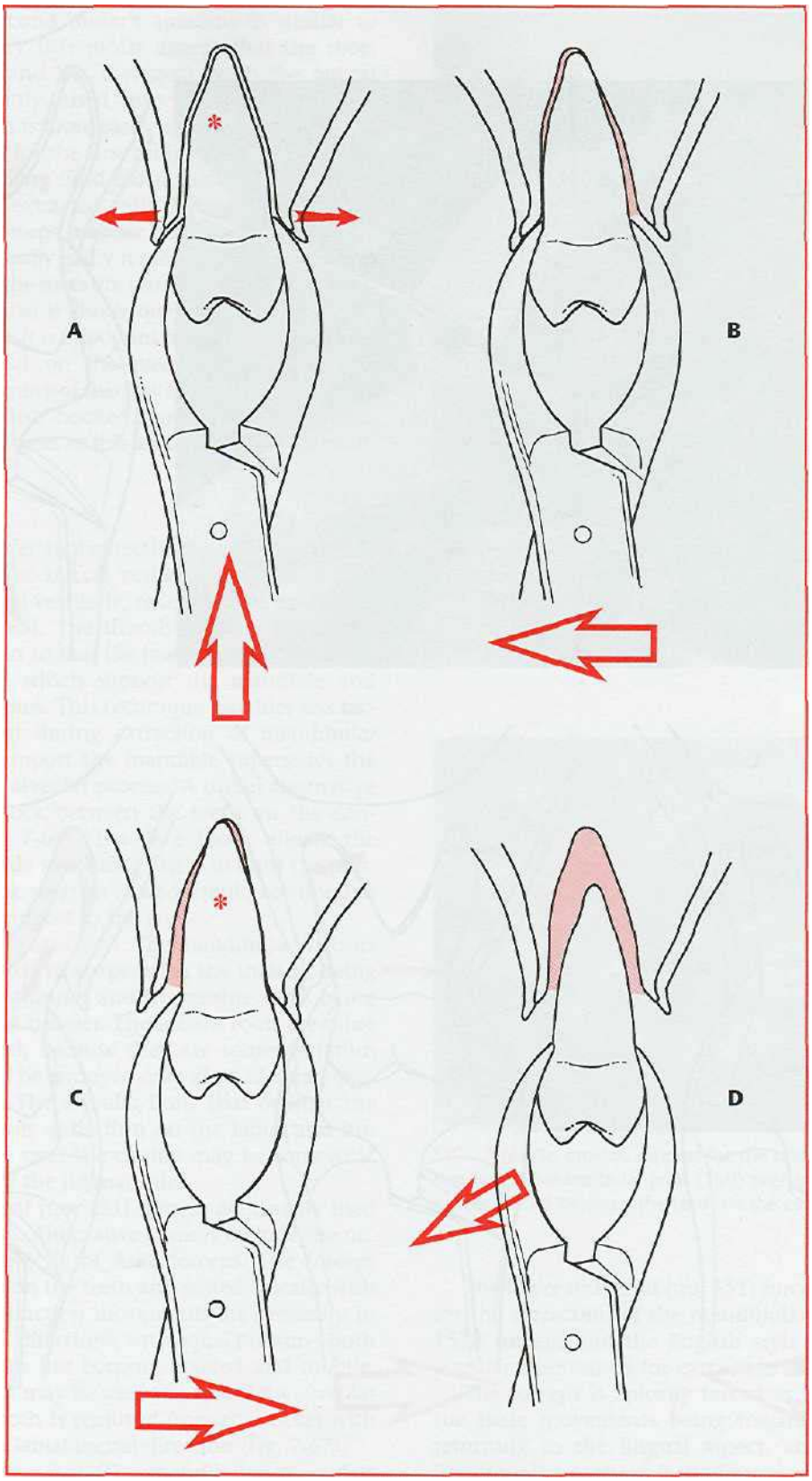


FIG. 7-63 A, When extracting maxillary second premolar, forceps is seated as far apically as possible. B, Luxation is begun with buccal pressure. C, Very slight lingual pressure is used. D, Tooth is delivered in buccoocclusal direction.

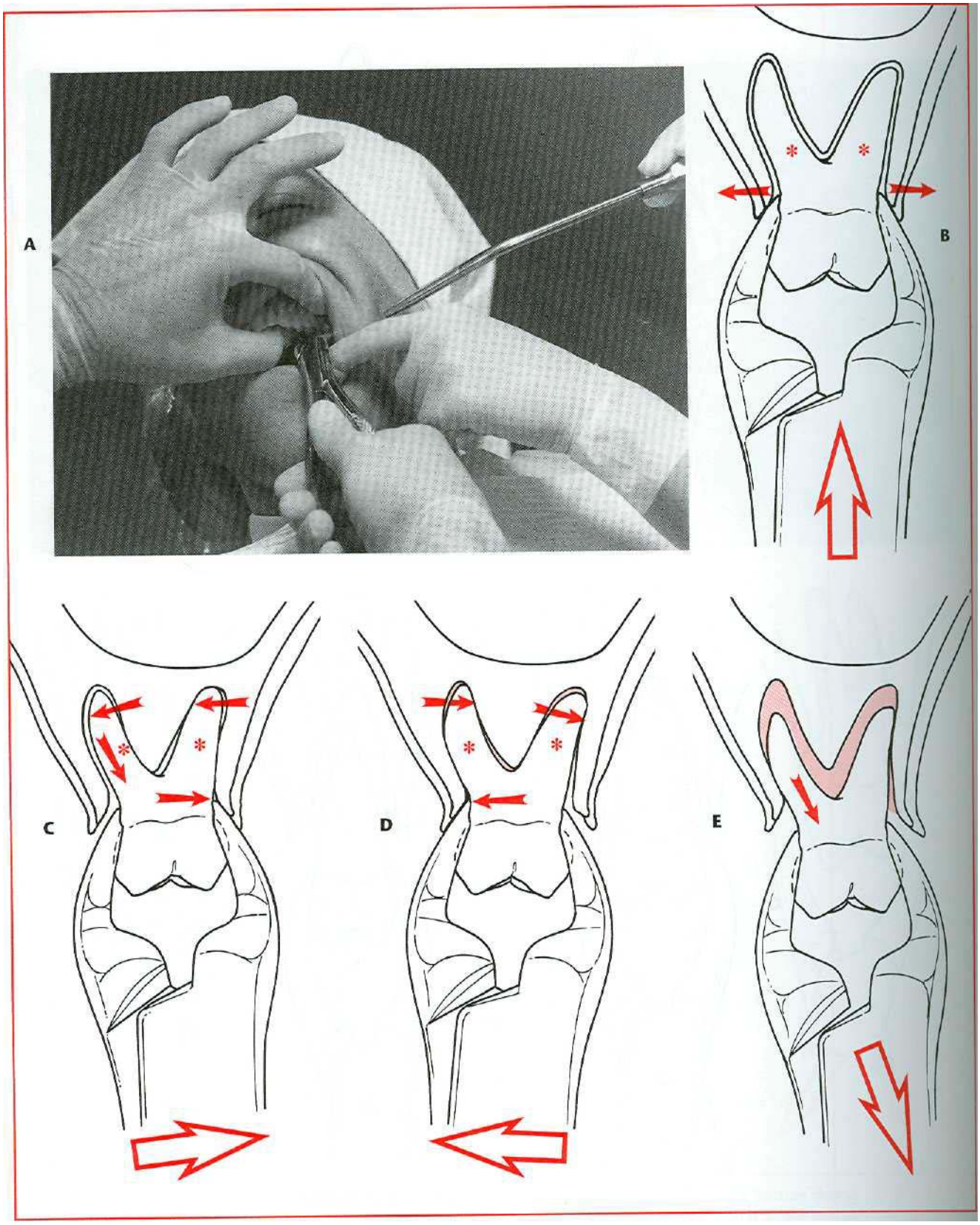


FIG. 7-64 A, Extraction of maxillary molars. Soft tissue of lips and cheek is reflected, and alveolar process is grasped with opposite hand. B, Forceps beaks are seated apically as far as possible. C, Luxation is begun with strong buccal force. D, Lingual pressures are used only moderately. E, Tooth is delivered in buccoocclusal direction.

The maxillary second molar's anatomy is similar to that of the maxillary first molar except that the roots tend to be shorter and Jess divergent, with the buccal roots more commonly fused into a single root. This means that the tooth is more easily extracted by the same technique described for the first molar.

The erupted maxillary third molar frequently has conic roots and is usually extracted with the no. 210S forceps, which is universal forceps used for both the left and right sides. The tooth is usually easily removed, because the buccal bone is thin and the roots are usually fused and conical. The erupted third molar is also frequently extracted by the use of elevators alone. It is important to clearly visualize the maxillary third molar on the preoperative radiograph, because the root anatomy of this tooth is quite variable and often small, dilacerated, hooked roots exist in this area. Retrieval of fractured roots in this area can be very difficult.

Mandibular Teeth

When removing lower molar teeth, the index finger of the left hand is in the buccal vestibule and the second finger is in the lingual vestibule, reflecting the lip, cheek, and tongue (Fig. 7-65). The thumb of the left hand is placed below the chin so that the jaw is held between the fingers and thumb, which support the mandible and minimize TMJ pressures. This technique provides less tactile information, but during extraction of mandibular teeth the need to support the mandible supersedes the need to support the alveolar process. A useful alternative is to place a bite block between the teeth on the contralateral side (Fig. 7-66). The bite block allows the patient to help provide stabilizing forces to limit the pressure on the TMJs. The surgeon's hand should continue to provide additional support to the jaw.

Mandibular anterior teeth. The mandibular incisors and canines are similar in shape, with the incisors being shorter and slightly thinner and the canine roots being longer and somewhat heavier. The incisor roots are more likely to be fractured, because they are somewhat thin and therefore should be removed only after adequate preextraction luxation. The alveolar bone that overlies the incisors and canines is quite thin on the labial and lingual sides. The bone over the canine may be somewhat thicker, especially on the lingual side.

The lower universal (no. 151) forceps are usually used to remove these teeth. Alternative choices include the no. 151A or the English style of Ashe forceps. The forceps beaks are positioned on the teeth and seated apically with strong force. The extraction movements are generally in the labial and lingual directions, with equal pressures both ways. Once the tooth has become luxated and mobile, rotational movement may be used to expand the alveolar bone further. The tooth is removed from the socket with fractional forces in a labial-incisal direction (Fig. 7-67).

Mandibular premolars. The mandibular premolars are among the easiest teeth to remove. The roots tend to be straight and conic, albeit sometimes slender. The overlying alveolar bone is thin on the buccal aspect and somewhat heavier on the lingual side.

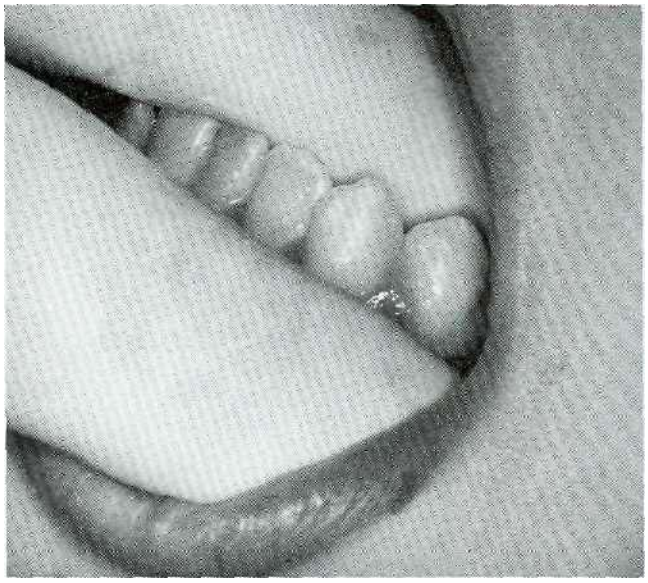


FIG. 7-65 Extraction of mandibular left posterior teeth. Surgeon's left index finger is positioned in buccal vestibule, reflecting cheek, and second finger is positioned in lingual vestibule, reflecting tongue. Thumb is positioned under chin. Jaw is grasped between fingers and thumb to provide support during extraction.

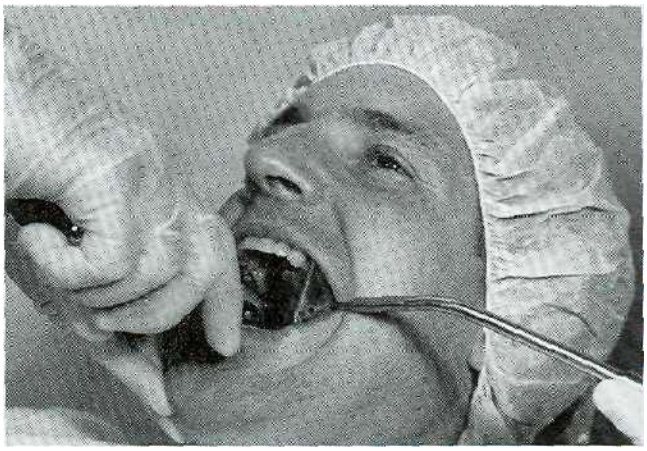


FIG. 7-66 To provide support for the mandible to prevent excessive temporomandibufar joint (TMJ) pressures, a rubber bite block can be placed between the teeth on the contralateral side.

The lower universal (no. 151) forceps is usually chosen for the extraction of the mandibular premolars. The no. 151A forceps and the English style of forceps are both popular alternatives for extraction of these teeth.

The forceps is apically forced as far as possible, with the basic movements being toward the buccal aspect, returning to the lingual aspect, and, finally, rotating. Rotational movement is used more when extracting these teeth than any others, except perhaps the maxillary central incisor. The tooth is then delivered in the occluso-**buccal** direction (Fig. 7-68). Careful preoperative radiographic assessment must be performed to assure the

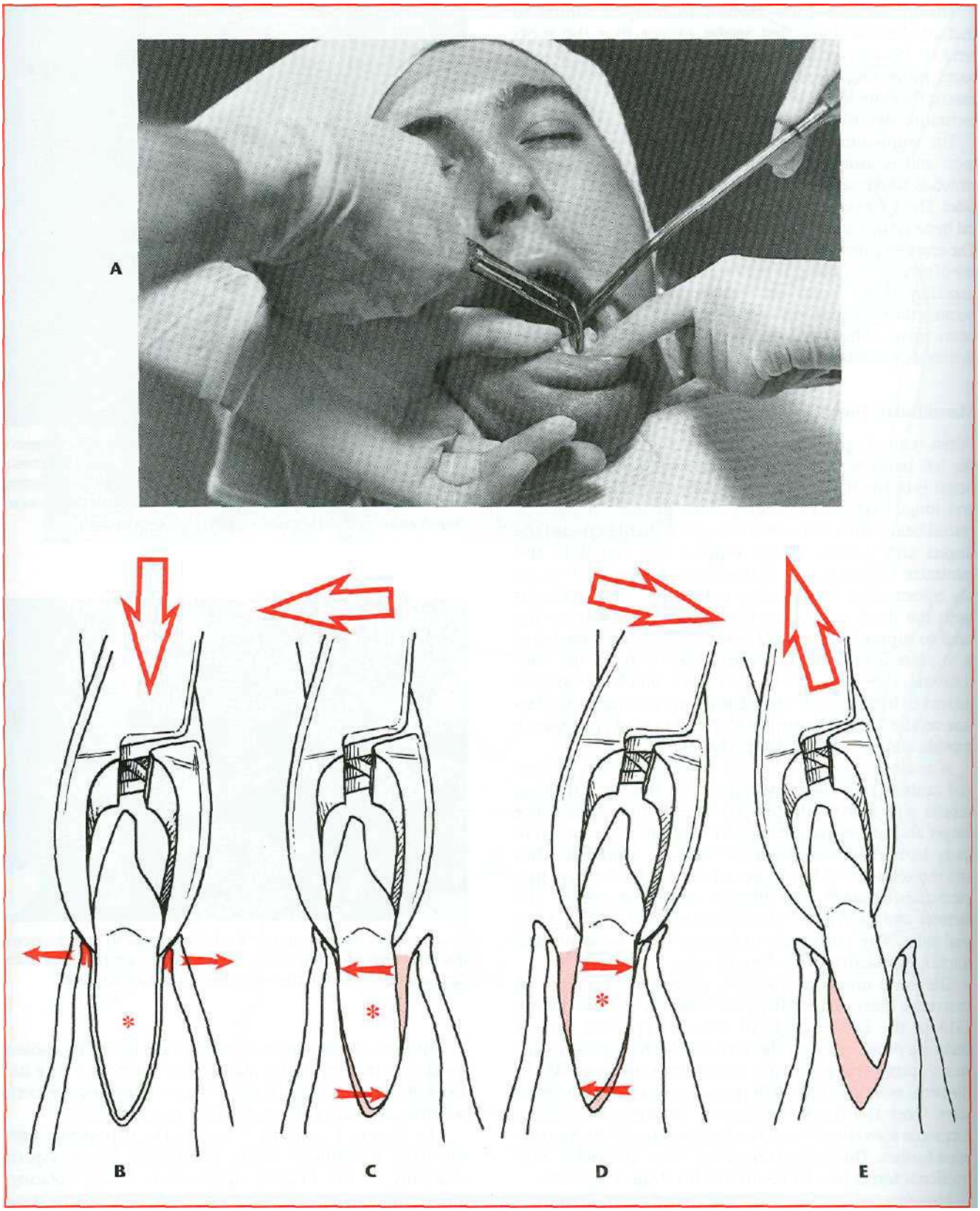


FIG. 7-67 A, When extracting mandibular anterior teeth, no. 151 forceps is used. Assistant reflects lip, and surgeon stabilizes jaw with left hand. B, Forceps is seated apically as far as possible. C, Moderate labial pressure is used to initiate luxation process. D, Lingual force is used to continue expansion of bone. E, Tooth is delivered in labial-incisal direction.

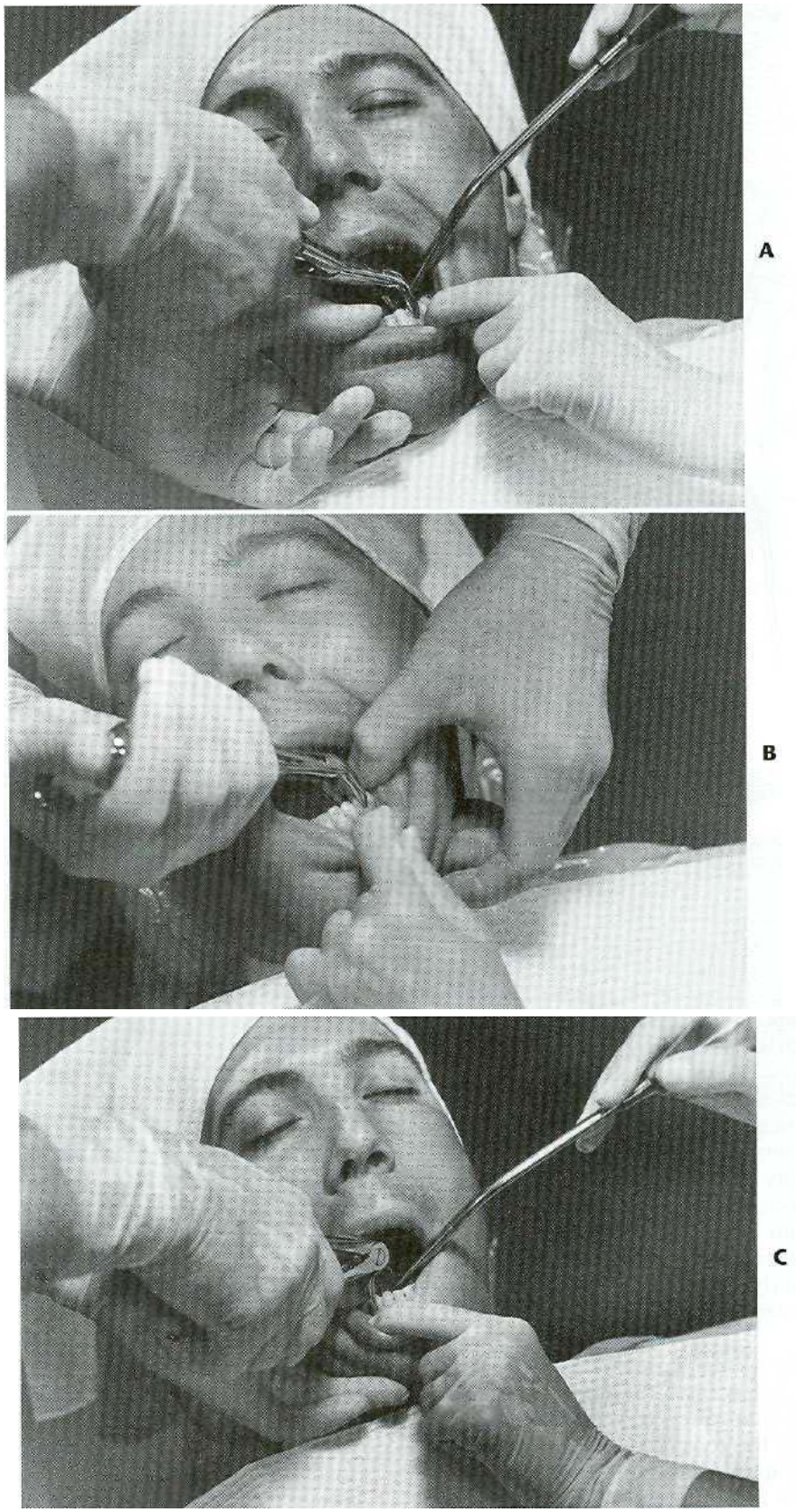


FIG. 7-68 A, Extraction of mandibular premolar. Jaw is stabilized, soft tissue is reflected, and no. 151 forceps is positioned. B, Hand position is modified slightly for behind-the-patient technique. C, English style of forceps can also be used.

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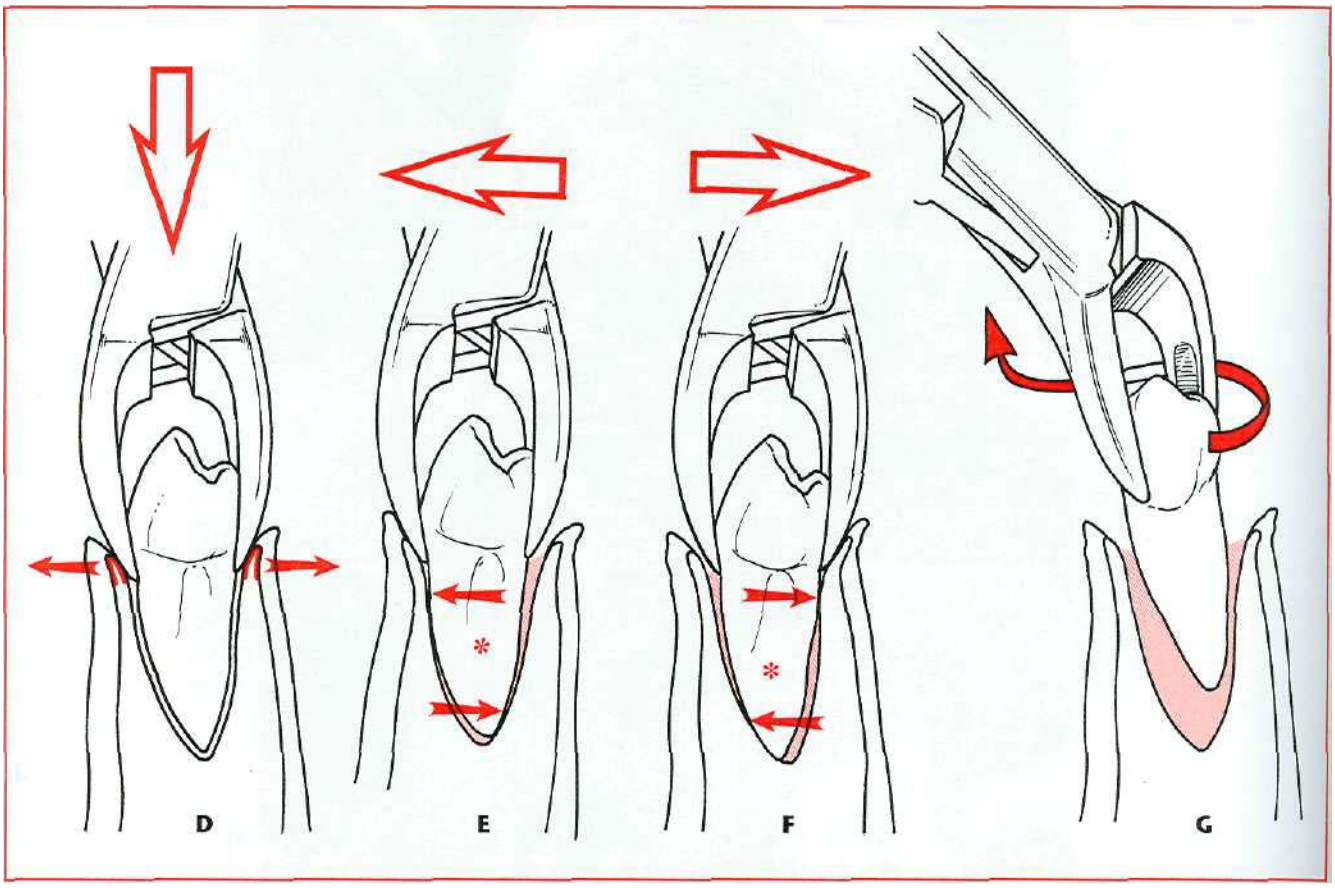


FIG. 7-68—cont'd D, Forceps is seated apically as far as possible to displace center of rotation and to begin expansion of crestal bone. E, Buccal forceps is applied to begin luxation process. F, Slight lingual pressure is used. C, Tooth is delivered with rotational, tractional force.

operator that no root curvature exists in the apical third of the tooth. If such a curvature does exist, the rotational movements should be reduced or eliminated from the extraction procedure (Fig. 7-69).

Mandibular molars. The mandibular molars are usually two rooted, with roots of the first molar more widely divergent than those of the second molar. Additionally the roots may converge at the apical one third, which increases the difficulty of extraction. The roots are generally heavy and strong. The overlying alveolar bone is heavier than the bone on any other teeth in the mouth. The combination of relatively long, strong, divergent roots with heavy overlying buccolingual bone makes the mandibular first molar the most difficult of all teeth to extract.

The no. 17 forceps is usually used for extraction of the mandibular molars; it has small tip projections on both beaks to fit into the bifurcation of the tooth roots. The forceps is adapted to the root of the tooth in the usual fashion, and strong apical pressure is applied to set the beaks of the forceps apically as far as possible. Strong buccolingual motion is then used to expand the tooth socket and allow the tooth to be delivered in the buccoocclusal direction. The linguoalveolar bone around the second molar is thinner than the buccal plate, so the second molar can be more easily removed with stronger lingual than buccal pressures (Fig. 7-70).

If the tooth roots are clearly bifurcated, the no. 23, or cowhorn, forceps can be used. This instrument is; designed to be closed forcefully with the handles, thereby squeezing the beaks of the forceps into the bifurcation. This creates force against the crest of the alveolar ridge on the buccolingual aspects and literally forces the tooth superiorly directly out of the tooth socket {Fig. 7-71). If initially this is not successful, the forceps is given buccolingual movements to expand the alveolar bone, and more squeezing of the handles is performed. Care must be taken with these forceps to prevent damaging the maxillary teeth, because the lower molar may actually pop out of the socket and thus release the forceps to strike the upper teeth (see Fig. 7-71).

Erupted mandibular third molars usually have fused conical roots. Because a bifurcation is not likely, the no. 222 forceps—a short-beaked, right-angled forceps—is used to extract this tooth. The lingual plate of bone is definitely thinner than the buccocortical plate, so most of the extraction forces should be delivered to the lingual aspect. The third molar is delivered in the linguloocclusal direction. The erupted mandibular third molar that is in function can be a deceptively difficult tooth to extract.

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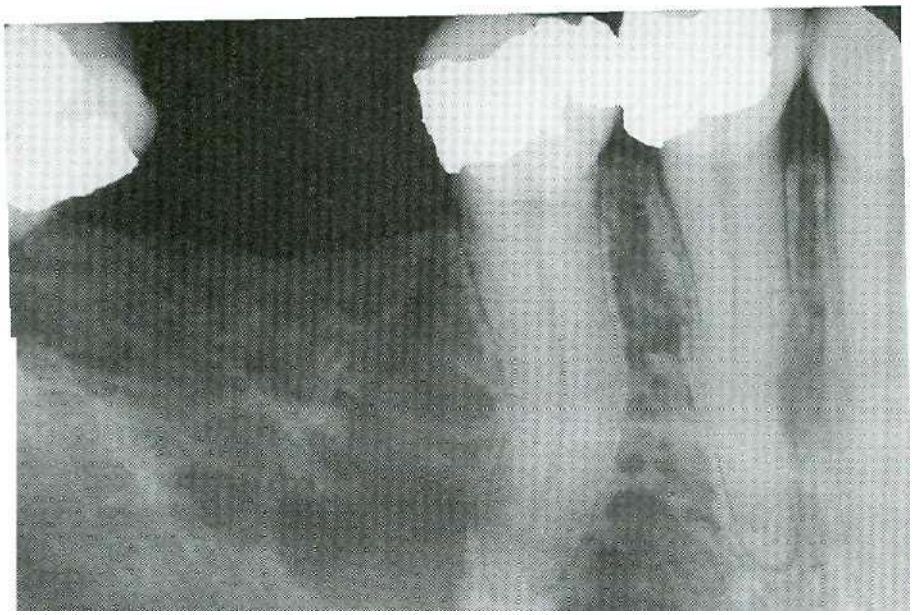


FIG. 7-69 If curvature of premolar root exists, rotational extraction forces will result in fracture of curved portion of root, and therefore such forces should be minimized.



A

FIG. 7-70 A, Mandibular molars are extracted with no. 1 7 or no. 23 forceps. Hand positions of surgeon and assistant are same for both forceps.

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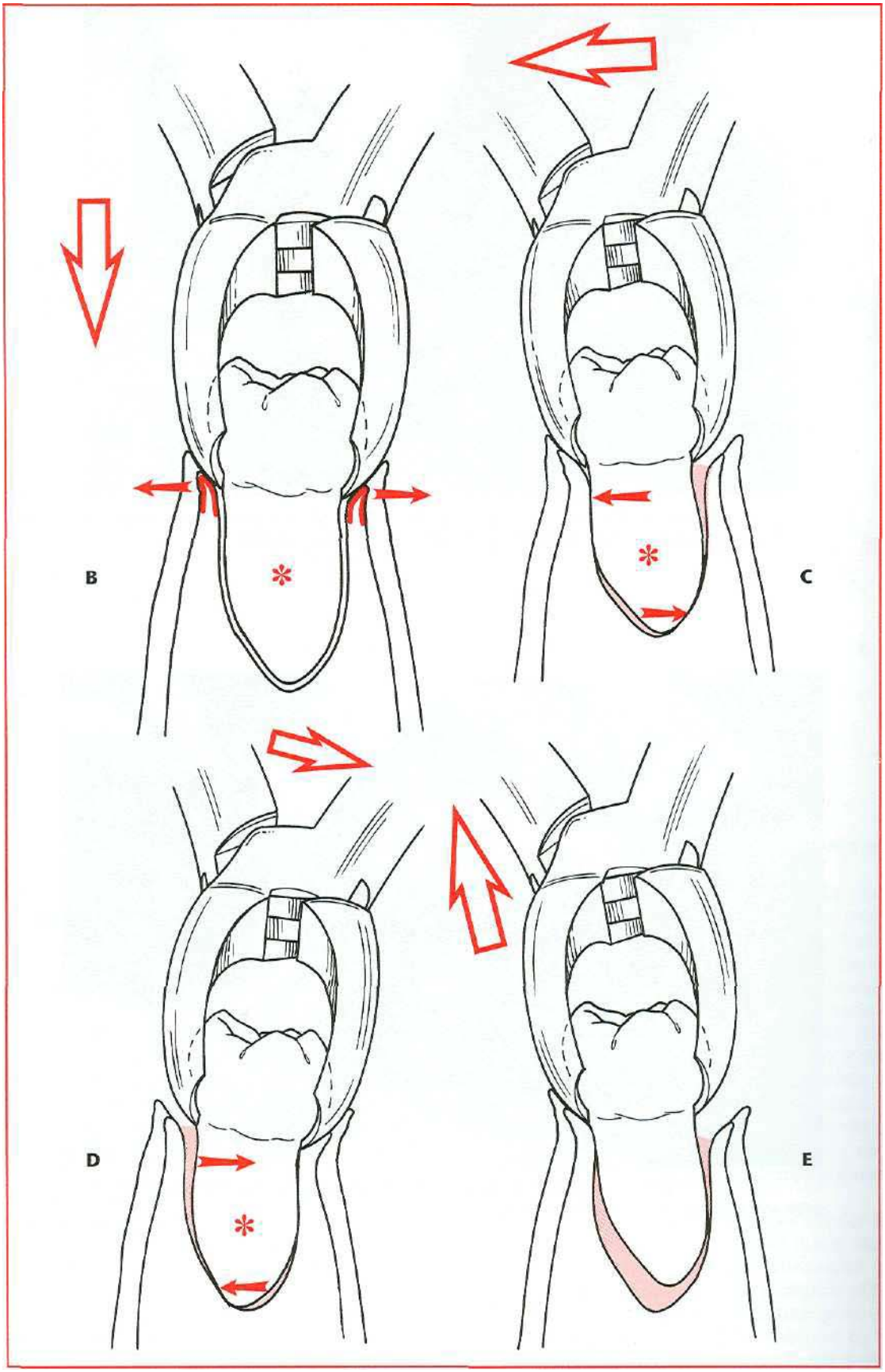


FIG. 7-70—cont'd **B,** No. **1** 7 forceps is seated as far apically as possible. **C**, Luxation of molar is begun with strong buccal movement. **D**, Strong lingual pressure is used to continue luxation. **E**, Tooth is delivered in buccoocclusal direction.

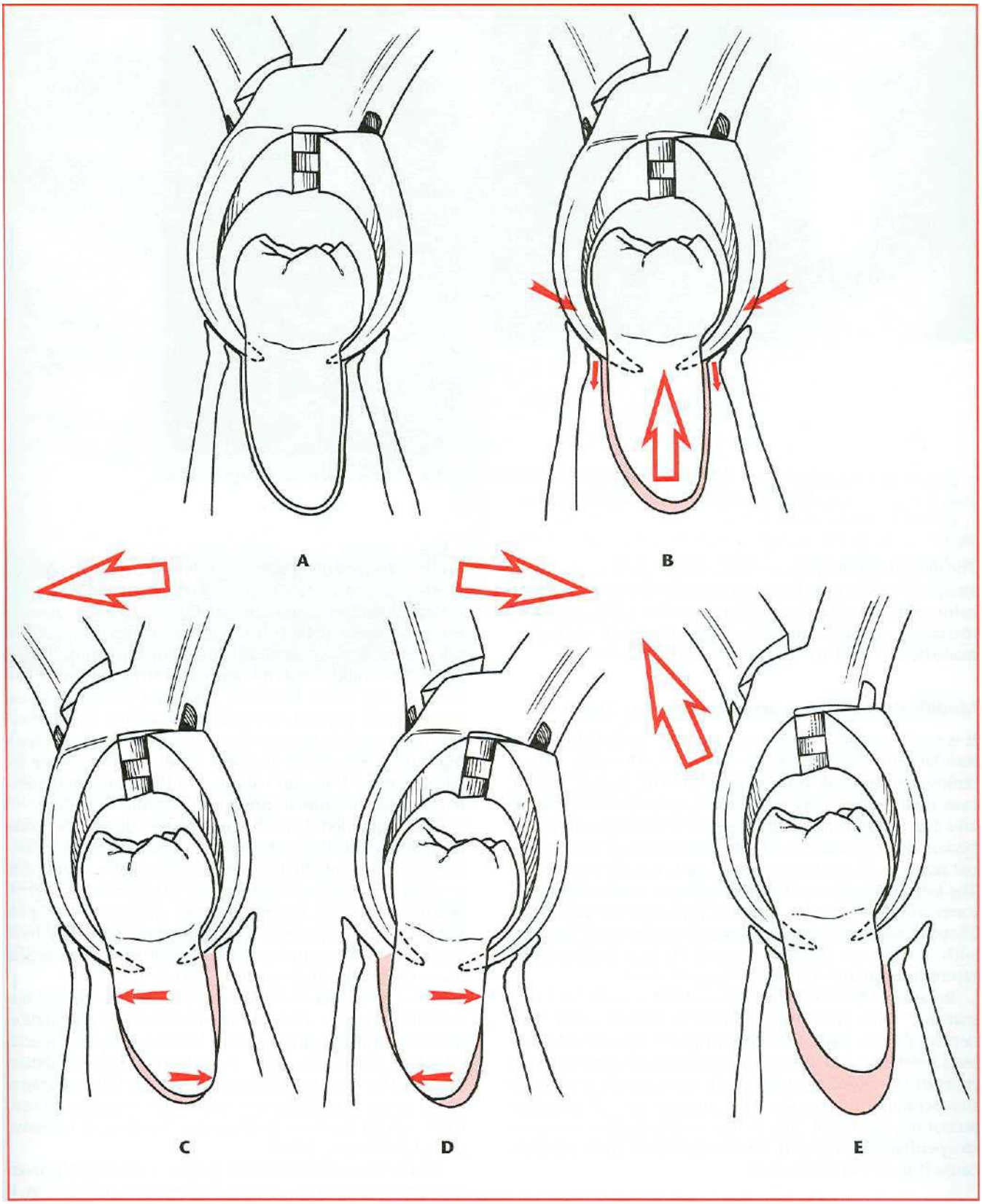


FIG. 7-71 **A**, No. 23 forceps is carefully positioned to engage bifurcation area of lower molar. **B**, Handles of forceps are squeezed forcibly together, which causes beaks of forceps to be forced into bifurcation and exerts tractional forces on tooth. **C**, Strong buccal forces are then used to expand socket. **D**, Strong lingual forces are used to luxate tooth further. **E**, Tooth is delivered in buccoocclusal direction with buccal and tractional forces.

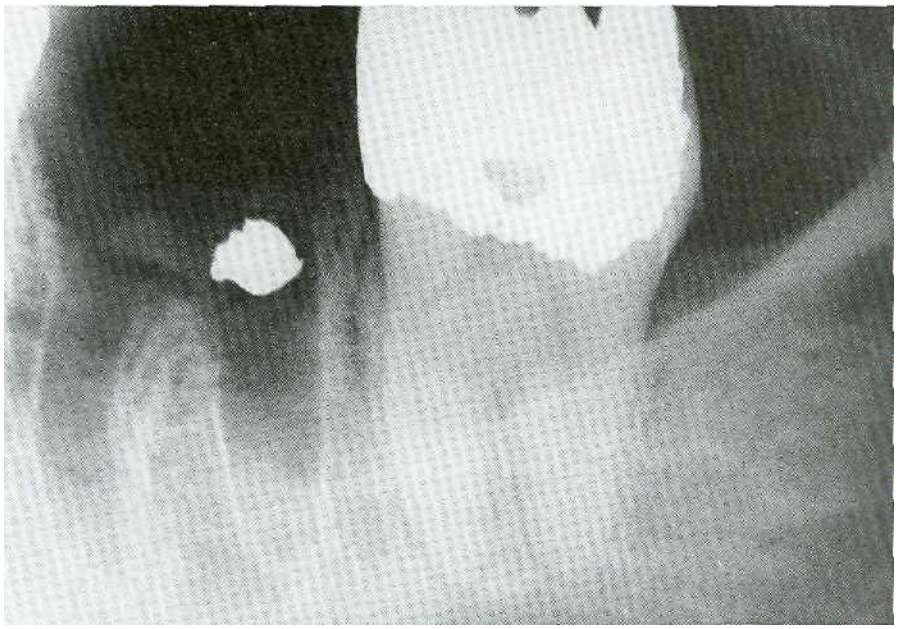


FIG. 7-72 Amalgam fragment left in this tooth socket after extraction, because surgeon failed to inspect and debride surgical field.

The dentist should give serious consideration to using the straight elevator to achieve a moderate degree of luxation before applying the forceps. Pressure should be gradually increased, and attempts to mobilize the tooth should be made before final strong pressures are delivered.

Modifications for Extraction of Primary Teeth

It is rarely necessary to remove primary teeth before substantial root resorption has occurred. However, when removal is required, it must be done with a great deal of care, because the roots of the primary teeth are very long and delicate and subject to fracture. This is especially true because the succedaneous tooth causes resorption of coronal portions of the root structure and thereby weakens it. The forceps usually used is an adaptation of the upper and lower universal forceps, the no. 150S and the no. 151S. They are adapted and forced apically in the usual fashion, with slow, steady pressures toward the buccal aspect and return movements toward the lingual aspect.

Rotational motions may be used but should be minimal and used judiciously with multirooted teeth. The dentist should pay careful attention to the direction of least resistance and deliver the tooth into that path. If the roots of the primary molar tooth embrace the crown of the permanent premolar, the surgeon should consider sectioning the tooth. Rarely the roots hold the crown of the permanent premolar firmly enough in their grasp to cause it to be extracted also.

POSTEXTRACTION CARE OF TOOTH SOCKET

Once the tooth has been removed from the socket, it is necessary to provide proper care. The socket should be debrided only if necessary. If a periapical lesion is visible on the preoperative radiograph and there was no granu loma attached to the tooth when it was removed, the periapical region should be carefully curetted to remove the granuloma or cyst. If any debris is obvious, such as calculus, amalgam, or tooth fragment remaining in the socket, it should be gently removed with a curette or suc-tion tip (Fig. 7-72). However, if neither periapical lesion nor debris is present, the socket *should not* be curetted. The remnants of the periodontal ligament and the bleed-ing bony walls are in the best condition to provide for rapid healing. Vigorous curettage of the socket wall mere-ly produces additional injury and may delay healing.

The expanded buccolingual plates should be compressed back to their original configuration. Finger pressure should be applied to the buccolingual cortical plate to gently but firmly compress the plates to their original position or approximate them even more closely, if possible. This helps prevent bony undercuts that may have been caused by excessive expansion of the buccocortical plate, especially after first molar extraction.

If the teeth were removed because of periodontal disease, there may be an accumulation of excess granulation tissue around the gingival cuff. If this is the case, special attention should be given to removing this granulation tissue with a curette or hemostat. The arterioles of granulation tissue have little or no capacity to retract and constrict, which leads to bothersome bleeding if excessive granulation tissue is left.

Finally, the bone should be palpated through the overlying mucosa to check for any sharp, bony projections. If any exist, the mucosa should be reflected and the sharp edges smoothed judiciously with a bone file.

To gain initial control of hemorrhage, a moistened 2 X 2 inch gauze is placed over the extraction socket. The gauze should be positioned so that when

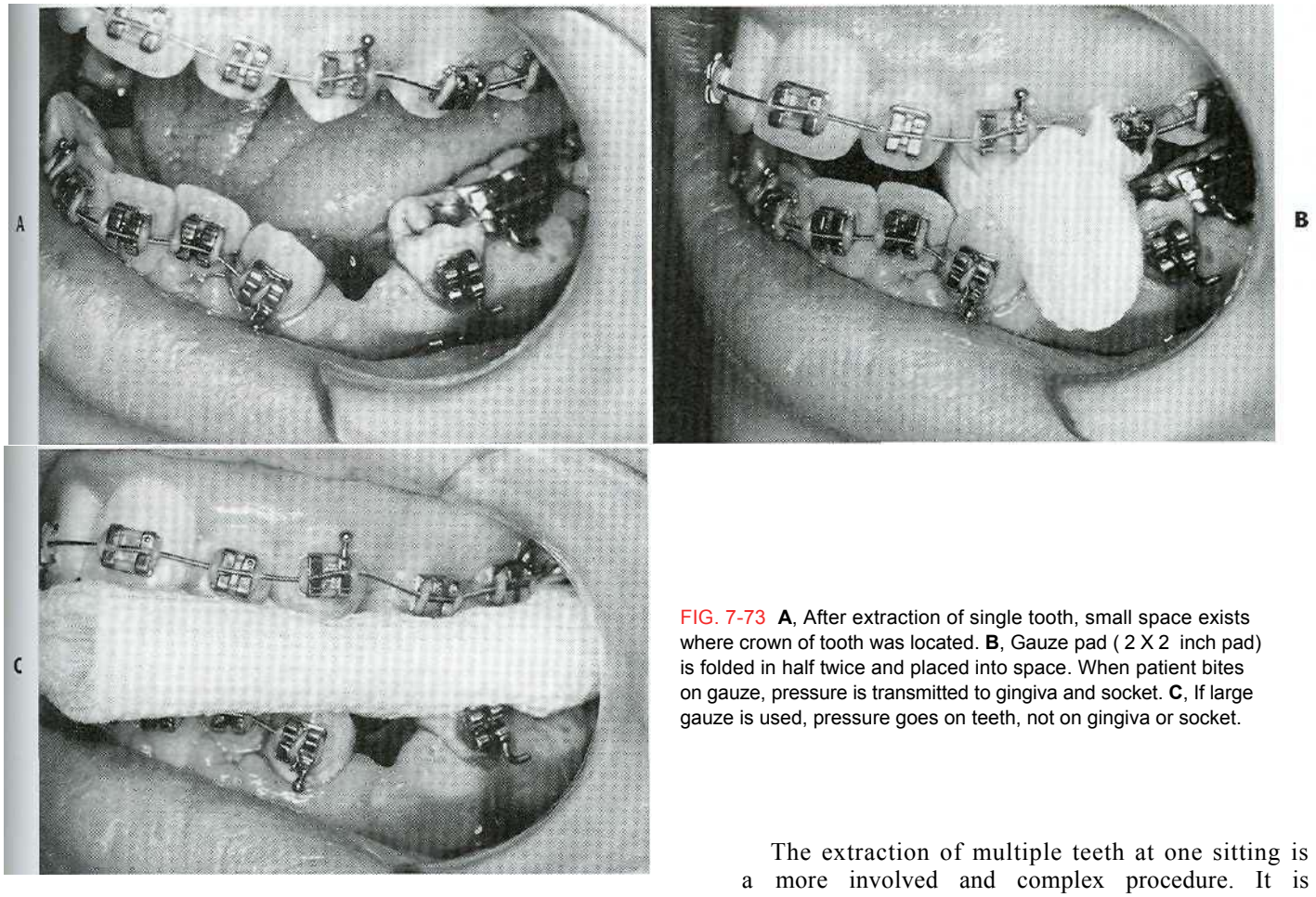


FIG. 7-73 **A**, After extraction of single tooth, small space exists where crown of tooth was located. **B**, Gauze pad (2 X 2 inch pad) is folded in half twice and placed into space. When patient bites on gauze, pressure is transmitted to gingiva and socket. **C**, If large gauze is used, pressure goes on teeth, not on gingiva or socket.

patient closes the teeth together, it fits into the space previously occupied by the crown of the tooth. The pressure of biting the teeth together is placed on the gauze and is transmitted to the socket. This pressure results in hemostasis. If the gauze is simply placed on the occlusal table, the pressure applied to the bleeding socket is insufficient to achieve adequate hemostasis (Fig. 7-73). A larger gauze sponge (4 x 4 inch) may be required if multiple teeth have been extracted or if the opposing arch is edentulous.

The extraction of multiple teeth at one sitting is a more involved and complex procedure. It is discussed in Chapter 8.

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